



ThinkSystem ST550 Maintenance Manual



Machine Types: 7X09 and 7X10

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>

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

在安装本产品之前，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 pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

ཐོན་ཁུངས་འདི་བདེ་སྤྱོད་མ་བྱས་གོང་། སློབ་གྲི་ཡིད་གཟབ་
བྱ་འདྲ་མིན་ཡོད་པའི་འོད་སྤེར་བལྟ་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

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canjbinj soengq cungj vahgangj ancien siusik.

Safety inspection checklist

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

Notes:

1. The product is not suitable for use at visual display workplaces according to §2 of the Workplace Regulations.
2. The set-up of the server is made in the server room only.

CAUTION:

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

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

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

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

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

a. Go to:

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

b. 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 ST550 server is a 4U tower 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://support.lenovo.com/us/en/solutions/ht503310>

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

Identifying your server

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

The machine type and serial number are on the ID label on the front of the server.

The following illustration shows the location of the ID label.

Note: The illustrations in this document might differ slightly from your server.

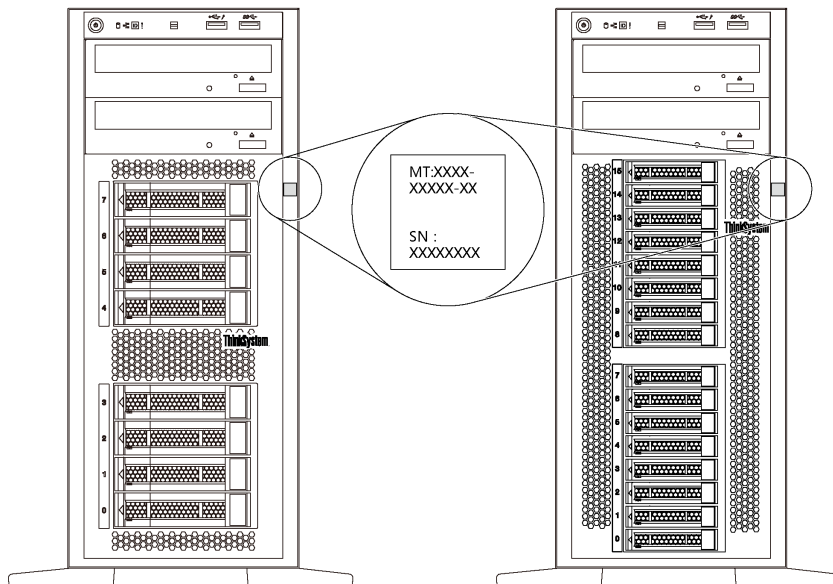


Figure 1. Location of the ID label

XClarity Controller network access label

The XClarity® Controller network access label is attached on the front bezel as shown. After you get the server, peel the XClarity Controller network access label away and store it in a safe place for future use.

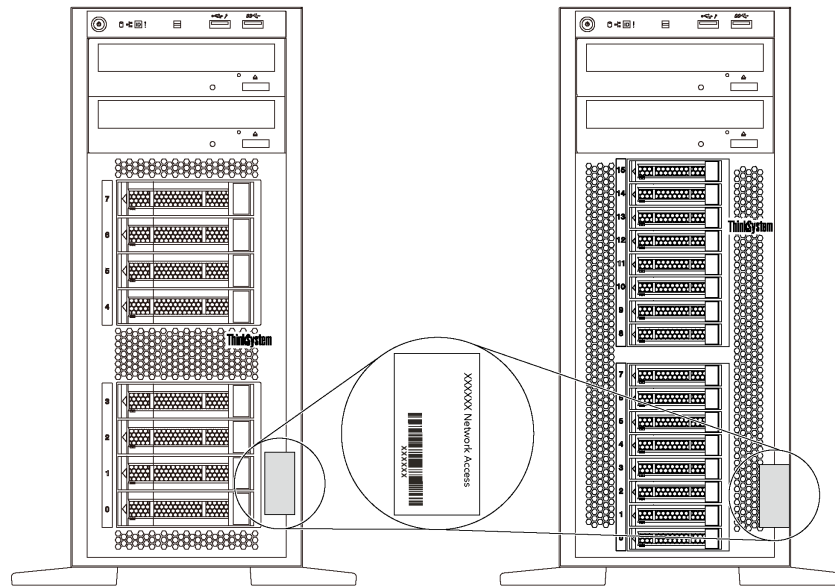


Figure 2. Location of the XClarity Controller network access label

Quick response code

The system service label, which is on the inside of the server 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 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/st550>



Figure 3. QR code

Server form factor

The ThinkSystem ST550 server is designed to support both tower and rack form factors.

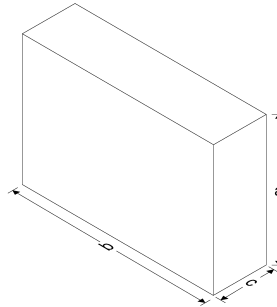
You can change the server from tower form factor to rack form factor by installing the tower-to-rack conversion kit. For instructions on how to install the tower-to-rack conversion kit, refer to the documentation that comes with the conversion kit.

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.

Dimensions for tower form factor

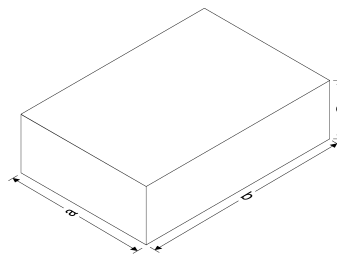
- **a** Height:
 - With foot stands: 437.7 mm (17.3 inches)
 - Without foot stands: 425.5 mm (16.8 inches)
- **b** Depth: 666.4 mm (26.3 inches)
- **c** Width:
 - With foot stands: 272.0 mm (10.7 inches)
 - Without foot stands: 175.8 mm (7.0 inches)



Note: The depth is measured with power supplies installed, but without the front door installed.

