ThinkSystem SR650
Maintenance Manual

Machine Types: 7X05 and 7X06

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, ensure 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

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

ཐོན་རྟས་འདི་བདེ་སྐྱིད་མ་བྱས་གོང་། །སྐྱར་གྱི་ཡིད་གཟབ་
བྱ་འདུ་མིན་ཡོད་པའི་འོད་སྟེར་བལྟ་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۇر مەھسۇلاتنى ئورنتشتتن بۇرۇن بمخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقلك.

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

Safety inspection checklist

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

CAUTION:
**This equipment must be installed by trained service personnel, as defined by the NEC and IEC 60950-
1, Second Edition, the standard for Safety of Information Technology Equipment. Lenovo assumes you
are qualified in the servicing of equipment and trained in recognizing hazards in products with
hazardous energy levels.**

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://lesc.lenovo.com

     b. In the Customize a Model pane:

        1) Click **Select Options/Parts for a Model**.

        2) Enter the machine type and model for your server.

     c. Click the Power tab to see all line cords.

   - Make sure that the insulation is not frayed or worn.

3. Check for any obvious non-Lenovo alterations. Use good judgment as to the safety of any non-Lenovo alterations.

4. Check inside the server for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.

5. Check for worn, frayed, or pinched cables.

6. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Chapter 1. Introduction

The ThinkSystem SR650 server is a 2U rack server designed for performance and expansion for various IT workloads. With the modular design, the server is flexible to be customized for maximum storage capacity or high storage density with selectable input/output options and tiered system management.

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://datacentersupport.lenovo.com/documents/ht100742

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.
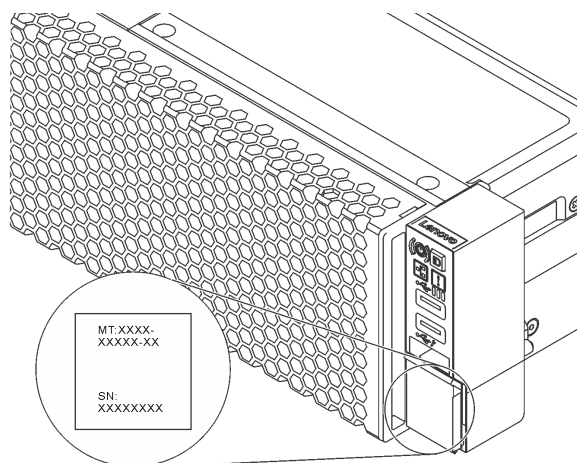
Figure 1. Location of the ID label

XClarity Controller network access label

The XClarity Controller network access label is attached on the top side of the pull-out information tab. After you get the server, peel the XClarity Controller network access label away and store it in a safe place.
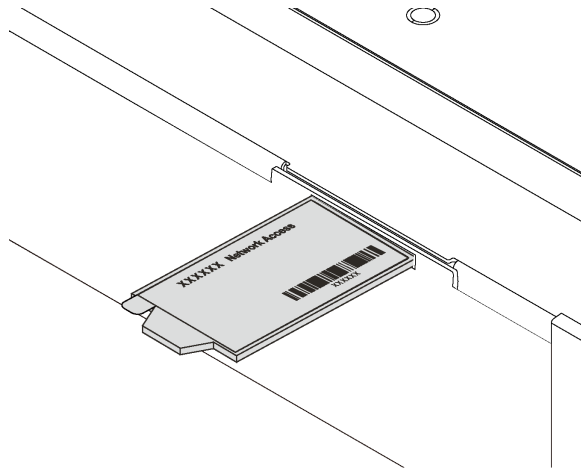
Figure 2. Location of the XClarity Controller network access label

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://support.lenovo.com/p/servers/sr650

Figure 3. QR code

Specifications

The following information is a summary of the features and specifications of the server. Depending on the model, some features might not be available, or some specifications might not apply.

Table 1. Server specifications
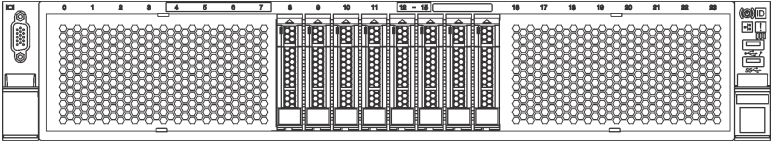
Specification	Description
Dimension	2U - Height: 86.5 mm (3.4 inches) - Width: - With rack latches: 482.0 mm (19.0 inches) - Without rack latches: 444.6 mm (17.5 inches) - Depth: 763.7 mm (30.1 inches) **Note:** The depth is measured with rack latches installed, but without the security bezel installed.
Weight	Up to 32.0 kg (70.6 lb), depending on the server configuration
Processor (depending on the model)	- Up to two Intel® processors - Designed for Land Grid Array (LGA) 3647 socket - Scalable up to 28 cores - Thermal Design Power (TDP): up to 205 watts For a list of supported processors, see: http://www.lenovo.com/us/en/serverproven/ **Note:** If you want to install the following processors to the server, ensure that the server chassis is twenty-four 2.5-inch-bay chassis and one backplane is installed in only the middle cage (for drive bays 8–15). - Intel Xeon® 6144 and 6146 processors - Processors with TDP equal to 200 watts or 205 watts *Figure 4. Front view of server models installed with Intel Xeon 6144 and 6146 processors, or processors with TDP equal to 200 watts or 205 watts*

Table 1. Server specifications (continued)

Specification	Description
DIMM	- Minimum: 8 GB - Maximum: 768 GB using registered DIMMs (RDIMMs) 1.5 TB using load-reduced DIMMs (LRDIMMs) 3 TB using three-dimensional stack registered DIMMs (3DS RDIMMs) - Type: - PC4-21300 (DDR4-2666), operating speed depends on processor model and UEFI Operating Mode selection - Single-rank, dual-rank, quad-rank, or octa-rank - RDIMM, LRDIMM, or 3DS RDIMM - Slots: 24 DIMM slots - Supports (depending on the model): 8 GB, 16 GB, and 32 GB RDIMMs 64 GB LRDIMMs 128 GB 3DS RDIMMs **Note:** For a list of supported DIMMs, see: http://www.lenovo.com/us/en/serverproven/
Internal drives	The supported drives vary by models. - Up to eight 3.5-inch hot-swap SAS/SATA drives - Up to twelve 3.5-inch hot-swap SAS/SATA drives - Up to twelve 3.5-inch hot-swap SAS/SATA/NVMe drives (NVMe drives are supported only in drive bays 8–11) - Up to eight 2.5-inch hot-swap SAS/SATA drives - Up to eight 2.5-inch hot-swap SAS/SATA/NVMe drives (NVMe drives are supported only in drive bays 4–7) - Up to sixteen 2.5-inch hot-swap SAS/SATA drives - Up to sixteen 2.5-inch hot-swap SAS/SATA/NVMe drives (NVMe drives are supported in drive bays 4–7 and bays 12–15) - Up to twenty-four 2.5-inch hot-swap SAS/SATA drives - Up to twenty-four 2.5-inch hot-swap SAS/SATA/NVMe drives (NVMe drives are supported in drive bays 4–7 and bays 12–15) - Up to two 3.5-inch hot-swap SAS/SATA drives in the rear - Up to two M.2 drives **Note:** NVMe drives means Non-Volatile Memory express drives.
Expansion slots	- One PCIe slot on the system board - One RAID adapter slot on the system board - Two riser card slots on the system board - Two or three PCIe slots on the riser card For detailed information, see "Rear view" on page 18.
Input/Output (I/O) features	- Front panel: - One VGA connector (available on some models) - One XClarity Controller USB connector - One USB 3.0 connector - Rear panel: - One VGA connector - One XClarity Controller network connector - One serial port (available on some models) - Two USB 3.0 connectors - Two or four Ethernet connectors on the LOM adapter (available on some models)

Table 1. Server specifications (continued)

Specification	Description
Graphics processing unit (GPU)	• Full-height, full-length, double-width • TDP: up to 300 watts **Note:** GPU is supported only when the following hardware configuration requirements are met at the same time: • Server model: eight 3.5-inch-drive bays, eight 2.5-inch-drive bays, or sixteen 2.5-inch-drive bays • Processor: not High Tcase type; TDP less than or equal to 150 watts • Drive: no NVMe drives installed • Power supply: for one GPU, 1100-watt or 1600-watt power supplies installed; for two GPUs, 1600-watt power supplies installed
RAID adapters (depending on the model)	• A RAID 530-8i SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, 5, 10, and 50 • A RAID 730-8i SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, 5, 10, and 50 (only available in China) • A RAID 930-8i, 930-16i, or 930-24i SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, 5, 6, 10, 50, and 60 • A RAID 930-8e SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, 5, 6, 10, 50, and 60
System fans	• One processor: five hot-swap fans (including one redundant fan) • Two processors: six hot-swap fans (including one redundant fan) **Notes:** • For server models installed with Intel Xeon 6144, 6146, 6154, 8168, 8180, and 8180M, fan redundancy function is not supported. If one fan fails, the server performance might be degraded. • If your server comes with only one processor, five system fans (fan 1 to fan 5) are adequate to provide proper cooling. However, you must keep the location for fan 6 occupied by a fan filler to ensure proper airflow.
Power supplies (depending on the model)	One or two hot-swap power supplies for redundancy support • 550-watt ac 80 PLUS Platinum • 750-watt ac 80 PLUS Platinum • 750-watt ac 80 PLUS Titanium • 1100-watt ac 80 PLUS Platinum • 1600-watt ac 80 PLUS Platinum

Table 1. Server specifications (continued)

Specification	Description
Electrical input	- Sine-wave input (50 Hz to 60 Hz) required - Input voltage low range: - Minimum: 100 V ac - Maximum: 127 V ac - Input voltage high range: - Minimum: 200 V ac - Maximum: 240 V ac **Note:** For server models with 750-watt ac 80 PLUS Titanium or 1600-watt ac 80 PLUS Platinum power supplies, 100–127 V ac input voltage is not supported. **CAUTION:** **240 V dc input (input range: 180-300 V dc) is supported in China 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.**
Environment	The server is supported in the following environment: - Air temperature: - Operating: - ASHRAE class A2: 10–35°C (50–95°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 300 m (984 ft) of altitude increase. - ASHRAE class A3: 5–40°C (41–104°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 175 m (574 ft) of altitude increase. - ASHRAE class A4: 5–45°C (41–113°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 125 m (410 ft) of altitude increase. - Server off: 5–45°C (41–113°F) - Shipping or storage: -40–60°C (-40–140°F) - Maximum altitude: 3050 m (10 000 ft) - Relative humidity (non-condensing): - Operating: - ASHRAE class A2: 8%–80%; maximum dew point: 21°C (70°F) - ASHRAE class A3: 8%–85%; maximum dew point: 24°C (75°F) - ASHRAE class A4: 8%–90%; maximum dew point: 24°C (75°F) - Shipping or storage: 8%–90% - Particulate contamination **Attention:** Airborne particulates and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server. For information about the limits for particulates and gases, see "Particulate contamination" on page 228. **Note:** Your server complies with ASHRAE class A2 specifications. The server performance might be impacted when the operating temperature is outside the ASHRAE A2 specifications. Depending on the hardware configuration, some server models comply with ASHRAE class A3 and class A4 specifications. To comply with ASHRAE class A3 and class A4 specifications, the server models must meet the following hardware configuration requirements at the same time: - Two power supplies installed

Table 1. Server specifications (continued)

Specification	Description
	- NVMe drives not installed - PCIe flash adapter not installed - GPU not installed - Certain processors not installed: – Processors with TDP more than or equal to 150 watts not installed – For server models with sixteen 2.5-inch drives, twenty-four 2.5-inch drives, or twelve 3.5-inch drives, the following frequency optimized processors not installed: Intel Xeon 4112, 5122, 6126, 6128, 6132, 6134, 6134M, and 8156 processors

Firmware updates

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.

Note: 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.

Best practices related to updating firmware is available at the following location:

http://lenovopress.com/LP0656

Important 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.

See the following table to determine the best Lenovo tool to use for installing and setting up the firmware:

Tool	In-band update	Out-of-band update	On-target update	Off-target update	Graphical user interface	Command-line interface	Supports UXSPs
Lenovo XClarity Provisioning Manager Limited to core system firmware only.	√			√	√		√
Lenovo XClarity Controller Supports core system firmware and most advanced I/O option firmware updates		√		√	√	√	
Lenovo XClarity Essentials OneCLI Supports all core system firmware, I/O firmware, and installed operating system driver updates	√	√				√	√
Lenovo XClarity Essentials UpdateXpress Supports all core system firmware, I/O firmware, and installed operating system driver updates	√	√			√		√
Lenovo XClarity Essentials Bootable Media Creator Supports core system firmware and I/O firmware updates. You can update the Microsoft Windows operating system, but device drivers are not included on the bootable image	√				√	√	√
Lenovo XClarity Administrator Supports core system firmware and I/O firmware updates	√	√		√	√		

The latest firmware can be found at the following site:

http://datacentersupport.lenovo.com/products/servers/thinksystem/sr650/7X05/downloads

- **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.

Additional information about using Lenovo XClarity Provisioning Manager to update firmware is available at:

http://sysmgt.lenovofiles.com/help/topic/LXPM/platform_update.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.

    Additional information about configuring Ethernet over USB is available at:

    http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/NN1ia_c_configuringUSB.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.

  Specific details about updating firmware using Lenovo XClarity Controller are available at:

  http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/NN1ia_c_manageserverfirmware.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).

  Specific details about updating firmware using Lenovo XClarity Essentials OneCLI is available at:

  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/lnvo-xpress

- **Lenovo XClarity Essentials Bootable Media Creator**

  You can use Lenovo XClarity Essentials Bootable Media Creator to create bootable media that is suitable for applying firmware updates, running preboot diagnostics, and deploying Microsoft Windows operating systems.

  You can obtain Lenovo XClarity Essentials BoMC from the following location:

  https://datacentersupport.lenovo.com/solutions/lnvo-bomc

- **Lenovo XClarity Administrator**

  If you are managing multiple servers using the Lenovo XClarity Administrator, you can update firmware for all managed servers through that interface. Firmware management is simplified by assigning firmware-compliance policies to managed endpoints. When you create and assign a compliance policy to managed endpoints, Lenovo XClarity Administrator monitors changes to the inventory for those endpoints and flags any endpoints that are out of compliance.

Specific details about updating firmware using Lenovo XClarity Administrator are available at:

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

Configuring the LAN over USB interface manually

To perform a firmware update through the operating system using Lenovo XClarity Essentials OneCLI, the Lenovo XClarity Controller must be configured to use the LAN over USB interface. The firmware update package attempts to perform the setup automatically, if needed. If the automatic setup fails or if you prefer to set up the LAN over USB manually, use one of the following procedures.

Additional information about using the Lenovo XClarity Controller to enable LAN over USB is available at:

http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/NN1ia_c_configuringUSB.html

Installing the LAN over USB Windows device driver

When you install a Windows operating system, there might be an unknown RNDIS device in the Device Manager. Lenovo provides a Windows INF file that identifies this device.

Complete the following steps to install `ibm_rndis_server_os.inf`:

Note: You only have to perform these steps if the compute node is running a Windows operating system and the `ibm_rndis_server_os.inf` file has not been previously installed. The file only has to be installed once. It is required by Windows operating systems to detect and use the LAN over USB functionality.

Step 1. Click **Administrative Tools → Computer Management → Device Manager** and find the RNDIS Device. Click **Properties → Driver → Reinstall driver**. Point the server to the `\Windows\inf` directory where it can find the `ibm_rndis_server_os.inf` file and install the device.

Step 2. Click **Administrative Tools → Device Manager**. Right-click **Network adapters** and select **Scan for hardware changes**. A small pop-up confirms that the Ethernet device is found and installed. The New Hardware Wizard starts automatically.

Step 3. When you are prompted `Can Windows connect to Windows Update to search for software?`, select **No, not this time**. Click **Next** to continue.

Step 4. When you are prompted `What do you want the wizard to do?`, select **Install from a list or specific location (Advanced)**. Click **Next** to continue.

Step 5. When you are prompted `Please choose your search and installation options`, select **Don't search. I will choose the driver to install**. Click **Next** to continue.

Step 6. When you are prompted `Select a hardware type, and then click Next`, select **Network adapters**. Click **Next** to continue.

Step 7. When you are prompted with the statement `Completing the Found New Hardware Wizard`, click **Finish**. A new local area connection appears. If the message `This connection has limited or no connectivity` is displayed, ignore this message.

Step 8. Return to the Device Manager. **Lenovo USB Remote NDIS Network Device** appears under **Network Adapters**.

Step 9. Use the Lenovo XClarity Controller interface to view or set the IP address for the LAN adapter.

Additional information about using the Lenovo XClarity Controller to configure LAN over USB is available at:

http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/NN1ia_c_configuringUSB.html

Tech Tips

Lenovo continually updates the support website with the latest tips and techniques that you can use to solve issues that you might have with your server. These Tech Tips (also called retain tips or service bulletins) provide procedures to work around issues 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 **How-tos & Solutions**.

   Expand **Symptom** to choose a category for the type is 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

Power on the server

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

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

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

For information about powering off the server, see "Power off the server" on page 11.

Power off the server

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

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

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

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

When in a standby state, the server can respond to remote power-on requests sent to the Lenovo XClarity Controller. For information about powering on the server, see "Power on the server" on page 11.

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.

The illustrations in this topic show the server front views based on the supported drive bays.

Notes:

- Your server might look different from the illustrations in this topic.
- The chassis for sixteen 2.5-inch-drive bays cannot be upgraded to the chassis for twenty-four 2.5-inch-drive bays.
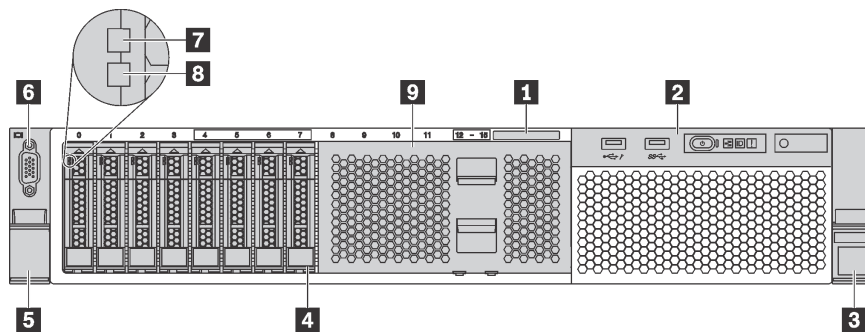
Figure 5. Front view of server models with eight 2.5-inch drive bays
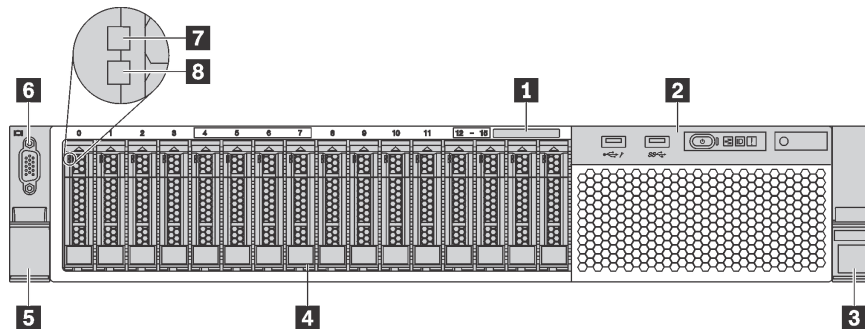
Figure 6. Front view of server models with sixteen 2.5-inch drive bays
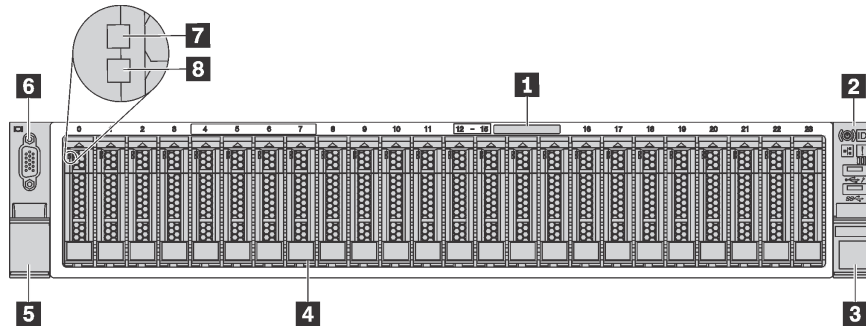
Figure 7. Front view of server models with twenty-four 2.5-inch drive bays
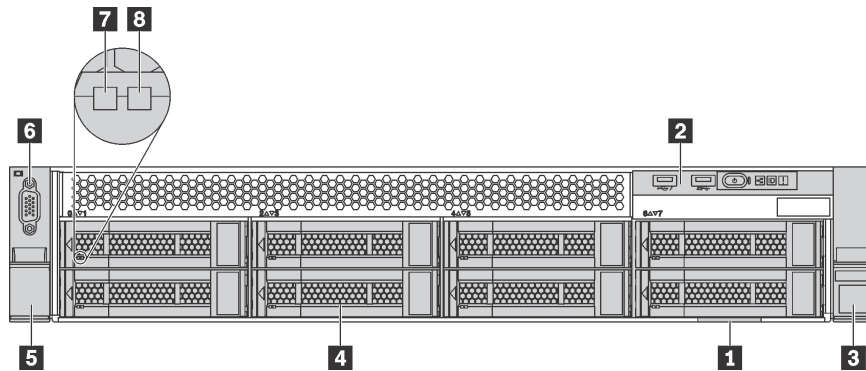
Figure 8. Front view of server models with eight 3.5-inch drive bays
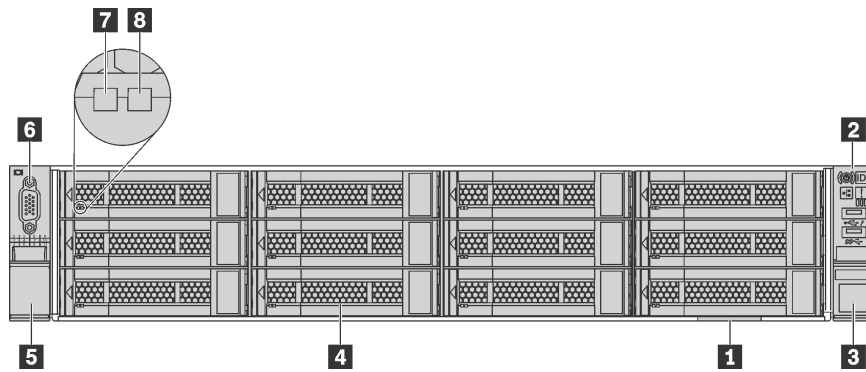
Figure 9. Front view of server models with twelve 3.5-inch drive bays

Table 2. Components on the front of server models with 2.5-inch drives

Callout	Callout
1 Pull-out information tab	**2** Front I/O assembly
3 Rack latch (right)	**4** Drive bays
5 Rack latch (left)	**6** VGA connector (available on some models)
7 Drive activity LED	**8** Drive status LED
9 Drive bay filler	

1 Pull-out information tab

The XClarity Controller network access label is attached on the top side of the pull-out information tab.

2 Front I/O assembly

For information about the controls, connectors, and status LEDs on the front I/O assembly, see "Front I/O assembly" on page 15.

3 5 Rack latches

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

4 Drive bays

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. The vacant drive bays must be occupied by drive bay fillers or drive fillers.

6 VGA connector (available on some models)

Used to attach a high-performance monitor, a direct-drive monitor, or other devices that use a VGA connector.

7 Drive activity LED

8 Drive status LED

Each hot-swap drive has two LEDs.

Drive LED	Status	Description
7 Drive activity LED	Solid green	The drive is powered but not active.
	Blinking green	The drive is active.
8 Drive status LED	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.

9 Drive bay filler

The drive bay filler is used to cover vacant drive bays.

Front I/O assembly

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

The following illustrations show the controls, connectors, and LEDs on the front I/O assembly of the server. To locate the front I/O assembly, see "Front view" on page 13.
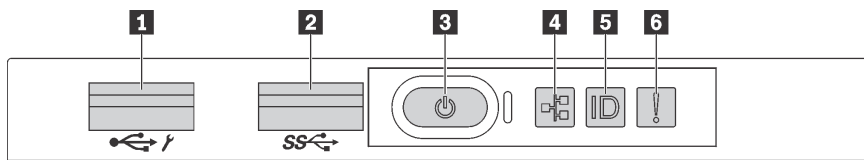
Figure 10. Front I/O assembly for server models with eight 3.5-inch-drive bays, eight 2.5-inch-drive bays, and sixteen 2.5-inch-drive bays
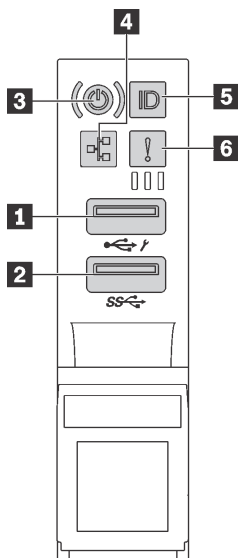
Figure 11. Front I/O assembly for server models with twelve 3.5-inch-drive bays and twenty-four 2.5-inch-drive bays

Table 3. Components on the front I/O assembly

Callout	Callout
1 XClarity Controller USB connector	**2** USB 3.0 connector
3 Power button with power status LED	**4** Network activity LED
5 System ID button with system ID LED	**6** System error LED

1 XClarity Controller USB connector

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, you can attach a device that requires a USB 2.0 connection, such as a keyboard, a mouse, or a USB storage device.
- If the connector is set for XClarity Controller management function, you can attach a mobile device installed with the application to run XClarity Controller event logs.
- 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.

2 USB 3.0 connector

Used to attach a device that requires a USB 2.0 or 3.0 connection, such as a keyboard, a mouse, or a USB storage device.

3 Power button with power status LED

You can press the power button to turn on the server when you finish setting up the server. You also can hold the power button for several seconds to turn off the server if you cannot turn off the server from the operating system. The power status LED helps you to determine the current power status.

Status	Color	Description
Solid on	Green	The server is on and running.
Slow blinking (about one flash per second)	Green	The server is off and is ready to be powered on (standby state).
Fast blinking (about four flashes per second)	Green	The server is off, but the XClarity Controller is initializing, and the server is not ready to be powered on.
Off	None	There is no ac power applied to the server.

4 Network activity LED

The network activity LED on the front I/O assembly helps you identify the network connectivity and activity.

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.

5 System ID button with system ID LED

Use this system ID button and the blue system ID LED to visually locate the server. A system ID LED is also located on the rear of the server. Each time you press the system ID button, the state of both the system ID LEDs changes. The LEDs can be changed to on, blinking, or off. You can also use the Lenovo XClarity Controller or a remote management program to change the state of the system ID LEDs to assist in visually locating the server among other servers.

If the XClarity Controller USB connector is set to have both the USB 2.0 function and XClarity Controller management function, you can press the system ID button for three seconds to switch between the two functions.

6 System error LED

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

Status	Color	Description	Action
On	Yellow	An error has been detected on the server. Causes might include but not limited to the following errors: • The temperature of the server reached the non-critical temperature threshold. • The voltage of the server reached the non-critical voltage threshold. • A fan has been detected to be running at low speed. • A hot-swap fan has been removed. • The power supply has a critical error. • The power supply is not connected to the power.	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 "Light path diagnostics" on page 207.
Off	None	The server is off or the server is on and is working correctly.	None.

Rear view

The rear of the server provides access to several connectors and components.
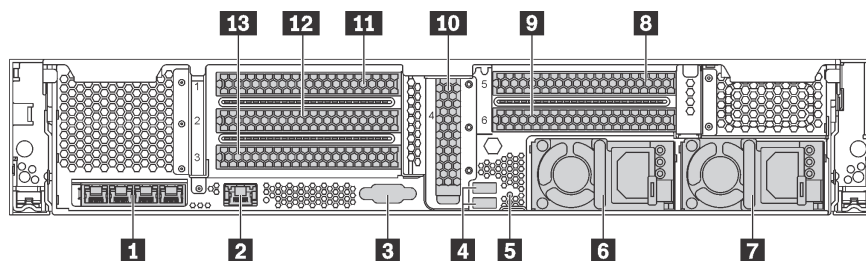
Figure 12. Rear view of server models with six PCIe slots
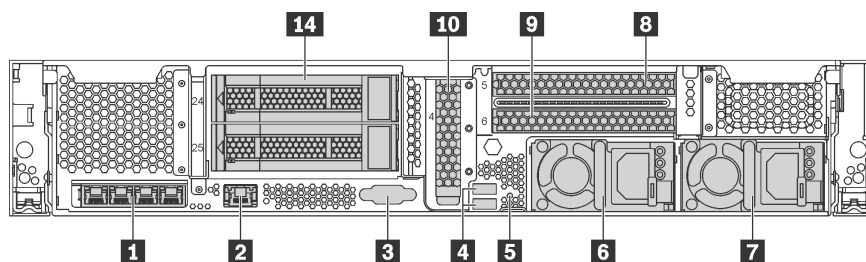

Figure 13. Rear view of server models with two rear 3.5-inch drive bays and three PCIe slots

Table 4. Components on the rear of the server

Callout	Callout
1 Ethernet connectors on the LOM adapter (available on some models)	**2** XClarity Controller network connector
3 VGA connector	**4** USB 3.0 connectors (2)
5 NMI button	**6** Power supply 1

Table 4. Components on the rear of the server (continued)

Callout	Callout
7 Power supply 2 (available on some models)	**8** PCIe slot 5 (on riser 2)
9 PCIe slot 6 (on riser 2)	**10** PCIe slot 4 (with a serial port module installed on some models)
11 PCIe slot 1 (on riser 1)	**12** PCIe slot 2 (on riser 1)
13 PCIe slot 3 (on riser 1)	**14** Rear 3.5-inch drive bays (2)

1 Ethernet connectors on the LOM adapter (available on some models)

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

The leftmost Ethernet connector on the LOM adapter can be set as XClarity Controller network connector. To set the Ethernet connector as XClarity Controller network connector, start Setup utility, go to **BMC Settings → Network Settings → Network Interface Port** and select **Shared**. Then, go to **Shared NIC on** and select **PHY card**.

2 XClarity Controller network connector

Used to attach an Ethernet cable to manage the system using XClarity Controller.

3 VGA connector

Used to attach a high-performance monitor, a direct-drive monitor, or other devices that use a VGA connector.

4 USB 3.0 connectors (2)

Used to attach a device that requires a USB 2.0 or 3.0 connection, such as a keyboard, a mouse, or a USB storage device.

5 NMI button

Press this button to force a nonmaskable interrupt (NMI) to the processor. By this way, you can blue screen the server and take a memory dump. You might have to use a pen or the end of a straightened paper clip to press the button.

6 Power supply 1
7 Power supply 2 (available on some models)

The hot-swap redundant power supplies help 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 status LEDs, see "Rear view LEDs" on page 21.

8 9 10 11 12 13 PCIe slots

You can find the PCIe slot numbers on the rear of the chassis.

Notes:

- Your server supports PCIe slot 5 and PCIe slot 6 when two processors are installed.

- Do not install PCIe adapters with small form factor (SFF) connectors in PCIe slot 6.
- Observe the following PCIe slot selection priority when installing an Ethernet adapter or a converged network adapter:

Number of installed processors	PCIe slot selection priority
One processor	4, 2, 3, 1
Two processors	4, 2, 6, 3, 5, 1

PCIe slots 1, 2, and 3 on riser 1:

There are four different riser cards that can be installed in riser 1.

- Type 1
  - Slot 1: PCIe x16 (x8, x4, x1), full-height, half-length
  - Slot 2: PCIe x16 (x8, x4, x1), full-height, half-length
  - Slot 3: PCIe x16 (x8, x4, x1), full-height, half-length
- Type 2
  - Slot 1: PCIe x16 (x8, x4, x1), full-height, half-length
  - Slot 2: PCIe x16 (x8, x4, x1), full-height, half-length
  - Slot 3: ML2 x8 (x8, x4, x1), full-height, half-length
- Type 3
  - Slot 1: PCIe x16 (x16, x8, x4, x1), full-height, half-length
  - Slot 2: Not available
  - Slot 3: PCIe x16 (x8, x4, x1), full-height, half-length
- Type 4
  - Slot 1: PCIe x16 (x8, x4, x1), full-height, half-length
  - Slot 2: Not available
  - Slot 3: ML2 x16 (x16, x8, x4, x1), full-height, half-length

PCIe slot 4 on the system board: PCIe x8 (x8, x1), low-profile

PCIe slots 5 and 6 on riser 2:

- Slot 5: PCIe x16 (x16, x8, x4, x1), full-height, half-length
- Slot 6: PCIe x16 (x16, x8, x4, x1), full-height, half-length

🔟🔟 Rear 3.5-inch drive bays (2)

Used to install up to two 3.5-inch hot-swap drives on the rear of the server. The rear 3.5-inch drive bays are available on some models.

The number of the installed drives in your server varies by model. The EMI integrity and cooling of the server are protected by having all drive bays occupied. The vacant drive bays must be occupied by drive bay fillers or drive fillers.

Rear view LEDs

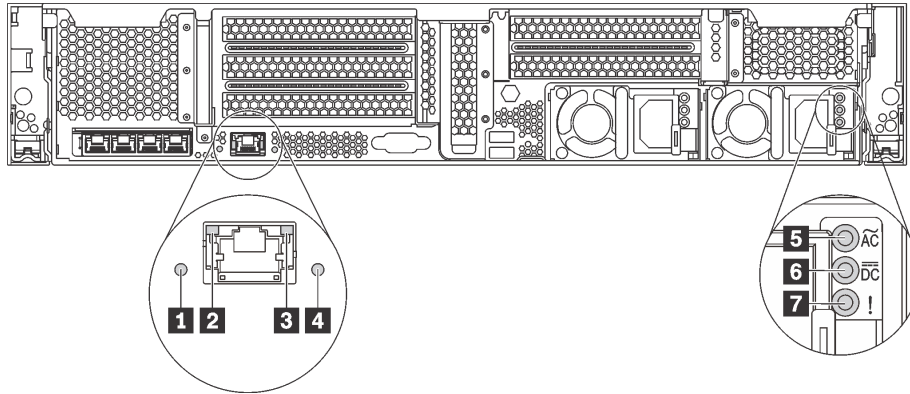The illustration in this section shows the LEDs on the rear of the server.

Figure 14. Rear view LEDs of the server

Table 5. 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. You can also use the Lenovo XClarity Controller or a remote management program to change the state of the system ID LEDs to assist in visually locating the server among other servers.

2 3 Ethernet status LEDs

The XClarity Controller network 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 I/O assembly" on page 15.

5 **Power input LED**
6 **Power output LED**
7 **Power supply error LED**

Each hot-swap power supply has three status LEDs.

LED	Description
5 Power input LED	• 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	• 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, start the Setup utility, go to **System Settings ➔ Power ➔ Zero Output** and select **Disable**. 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	• Yellow: The power supply has failed. To resolve the issue, replace the power supply. • Off: The power supply is working normally.

System board components

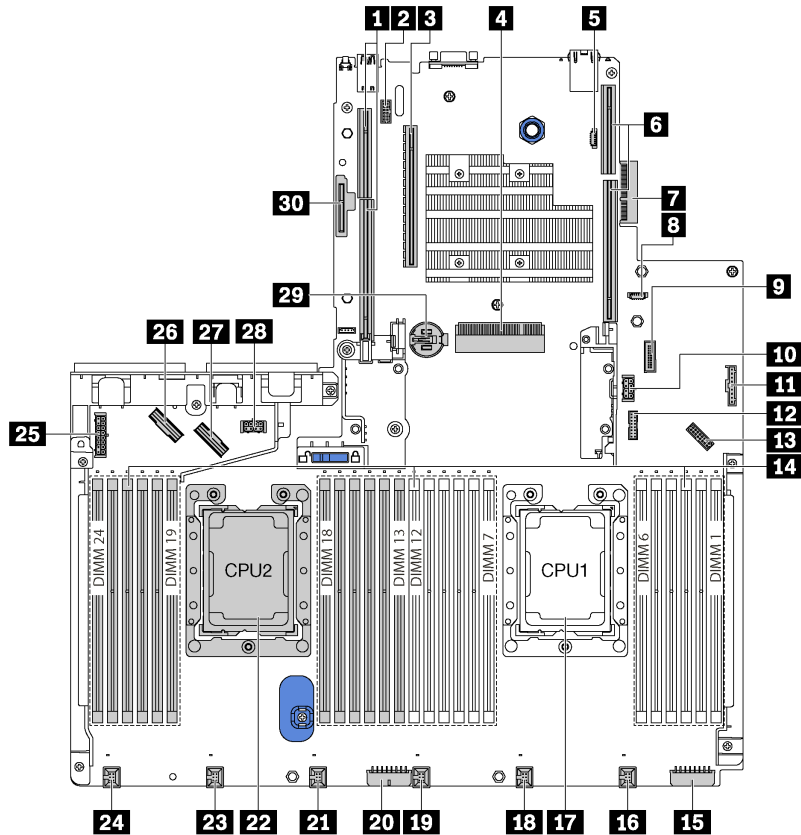The illustration in this section shows the component locations on the system board.

Figure 15. System board components

Table 6. Components on the system board

Callout	Callout
1 Riser 2 slot	**2** Serial-port-module connector
3 PCIe slot 4	**4** RAID adapter slot
5 BIOS ROM programming connector	**6** Riser 1 slot
7 LOM adapter connector	**8** XCC ROM programming connector
9 Front USB connector	**10** GPU power connector 2
11 Operator-information-panel connector	**12** Trusted Cryptography Module (TCM) connector (for China only)
13 Front VGA connector	**14** DIMM slots (24)
15 Backplane power connector 3	**16** System fan 1 connector
17 Processor 1 socket	**18** System fan 2 connector
19 System fan 3 connector	**20** Backplane power connector 2

Table 6. Components on the system board (continued)

Callout	Callout
21 System fan 4 connector	**22** Processor 2 socket
23 System fan 5 connector	**24** System fan 6 connector
25 Backplane power connector 1	**26** NVMe 2–3 connector
27 NVMe 0–1 connector	**28** GPU power connector 1
29 CMOS battery	**30** M.2 module slot (SATA / PCIe slot 8)

System board LEDs

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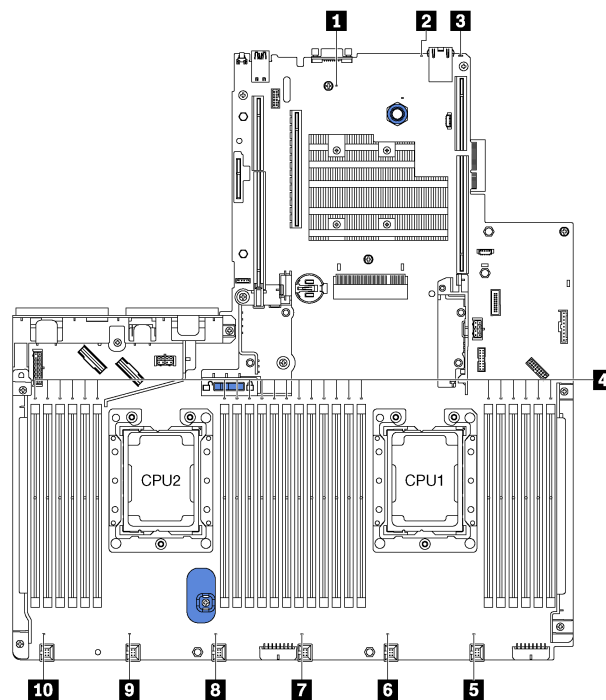

Figure 16. System board LEDs

Table 7. LEDs on the system board

Callout	Callout
1 System power LED	**2** System ID LED
3 System error LED	**4** DIMM error LEDs (24)
5 Fan 1 error LED	**6** Fan 2 error LED
7 Fan 3 error LED	**8** Fan 4 error LED
9 Fan 5 error LED	**10** Fan 6 error LED

1 System power LED

When this LED is lit, it indicates that the server is powered on.

❷ 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. You can also use the Lenovo XClarity Controller or a remote management program to change the state of the system ID LEDs to assist in visually locating the server among other servers.

❸ 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 I/O assembly" on page 15.

❹ DIMM error LEDs

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

❺ ❻ ❼ ❽ ❾ ❿ Fan error LEDs

When a fan error LED is lit, it indicates that the corresponding system fan is operating slowly or has failed.

System board jumpers

The following illustration shows the location of the jumpers on the system board of your server.
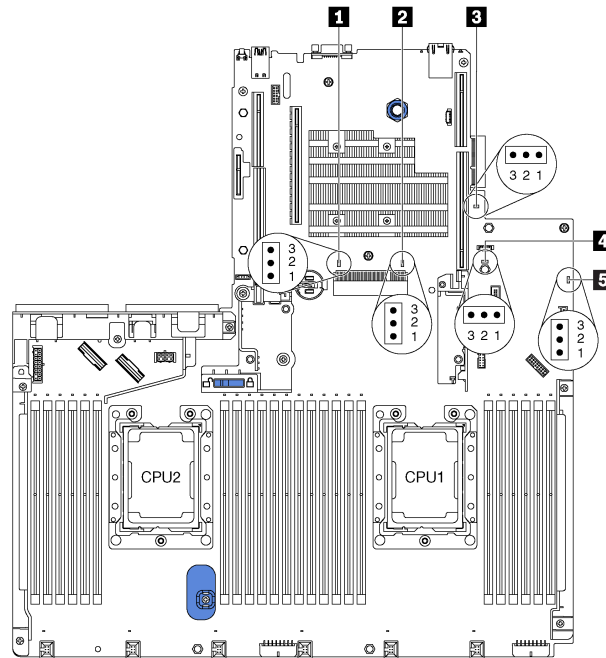

Figure 17. System board jumpers

Table 8. Jumper description

Jumper name	Jumper number	Jumper setting
1 Clear CMOS jumper	J95	• Pins 1 and 2: The jumper is in default setting. • Pins 2 and 3: Clear the real-time clock (RTC) registry.
2 Override power-on password jumper	J50	• Pins 1 and 2: The jumper is in default setting. • Pins 2 and 3: Override the power-on password.
3 TPM/TCM physical presence jumper * TPM: Trusted Platform Module * TCM: Trusted Cryptography Module (for China only)	J46	• Pins 1 and 2: The jumper is in default setting. • Pins 2 and 3: TPM/TCM physical presence is asserted.
4 Force XCC update jumper	J45	• Pins 1 and 2: The jumper is in default setting. • Pins 2 and 3: Force the Lenovo XClarity Controller o update to the latest version.
5 Force XCC reset jumper	J181	• Pins 1 and 2: The jumper is in default setting. • Pins 2 and 3: Reset the Lenovo XClarity Controller.

Important:

- Before you move any jumpers, power off the server; then, disconnect all power cords and external cables. Do not open your server or attempt any repair before reading and understanding the following information:
  - http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html
  - "Handling static-sensitive devices" on page 91
- Any system-board switch or jumper block that is not shown in the illustrations in this document are reserved.

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.
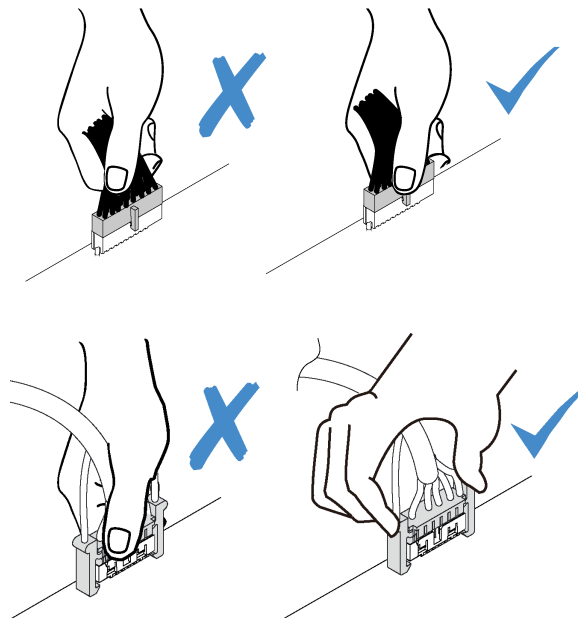
VGA connector

Use the section to understand the cable routing for the VGA connector on the left rack latch.

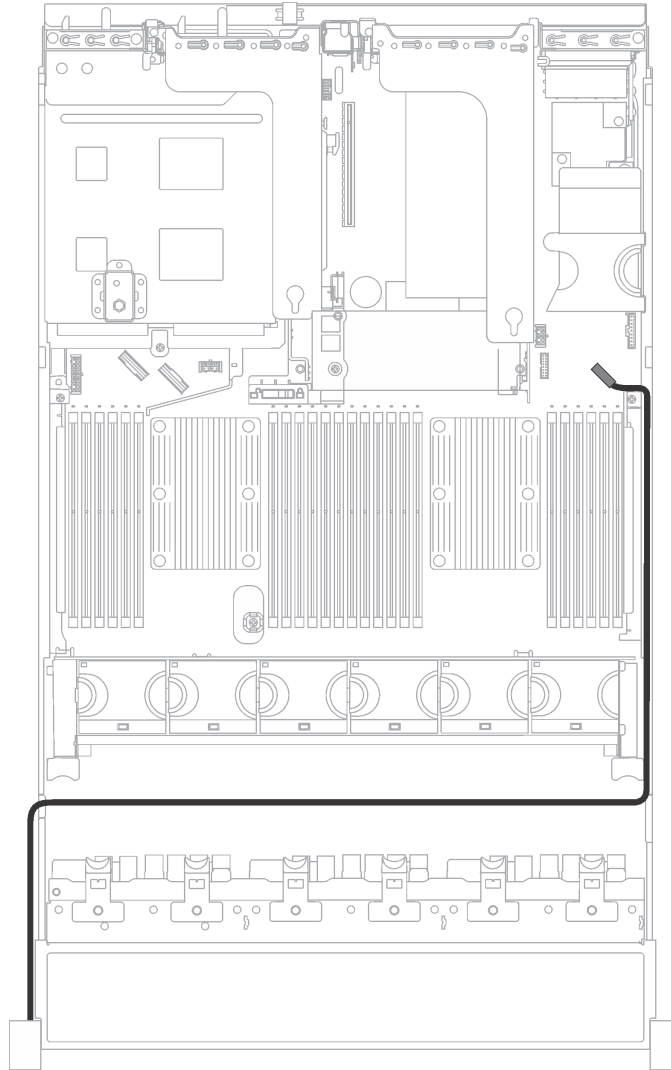**Note:** The VGA connector is available on some models.

Figure 18. VGA connector cable routing

From	To
VGA cable on the left rack latch	Front VGA connector on the system board

Front I/O assembly

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

Front I/O assembly on the chassis

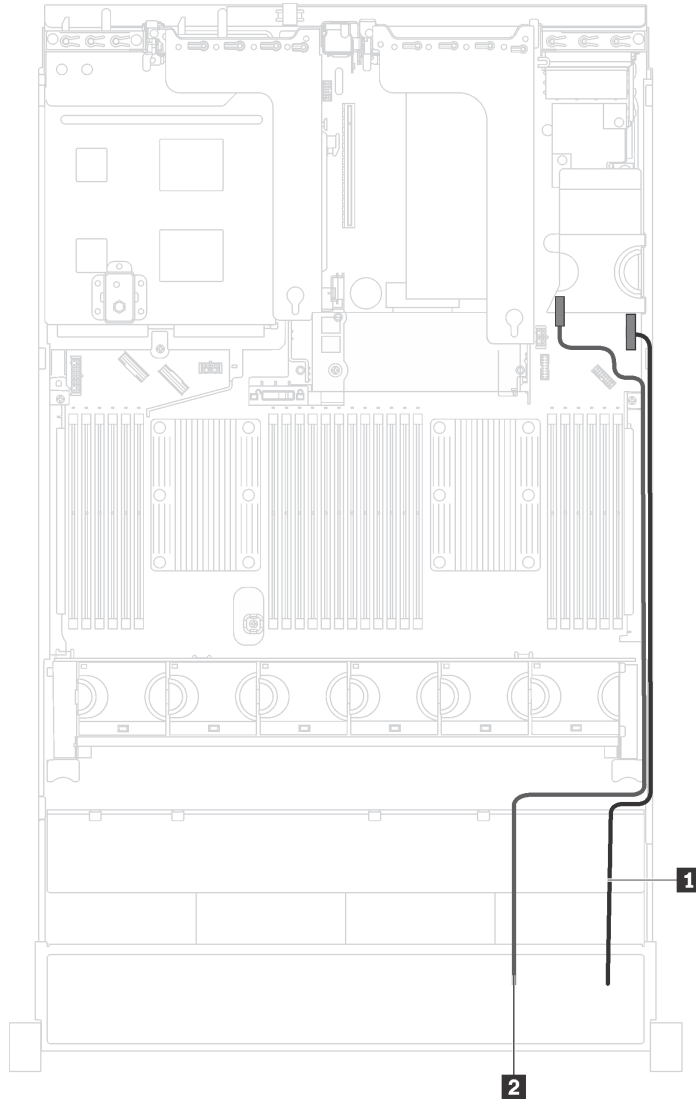Figure 19. Cable routing for the front I/O assembly on the chassis

From	To
1 Operator-information-panel cable	Operator-information-panel connector on the system board
2 Front USB cable	Front USB connector on the system board

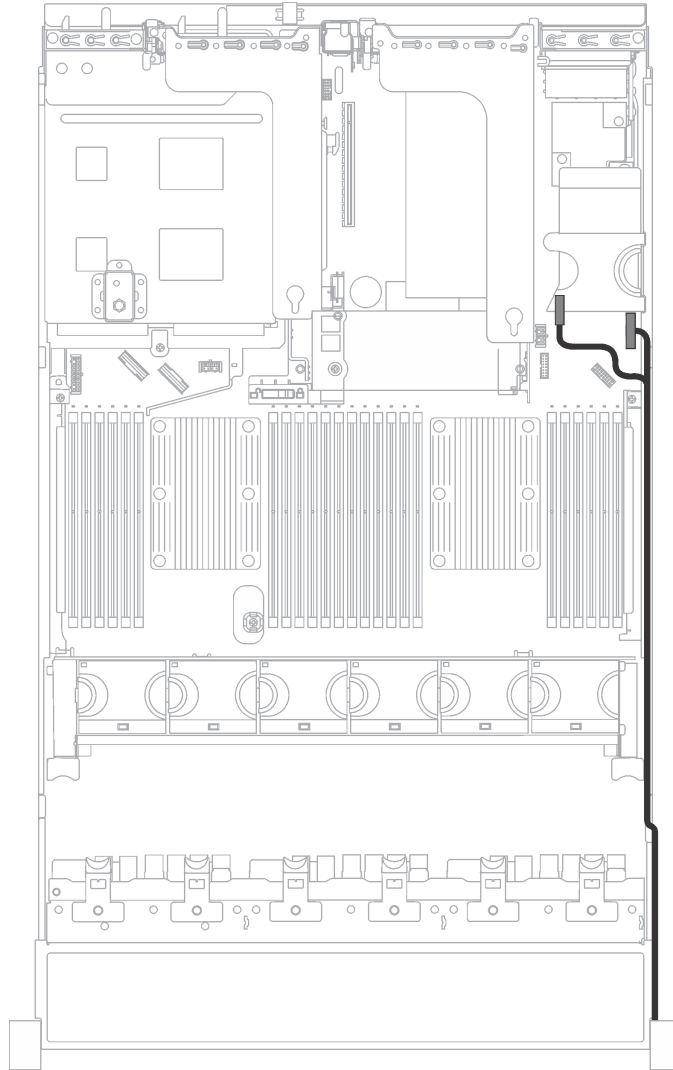**Front I/O assembly on the right rack latch**

Figure 20. Cable routing for the front I/O assembly on the right rack latch

From	To
Front-I/O-assembly cable	Operator-information-panel connector and front USB connector on the system board

GPU

Use the section to understand the cable routing for the GPUs.

Figure 21. GPU cable routing
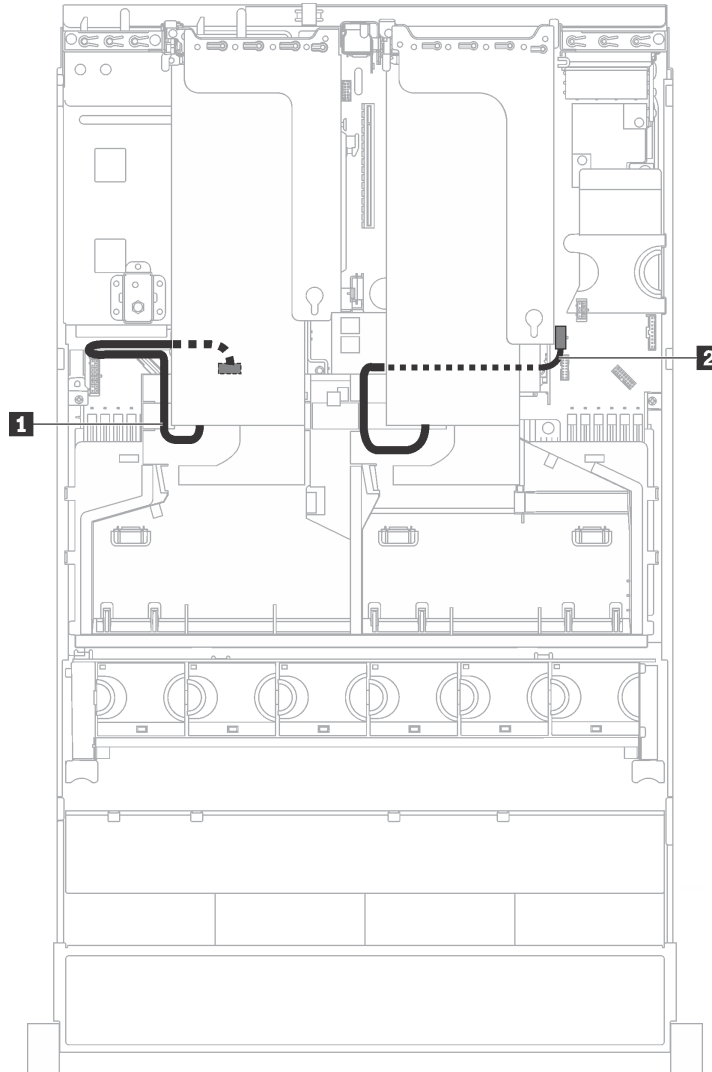
Cable	From	To
1 GPU power cable	Power connector on the GPU	GPU power connector 1 on the system board
2 GPU power cable	Power connector on the GPU	GPU power connector 2 on the system board

Backplane

Use the section to understand the cable routing for backplanes.

This topic contains the following information:

- "Server models with eight 2.5-inch drives" on page 33
- "Server models with sixteen 2.5-inch drives" on page 38
- "Server models with twenty-four 2.5-inch drives" on page 53
- "Server models with eight 3.5-inch drives" on page 78
- "Server models with twelve 3.5-inch drives" on page 81

Before you route cables for backplanes, observe the adapter priority and the PCIe slot selection priority when installing the NVMe switch adapter or a RAID adapter.

- Adapter priority: NVMe switch adapter, 24i RAID adapter, 8i RAID adapter, 16i RAID adapter
- PCIe slot selection priority when installing the NVMe switch adapter:

Number of installed processors	PCIe slot selection priority
One processor	1
Two processors	1, 5, 6

- PCIe slot selection priority when installing a 24i RAID adapter:

Number of installed processors	PCIe slot selection priority
One processor	1, 2, 3
Two processors	1, 2, 3, 5, 6

- PCIe slot selection priority when installing a 8i or 16i RAID adapter:

Number of installed processors	PCIe slot selection priority
One processor	7, 4, 2, 3, 1
Two processors	7, 4, 2, 3, 1, 5, 6

Notes:

- The PCIe slot 7 refers to the RAID adapter slot on the system board.
- If the rear hot-swap drive assembly is installed, PCIe slots 1, 2, and 3 will become unavailable because the space is occupied by the rear hot-swap drive assembly.

Server models with eight 2.5-inch drives

Use this section to understand the cable routing for server models with eight 2.5-inch drives.

Server model: eight 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 16i RAID adapter
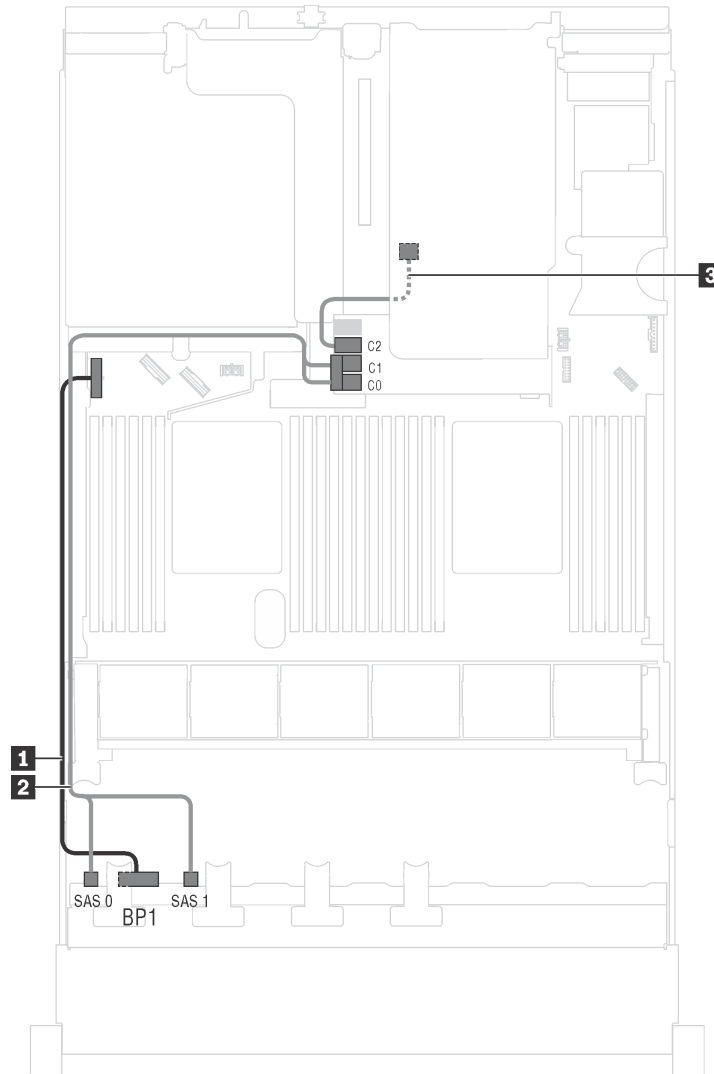

Figure 22. Cable routing for server models with eight 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and one 16i RAID adapter

Cable	From	To
1 Power cable for front backplane	Power connector on front backplane	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane	SAS 0 and SAS 1 connectors on front backplane	C0 and C1 connectors on the 16i RAID adapter installed on the RAID adapter slot
3 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C2 connector on the 16i RAID adapter installed on the RAID adapter slot

Server model: eight 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, two 8i RAID adapters

Note: The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i RAID adapter on PCIe slot 4 might not be available on your server.