Dimensions for rack form factor

- **a** Width:
 - With rack latches: 482.0 mm (19.0 inches)
 - Without rack latches: 427.7 mm (16.9 inches)
- **b** Depth: 670.2 mm (26.4 inches)
- **c** Height: 175.8 mm (7.0 inches)



Note: The depth is measured with rack latches and power supplies installed.

Weight

Up to 36.9 kg (79.4 lb), depending on the server configuration

Processor

- Up to two Intel® Xeon® scalable processors
 - Scalable up to 22 cores
 - Designed for Land Grid Array (LGA) 3647 socket
- Up to two Jintide® processors for Chinese Mainland only

Note: For Jintide processors, only C08101, C10201, C12301, C14501, and C16401 models are supported for Chinese Mainland.

For a list of supported processors, see:
<https://static.lenovo.com/us/en/serverproven/index.shtml>

Memory

For 1st Generation Intel Xeon Scalable Processors (Intel Xeon SP Gen 1) or Jintide processors

- Minimum: 8 GB
- Maximum:
 - 384 GB using registered DIMMs (RDIMMs)
 - 768 GB using load-reduced DIMMs (LRDIMMs)

- Type:
 - TruDDR4 2666, single-rank/dual-rank, 8 GB/16 GB/32 GB registered DIMMs (RDIMMs)
 - TruDDR4 2666, quad-rank, 64 GB load-reduced DIMMs (LRDIMMs)
- Slots: 12 DIMM slots

For 2nd Generation Intel Xeon Scalable Processors (Intel Xeon SP Gen 2)

- Minimum: 8 GB
- Maximum: 768 GB
- Type:
 - TruDDR4 2666, single-rank/dual-rank, 16 GB/32 GB registered DIMMs (RDIMMs)
 - TruDDR4 2933, single-rank/dual-rank, 8 GB/16 GB/32 GB/64 GB registered DIMMs (RDIMMs)
- Slots: 12 DIMM slots

Note: The actual operating speed depends on the processor model and UEFI Operating Mode selection. For a list of supported DIMMs, see:

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

Supported operating systems

Below lists all supported and certified operating systems:

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

For a complete list of operating systems, see:

<https://lenovopress.com/osig>

For OS deployment instructions, see: “Deploy the operating system” in *Setup Guide*.

Supported drives

The drives supported by your server vary by model.

- Storage drive

Drive bay	Supported drive type
Eight 2.5-inch drive bays	Hot-swap SAS/SATA/NVMe HDD or SSD (NVMe drives are supported only in bays 4–7 if an AnyBay backplane is installed)
Sixteen 2.5-inch drive bays	Hot-swap SAS/SATA/NVMe HDD or SSD (NVMe drives are supported only in bays 4–7 if an AnyBay backplane is installed)
Twenty 2.5-inch drive bays	Hot-swap SAS/SATA/NVMe HDD or SSD (NVMe drives are supported only in bays 4–7 if an AnyBay backplane is installed)
Four 3.5-inch drive bays	<ul style="list-style-type: none"> – Simple-swap SATA HDD – Hot-swap SAS/SATA HDD or SSD
Eight 3.5-inch drive bays	<ul style="list-style-type: none"> – Simple-swap SATA HDD – Hot-swap SAS/SATA HDD or SSD
Eight 3.5-inch drive bays and four 2.5-inch drive bays	Hot-swap SAS/SATA HDD or SSD

To locate the storage drives or drive bays, see [“Front view” on page 17](#).

- Optical drive

Some server models have two optical drive bays. For more information, see [“Front view” on page 17](#).

- Tape drive

A tape drive enables you to store data on tape media. For server models with two optical drive bays, you can install an internal tape drive in the optical-drive bay 2.

- M.2 drive

Your server supports one M.2 backplane which provides an easy way for data storage. You can install up to two M.2 drives into the M.2 backplane. For more information, see [“Install the M.2 backplane and M.2 drive” on page 143](#).

Expansion slots

The server has six expansion slots on the system board for installing appropriate Peripheral Component Interconnect Express (PCIe) adapters.

- For processor 1

- PCIe slot 1: PCIe x8 (x8, x4, x1), full-height, half-length
- PCIe slot 2: PCIe x16 (x16, x8, x4, x1), full-height, half-length
- PCIe slot 3: PCIe x16 (x16, x8, x4, x1), full-height, full-length, double-width
- PCIe slot 6: PCIe x8 (x4, x1), full-height, full-length

- For processor 2

- PCIe slot 4: PCIe x16 (x8, x4, x1), full-height, full-length
- PCIe slot 5: PCIe x16 (x16, x8, x4, x1), full-height, full-length, double-width

The following HBA/RAID adapters can be installed in an appropriate PCIe slot.

- SAS/SATA HBA adapters

- ThinkSystem 430-8i SAS/SATA 12Gb HBA
- ThinkSystem 430-16i SAS/SATA 12Gb HBA
- ThinkSystem 430-8e SAS/SATA 12Gb HBA
- ThinkSystem 440-8i SAS/SATA PCIe Gen4 12Gb HBA
- ThinkSystem 440-16i SAS/SATA PCIe Gen4 12Gb HBA
- ThinkSystem 4350-8i SAS/SATA 12Gb HBA

- SAS/SATA RAID adapters

- ThinkSystem RAID 530-8i PCIe 12Gb Adapter
- ThinkSystem RAID 540-8i PCIe 12Gb Adapter
- ThinkSystem RAID 730-8i 1GB Adapter
- ThinkSystem RAID 730-8i 2GB PCIe Adapter
- ThinkSystem RAID 930-8e 4GB Flash PCIe 12Gb Adapter
- ThinkSystem RAID 930-8i 2GB Flash PCIe 12Gb Adapter
- ThinkSystem RAID 930-16i 4GB Flash PCIe 12Gb Adapter
- ThinkSystem RAID 930-16i 8GB Flash PCIe 12Gb Adapter
- ThinkSystem RAID 930-24i 4GB Flash PCIe 12Gb Adapter
- ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter

- ThinkSystem RAID 940-8e 4GB Flash PCIe 12Gb Adapter
- ThinkSystem RAID 940-16i 4GB Flash PCIe Gen4 12Gb Adapter
- ThinkSystem RAID 940-16i 8GB Flash PCIe Gen4 12Gb Adapter
- ThinkSystem RAID 940-32i 8GB Flash PCIe Gen4 12Gb Adapter
- ThinkSystem RAID 5350-8i PCIe 12Gb Adapter
- ThinkSystem RAID 9350-8i 2GB Flash PCIe 12Gb Adapter

Notes:

- RAID 730-8i 1G Cache SAS/SATA adapter is not available for North America.
- RAID 530-8i SAS/SATA adapter cannot be mixed with RAID 730-8i 1G Cache SAS/SATA adapter.
- RAID 730-8i 2G Flash SAS/SATA adapter cannot be mixed with RAID 730-8i 1G Cache SAS/SATA adapter or RAID 930-8i SAS/SATA adapter.
- The RAID 940 adapters can be mixed with the ThinkSystem 440-8i SAS/SATA PCIe Gen4 12Gb HBA and the ThinkSystem 440-16i SAS/SATA PCIe Gen4 12Gb HBA.
- Mixing of RAID/HBA 430/530/730/930 adapters (Gen 3) and RAID/HBA 440/540/940 adapters (Gen 4) in the same system is not allowed.
- RAID 930/940 series or 9350 series adapters require a RAID flash power module.
- RAID 4350/5350/9350 series adapters cannot be mixed with HBA/RAID 430/440/530/540/730/930/940 series SAS/SATA adapters.
- For server models that support NVMe drives, the NVMe adapter (also known as the NVMe switch adapter) can be installed only in PCIe slot 2.
- For RAID adapters or host bus adapters, you can install them in either PCIe slot 1 or PCIe slot 2.
- For server models with one processor, you can install a double-width graphics adapter only in PCIe slot 3. For server models with two processors, you can install up to two double-width graphics adapters in PCIe slot 3 and PCIe slot 5. After any double-width graphics adapter is installed, PCIe slot 4 or PCIe slot 6 becomes unavailable because the space is occupied by the double-width adapter.

Graphics adapters

- Your server supports the following GPUs:
 - Full-height, full-length, double-slot GPUs: NVIDIA P6000
 - Full-height, full-length, single-slot GPU: NVIDIA P4000, NVIDIA RTX4000.
 - Full-height, 3/4-length, single-slot GPU: NVIDIA P2000, NVIDIA P2200.
 - Low-profile, half-height, half-length, single-slot GPUs: NVIDIA P600, NVIDIA P620
- Thermal Design Power (TDP): up to 250 watts

Notes:

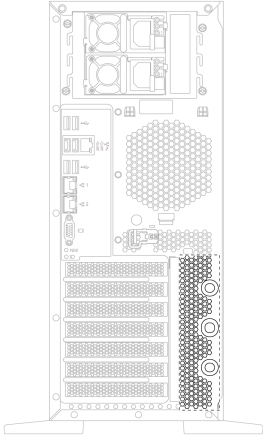
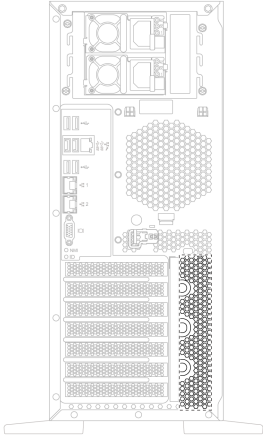
- NVIDIA P4000 and NVIDIA RTX4000 are supported only in the new chassis. See [“Differences between the original chassis and new chassis” on page 7](#)
- Your server supports up to two graphics adapters installed.
- Graphics adapter is supported only when the following configuration requirements are met:
 - Fan 4 is installed.
 - Two 1100-watt power supplies are installed.
 - For NVIDIA P6000 graphics adapter, operating temperature is lower than 35°C (95°F) when one P6000 is installed, and operating temperature is lower than 30°C (86°F) when two are installed. For other

supported graphics adapters, operating temperature is lower than 35°C (95°F) when one or two graphic adapters are installed.

- Fan redundancy function is supported when:
 - One NVIDIA P600, P620, P2000, P2200, P4000, or RTX4000 graphics adapter is installed
 - Two NVIDIA P600 or P620 graphics adapters are installed

Differences between the original chassis and new chassis

Two types of chassis are available for your server, and different chassis type supports different GPU models. You can identify the chassis type of your server by the rear view of your server or the part number label affixed on the bottom of your server.

Chassis type	Rear view	Part number	Supported GPU model
Original chassis		<ul style="list-style-type: none"> • SC87A02105 (eight 3.5-inch-drive-bay chassis) • SC87A02106 (sixteen 2.5-inch-drive-bay chassis) 	<ul style="list-style-type: none"> • NVIDIA P2000 • NVIDIA P2200 • NVIDIA P6000 • NVIDIA P600 • NVIDIA P620
New chassis		<ul style="list-style-type: none"> • SC87A19892 (eight 3.5-inch-drive-bay chassis) • SC87A19894 (sixteen 2.5-inch-drive-bay chassis) 	<ul style="list-style-type: none"> • NVIDIA P2000 • NVIDIA P2200 • NVIDIA P4000, NVIDIA RTX4000 and other NVIDIA form factor V3.0 GPUs • NVIDIA P6000 • NVIDIA P600 • NVIDIA P620

Notes:

- The new chassis is the updated version of the original chassis to support NVIDIA form factor V3.0 GPUs, such as NVIDIA P4000 and NVIDIA RTX4000.
- The original chassis will phase out and be replaced by the new chassis.

Input/Output (I/O) features

- Front panel:

- One XClarity Controller USB connector
- One USB 3.0 connector
- Rear panel:
 - One VGA connector
 - One XClarity Controller network connector
 - Two Ethernet connectors
 - Two USB 3.0 connectors
 - Four USB 2.0 connectors

System fans

- One processor: two fans (fan 1 and 2) or three fans (fan 1, 2, and 4)
- Two processors: three fans (fan 1, 2, and 3) or four fans (fan 1, 2, 3, and 4)

Notes:

- Fan 3 is required if the expansion drive cage is installed.
- Fan 4 is optional and is the redundant fan.
- If your server comes with only one processor, two or three system fans are adequate to provide proper cooling. However, you must keep the location for fan 3 occupied by a fan filler to ensure proper airflow.

Power supplies

- One fixed 450-watt power supply
- 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

Electrical input

- ac 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 power supplies, the 100 V –127 V ac input voltage is not supported.

CAUTION:

240 V dc input (input range: 180-300 V dc) is supported in Chinese Mainland ONLY. Power supply with 240 V dc input cannot support hot plugging power cord function. Before removing the power supply with dc input, please turn off server or disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the power cord.

Minimal configuration for debugging

- One processor in processor socket 1
- One memory DIMM on slot 3
- One power supply
- Two system fans (fan 1 and 2)

Acoustical noise

- Sound power levels, idle
 - 4.0 bels, minimum
 - 4.7 bels, typical
 - 5.3 bels, maximum
- Sound power levels, operating
 - 4.1 bels, minimum
 - 4.7 bels, typical
 - 5.3 bels, maximum

Notes:

- These sound power levels are measured in controlled acoustical environments according to procedures specified by ISO 7779 and are reported in accordance with ISO 9296.
- The declared acoustic noise levels are based on specified configurations, which may change depending on configurations/conditions.

Environment

The server is supported in the following environment:

Note: This server is designed for standard data center environment and recommended to be placed in industrial data center.

- 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 10](#).

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:

- Fan 4 is installed.
- Two hot-swap power supplies are installed.
- NVMe SSD is not installed.
- Graphics adapters are not installed.
- SAS drives with capacity larger than or equal to 2 TB are not installed in the expansion drive cage.
- Processors with TDP more than 125 watts are not installed.

Important information about EU ecodesign requirements

The following are EU ecodesign requirements for ErP Lot 9 products:

- Minimum memory should be 16 GB.
- Delta or Acbel 450-watt power supplies should not be picked.
- Processors should not be picked for one-processor configurations: Intel Xeon 3104, 3106, 3204, 4108, 4112, 5122, 5222, 8156, and 8256

Particulate contamination

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

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

Table 1. Limits for particulates and gases

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

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:

Note: The server UEFI settings for option ROM must be set to **Auto** or **UEFI** to update firmware using Lenovo XClarity Administrator or Lenovo XClarity Essentials. For more information, see the following Tech Tip:

<https://datacentersupport.lenovo.com/us/en/solutions/ht506118>

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.	√ ²			√	√		√
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	√	√		√	√		

Tool		In-band update	Out-of-band update	On-target update	Off-target update	Graphical user interface	Command-line interface	Supports UXSPs
Lenovo XClarity Integrator offerings	Lenovo XClarity Integrator for VMware vCenter Supports all core system firmware, I/O firmware, and installed operating system driver updates		√		√	√		
	Lenovo XClarity Integrator for Microsoft Windows Admin Center Supports all core system firmware, I/O firmware, and installed operating system driver updates	√	√	√	√	√		
	Lenovo XClarity Integrator for Microsoft System Center Configuration Manager Supports all core system firmware, I/O firmware, and installed operating system driver updates	√		√		√		√

The latest firmware can be found at the following site:

<http://datacentersupport.lenovo.com/us/en/products/servers/thinksystem/st550/7X09/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://sysmgmt.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/toolstr_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

- **Lenovo XClarity Integrator offerings**

Lenovo XClarity Integrator offerings can integrate management features of Lenovo XClarity Administrator and your server with software used in a certain deployment infrastructure, such as VMware vCenter, Microsoft Admin Center, or Microsoft System Center.

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

https://sysmgmt.lenovofiles.com/help/topic/lxci/lxci_product_page.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 **Documentation** from the navigation pane.

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

Security advisories

Lenovo is committed to developing products and services that adhere to the highest security standards in order to protect our customers and their data. When potential vulnerabilities are reported, it is the responsibility of the Lenovo Product Security Incident Response Team (PSIRT) to investigate and provide information to our customers so they may put mitigation plans in place as we work toward providing solutions.

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

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

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 15](#).

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-on LED off), you must disconnect all power cables.

To place the server in a standby state (power-on 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-on 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 15](#).

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.

Note: Your server might look different from the illustrations in this topic.