Figure 23. Cable routing for server models with eight 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and two 8i RAID adapters

Cable	From	To
1 Power cable for front backplane	Power connector on front backplane	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane	SAS 0 and SAS 1 connectors on front backplane	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
3 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C0 connector on the 8i RAID adapter installed on PCIe slot 4

Server model: four 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, two 8i RAID adapters

Note: The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i RAID adapter on PCIe slot 4 might not be available on your server.
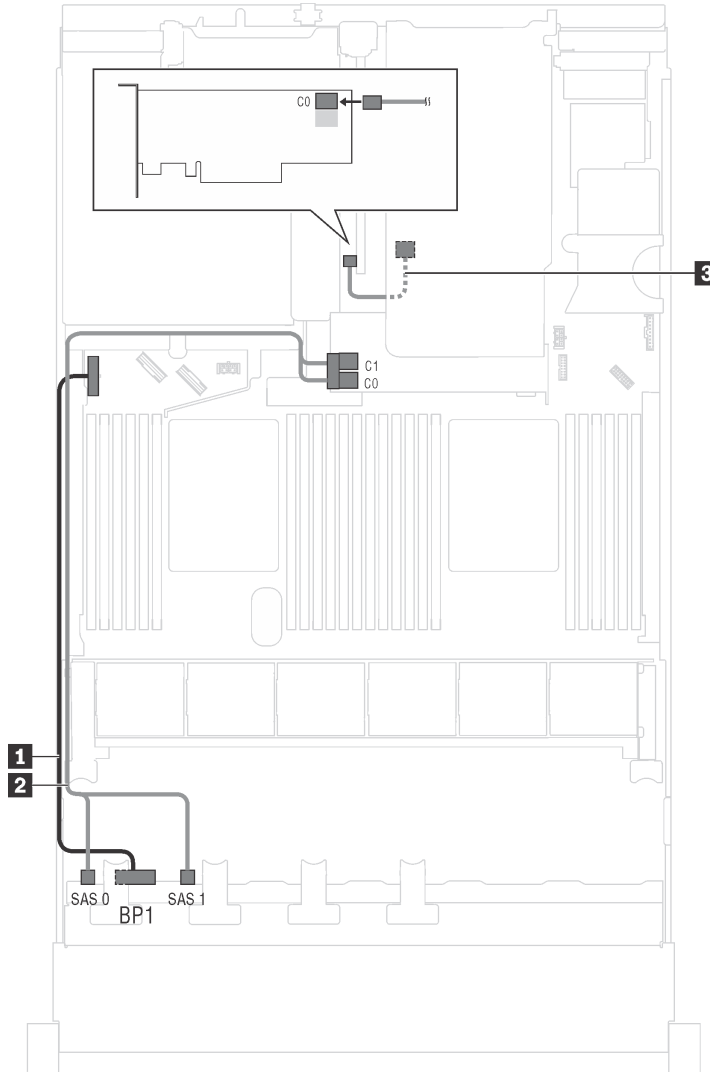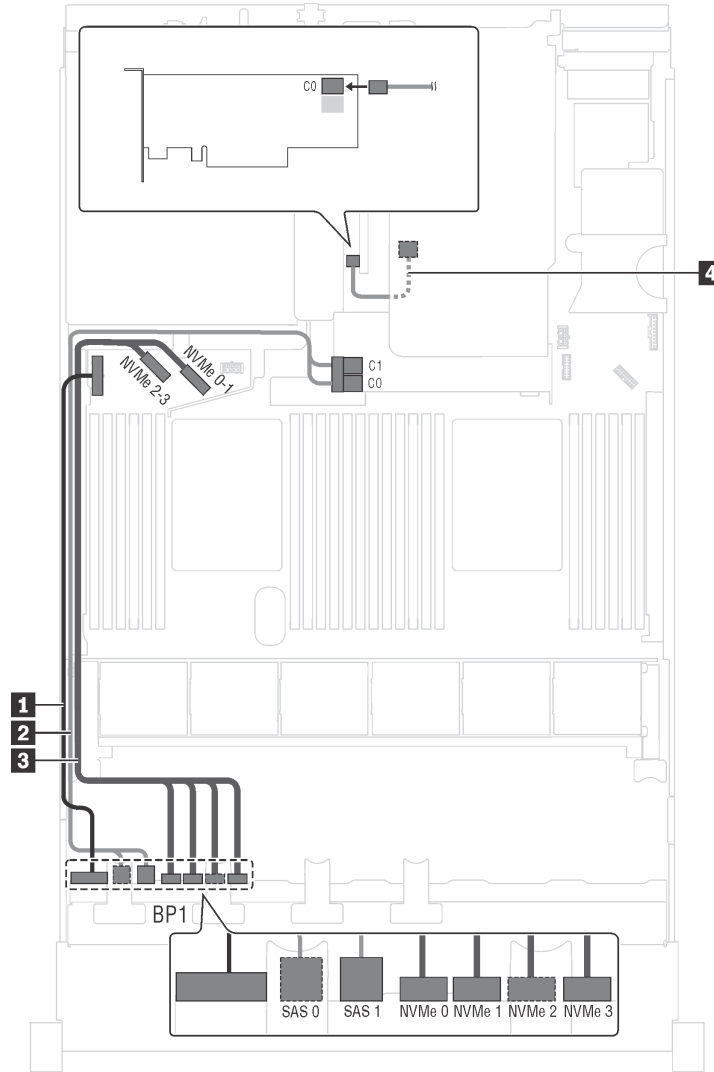

Figure 24. Cable routing for server models with four 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, and two 8i RAID adapters

Cable	From	To
1 Power cable for front backplane	Power connector on front backplane	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane	SAS 0 and SAS 1 connectors on front backplane	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot

Cable	From	To
3 NVMe signal cable for front backplane	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C0 connector on the 8i RAID adapter installed on PCIe slot 4

Server model: four 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, one 16i RAID adapter
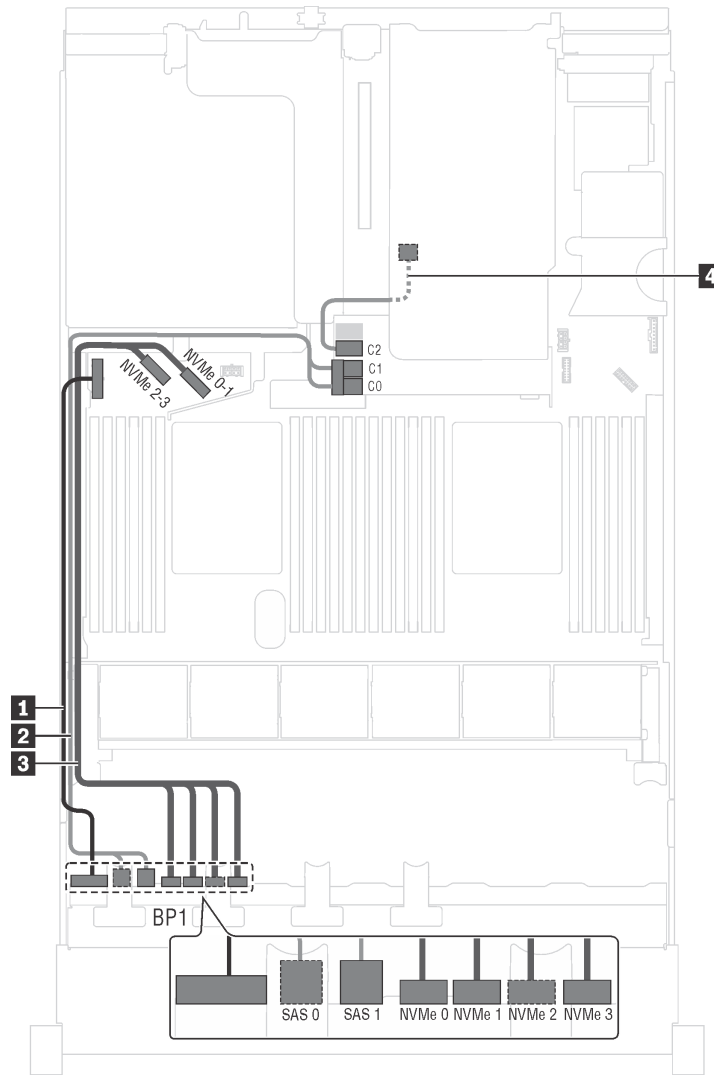

Figure 25. Cable routing for server models with four 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, and one 16i RAID adapter

Cable	From	To
1 Power cable for front backplane	Power connector on front backplane	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane	SAS 0 and SAS 1 connectors on front backplane	C0 and C1 connectors on the 16i RAID adapter installed on the RAID adapter slot
3 NVMe signal cable for front backplane	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C2 connector on the 16i RAID adapter installed on the RAID adapter slot

Server models with sixteen 2.5-inch drives

Use this section to understand the cable routing for server models with sixteen 2.5-inch drives.

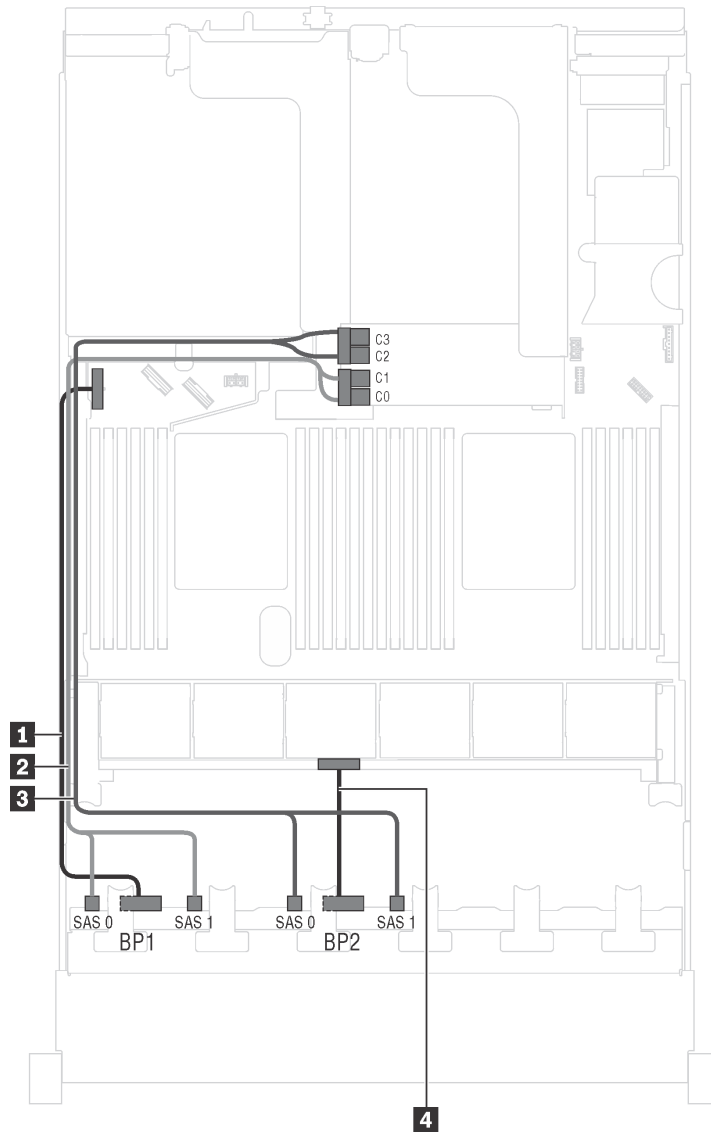**Server model: sixteen 2.5-inch SAS/SATA drives, one 16i RAID adapter**

Figure 26. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives and one 16i RAID adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 16i RAID adapter installed on the RAID adapter slot

Cable	From	To
3 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 16i RAID adapter installed on the RAID adapter slot
4 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

Server model: sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 8i RAID adapter, one 16i RAID adapter
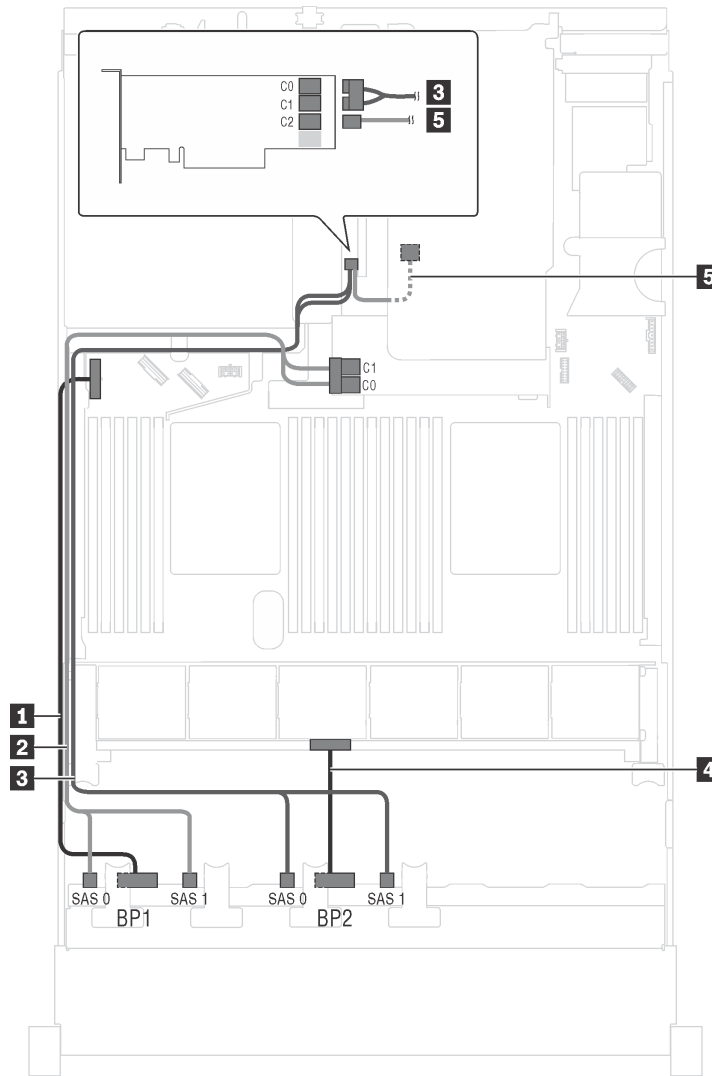

Figure 27. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 8i RAID adapter, and one 16i RAID adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
3 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C0 and C1 connectors on the 16i RAID adapter installed on PCIe slot 4
4 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
5 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C2 connector on the 16i RAID adapter installed on PCIe slot 4

Server model: sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 24i RAID adapter

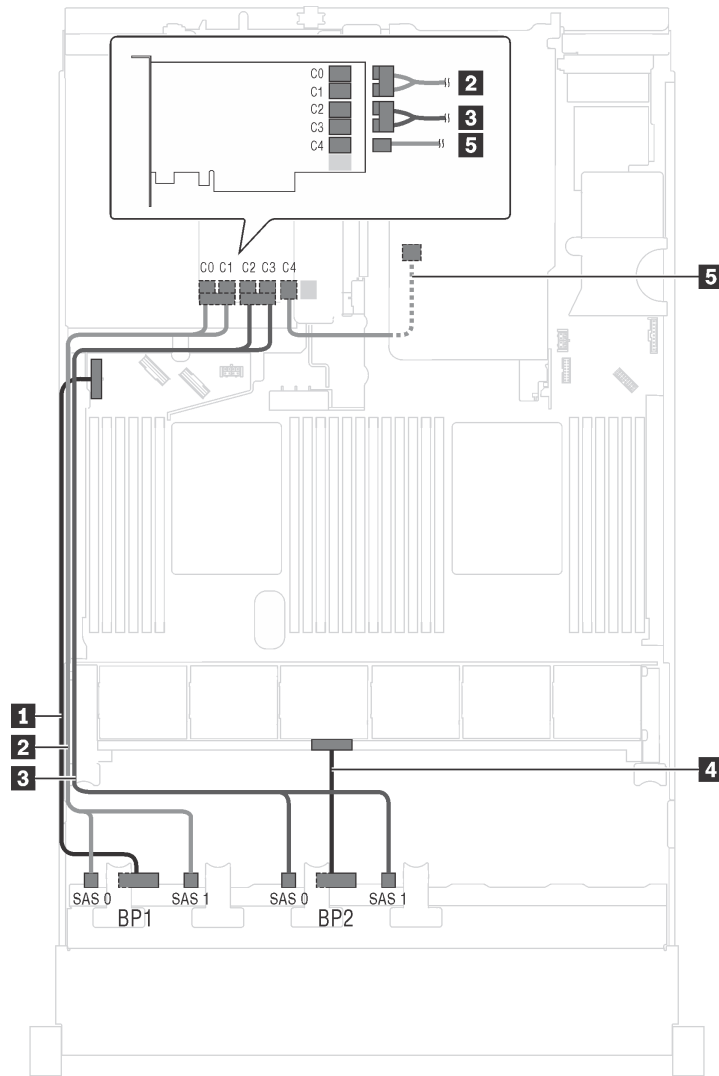Figure 28. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and one 24i RAID adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter installed on PCIe slot 5
3 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter installed on PCIe slot 5
4 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
5 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C4 connector on the 24i RAID adapter installed on PCIe slot 5

Server model: sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, three 8i RAID adapters

Note: The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i RAID adapter on PCIe slot 5 might not be available on your server.
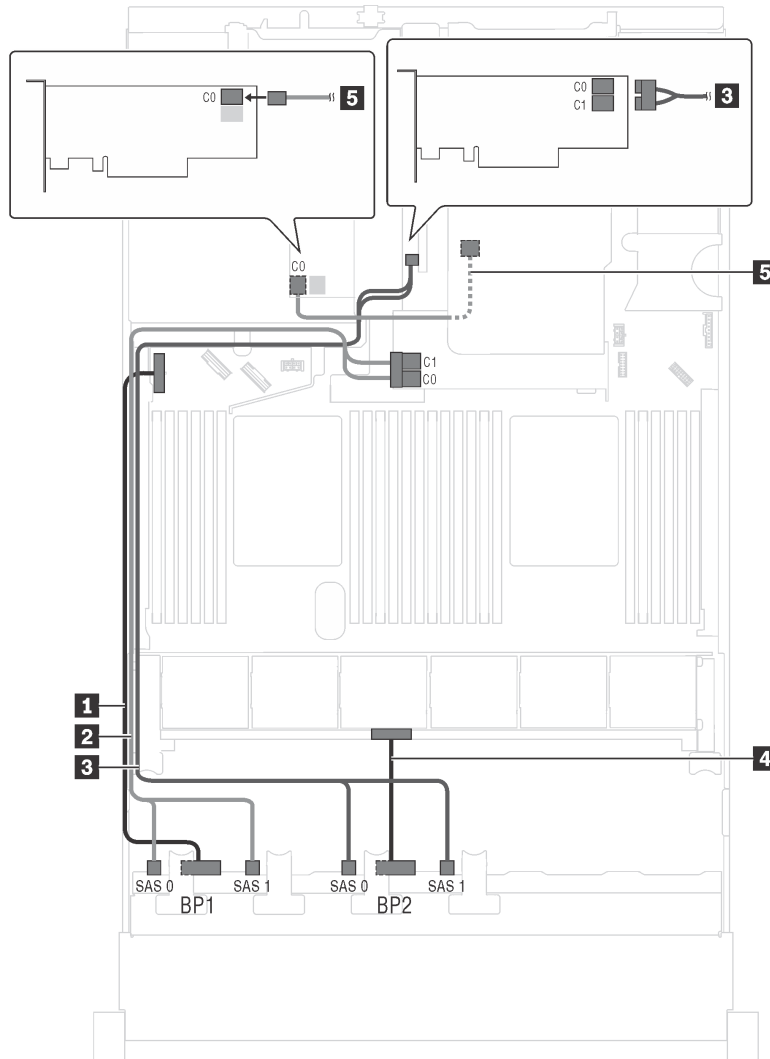

Figure 29. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and three 8i RAID adapters

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
3 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C0 and C1 connectors on the 8i RAID adapter installed on PCIe slot 4

Cable	From	To
4 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
5 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C0 connector on the 8i RAID adapter installed on PCIe slot 5

Server model: twelve 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, one 16i RAID adapter
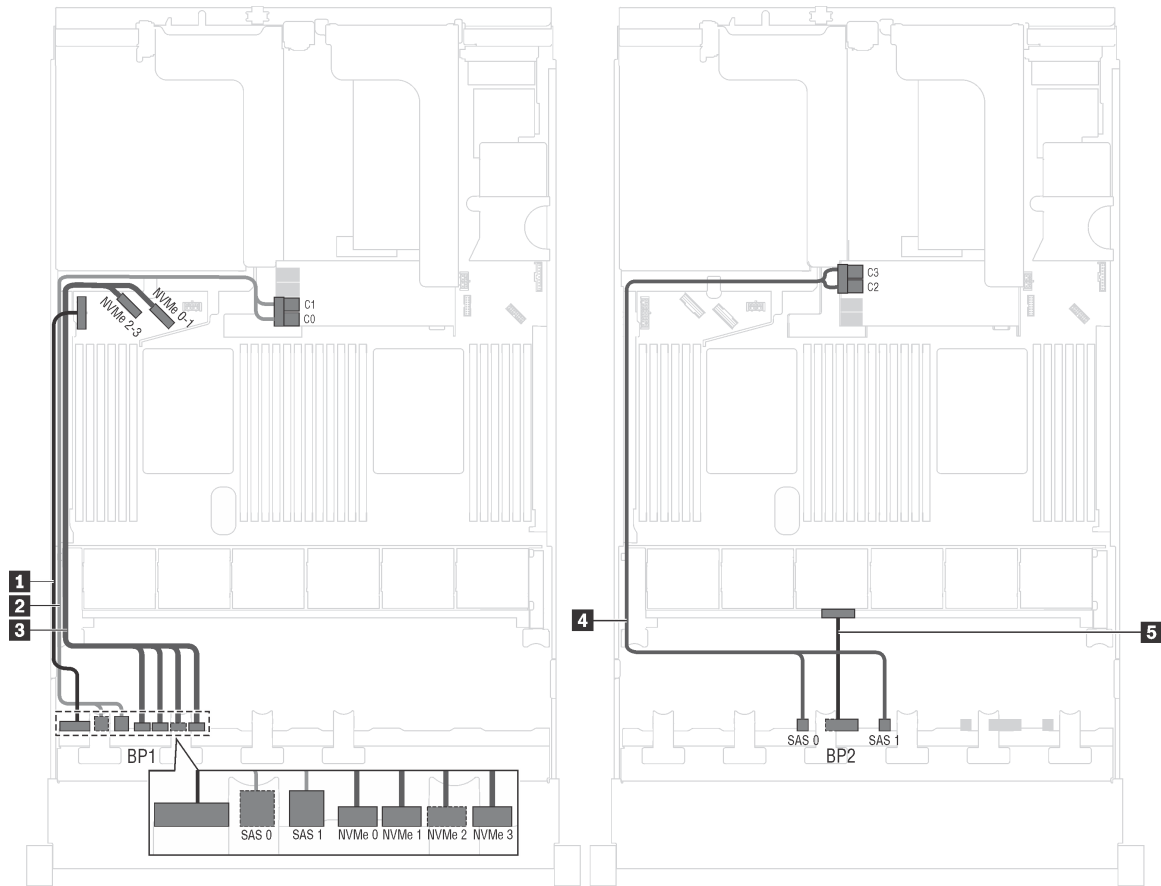

Figure 30. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, and one 16i RAID adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on backplane 1	C0 and C1 connectors on the 16i RAID adapter installed on the RAID adapter slot
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 16i RAID adapter installed on the RAID adapter slot
5 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

Server model: twelve 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, one 8i RAID adapter, one 16i RAID adapter
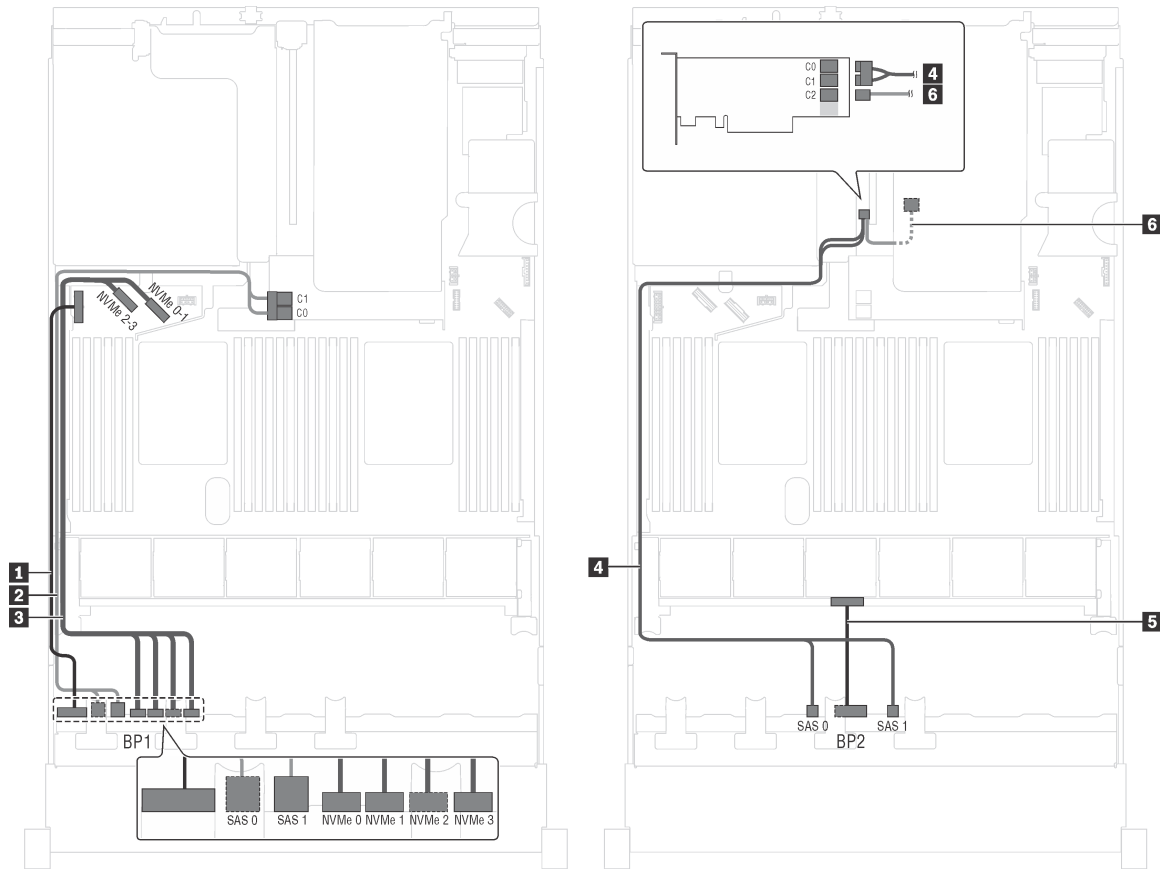

Figure 31. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, one 8i RAID adapter, and one 16i RAID adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C0 and C1 connectors on the 16i RAID adapter installed on PCIe slot 4
5 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
6 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C2 connector on the 16i RAID adapter installed on PCIe slot 4

Server model: twelve 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, one 24i RAID adapter
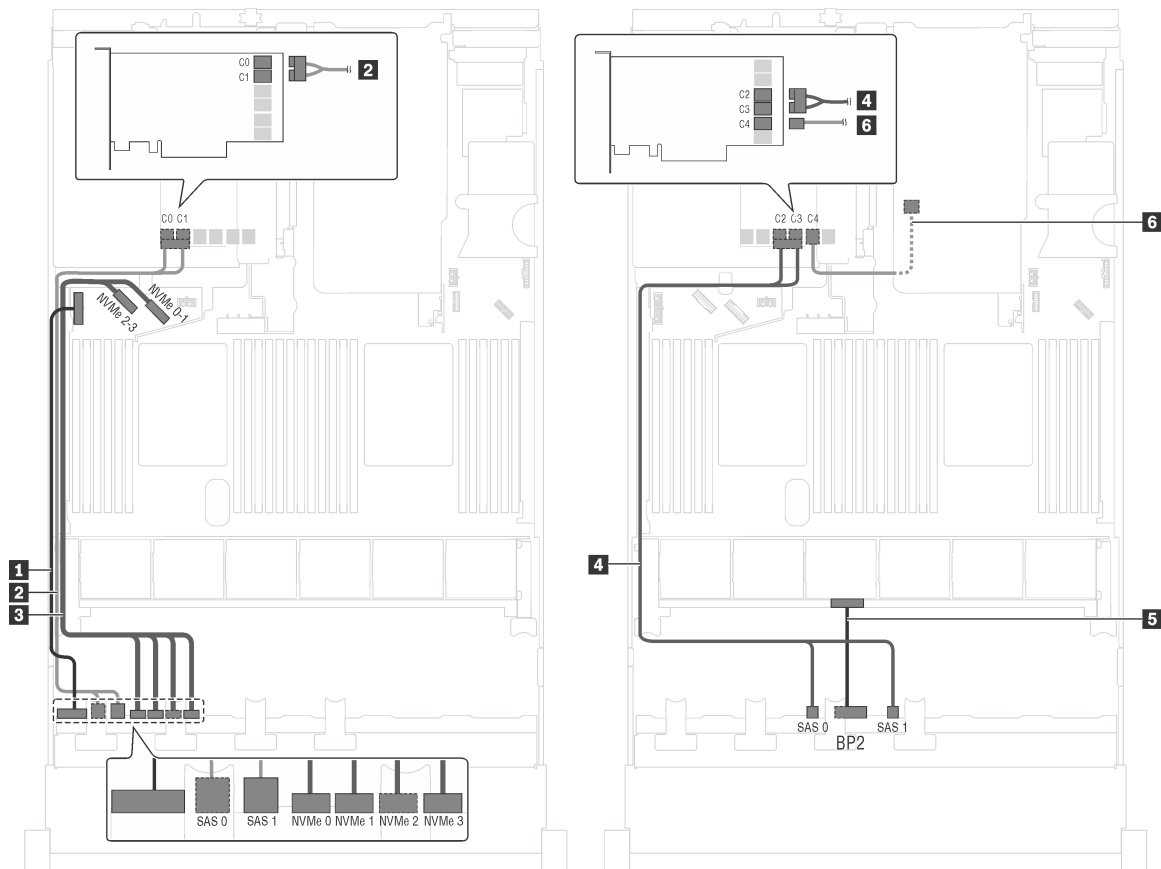

Figure 32. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, and one 24i RAID adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter installed on PCIe slot 5
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter installed on PCIe slot 5
5 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
6 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C4 connector on the 24i RAID adapter installed on PCIe slot 5

Server model: eight 2.5-inch SAS/SATA drives, eight 2.5-inch NVMe drives, one 16i RAID adapter, one NVMe switch adapter

Note: The cable routing illustration is based on the scenario that the NVMe switch adapter is installed on PCIe slot 1. If the NVMe switch adapter is installed on PCIe slot 5 or PCIe slot 6, route the NVMe signal cable for front backplane 2 along the left side of the chassis.
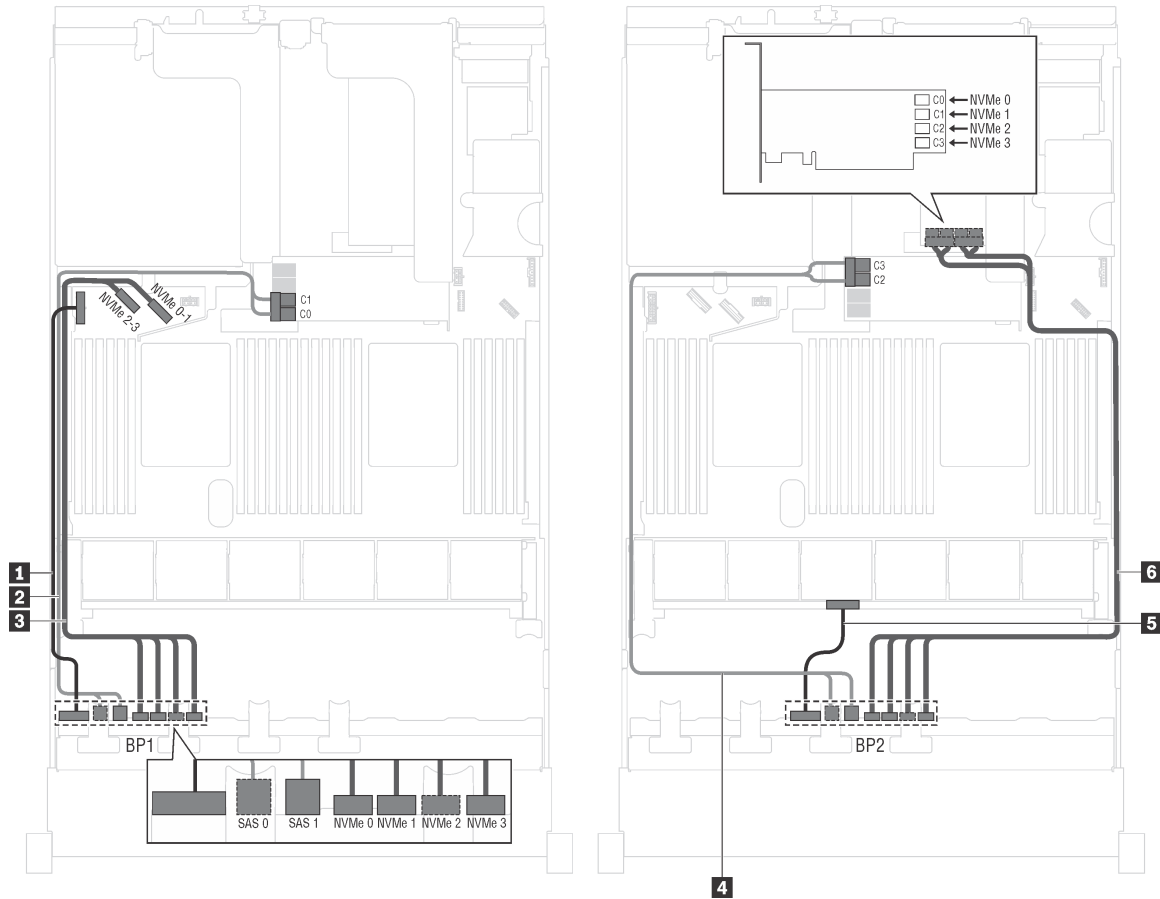

Figure 33. Cable routing for server models with eight 2.5-inch SAS/SATA drives, eight 2.5-inch NVMe drives, one 16i RAID adapter, and one NVMe switch adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 16i RAID adapter installed on the RAID adapter slot
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 16i RAID adapter installed on the RAID adapter slot

Cable	From	To
5 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
6 NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed on PCIe slot 1

Server model: eight 2.5-inch SAS/SATA drives, eight 2.5-inch NVMe drives, the rear hot-swap drive assembly, one 8i RAID adapter, one 16i RAID adapter, one NVMe switch adapter
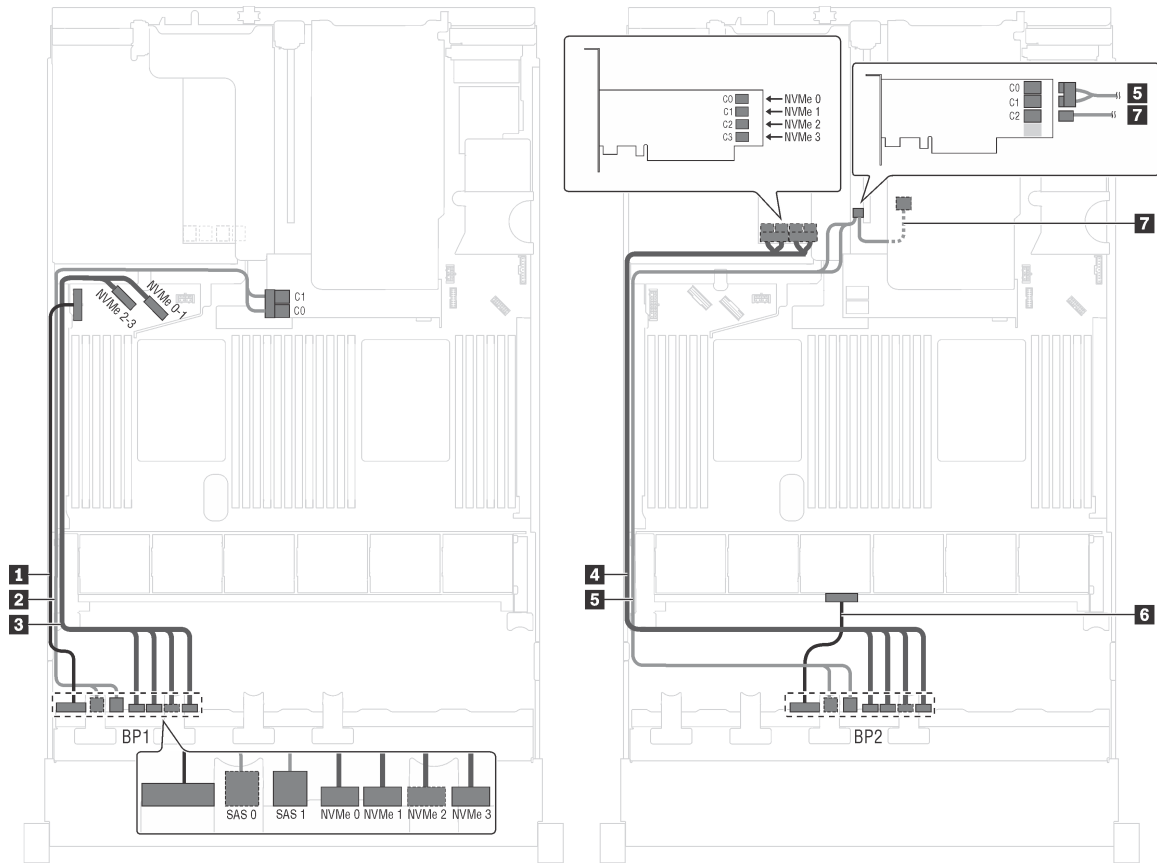

Figure 34. Cable routing for server models with eight 2.5-inch SAS/SATA drives, eight 2.5-inch NVMe drives, the rear hot-swap drive assembly, one 8i RAID adapter, one 16i RAID adapter, and one NVMe switch adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed on PCIe slot 5
5 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C0 and C1 connectors on the 16i RAID adapter installed on PCIe slot 4
6 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
7 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C2 connector on the 16i RAID adapter installed on PCIe slot 4

Server model: eight 2.5-inch SAS/SATA drives, eight 2.5-inch NVMe drives, the rear hot-swap drive assembly, three 8i RAID adapters, one NVMe switch adapter

Notes:

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i RAID adapter on PCIe slot 6 might not be available on your server.
- Depending on the model, if the NVMe switch adapter is installed on PCIe slot 1, route the NVMe signal cable along the right side of the chassis.
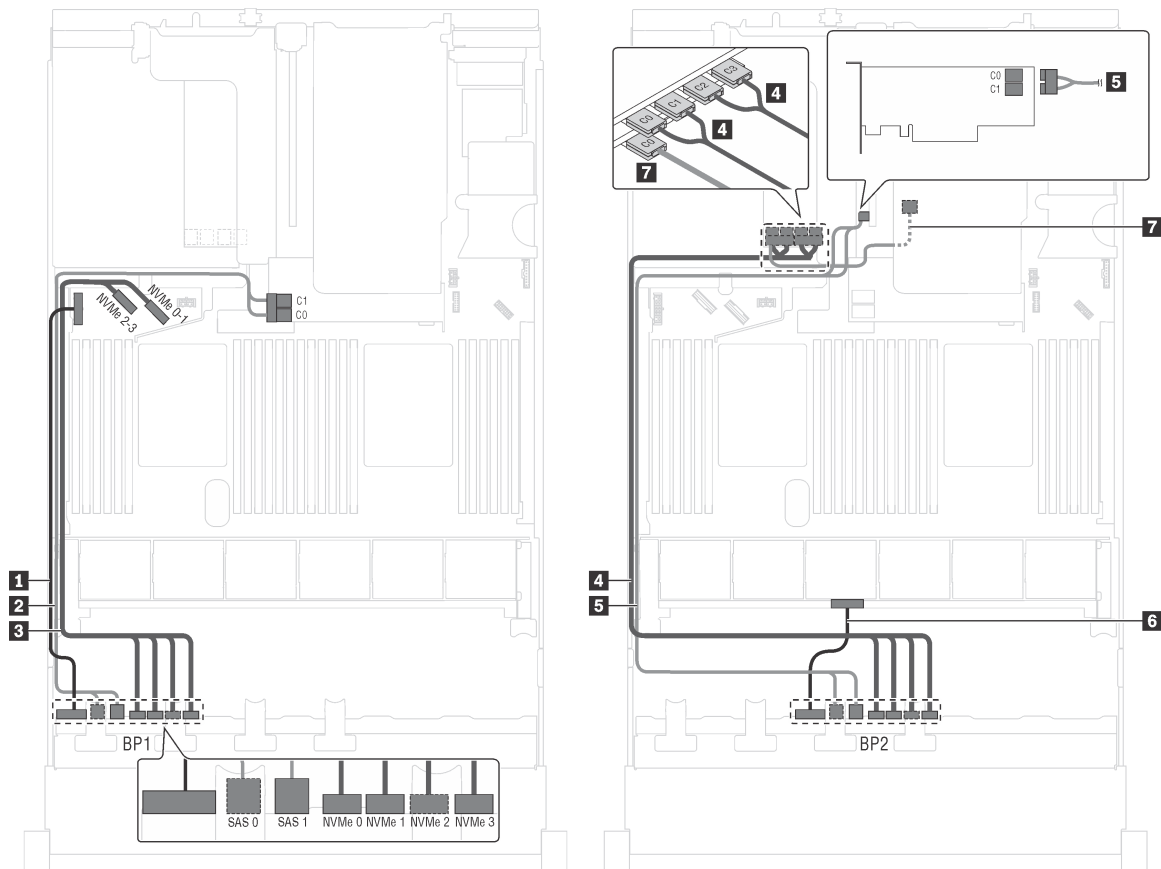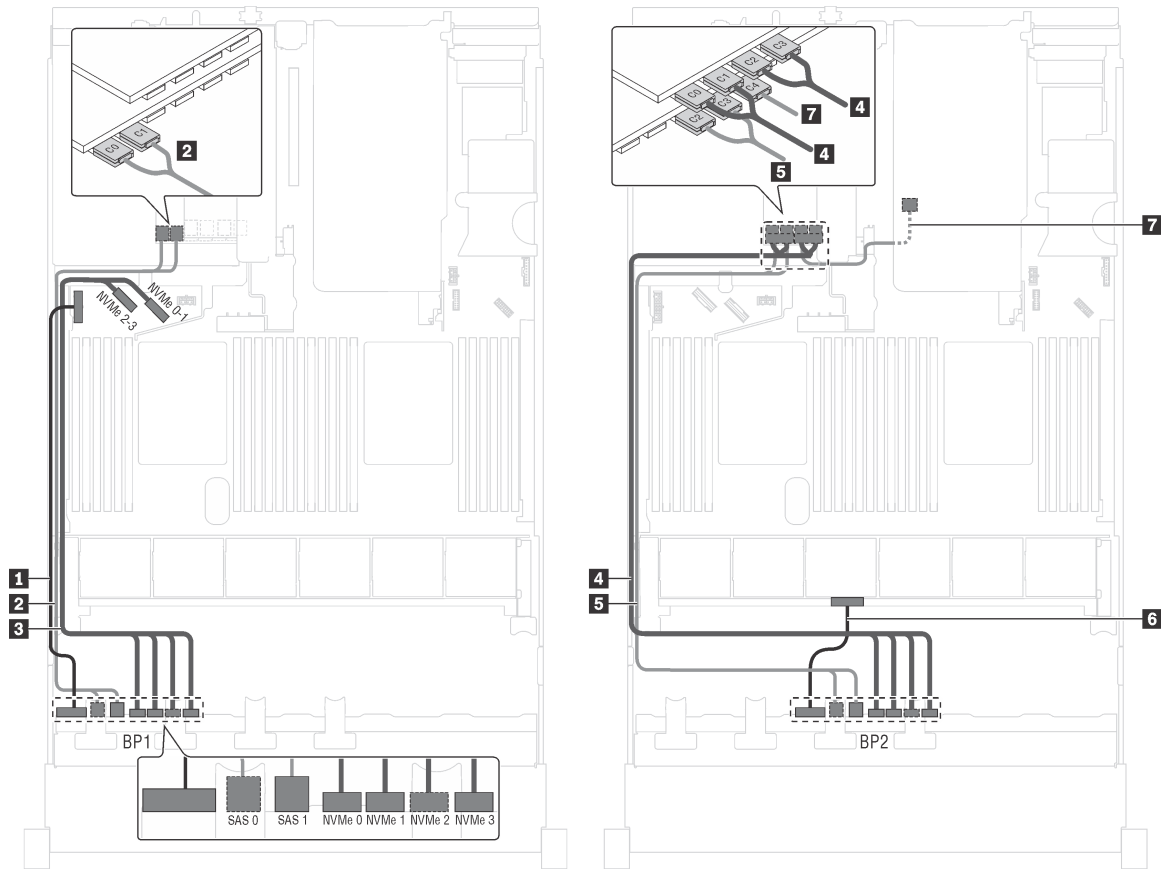

Figure 35. Cable routing for server models with eight 2.5-inch SAS/SATA drives, eight 2.5-inch NVMe drives, the rear hot-swap drive assembly, three 8i RAID adapters, and one NVMe switch adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed on PCIe slot 5

Cable	From	To
5 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C0 and C1 connectors on the 8i RAID adapter installed on PCIe slot 4
6 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
7 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C0 connector on the 8i RAID adapter installed on PCIe slot 6

Server model: eight 2.5-inch SAS/SATA drives, eight 2.5-inch NVMe drives, the rear hot-swap drive assembly, one 24i RAID adapter, one NVMe switch adapter

Figure 36. Cable routing for server models with eight 2.5-inch SAS/SATA drives, eight 2.5-inch NVMe drives, the rear hot-swap drive assembly, one 24i RAID adapter, and one NVMe switch adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter installed on PCIe slot 6
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed on PCIe slot 5
5 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter installed on PCIe slot 6
6 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
7 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C4 connector on the 24i RAID adapter installed on PCIe slot 6

Server models with twenty-four 2.5-inch drives

Use this section to understand the cable routing for server models with twenty-four 2.5-inch drives.

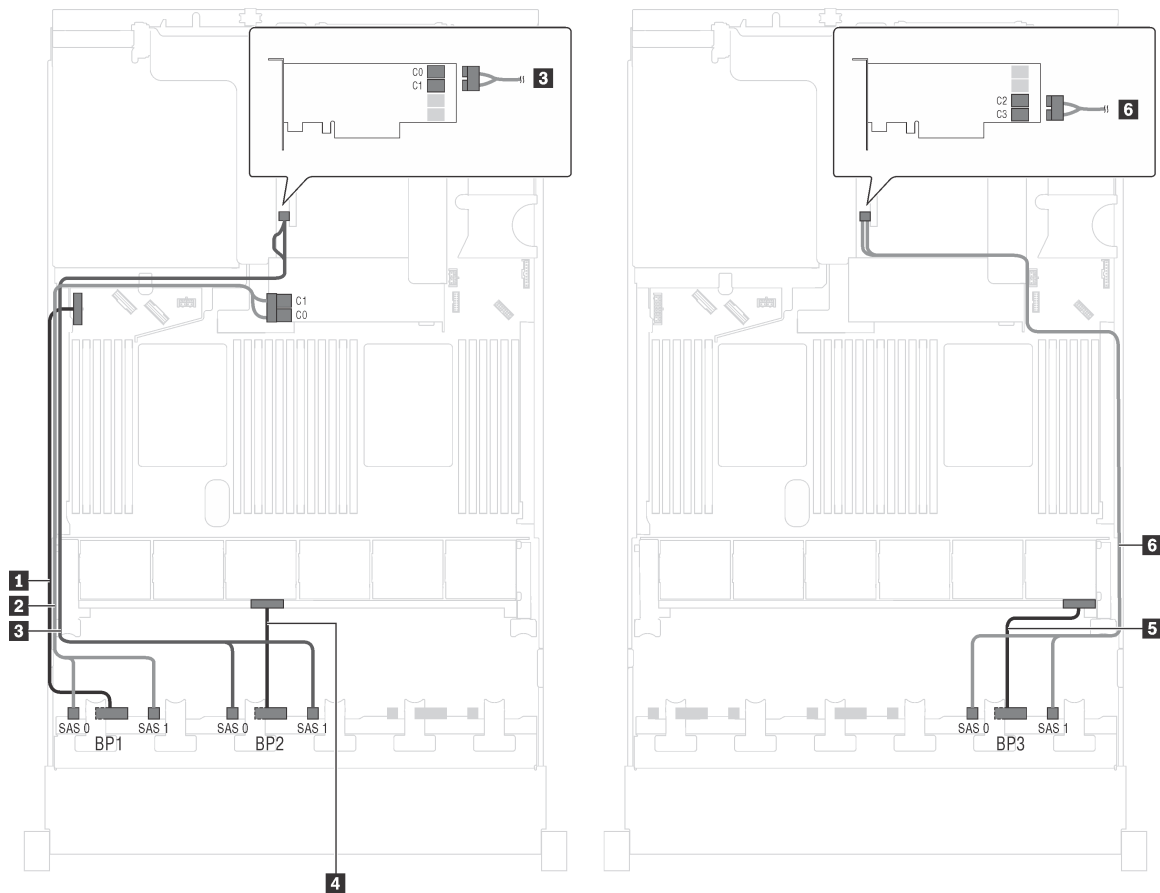**Server model: twenty-four 2.5-inch SAS/SATA drives, one 8i RAID adapter, one 16i RAID adapter**

Figure 37. Cable routing for server models with twenty-four 2.5-inch SAS/SATA drives, one 8i RAID adapter, and one 16i RAID adapter

Cable	From	To
1 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
2 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
3 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C0 and C1 connectors on the 16i RAID adapter installed on the PCIe slot 4
4 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
5 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
6 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C2 and C3 connectors on the 16i RAID adapter installed on the PCIe slot 4

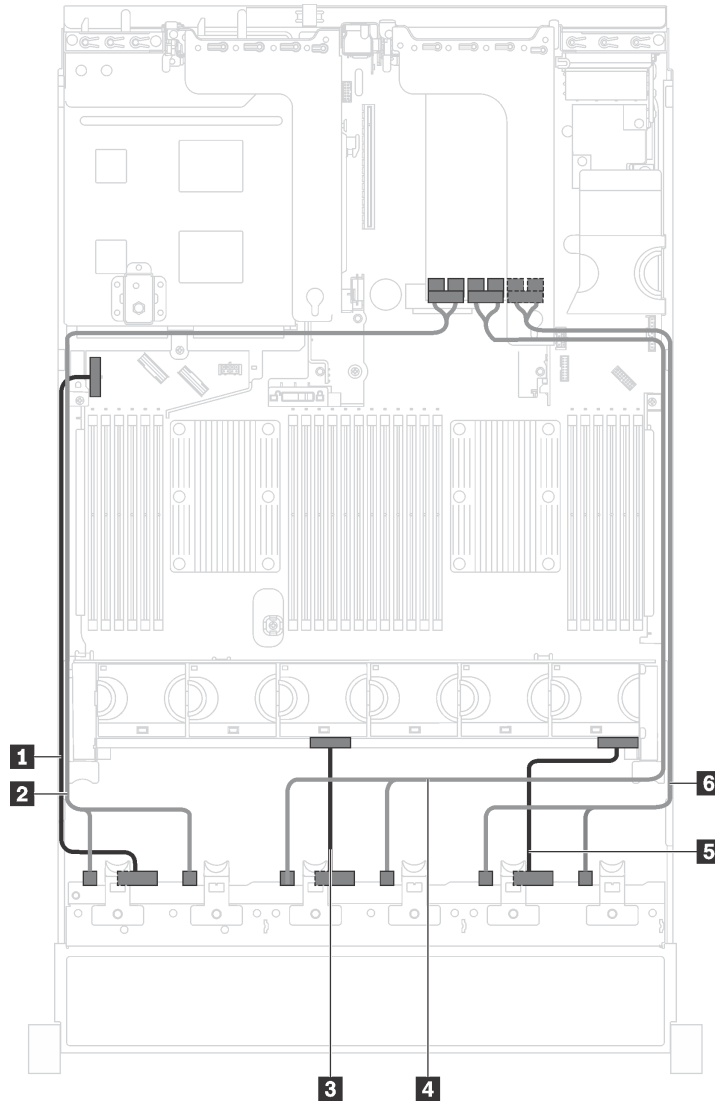**Server model: twenty-four 2.5-inch SAS/SATA drives, one 24i RAID adapter**

Figure 38. Cable routing for server models with twenty-four 2.5-inch SAS/SATA drives and one 24i RAID adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter installed on riser 1 assembly
3 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
4 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter installed on riser 1 assembly

Cable	From	To
5 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
6 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C4 and C5 connectors on the 24i RAID adapter installed on riser 1 assembly

Server model: twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, four 8i RAID adapters

Note: The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i RAID adapter on PCIe slot 6 might not be available on your server.
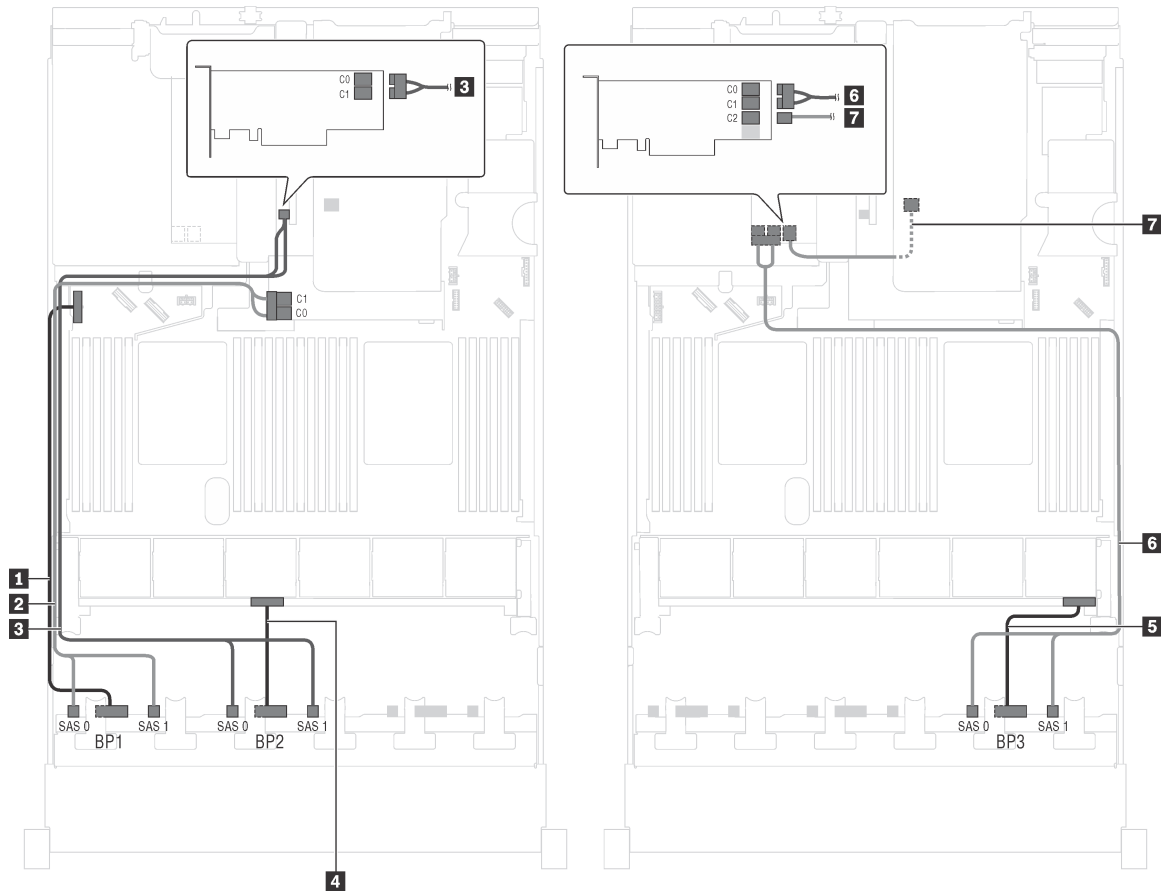

Figure 39. Cable routing for server models with twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and four 8i RAID adapters

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
3 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C0 and C1 connectors on the 8i RAID adapter installed on PCIe slot 4
4 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
5 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board

Cable	From	To
6 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C0 and C1 connectors on the 8i RAID adapter installed on PCIe slot 5
7 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C0 connector on the 8i RAID adapter installed on PCIe slot 6

Server model: twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, two 8i RAID adapters, one 16i RAID adapter
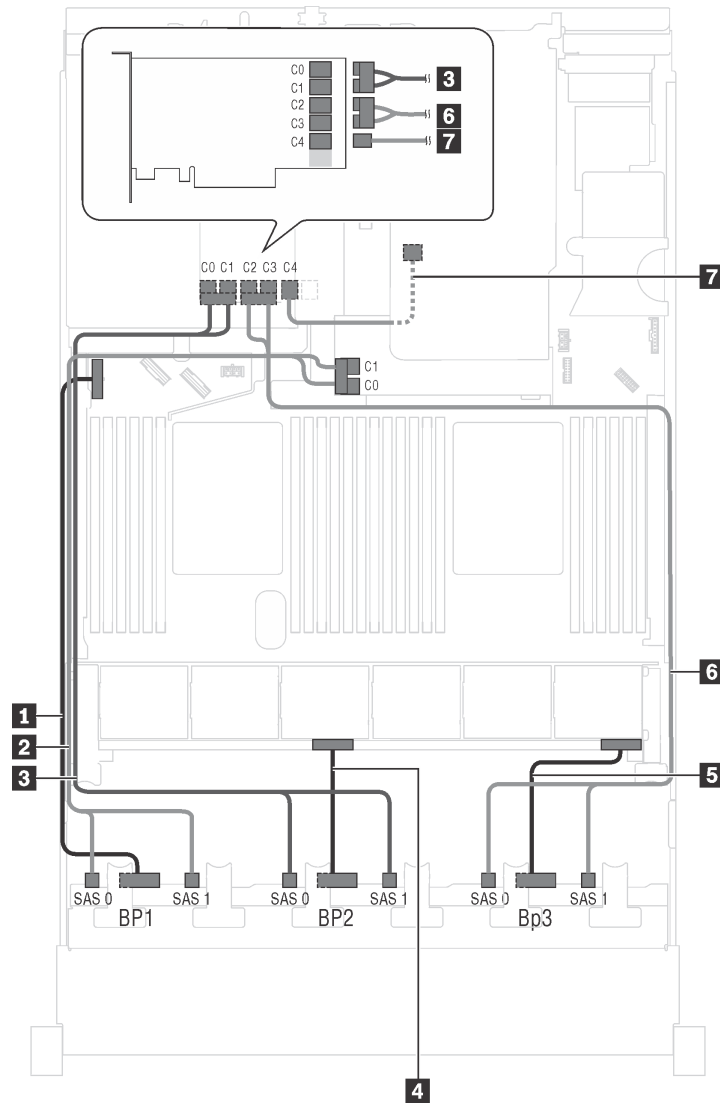

Figure 40. Cable routing for server models with twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, two 8i RAID adapters, and one 16i RAID adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
3 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C0 and C1 connectors on the 8i RAID adapter installed on PCIe slot 4
4 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
5 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
6 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C0 and C1 connectors on the 16i RAID adapter installed on PCIe slot 5
7 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C2 connector on the 16i RAID adapter installed on PCIe slot 5

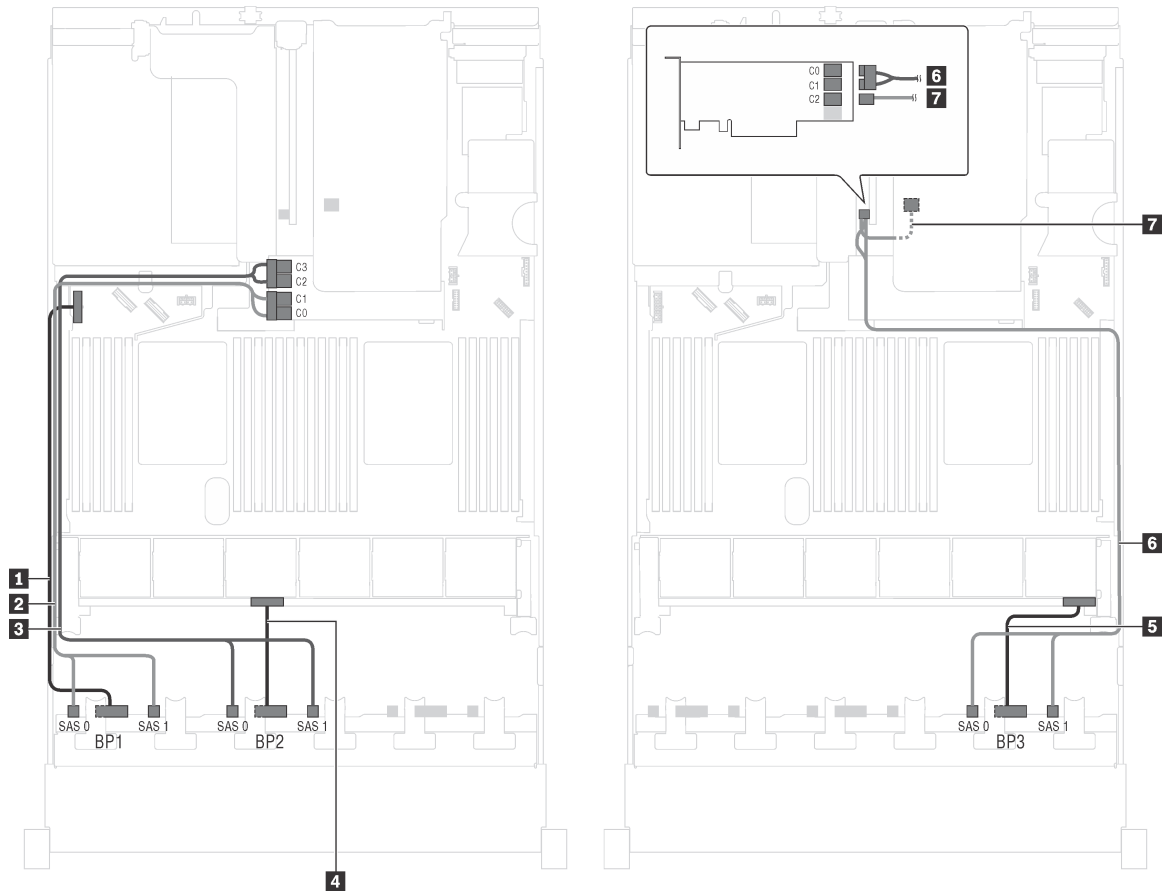**Server model: twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 8i RAID adapter, one 24i RAID adapter**

Figure 41. Cable routing for server models with twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 8i RAID adapter, and one 24i RAID adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
3 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C0 and C1 connectors on the 24i RAID adapter installed on PCIe slot 5
4 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
5 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board

Cable	From	To
6 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C2 and C3 connectors on the 24i RAID adapter installed on PCIe slot 5
7 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C4 connector on the 24i RAID adapter installed on PCIe slot 5

Server model: twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, two 16i RAID adapters

Figure 42. Cable routing for server models with twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and two 16i RAID adapters

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 16i RAID adapter installed on the RAID adapter slot
3 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 16i RAID adapter installed on the RAID adapter slot
4 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
5 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
6 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C0 and C1 connectors on the 16i RAID adapter installed on PCIe slot 4
7 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C2 connector on the 16i RAID adapter installed on PCIe slot 4

Server model: twenty 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, one 8i RAID adapter, one 16i RAID adapter
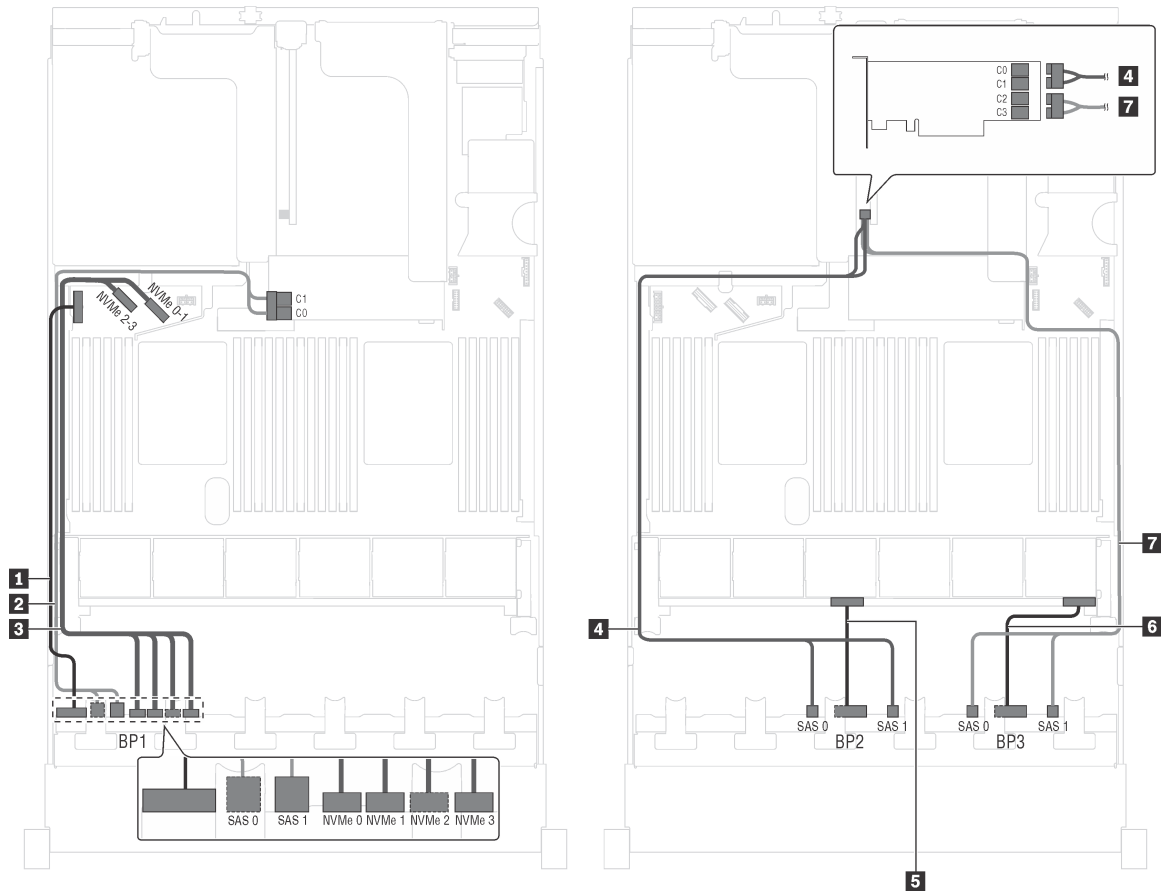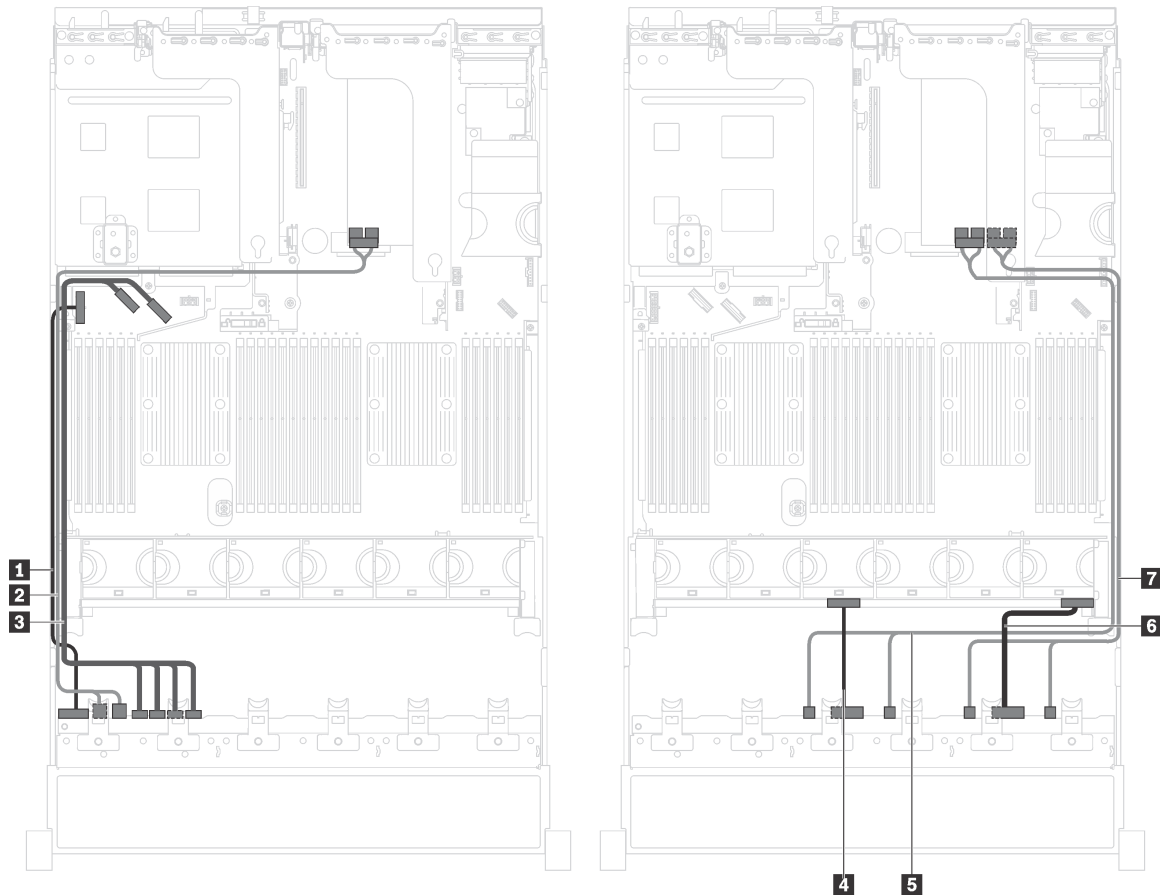

Figure 43. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, one 8i RAID adapter, and one 16i RAID adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 16i RAID adapter installed on the RAID adapter slot
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C0 and C1 connectors on the 16i RAID adapter installed on PCIe slot 4
5 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
6 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
7 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C2 and C3 connectors on the 16i RAID adapter installed on PCIe slot 4

Server model: twenty 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, one 24i RAID adapter

Figure 44. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, and one 24i RAID adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter installed on riser 1 assembly
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
5 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter installed on riser 1 assembly
6 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
7 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C4 and C5 connectors on the 24i RAID adapter installed on riser 1 assembly

Server model: twenty 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, four 8i RAID adapters

Note: The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i RAID adapter on PCIe slot 6 might not be available on your server.
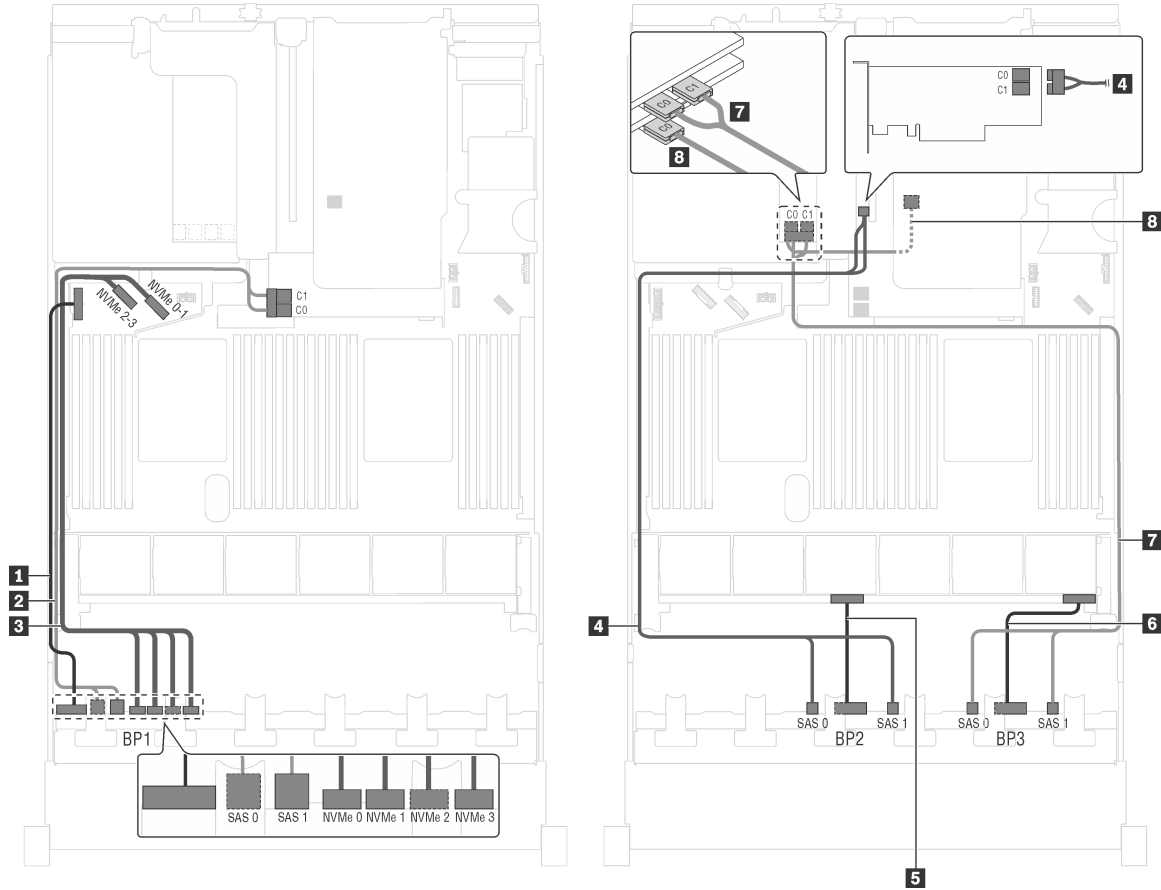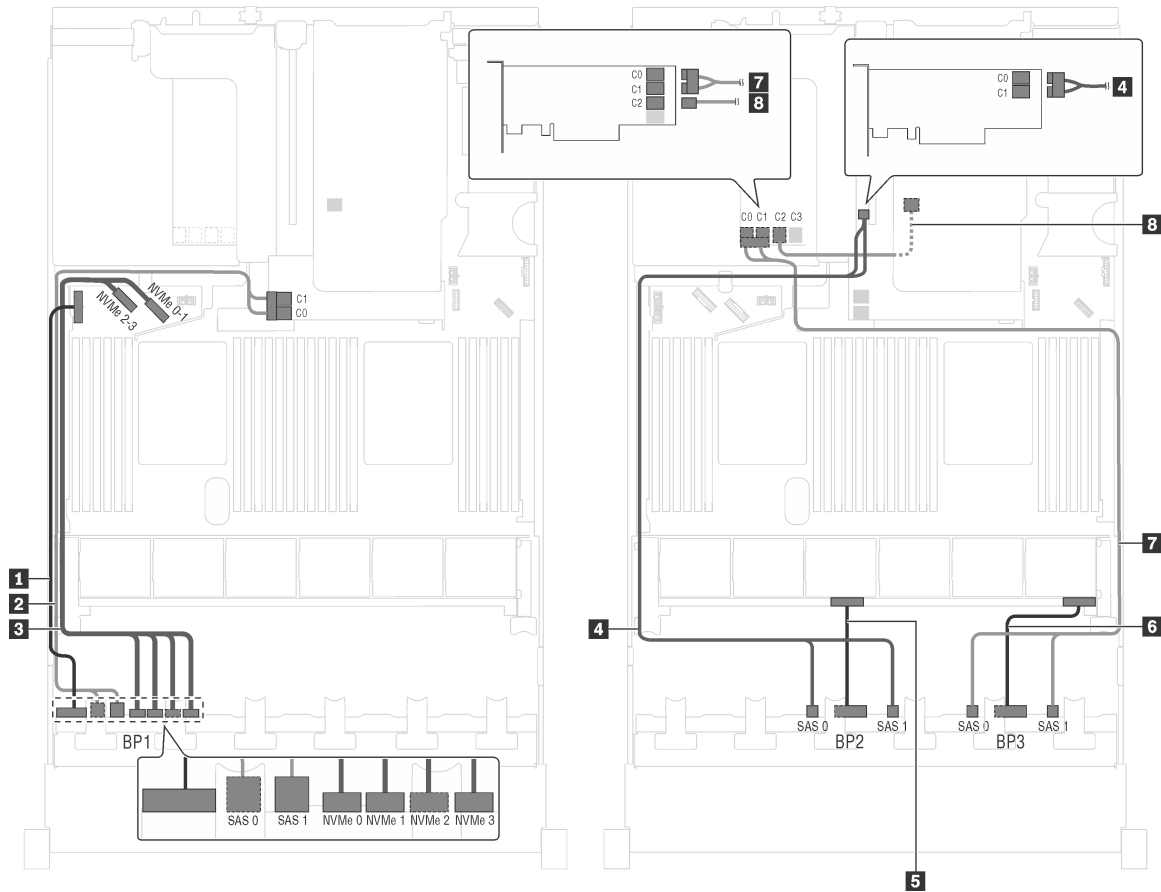

Figure 45. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, and four 8i RAID adapters

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C0 and C1 connectors on the 8i RAID adapter installed on PCIe slot 4
5 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
6 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board

Cable	From	To
7 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C0 and C1 connectors on the 8i RAID adapter installed on PCIe slot 5
8 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C0 connector on the 8i RAID adapter installed on PCIe slot 6

Server model: twenty 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, two 8i RAID adapters, one 16i RAID adapter
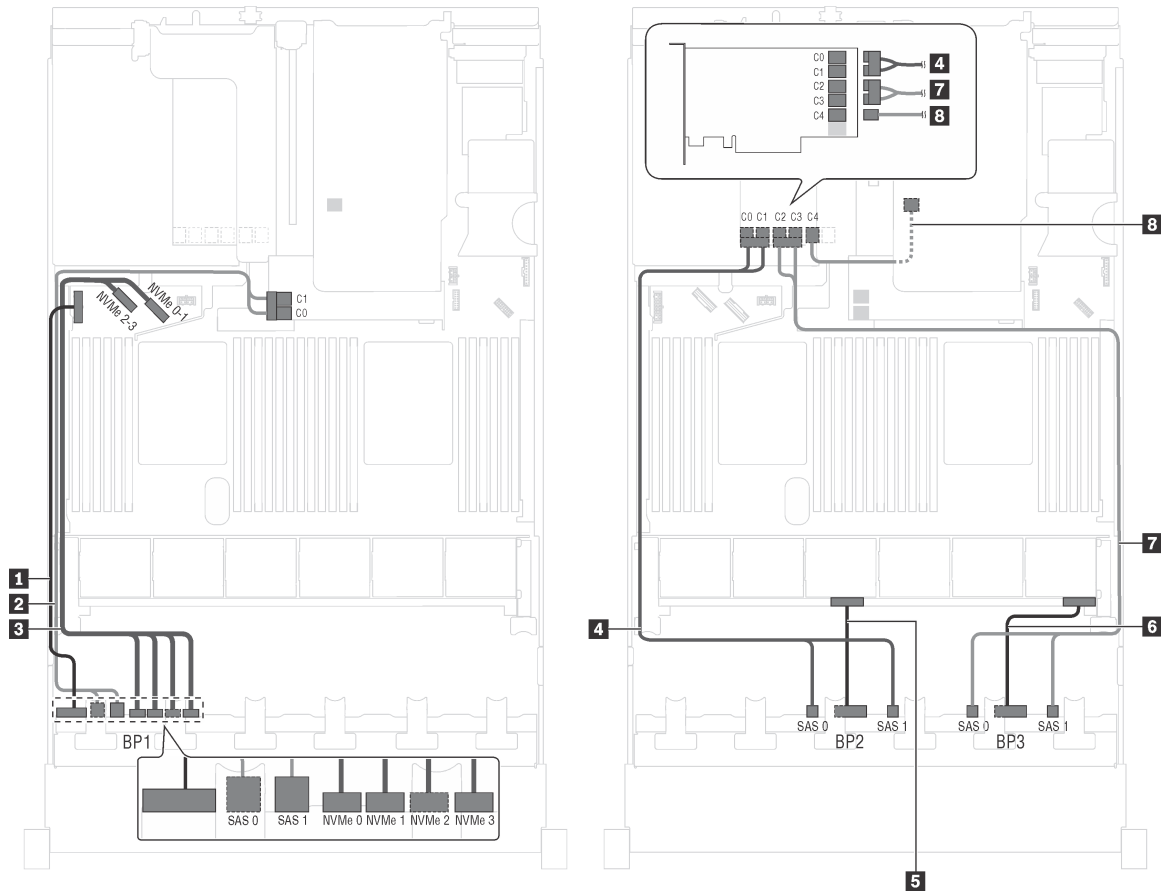

Figure 46. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, two 8i RAID adapters, and one 16i RAID adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C0 and C1 connectors on the 8i RAID adapter installed on PCIe slot 4
5 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
6 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board

Cable	From	To
7 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C0 and C1 connectors on the 16i RAID adapter installed on PCIe slot 5
8 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C2 connector on the 16i RAID adapter installed on PCIe slot 5

Server model: twenty 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, one 8i RAID adapter, one 24i RAID adapter
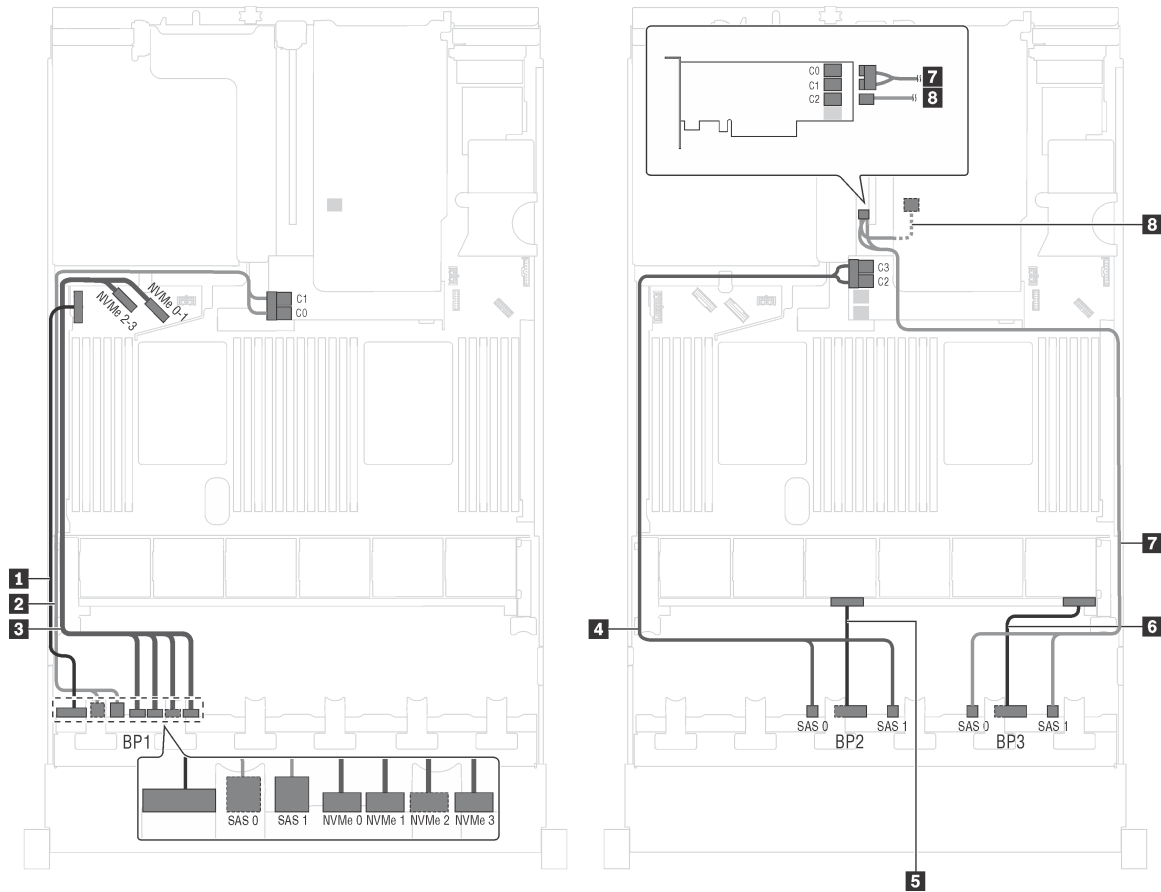

Figure 47. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, one 8i RAID adapter, and one 24i RAID adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C0 and C1 connectors on the 24i RAID adapter installed on PCIe slot 5
5 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
6 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board

Cable	From	To
7 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C2 and C3 connectors on the 24i RAID adapter installed on PCIe slot 5
8 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C4 connector on the 24i RAID adapter installed on PCIe slot 5

Server model: twenty 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, two 16i RAID adapters
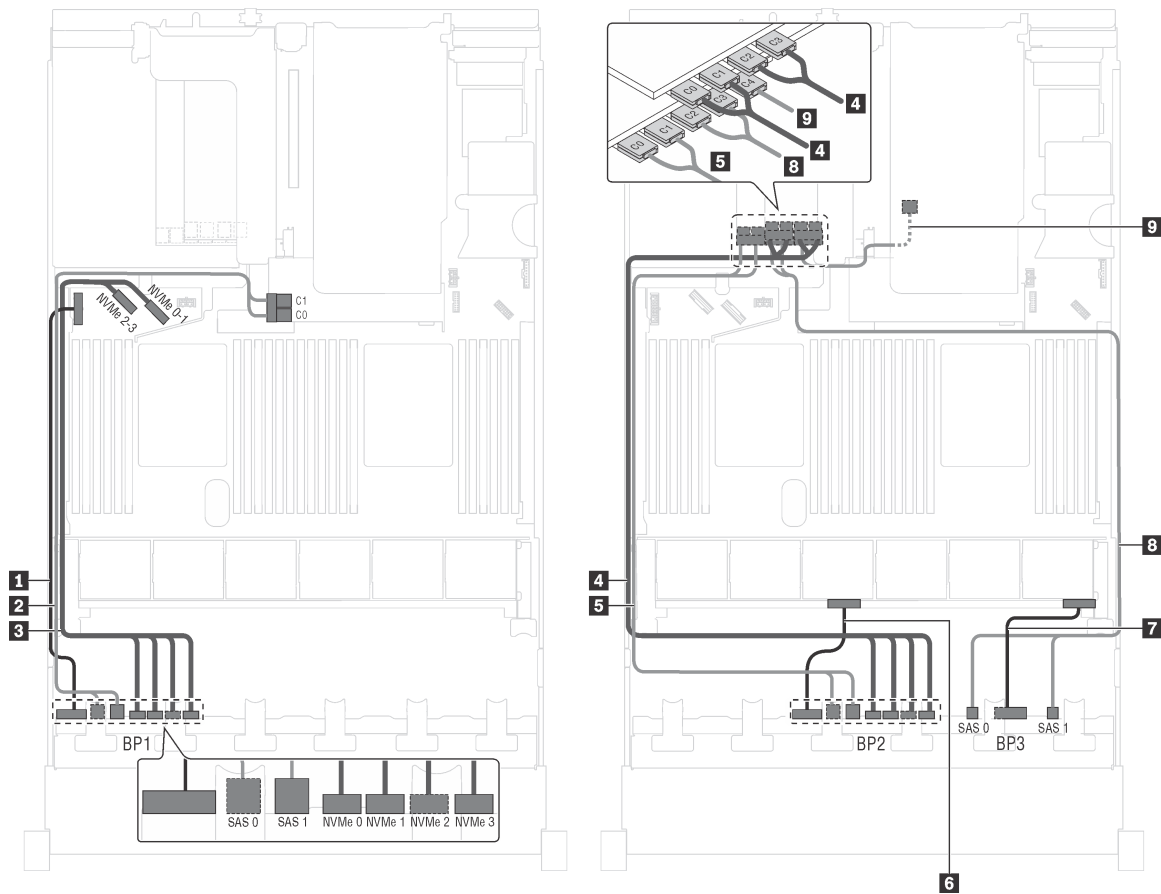

Figure 48. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, four 2.5-inch NVMe drives, the rear hot-swap drive assembly, and two 16i RAID adapters

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 16i RAID adapter installed on the RAID adapter slot
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 16i RAID adapter installed on the RAID adapter slot
5 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
6 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board

Cable	From	To
7 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C0 and C1 connectors on the 16i RAID adapter installed on PCIe slot 4
8 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C2 connector on the 16i RAID adapter installed on PCIe slot 4

Server model: sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch NVMe drives, one 24i RAID adapter, one NVMe switch adapter
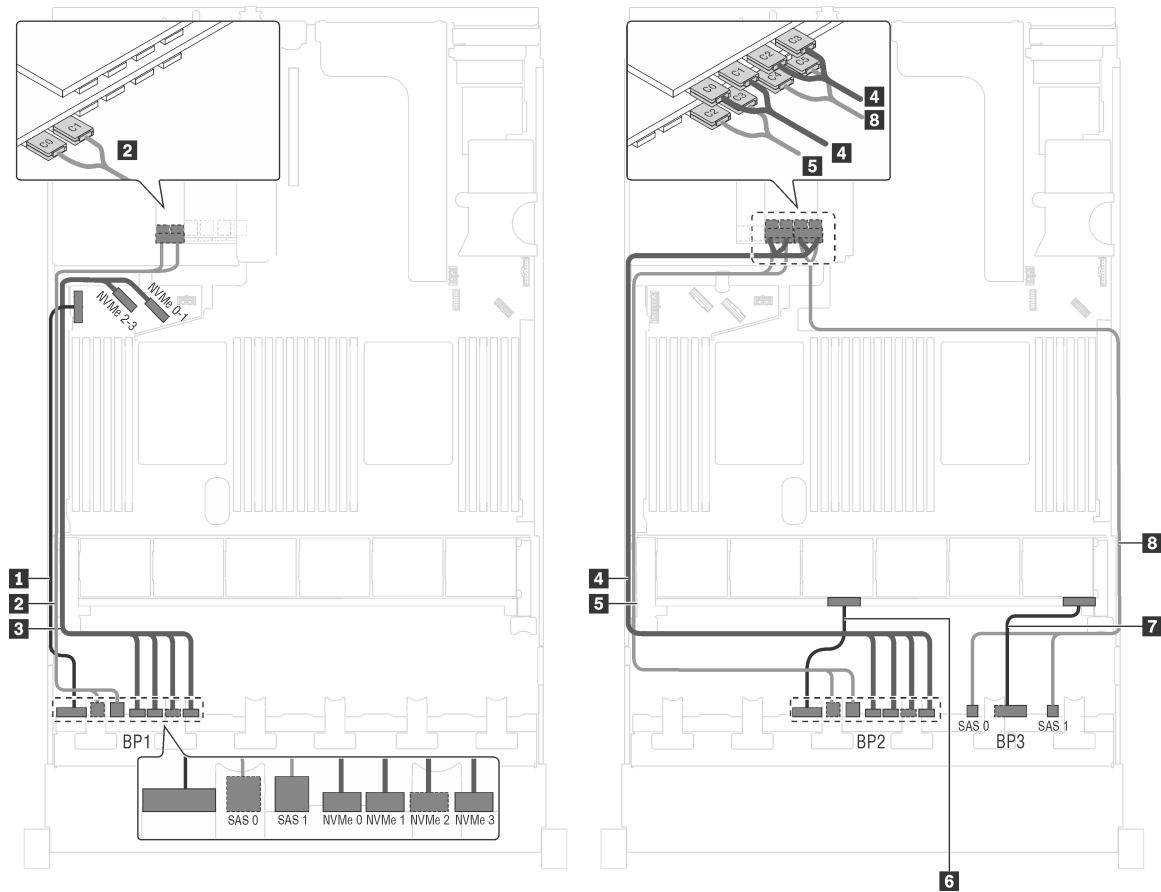
Figure 49. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch NVMe drives, one 24i RAID adapter, and one NVMe switch adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter installed on an available PCIe slot
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed on an available PCIe slot
5 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter installed on an available PCIe slot
6 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

Cable	From	To
7 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
8 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C4 and C5 connectors on the 24i RAID adapter installed on an available PCIe slot

Server model: sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch NVMe drives, the rear hot-swap drive assembly, one 8i RAID adapter, one 24i RAID adapter, one NVMe switch adapter

Figure 50. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch NVMe drives, the rear hot-swap drive assembly, one 8i RAID adapter, one 24i RAID adapter, and one NVMe switch adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed on PCIe slot 5
5 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C0 and C1 connectors on the 24i RAID adapter installed on PCIe slot 6
6 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
7 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board

Cable	From	To
8 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C2 and C3 connectors on the 24i RAID adapter installed on PCIe slot 6
9 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C4 connector on the 24i RAID adapter installed on PCIe slot 6

Server model: sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch NVMe drives, the rear hot-swap drive assembly, two 16i RAID adapters, one NVMe switch adapter
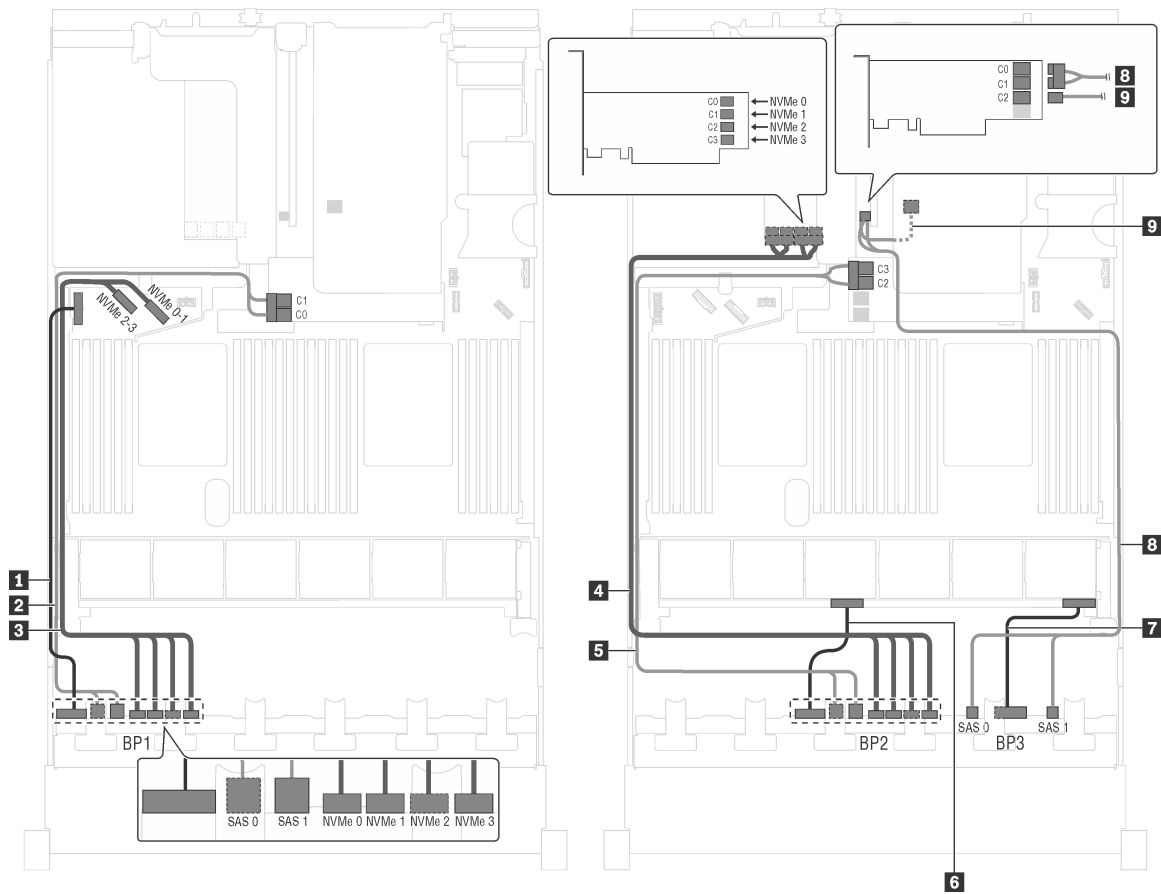
Figure 51. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch NVMe drives, the rear hot-swap drive assembly, two 16i RAID adapters, and one NVMe switch adapter

Cable	From	To
1 Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
2 SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 16i RAID adapter installed on the RAID adapter slot
3 NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
4 NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed on PCIe slot 5
5 SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 16i RAID adapter installed on the RAID adapter slot
6 Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

Cable	From	To
7 Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
8 SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C0 and C1 connectors on the 16i RAID adapter installed on PCIe slot 4
9 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C2 connector on the 16i RAID adapter installed on PCIe slot 4

Server models with eight 3.5-inch drives

Use this section to understand the cable routing for server models with eight 3.5-inch SAS/SATA drives.

Server model: eight 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, two 8i RAID adapters

Note: The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i RAID adapter on PCIe slot 4 might not be available on your server.
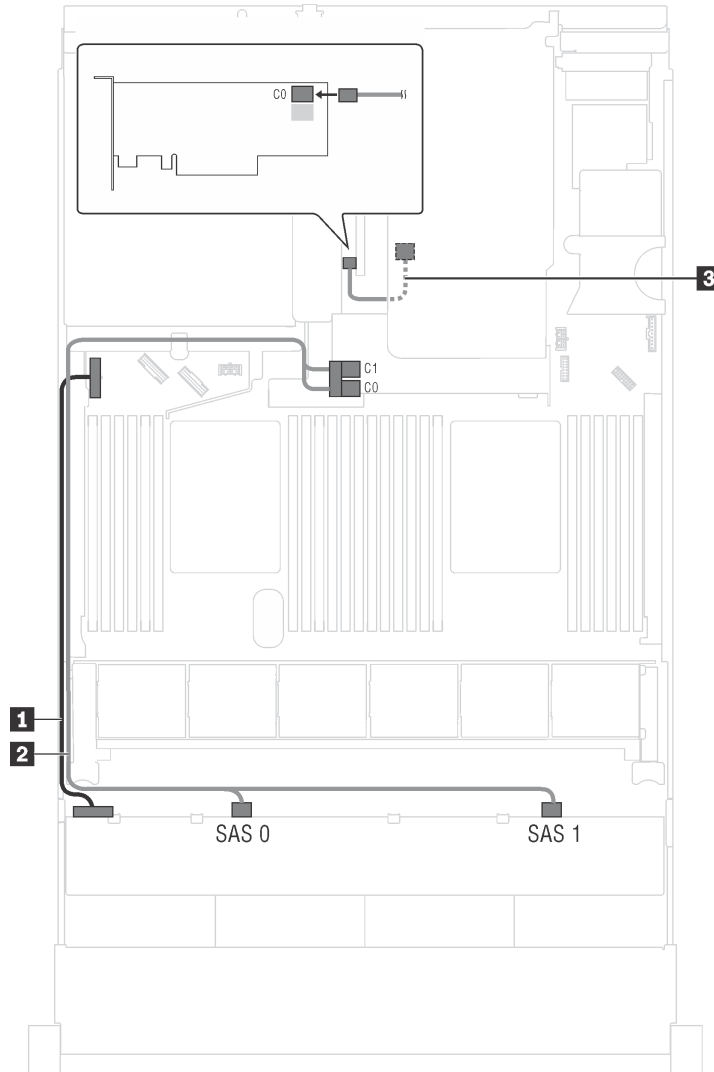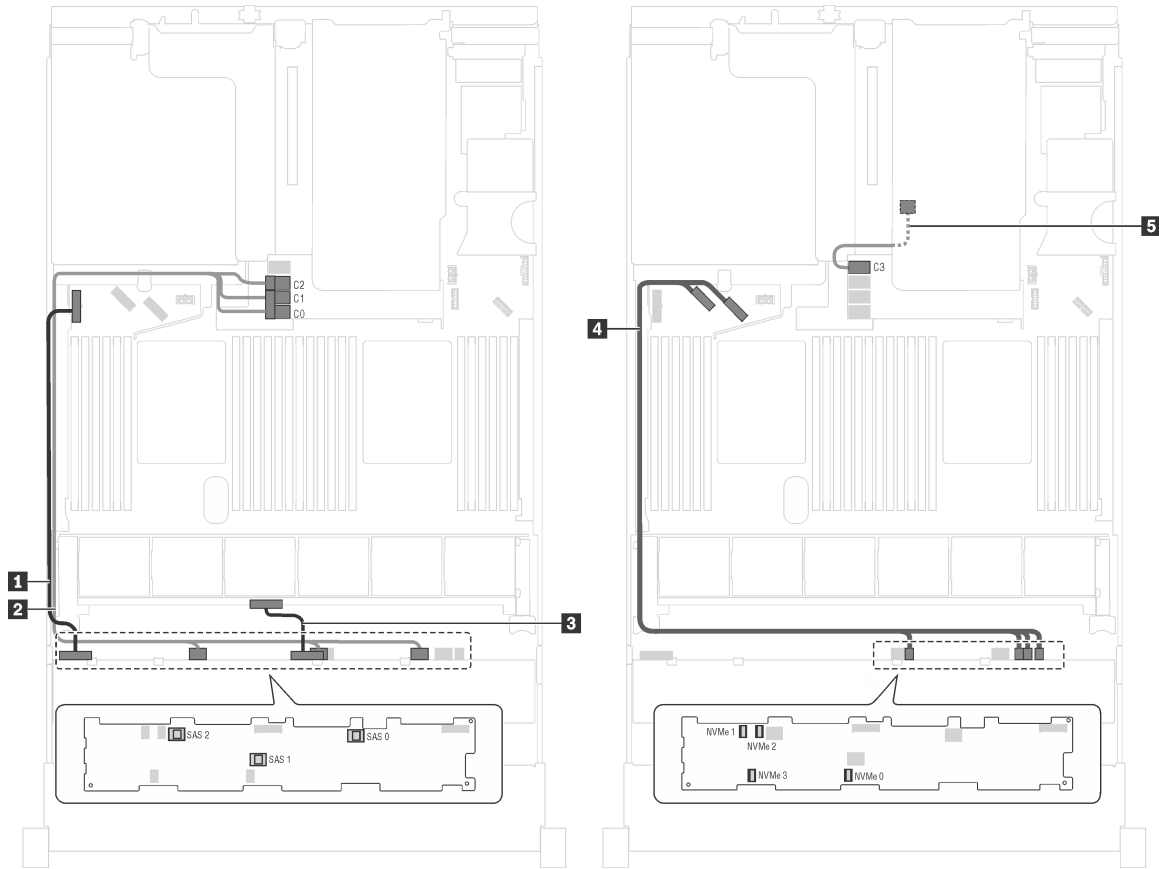

Figure 52. Cable routing for server models with eight 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and two 8i RAID adapters

Cable	From	To
1 Power cable	Power connector on the backplane	Backplane power connector 1 on the system board
2 SAS signal cable	SAS 0 and SAS 1 connectors on the backplane	C0 and C1 connectors on the 8i RAID adapter installed on the RAID adapter slot
3 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C0 connector on the 8i RAID adapter installed on PCIe slot 4

Server model: eight 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 16i RAID adapter

Figure 53. Cable routing for server models with eight 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and one 16i RAID adapter

Cable	From	To
1 Power cable	Power connector on the backplane	Backplane power connector 1 on the system board
2 SAS signal cable	SAS 0 and SAS 1 connectors on the backplane	C0 and C1 connectors on the 16i RAID adapter installed on the RAID adapter slot
3 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C2 connector on the 16i RAID adapter installed on the RAID adapter slot

Server models with twelve 3.5-inch drives

Use this section to understand the cable routing for server models with twelve 3.5-inch drives.

Server model: twelve 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 16i RAID adapter

Note: The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly might not be available on your server.
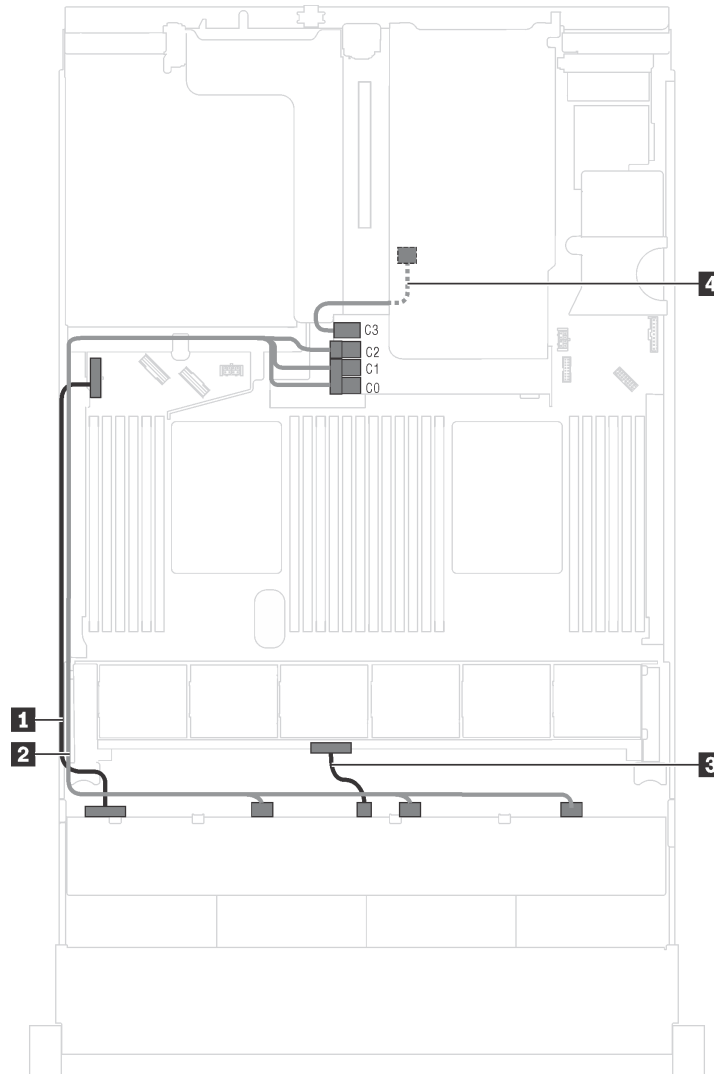
Figure 54. Cable routing for server models with twelve 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and one 16i RAID adapter

Cable	From	To
1 Power cable	Power 1 connector on the front backplane	Backplane power connector 1 on the system board
2 SAS signal cable	SAS 0, SAS 1, and SAS 2 connectors on the backplane	C0, C1, and C2 connectors on the 16i RAID adapter installed on the RAID adapter slot

Cable	From	To
3 Power cable	Power 2 connector on the front backplane	Backplane power connector 2 on the system board
4 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C3 connector on the 16i RAID adapter installed on the RAID adapter slot

Server model: eight 3.5-inch SAS/SATA drives, four 3.5-inch NVMe drives, the rear hot-swap drive assembly, one 16i RAID adapter

Note: The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly might not be available on your server.

Figure 55. Cable routing for server models with eight 3.5-inch SAS/SATA drives, four 3.5-inch NVMe drives, the rear hot-swap drive assembly, and one 16i RAID adapter

Cable	From	To
1 Power cable	Power 1 connector on the front backplane	Backplane power connector 1 on the system board
2 SAS signal cable	SAS 0, SAS 1, and SAS 2 connectors on the backplane	C0, C1, and C2 connectors on the 16i RAID adapter installed on the RAID adapter slot
3 Power cable	Power 2 connector on the front backplane	Backplane power connector 2 on the system board
4 SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C3 connector on the 16i RAID adapter installed on the RAID adapter slot
5 NVMe signal cable	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on the front backplane	NVMe 0–1 and NVMe 2–3 connectors on the system board

Parts list

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

For more information about ordering the parts shown in Figure 56 "Server components" on page 84:

http://datacentersupport.lenovo.com/us/en/products/servers/thinksystem/sr650/7x05/parts

Note: Depending on the model, your server might look slightly different from the illustration.
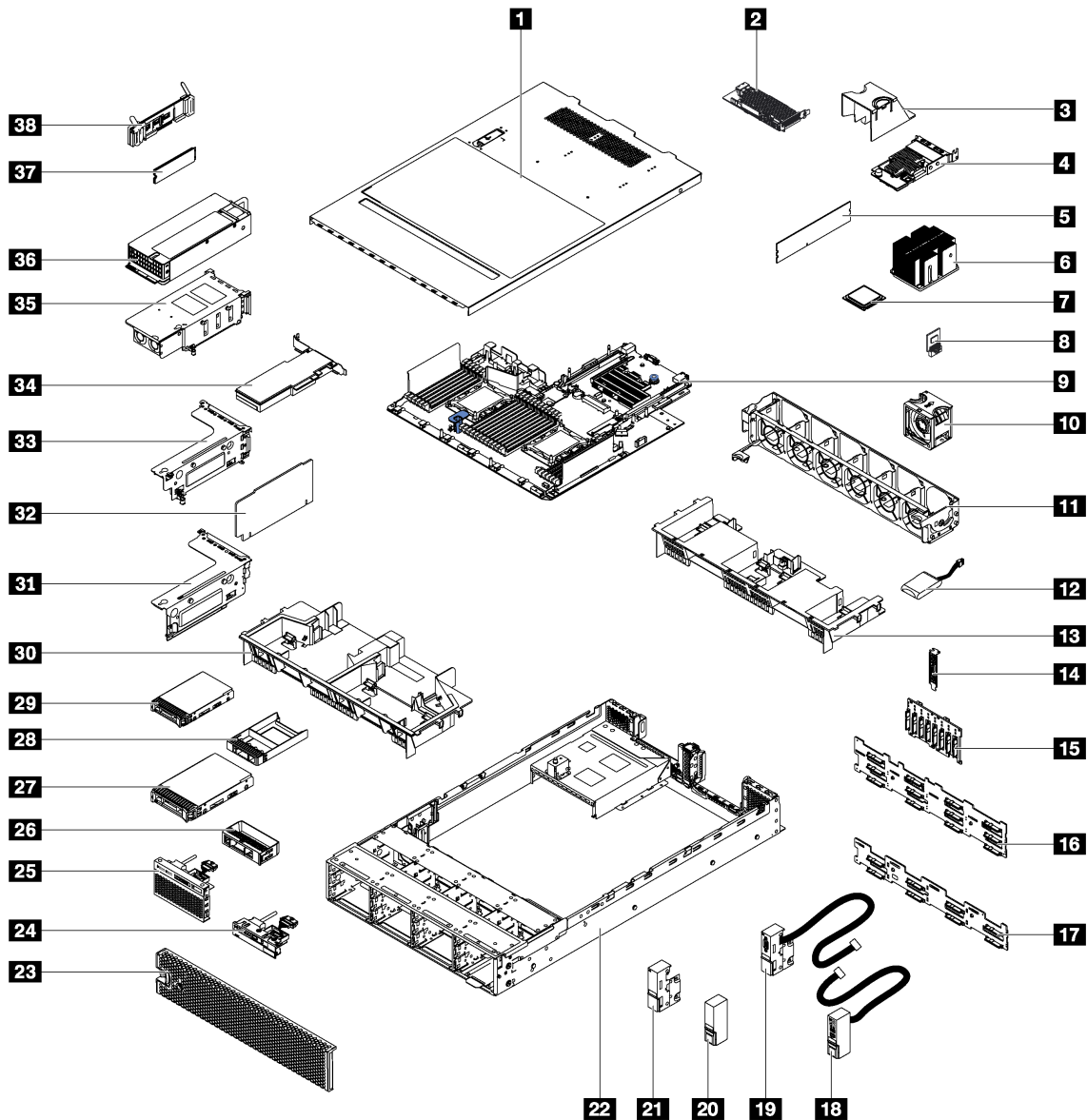
Figure 56. Server components

The parts listed in the following table 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:** 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 9. Parts listing

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and Structural parts
For more information about ordering the parts shown in Figure 56 "Server components" on page 84: http://datacentersupport.lenovo.com/us/en/products/servers/thinksystem/sr650/7x05/parts					
1	Top cover	√			
2	RAID adapter	√			
3	LOM-adapter air baffle				√
4	LOM adapter	√			
5	DIMM	√			
6	Heat sink			√	
7	Processor			√	
8	TCM (for China only)			√	
9	System board			√	
10	Fan	√			
11	Fan cage				√
12	RAID super capacitor module	√			
13	Air baffle				√
14	Serial port module	√			
15	Backplane, eight 2.5-inch hot-swap drives	√			
16	Backplane, twelve 3.5-inch hot-swap drives	√			
17	Backplane, eight 3.5-inch hot-swap drives	√			
18	Right rack latch, with front I/O assembly	√			
19	Left rack latch, with VGA connector	√			
20	Right rack latch, without front I/O assembly				√

Table 9. Parts listing (continued)

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and Structural parts
21	Left rack latch, without VGA connector				√
22	Chassis			√	
23	Security bezel	√			
24	Front I/O assembly, server models with eight 3.5-inch drive bays	√			
25	Front I/O assembly, server models with eight or sixteen 2.5-inch drive bays	√			
26	Filler, 3.5-inch drive				√
27	Storage drive, 3.5-inch, hot-swap	√			
28	Filler, 2.5-inch drive				√
29	Storage drive, 2.5-inch, hot-swap	√			
30	Air baffle, for server models with GPU				√
31	Riser 2 bracket	√			
32	Riser card	√			
33	Riser 1 bracket	√			
34	PCIe adapter	√			
35	Rear hot-swap drive assembly	√			
36	Power supply	√			
37	M.2 drive	√			
38	M.2 backplane	√			

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://lesc.lenovo.com

2. In the Customize a Model pane:

   a. Click **Select Options/Parts for a Model**.

   b. Enter the machine type and model for your server.

3. Click the Power tab to see all line cords.

Notes:

- For your safety, a power cord with a grounded attachment plug is provided to use with this product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.

- Power cords for this product that are used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

- For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

- For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

- For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

- Power cords for a specific country or region are usually available only in that country or region.

Chapter 3. Hardware replacement procedures

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

For more information about ordering parts:

http://datacentersupport.lenovo.com/us/en/products/servers/thinksystem/sr650/7x05/parts

Note: If you replace a part, such as an adapter, that contains firmware, you might also need to update the firmware for that part. For more information about updating firmware, see "Firmware updates" on page 7.

Installation Guidelines

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

Before installing optional devices, read the following notices carefully:

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

- Read the safety information and guidelines to ensure that you work safely.
  - A complete list of safety information for all products is available at:

    http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html
  - The following guidelines are available as well: "Handling static-sensitive devices" on page 91 and "Working inside the server with the power on" on page 91.
- Make sure the components you are installing are supported by the server. For a list of supported optional components for the server, see http://www.lenovo.com/us/en/serverproven/.
- 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 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.

- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- 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.
- Blue on a component indicates touch points, where you can grip to remove a component from or install it in the server, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped if the server and operating system support hot-swap capability, which means that you can remove or install the component while the server is still running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- The Red strip on the drives, adjacent to the release latch, indicates that the drive can be hot-swapped if the server and operating system support hot-swap capability. This means that you can remove or install the drive while the server is still running.