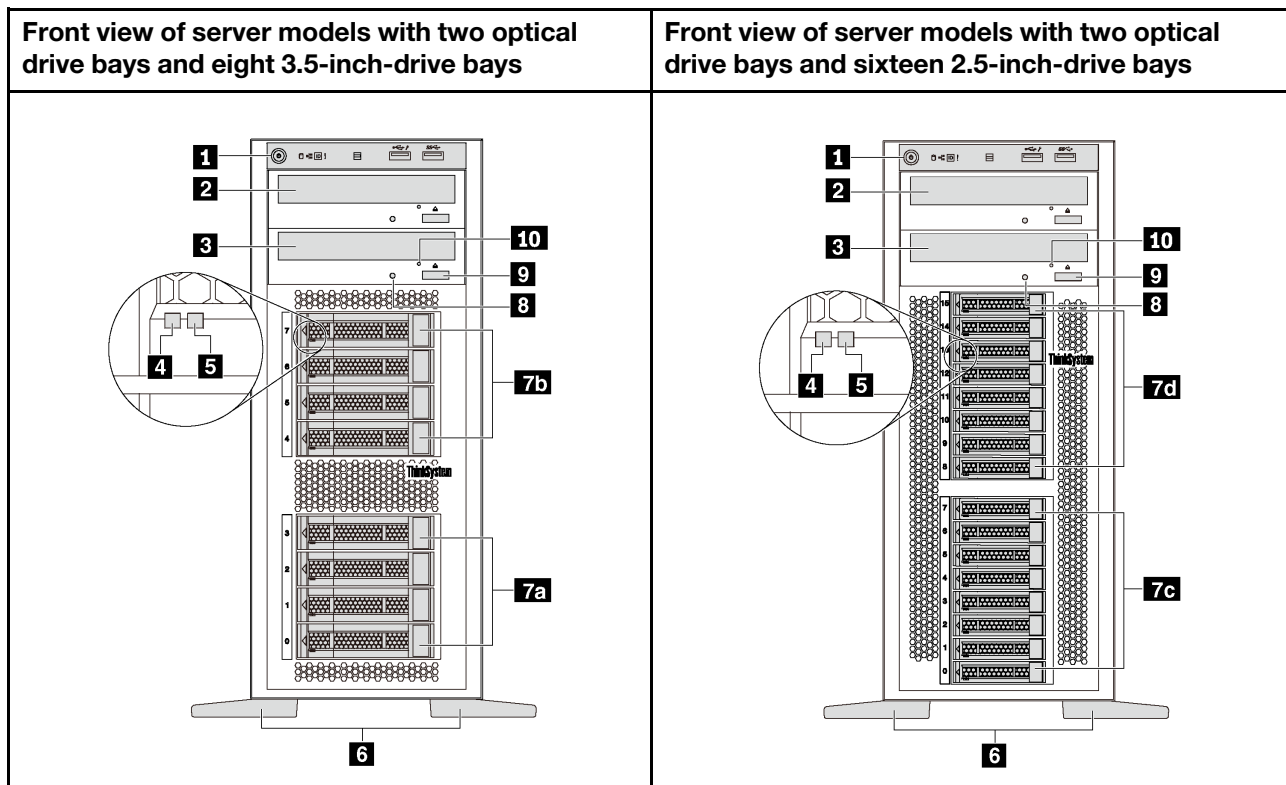


Figure 4. Front view of server models with optical drive bays

Table 2. Components on the front of server models with optical drive bays

Callout	Callout
1 Front panel	2 Optical-drive bay 2
3 Optical-drive bay 1	4 Drive activity LED (green)
5 Drive status LED (yellow)	6 Foot stands
7a 3.5-inch drive bays 0–3	7b 3.5-inch drive bays 4–7
7c 2.5-inch drive bays 0–7	7d 2.5-inch drive bays 8–15
8 Optical-drive status LED	9 Optical-drive eject/close button
10 Optical-drive manual-eject hole	

1 Front panel

For information about the controls, connectors, and status LEDs on the front panel, see [“Front panel” on page 20](#).

2 Optical-drive bay 2

The 5.25-inch optical-drive bay 2 is for a secondary optical drive or a tape drive. Some models have a secondary optical drive or a tape drive installed.

3 Optical-drive bay 1

Depending on the model, your server might come with an optical drive installed in the 5.25-inch optical-drive bay 1.

4 Drive activity LED

5 Drive status LED

Each hot-swap drive has two LEDs.

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

6 Foot stands

For tower-form-factor models, your server comes with four foot stands. To help the server stand steadily, ensure that you install the foot stands correctly as shown. See [“Install the foot stands” on page 77](#).

7a 7b 7c 7d Drive bays

The drive bays are used to install 3.5-inch or 2.5-inch storage drives. 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. Depending on the model, your server supports one of the following drive bay configurations:

- Four 3.5-inch-drive bays
- Eight 3.5-inch-drive bays
- Eight 2.5-inch-drive bays
- Sixteen 2.5-inch-drive bays

Note: For the 2.5-inch-drive-bay models that support NVMe drives, you can install up to four NVMe drives in bays 4–7.

8 Optical-drive status LED

The optical-drive status LED is blinking in green when the optical drive is working or in the POST process.

9 Optical-drive eject/close button

Press this button to eject or close the optical drive when the server power is on.

10 Optical-drive manual-eject hole

Insert a straightened paper clip into the optical-drive manual-eject hole to eject the disc tray when the eject/close button does not work.