  Note: See the system specific instructions for removing or installing a hot-swap drive for any additional procedures that you might need to perform before you remove or install the drive.
- After finishing working on the server, make sure you reinstall all safety shields, guards, labels, and ground wires.

System reliability guidelines

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

Make sure the following requirements are met:

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

Working inside the server with the power on

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

Attention: The server might stop and loss of data 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 long hair from dangling into the server.
- Remove jewelry, such as bracelets, necklaces, rings, cuff links, and wrist watches.
- Remove items from your shirt pocket, such as pens and pencils, in case they fall into the server as you lean over it.
- Avoid dropping any metallic objects, such as paper clips, hairpins, and screws, into the server.

Handling static-sensitive devices

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

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

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

Security bezel replacement

Use this information to remove and install the security bezel.

Note: The security bezel is available on some models.

Remove the security bezel

Use this information to remove the security bezel.

Read the
Installation
Guidelines

To remove the security bezel, complete the following steps:

Watch the procedure. A video of the removal process is available:
* Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
* Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1. Use the key to unlock the security bezel to the open position.
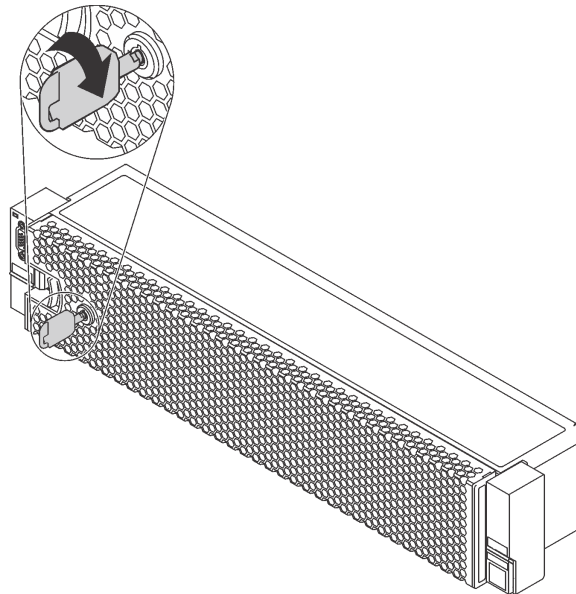
Figure 57. Unlocking the security bezel

Step 2. Press the release latch ◼ and pivot the security bezel outward to remove it from the chassis.
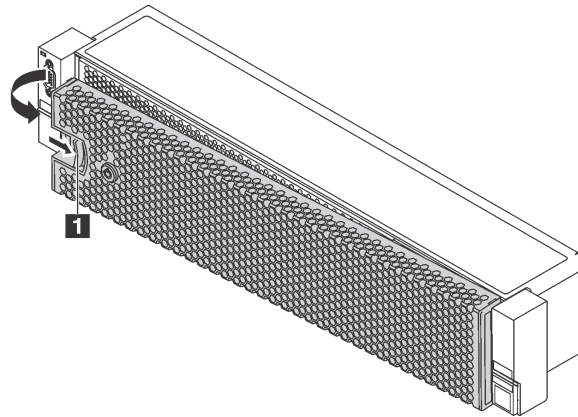
Figure 58. Security bezel removal

Attention: Before you ship the rack with the server installed, reinstall and lock the security bezel into place.

Install the security bezel

Use this information to install the security bezel.

Read the Installation Guidelines

Before installing the security bezel, if you have removed the rack latches, reinstall them. See "Install the rack latches" on page 99.

To install the security bezel, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Attention: Before you ship the rack with the server installed, reinstall and lock the security bezel into place.

Step 1.   If the key is held inside the security bezel, remove it out of the security bezel.
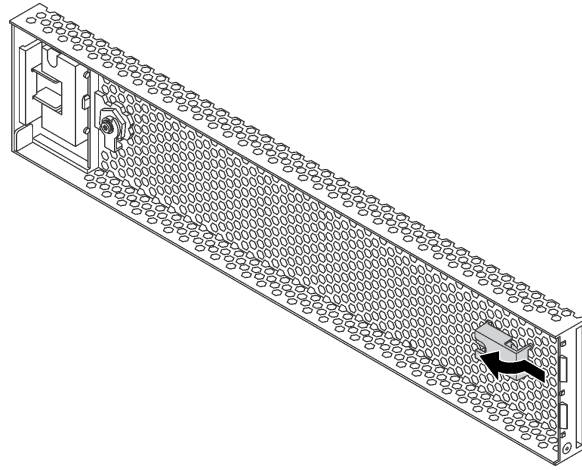
Figure 59. Key removal

Step 2. Carefully insert the tabs on the security bezel into the slots on the right rack latch. Then, press and hold the release latch **1** and pivot the security bezel inward until the other side clicks into place.
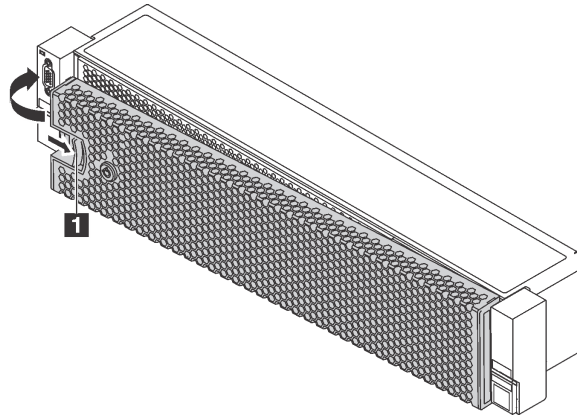
Figure 60. Security bezel installation

Step 3. Use the key to lock the security bezel to the closed position.
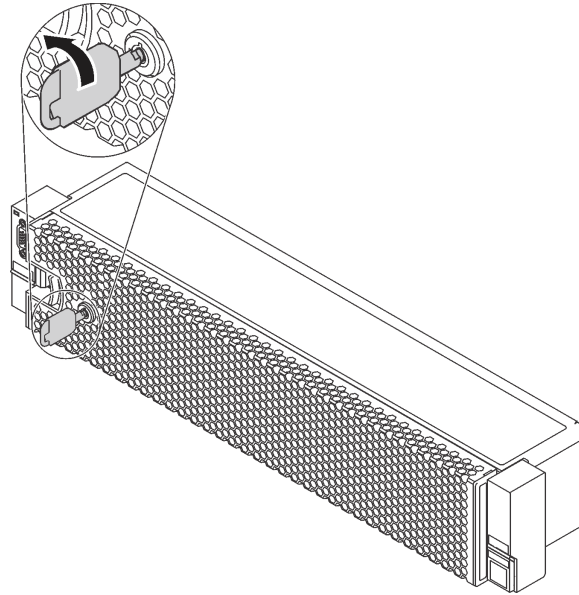
Figure 61. Locking the security bezel

Rack latches replacement

Use this information to remove and install the rack latches.

Note: Depending on the model, the left rack latch might be assembled with a VGA connector and the right rack latch might be assembled with the front I/O assembly.

Remove the rack latches

Use this information to remove the rack latches.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION: Static Sensitive Device** Ground package before opening

Note: If the rack latches are not assembled with a VGA connector or the front I/O assembly, you can remove the rack latches without powering off the server.

Before removing the rack latches:

1. If the server is installed with the security bezel, remove it first. See "Remove the security bezel" on page 92.

2. Use a flat-blade screwdriver to remove the ID label plate on the right rack latch and place it in a safe place.
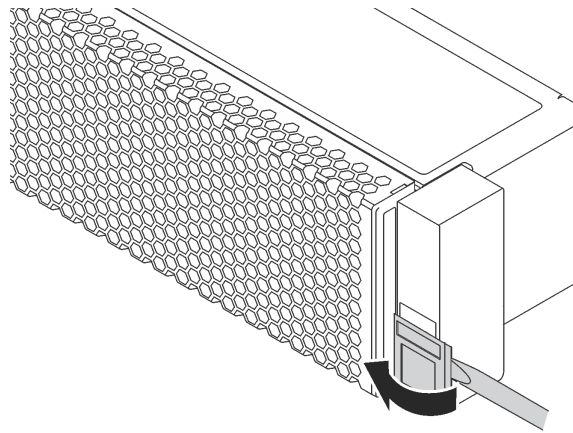
Figure 62. ID label plate removal

To remove the rack latches, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1.   Do one of the following:

- If the rack latches are not assembled with a VGA connector or the front I/O assembly, go to the next step.

- If the rack latches are assembled with a VGA connector, the front I/O assembly, or both, complete the following steps:

    1. Disconnect the VGA cable **1**, the front-I/O-assembly cable **2**, or both cables from the system board.
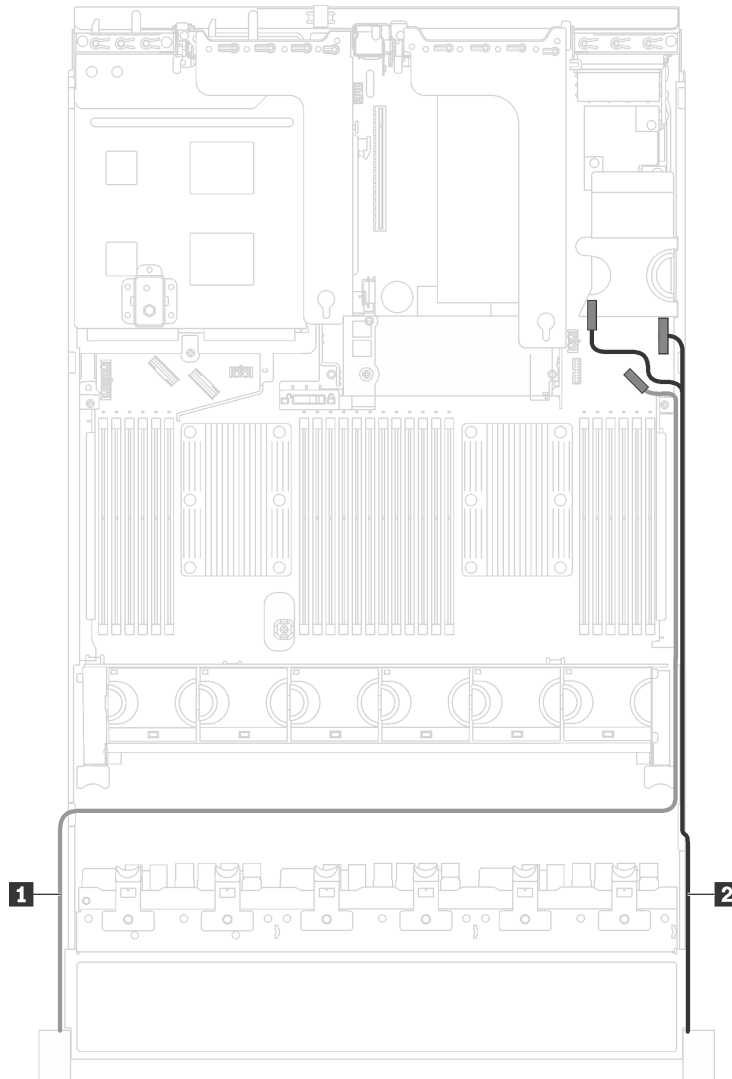
Figure 63. Cable routing for the VGA connector and the front I/O assembly on rack latches

2. Remove the screws that secure the cable retainer on the side of the server. Then, remove the cable retainer from the chassis.
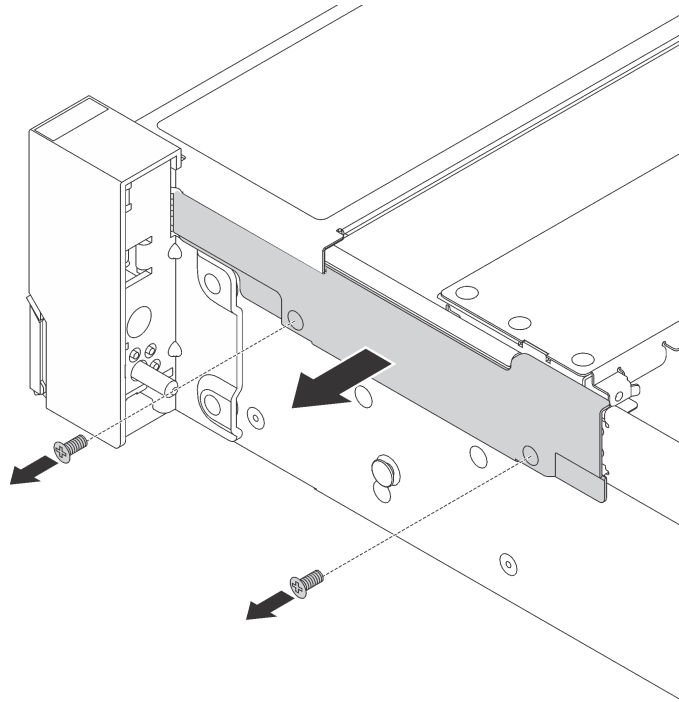
Figure 64. Cable retainer removal

Step 2.   On each side of the server, remove the screws that secure the rack latch.
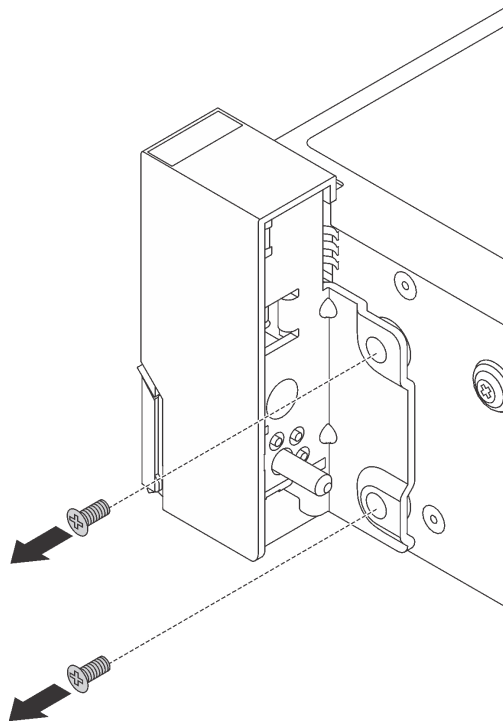
Figure 65. Screws removal

Step 3.   On each side of the server, slide the rack latch forward slightly and then remove the rack latch from the chassis.
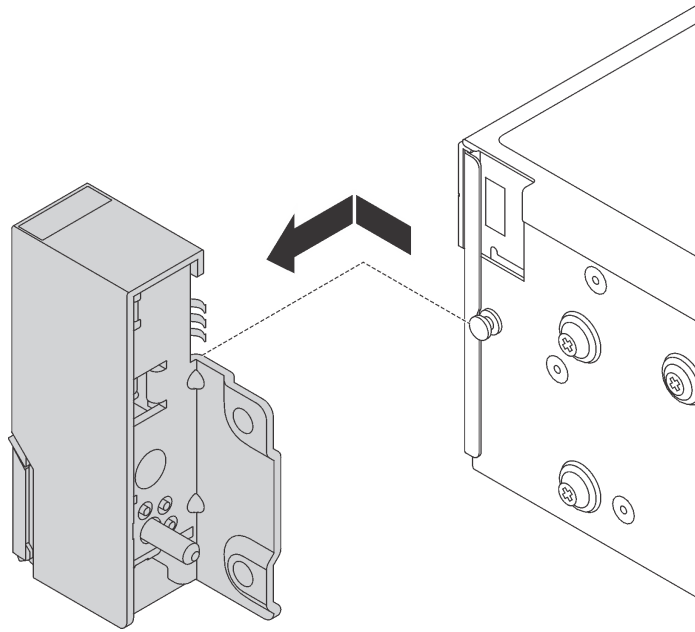
Figure 66. Rack latch removal

If you are instructed to return the old rack latches, follow all packaging instructions and use any packaging materials that are provided.

Install the rack latches

Use this information to install the rack latches.

Note: If the rack latches are not assembled with a VGA connector or the front I/O assembly, you can install the rack latches without powering off the server.

To install the rack latches, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
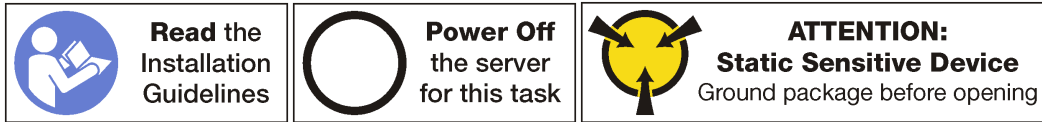- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1.   Touch the static-protective package that contains the new rack latches to any unpainted surface on the outside of the server. Then, take the new rack latches out of the package and place them on a static-protective surface.

Step 2.   On each side of the server, align the rack latch with the pin on the chassis. Then, press the rack latch onto the chassis and slightly slide it backward.
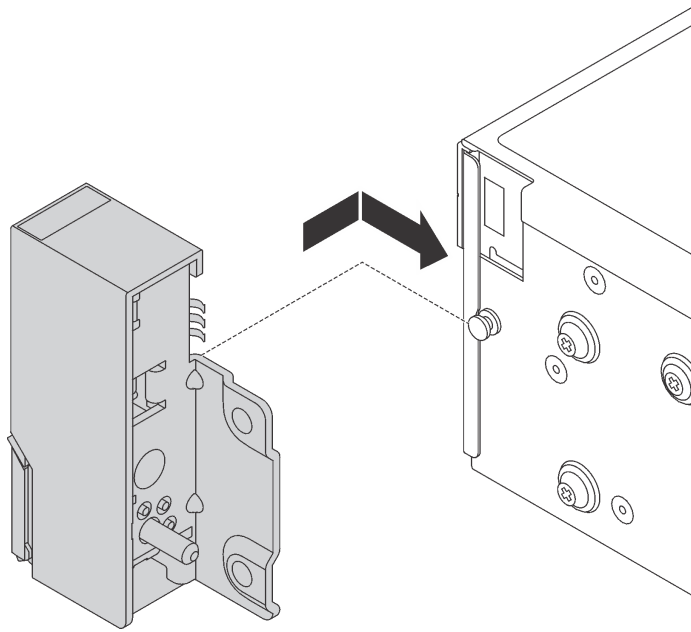
Figure 67. Rack latch installation

Step 3.   Install the screws to secure the rack latch on each side of the server.
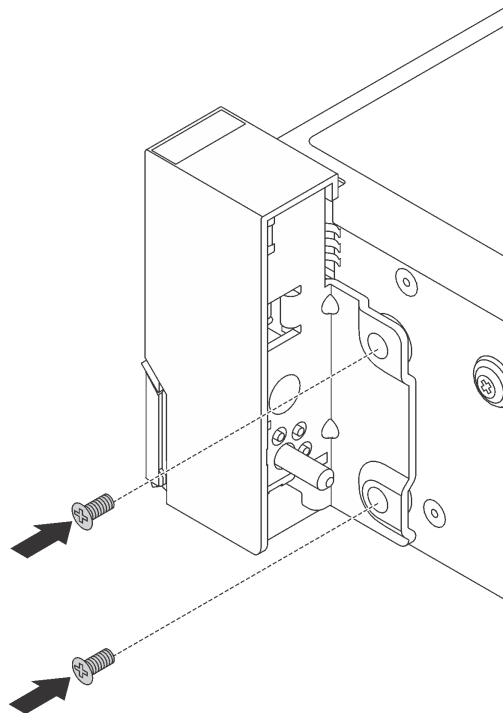
Figure 68. Screws installation

Step 4.   If the rack latches are assembled with a VGA connector, the front I/O assembly, or both, complete the following steps:

    1. Route the VGA cable, the front-I/O-assembly cable, or both cables across the notch on the chassis as shown. Then, install the screws to secure the cable retainer.
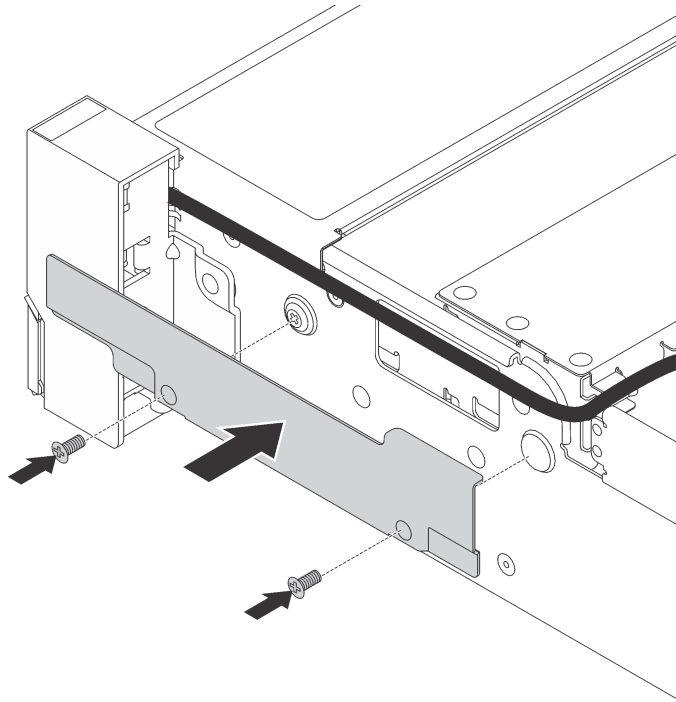
Figure 69. Cable retainer installation

2. Connect the VGA cable **1**, the front-I/O-assembly cable **2**, or both cables to the system board.
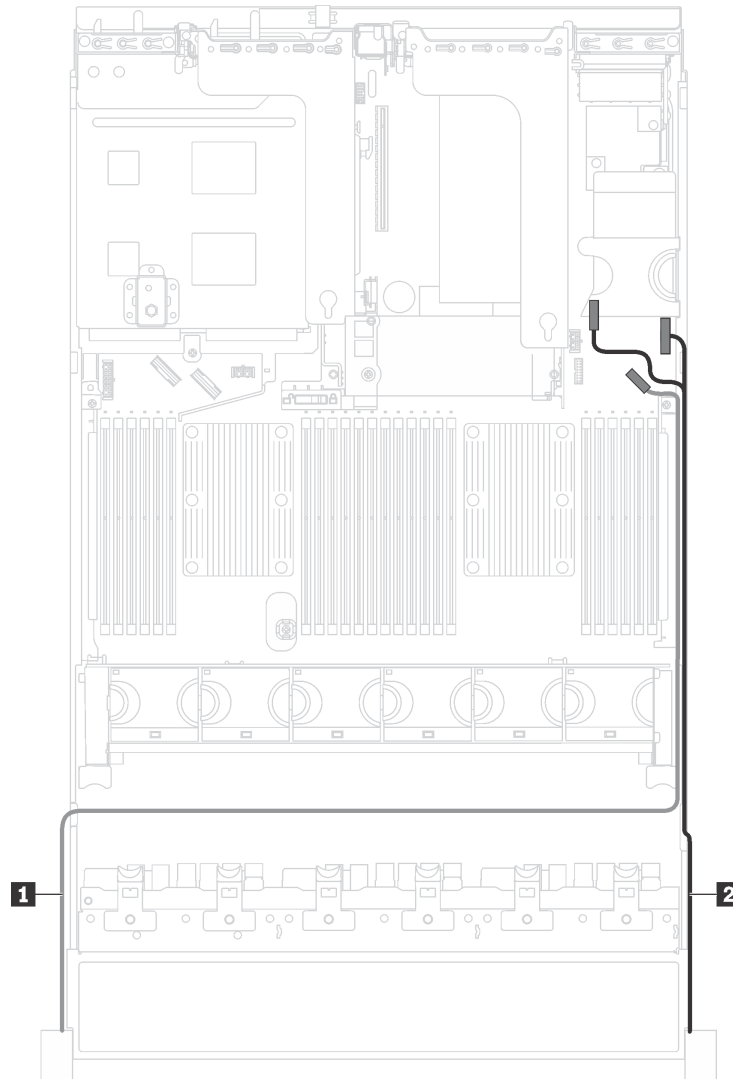
Figure 70. Cable routing for the VGA connector and the front I/O assembly on rack latches

After installing the rack latches:

1. Install the ID label plate to the right rack latch as shown.
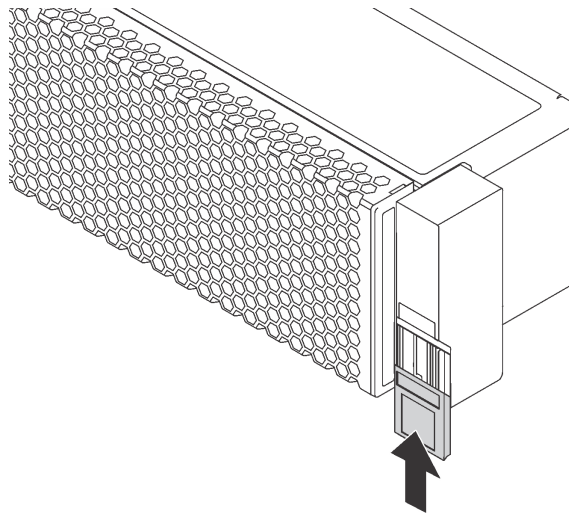
Figure 71. ID label plate installation

2. Complete the parts replacement. See "Complete the parts replacement" on page 203.

Top cover replacement

Use this information to remove and install the top cover.

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 following label is attached.

Remove the top cover

Use this information to remove the top cover.
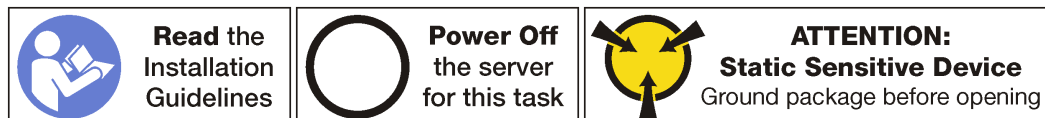
Note: You can remove or install a hot-swap fan without powering off the server, which helps you avoid significant interruption to the operation of the system.

To remove the top cover, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444
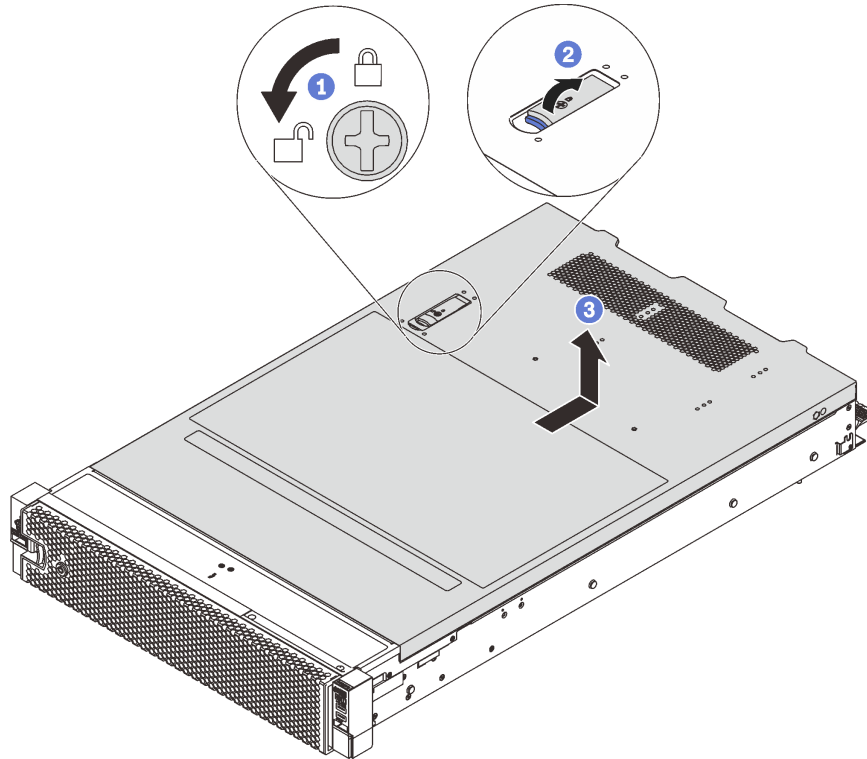
Figure 72. Top cover removal

Step 1.   Use a screwdriver to turn the cover lock to the unlocked position as shown.

Step 2.   Press the release button on the cover latch and then fully open the cover latch.

Step 3.   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.

> **Attention:**
>
> - Handle the top cover carefully. Dropping the top cover with the cover latch open might damage the cover latch.
> - For proper cooling and airflow, install the top cover before you power on the server. Operating the server with the top cover removed might damage server components.

Install the top cover

Use this information to install the top cover.

Read the Installation Guidelines	Power Off the server for this task	ATTENTION: Static Sensitive Device Ground package before opening

Before you install the top cover:

1. Ensure that all cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server.

2. Ensure that all internal cables are connected and routed correctly. See "Internal cable routing" on page 27.

3. If you are installing a new top cover, attach the service label to the new top cover first if necessary.

    Note: A new top cover comes without a service label attached. If you need a service label, order it together with the new top cover. The service label is free of charge.

To install the top cover, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444
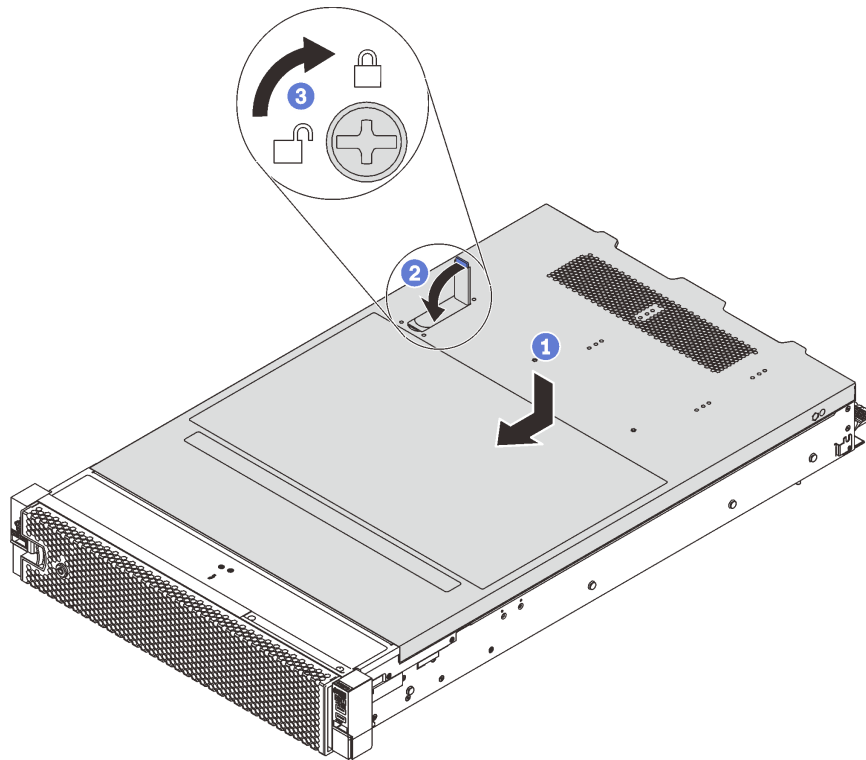
Figure 73. Top cover installation

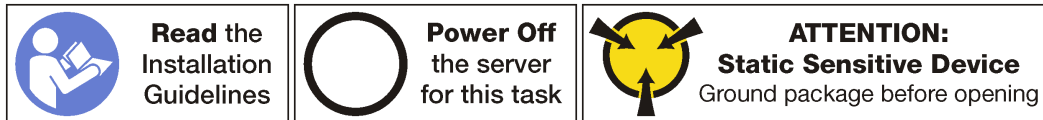**Note:** Before you slide the top cover forward, ensure that all the tabs on the top cover engage the chassis correctly. If the tabs do not engage the chassis correctly, it will be very difficult to remove the top cover later.

Step 1. Ensure that the cover latch is in the open position. Lower the top cover onto the chassis until both sides of the top cover engage the guides on both sides of the chassis.

Step 2. Pivot the cover latch and slide the top cover to the front of the chassis at the same time until the top cover snaps into position. Ensure that the cover latch is closed.

Step 3.   Use a screwdriver to turn the cover lock to the locked position.

After installing the top cover, complete the parts replacement. See "Complete the parts replacement" on page 203.

RAID super capacitor module replacement

Use this information to remove and install the RAID super capacitor module.

The RAID super capacitor module protects the cache memory on the installed RAID adapter. You can purchase a RAID super capacitor module from Lenovo.

For a list of supported options, see:
http://www.lenovo.com/us/en/serverproven/

Remove a RAID super capacitor module

Use this information to remove a RAID super capacitor module.

	Read the Installation Guidelines		Power Off the server for this task		ATTENTION: Static Sensitive Device Ground package before opening
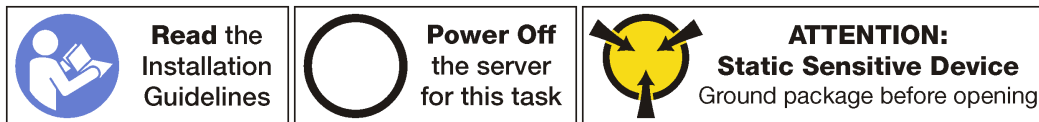
Before removing a RAID super capacitor module:
1. Remove the top cover. See "Remove the top cover" on page 103.
2. Disconnect the cable of the RAID super capacitor module.

To remove a RAID super capacitor module, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444
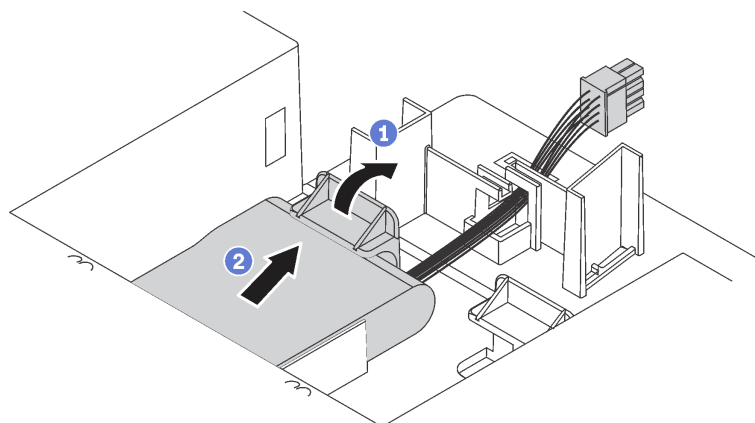
Figure 74. RAID super capacitor module removal

Step 1.   Gently press the tab on the air baffle as shown.

Step 2.   Remove the RAID super capacitor module from the air baffle.

If you are instructed to return the old RAID super capacitor module, follow all packaging instructions and use any packaging materials that are provided.

Install a RAID super capacitor module

Use this information to install a RAID super capacitor module.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening

Before installing a RAID super capacitor module:

1. Touch the static-protective package that contains the new RAID super capacitor module to any unpainted surface on the outside of the server. Then, take the new RAID super capacitor module out of the package and place it on a static-protective surface.

2. Locate the holder for the RAID super capacitor module on the air baffle and note the orientation of the RAID super capacitor module.

To install a RAID super capacitor module, complete the following steps:

Watch the procedure. A video of the installation process is available:
• Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
• Youku: http://list.youku.com/albumlist/show/id_50483444
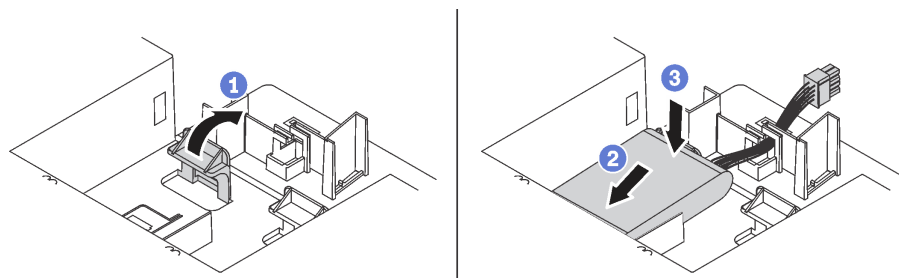
Figure 75. RAID super capacitor module installation

Step 1.   Gently press and hold the tab on the air baffle as shown.

Step 2.   Insert the RAID super capacitor module into the holder on the air baffle.

Step 3.   Press down the RAID super capacitor module to install it into the holder.

After installing the RAID super capacitor module:

1. Connect the RAID super capacitor module to a RAID adapter with the extension cable that comes with the RAID super capacitor module.

2. Complete the parts replacement. See "Complete the parts replacement" on page 203.

Air baffle replacement

Use this information to remove and install the air baffle.

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.

<u>S017</u>

CAUTION:
Hazardous moving fan blades nearby.

Remove the air baffle

Use this information to remove the air baffle.

Before removing the air baffle:

1. Remove the top cover. See "Remove the top cover" on page 103.

2. If there is a RAID super capacitor module installed on the air baffle, disconnect the RAID super capacitor module cable first.

3. If you are removing the air baffle for server models with a GPU installed, remove the GPU first. See "Remove a GPU" on page 157.

To remove the air baffle, complete the following step:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1.   Grasp the air baffle and carefully lift it out of the server.

> **Attention:** For proper cooling and airflow, install the air baffle before you power on the server. Operating the server with the air baffle removed might damage server components.
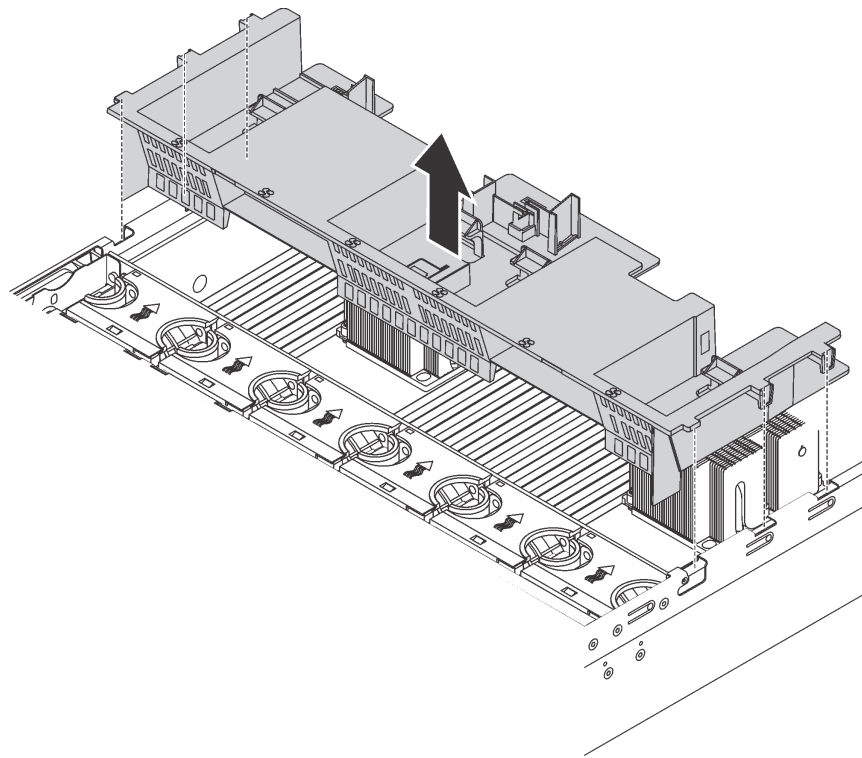
Figure 76. Removal of the air baffle for server models without GPU
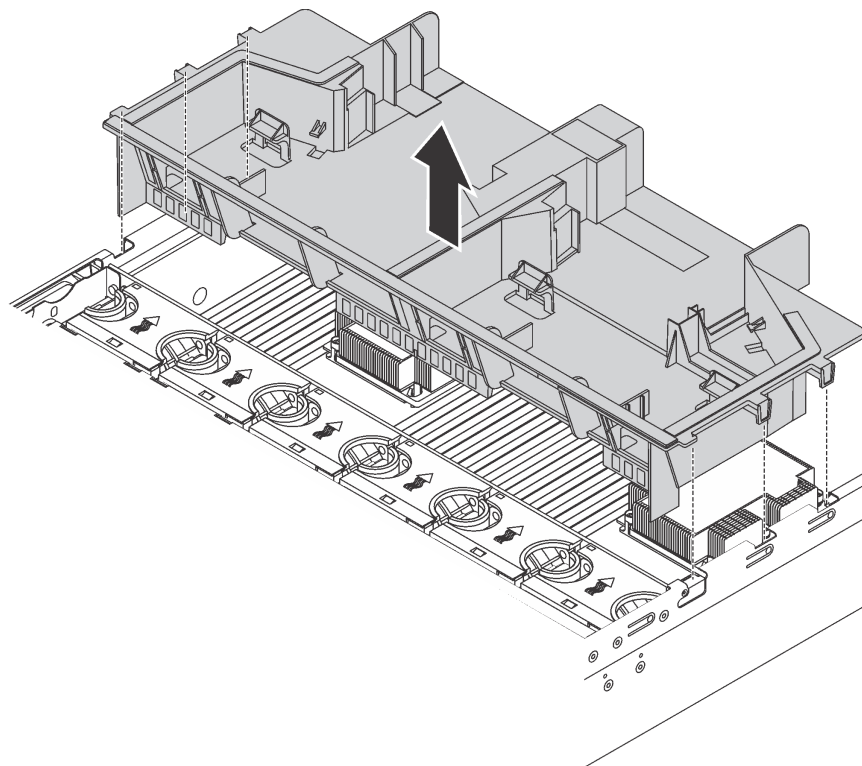
Figure 77. Removal of the air baffle for server models with GPU

After installing the air baffle for server models without GPU, if there is a plastic filler installed in the air baffle, remove the plastic filler.
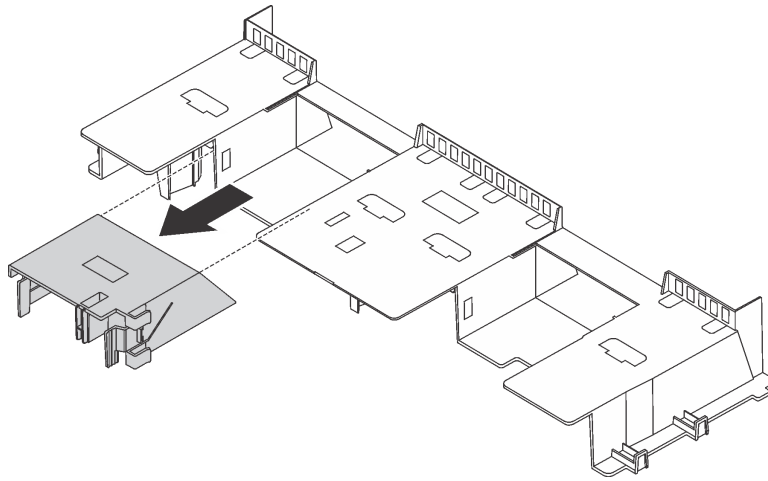
Figure 78. Plastic filler removal

Install the air baffle

Use this information to install the air baffle.

Before installing the air baffle:

1. Ensure that no tools or loose screws are left inside your server.
2. Ensure that all components have been reassembled correctly.
3. Ensure that all cables inside the server have been properly routed and they will not interfere with installing the air baffle.
4. If necessary, install the removed plastic filler to the air baffle for server models without GPU.
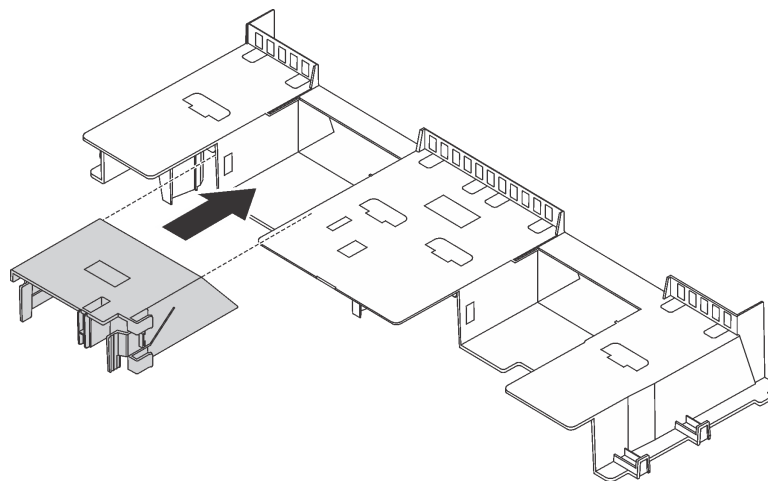
Figure 79. Plastic filler installation

To install the air baffle, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1. Note the orientation of the air baffle.

Step 2. 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.
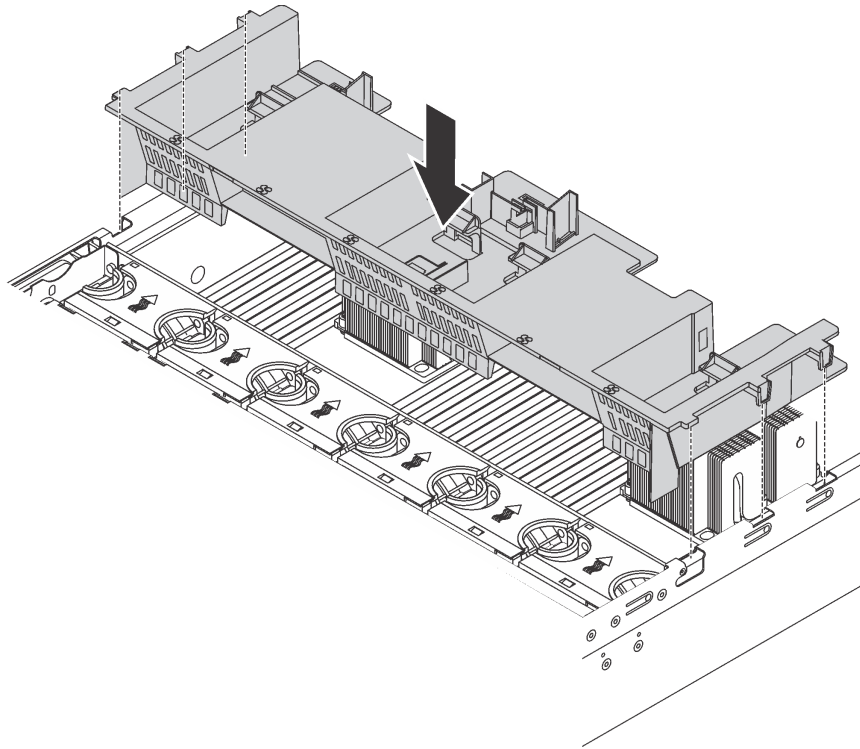
Figure 80. Installation of air baffle for server models without GPU
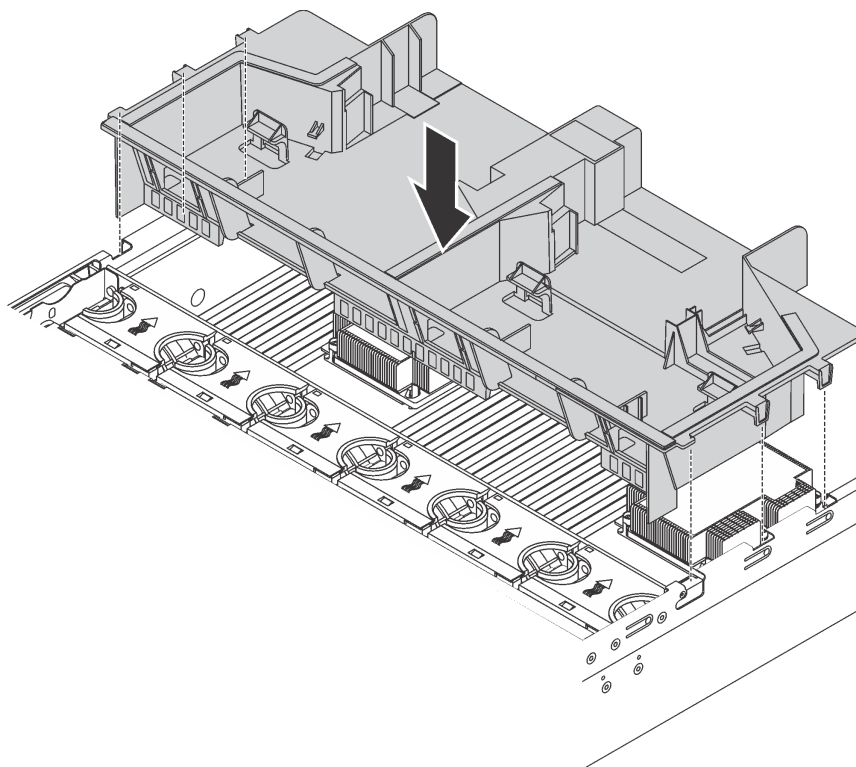
Figure 81. Installation of air baffle for server models with GPU

After installing the air baffle:

1. If there is a RAID super capacitor module installed on the air baffle, connect it to the RAID adapter with the extension cable that comes with the RAID super capacitor module.

2. Complete the parts replacement. See "Complete the parts replacement" on page 203.

System fan replacement

Use this information to remove and install a system fan.

Remove a system fan

Use this information to remove a system fan. You can remove a hot-swap fan without powering off the server, which helps you avoid significant interruption to the operation of the system.

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.

Attention: When removing a system fan without powering off the server, do not touch the system fan cage.

Before removing a system fan:
1. Remove the top cover. See "Remove the top cover" on page 103.
2. View the fan error LEDs ◼ to locate the failing system fan.
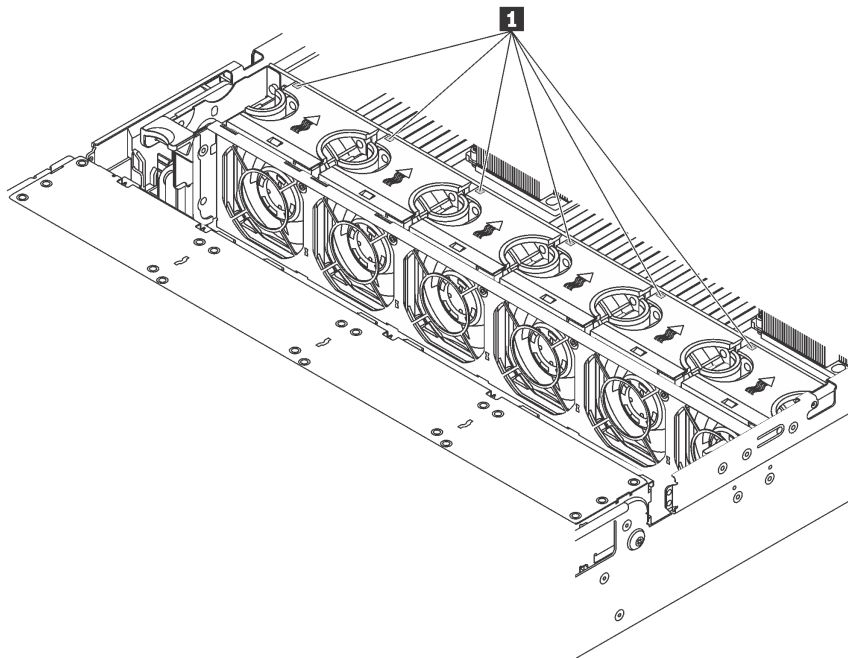
Figure 82. Viewing the fan error LEDs from the top of the system fans

To remove a system fan, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444
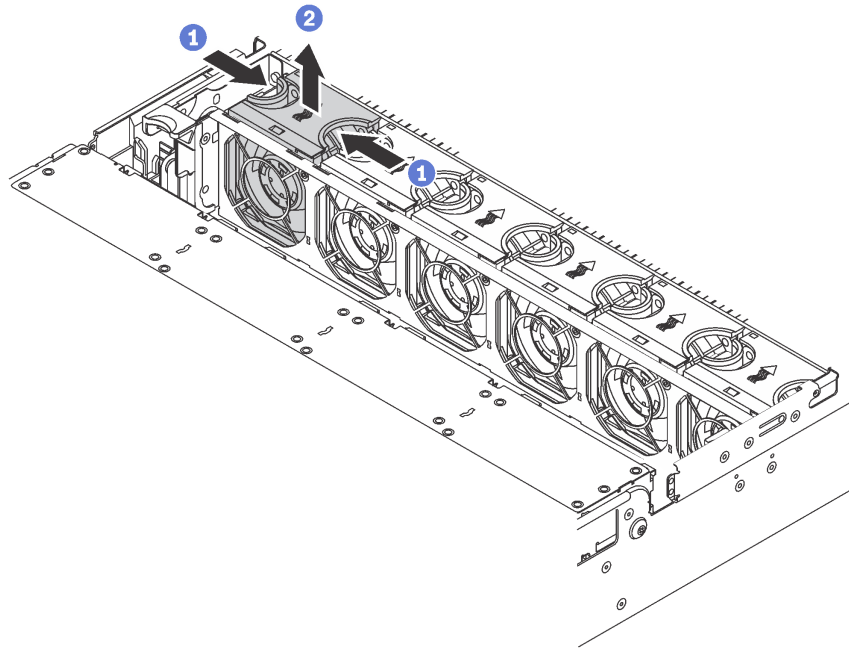
Figure 83. System fan removal

Step 1.   Grasp the top of the system fan with your fingers.

Step 2.   Lift the system fan out of the server.

After removing the system fan:

1. Install a new system fan or install a fan filler to cover the place. See "Install a system fan" on page 114.

2. If you are instructed to return the old system fan, follow all packaging instructions and use any packaging materials that are provided.

Install a system fan

Use this information to install a system fan. You can install a hot-swap fan without powering off the server, which helps you avoid significant interruption to the operation of the system.

<u>S033</u>

CAUTION:
Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in spattered metal, burns, or both.

<u>S017</u>

CAUTION:
Hazardous moving fan blades nearby.

Attention: When installing a system fan without powering off the server, do not touch the system fan cage.

To install a system fan, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
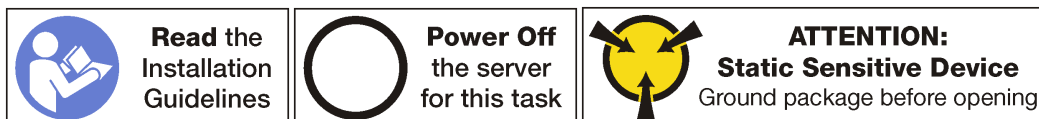- Youku: http://list.youku.com/albumlist/show/id_50483444

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. 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.
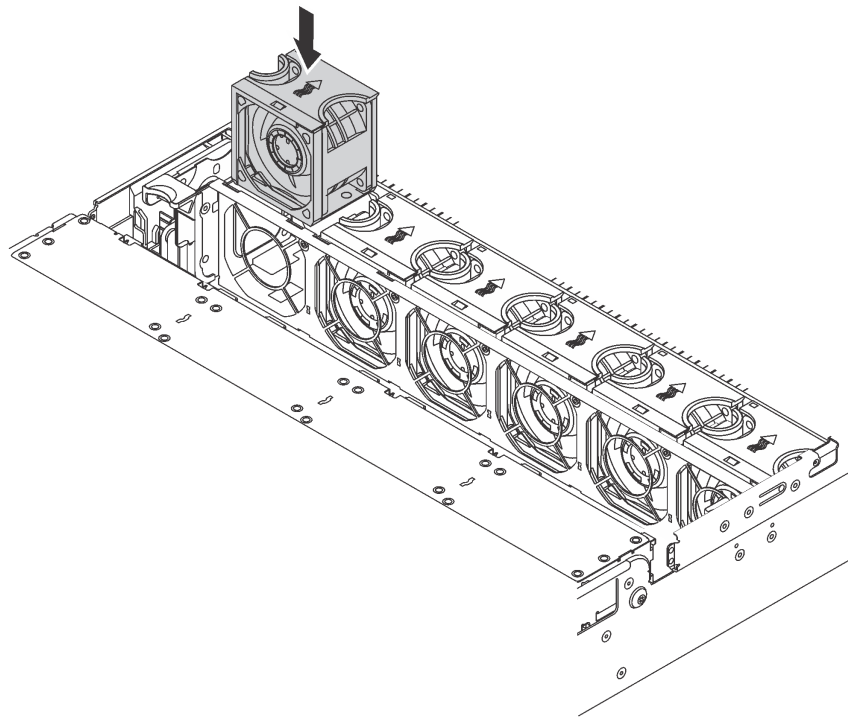
Figure 84. System fan installation
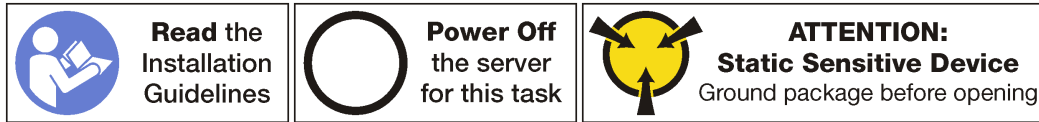
After installing the system fan, complete the parts replacement. See "Completing the parts replacement" on page 203.

System fan cage replacement

Use this information to remove and install the system fan cage.

Remove the system fan cage

Use this information to remove the system fan cage.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening

Before removing the system fan cage:

1. Remove the top cover. See "Remove the top cover" on page 103.
2. If you are replacing the system fan cage, remove all system fans first. See "Remove a system fan" on page 112. If you are removing the system fan cage to access other components, you can remove it with the system fans installed.

To remove the system fan cage, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444
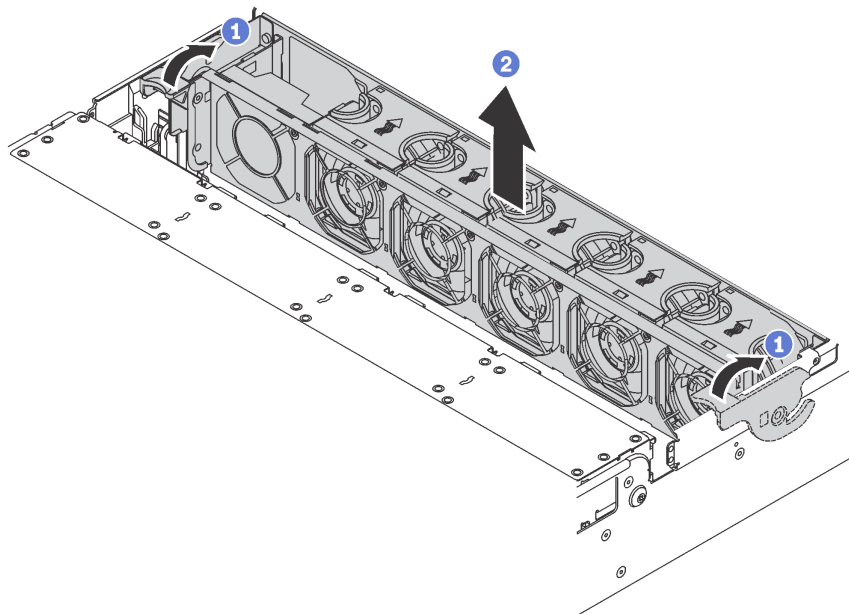
Figure 85. System fan cage removal

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.

Install the system fan cage

Use this information to install the system fan cage.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening

To install the system fan cage, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
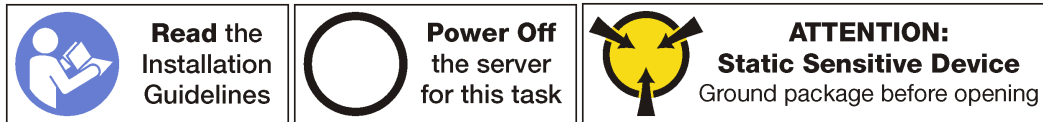- Youku: http://list.youku.com/albumlist/show/id_50483444
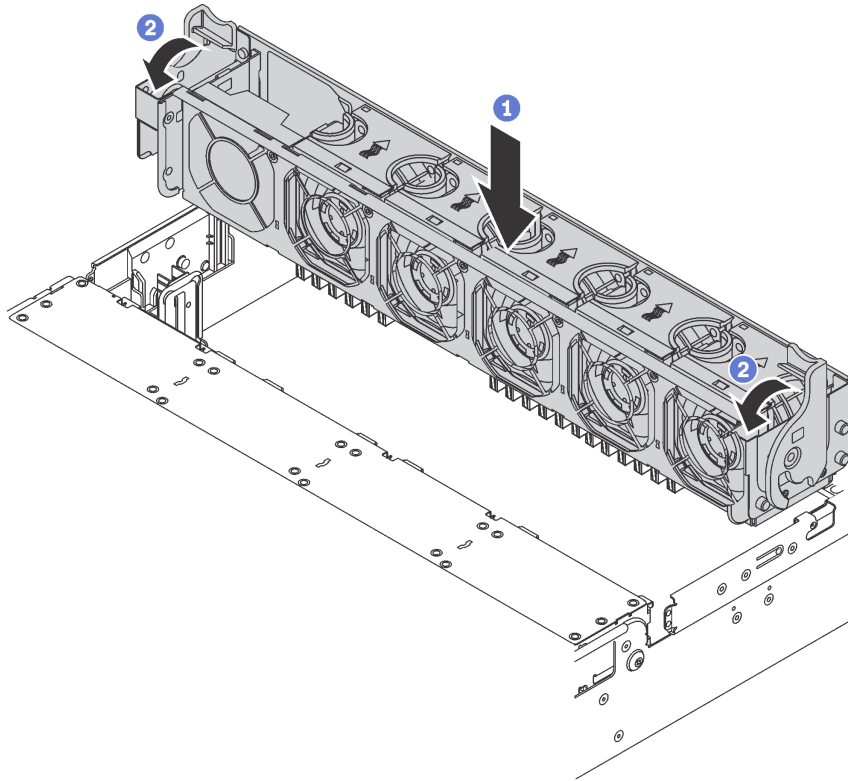
Figure 86. System fan cage installation

Step 1.   Align both sides of the system fan cage with the corresponding mounting posts in the chassis. Then, press the system fan cage straight down into the chassis.

> **Note:** If there are system fans installed in the system fan cage, ensure that the system fans are correctly connected to the system fan connectors on the system board.

Step 2.   Rotate the levers of the system fan cage to the front of the server to secure the system fan cage.

After installing the system fan cage:

1. If you have removed the system fans, reinstall them. See "Install a system fan" on page 114.

2. Complete the parts replacement. See "Completing the parts replacement" on page 203.

Front I/O assembly replacement

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

Note: Depending on the model, your server and the front I/O assembly might look different from the illustrations in this topic.

Remove the front I/O assembly

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

Read the Installation Guidelines	Power Off the server for this task	ATTENTION: Static Sensitive Device Ground package before opening
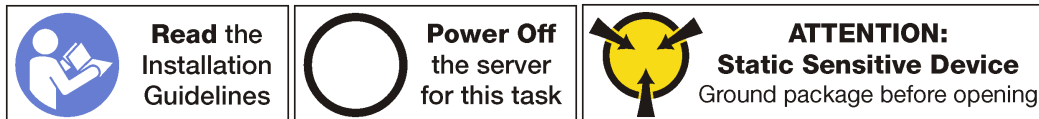
Note: The following procedure is based on the scenario that you are removing the front I/O assembly for server models with eight 3.5-inch drive bays. The removal procedure is similar for the front I/O assembly for server models with eight or sixteen 2.5-inch drive bays.
For server models with twelve 3.5-inch drive bays or twenty-four 2.5-inch drive bays, the front I/O assembly is assembled with the right rack latch. See "Remove the rack latches" on page 95 for the removal procedures.

Before removing the front I/O assembly:

1. Remove the top cover. See "Remove the top cover" on page 103.

2. If the security bezel is installed, remove it. See "Remove the security bezel" on page 92.

3. Disconnect the cables of the front I/O assembly from the system board. See "Front I/O assembly" on page 29.

To remove the front I/O assembly, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444
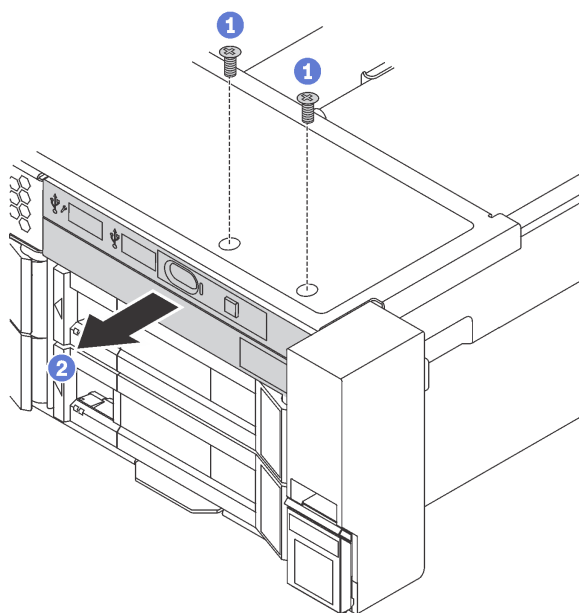
Figure 87. Front I/O assembly removal

Step 1.   Remove the screws that secure the front I/O assembly.

Step 2.   Slide the front I/O assembly out of the assembly bay.

If you are instructed to return the old front I/O assembly, follow all packaging instructions and use any packaging materials that are provided.

Install the front I/O assembly

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

Read the Installation Guidelines	Power Off the server for this task	ATTENTION: Static Sensitive Device Ground package before opening

Note: The following procedure is based on the scenario that you are installing the front I/O assembly for server models with eight 3.5-inch drive bays. The installation procedure is similar for the front I/O assembly for server models with eight or sixteen 2.5-inch drive bays.
For server models with twelve 3.5-inch drive bays or twenty-four 2.5-inch drive bays, the front I/O assembly is assembled with the right rack latch. See "Install the rack latches" on page 99 for the installation procedures.

Before installing the front I/O assembly, touch the static-protective package that contains the new front I/O assembly to any unpainted surface on the outside of the server. Then, take the new front I/O assembly out of the package and place it on a static-protective surface.

To install the front I/O assembly, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444
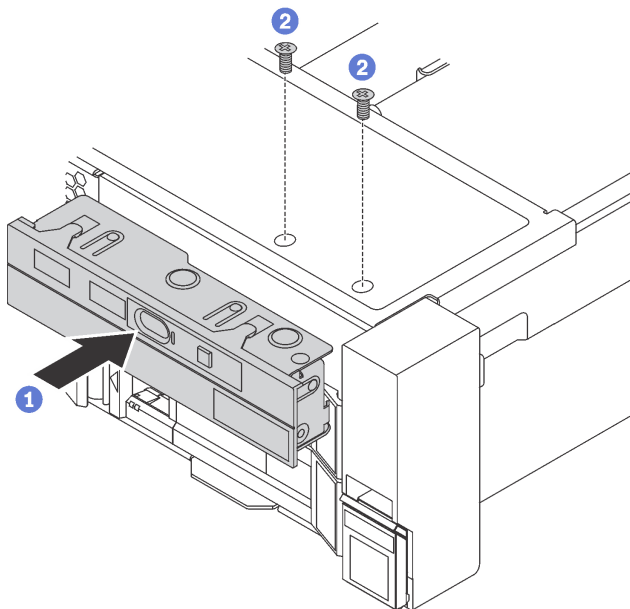
Figure 88. Front I/O assembly installation

Step 1. Insert the front I/O assembly into the assembly bay.

Step 2. Install the screws to secure the front I/O assembly in place.

After installing the front I/O assembly:

1. Connect the cables of the front I/O assembly to the system board. See "Front I/O assembly" on page 29.

2. Complete the parts replacement. See "Completing the parts replacement" on page 203.

Hot-swap drive replacement

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

Notes:

- The term "hot-swap drive" refers to all the supported types of hot-swap hard disk drives, hot-swap solid-state drives, and hot-swap NVMe drives.

- Use any documentation that comes with the drive and follow those instructions in addition to the instructions in this topic. Ensure that you have all the cables and other equipment that are specified in the documentation that comes with the drive.

- The electromagnetic interference (EMI) integrity and cooling of the server are protected by having all drive bays covered or occupied. The vacant bays are either covered by an EMI-protective panel or occupied by drive fillers. When installing a drive, save the removed drive filler in case that you later remove the drive and need the drive filler to cover the place.

- To avoid damage to the drive connectors, ensure that the top cover is in place and fully closed whenever you install or remove a drive.

Remove a hot-swap drive

Use this information to remove a hot-swap drive.

Read the Installation Guidelines	**ATTENTION:** **Static Sensitive Device** Ground package before opening

Before removing a hot-swap drive:

1. Ensure that you have back up data on your drive, especially if it is part of a RAID array.

   - Before you make changes to drives, RAID adapters, drive backplanes, or drive cables, back up all important data that is stored on the drives.

   - Before you remove any component of a RAID array, back up all RAID configuration information.

2. If one or more NVMe drives are to be removed, it is recommended to disable them first in Safely Remove Hardware and Eject Media (Windows) or filesystem (Linux). See the labels above the drive bays to determine the type of the drive to remove. If the drive bay numbers come with the term "NVMe," it indicates that the installed drives are NVMe drives.

3. If the security bezel is installed, remove it. See "Remove the security bezel" on page 92.

Attention: To ensure that there is adequate system cooling, do not operate the server for more than two minutes without either a drive or a drive filler installed in each bay.

To remove a hot-swap drive, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

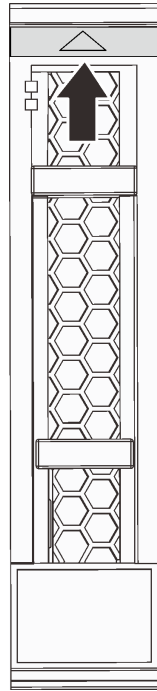Step 1.   Slide the release latch to open the drive tray handle.

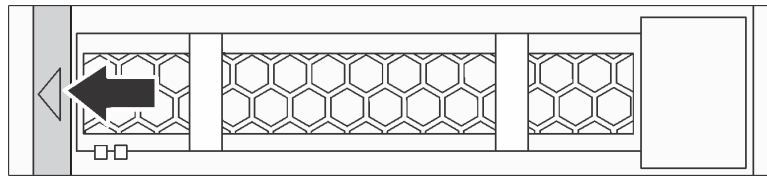*Figure 89. Opening the drive tray handle of a 2.5-inch hot-swap drive*

Figure 90. Opening the drive tray handle of a 3.5-inch hot-swap drive

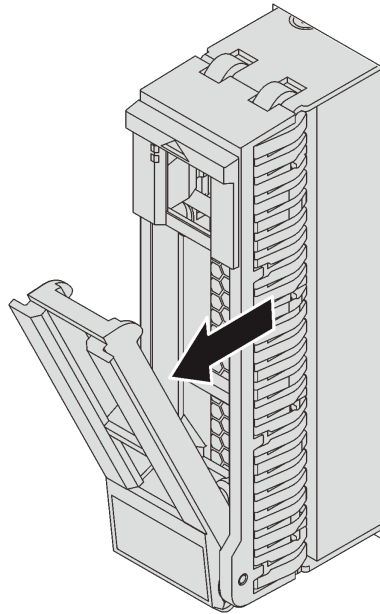Step 2. Grasp the handle and slide the drive out of the drive bay.

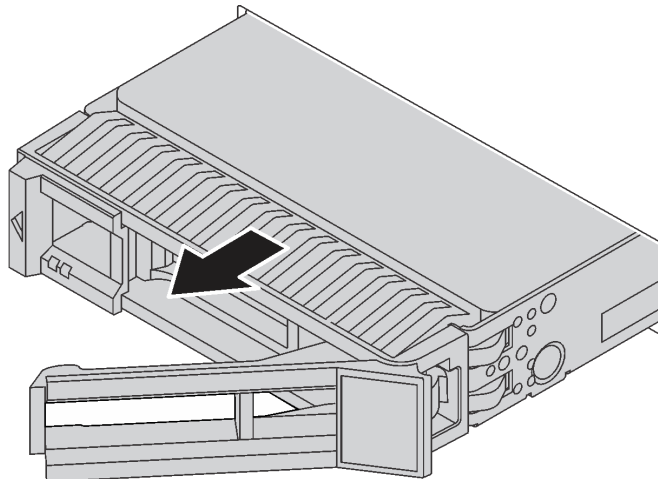*Figure 91. 2.5-inch hot-swap drive removal*

Figure 92. 3.5-inch hot-swap drive removal

After removing a hot-swap drive:

1. Install the drive filler or a new drive to cover the drive bay. See "Install a hot-swap drive" on page 122.

2. If you are instructed to return the old hot-swap drive, follow all packaging instructions and use any packaging materials that are provided.

Install a hot-swap drive

Use this information to install a hot-swap drive.

The following notes describe the type of drives that your server supports and other information that you must consider when you install a drive.

- Depending on your server models, your server supports the following drive types:
  - NVMe SSD
  - SAS/SATA SSD
  - SAS/SATA HDD

  For a list of supported drives, see:
  http://www.lenovo.com/us/en/serverproven/
- The drive bays are numbered to indicate the installation order (starting from number "0"). Follow the installation order when you install a drive. See "Front view" on page 13.
- You can mix drives of different types, different sizes, and different capacities in one system, but not in one RAID array. The following order is recommended when installing the drives:
  - Drive type priority: NVMe SSD, SAS SSD, SATA SSD, SAS HDD, SATA HDD
  - Drive size priority: 2.5 inch, 3.5 inch
  - Drive capacity priority: the lowest capacity first
- The drives in a single RAID array must be the same type, same size, and same capacity.
- Some server models support NVMe drives and the bays for installing NVMe drives vary by model:
  - For eight-2.5-inch-drive-bay models that support NVMe drives, you can install up to four NVMe drives in the bays 4–7.
  - For sixteen-2.5-inch-drive-bay models that support NVMe drives, you can install up to eight NVMe drives in the bays 4–7 and bays 12–15.
  - For twenty-four-2.5-inch-drive-bay models that support NVMe drives, you can install up to eight NVMe drives in the bays 4–7 and bays 12–15.
  - For twelve-3.5-inch-drive-bay model that supports NVMe drives, you can install up to four NVMe drives in the bays 8–11.

Before installing a hot-swap drive:

1. If the drive bay has a drive filler installed, pinch the two tabs to remove the drive filler. Keep the drive filler in a safe place.
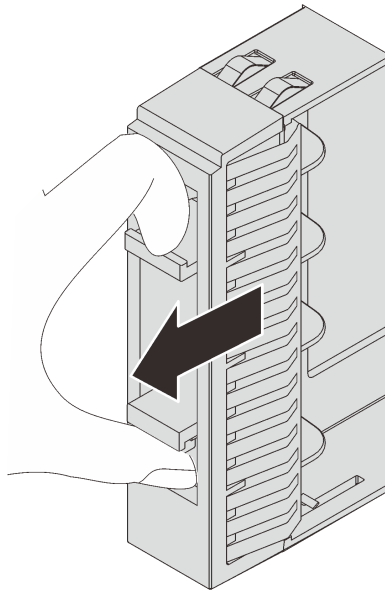
Figure 93. 2.5-inch drive filler removal
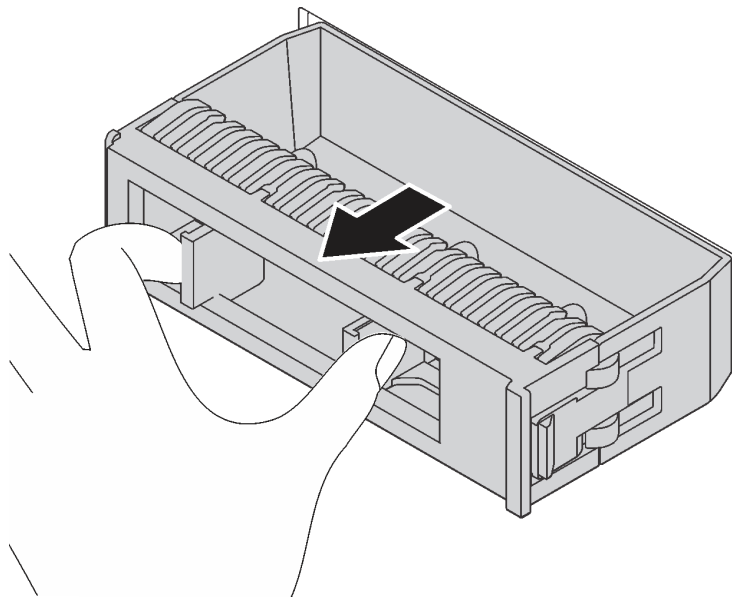
Figure 94. 3.5-inch drive filler removal

2. Touch the static-protective package that contains the new drive to any unpainted surface on the outside of the server. Then, take the new drive out of the package and place it on a static-protective surface.

To install a hot-swap drive, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444
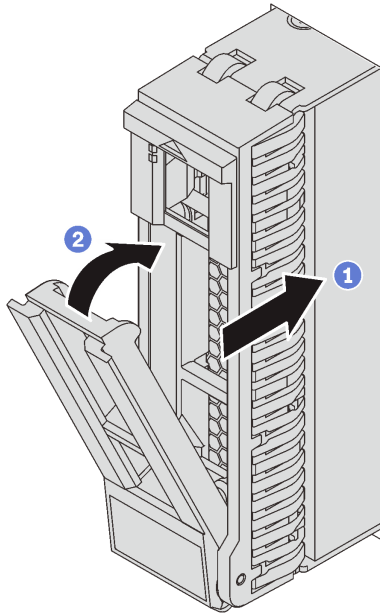
Figure 95. 2.5-inch hot-swap drive installation
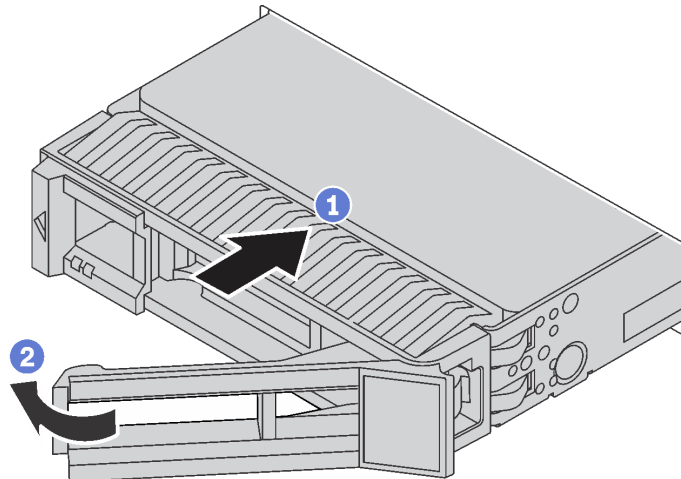
Figure 96. 3.5-inch hot-swap drive installation

Step 1. Ensure that the drive tray handle is in the open position. Slide the drive into the drive bay until it snaps into position.

Step 2. Close the drive tray handle to lock the drive in place.

Step 3. Check the drive status LED to verify that the drive is operating correctly.

- If the yellow drive status LED is lit continuously, that drive is faulty and must be replaced.
- If the green drive activity LED is flashing, the drive is being accessed.

Step 4. Continue to install additional hot-swap drives if necessary.

After installing all hot-swap drives:

1. If you have removed the security bezel, reinstall it. See "Install the security bezel" on page 93.

2. Use the Lenovo XClarity Provisioning Manager to configure the RAID if necessary. For more information, see:
    http://sysmgt.lenovofiles.com/help/topic/LXPM/RAID_setup.html

Backplane replacement

Use this information to remove and install a hot-swap-drive backplane.

This topic contains the following information:

- "Remove the 2.5-inch-drive backplane" on page 126
- "Install the 2.5-inch-drive backplane" on page 127
- "Remove the 3.5-inch-drive backplane" on page 129
- "Install the 3.5-inch-drive backplane" on page 130

Remove the 2.5-inch-drive backplane

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

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening
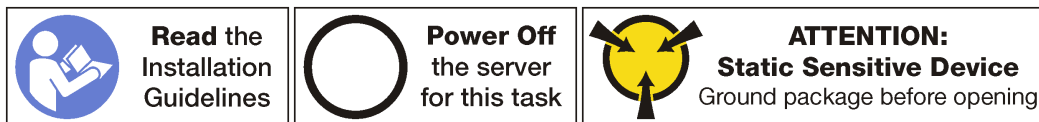
Before removing the 2.5-inch-drive backplane:

1. Remove the top cover. See "Remove the top cover" on page 103.
2. Remove the system fan cage for easier operation. See "Remove the system fan cage" on page 116.
3. Remove all the installed drives and fillers (if any) from the drive bays. See "Remove a hot-swap drive" on page 120.

To remove the 2.5-inch-drive backplane, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1. Lift the release tabs and rotate the backplane backward slightly to release it from the two pins on the chassis.
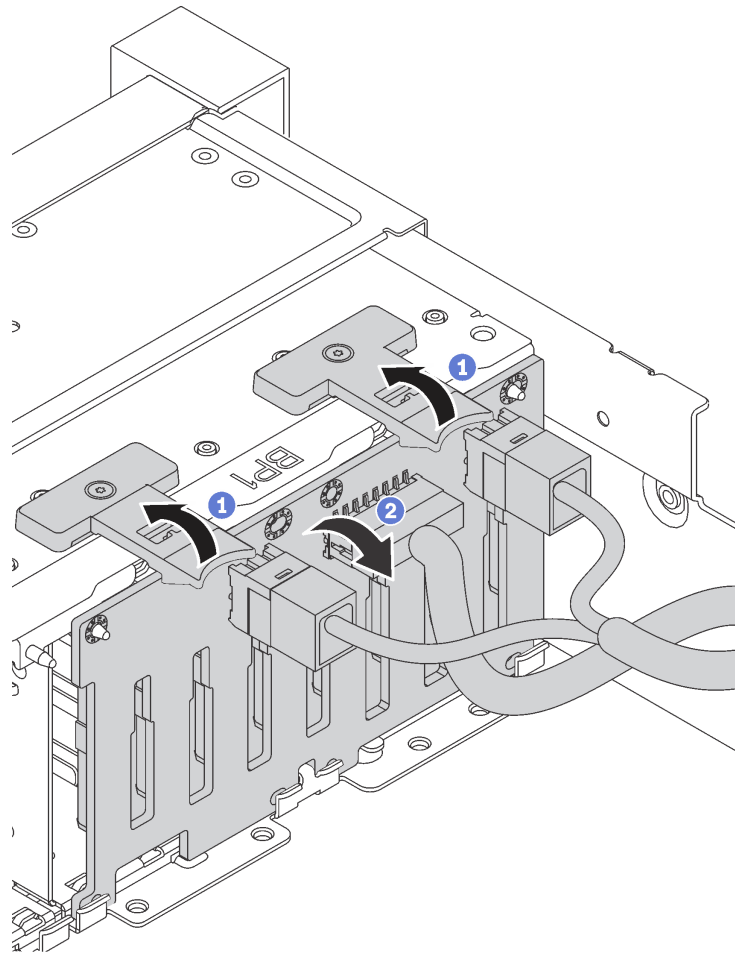
Step 2. Record the cable connections on the backplane and then disconnect all cables from the backplane. For information about the backplane cable routing, see "Backplane" on page 32.

If you are instructed to return the old backplane, follow all packaging instructions and use any packaging materials that are provided.

Install the 2.5-inch-drive backplane

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

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening

Note:

Your server supports two types of 2.5-inch-drive backplanes: 8-bay backplane (eight SAS/SATA drive bays) and AnyBay backplane (four SAS/SATA drive bays and four NVMe drive bays). Depending on the backplane type and quantity, the installation location of the backplanes varies.

- One backplane

    Always install either the 8-bay backplane or the AnyBay backplane to drive bays 0–7.

- Two backplanes

  - Two 8-bay backplanes or two AnyBay backplanes: install the two backplanes to drive bays 0–7 and drive bays 8–15

  - One 8-bay backplane and one AnyBay backplane: install the AnyBay backplane to drive bays 0–7; install the 8–bay backplane to drive bays 8–15

- Three backplanes

  - Three 8-bay backplanes or three AnyBay backplanes: install the three backplanes to drive bays 0–7, drive bays 8–15, and drive bays 16–23

  - Two 8-bay backplanes and one AnyBay backplane: install the AnyBay backplane to drive bays 0–7; install the two 8–bay backplanes to drive bays 8–15 and drive bays 16–23

  - Two AnyBay backplanes and one 8-bay backplane: install the two AnyBay backplanes to drive bays 0–7 and drive bays 8–15; install the 8–bay backplanes to drive bays 16–23

Before installing the 2.5-inch-drive backplane, 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.

To install the 2.5-inch-drive backplane, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1. Connect the cables to the backplane.

Step 2. Align the bottom of the backplane in the slots on the bottom of the chassis. Then, rotate the backplane to 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.
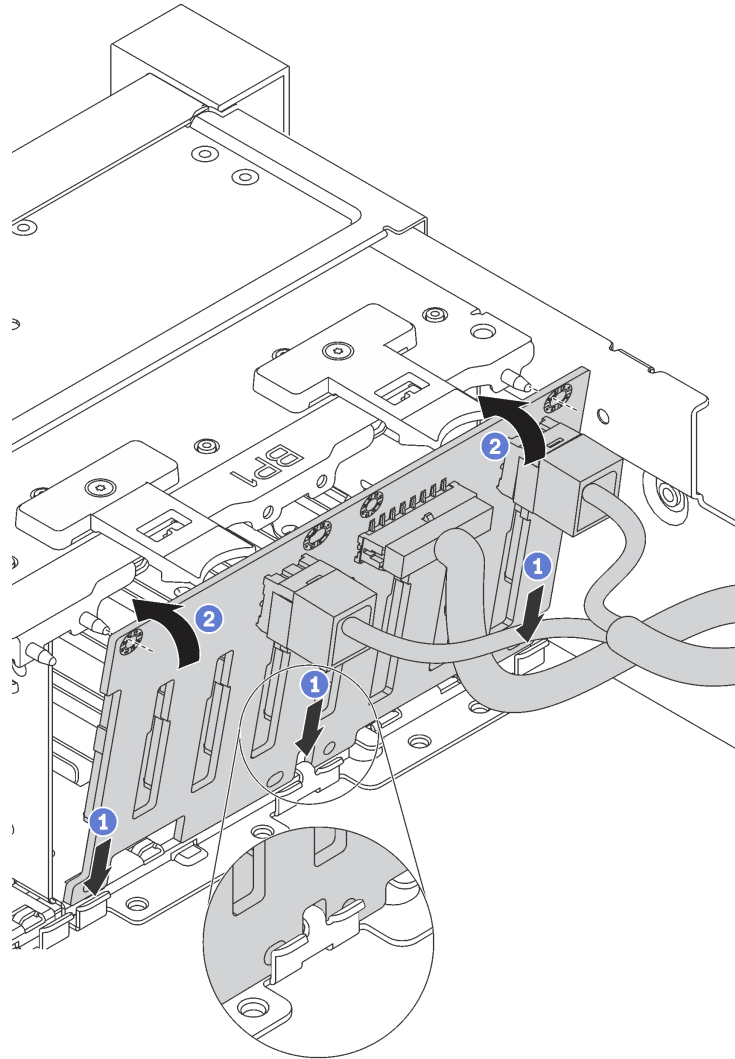
Figure 97. 2.5-inch-drive backplane installation

After installing the 2.5-inch-drive backplane:

1. Reinstall all the drives and fillers (if any) into the drive bays. See "Install a hot-swap drive" on page 122.

2. Complete the parts replacement. See "Completing the parts replacement" on page 203.

Remove the 3.5-inch-drive backplane

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

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION: Static Sensitive Device** Ground package before opening

Note: The procedure is based on the scenario that you want to remove the backplane for up to twelve 3.5-inch drives. The procedure is similar for the backplane for up to eight 3.5-inch drives.

Before removing the 3.5-inch-drive backplane:

1. Remove the top cover. See "Remove the top cover" on page 103.

2. Remove the system fan cage for easier operation. See "Remove the system fan cage" on page 116.

3. Remove all the installed drives and fillers (if any) from the drive bays. See "Remove a hot-swap drive" on page 120.

To remove the 3.5-inch-drive backplane, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Figure 98. 3.5-inch-drive backplane removal

Step 1.   Pull the release pins and slightly slide the backplane in the direction as shown.

Step 2.   Pivot the backplane backward slightly to release it from the four hooks on the chassis. Then, carefully lift the backplane out of the chassis.

Step 3.   Record the cable connections on the backplane and then disconnect all cables from the backplane. For information about the backplane cable routing, see "Backplane" on page 32.

If you are instructed to return the old backplane, follow all packaging instructions and use any packaging materials that are provided.

Install the 3.5-inch-drive backplane

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

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening

Note: The procedure is based on the scenario that you want to install the backplane for up to twelve 3.5-inch drives. The procedure is similar for the backplane for up to eight 3.5-inch drives.

Before installing the 3.5-inch-drive backplane, 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.

To install the 3.5-inch-drive backplane, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444
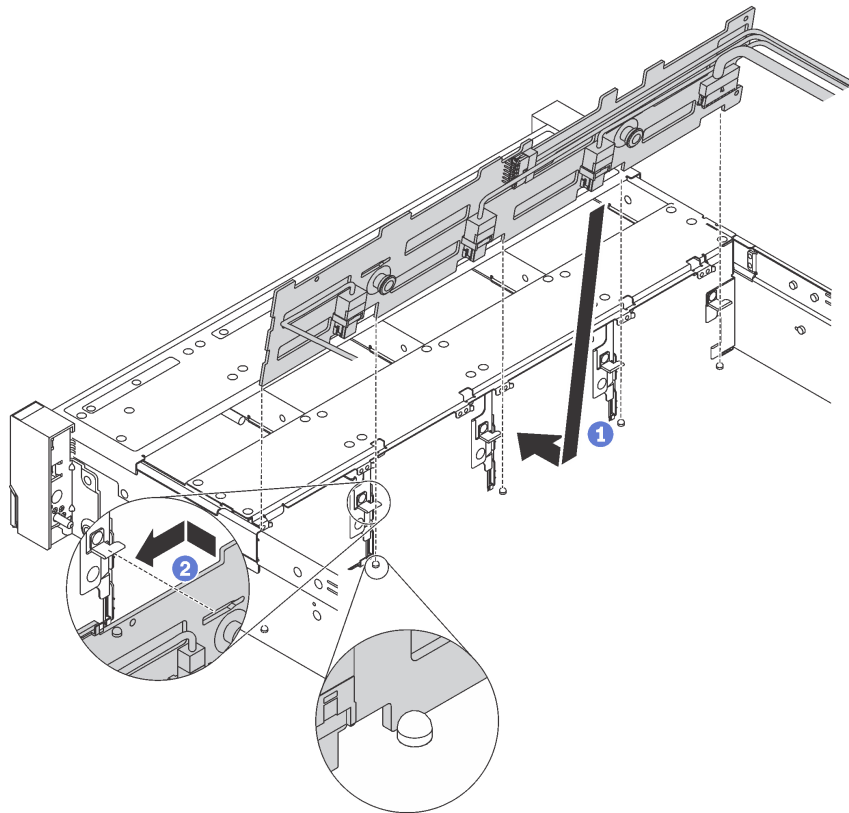
Figure 99. 3.5-inch-drive backplane installation

Step 1. Connect the cables to the backplane.

Step 2. Align the backplane with the chassis and lower it into the chassis. Then, put the backplane into place with it leaning backward slightly.

Step 3. Rotate the backplane to vertical position to ensure that the four hooks on the chassis pass through the corresponding holes in the backplane. Then, slide the new backplane as shown until it is secured into place.
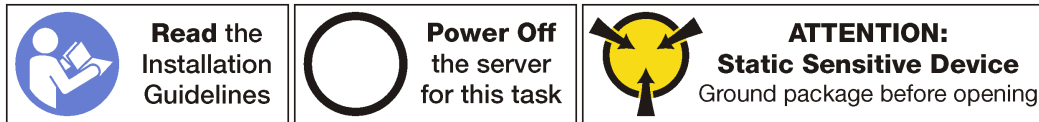
After installing the 3.5-inch-drive backplane:

1. Reinstall all the drives and fillers (if any) into the drive bays. See "Install a hot-swap drive" on page 122.

2. Complete the parts replacement. See "Completing the parts replacement" on page 203.

DIMM replacement

Use this information to remove and install a DIMM.

Remove a DIMM

Use this information to remove a DIMM.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening

Attention:

- Disconnect all power cords for this task.
- DIMMs are sensitive to static discharge and require special handling. In addition to the standard guidelines for Handling static-sensitive devices:
  - Always wear an electrostatic-discharge strap when removing or installing DIMMs. Electrostatic-discharge gloves can also be used.
  - Never hold two or more DIMMs together so that they touch. Do not stack DIMMs directly on top of each other during storage.
  - Never touch the gold DIMM connector contacts or allow these contacts to touch the outside of the DIMM connector housing.
  - Handle DIMMs with care: never bend, twist, or drop a DIMM.

Before removing a DIMM:

1. Remove the top cover. See "Remove the top cover" on page 103.
2. Remove the air baffle. See "Remove the air baffle" on page 108.

To remove a DIMM, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
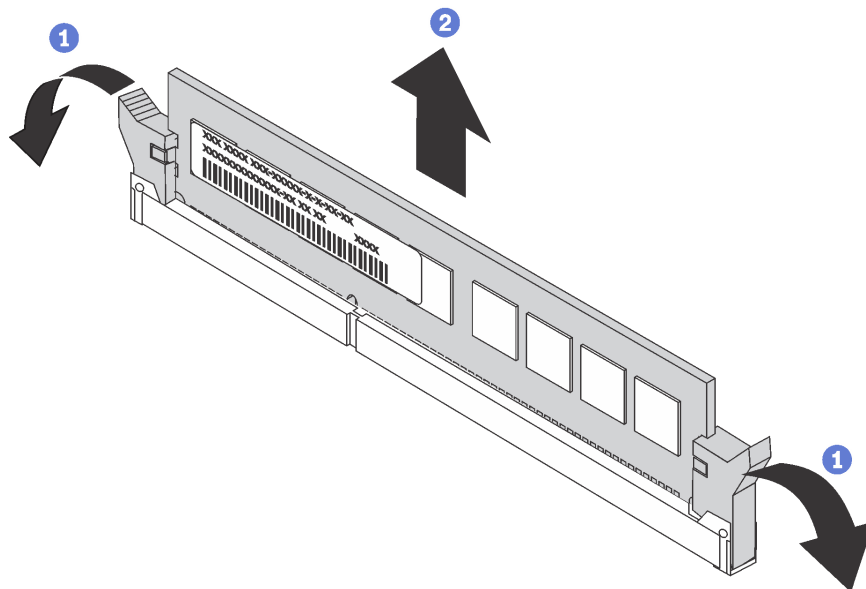- Youku: http://list.youku.com/albumlist/show/id_50483444

Figure 100. DIMM removal

Step 1. Open the retaining clips on each end of the DIMM slot.

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

Step 2. Grasp the DIMM at both ends and carefully lift it up to remove it from the slot.

After removing a DIMM:

1. Install a DIMM filler or a new DIMM to cover the slot. See "Install a DIMM" on page 138.

2. If you are instructed to return the old DIMM, follow all packaging instructions and use any packaging materials that are provided.

DIMM installation rules

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

Your server has 24 DIMM slots and it has the following features:

- Each slot supports 8 GB, 16 GB, and 32 GB DDR4 RDIMMs with Error Checking and Correcting (ECC) technology.

- Each slot supports 64 GB DDR4 LRDIMMs with ECC technology.

- Each slot supports 128 GB DDR4 3DS RDIMMs with ECC technology.

- Your server supports up to 12 DIMMs when one processor is installed, and up to 24 DIMMs when two processors are installed.

- The minimum system memory is 8 GB (only one processor installed and only one 8 GB RDIMM installed in the CPU1 DIMM5 slot).

- The maximum system memory is as follows:

  - 768 GB using RDIMMs (two processors installed and one 32 GB RDIMM installed in each of the 24 DIMM slots)

  - 1.5 TB using LRDIMMs (two processors installed and one 64 GB LRDIMM installed in each of the 24 DIMM slots)

  - 3 TB using 3DS RDIMMs (two processors installed and one 128 GB 3DS RDIMM installed in each of the 24 DIMM slots)

For a list of supported DIMM options, see:
http://www.lenovo.com/us/en/serverproven/

Before installing a DIMM, ensure that all DIMMs to be installed must be the same type. Your server supports the following types of DIMMs:

- DDR4 RDIMM with ECC technology

- DDR4 LRDIMM with ECC technology

- DDR4 3DS RDIMM with ECC technology

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

The following illustration helps you to locate the DIMM slots on the system board.
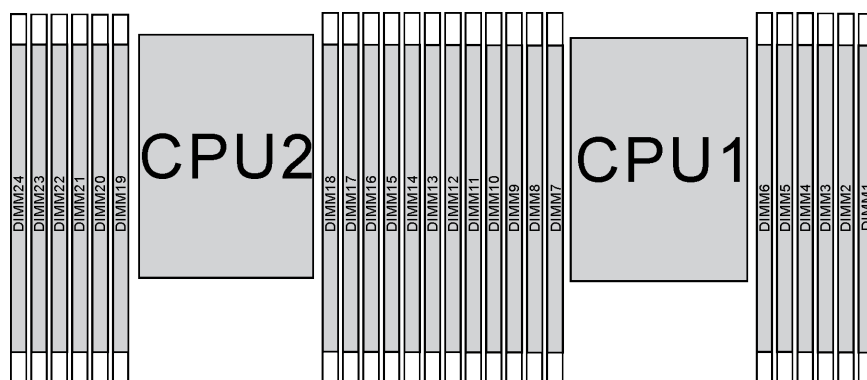
Figure 101. DIMM slots on the system board

Your server supports the following memory modes:

- "Independent mode" on page 134
- "Mirroring mode" on page 136
- "Rank sparing mode" on page 137

Independent mode

Independent mode provides high performance memory capability. You can populate all channels with no matching requirements. Individual channels can run at different DIMM timings, but all channels must run at the same interface frequency.

Notes:

- All DIMMs to be installed must be the same type.
- When you install DIMMs with same rank and different capacity, install the DIMM that has the highest capacity first.

The following table shows the DIMM population sequence for independent mode when only one processor (CPU1) is installed.

Notes:

- If there are three identical DIMMs to be installed for CPU1, and the three DIMMs have the same Lenovo part number, move the DIMM to be installed in slot 8 to slot 1.
- If there are ten identical DIMMs to be installed for CPU1, and the ten DIMMs have the same Lenovo part number, move the DIMM to be installed in slot 6 to slot 12.

Table 10. Independent mode with one processor

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

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

The following table shows the DIMM population sequence for independent mode when two processors (CPU1 and CPU2) are installed.

Notes:

- If there are three identical DIMMs to be installed for CPU1, and the three DIMMs have the same Lenovo part number, move the DIMM to be installed in slot 8 to slot 1.
- If there are three identical DIMMs to be installed for CPU2, and the three DIMMs have the same Lenovo part number, move the DIMM to be installed in slot 20 to slot 13.
- If there are ten identical DIMMs to be installed for CPU1, and the ten DIMMs have the same Lenovo part number, move the DIMM to be installed in slot 6 to slot 12.
- If there are ten identical DIMMs to be installed for CPU2, and the ten DIMMs have the same Lenovo part number, move the DIMM to be installed in slot 18 to slot 24.

Table 11. Independent mode with two processors

Total DIMMs	Processor 2												Processor 1												Total DIMMs
	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
2								17												5					2
3								17									8			5					3
4					20			17									8			5					4
5					20			17									8			5		3			5
6					20			17		15							8			5		3			6
7					20			17		15					10		8			5		3			7
8			22		20			17		15					10		8			5		3			8
9			22		20			17		15					10		8			5		3		1	9
10			22		20			17		15		13			10		8			5		3		1	10
11			22		20			17		15		13	12		10		8			5		3		1	11
12	24		22		20			17		15		13	12		10		8			5		3		1	12
13	24		22		20			17		15		13	12		10		8		6	5	4	3			13
14	24		22		20		18	17	16	15			12		10		8		6	5	4	3			14
15	24		22		20		18	17	16	15					10	9	8	7	6	5	4	3			15
16			22	21	20	19	18	17	16	15					10	9	8	7	6	5	4	3			16
17			22	21	20	19	18	17	16	15			12		10		8		6	5	4	3	2	1	17

Table 11. Independent mode with two processors (continued)

Total DIMMs	Processor 2												Processor 1												Total DIMMs
	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
18	24		22		20		18	17	16	15	14	13	12		10		8		6	5	4	3	2	1	18
19	24		22		20		18	17	16	15	14	13			10	9	8	7	6	5	4	3	2	1	19
20			22	21	20	19	18	17	16	15	14	13			10	9	8	7	6	5	4	3	2	1	20
21	24		22		20		18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	21
22	24		22	21	20	19	18	17	16	15	14	13	12		10	9	8	7	6	5	4	3	2	1	22
23	24		22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	23
24	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	24

Mirroring mode

In mirroring mode, each DIMM 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.

Note: All DIMMs to be installed must be the same type with the same capacity, frequency, voltage, and ranks.

The following table shows the DIMM population sequence for mirroring mode when only one processor (CPU1) is installed.

Table 12. Mirroring mode with one processor

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

The following table shows the DIMM population sequence for mirroring mode when two processors (CPU1 and CPU2) are installed.

Table 13. Mirroring mode with two processors

Total DIMMs	Processor 2												Processor 1												Total DIMMs
	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
4								17		15										5		3			4
5								17		15										5		3		1	5
6								17		15		13								5		3		1	6
7								17		15		13			10		8			5		3			7

Table 13. Mirroring mode with two processors (continued)

Total DIMMs	Processor 2												Processor 1												Total DIMMs
	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
8			22		20			17		15					10		8			5		3			8
9								17		15		13	12		10		8			5		3		1	9
10			22		20			17		15			12		10		8			5		3		1	10
12	24		22		20			17		15		13	12		10		8			5		3		1	12
13			22		20			17		15			12		10		8		6	5	4	3	2	1	13
14			22	21	20	19	18	17	16	15			12		10		8			5		3		1	14
15	24		22		20			17		15		13	12		10		8		6	5	4	3	2	1	15
16			22	21	20	19	18	17	16	15					10	9	8	7	6	5	4	3			16
17			22	21	20	19	18	17	16	15			12		10		8		6	5	4	3	2	1	17
18	24		22		20			17		15		13	12	11	10	9	8	7	6	5	4	3	2	1	18
20			22	21	20	19	18	17	16	15			12	11	10	9	8	7	6	5	4	3	2	1	20
21	24		22		20		18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	21
24	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	24

Rank sparing mode

In rank sparing mode, one rank of a DIMM works as the spare rank for the other ranks on the same channel. The spare rank is not available as system memory.

Notes:

- All DIMMs to be installed must be the same type with the same capacity, frequency, voltage, and ranks.
- If the rank of installed DIMMs is one rank, follow the installation rules listed in the following tables. If the rank of installed DIMMs is more than one rank, follow the installation rules of independent mode.

The following table shows the DIMM population sequence for rank sparing mode when only one processor (CPU1) is installed.

Table 14. Rank sparing mode with one processor

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

The following table shows the DIMM population sequence for rank sparing mode when two processors (CPU1 and CPU2) are installed.

Table 15. *Rank sparing mode with two processors*

Total DIMMs	Processor 2												Processor 1												Total DIMMs
	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
4							18	17											6	5					4
6							18	17									8	7	6	5					6
8					20	19	18	17									8	7	6	5					8
10					20	19	18	17									8	7	6	5	4	3			10
12					20	19	18	17	16	15							8	7	6	5	4	3			12
14					20	19	18	17	16	15					10	9	8	7	6	5	4	3			14
16			22	21	20	19	18	17	16	15					10	9	8	7	6	5	4	3			16
18			22	21	20	19	18	17	16	15					10	9	8	7	6	5	4	3	2	1	18
20			22	21	20	19	18	17	16	15	14	13			10	9	8	7	6	5	4	3	2	1	20
22			22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	22
24	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	24

Install a DIMM

Use this information to install a DIMM.

Read the Installation Guidelines | **Power Off** the server for this task | **ATTENTION: Static Sensitive Device** Ground package before opening

Attention:

- Disconnect all power cords for this task.
- DIMMs are sensitive to static discharge and require special handling. In addition to the standard guidelines for Handling static-sensitive devices:
  - Always wear an electrostatic-discharge strap when removing or installing DIMMs. Electrostatic-discharge gloves can also be used.
  - Never hold two or more DIMMs together so that they touch. Do not stack DIMMs directly on top of each other during storage.
  - Never touch the gold DIMM connector contacts or allow these contacts to touch the outside of the DIMM connector housing.
  - Handle DIMMs with care: never bend, twist, or drop a DIMM.

Before installing a DIMM:

1. Touch the static-protective package that contains the new DIMM to any unpainted surface on the outside of the server. Then, take the new DIMM out of the package and place it on a static-protective surface.
2. Locate the required DIMM slot on the system board and ensure that you observe the installation rules and sequence. See "DIMM installation rules" on page 133.

To install a DIMM, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_

- Youku: http://list.youku.com/albumlist/show/id_50483444
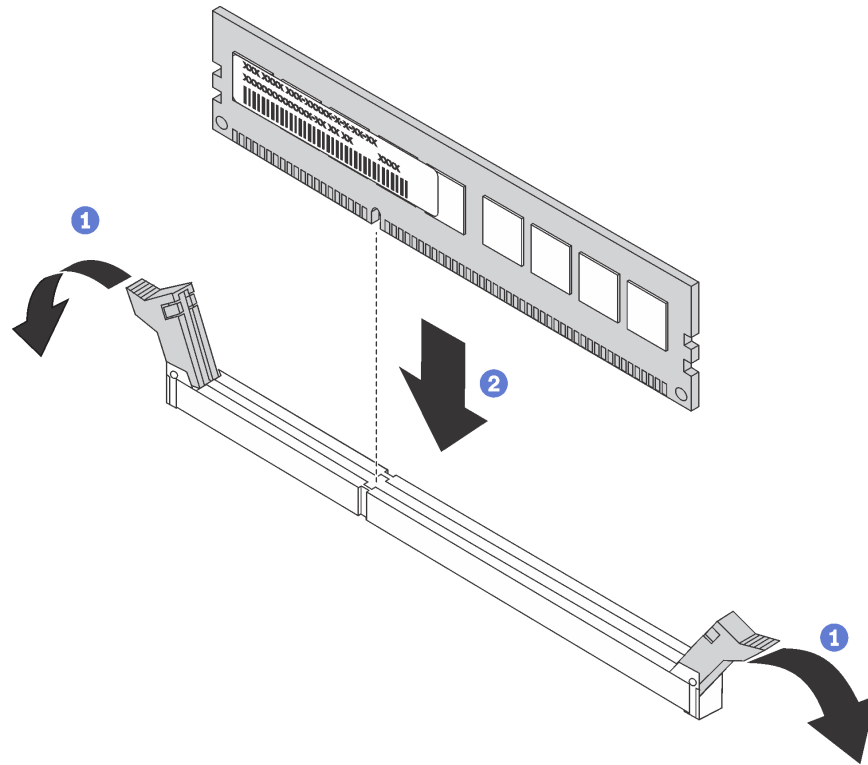
Figure 102. DIMM installation

Step 1. Open the retaining clips on each end of the DIMM slot.

> **Attention:** To avoid breaking the retaining clips or damaging the DIMM slots, open and close the clips gently.

Step 2. Align the DIMM with the slot, and firmly press both ends of the DIMM straight down into the slot until the retaining clips snap into the locked position.

> **Note:** If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly inserted; open the retaining clips, remove the DIMM, and then reinsert it.

After installing a DIMM, complete the parts replacement. See "Completing the parts replacement" on page 203.

RAID adapter replacement

Use this information to remove and install the RAID adapter on the system board.

Notes:

- For a list of the supported RAID adapters, see:
  http://www.lenovo.com/us/en/serverproven/
- Depending on the specific type, your RAID adapter might look different from the illustrations in this topic.

Attention: Replacing the RAID adapter might impact your RAID configurations. Back up your data before you begin to avoid any data loss due to a RAID configuration change.

Remove the RAID adapter

Use this information to remove the RAID adapter from the RAID adapter slot on the system board.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening

Note: The following procedure is based on the scenario that the RAID adapter is installed in the RAID adapter slot on the system board. For the procedure about removing the RAID adapter from the PCIe slot, see "Remove a PCIe adapter" on page 151.

Before removing the RAID adapter:

1. Remove the top cover. See "Remove the top cover" on page 103.

2. Remove any parts and disconnect any cables that might impede your access to the RAID adapter.

3. Record the cable connections on the RAID adapter and then disconnect all cables from the RAID adapter. For information about the cable routing, see "Internal cable routing" on page 27.

To remove the RAID adapter from the RAID adapter slot on the system board, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444
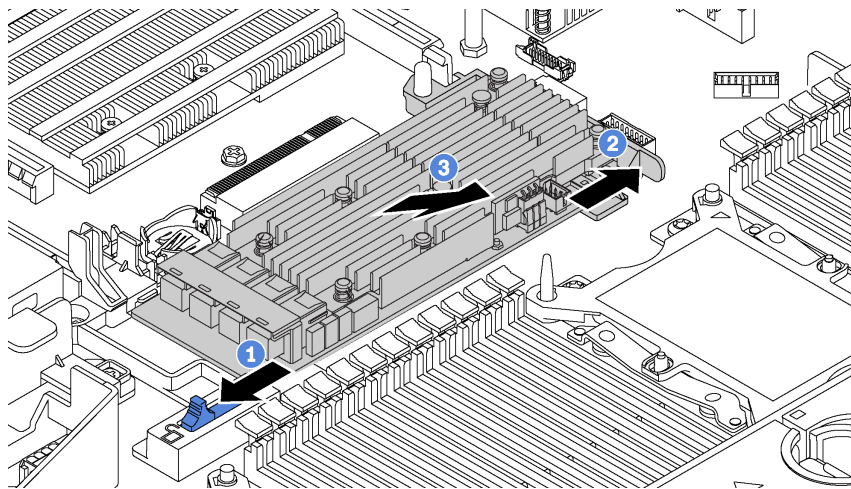
Figure 103. RAID adapter removal

Step 1.   Slide the left-side latch to the unlocked position.

Step 2.   Push and hold the right-side latch in the direction as shown.

Step 3.   Grasp the RAID adapter by its edges and carefully remove it from the RAID adapter slot on the system board.

If you are instructed to return the old RAID adapter, follow all packaging instructions and use any packaging materials that are provided.

Install the RAID adapter

Use this information to install the RAID adapter in the RAID adapter slot on the system board.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION: Static Sensitive Device** Ground package before opening
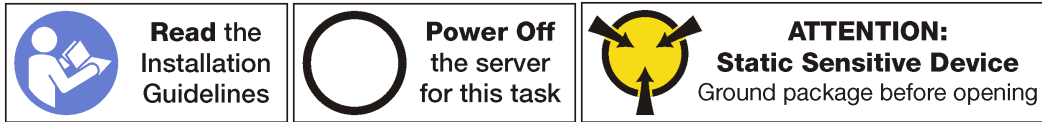
Ensure that you follow the installation order if you install more than one RAID adapter:

- The RAID adapter slot on the system board
- The PCIe slot 4 on the system board if the serial port module is not installed
- A PCIe slot on the riser card

Note: The following procedure is based on the scenario that the RAID adapter will be installed in the RAID adapter slot on the system board. For the procedure about installing the RAID adapter in PCIe slot 4 or a PCIe slot on the riser assembly, see "Install a PCIe adapter" on page 154.

Before installing the RAID adapter:

1. Touch the static-protective package that contains the new RAID adapter to any unpainted surface on the outside of the server. Then, take the new RAID adapter out of the package and place it on a static-protective surface.
2. If the RAID adapter is installed with a bracket, remove the bracket.

To install the RAID adapter in the RAID adapter slot on the system board, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444
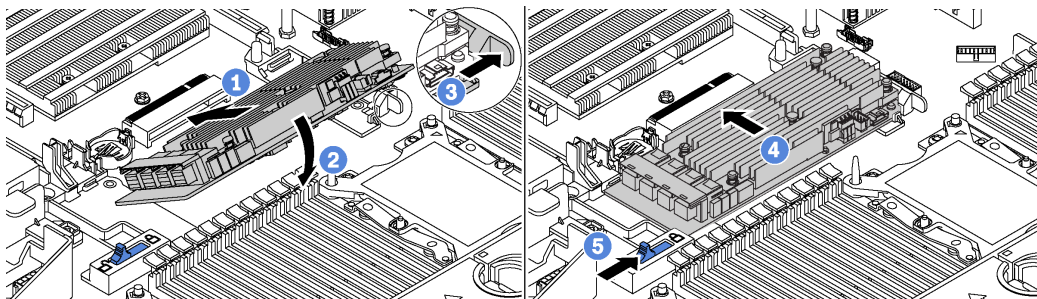
Figure 104. RAID adapter installation

Step 1.   Place the RAID adapter into the slot at an angle.

Step 2.   Rotate the RAID adapter down.

Step 3.   Push the right-side latch open.

Step 4.   Push the RAID adapter to the fully horizontal position and insert it into the RAID adapter slot.

Step 5.   Slide the left-side latch to the locked position.

After installing the RAID adapter:

1. Connect cables to the new RAID adapter. See "Internal cable routing" on page 27.
2. Complete the part replacement. See "Completing the parts replacement" on page 203.

CMOS battery replacement

Use this information to remove and install the CMOS battery.

Remove the CMOS battery

Use this information to remove the CMOS battery.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening
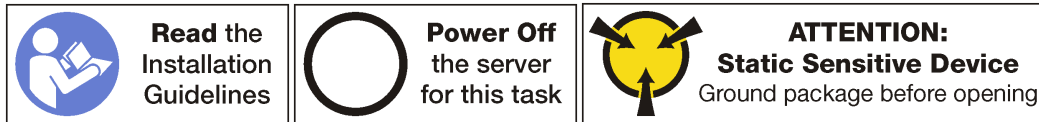
The following tips describe information that you must consider when removing the CMOS battery.

- Lenovo has designed this product with your safety in mind. The lithium CMOS battery must be handled correctly to avoid possible danger. If you replace the CMOS battery, you must adhere to the following instructions.

  Note: In the U.S., call 1-800-IBM-4333 for information about battery disposal.

- If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.

- To order replacement batteries, call 1-800-IBM-SERV within the U.S., and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your support center or business partner.

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

S004

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

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

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

S002

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current that is 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.

Before removing the CMOS battery:

1. Remove the top cover. See "Remove the top cover" on page 103.

2. Remove any parts and disconnect any cables that might impede your access to the CMOS battery.

To remove the CMOS battery, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1.   Locate the CMOS battery. See "System board components" on page 23.

Step 2.   Press the battery clip as shown and carefully lift CMOS battery out of the socket.

> **Attention:**
>
> - Failing to remove the CMOS battery properly might damage the socket on the system board. Any damage to the socket might require replacing the system board.
>
> - Do not tilt or push the CMOS battery by using excessive force.
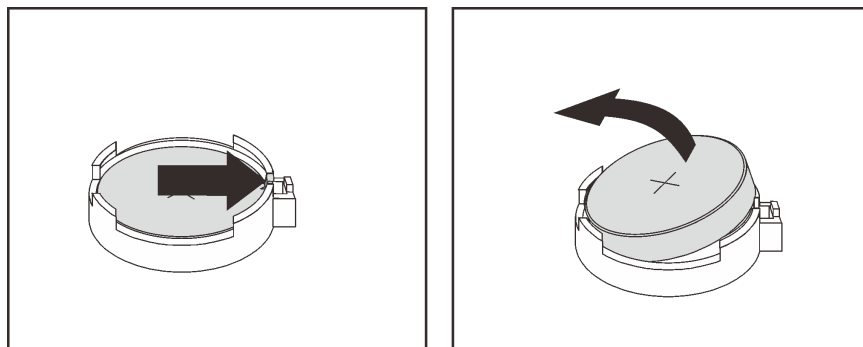
Figure 105. CMOS battery removal

After removing the CMOS battery:

1. Install a new CMOS battery. See "Install the CMOS battery" on page 143.

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

Install the CMOS battery

Use this information to install the CMOS battery.
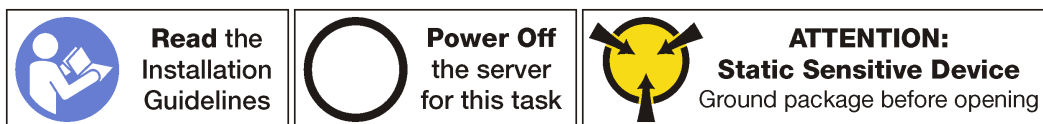
The following tips describe information that you must consider when installing the CMOS battery.

- Lenovo has designed this product with your safety in mind. The lithium battery must be handled correctly to avoid possible danger. If you install the CMOS battery, you must adhere to the following instructions.