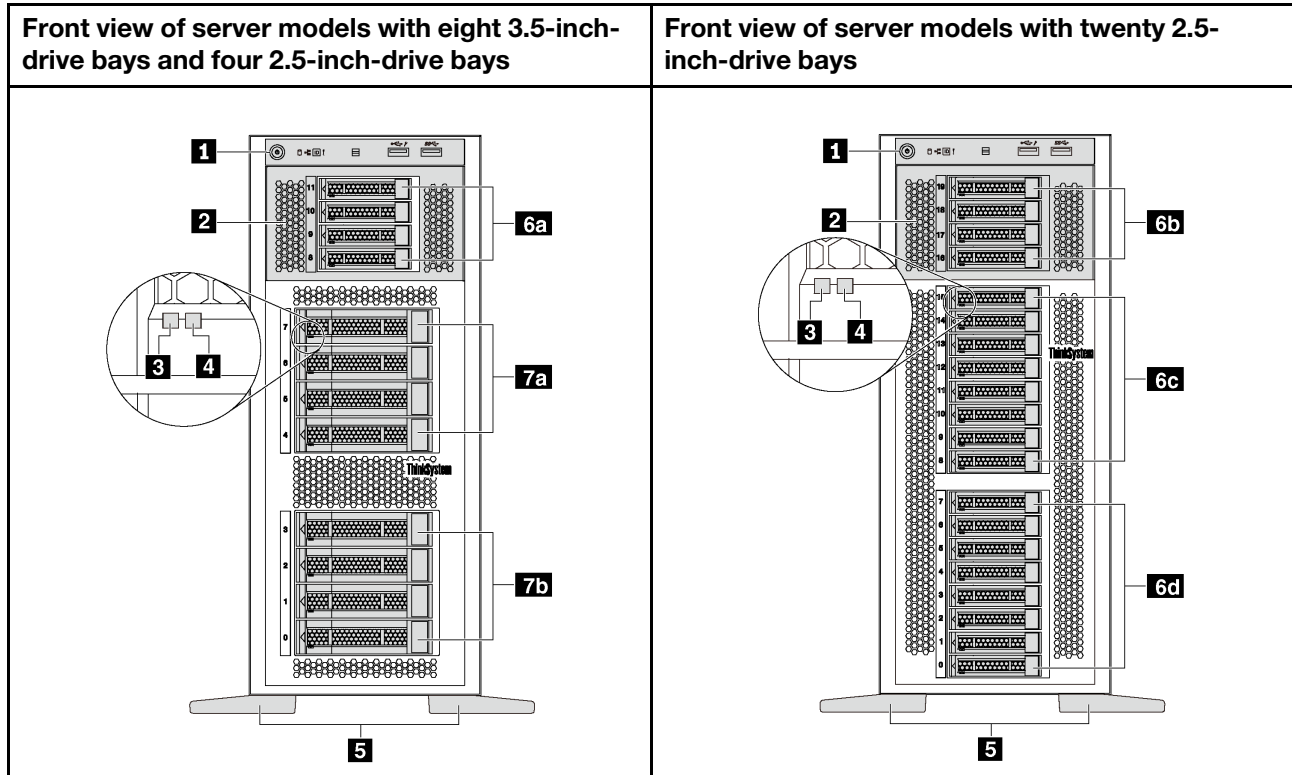


Figure 5. Front view of server models without optical drive bays

Table 3. Components on the front of server models without optical drive bays

Callout	Callout
1 Front panel	2 Expansion drive cage
3 Drive activity LED (green)	4 Drive status LED (yellow)
5 Foot stands	6a 2.5-inch drive bays 8–11
6b 2.5-inch drive bays 16–19	6c 2.5-inch drive bays 8–15
6d 2.5-inch drive bays 0–7	7a 3.5-inch drive bays 4–7
7b 3.5-inch drive bays 0–3	

1 Front panel

For information about the controls, connectors, and status LEDs on the front panel, see [“Front panel” on page 20](#).

2 Expansion drive cage

For some server models, your server comes with an expansion drive cage. You can install up to four 2.5-inch SAS/SATA drives to the cage.

3 Drive activity LED

4 Drive status LED

Each hot-swap drive has two LEDs.

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

5 Foot stands

For tower-form-factor models, your server comes with four foot stands. To help the server stand steadily, ensure that you install the foot stands correctly as shown. See [“Install the foot stands” on page 77](#).

6a 6b 6c 6d 7a 7b Drive bays

The drive bays are used to install 3.5-inch or 2.5-inch storage drives. 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. When you install drives, follow the order of the drive bay numbers.

Note: For the 2.5-inch-drive-bay models that support NVMe drives, you can install up to four NVMe drives in bays 4–7.

Front panel

The front panel of the server provides controls, connectors, and LEDs.

The following illustration shows the control, connectors, and LEDs on the front panel of the server.

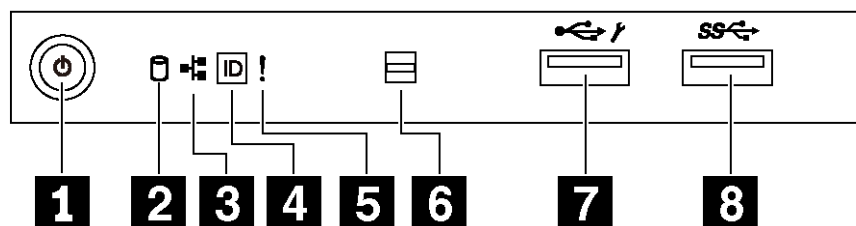


Figure 6. Front panel

Table 4. Components on the front panel

Callout	Callout
1 Power button with power status LED (green)	2 Simple-swap-drive activity LED (green)
3 Network activity LED (green)	4 System ID button with system ID LED (blue)
5 System error LED (yellow)	6 Opening for temperature sensor
7 XClarity Controller USB connector	8 USB 3.0 connector

1 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.

2 Simple-swap-drive activity LED

The simple-swap-drive activity LED is only for server models with simple-swap storage drives.

Status	Color	Description
Solid on	Green	The simple-swap drive is active.
Off	None	The simple-swap drive is not active.

3 Network activity LED

Compatibility of the NIC adapter and the network activity LED.

NIC adapter	NIC adapter
LOM adapter	Support
ML2 NIC adapter	Support
PCIe NIC adapter	Not support

The network activity LED on the front panel 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.

4 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.

5 System error LED

The system error LED provides basic diagnostic functions for your server.

Status	Color	Description	Action
On	Yellow	<p>An error has been detected on the server. Causes might include one or more of the following errors:</p> <ul style="list-style-type: none"> The temperature of the server reached the non-critical temperature threshold. The voltage of the server reached the non-critical voltage threshold. A fan has been detected to be running at low speed. A 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.
Off	None	The server is off or the server is on and is working correctly.	None.

6 Opening for temperature sensor

Used to detect the surrounding temperature.

7 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.

8 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 flash drive.