  Note: In the U. S., call 1-800-IBM-4333 for information about battery disposal.

- If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.

- To order replacement batteries, call 1-800-IBM-SERV within the U.S., and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your support center or business partner.

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

S004

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

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

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

S002

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current that is 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.

To install the CMOS battery, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1.   Touch the static-protective package that contains the new CMOS battery to any unpainted surface on the outside of the server. Then, take the new CMOS battery out of the package and place it on a static-protective surface.

Step 2.   Install the new CMOS battery as shown. Ensure that the CMOS battery socket holds the battery securely.
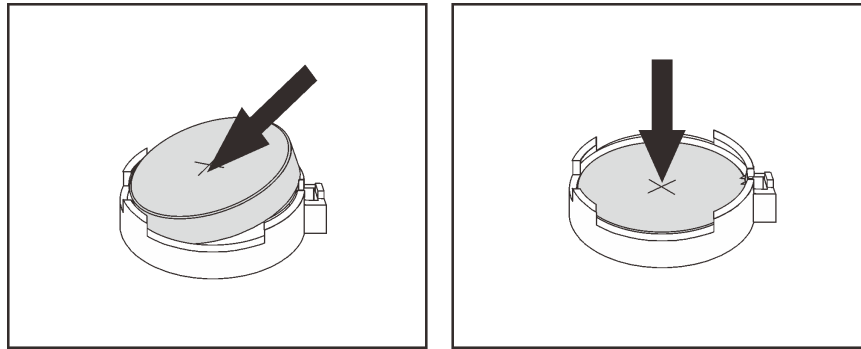
Figure 106. CMOS battery installation

After installing the CMOS battery:

1. Complete the parts replacement. See "Complete the parts replacement" on page 203.
2. Use the Setup utility to set the date, time, and any passwords.

Riser card replacement

Use this information to remove and install a riser card.

Note: Depending on the specific type, your riser card might look different from the illustrations in this topic.

Remove a riser card

Use this information to remove a riser card.
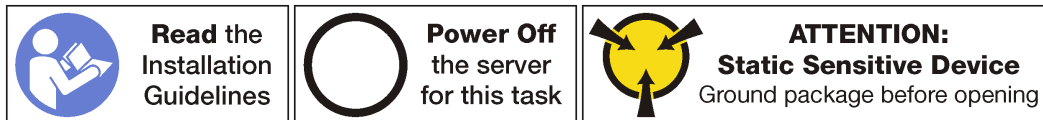
Before removing a riser card:

1. Remove the top cover. See "Remove the top cover" on page 103.
2. If there is any PCIe adapter installed on the riser card, record the cable connections first. Then, disconnect all cables from the PCIe adapter.

To remove a riser card, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1. Grasp the riser assembly by its edges and carefully lift it straight up and off the chassis.
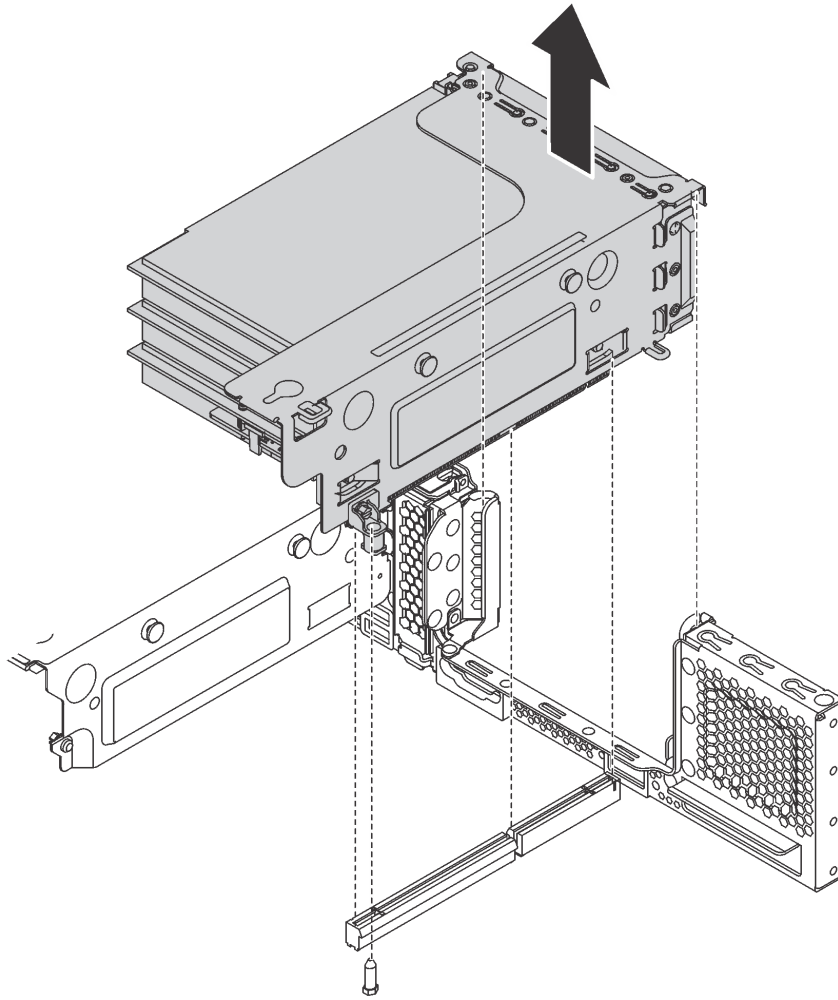
Figure 107. Riser 1 assembly removal
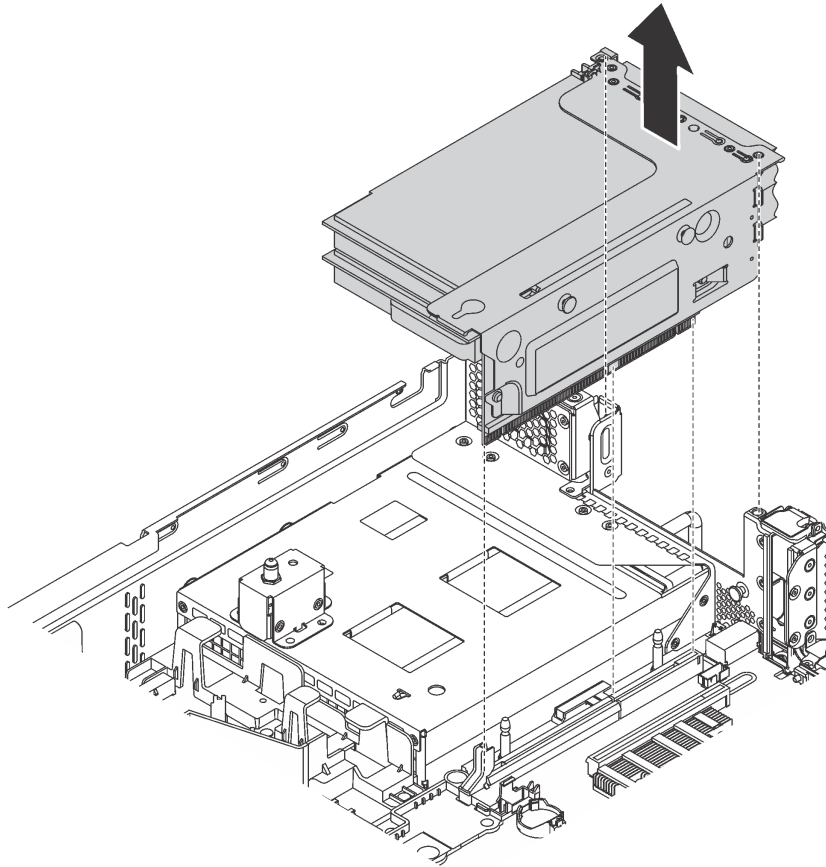
Figure 108. Riser 2 assembly removal

Step 2. Remove the PCIe adapters that are installed on the riser card. See "Remove a PCIe adapter from the riser assembly" on page 151.

Step 3. Remove the two screws that secure the failing riser card. Then, remove the failing riser card from the bracket.
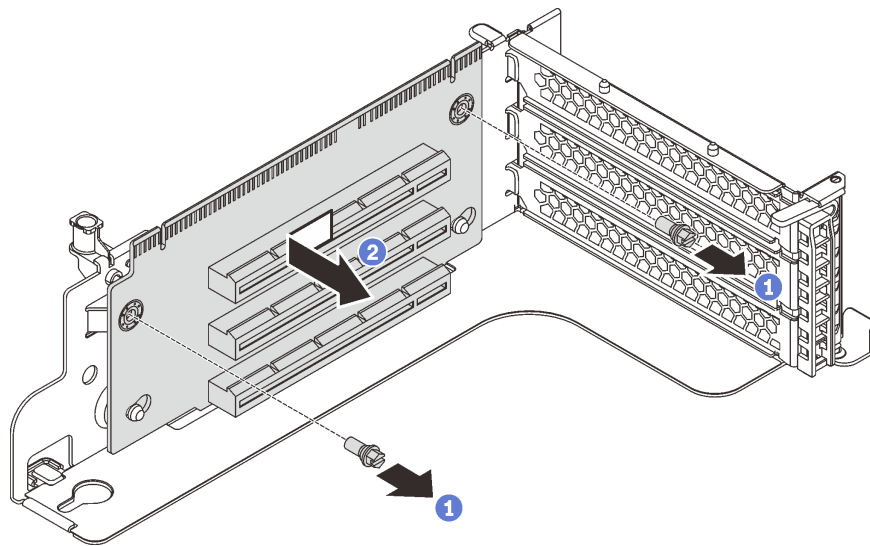
Figure 109. Riser card removal

If you are instructed to return the old riser card, follow all packaging instructions and use any packaging materials that are provided.

Install a riser card

Use this information to install a riser card.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening
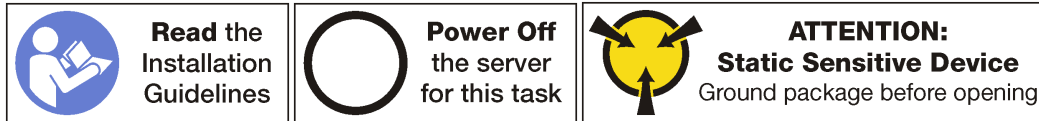
Before installing a riser card, touch the static-protective package that contains the new riser card to any unpainted surface on the outside of the server. Then, take the new riser card out of the package and place it on a static-protective surface.

To install a riser card, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1. Align the holes in the riser card with the mounting studs on the bracket. Then, install the riser card to the bracket in the direction as shown. Ensure that the screw holes in the riser card align with the corresponding holes in the bracket.
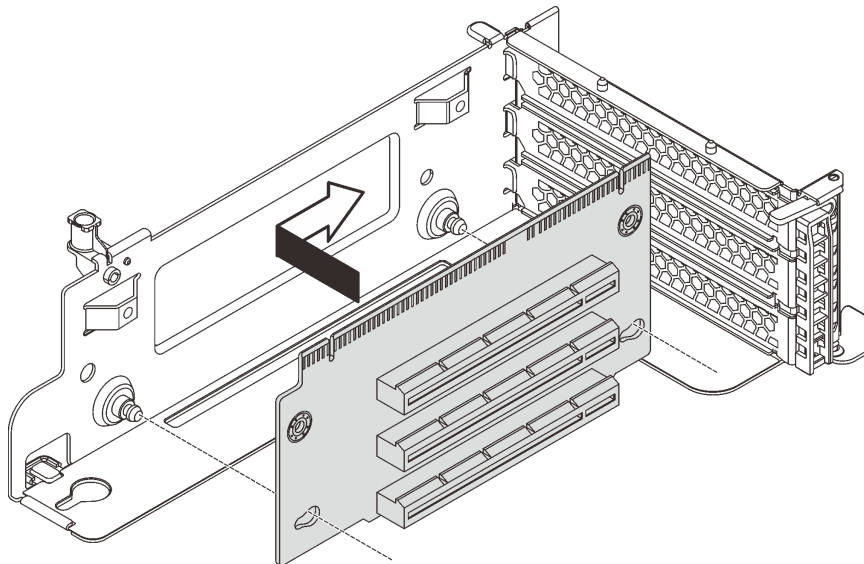
Figure 110. Riser card installation

Step 2. Install the two screws to secure the riser card to the bracket.
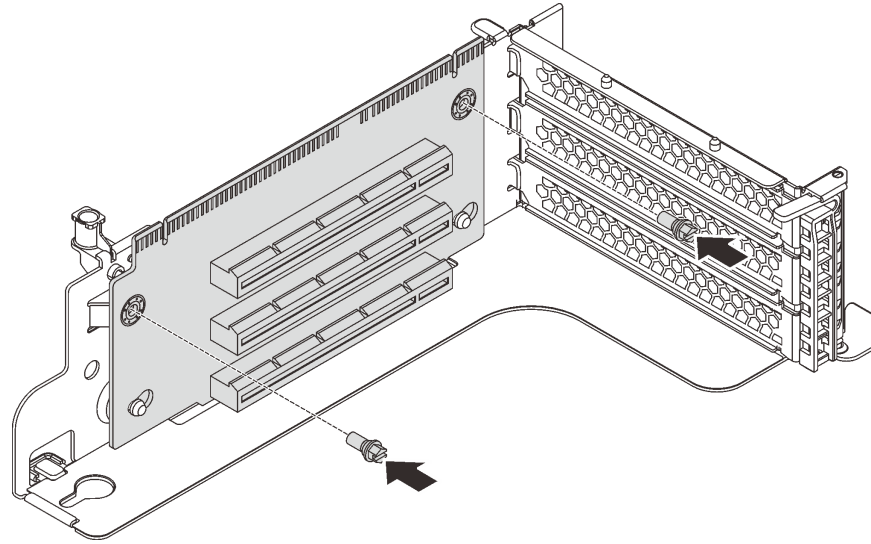
Figure 111. Installing the screws to secure the riser card

After installing the riser card:

1. Refer to your note to reconnect any cables to the removed PCIe adapters.

2. Reinstall the PCIe adapters on the new riser card. See "Install a PCIe adapter on the riser assembly" on page 154.

3. Install the riser assembly by doing the following:

   - To install the riser 1 assembly, align the mounting stud on the system board with the corresponding hole in the riser bracket. Meanwhile, align the rear of the riser 1 assembly with the corresponding rail guides in the rear of the chassis. Then, carefully press the riser 1 assembly straight down into the chassis until it is fully seated.
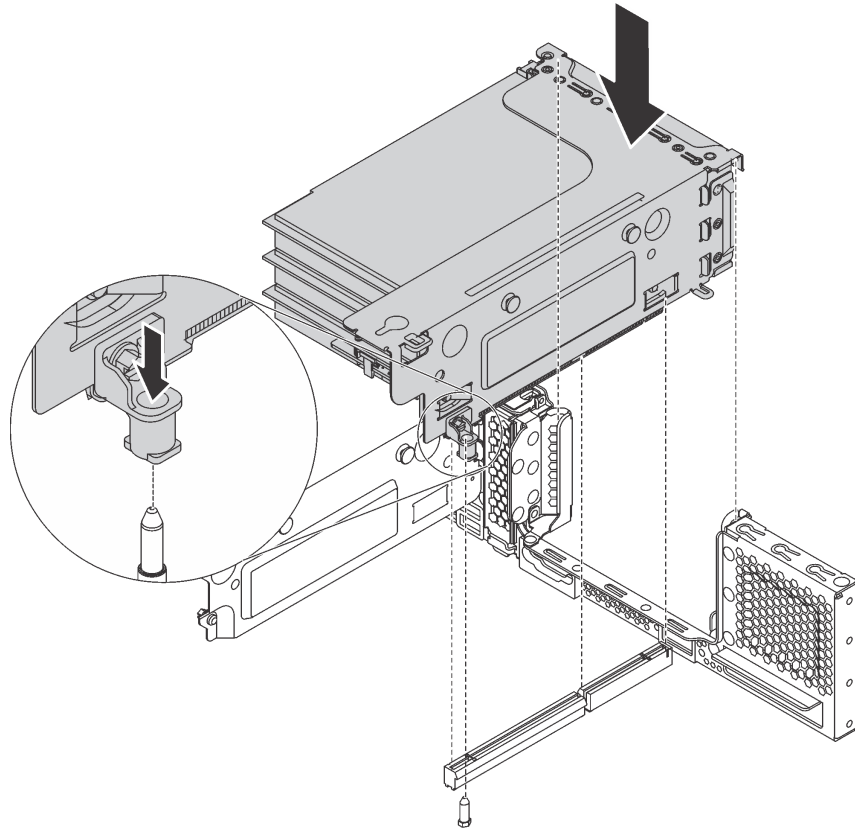
Figure 112. Riser 1 assembly installation

   - To install the riser 2 assembly, align the rear of the riser 2 assembly with the corresponding rail guides in the rear of the chassis. Then, carefully press the riser 2 assembly straight down into the chassis until it is fully seated.
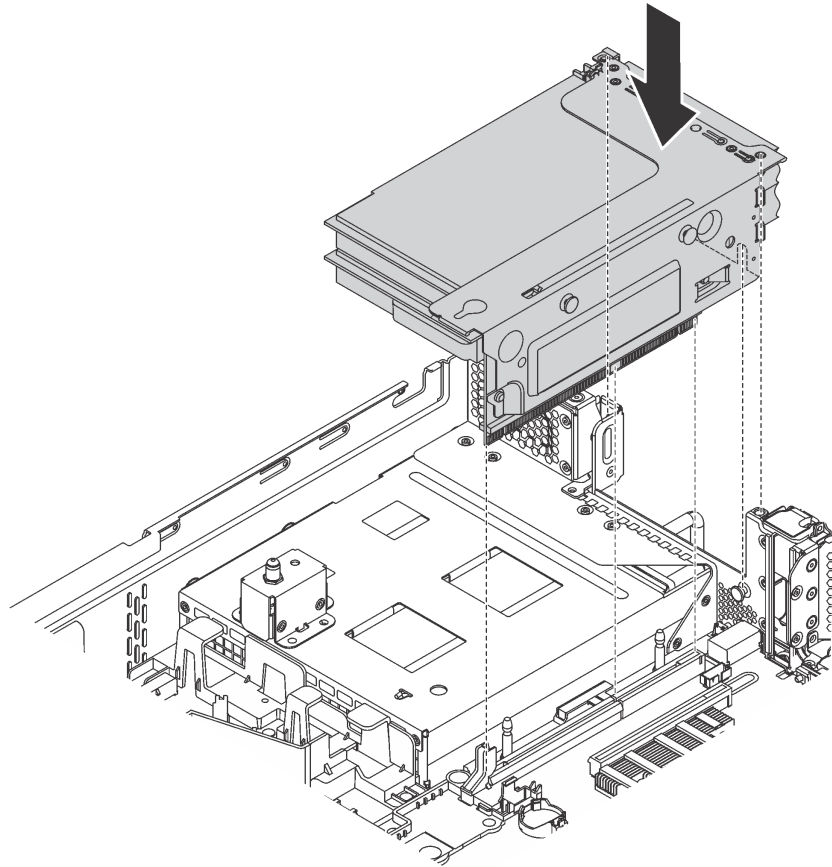
Figure 113. Riser 2 assembly installation

4. Complete the parts replacement. See "Completing the parts replacement" on page 203.

PCIe adapter replacement

Use this information to remove and install a PCIe adapter.

The PCIe adapter can be an Ethernet adapter, a host bus adapter, a RAID adapter, a PCIe solid-state drive, or any other supported PCIe adapters. PCIe adapters vary by type, but the installation and removal procedures are the same.

Note: For a list of the supported PCIe adapters, see:
http://www.lenovo.com/us/en/serverproven/

Remove a PCIe adapter

Use this information to remove a PCIe adapter.

This topic contains the following information:

- "Remove a PCIe adapter from the riser assembly" on page 151
- "Remove a PCIe adapter from the system board" on page 153

Remove a PCIe adapter from the riser assembly

Use this information to remove a PCIe adapter from the riser assembly.

Read the Installation Guidelines	Power Off the server for this task	ATTENTION: Static Sensitive Device Ground package before opening

Notes:

- Depending on the specific type, your PCIe adapter might look different from the illustration in this topic.
- Use any documentation that comes with the PCIe adapter and follow those instructions in addition to the instructions in this topic.

Before removing a PCIe adapter from the riser assembly:

1. Remove the top cover. See "Remove the top cover" on page 103.
2. Record the cable connections on the PCIe adapter and then disconnect all cables from the PCIe adapter.
3. Remove the riser assembly and lay it upside down on a flat, clean, and static-protective surface. See "Remove a riser card" on page 145.

To remove a PCIe adapter from the riser assembly, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1. Press the tab to pivot the PCIe adapter retention latch to the open position.
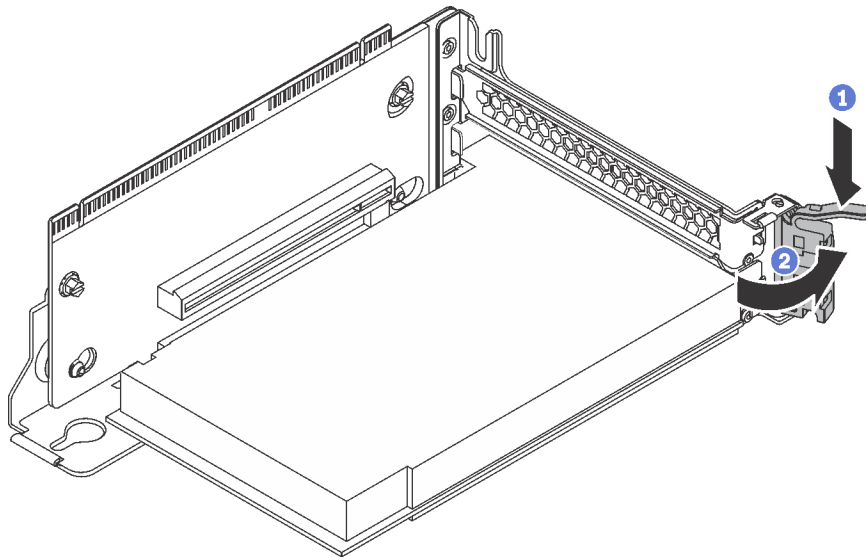
Figure 114. Opening the PCIe adapter retention latch

Step 2. Grasp the PCIe adapter by its edges and carefully pull it out of the PCIe slot.

Note: The PCIe adapter might fit tightly into the PCIe slot. If necessary, alternatively move each side of the PCIe adapter a small and equal amount until it is removed from the slot.
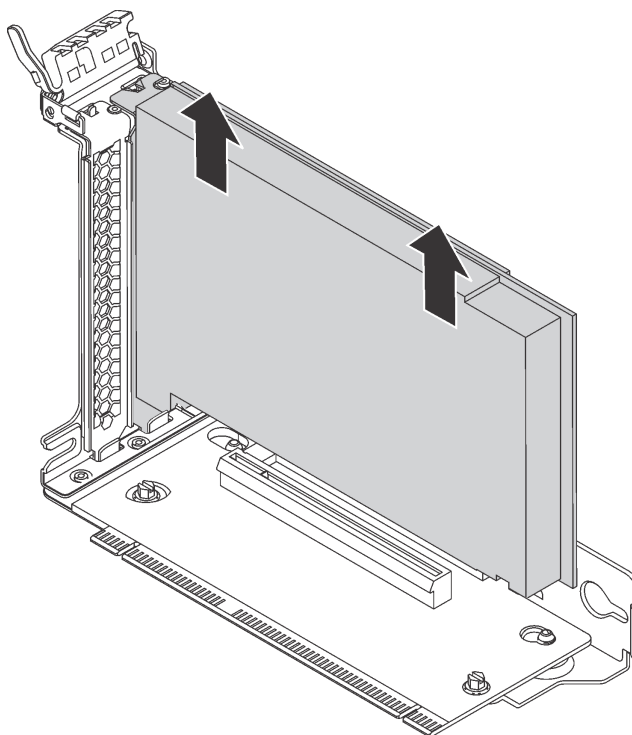
Figure 115. Removing a PCIe adapter from the riser assembly

If you are instructed to return the old PCIe adapter, follow all packaging instructions and use any packaging materials that are provided.

Remove a PCIe adapter from the system board

Use this information to remove a PCIe adapter from the system board.

Notes:

- Depending on the specific type, your PCIe adapter might look different from the illustration in this topic.
- Use any documentation that comes with the PCIe adapter and follow those instructions in addition to the instructions in this topic.

Before removing a PCIe adapter from the system board:

1. Remove the top cover. See "Remove the top cover" on page 103.

2. Record the cable connections on the PCIe adapter and then disconnect all cables from the PCIe adapter.

To remove a PCIe adapter from the system board, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444
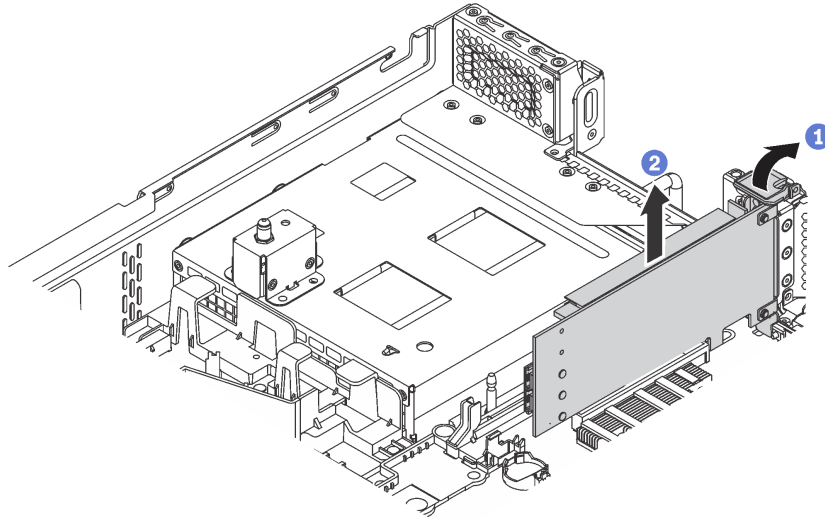
Figure 116. Removing a PCIe adapter from the system board

Step 1. Locate the PCIe slot 4. Then, pivot the PCIe adapter retention latch to the open position.

Step 2. Grasp the PCIe adapter by its edges and carefully pull it out of the PCIe slot.

> **Note:** The PCIe adapter might fit tightly into the PCIe slot. If necessary, alternatively move each side of the PCIe adapter a small and equal amount until it is removed from the slot.

If you are instructed to return the old PCIe adapter, follow all packaging instructions and use any packaging materials that are provided.

Install a PCIe adapter

Use this information to install a PCIe adapter on the riser assembly or on the system board.

This topic contains the following information:

- "Install a PCIe adapter on the riser assembly" on page 154
- "Install a PCIe adapter on the system board" on page 156

Install a PCIe adapter on the riser assembly

Use the following information to install a PCIe adapter on the riser assembly.

Notes:

- Depending on the specific type, your PCIe adapter might look different from the illustration in this topic.
- Use any documentation that comes with the PCIe adapter and follow those instructions in addition to the instructions in this topic.

Before installing a PCIe adapter on the riser assembly:

1. Touch the static-protective package that contains the new PCIe adapter to any unpainted surface on the outside of the server. Then, take the new PCIe adapter out of the package and place it on a static-protective surface.

2. Locate an appropriate PCIe slot. See "Rear view" on page 18 to identify the PCIe slots of your server.

   Notes:

   - Do not install PCIe adapters with small form factor (SFF) connectors in PCIe slot 6.
   - Observe the following PCIe slot selection priority when installing an Ethernet adapter or a converged network adapter:

Number of installed processors	PCIe slot selection priority
One processor	4, 2, 3, 1
Two processors	4, 2, 6, 3, 5, 1

To install a PCIe adapter on the riser assembly, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1. Align the PCIe adapter with the PCIe slot on the riser card. Then, carefully press the PCIe adapter straight into the slot until it is securely seated and its bracket also is secured.
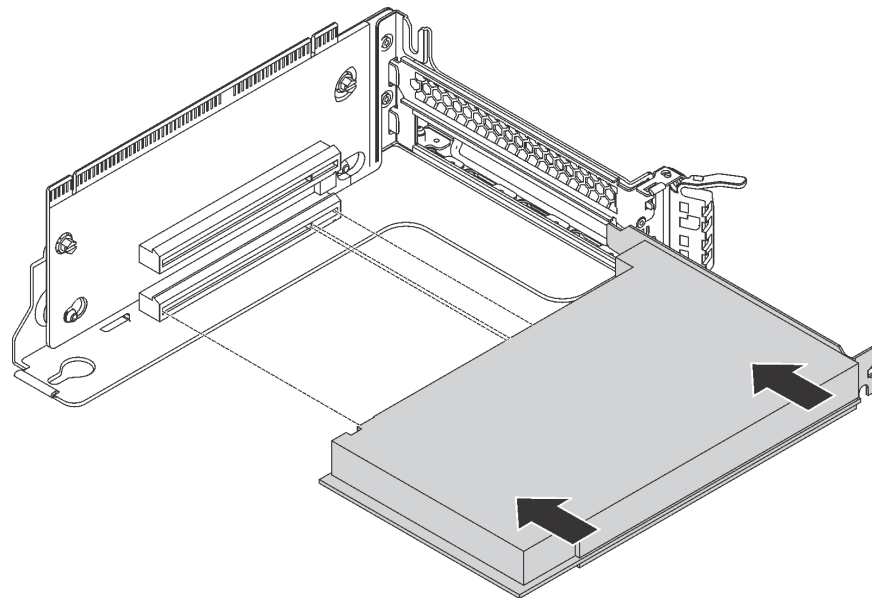
Figure 117. PCIe adapter installation

   Note: Carefully handle the PCIe adapter by its edges.

Step 2. Pivot the PCIe adapter retention latch to the closed position.
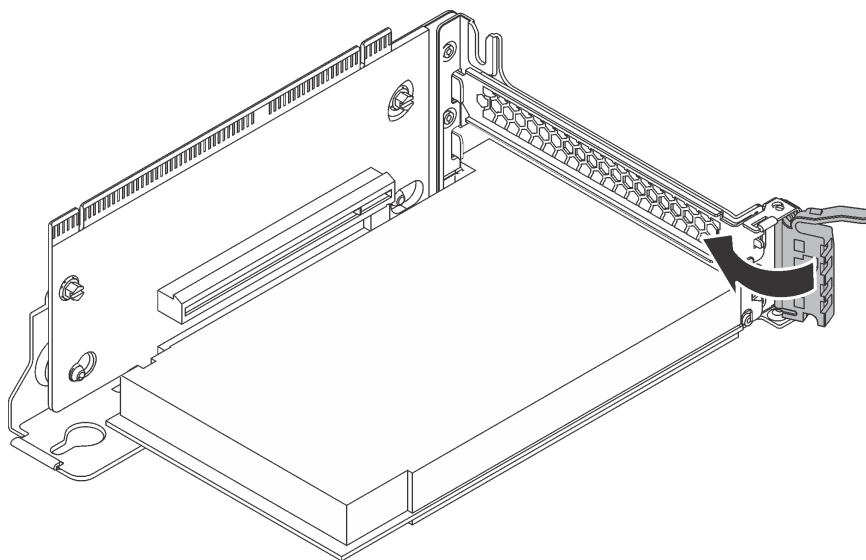
Figure 118. Closing the PCIe adapter retention latch

After installing the PCIe adapter on the riser assembly:

1. Refer to your record to reconnect the cables.

2. Reinstall the riser assembly. See "Install a riser card" on page 148.

3. Complete the parts replacement. See "Completing the parts replacement" on page 203.

Install a PCIe adapter on the system board

Use this information to install a PCIe adapter on the system board.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening

Notes:

- Depending on the specific type, your PCIe adapter might look different from the illustration in this topic.

- Use any documentation that comes with the PCIe adapter and follow those instructions in addition to the instructions in this topic.

Before installing the PCIe adapter on the system board:

1. Touch the static-protective package that contains the new PCIe adapter to any unpainted surface on the outside of the server. Then, take the new PCIe adapter out of the package and place it on a static-protective surface.

2. If the new PCIe adapter is installed with a full-height bracket, replace the full-height bracket with the low-profile bracket by doing the following:

   a. Carefully remove the screws that secure the PCIe adapter and then remove the full-height bracket from the PCIe adapter.

   b. Note the orientation and align the screw holes in the low-profile bracket with the corresponding holes in the PCIe adapter. Then, install the screws to secure the bracket to the PCIe adapter.

To install a PCIe adapter on the system board, complete the following steps:

Watch the procedure. A video of the installation process is available:

- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1. Position the PCIe adapter near the PCIe slot. Then, carefully press the PCIe adapter straight into the slot until it is securely seated and its bracket also is secured by the chassis.
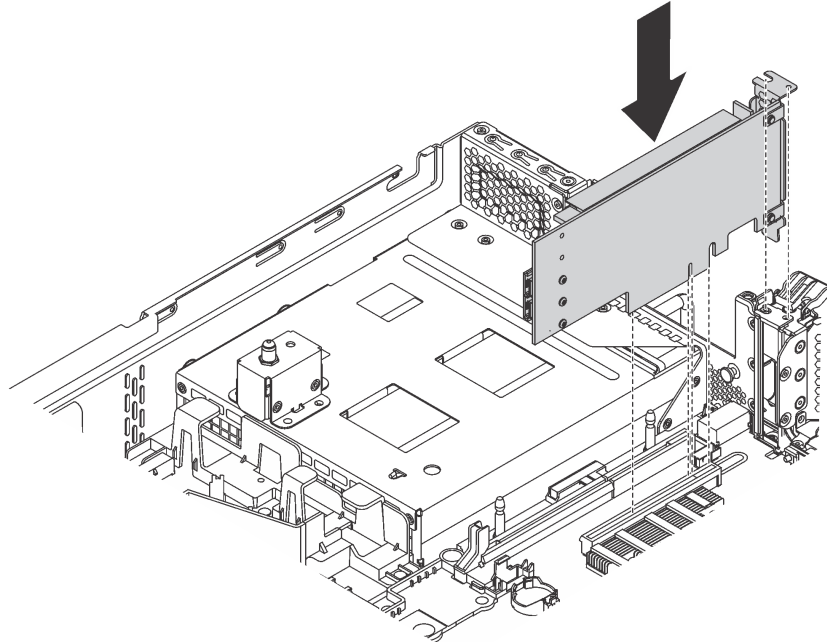
Figure 119. Installing a PCIe adapter on the system board

Step 2. Pivot the PCIe adapter retention latch to the closed position to secure the PCIe adapter in position.

After installing the PCIe adapter on the system board:

1. Refer to your record to reconnect the cables.
2. Complete the parts replacement. See "Completing the parts replacement" on page 203.

GPU replacement

Use this information to remove and install the GPU.

This topic applies only to the server models that have GPUs installed.

Remove a GPU

Use this information to remove a GPU.
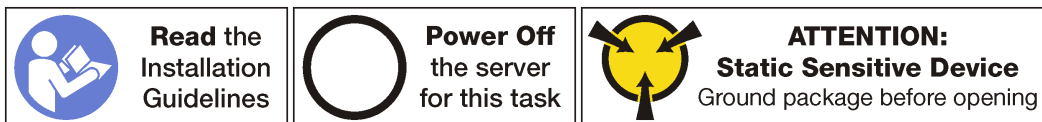
Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening

Notes:

- Depending on the specific type, your GPU might look different from the illustration in this topic.

- Use any documentation that comes with the GPU and follow those instructions in addition to the instructions in this topic.

Before removing a GPU:

1. Remove the top cover. See "Remove the top cover" on page 103.
2. Remove the riser assembly that has the GPU installed. For instructions on how to remove the riser assembly, see "Remove a riser card" on page 145.

To remove a GPU, complete the following steps:

Step 1.   Remove the GPU holder from the GPU assembly.
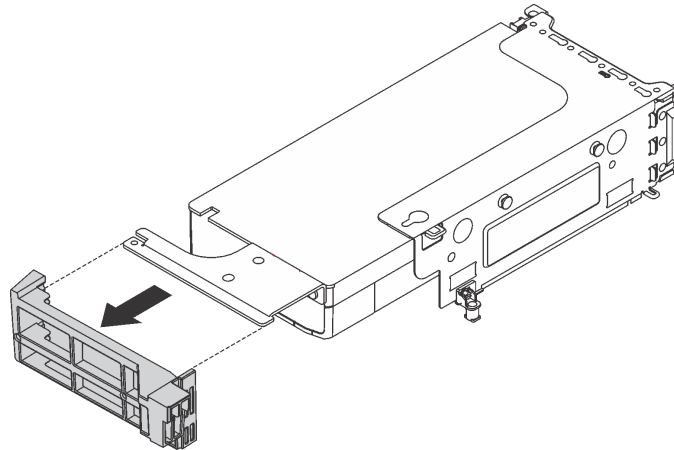
Figure 120. GPU holder removal

Step 2.   Disconnect the power cable from the GPU assembly.

Step 3.   Remove the GPU from the riser assembly. See "Remove a PCIe adapter from the riser assembly" on page 151.

If you are instructed to return the old GPU, follow all packaging instructions and use any packaging materials that are provided.

Install a GPU

Use this information to install a GPU.
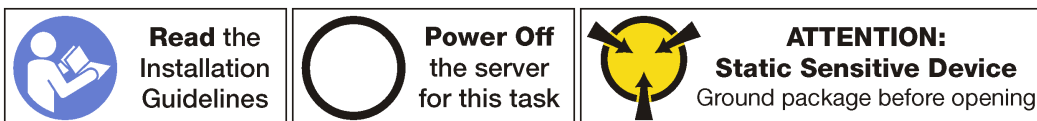
Read the Installation Guidelines   **Power Off** the server for this task   **ATTENTION:** **Static Sensitive Device** Ground package before opening

Notes:

- Depending on the specific type, your GPU might look different from the illustrations in this topic.
- Use any documentation that comes with the GPU and follow those instructions in addition to the instructions in this topic.

Before installing a GPU:

1. Touch the static-protective package that contains the new GPU to any unpainted surface on the outside of the server. Then, take the new GPU out of the package and place it on a static-protective surface.

2. If the GPU does not have a bracket installed on it, install the screws to secure the GPU bracket **1** to the GPU.
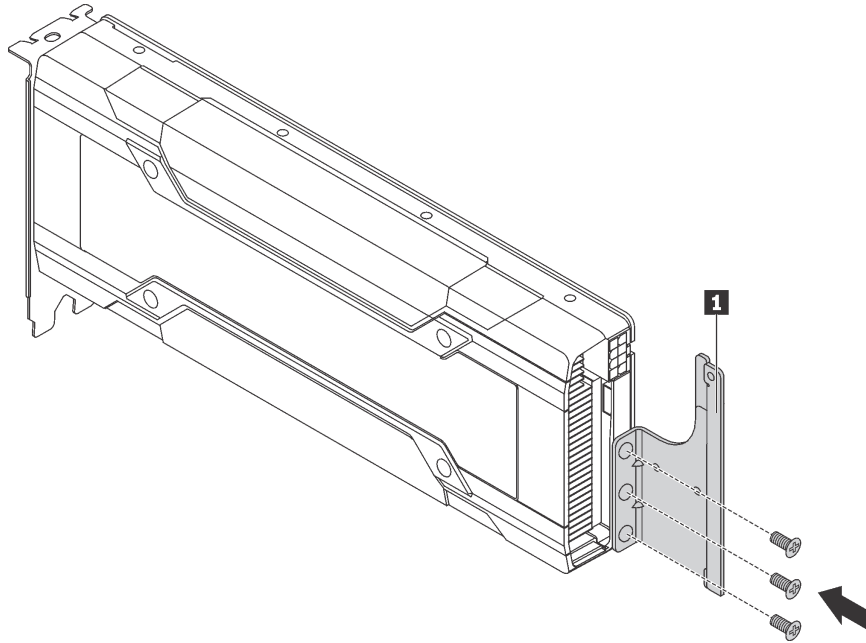
Figure 121. GPU bracket installation

3. Locate the correct PCIe slot for the GPU.

   Note: For server models with one processor, you can install one GPU in PCIe slot 1. For server models with two processors, you can install up to two GPUs in PCIe slot 1 and PCIe slot 5.

To install a GPU, complete the following steps:

Step 1. Align the GPU with the PCIe slot on the riser card. Then, carefully press the GPU straight into the slot until it is securely seated. See "Install a PCIe adapter on the riser assembly" on page 154.

Step 2. Install the GPU holder to the GPU assembly.
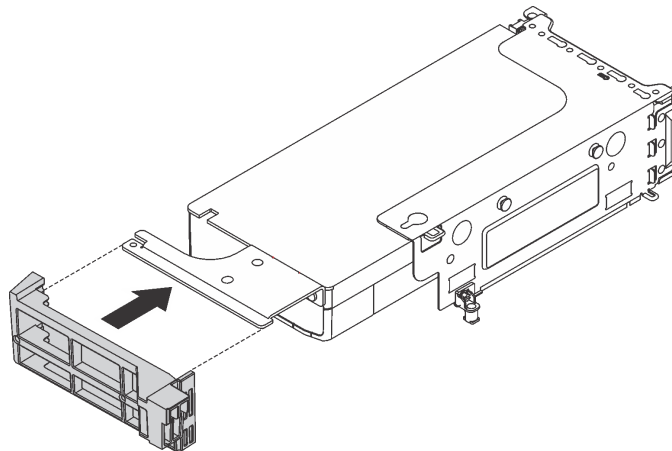
Figure 122. GPU holder installation

Step 3. Connect the power cable to the power connector on the GPU.

Step 4. Reinstall the riser assembly. Ensure that the GPU assembly is secured onto the air baffle.
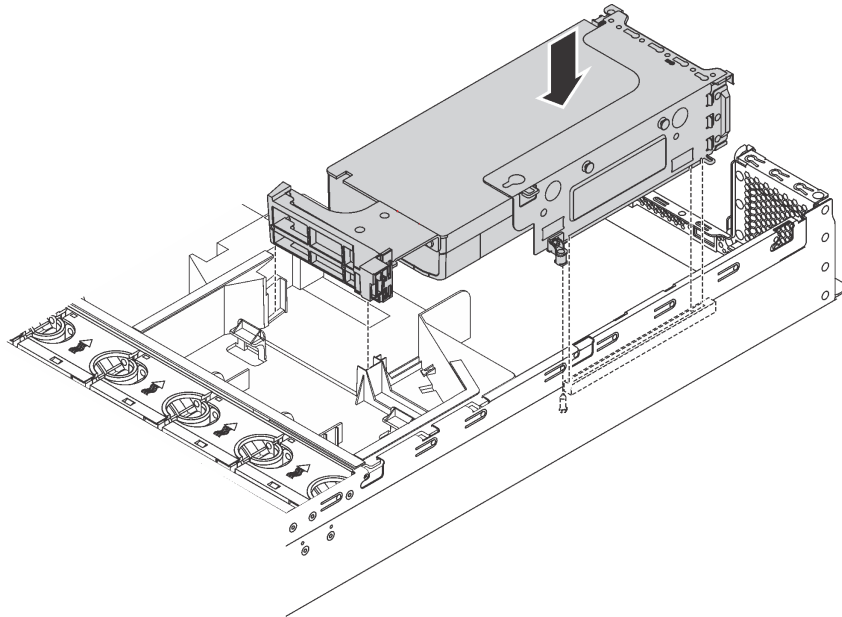
Figure 123. GPU assembly installation

After installing the GPU, complete the parts replacement. See "Completing the parts replacement" on page 203.

Rear hot-swap drive assembly replacement

Use this information to remove and install the rear hot-swap drive assembly.

The rear hot-swap drive assembly enables you to install up to two 3.5-inch hot-swap drives in the rear of the server.

Notes:

- The term "hot-swap drive" refers to all the supported types of 3.5-inch hot-swap hard disk drives and hot-swap solid-state drives.
- The rear hot-swap drive assembly is available on some models.

Remove the rear hot-swap drive assembly

Use this information to remove the rear hot-swap drive assembly.

Before removing the rear hot-swap drive assembly:

1. Remove the top cover. See "Remove the top cover" on page 103.
2. Remove the drives or drive fillers installed in the rear hot-swap drive assembly. See "Remove a hot-swap drive" on page 120.

To remove the rear hot-swap drive assembly, complete the following steps:

Step 1. Disconnect the signal cable from the rear hot-swap drive assembly. See "Internal cable routing" on page 27.

Step 2. Grasp the rear hot-swap drive assembly by its edges and carefully lift it straight up and off the chassis.
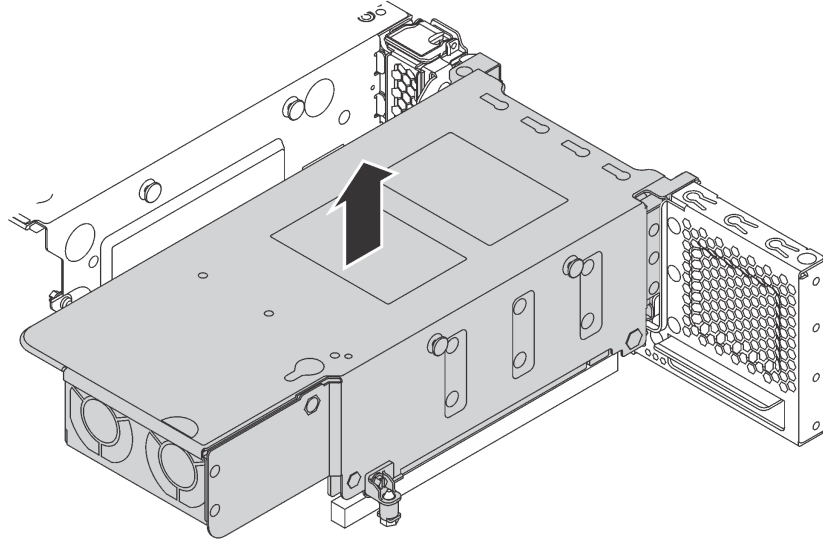
Figure 124. Rear hot-swap drive assembly removal

If you are instructed to return the old rear hot-swap drive assembly, follow all packaging instructions and use any packaging materials that are provided.

Install the rear hot-swap drive assembly

Use this information to install the rear hot-swap drive assembly.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening
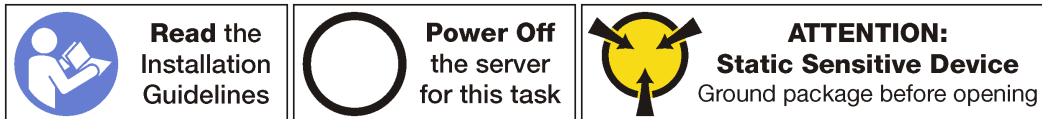
Before installing the rear hot-swap drive assembly, touch the static-protective package that contains the new rear hot-swap drive assembly to any unpainted surface on the outside of the server. Then, take the new rear hot-swap drive assembly out of the package and place it on a static-protective surface.

To install the rear hot-swap drive assembly, complete the following steps:

Step 1. Align the mounting stud on the system board with the corresponding hole in the rear hot-swap drive assembly. Meanwhile, align the rear of the rear hot-swap drive assembly with the corresponding rail guides in the rear of the chassis. Then, carefully press the rear hot-swap drive assembly straight down into the chassis until it is fully seated.
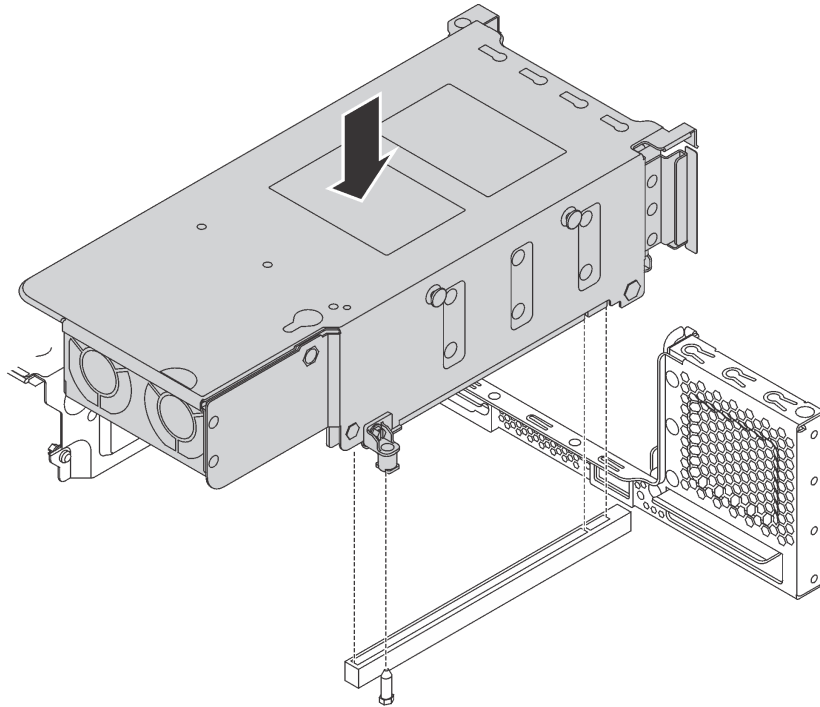
Figure 125. Rear hot-swap drive assembly installation

Step 2. Connect the signal cable to the rear hot-swap drive assembly. See "Internal cable routing" on page 27.

After installing the rear hot-swap drive assembly:

1. Reinstall the drives or drive fillers into the rear hot-swap drive assembly. See "Install a hot-swap drive" on page 122.

2. Complete the parts replacement. See "Completing the parts replacement" on page 203.

LOM adapter replacement

Use this information to remove and install the LOM adapter.

Remove the LOM adapter

Use this information to remove the LOM adapter.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION: Static Sensitive Device** Ground package before opening

Before removing the LOM adapter, remove the top cover. See "Remove the top cover" on page 103.

To remove the LOM adapter, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444
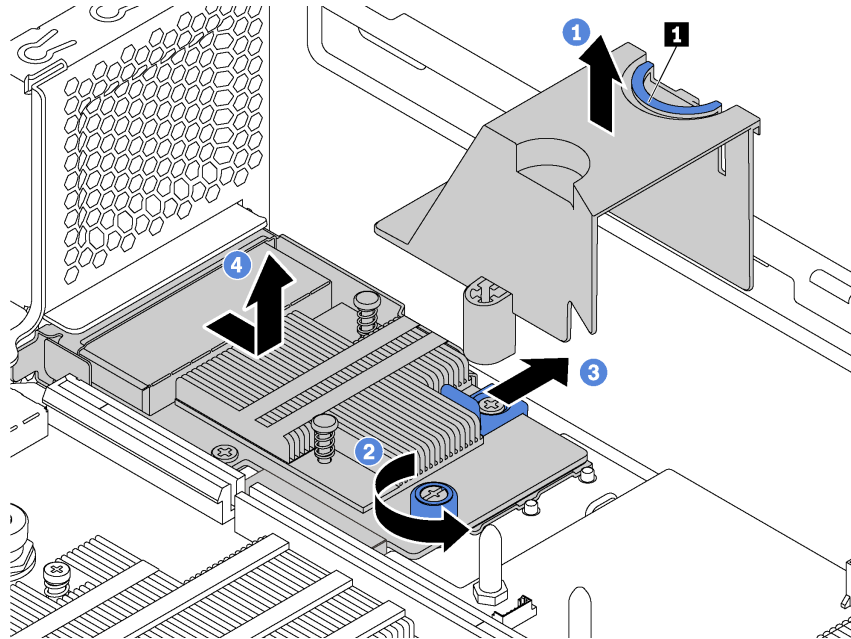
Figure 126. LOM adapter removal

Step 1. Remove the LOM-adapter air baffle by pinching the tab **1** and then lifting the air baffle out of the server.

Step 2. Loosen the thumbscrew that secures the LOM adapter.

Step 3. Push the LOM adapter out of the connector on the system board.

Step 4. Lift the LOM adapter off the server as shown.

If you are instructed to return the old LOM adapter, follow all of the packaging instructions and use any packaging materials that are provided.

Install the LOM adapter

Use this information to install the LOM adapter.

Before installing the LOM adapter:

1. If the server comes with a LOM adapter slot bracket, remove it with a tool first. Store the bracket in case that you later remove the LOM adapter and need the bracket to cover the place.

   CAUTION:
   Use a tool to remove the LOM adapter slot bracket to avoid injury.

2. Touch the static-protective package that contains the new LOM adapter to any unpainted surface on the outside of the server. Then, take the new LOM adapter out of the package and place it on a static-protective surface.

To install the LOM adapter, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444
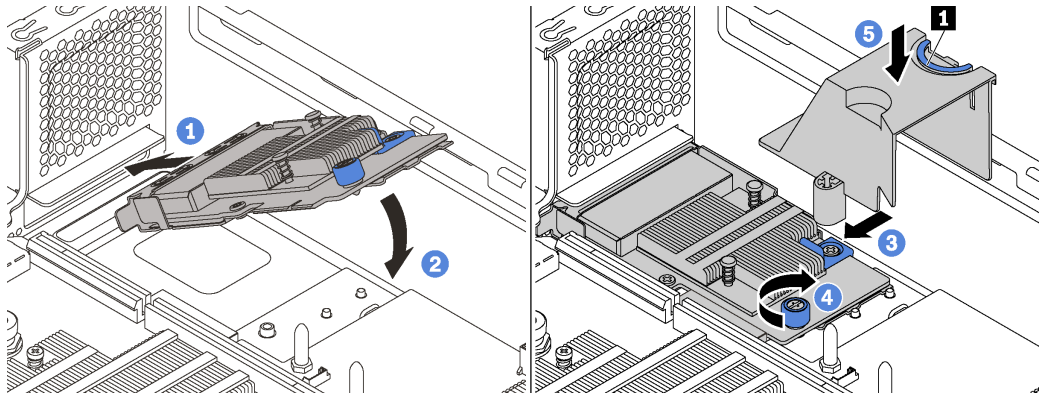
Figure 127. LOM adapter installation

Step 1. Place the LOM adapter into the connector at an angle.

Step 2. Rotate the LOM adapter down.

Step 3. Push the LOM adapter as shown to insert it into the connector on the system board.

Step 4. Tighten the thumbscrew to secure the LOM adapter.

Step 5. Align the mounting stud on the chassis with the hole in the LOM-adapter air baffle. Then, pinch the tab **1** and lower the LOM-adapter air baffle onto the LOM adapter.

After installing the LOM adapter, complete the parts replacement. See "Completing the parts replacement" on page 203.

Serial port module replacement

Use this information to remove and install the serial port module.

Note: The serial port module is available only on some models.

Remove the serial port module

Use this information to remove the serial port module.

Before removing the serial port module, remove the top cover. See "Remove the top cover" on page 103.

To remove the serial port module, complete the following steps:

Watch the procedure. A video of the removal process is available:

- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1.   Disconnect the cable of the serial port module from the system board.

Step 2.   Open the retention latch and remove the serial port module from the chassis.
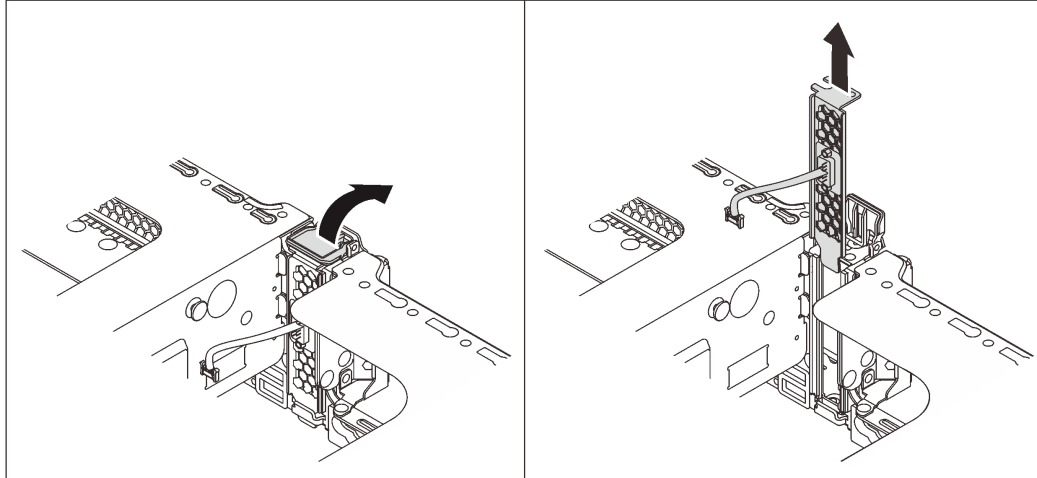
Figure 128. Serial port module removal

After removing the serial port module:

1. Install a new serial port module, a PCIe adapter, or a PCIe slot bracket to cover the place.

2. If you are instructed to return the old serial port module, follow all of the packaging instructions and use any packaging materials that are provided.

Install the serial port module

Use this information to install the serial port module.
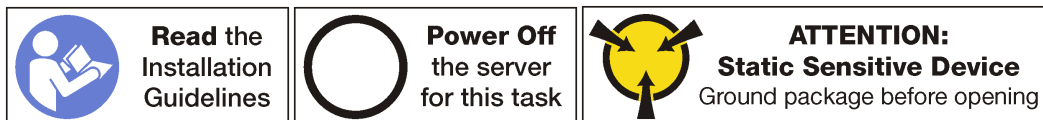
Before installing the serial port module:

1. If the slot is covered with a slot bracket, open the retention latch and remove the slot bracket from the chassis. Store the bracket in case that you later remove the serial port module and need the bracket to cover the place.

2. Touch the static-protective package that contains the new serial port module to any unpainted surface on the outside of the server. Then, take the new serial port module out of the package and place it on a static-protective surface.

To install the serial port module, complete the following steps:

Watch the procedure. A video of the installation process is available:

- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1.   Install the serial port module into the chassis and close the retention latch to secure it in position.
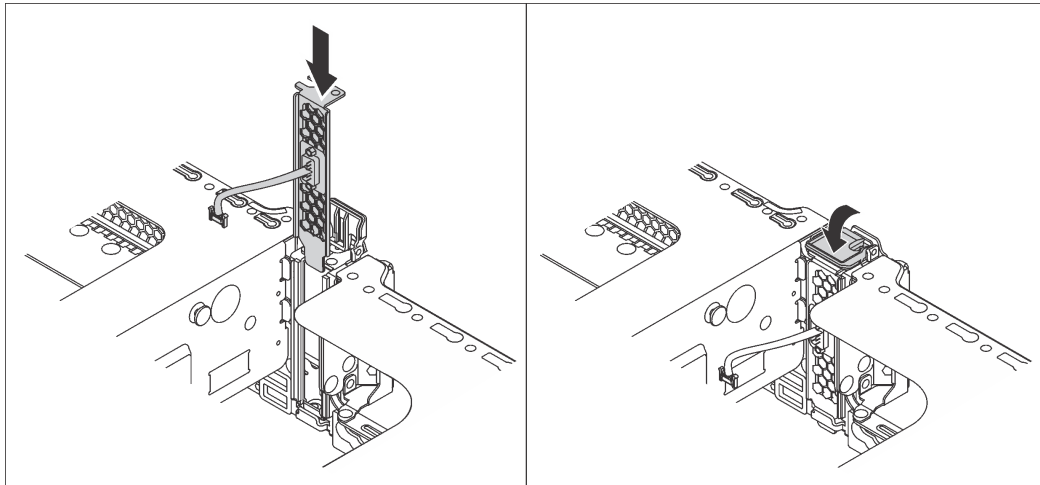
Figure 129. Serial port module installation

Step 2. 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 23.

After installing the serial port module:

1. Complete the parts replacement. See "Complete the parts replacement" on page 203.

2. 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:

     a. Open the ipmitool and enter the following command to disable the SOL feature:

        `-I lanplus -H IP -U USERID -P PASSWORD sol deactivate`

     b. Open Windows PowerShell and enter the following command to disable the Emergency Management Services (EMS) feature:

        `Bcdedit /ems no`

     c. Restart the server to ensure that the EMS setting takes effect.

M.2 backplane and M.2 drive replacement

Use this information to remove and install the M.2 backplane and M.2 drive (an assembled M.2 backplane and M.2 drive also known as M.2 module).

Remove the M.2 backplane and M.2 drive

Use this information to remove the M.2 backplane and M.2 drive.
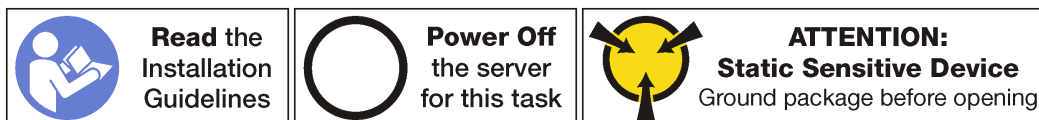
Before removing the M.2 backplane and M.2 drive:

1. Remove the top cover. See "Remove the top cover" on page 103.
2. For easier operation, remove the riser 2 assembly. See "Remove a riser card" on page 145.

To remove the M.2 backplane and M.2 drive, complete the following steps:

Step 1.   Grasp the M.2 backplane at both ends and pull it straight up to remove it from the system board.
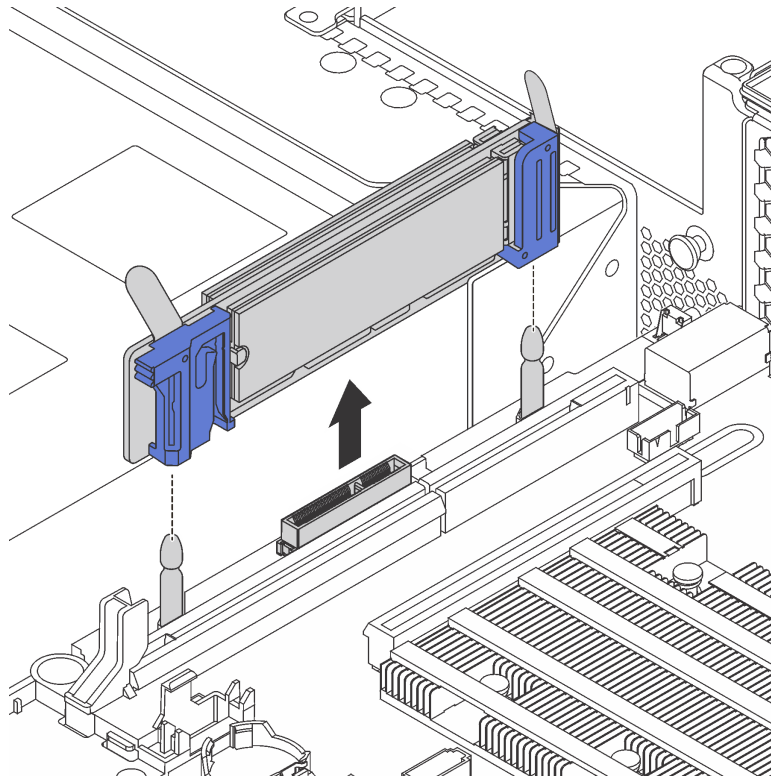
Figure 130. M.2 backplane removal

Step 2.   Remove the M.2 drive from the M.2 backplane by doing the following:
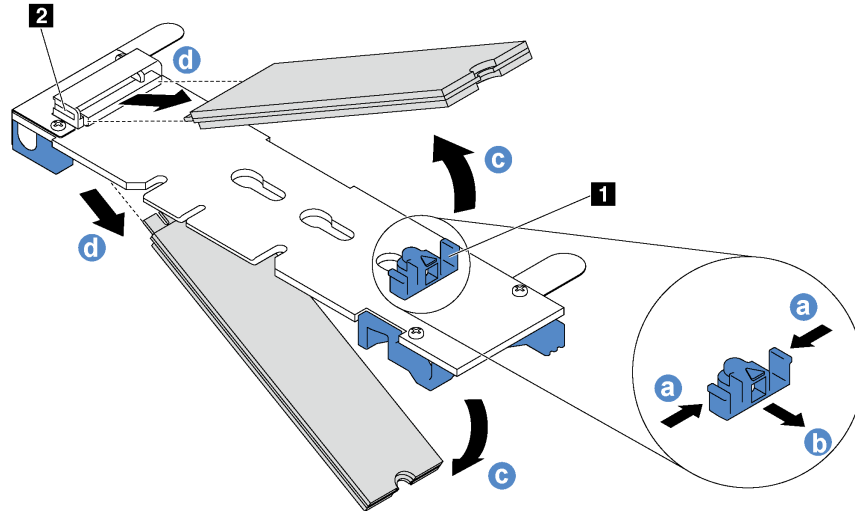
Figure 131. M.2 drive removal

a.   Press both sides of the retainer **1**.

b.   Slide the retainer backward to loosen the M.2 drive from the M.2 backplane.

   Note: If the M.2 backplane has two M.2 drives, they will both release outward when you slide the retainer backward.

c.   Rotate the M.2 drive away from the M.2 backplane.

d.   Pull it away from the connector **2** at an angle of approximately 30 degrees.

If you are instructed to return the old M.2 backplane or M.2 drive, follow all of the packaging instructions and use any packaging materials that are provided.

Adjust the retainer on the M.2 backplane

Use this information to adjust the retainer on the M.2 backplane.

Before adjusting the retainer on the M.2 backplane, locate the correct keyhole that the retainer should be installed into to accommodate the particular size of the M.2 drive you wish to install.

To adjust the retainer on the M.2 backplane, complete the following steps:
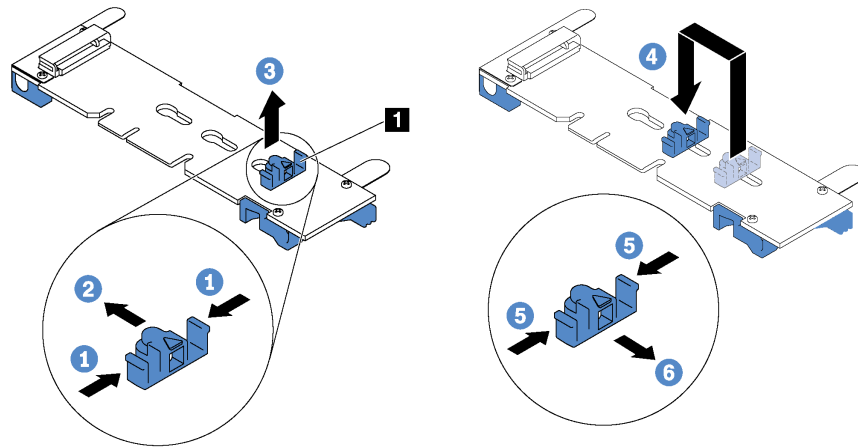
Figure 132. M.2 retainer adjustment

Step 1.　Press both sides of the retainer **1**.

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 until it is seated in place.

Install the M.2 backplane and M.2 drive

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

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening

Before installing the M.2 backplane and M.2 drive:

1. Touch the static-protective package that contains the new M.2 backplane and M.2 drive to any unpainted surface on the outside of the server. Then, take the new M.2 backplane and M.2 drive out of the package and place them on a static-protective surface.

2. 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 168.

To install the M.2 backplane and M.2 drive, complete the following steps:
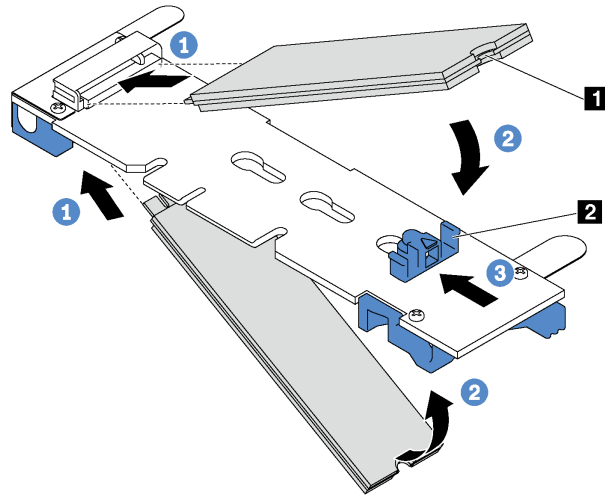
Figure 133. M.2 drive installation

Step 1. Insert the M.2 drive at an angle of approximately 30 degrees into the connector.

> **Note:** If your M.2 backplane supports two M.2 drives, insert the M.2 drives into the connectors at both sides.

Step 2. Rotate the M.2 drive down until the notch **1** catches on the lip of the retainer **2**.

Step 3. Slide the retainer forward (toward the connector) to secure the M.2 drive into place.

> **Attention:** When sliding the retainer forward, ensure that the two nubs **3** on the retainer enter the small holes **4** on the M.2 backplane. Once they enter the holes, you will hear a soft "click" sound.
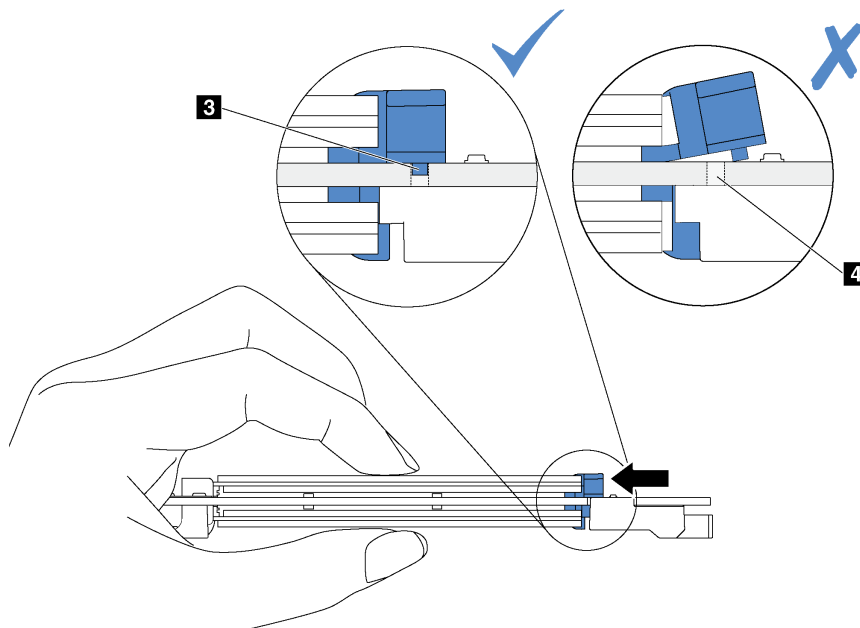

Figure 134. Instruction for sliding the retainer

Step 4. Align the blue plastic supports at each end of the M.2 backplane with the guide pins on the system board. Then, insert the M.2 backplane into the M.2 slot on the system board and press it down to fully seat it.
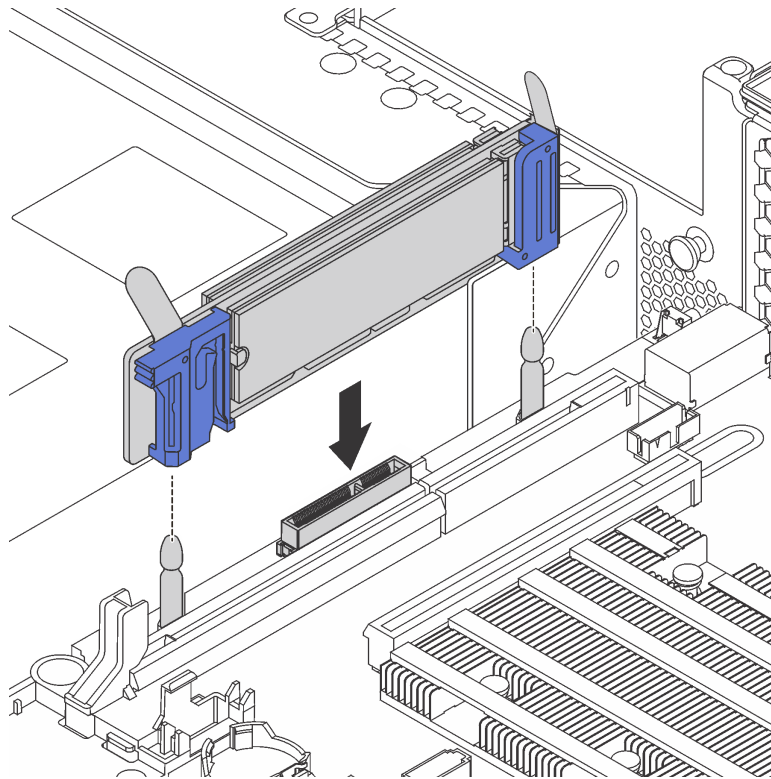
Figure 135. M.2 backplane installation

After installing the M.2 drive and M.2 backplane:

1. If you have removed the riser 2 assembly, reinstall it. See "Install a riser card" on page 148.

2. Complete the parts replacement. See "Complete the parts replacement" on page 203.

3. Use the Lenovo XClarity Provisioning Manager to configure the RAID. For more information, see: http://sysmgt.lenovofiles.com/help/topic/LXPM/RAID_setup.html

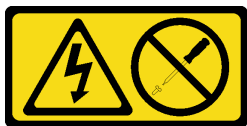# Hot-swap power supply replacement

Use this information to remove and install a hot-swap power supply.

Remove a hot-swap power supply

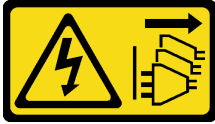Use this information to remove a hot-swap power supply.

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 that is 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

DANGER

Electrical current from power, telephone, and communication cables is hazardous.
To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**

- **Connect all power cords to a properly wired and grounded electrical outlet.**

- **Connect to properly wired outlets any equipment that will be attached to this product.**

- **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.**

- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**

- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:	To Disconnect:
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

Figure 136. Hot-swap power supply label on the cover

Attention: This type of power supply is hot-swap only when two power supplies are installed for redundancy. If only one power supply is installed, you must power off the server first before removing the power supply.

The following tips describe the information that you must consider when you remove a power supply with dc input.

CAUTION:
240 V dc input (input range: 180-300 V dc) is supported in China 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.

在直流输入状态下，若电源供应器插座不支持热插拔功能，请务必不要对设备电源线进行热插拔，此操作可能导致设备损坏及数据丢失。因错误执行热插拔导致的设备故障或损坏，不属于保修范围。

NEVER CONNECT AND DISCONNECT THE POWER SUPPLY CABLE AND EQUIPMENT WHILE YOUR EQUIPMENT IS POWERED ON WITH DC SUPPLY (hot-plugging). Otherwise you may damage the equipment and result in data loss, the damages and losses result from incorrect operation of the equipment will not be covered by the manufacturers' warranty.

S035

CAUTION:
Never remove the cover on a power supply or any part that has this label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

S019

CAUTION:

The power-control button on the device does not turn off the electrical current supplied to the device. The device also might have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals.

<u>S029</u>

DANGER

Electrical current from power, telephone, and communication cables is hazardous.
To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**

- **Connect all power cords to a properly wired and grounded power source.**

- **Connect to properly wired power sources any equipment that will be attached to this product.**

- **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.**

- **Disconnect the attached ac power cords, dc power sources, network connections, telecommunications systems, and serial cables before you open the device covers, unless you are instructed otherwise in the installation and configuration procedures.**

- **Connect and disconnect cables as described in the following table when you install, move, or open covers on this product or attached devices.**

To Connect:	To Disconnect:
1. Turn OFF all power sources and equipment that is to be attached to this product.	1. Turn OFF all power sources and equipment that is to be attached to this product.
2. Attach signal cables to the product.	• For ac systems, remove all power cords from the chassis power receptacles or interrupt power at the ac power distribution unit.
3. Attach power cords to the product.	• For dc systems, disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the dc cables.
• For ac systems, use appliance inlets.	2. Remove the signal cables from the connectors.
• For dc systems, ensure correct polarity of -48 V dc connections: RTN is + and -48 V dc is -. Earth ground should use a two-hole lug for safety.	3. Remove all cables from the devices.
4. Attach signal cables to other devices.	
5. Connect power cords to their sources.	
6. Turn ON all the power sources.	

To remove a hot-swap power supply, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1. If the server is in a rack, adjust the cable management arm (CMA) to gain access to the power supply bay.

If you have installed the 2U CMA Upgrade Kit for Toolless Slide Rail or Toolless Slide Rail Kit with 2U CMA, do the following:
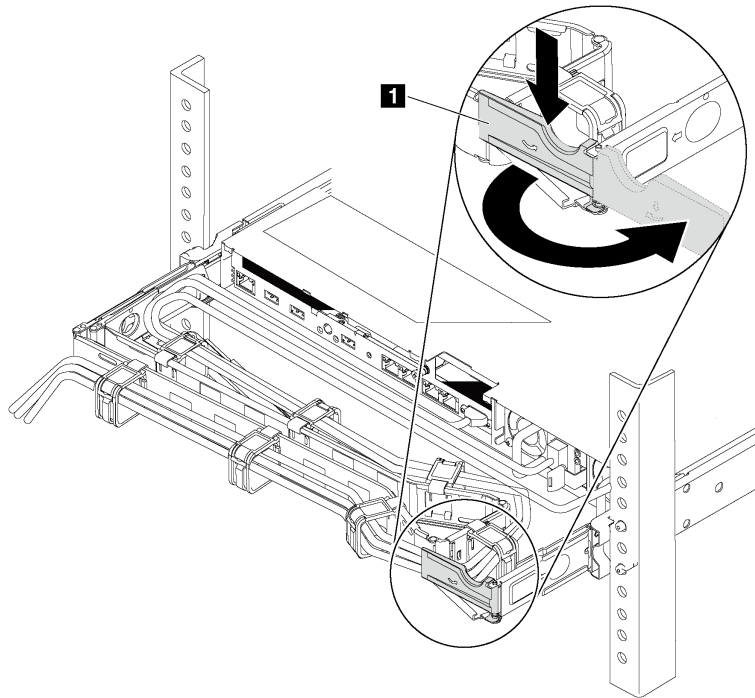

Figure 137. CMA adjustment

  a. Press down the stop bracket **1** and rotate it to the open position.

  b. Rotate the CMA out of the way to gain access to the power supply.

Step 2. Disconnect the power cord from the hot-swap power supply.

  Note: If you are replacing two power supplies, do the power supply replacement one by one to ensure that the power supply to the server is not interrupted. Do not disconnect the power cord from the secondly replaced power supply until the power output LED for the firstly replaced power supply is lit. For the location of the power output LED, refer to "Rear view LEDs" on page 21.

Step 3. Press the release tab toward the handle and carefully pull the handle at the same time to slide the hot-swap power supply out of the chassis.

  Note:

  Slightly pull the power supply upwards when sliding the power supply out of the chassis, if you have installed one of the following CMA kits:

  • 2U CMA Upgrade Kit for Toolless Slide Rail

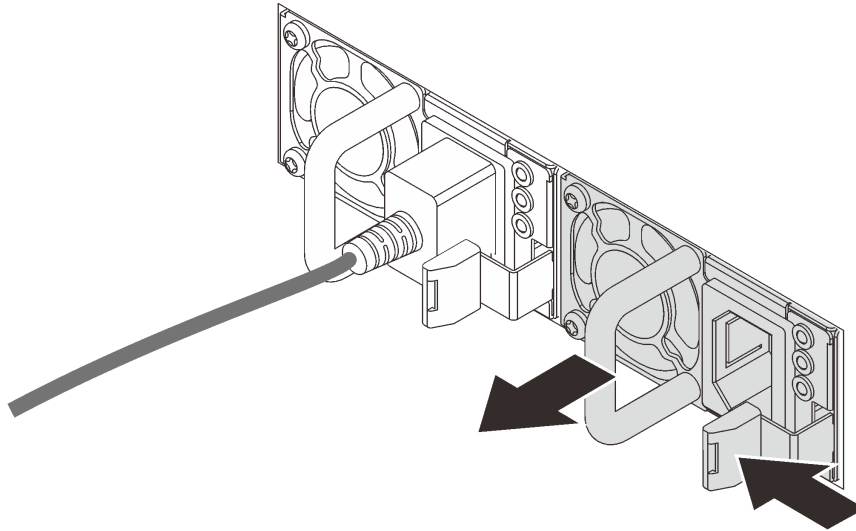 • Toolless Slide Rail Kit with 2U CMA

Figure 138. Hot-swap power supply removal

After removing the hot-swap power supply:

1. Install a new power supply or install the power-supply filler to cover the power supply bay. See "Install a hot-swap power supply" on page 176.

   Important: To ensure proper cooling during normal server operation, both of the power supply bays must be occupied. This means that each bay must have a power supply installed; or one has a power supply installed and the other has a power supply filler installed.

2. If you are instructed to return the old hot-swap power supply, follow all packaging instructions and use any packaging materials that are provided.

Install a hot-swap power supply

Use this information to install a hot-swap power supply.

The following tips describe the type of power supply that the server supports and other information that you must consider when you install a power supply:

- The standard shipping has only one power supply installed in the server. For redundancy and hot-swap support, you must install an additional hot-swap power supply. Certain customized models might be shipped with two power supplies installed.
- Ensure that the devices that you are installing are supported. For a list of supported optional devices for the server, go to:
  http://www.lenovo.com/us/en/serverproven/

Notes:

- Ensure that the two power supplies installed on the server have the same wattage.

- If you are replacing the existing power supply with a new power supply of different wattage, attach the power information label that comes with this option onto the existing label near the power supply.

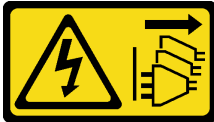*Figure 139. Hot-swap power supply label on the cover*

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 that is 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

⚠ **DANGER**

Electrical current from power, telephone, and communication cables is hazardous.
To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**

- **Connect all power cords to a properly wired and grounded electrical outlet.**

- **Connect to properly wired outlets any equipment that will be attached to this product.**

- **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.**

- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**

- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:	**To Disconnect:**
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

The following tips describe the information that you must consider when you install a power supply with dc input.
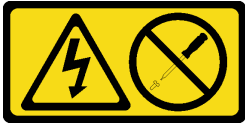
CAUTION:
240 V dc input (input range: 180-300 V dc) is supported in China ONLY. Power supply with 240 V dc input cannot support hot plugging power cord function. Before removing the power supply with dc input, please turn off server or disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the power cord.

在直流输入状态下，若电源供应器插座不支持热插拔功能，请务必不要对设备电源线进行热插拔，此操作可能导致设备损坏及数据丢失。因错误执行热插拔导致的设备故障或损坏，不属于保修范围。

NEVER CONNECT AND DISCONNECT THE POWER SUPPLY CABLE AND EQUIPMENT WHILE YOUR EQUIPMENT IS POWERED ON WITH DC SUPPLY (hot-plugging). Otherwise you may damage the equipment and result in data loss, the damages and losses result from incorrect operation of the equipment will not be covered by the manufacturers' warranty.

<u>S035</u>

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

DANGER

Electrical current from power, telephone, and communication cables is hazardous.
To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**

- **Connect all power cords to a properly wired and grounded power source.**

- **Connect to properly wired power sources any equipment that will be attached to this product.**

- **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.**

- **Disconnect the attached ac power cords, dc power sources, network connections, telecommunications systems, and serial cables before you open the device covers, unless you are instructed otherwise in the installation and configuration procedures.**

- **Connect and disconnect cables as described in the following table when you install, move, or open covers on this product or attached devices.**

To Connect:	**To Disconnect:**
1. Turn OFF all power sources and equipment that is to be attached to this product.	1. Turn OFF all power sources and equipment that is to be attached to this product.
2. Attach signal cables to the product.	• For ac systems, remove all power cords from the chassis power receptacles or interrupt power at the ac power distribution unit.
3. Attach power cords to the product.	• For dc systems, disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the dc cables.
• For ac systems, use appliance inlets.	2. Remove the signal cables from the connectors.
• For dc systems, ensure correct polarity of -48 V dc connections: RTN is + and -48 V dc is -. Earth ground should use a two-hole lug for safety.	3. Remove all cables from the devices.
4. Attach signal cables to other devices.	
5. Connect power cords to their sources.	
6. Turn ON all the power sources.	

Before installing a hot-swap power supply, touch the static-protective package that contains the new hot-swap power supply to any unpainted surface on the outside of the server. Then, take the new hot-swap power supply out of the package and place it on a static-protective surface.

To install a hot-swap power supply, complete the following steps:

Watch the procedure. A video of the installation process is available:
• Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
• Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1. If the server is in a rack, adjust the cable management arm (CMA) to gain access to the power supply bay.

If you have installed the 2U CMA Upgrade Kit for Toolless Slide Rail or Toolless Slide Rail Kit with 2U CMA, do the following:
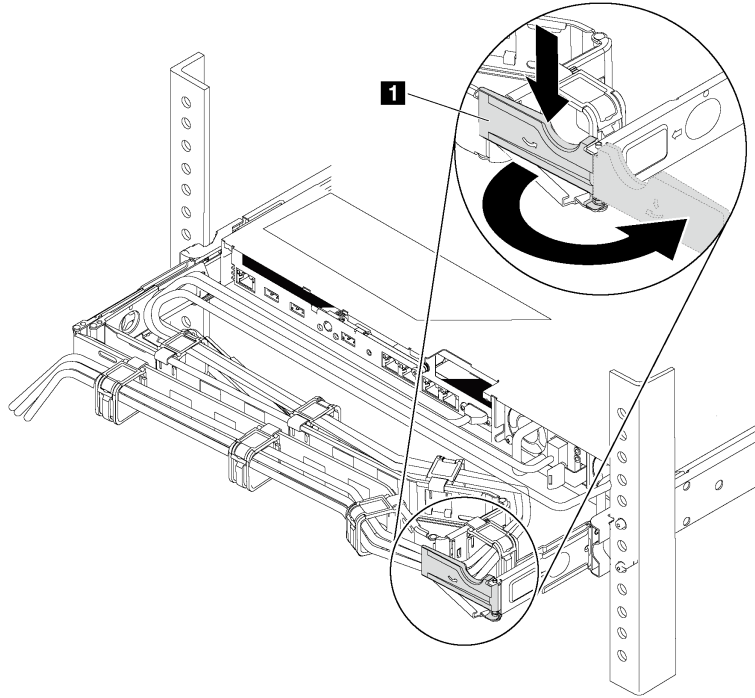
Figure 140. CMA adjustment

    a.   Press down the stop bracket **1** and rotate it to the open position.

    b.   Rotate the CMA out of the way to gain access to the power supply bay.

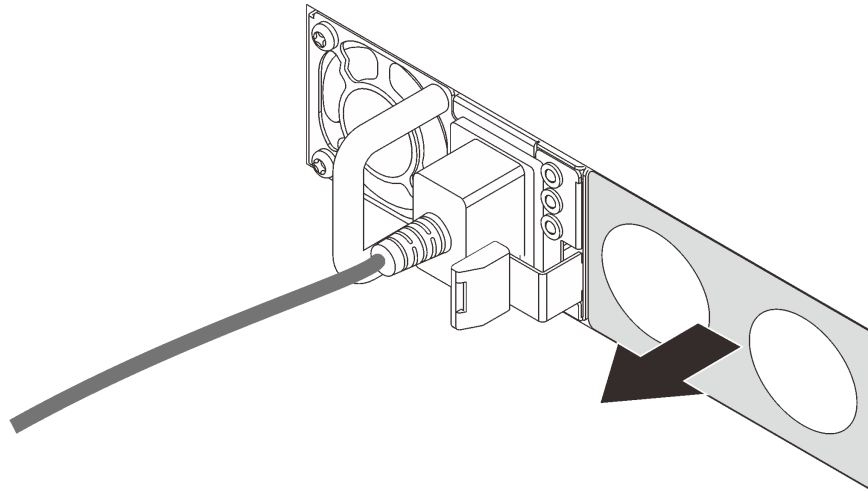Step 2.   If there is a power-supply filler installed, remove it.

Figure 141. Hot-swap power supply filler removal

Step 3.   Slide the new hot-swap power supply into the bay until it snaps into position.
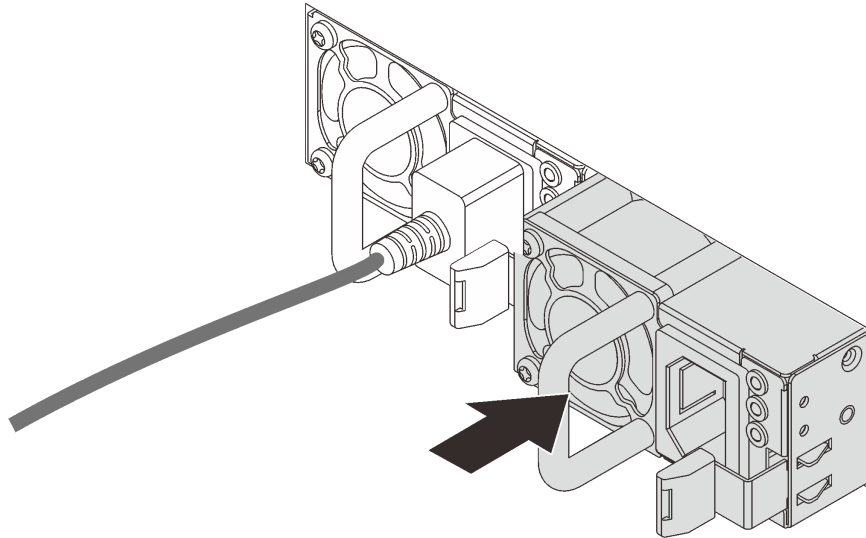
Figure 142. Hot-swap power supply installation

After installing the hot-swap power supply:

1. Connect one end of the power cord to the new power supply connector; then, connect the other end of the power cord into a properly grounded electrical outlet.
2. If the server is powered off, power on the server. Ensure that both the power input LED and the power output LED on the power supply are lit, indicating that the power supply is operating properly.

TCM replacement (for China only)

Use this information to remove and install the TCM.

Remove the TCM (for China only)

Use this information to remove the TCM.

Before removing the TCM, remove the top cover. See "Remove the top cover" on page 103.

To remove the TCM, complete the following steps:

Step 1.   Locate the TCM connector on the system board.

Step 2.   Press and hold the release latch, and then lift the TCM straight up.
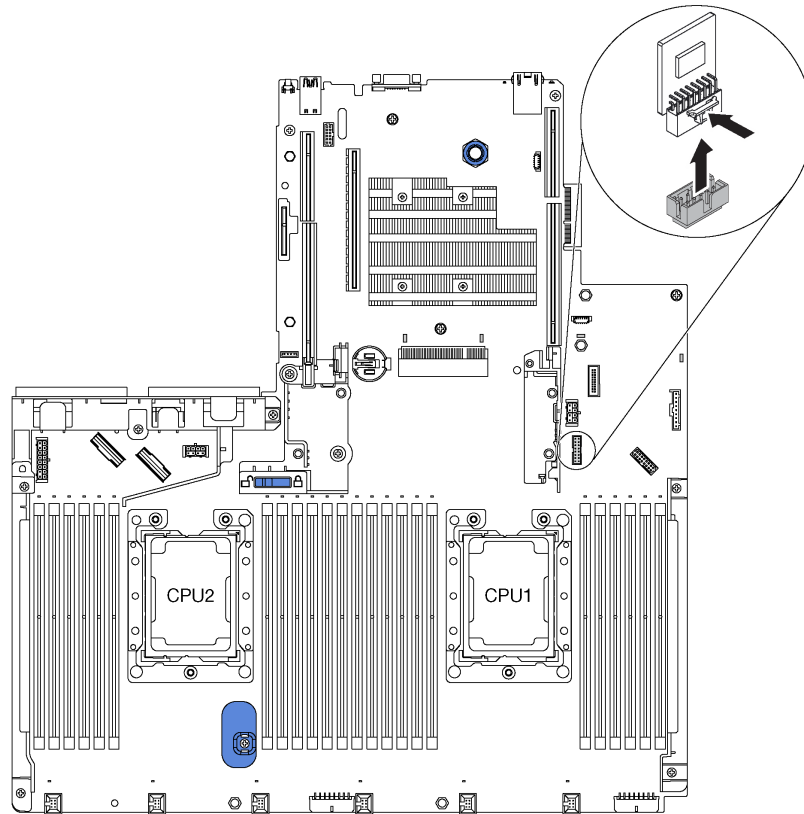
Note: Carefully handle the TCM by its edges.

Figure 143. TCM removal

If you are instructed to return the old TCM, follow all packaging instructions and use any packaging materials that are provided.

Install the TCM (for China only)

Use this information to install the TCM.

Before installing the TCM, touch the static-protective package that contains the new TCM to any unpainted surface on the outside of the server. Then, take the new TCM out of the package and place it on a static-protective surface.

To install the TCM, complete the following steps:

Step 1. Locate the TCM connector on the system board.

Step 2. Insert the TCM into the TCM connector on the system board.

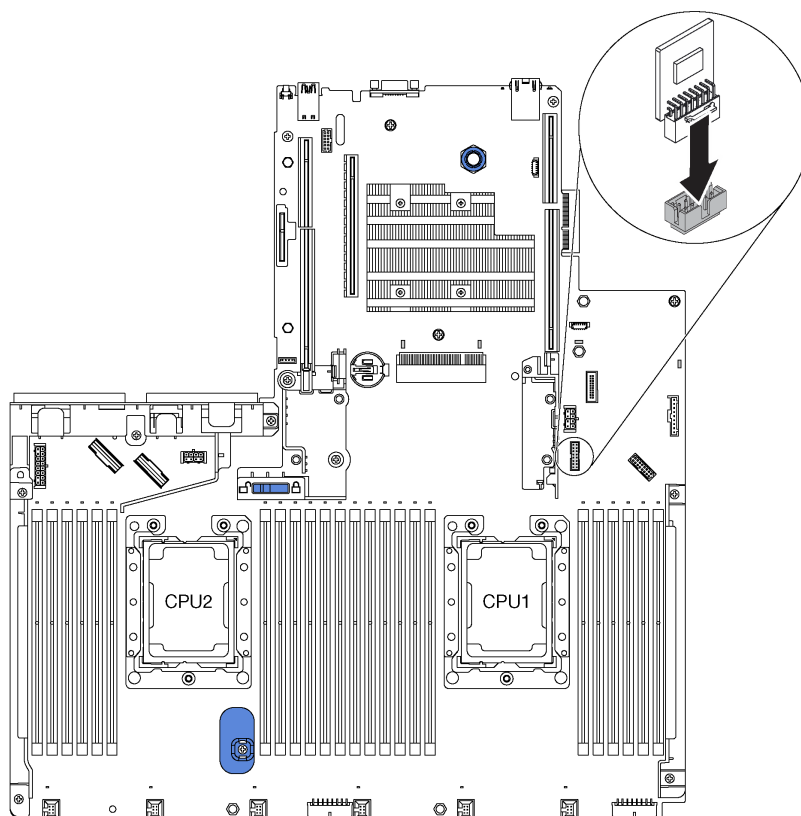> **Note:** Carefully handle the TCM by its edges.

Figure 144. TCM installation

After installing the TCM, complete the parts replacement. See "Complete the parts replacement" on page 203.

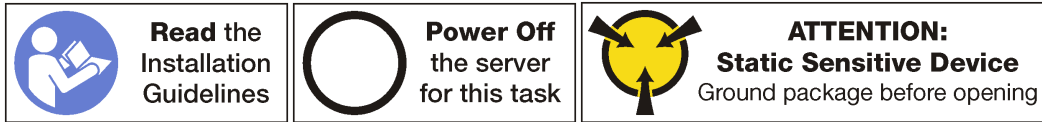## Processor and heat sink replacement

Use the following procedures to replace an assembled processor and heat sink, known as a processor-heat-sink module (PHM), a processor, or a heat sink.

Attention: Before you begin replacing a processor, make sure that you have an alcohol cleaning pad (part number 00MP352). You should use blue thermal grease (part number 01KP765) when replacing the microprocessor if that grease is available in your country. If it is not available, use gray thermal grease (part number 41Y9292).

Important: The processor in your server can throttle, temporarily lowering speed to reduce heat output, in response to thermal conditions. In instances where the throttling period is of extremely short duration (100 ms or less), the only indication will be an entry in the event log. In these instances the event can be ignored and processor replacement is not required.

Remove a processor and heat sink

This task has instructions for removing an assembled processor and heat sink, known as a processor-heat-sink module (PHM), a processor, and a heat sink. All of these tasks require a Torx T30 driver.

Read the Installation Guidelines	Power Off the server for this task	ATTENTION: Static Sensitive Device Ground package before opening

Attention:

- 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.

- 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.

- 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 electrical connectors in the processor socket. Do not remove the grease cover from a heat sink until you are instructed to do so.

Before removing a PHM:

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

1. Remove the top cover. See "Remove the top cover" on page 103.

2. Remove the air baffle. See "Remove the air baffle" on page 108.

3. Remove any parts and disconnect any cables that might impede your access to the PHM.

To remove a PHM, complete the following steps:

Watch the procedure. A video of the removal process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

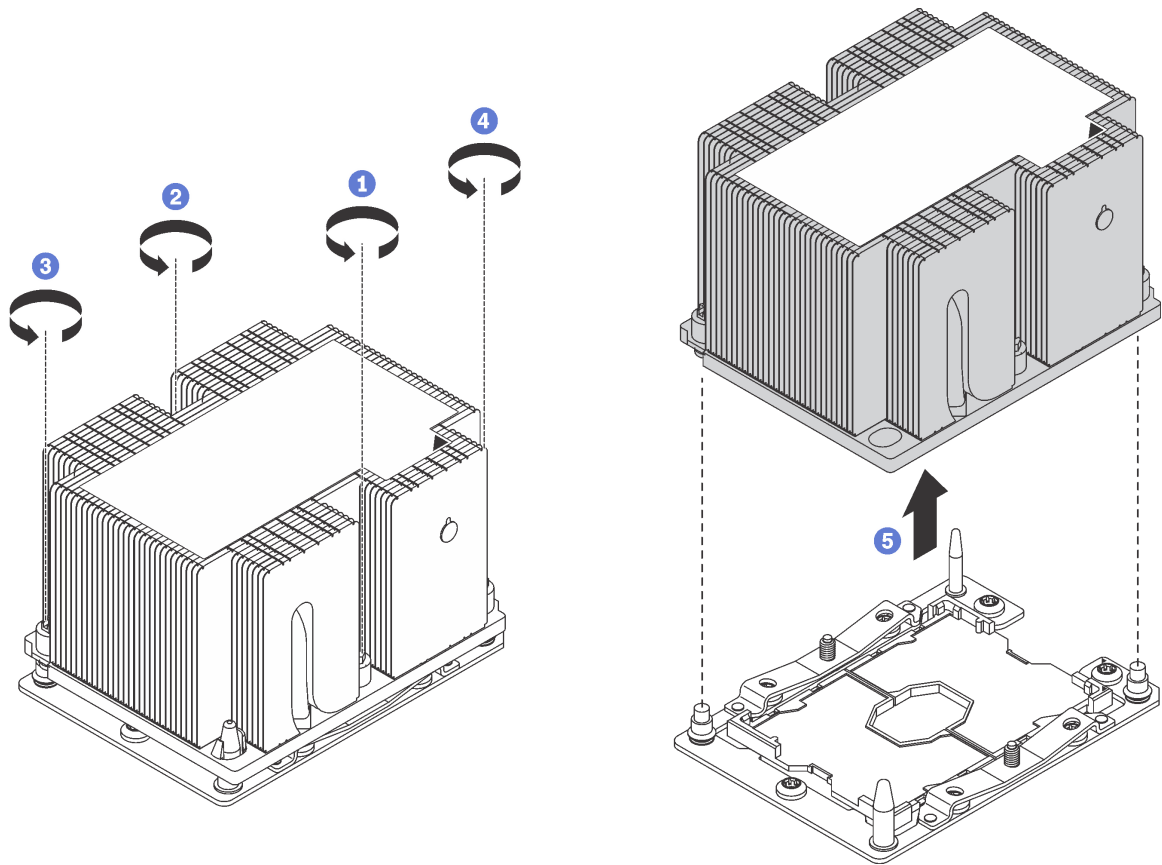Step 1.   Remove the PHM from the system board.

Figure 145. Removing a PHM

Attention: To prevent damage to components, make sure that you follow the indicated loosening sequence.

a. Fully loosen the Torx T30 captive fasteners on the processor-heat-sink module *in the removal sequence shown* on the heat-sink label.

b. Lift the processor-heat-sink module from the processor socket.

After removing a PHM:

- If you are removing the PHM as part of a system board replacement, set the PHM aside.

- If you are removing the PHM, remove the fan 6 after you remove the PHM. Then, install a fan filler to cover the place.

- If you are replacing the processor or heat sink, separate the processor and its retainer from the heat sink.
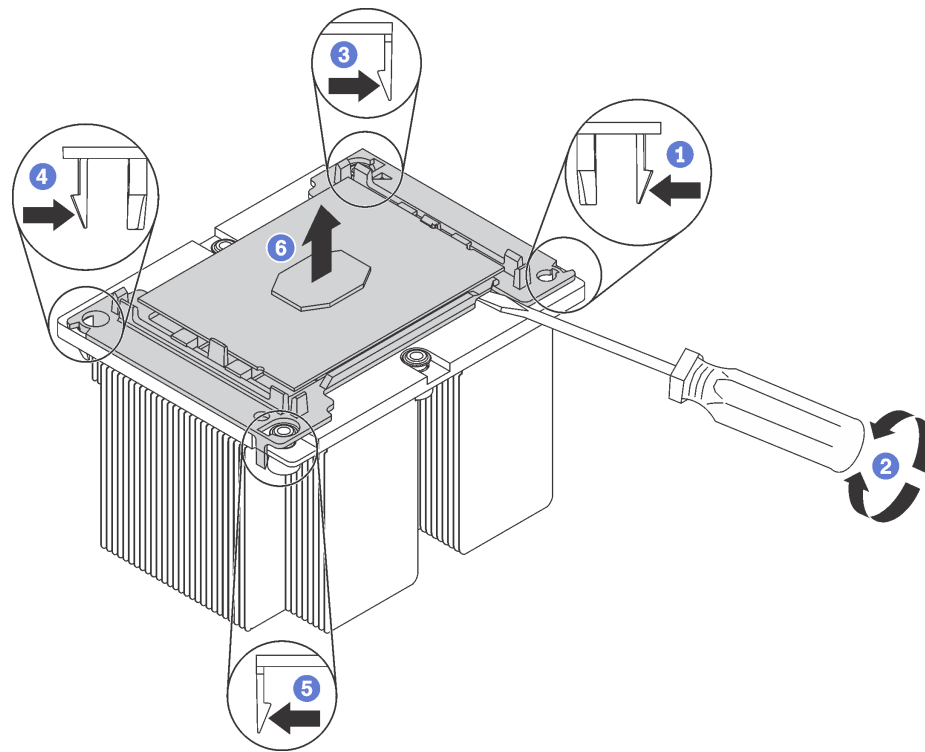
Figure 146. Separating a heat sink from a processor

1. Press the retaining clip at the corner of the processor retainer closest to the pry point; then, gently pry this corner of the retainer away from the heat sink with a flat-bladed screwdriver, using a twisting motion to break the processor-to-heat-sink seal.

2. Release the remaining retaining clips and lift the processor and retainer from the heat sink.

3. After separating the processor and retainer from the heat sink, hold the processor and retainer with the thermal-grease side down and the processor-contact side up to prevent the processor from falling out of the retainer.
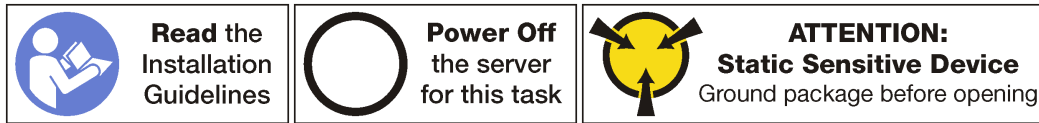
   Note: The processor retainer will be removed and discarded in a later step and replaced with a new one.

- If you are replacing the processor, you will be reusing the heat sink. Wipe the thermal grease from the bottom of the heat sink using an alcohol cleaning pad.

- If you are replacing the heat sink, you will be reusing the processor. Wipe the thermal grease from the top of the processor using an alcohol cleaning pad.

If you are instructed to return the old processor or heat sink, follow all packaging instructions and use any packaging materials that are provided.

Install a processor and heat sink

This task has instructions for installing an assembled processor and heat sink, known as a processor-heat-sink module (PHM), a processor, and a heat sink. All of these tasks require a Torx T30 driver.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening

Attention:

- 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.

- 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.

- 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 electrical connectors in the processor socket. Do not remove the grease cover from a heat sink until you are instructed to do so.

Notes:

- PHMs are keyed for the socket where they can be installed and for their orientation in the socket.

- See http://www.lenovo.com/us/en/serverproven/ 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 "Firmware updates" on page 7.

- Installing an additional PHM can change the memory requirements for your system. See "DIMM installation rules" on page 133 for a list of microprocessor-to-memory relationships.

- Optional devices available for your system might have specific processor requirements. See the documentation that comes with the optional device for information.

- The PHM for your system might be different than the PHM shown in the illustrations.

- If you want to install the following processors to the server, ensure that the server chassis is twenty-four 2.5-inch-bay chassis and only one backplane is installed in the middle cage (for drive bays 8–15).

  - Intel Xeon® 6144 and 6146 processors

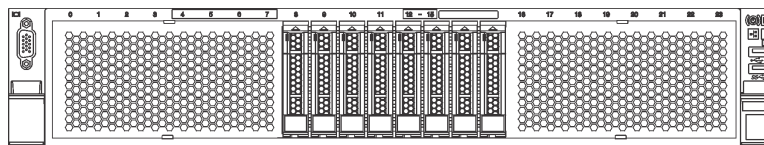 - Processors with TDP equal to 200 watts or 205 watts

Figure 147. Front view of server models installed with Intel Xeon 6144 and 6146 processors, or processors with TDP equal to 200 watts or 205 watts

Before installing a PHM:

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

1. Remove the existing PHM, if one is installed. See "Remove a processor and heat sink" on page 184.

2. If you are replacing a heat sink, replace the processor retainer. *Processor retainers should not be reused.*

   Note: Replacement processors come with both rectangular and square processor retainers. A rectangular retainer comes attached to the processor. The square retainer can be discarded.
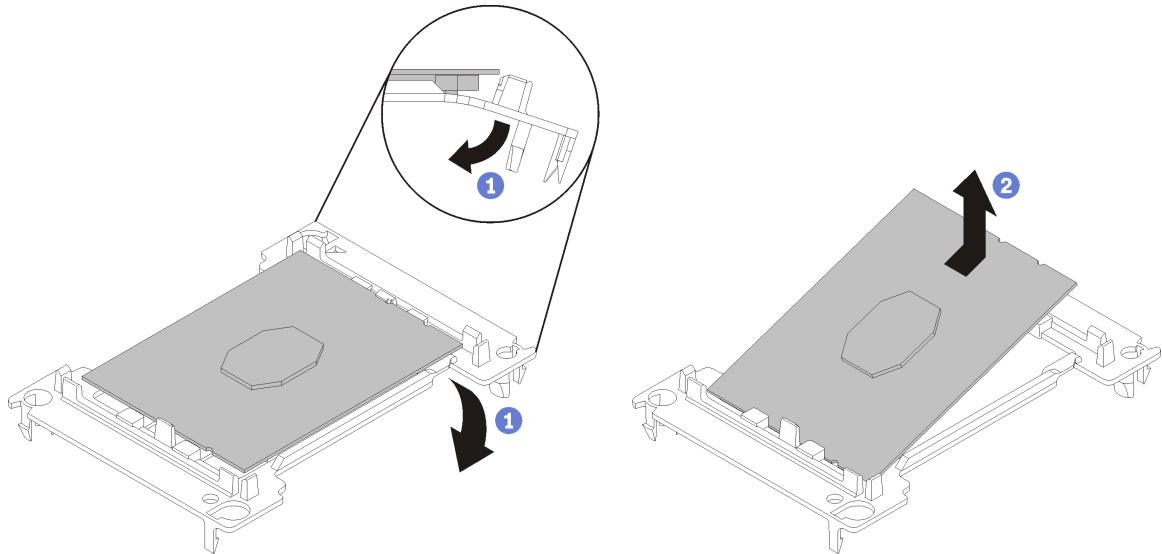
   a. Remove the old processor retainer.

Figure 148. Removing a processor retainer

   Note: When the processor is out of its retainer, hold the processor by the long edges to prevent touching the contacts or the thermal grease, if it is applied.

   With the processor-contact side up, flex the ends of the retainer down and away from the processor to release the retaining clips; then, remove the processor from the retainer. Discard the old retainer.

   b. Install a new processor retainer.
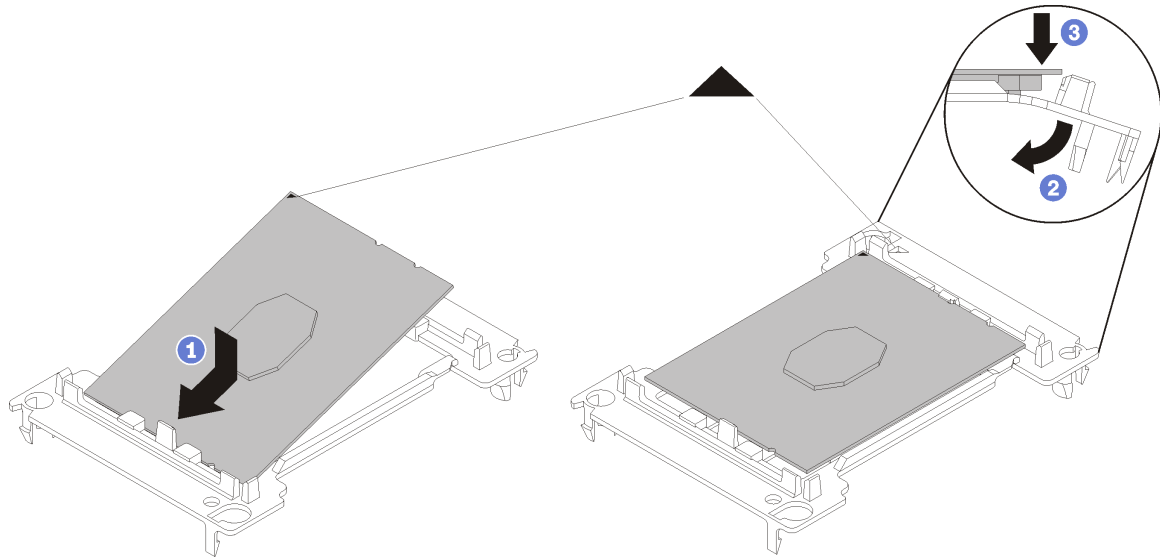
Figure 149. Installing a processor retainer

1) Position the processor on the new retainer so that the triangular marks align; then, insert the unmarked end of the processor into the retainer.

2) Holding the inserted end of the processor in place, flex the opposite end of the retainer down and away from the processor until you can press the processor under the clip on the retainer.

   To prevent the processor from falling out of the retainer after it is inserted, keep the processor-contact side up and hold the processor-retainer assembly by the sides of the retainer.

3) If there is any old thermal grease on the processor, gently clean the top of the processor using an alcohol cleaning pad.

   Note: If you are applying new thermal grease on the top of the processor, make sure to do it after the alcohol has fully evaporated.

3. If you are replacing a processor:

   a. Remove the processor identification label from the heat sink and replace it with the new label that comes with the replacement processor.

   b. Apply new thermal grease (1/2-syringe, 0.65 g) to the top of the new processor. If you have cleaned the top of the processor with an alcohol cleaning pad, make sure to apply the new thermal grease after the alcohol has fully evaporated.

      Attention: You should use blue thermal grease (part number 01KP765) when replacing the processor if that grease is available to your country. If it is not available, use gray thermal grease (part number 41Y9292).
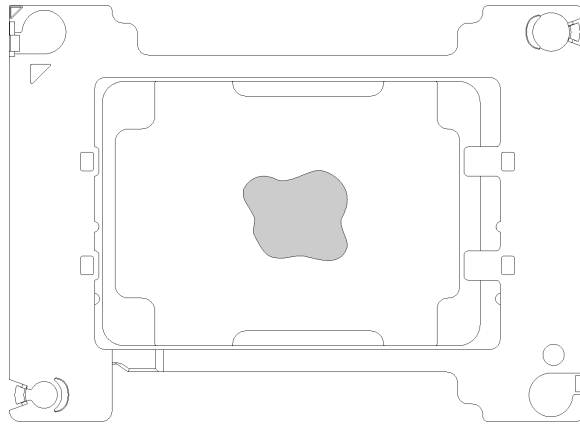
Figure 150. Thermal grease application

    1) Carefully place the processor and retainer on a flat surface with the processor-contact side down.

    2) Apply half a syringe of thermal grease, approximately 0.65 g, to the center of the processor top.

4. If you are replacing a heat sink, remove the processor identification label from the old heat sink and place it on the new heat sink in the same location. The label is on the side of the heat sink closet to the triangular alignment mark.

   If you are unable to remove the label and place it on the new heat sink, or if the label is damaged during transfer, write the processor serial number from the processor identification label on the new heat sink in the same location as the label would be placed using a permanent marker.

5. Assemble the processor and heat sink, if these components are separate.

   Notes:

   - If you are replacing a processor, install the heat sink onto the processor and retainer while the processor and retainer are in the shipping tray.

   - If you are replacing a heat sink, remove the heat sink from its shipping tray and place the processor and retainer in the opposite half of the heat sink shipping tray with the processor-contact side down. To prevent the processor from falling out of the retainer, hold the processor-retainer assembly by its sides with the processor-contact side up until you turn it over to fit in the shipping tray.
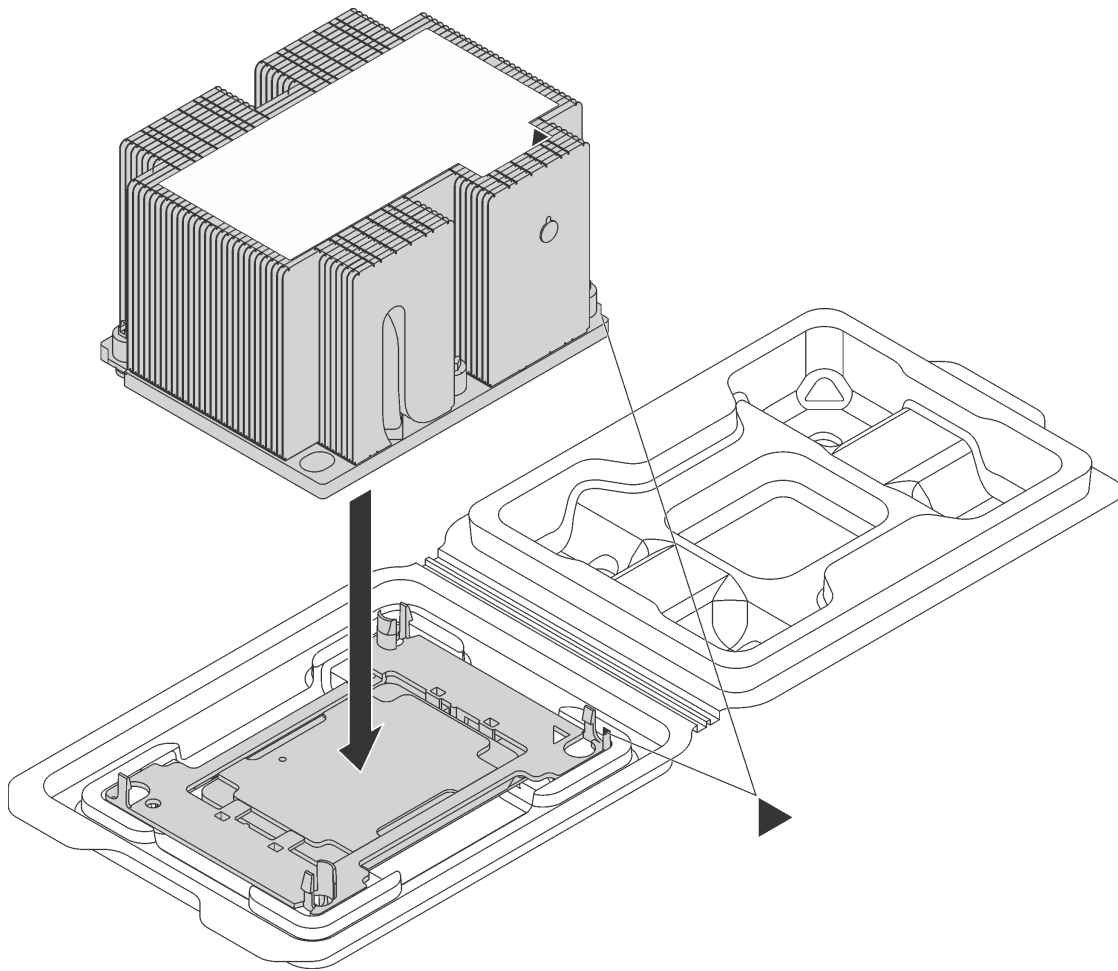
Figure 151. Assembling a PHM in the shipping tray

   a. Align the triangular marks on the processor retainer and the heat sink or align the triangular mark on the processor retainer with the notched corner of the heat sink.

   b. Insert the processor-retainer clips into the holes on the heat sink.

   c. Press the retainer into place until the clips at all four corners engage.