Rear view

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

Rear view of server models with a fixed power supply

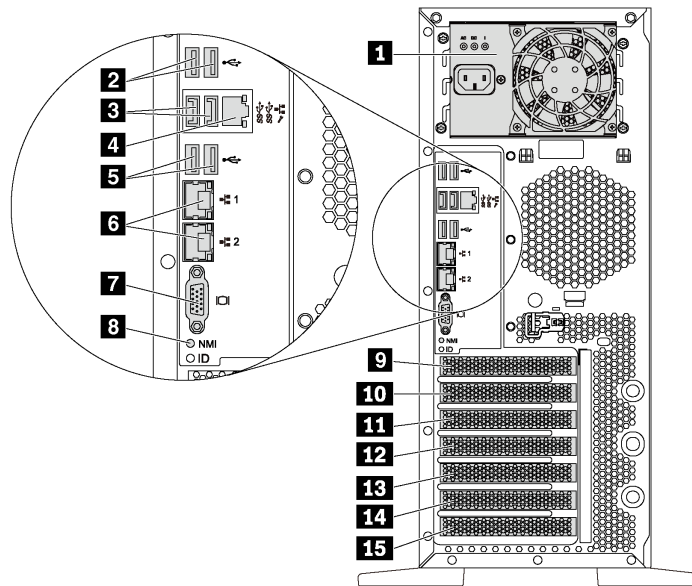


Figure 7. Rear view of server models with a fixed power supply

Table 5. Components on the rear of server models with a fixed power supply

Callout	Callout
1 Fixed power supply	2 USB 2.0 connectors (2)
3 USB 3.0 connectors (2)	4 XClarity Controller network connector
5 USB 2.0 connectors (2)	6 Ethernet connectors (2)
7 VGA connector	8 NMI button
9 Serial-port-module slot	10 PCIe slot 1
11 PCIe slot 2	12 PCIe slot 3
13 PCIe slot 4	14 PCIe slot 5
15 PCIe slot 6	

1 Fixed power supply

Used to connect the power cord.

2 3 5 USB connectors

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

4 XClarity Controller network connector

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

6 Ethernet connectors

Used to attach an Ethernet cable for a LAN. Each Ethernet connector has two status LEDs to help you identify the Ethernet connectivity and activity. For more information, see [“Rear view LEDs” on page 26](#).

7 VGA connector

Used to attach a VGA-compatible video device, such as a VGA monitor.

8 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.

9 Serial-port-module slot

Used to install a serial port module. The serial port module is available on some models. For instructions on how to install the serial port module, see [“Install the serial port module” on page 139](#).

10 11 12 13 14 15 PCIe slots

Your server has six PCIe slots on the system board for you to install appropriate PCIe adapters. For information about the PCIe slots, see [“Specifications” on page 3](#).

Rear view of server models with two hot-swap power supplies

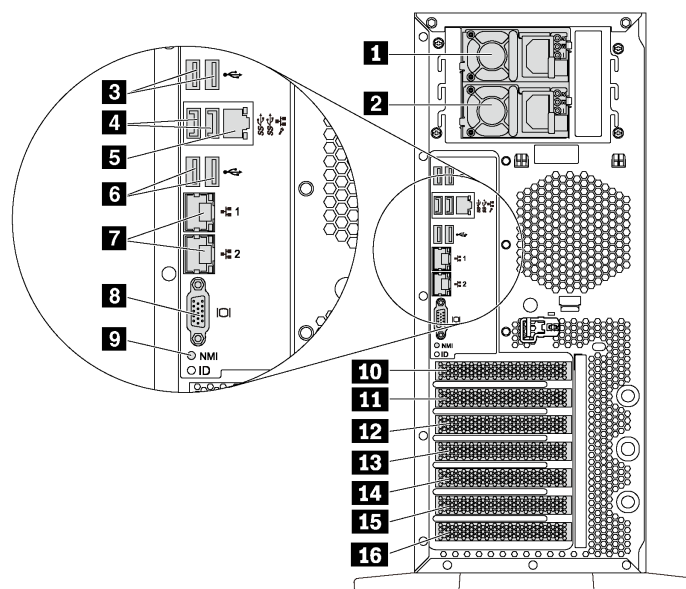


Figure 8. Rear view of server models with two hot-swap power supplies

Table 6. Components on the rear of server models with two hot-swap power supplies

Callout	Callout
1 Power supply 1	2 Power supply 2 (available on some models or available as an option)
3 USB 2.0 connectors (2)	4 USB 3.0 connectors (2)
5 XClarity Controller network connector	6 USB 2.0 connectors (2)
7 Ethernet connectors (2)	8 VGA connector
9 NMI button	10 Serial-port-module slot
11 PCIe slot 1	12 PCIe slot 2
13 PCIe slot 3	14 PCIe slot 4
15 PCIe slot 5	16 PCIe slot 6

1 Power supply 1

2 Power supply 2 (available on some models or available as an option)

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 26](#).

3 4 6 USB connectors

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

5 XClarity Controller network connector

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

7 Ethernet connectors

Used to attach an Ethernet cable for a LAN. Each Ethernet connector has two status LEDs to help you identify the Ethernet connectivity and activity. For more information, see [“Rear view LEDs” on page 26](#).

8 VGA connector

Used to attach a VGA-compatible video device, such as a VGA monitor.

9 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.

10 Serial-port-module slot

Used to install a serial port module. The serial port module is available on some models. For instructions on how to install the serial port module, see [“Install the serial port module” on page 139](#).

11 12 13 14 15 16 PCIe slots

Your server has six PCIe slots on the system board for you to install appropriate PCIe adapters. For information about the PCIe slots, see “Specifications” on page 3.