To install a PHM, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

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.

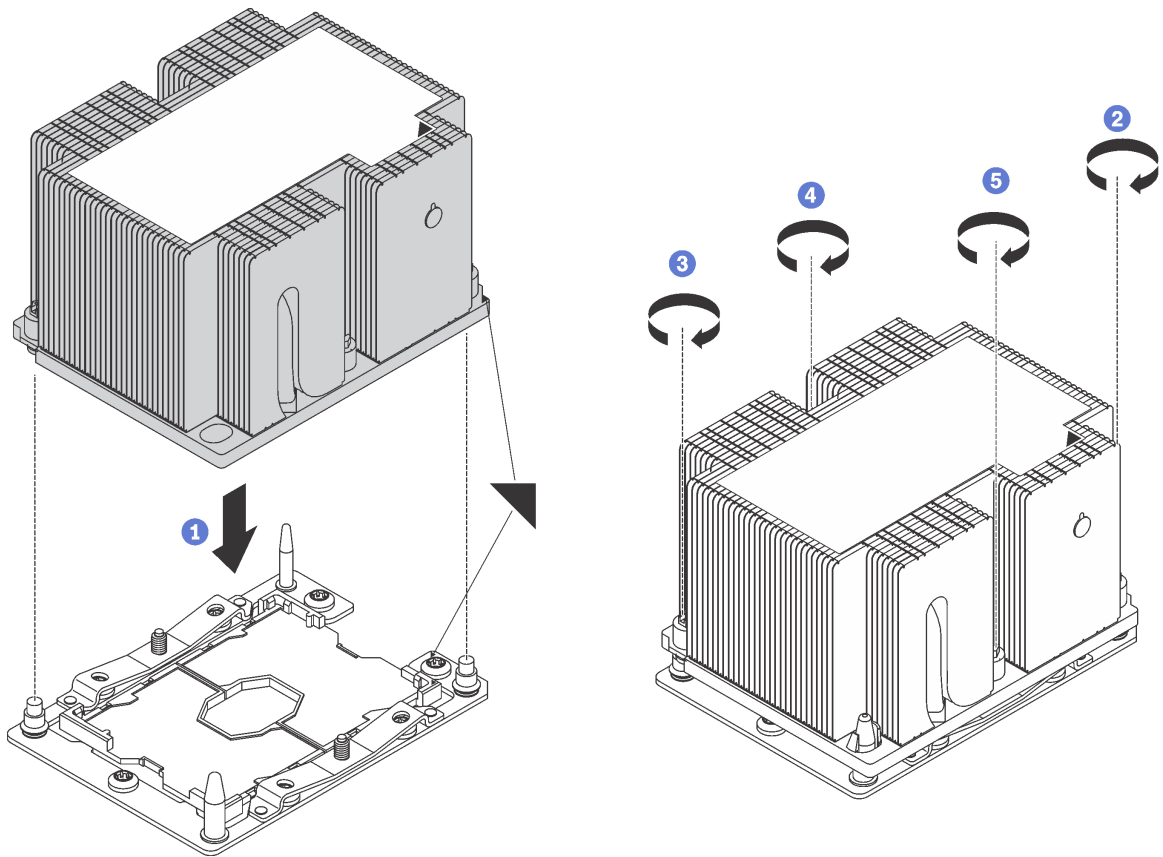Step 2. Install the processor-heat-sink module on the system board.

Figure 152. Installing a PHM

a. Align the triangular marks and guide pins on the processor socket with the PHM; then, insert the PHM into the processor socket.

   Attention: To prevent damage to components, make sure that you follow the indicated tightening sequence.

b. Fully tighten the Torx T30 captive fasteners *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 microprocessor socket. (For reference, the torque required for the nuts to fully tighten is 1.4 — 1.6 newton-meters, 12 — 14 inch-pounds).

After installing a PHM:

1. Complete the parts replacement. See "Completing the parts replacement" on page 203.

System board replacement

Use this information to remove and install the system board.

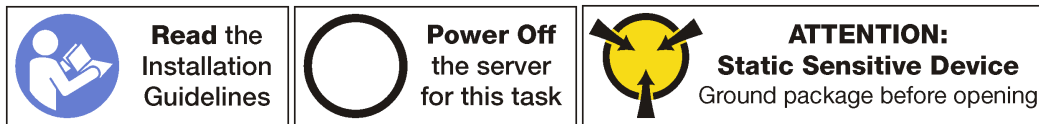**S017**

CAUTION:
Hazardous moving fan blades nearby.

<u>S012</u>

CAUTION:
Hot surface nearby.

Remove the system board

Use this information to remove the system board.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening

Before removing the system board:

1. Remove the top cover. See "Remove the top cover" on page 103.

2. Remove the air baffle. See "Remove the air baffle" on page 108.

3. Remove the system fan cage. See "Remove the system fan cage" on page 116.

4. Record where the cables are connected to the system board; then, disconnect all the cables.

   Attention: Disengage all latches, cable clips, release tabs, or locks on cable connectors beforehand. Failing to release them before removing the cables will damage the cable connectors on the system board. Any damage to the cable connectors may require replacing the system board.

5. Remove any of the following components that are installed on the system board and put them in a safe, static-protective place. See the related topics in this chapter.

   - DIMMs
   - LOM adapter
   - M.2 backplane
   - TCM (for China only)
   - CMOS battery
   - RAID adapter on the RAID adapter slot
   - PCIe adapters
   - Riser assemblies
   - Rear hot-swap drive assembly
   - PHM

     Important: Do not disassemble the PHM.

6. Pull out the power supplies slightly. Ensure that they are disconnected from the system board.

To remove the system board, complete the following step:

Watch the procedure. A video of the removal process is available:

- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1. Lift the release pin **1** and hold the lifting handle **2** at the same time and slide the system board toward the front of the server. Then, lift the system board out of the chassis.
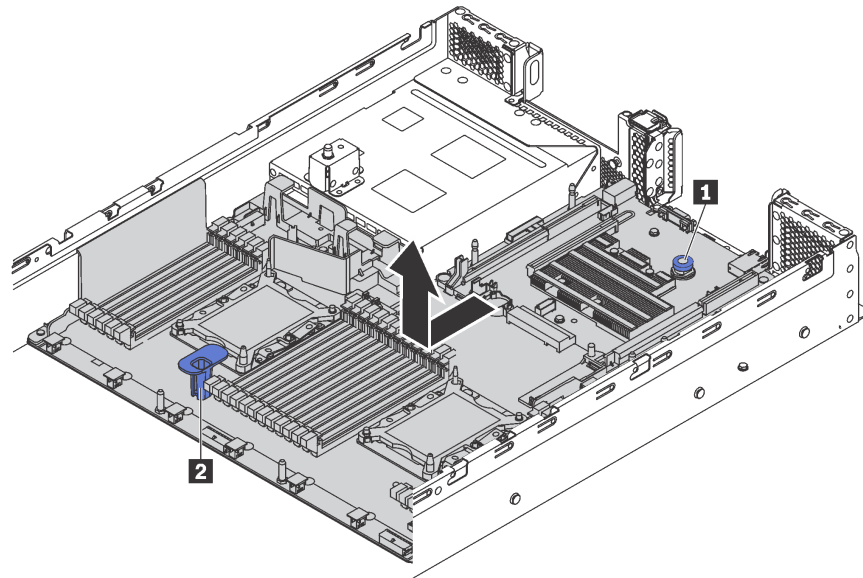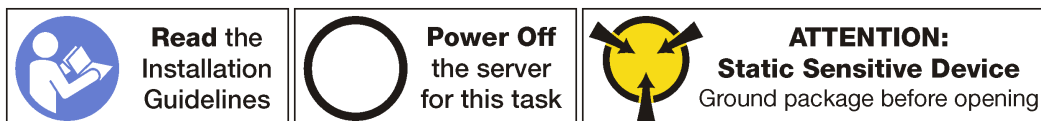

Figure 153. System board removal

If you are instructed to return the old system board, follow all packaging instructions and use any packaging materials that are provided.

Install the system board

Use this information to install the system board.

Read the Installation Guidelines	**Power Off** the server for this task	**ATTENTION:** **Static Sensitive Device** Ground package before opening

To install the system board, complete the following steps:

Watch the procedure. A video of the installation process is available:
- Youtube: https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_
- Youku: http://list.youku.com/albumlist/show/id_50483444

Step 1. Touch the static-protective package that contains the new system board to any unpainted surface on the outside of the server. Then, take the new system board out of the package and place it on a static-protective surface.

Step 2. Hold the release pin **1** and the lifting handle **2** at the same time to lower the system board into the chassis. Then, slide the system board to the rear of the server.

Ensure that:

- The new system board is engaged by the mounting stud **3** on the chassis.
- The rear connectors on the new system board are inserted into the corresponding holes in the rear panel.

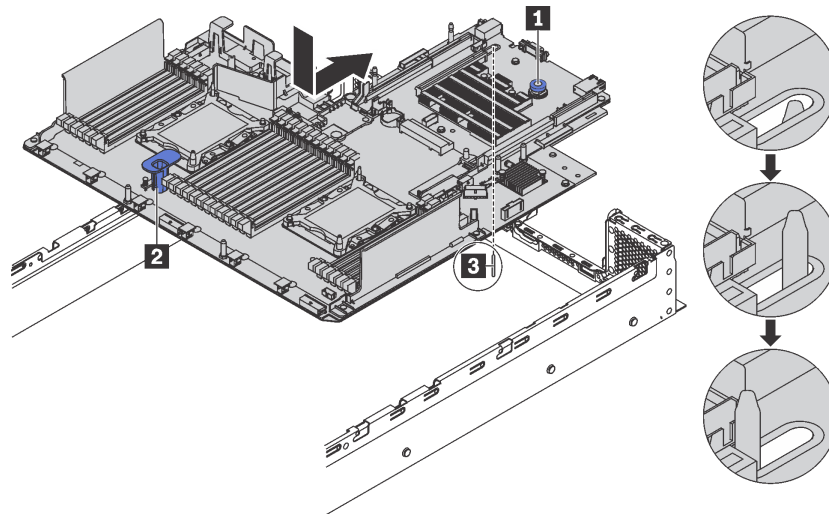- The release pin **1** secures the system board in place.

Figure 154. System board installation

After installing the system board:

1. Install any components that you removed from the failing system board. See the related topics in Chapter 3 "Hardware replacement procedures" on page 89.
2. Push the power supplies into the bays until they click into place.
3. Complete the parts replacement. See "Complete the parts replacement" on page 203.
4. Update the Universal Unique Identifier (UUID). See "Update the Universal Unique Identifier (UUID)" on page 196.
5. Update the SMBIOS/DMI information. See "Update the DMI/SMBIOS data" on page 198.
6. Enable TPM/TCM. See "Enable TPM/TCM" on page 200.
7. Optionally, enable Secure Boot.

Update the Universal Unique Identifier (UUID)

The Universal Unique Identifier (UUID) must be updated when the system board is replaced. Use the Lenovo XClarity Essentials OneCLI to update the UUID in the UEFI-based solution. Lenovo XClarity Essentials OneCLI is an online tool that supports several operating systems; make sure that you download the version for your operating system.

Notes: You can use Lenovo XClarity Provisioning Manager to update the UUID for the solution:

1. Start the solution and press F1 to display the Lenovo XClarity Provisioning Manager system setup interface.
2. From the System Summary page, click **Update VPD**.
3. Update the UUID.

To download Lenovo XClarity Essentials OneCLI, go to the following site:

https://datacentersupport.lenovo.com/solutions/HT116433

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:

- Online from the target system, such as LAN or keyboard console style (KCS) access

- Remote access to the target system (LAN based)

Step 1. Copy and unpack the OneCLI package, which also includes other required files, to the solution. Make sure that you unpack the OneCLI and the required files to the same directory.

Step 2. After you have OneCLI in place, use the following command syntax 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 selected to use from the following methods:

- Online authenticated LAN access, type the command:

  Example that does not use the user ID and password default values:
  ```
  onecli config set SYSTEM_PROD_DATA.SYsInfoUUID <uuid_value> --user <user_id>
  --password <password>
  ```

  Example that uses the user ID and password default values:
  ```
  onecli config set SYSTEM_PROD_DATA.SysInfoUUID <uuid_value>
  ```

- 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:
  ```
  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:

  Note: When using the remote LAN access method to access Lenovo XClarity Controller using the LAN from a client, the *host* and the *xcc_external_ip* address are required parameters.
  ```
  [--imm xcc_user_id:xcc_password@xcc_external_ip]
  ```
  or
  ```
  [--bmc xcc_user_id:xcc_password@xcc_external_ip]
  ```
  Where:

  xcc_external_ip
  > The BMC/IMM/XCC external LAN 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). The default value is PASSW0RD (with a zero 0 not an O).

  Note: BMC, IMM, or XCC external LAN IP address, account name, and password are all valid for this command.

Example that does use the user ID and password default values:
```
onecli config set SYSTEM_PROD_DATA.SysInfoUUID <uuid_value>
```

Step 3. Restart the Lenovo XClarity Controller.

Step 4. Restart the solution.

Update the DMI/SMBIOS data

The Desktop Management Interface (DMI) must be updated when the system board is replaced. Use the Lenovo XClarity Essentials OneCLI to update the DMI in the UEFI-based solution. Lenovo XClarity Essentials OneCLI is an online tool that supports several operating systems; make sure that you download the version for your operating system.

Notes: You can use Lenovo XClarity Provisioning Manager to update the asset tag for the solution:

1. Start the solution and press F1 to display the Lenovo XClarity Provisioning Manager system setup interface.

2. From the System Summary page, click **Update VPD**.

3. Update the asset tag information.

To download Lenovo XClarity Essentials OneCLI, go to the following site:

https://datacentersupport.lenovo.com/solutions/HT116433

Lenovo XClarity Essentials OneCLI sets the DMI in the Lenovo XClarity Controller. Select one of the following methods to access the Lenovo XClarity Controller and set the DMI:

- Online from the target system, such as LAN or keyboard console style (KCS) access

- Remote access to the target system (LAN based)

Step 1. After you haveLenovo XClarity Essentials OneCLI in place, type the following commands to set the DMI:
```
onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model> [access_method]
onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n> [access_method]
onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag> [access_method]
```

Where:

<m/t_model>
    The solution machine type and model number. Type `mtm xxxxyyy`, where *xxxx* is the machine type and *yyy* is the solution model number.

<s/n>
    The serial number on the solution. Type `sn zzzzzzz`, where *zzzzzzz* is the serial number.

<asset_method>
    The solution asset tag number. Type `asset aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa`, where *aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa* 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:

      `[--imm xcc_user_id:xcc_password@xcc_internal_ip]`

      or

      `[--bmc xcc_user_id:xcc_password@xcc_internal_ip]`

Where:

xcc_internal_ip
    The BMC/IMM/XCC internal LAN/USB IP address. The default value is 169.254.95.118.

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). The default value is PASSW0RD (with a zero 0 not an O).

Notes:

1. BMC, IMM, or XCC internal LAN/USB IP address, account name, and password are all valid for this command.

2. If you do not specify any of these parameters, OneCLI will use the default values. When the default values are used and OneCLI is unable to access the Lenovo XClarity Controller using the online authenticated LAN access method, OneCLI will automatically use the unauthenticated KCS access method.

Examples that do use the user ID and password default values:
```
onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model>
onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n>
onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag>
```

- Online KCS access (unauthenticated and user restricted): You do not need to specify a value for *access_method* when you use this access method.

  Note: The KCS access method uses the IPMI/KCS interface, which requires that the IPMI driver be installed.

  The following commands are examples of not using the user ID and password default values:
  ```
  onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model>
  onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n>
  onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag>
  ```

- Remote LAN access, type the command:

  Note: When using the remote LAN access method to access Lenovo XClarity Controller using the LAN from a client, the *host* and the *xcc_external_ip* address are required parameters.
  ```
  [--imm xcc_user_id:xcc_password@xcc_external_ip]
  or
  [--bmc xcc_user_id:xcc_password@xcc_external_ip]
  ```
  Where:

  xcc_external_ip
      The BMC/IMM/XCC LAN 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). The default value is PASSW0RD (with a zero 0 not an O).

> **Note:** BMC, IMM, or XCC internal LAN/USB IP address, account name, and password are all valid for this command.
>
> Examples that do use the user ID and password default values:
> ```
> onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model> --host <xcc_ip>
> onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n> --host <xcc_ip>
> onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag> --host <xcc_ip>
> ```

Step 2. Restart the solution.

Enable TPM/TCM

The server supports Trusted Platform Module (TPM), Version 1.2 or Version 2.0.

Note: For customers in the People's Republic of China, TPM is not supported. However, customers in the People's Republic of China can install a Trusted Cryptographic Module (TCM) adapter (sometimes called a daughter card).

When a system board is replaced, you must make sure that the TPM/TCM policy is set correctly.

CAUTION:
Take special care when setting the TPM/TCM policy. If it is not set correctly, the system board can become unusable.

Set the TPM/TCM policy

By default, a replacement system board is shipped with the TPM/TCM policy set to **undefined**. You must modify this setting to match the setting that was in place for the system board that is being replaced.

You can set the TPM/TCM policy from Lenovo XClarity Provisioning Manager.

Complete the following steps to set the TPM/TCM policy.

Step 1. Start the server and when prompted, press F1 to display Lenovo XClarity Provisioning Manager.

Step 2. If the power-on Administrator password is required, enter the password.

Step 3. From the System Summary page, click **Update VPD**.

Step 4. Set the policy to one of the following settings.

- **TCM enabled - China only**. Customers in the People's Republic of China should choose this setting if a TCM adapter is installed.
- **TPM enabled - ROW**. Customers outside of the People's Republic of China should choose this setting.
- **Permanently disabled**. Customers in the People's Republic of China should use this setting if no TCM adapter is installed.

Although the setting **undefined** is available as a policy setting, it should not be used.

Assert Physical Presence

Before you can assert Physical Presence, the Physical Presence Policy must be enabled. By default, the Physical Presence Policy is enabled with a timeout of 30 minutes.

If the Physical Presence Policy is enabled, you can assert Physical Presence through the Lenovo XClarity Controller or through hardware jumpers on the system board.

Notes: If the Physical Presence Policy has been disabled:

1. Set the hardware Physical Presence jumper on the system board to assert Physical Presence.

2. Enable the Physical Presence Policy using either F1 (UEFI Settings) or Lenovo XClarity Essentials OneCLI.

Assert Physical Presence through the Lenovo XClarity Controller

Complete the following steps to assert Physical Presence through the Lenovo XClarity Controller:

1. Log in to the Lenovo XClarity Controller interface.

   For information about logging in to the Lenovo XClarity Controller, see:

   http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/dw1lm_c_chapter2_openingandusing.html

2. Click **BMC Configuration ➙ Security** and verify that Physical Presence is set to **assert**.

Assert Physical Presence through the hardware

You can also assert hardware Physical Presence through the use of a jumper on the system board. For more information about asserting hardware Physical Presence through the use of a jumper, see:

"System board jumpers" on page 26

Set the TPM version

To set the TPM version, Physical Presence must be asserted.

For information about accessing the Lenovo XClarity Controller interface, see:

http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/dw1lm_c_chapter2_openingandusing.html

To set the TPM version:

1. Download and install Lenovo XClarity Essentials OneCLI.

   a. Go to http://datacentersupport.lenovo.com and navigate to the support page for your server.

   b. Click **Drivers & Software**.

   c. Navigate to the version of Lenovo XClarity Essentials OneCLI for your operating system and download the package.

2. Run the following command to set the TPM version:

   Note: You can change the TPM version from 1.2 to 2.0 and back again. However, you can toggle between versions a maximum of 128 times.

   To set the TPM version to version 2.0:
   ```
   OneCli.exe config set TPMVersion.TPMVersion "Update to TPM2.0 compliant" -v --override --host <ip_address>
           --user <userid> --password <password>
   ```

   To set the TPM version to version 1.2:
   ```
   OneCli.exe config set TPMVersion.TPMVersion "Update to TPM1.2 compliant" -v --override --host <ip_address>
           --user <userid> --password <password>
   ```

   where:

   - <userid>:<password> are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSW0RD (zero, not an uppercase o).

   - <ip_address> is the IP address of the BMC.

   For more information about the Lenovo XClarity Essentials OneCLI **set** command, see:

   http://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_set_command.html

3. Alternatively, you can use the following Advanced Settings Utility (ASU) commands:

To set the TPM version to version 2.0:
```
asu64 set TPMVersion.TPMVersion "Update to TPM2.0 compliant" --host <ip_address>
            --user <userid> --password <password>  --override
```

To set the TPM version to version 1.2:
```
asu64 set TPMVersion.TPMVersion "Update to TPM1.2 compliant" --host <ip_address>
            --user <userid> --password <password>  --override
```

where:

- *<userid>* and *<password>* are the credentials used to the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSW0RD (zero, not an uppercase o).

- *<ip_address>* is the IP address of the BMC.

Enable UEFI Secure Boot

Optionally, you can enable UEFI Secure Boot.

Physical Presence must be asserted if you are going to enable UEFI Secure Boot. See "Assert Physical Presence" on page 200.

For information about accessing the Lenovo XClarity Controller interface, see:

http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/dw1lm_c_chapter2_openingandusing.html

There are two methods available to enable UEFI Secure Boot:

- From Lenovo XClarity Provisioning Manager

  To enable UEFI Secure Boot from Lenovo XClarity Provisioning Manager:

  1. Start the server and when prompted, press F1 to display Lenovo XClarity Provisioning Manager.

  2. If the power-on Administrator password is required, enter the password.

  3. From the UEFI Setup page, click **System Settings ➙ Security ➙ Secure Boot**.

  4. Enable Secure Boot and save the settings.

- From Lenovo XClarity Essentials OneCLI

  To enable UEFI Secure Boot from Lenovo XClarity Essentials OneCLI:

  1. Download and install Lenovo XClarity Essentials OneCLI.

     a. Go to http://datacentersupport.lenovo.com and navigate to the support page for your server.

     b. Click **Drivers & Software**.

     c. Navigate to the version of Lenovo XClarity Essentials OneCLI for your operating system and download the package.

  2. Run the following command to enable Secure Boot:
     ```
     OneCli.exe config set SecureBootConfiguration.SecureBootSetting Enabled  --override
                    --imm <userid>:<password>@<ip_address>
     ```
     where:

     - *<userid>:<password>* are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSW0RD (zero, not an uppercase o).

     - *<ip_address>* is the IP address of the BMC.

     For more information about the Lenovo XClarity Essentials OneCLI **set** command, see:

3. Alternatively, you can use the following Advanced Settings Utility (ASU) commands:

To enable secure boot:

```
asu64.exe set SecureBootConfiguration.SecureBootis Enabled -v --override --host <ip_address>
                --user <userid> --password <password>
```

To disable secure boot:

```
asu64.exe set SecureBootConfiguration.SecureBootis Disabled -v --override --host <ip_address>
                --user <userid> --password <password>
```

To read the secure boot setting:

```
asu64.exe show SecureBootConfiguration.SecureBootis -v --override --host <ip_address>
                --user <userid> --password <password>
```

where:

– *<userid>* and *<password>* are the credentials used to the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSW0RD (zero, not an uppercase o).

– *<ip_address>* is the IP address of the BMC.

Complete the parts replacement

Use this information to complete the parts replacement.

To complete the parts replacement, do the following:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your server.

2. Properly route and secure the cables in the server. Refer to the cable connecting and routing information for each component.

3. If you have removed the top cover, reinstall it. See "Install the top cover" on page 104.

4. Reconnect external cables and power cords to the server.

   Attention: To avoid component damage, connect the power cords last.

5. Update the server configuration if necessary.

   • Download and install the latest device drivers: http://datacentersupport.lenovo.com

   • Update the system firmware. See "Firmware updates" on page 7.

   • Use the Lenovo XClarity Provisioning Manager to update the UEFI configuration. For more information, see:
   http://sysmgt.lenovofiles.com/help/topic/LXPM/UEFI_setup.html

   • Use the Lenovo XClarity Provisioning Manager to configure the RAID if you have installed or removed a hot-swap drive, a RAID adapter, or the M.2 backplane and M.2 drive. For more information, see:
   http://sysmgt.lenovofiles.com/help/topic/LXPM/RAID_setup.html

Chapter 4. Problem determination

Use the information in this section to isolate and resolve issues that you might encounter while using your server.

Lenovo servers can be configured to automatically notify Lenovo Support if certain events are generated. You can configure automatic notification, also known as Call Home, from management applications, such as the Lenovo XClarity Administrator. If you configure automatic problem notification, Lenovo Support is automatically alerted whenever a server encounters a potentially significant event.

To isolate a problem, you should typically begin with the event log of the application that is managing the server:

- If you are managing the server from the Lenovo XClarity Administrator, begin with the Lenovo XClarity Administrator event log.
- If you are managing the server from the Chassis Management Module 2, begin with the Chassis Management Module 2 event log.
- If you are using some other management application, begin with the Lenovo XClarity Controller event log.

Event logs

An *alert* is a message or other indication that signals an event or an impending event. Alerts are generated by the Lenovo XClarity Controller or by UEFI in the servers. These alerts are stored in the Lenovo XClarity Controller Event Log. If the server is managed by the Chassis Management Module 2 or by the Lenovo XClarity Administrator, alerts are automatically forwarded to those management applications.
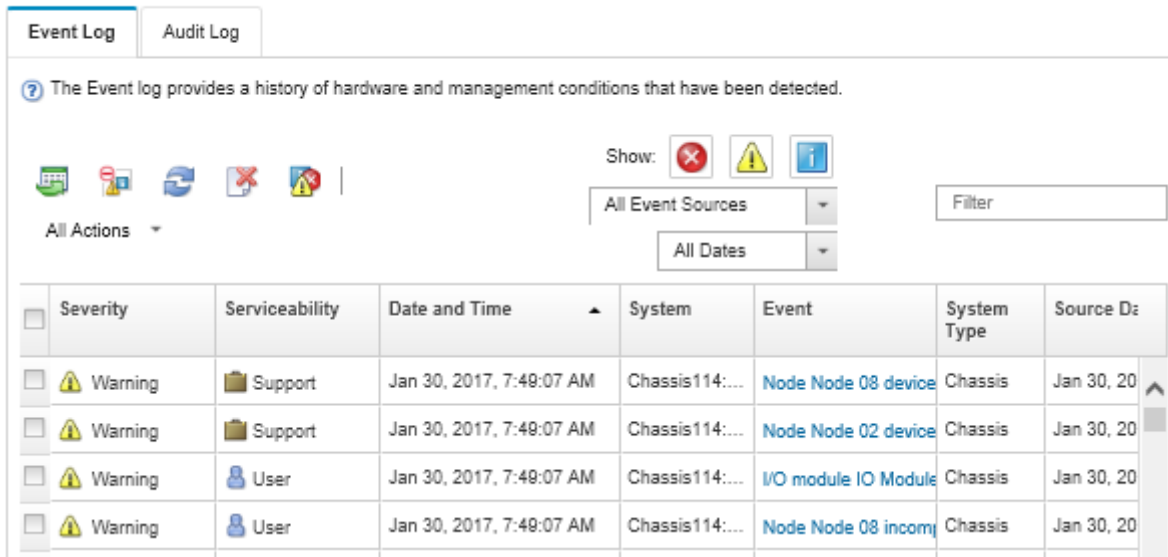
Note: For a listing of events, including user actions that might need to be performed to recover from an event, see the *Messages and Codes Reference*, which is available at:
http://thinksystem.lenovofiles.com/help/topic/7X05/pdf_files.html

Lenovo XClarity Administrator event log

If you are using Lenovo XClarity Administrator to manage server, network, and storage hardware, you can view the events from all managed devices through the XClarity Administrator.

Figure 155. Lenovo XClarity Administrator event log
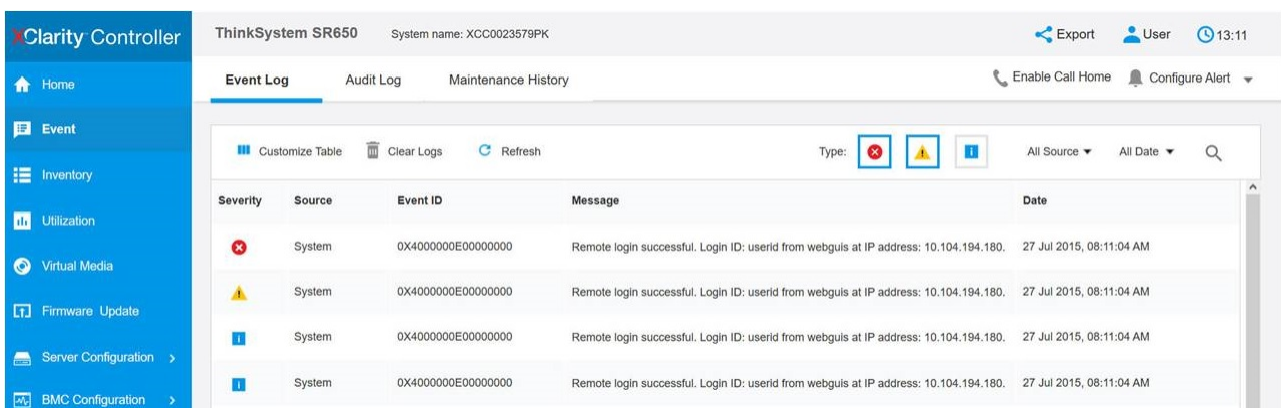
For more information about working with events from XClarity Administrator, see:

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

Lenovo XClarity Controller event log

The Lenovo XClarity Controller monitors the physical state of the server and its components using sensors that measure internal physical variables such as temperature, power-supply voltages, fan speeds, and component status. The Lenovo XClarity Controller provides various interfaces to systems management software and to system administrators and users to enable remote management and control of a server.

The Lenovo XClarity Controller monitors all components of the server and posts events in the Lenovo XClarity Controller event log.

Figure 156. Lenovo XClarity Controller event log

For more information about accessing the Lenovo XClarity Controller event log, see:

http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/event_log.html

Light path diagnostics

Light path diagnostics is a system of LEDs on various external and internal components of the server that leads you to the failed component. When an error occurs, LEDs are lit on the front I/O assembly, the rear panel, the system board, and the failed component. By viewing the following LEDs, you can often identify the system and device status and diagnose problems.

- "Front I/O assembly" on page 15
- "Rear view LEDs" on page 21
- "System board LEDs" on page 24

General problem determination procedures

Use the information in this section to resolve problems if the event log does not contain specific errors or the server is inoperative.

If you are not sure about the cause of a problem and the power supplies are working correctly, complete the following steps to attempt to resolve the problem:

1. Power off the server.
2. Make sure that the server is cabled correctly.
3. Remove or disconnect the following devices, one at a time, until you find the failure. Power on and configure the server each time you remove or disconnect a device.
   - Any external devices,
   - Surge-suppressor device (on the server).
   - Printer, mouse, and non-Lenovo devices,
   - Each adapter.
   - Hard disk drives.
   - Memory modules until you reach the minimum configuration that is supported for the server.

   Note: The minimum configuration required for the server to start is one processor and one 2 GB DIMM.
4. Power on the server.

If the problem is solved when you remove an adapter from the server, but the problem recurs when you install the same adapter again, suspect the adapter. If the problem recurs when you replace the adapter with a different one, try a different PCIe slot.

If the problem appears to be a networking problem and the server passes all system tests, suspect a network cabling problem that is external to the server.

Resolving suspected power problems

Power problems can be difficult to solve. For example, a short circuit can exist anywhere on any of the power distribution buses. Usually, a short circuit will cause the power subsystem to shut down because of an overcurrent condition.

Complete the following steps to diagnose and resolve a suspected power problem.

Step 1. Check the event log and resolve any errors related to the power.

   Note: Start with the event log of the application that is managing the server. For more information about event logs, see "Event logs" on page 205.

Step 2. Check for short circuits, for example, if a loose screw is causing a short circuit on a circuit board.

Step 3.   Remove the adapters and disconnect the cables and power cords to all internal and external devices until the server is at the minimum configuration that is required for the server to start. See "Specifications" on page 3 to determine the minimum configuration for your server.

Step 4.   Reconnect all ac power cords and turn on the server. If the server starts successfully, reseat the adapters and devices one at a time until the problem is isolated.

If the server does not start from the minimum configuration, replace the components in the minimum configuration one at a time until the problem is isolated.

Resolving suspected Ethernet controller problems

The method that you use to test the Ethernet controller depends on which operating system you are using. See the operating-system documentation for information about Ethernet controllers, and see the Ethernet controller device-driver readme file.

Complete the following steps to attempt to resolve suspected problems with the Ethernet controller.

Step 1.   Make sure that the correct device drivers, which come with the server are installed and that they are at the latest level.

Step 2.   Make sure that the Ethernet cable is installed correctly.

- The cable must be securely attached at all connections. If the cable is attached but the problem remains, try a different cable.

- If you set the Ethernet controller to operate at 100 Mbps or 1000 Mbps, you must use Category 5 cabling.

Step 3.   Determine whether the hub supports auto-negotiation. If it does not, try configuring the integrated Ethernet controller manually to match the speed and duplex mode of the hub.

Step 4.   Check the Ethernet controller LEDs on the rear panel of the server. These LEDs indicate whether there is a problem with the connector, cable, or hub.

- The Ethernet link status LED is lit when the Ethernet controller receives a link pulse from the hub. If the LED is off, there might be a defective connector or cable or a problem with the hub.

- The Ethernet transmit/receive activity LED is lit when the Ethernet controller sends or receives data over the Ethernet network. If the Ethernet transmit/receive activity is off, make sure that the hub and network are operating and that the correct device drivers are installed.

Step 5.   Check the LAN activity LED on the rear of the server. The LAN activity LED is lit when data is active on the Ethernet network. If the LAN activity LED is off, make sure that the hub and network are operating and that the correct device drivers are installed.

Step 6.   Check for operating-system-specific causes of the problem, and also make sure that the operating system drivers are installed correctly.

Step 7.   Make sure that the device drivers on the client and server are using the same protocol.

If the Ethernet controller still cannot connect to the network but the hardware appears to be working, the network administrator must investigate other possible causes of the error.

Troubleshooting by symptom

Use this information to find solutions to problems that have identifiable symptoms.

To use the symptom-based troubleshooting information in this section, complete the following steps:

1. Check the event log of the application that is managing the server and follow the suggested actions to resolve any event codes.

- If you are managing the server from the Lenovo XClarity Administrator, begin with the Lenovo XClarity Administrator event log.

- If you are using some other management application, begin with the Lenovo XClarity Controller event log.

For more information about event logs, see "Event logs" on page 205.

2. Review this section to find the symptoms that you are experiencing and follow the suggested actions to resolve the issue.

3. If the problem persists, contact support (see "Contacting Support" on page 225).

Power on and power off problems

Use this information to resolve issues when powering on or powering off the server.

Embedded hypervisor is not in the boot list

Complete the following steps until the problem is solved.

1. 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.

2. See the documentation that comes with the optional embedded hypervisor flash device for setup and configuration information.

3. Check http://www.lenovo.com/us/en/serverproven/ to validate that the embedded hypervisor device is supported for the server.

4. 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 the XClarity Controller product documentation:

   http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/dw1lm_c_chapter2_openingandusing.html

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.

The power button does not work (server does not start)

Note: The power button will not function until approximately 1 to 3 minutes after the server has been connected to ac power.

Complete the following steps until the problem is resolved:

1. Make sure that the power button on the server is working correctly:

   a. Disconnect the server power cords.

   b. Reconnect the server power cords.

   c. Reseat the operator information panel cable, and then repeat steps a and b.

      - If the server starts, reseat the operator information panel.

- If the problem remains, replace the operator information panel.

2. Make sure that:

   - The power cords are correctly connected to the server and to a working electrical outlet.
   - The LEDs on the power supply do not indicate a problem.

3. Reseat the power supplies.

4. Replace each power supply, restarting the server each time:

   - DIMMs
   - Power supplies

5. If you just installed an optional device, remove it, and restart the server. If the server starts, you might have installed more devices than the power supply supports.

Server does not power on

Complete the following steps until the problem is resolved:

1. Check the event log for any events related to the server not powering on.
2. Check for any LEDs that are flashing amber.
3. Check the power LED on the system board.
4. Reseat the power supply.
5. Replace the power supply.

Server does not power off

Complete the following steps until the problem is resolved:

1. Determine whether you are using an Advanced Configuration and Power Interface (ACPI) or a non-ACPI operating system. If you are using a non-ACPI operating system, complete the following steps:

   a. Press `Ctrl+Alt+Delete`.

   b. Turn off the server by pressing the power button and holding it down for 5 seconds.

   c. Restart the server.

   d. If the server fails POST and the power button does not work, disconnect the power cord for 20 seconds; then, reconnect the power cord and restart the server.

2. If the problem remains or if you are using an ACPI-aware operating system, suspect the system board.

Memory problems

Use this information to resolve issues related to memory.

- "Displayed system memory less than installed physical memory" on page 210
- "Multiple rows of DIMMs in a branch identified as failing" on page 211

Displayed system memory less than installed physical memory

Complete the following steps until the problem is resolved:

Note: Each time you install or remove a DIMM, 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 DIMM 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.
- If you changed the memory, you updated the memory configuration in the Setup utility.
- All banks of memory are enabled. The server might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled.
- There is no memory mismatch when the server is at the minimum memory configuration.

2. Reseat the DIMMs, and then restart the server.
3. Run memory diagnostics. When you start a server and press F1, the Lenovo XClarity Provisioning Manager interface is displayed by default. You can perform memory diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic ➙ Memory test**.
4. Check the POST error log:
   - If a DIMM was disabled by a systems-management interrupt (SMI), replace the DIMM.
   - If a DIMM was disabled by the user or by POST, reseat the DIMM; then, run the Setup utility and enable the DIMM.
5. Reseat the DIMM.
6. Restart the server.

Multiple rows of DIMMs in a branch identified as failing

1. Reseat the DIMMs; then, restart the server.
2. Remove the lowest-numbered DIMM pair of those that are identified and replace it with an identical known good DIMM; then, restart the server. Repeat as necessary. If the failures continue after all identified DIMMs are replaced, go to step 4.
3. Return the removed DIMMs, one at a time, to their original connectors, restarting the server after each DIMM, until a DIMM fails. Replace each failing DIMM with an identical known good DIMM, restarting the server after each DIMM replacement. Repeat step 3 until you have tested all removed DIMMs.
4. Replace the lowest-numbered DIMM of those identified; then, restart the server. Repeat as necessary.
5. Reverse the DIMMs between the channels (of the same processor), and then restart the server. If the problem is related to a DIMM, replace the failing DIMM.
6. (Trained technician only) Replace the system board.

Hard disk drive problems

Use this information to resolve issues related to the hard disk drives.

- "Server cannot recognize a hard drive" on page 211
- "Multiple hard drives fail" on page 212
- "Multiple hard drives are offline" on page 212
- "A replacement hard disk drive does not rebuild" on page 213
- "Green hard disk drive activity LED does not represent actual state of associated drive" on page 213
- "Yellow hard disk drive status LED does not represent actual state of associated drive" on page 213

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 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:

   - 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 → HDD test**.

   - If the green activity LED is flashing and the yellow status LED is flashing slowly, the drive is recognized by the controller and is rebuilding.

   - If neither LED is lit or flashing, check the hard disk drive backplane.

   - 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 → HDD test**.

   Based on those tests:

   - If the adapter passes the test but the drives are not recognized, replace the backplane signal cable and run the tests again.

   - Replace the backplane.

   - If the adapter fails the test, disconnect the backplane signal cable from the adapter and run the tests again.

   - If the adapter fails the test, replace the adapter.

Multiple hard drives fail

Complete the following steps until the problem is solved:

- View the Lenovo XClarity Controller event log for events related to power supplies or vibration issues and resolve those events.

- Make sure that the device drivers and firmware for the hard disk drive and server are at the latest level

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

Multiple hard drives are offline

Complete the following steps until the problem is solved:

- View the Lenovo XClarity Controller event log for events related to power supplies or vibration issues and resolve those events.

- View the storage subsystem log for events related to the storage subsystem and resolve those events.

A replacement hard disk drive does not rebuild

Complete the following steps until the problem is solved:

1. Make sure that the hard disk drive is recognized by the adapter (the green hard disk drive activity LED is flashing).

2. Review the SAS/SATA RAID adapter documentation to determine the correct configuration parameters and settings.

Green hard disk drive activity LED does not represent actual state of associated drive

Complete the following steps until the problem is solved:

1. If the green hard disk drive activity LED does not flash when the drive is in use, 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 ➙ HDD test**.

2. If the drive passes the test, replace the backplane.

3. If the drive fails the test, replace the drive.

Yellow hard disk drive status LED does not represent actual state of associated drive

Complete the following steps until the problem is solved:

1. Turn off the server.

2. Reseat the SAS/SATA adapter.

3. Reseat the backplane signal cable and backplane power cable.

4. Reseat the hard disk drive.

5. Power on the server and observe the activity of the hard disk drive LEDs.

Monitor and video problems

Use this information to solve problems related to a monitor or video.

- "Incorrect characters are displayed" on page 213
- "Screen is blank" on page 213
- "Screen goes blank when you start some application programs" on page 214
- "The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted." on page 214
- "The wrong characters appear on the screen" on page 214

Incorrect characters are displayed

Complete the following steps:

1. Verify that the language and locality settings are correct for the keyboard and operating system.

2. If the wrong language is displayed, update the server firmware to the latest level. See "Firmware updates" on page 7.

Screen is blank

1. If the server is attached to a KVM switch, bypass the KVM switch to eliminate it as a possible cause of the problem: connect the monitor cable directly to the correct connector on the rear of the server.

2. The management controller remote presence function is disabled if you install an optional video adapter. To use the management controller remote presence function, remove the optional video adapter.

3. If the server installed with the graphical adapters while turning on the server, the Lenovo logo displays on the screen after approximately 3 minutes. This is normal operation while the system loads.

4. Make sure that:
   - The server is turned on. If there is no power to the server.
   - The monitor cables are connected correctly.
   - The monitor is turned on and the brightness and contrast controls are adjusted correctly.

5. Make sure that the correct server is controlling the monitor, if applicable.

6. Make sure that corrupted server firmware is not affecting the video; see "Firmware updates" on page 7.

7. Observe the LEDs on the system board; if the codes are changing, go to step 6.

8. Replace the following components one at a time, in the order shown, restarting the server each time:

   a. Monitor

   b. Video adapter (if one is installed)

   c. (Trained technician only) System board

Screen goes blank when you start some application programs

1. Make sure that:

   - The application program is not setting a display mode that is higher than the capability of the monitor.

   - You installed the necessary device drivers for the application.

The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted.

1. If the monitor self-tests show that the monitor is working correctly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescents, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor.

   Attention: Moving a color monitor while it is turned on might cause screen discoloration.

   Move the device and the monitor at least 305 mm (12 in.) apart, and turn on the monitor.

   Notes:
   a. To prevent diskette drive read/write errors, make sure that the distance between the monitor and any external diskette drive is at least 76 mm (3 in.).

   b. Non-Lenovo monitor cables might cause unpredictable problems.

2. Reseat the monitor cable.

3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time:

   a. Monitor cable

   b. Video adapter (if one is installed)

   c. Monitor

   d. (Trained technician only) System board

The wrong characters appear on the screen

Complete the following steps until the problem is solved:

1. Verify that the language and locality settings are correct for the keyboard and operating system.

2. If the wrong language is displayed, update the server firmware to the latest level. See "Firmware updates" on page 7.

Keyboard, mouse, or USB-device problems

Use this information to solve problems related to a keyboard, mouse, or USB device.

- "All or some keys on the keyboard do not work." on page 215
- "Mouse does not work." on page 215
- "USB-device does not work." on page 215

All or some keys on the keyboard do not work.

1. Make sure that:
   - The keyboard cable is securely connected.
   - The server and the monitor are turned on.

2. If you are using a USB keyboard, run the Setup utility and enable keyboardless operation.

3. If you are using a USB keyboard and it is connected to a USB hub, disconnect the keyboard from the hub and connect it directly to the server.

4. Replace the keyboard.

Mouse does not work.

1. Make sure that:

   - The mouse cable is securely connected to the server.

   - The mouse device drivers are installed correctly.

   - The server and the monitor are turned on.

   - The mouse option is enabled in the Setup utility.

2. If you are using a USB mouse and it is connected to a USB hub, disconnect the mouse from the hub and connect it directly to the server.

3. Replace the mouse.

USB-device does not work.

1. Make sure that:
   - The correct USB device driver is installed.
   - The operating system supports USB devices.

2. Make sure that the USB configuration options are set correctly in system setup.

   Restart the server and press F1 to display the Lenovo XClarity Provisioning Manager system setup interface. Then, click **System Settings ➙ Devices and I/O Ports ➙ USB Configuration**.

3. If you are using a USB hub, disconnect the USB device from the hub and connect it directly to the server.

Optional-device problems

Use this information to solve problems related to optional devices.

- "External USB device not recognized" on page 216
- "PCIe adapter is not recognized or is not functioning" on page 216
- "A Lenovo optional device that worked previously does not work now. " on page 217
- "A Lenovo optional device that was just installed does not work." on page 216
- "A Lenovo optional device that worked previously does not work now. " on page 217

External USB device not recognized

Complete the following steps until the problem is resolved:

1. Make sure that the proper drivers are installed on the compute node. See the product documentation for the USB device for information about device drivers.

2. Use the Setup utility to make sure that the device is configured correctly.

3. If the USB device is plugged into a hub or the console breakout cable, unplug the device and plug it directly into the USB port on the front of the compute node.

PCIe adapter is not recognized or is not functioning

Complete the following steps until the problem is resolved:

1. Check the event log and resolve any issues related to the device.

2. Validate that the device is supported for the server (see http://www.lenovo.com/us/en/serverproven/).

3. Make sure that the adapter is installed in a correct slot.

4. Make sure that the proper device drivers are installed for the device.

5. Resolve any resource conflicts if running legacy mode (UEFI).

6. Check http://datacentersupport.lenovo.com for any tech tips (also known as retain tips or service bulletins) that might be related to the adapter.

7. Ensure any adapter external connections are correct and that the connectors are not physically damaged.

Insufficient PCIe resources are detected.

If you see an error message stating "Insufficient PCI Resources Detected," complete the following steps until the problem is resolved:

1. Remove one of the PCIe adapters.

2. Restart the system and press F1 to display the Lenovo XClarity Provisioning Manager system setup interface.

3. Click **UEFI Setup ➙ System Settings ➙ Devices and I/O Ports ➙ MM Config Base**; then, modify the setting to the lower memory capacity. For example, modify 3 GB to 2 GB or modify 2 GB to 1 GB.

4. Save the settings and restart the system.

5. The action for this step will differ based on whether or not the reboot is successful.

   - If the reboot is successful, shut down the solution and reinstall the PCIe card you removed.

   - If the reboot failed, repeat step 2 to step 5.

A Lenovo optional device that was just installed does not work.

1. Make sure that:
   - The device is supported for the server (see http://www.lenovo.com/us/en/serverproven/).
   - 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 system setup interface. Whenever memory or any other device is changed, you must update the configuration.

2. Reseat the device that you just installed.

3. Replace the device that you just installed.

A Lenovo optional device that worked previously does not work now.

1. Make sure that all of the cable connections for the device are secure.

2. If the device comes with test instructions, use those instructions to test the device.

3. If the failing device is a SCSI device, make sure that:
   - The cables for all external SCSI devices are connected correctly.
   - The last device in each SCSI chain, or the end of the SCSI cable, is terminated correctly.
   - Any external SCSI device is turned on. You must turn on an external SCSI device before you turn on the server.

4. Reseat the failing device.

5. Replace the failing device.

Serial-device problems

Use this information to solve problems with serial ports or devices.

Number of displayed serial ports is less than the number of installed serial ports

Complete the following steps until the problem is solved.

1. Make sure that:

   - Each port is assigned a unique address in the Setup utility and none of the serial ports is disabled.
   - The serial-port adapter (if one is present) is seated correctly.

2. Reseat the serial port adapter.

3. Replace the serial port adapter.

Serial device does not work

1. Make sure that:

   - The device is compatible with the server.
   - The serial port is enabled and is assigned a unique address.
   - The device is connected to the correct connector.

2. Reseat the following components:

   a. Failing serial device.

   b. Serial cable.

3. Replace the following components:

   a. Failing serial device.

   b. Serial cable.

4. (Trained technician only) Replace the system board.

Intermittent problems

Use this information to solve intermittent problems.

Intermittent external device problems

Complete the following steps until the problem is solved.

1. Make sure that the correct device drivers are installed. See the manufacturer's website for documentation.

2. For a USB device:

    a. Make sure that the device is configured correctly.

    Restart the server and press F1 to display the Lenovo XClarity Provisioning Manager system setup interface. Then, click **System Settings ➙ Devices and I/O Ports ➙ USB Configuration**.

    b. Connect the device to another port. If using a USB hub, remove the hub and connect the device directly to the compute node. Make sure that the device is configured correctly for the port.

Intermittent KVM problems

Complete the following steps until the problem is solved.

Video problems:

1. Make sure that all cables and the console breakout cable are properly connected and secure.

2. Make sure that the monitor is working properly by testing it on another compute node.

3. Test the console breakout cable on a working compute node to ensure that it is operating properly. Replace the console breakout cable if it is defective.

Keyboard problems:

Make sure that all cables and the console breakout cable are properly connected and secure.

Mouse problems:

Make sure that all cables and the console breakout cable are properly connected and secure.

Intermittent unexpected reboots

Note: Some correctable errors require that the server reboot so that it can disable a device, such as a memory DIMM or a processor to allow the machine to boot up properly.

1. If the reset occurs during POST and the POST watchdog timer is enabled, make sure that sufficient time is allowed in the watchdog timeout value (POST Watchdog Timer).

    To check the POST watchdog time, restart the server and press F1 to display the Lenovo XClarity Provisioning Manager system setup interface. Then, click **BMC Settings ➙ POST Watchdog Timer**.

2. If the reset occurs after the operating system starts, disable any automatic server restart (ASR) utilities, such as the Automatic Server Restart IPMI Application for Windows, or any ASR devices that are installed.

3. See the management controller event log to check for an event code that indicates a reboot. See "Event logs" on page 205 for information about viewing the event log.

Power problems

Use this information to resolve issues related to power.

System error LED is on and event log "Power supply has lost input" is displayed

To resolve the problem, ensure that:

1. The power supply is properly connected to a power cord.

2. The power cord is connected to a properly grounded electrical outlet for the server.

Network problems

Use this information to resolve issues related to networking.

- "Cannot wake server using Wake on LAN" on page 219
- "Could not log in using LDAP account with SSL enabled" on page 219

Cannot wake server using Wake on LAN

Complete the following steps until the problem is resolved:

1. If you are using the dual-port network adapter and the server is connected to the network using Ethernet 5 connector, check the system-error log or IMM2 system event log (see "Event logs" on page 205), make sure:

   a. Fan 3 is running in standby mode, if Emulex dual port 10GBase-T embedded adapter is installed.

   b. The room temperature is not too high (see "Specifications" on page 3).

   c. The air vents are not blocked.

   d. The air baffle is installed securely.

2. Reseat the dual-port network adapter.

3. Turn off the server and disconnect it from the power source; then, wait 10 seconds before restarting the server.

4. If the problem still remains, replace the dual-port network adapter.

Could not log in using LDAP account with SSL enabled

Complete the following steps until the problem is resolved:

1. Make sure that the license key is valid.

2. Generate a new license key and log in again.

Observable problems

Use this information to solve observable problems.

- "The server immediately displays the POST Event Viewer when it is turned on" on page 219
- "Server is unresponsive (POST is complete and operating system is running)" on page 220
- "Server is unresponsive (cannot press F1 to start System Setup)" on page 220
- "Voltage planar fault is displayed in the event log" on page 221
- "Unusual smell" on page 221
- "Server seems to be running hot" on page 221
- "Cracked parts or cracked chassis" on page 221

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 http://www.lenovo.com/us/en/serverproven/ .

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

Server is unresponsive (POST is complete and operating system is running)

Complete the following steps until the problem is solved.

- If you are in the same location as the compute node, complete the following steps:

    1. If you are using a KVM connection, make sure that the connection is operating correctly. Otherwise, make sure that the keyboard and mouse are operating correctly.

    2. If possible, log in to the compute node and verify that all applications are running (no applications are hung).

    3. Restart the compute node.

    4. If the problem remains, make sure that any new software has been installed and configured correctly.

    5. Contact your place of purchase of the software or your software provider.

- If you are accessing the compute node from a remote location, complete the following steps:

    1. Make sure that all applications are running (no applications are hung).

    2. Attempt to log out of the system and log back in.

    3. Validate the network access by pinging or running a trace route to the compute node from a command line.

        a. If you are unable to get a response during a ping test, attempt to ping another compute node in the enclosure to determine whether it is a connection problem or compute node problem.

        b. Run a trace route to determine where the connection breaks down. Attempt to resolve a connection issue with either the VPN or the point at which the connection breaks down.

    4. Restart the compute node remotely through the management interface.

    5. If the problem remains, verify that any new software has been installed and configured correctly.

    6. Contact your place of purchase of the software or your software provider.

Server is unresponsive (cannot press F1 to start System Setup)

Configuration changes, such as added devices or adapter firmware updates, and firmware or application code problems can cause the server to fail POST (the power-on self-test).

If this occurs, the server responds in either of the following ways:

- The server restarts automatically and attempts POST again.

- The server hangs, and you must manually restart the server for the server to attempt POST again.

After a specified number of consecutive attempts (automatic or manual), the server to reverts to the default UEFI configuration and starts System Setup so that you can make the necessary corrections to the configuration and restart the server. If the server is unable to successfully complete POST with the default configuration, there might be a problem with the system board.

You can specify the number of consecutive restart attempts in System Setup. Restart the server and press F1 to display the Lenovo XClarity Provisioning Manager system setup interface. Then, click **System Settings ➙ Recovery and RAS ➙ POST Attempts ➙ POST Attempts Limit**. Available options are 3, 6, 9, and disable.

Voltage planar fault is displayed in the event log

Complete the following steps until the problem is solved.

1. Revert the system to the minimum configuration. See "Specifications" on page 3 for the minimally required number of processors and DIMMs.

2. Restart the system.
   - If the system restarts, add each of the items that you removed one at a time, restarting 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.

Unusual smell

Complete the following steps until the problem is solved.

1. An unusual smell might be coming from newly installed equipment.

2. If the problem remains, contact Lenovo Support.

Server seems to be running hot

Complete the following steps until the problem is solved.

Multiple compute nodes or chassis:

1. Make sure that the room temperature is within the specified range (see "Specifications" on page 3).

2. Check the management processor event log for rising temperature events. If there are no events, the compute node is running within normal operating temperatures. Note that you can expect some variation in temperature.

Cracked parts or cracked chassis

Contact Lenovo Support.

Software problems

Use this information to solve software problems.

1. To determine whether the problem is caused by the software, make sure that:
   - The server has the minimum memory that is needed to use the software. For memory requirements, see the information that comes with the software.

     Note: If you have just installed an adapter or memory, the server might have a memory-address conflict.
   - The software is designed to operate on the server.
   - Other software works on the server.
   - The software works on another server.

2. If you receive any error messages while you use the software, see the information that comes with the software for a description of the messages and suggested solutions to the problem.

3. Contact your place of purchase of the software.

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.

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 http://www.lenovo.com/us/en/serverproven/ to make sure that the hardware and software is 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 believe that you require warranty service for your Lenovo product, the service technicians will be able to assist you more efficiently if you prepare before you call. You can also see 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://www-947.ibm.com/support/servicerequest/Home.action 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 http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/NN1ia_c_servicesandsupport.html.

  – For more information about using the CLI to collect service data, see http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/nn1ia_r_ffdccommand.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 can be run in-band from the operating system. In addition to the hardware service data, Lenovo XClarity Essentials OneCLI can collect information about the operating system, such as the operating system event log.

  To obtain service data, you can run the **getinfor** command. For more information about running the **getinfor**, see http://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_getinfor_command.html.

Contacting Support

You can contact Support to obtain help for your issue.

You can receive hardware service through a Lenovo Authorized Service Provider. To locate a service provider authorized by Lenovo to provide warranty service, go to https://datacentersupport.lenovo.com/serviceprovider and use filter searching for different countries. For Lenovo support telephone numbers, see https://datacentersupport.lenovo.com/supportphonelist. In the U.S. and Canada, call 1-800-426-7378.

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U. K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

China product support

To contact product support in China, go to:
http://support.lenovo.com.cn/lenovo/wsi/es/ThinkSystem.html

You can also call 400-106-8888 for product support. The call support is available Monday through Friday, from 9 a.m. to 6 p.m.

Taiwan product support

To contact product support for Taiwan, call 0800–016–888. The call support is available 24 hours a day, 7 days a week.

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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Lenovo (United States), Inc.
1009 Think Place
Morrisville, NC 27560
U.S.A.
Attention: Lenovo VP of Intellectual Property

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Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

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Microsoft and Windows are trademarks of the Microsoft group of companies.

Linux is a registered trademark of Linus Torvalds.

Other company, product, or service names may be trademarks or service marks of others.

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.

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 16. Limits for particulates and gases

Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2[1]. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%[2]. • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985[3] • Silver: Corrosion rate of less than 300 Å in 30 days
[1] ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. [2] 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. [3] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.	

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	○	○	○	○	○	○
機械組合件	−	○	○	○	○	○
空氣傳動設備	−	○	○	○	○	○
冷卻組合件	−	○	○	○	○	○
內存模塊	−	○	○	○	○	○
處理器模塊	−	○	○	○	○	○
電纜組合件	−	○	○	○	○	○
電源	−	○	○	○	○	○
儲備設備	−	○	○	○	○	○
電路卡	−	○	○	○	○	○
光碟機	−	○	○	○	○	○
雷射器	−	○	○	○	○	○

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.

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