Rear view LEDs

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

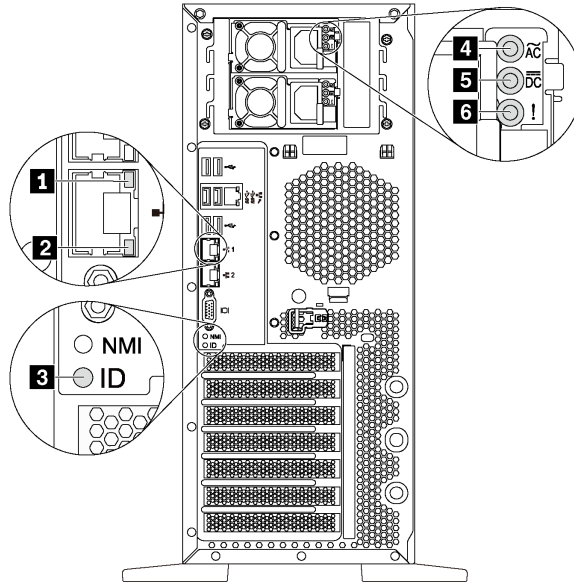


Figure 9. Rear view LEDs of the server

Table 7. LEDs on the rear of the server

Callout	Callout
1 Ethernet link LED (green)	2 Ethernet activity LED (green)
3 System ID LED (blue)	4 Power input LED (green)
5 Power output LED (green)	6 Power supply error LED (yellow)

1 2 Ethernet status LEDs

Each network connector has two status LEDs.

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

3 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.

4 Power input LED

5 Power output LED

6 Power supply error LED

Each hot-swap power supply has three status LEDs.

LED	Description
4 Power input LED	<ul style="list-style-type: none"> • Off: The power supply is disconnected from the ac power source or a power problem occurs. • Green: The power supply is connected to the ac power source.
5 Power output LED	<ul style="list-style-type: none"> • Green: The server is on and the power supply is working normally. • Blinking green: The power supply is in zero-output mode (standby). When the server power load is low, one of the installed power supplies enters into the standby state while the other one delivers entire load. When the power load increases, the standby power supply will switch to active state to provide sufficient power to the server. To disable zero-output mode, 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.
6 Power supply error LED	<ul style="list-style-type: none"> • Off: The power supply is working normally. • Yellow: The power supply has failed. To resolve the issue, replace the power supply.

System board components

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

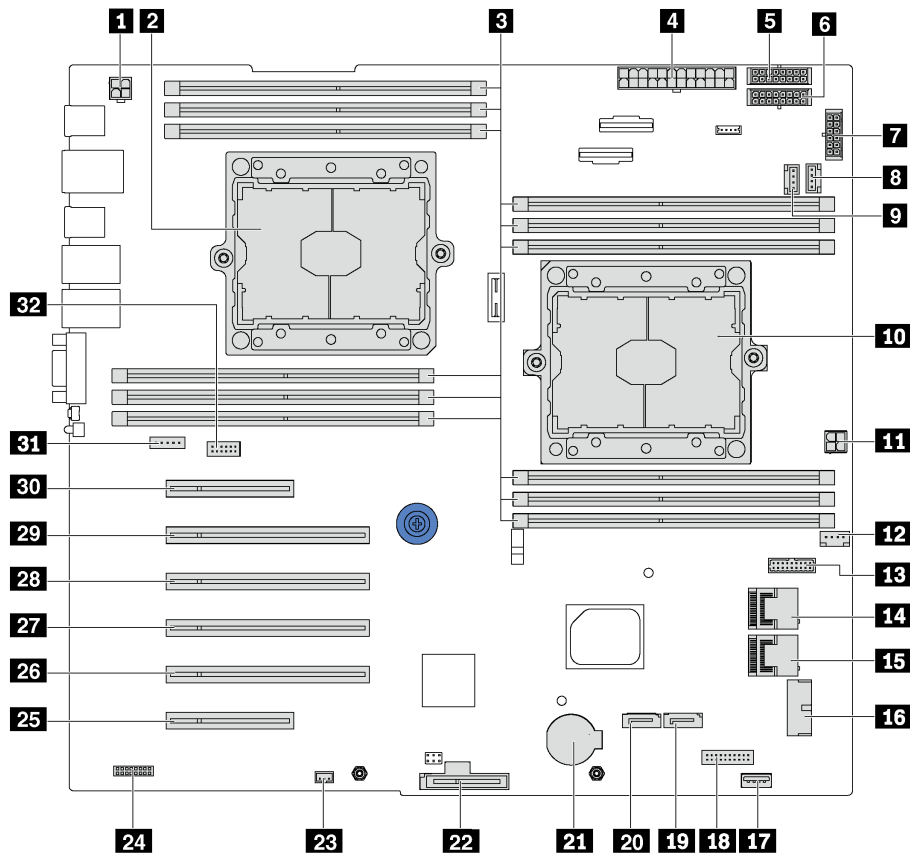


Figure 10. System board components

Table 8. Components on the system board

Callout	Callout
1 CPU 2 power connector	2 Processor 2 socket
3 DIMM slots (12)	4 Main power connector
5 Backplane 1 power connector	6 Backplane 2 power connector
7 Backplane 3 power connector	8 System fan 2 connector
9 System fan 3 connector	10 Processor 1 socket
11 CPU 1 power connector	12 System fan 1 connector
13 Power-interface-board signal connector	14 SAS 4–7 connector
15 SAS 0–3 connector	16 Front-panel-USB connector
17 Internal USB 3.0 connector	18 Operator-information-panel connector
19 Optical-drive-2 signal connector	20 Optical-drive-1 signal connector
21 CMOS battery connector	22 M.2 module slot

Table 8. Components on the system board (continued)

Callout	Callout
23 Intrusion switch connector	24 TCM ¹ /TPM ² connector (for only)
25 PCIe slot 6 (for processor 1)	26 PCIe slot 5 (for processor 2)
27 PCIe slot 4 (for processor 2)	28 PCIe slot 3 (for processor 1)
29 PCIe slot 2 (for processor 1)	30 PCIe slot 1 (for processor 1)
31 System fan 4 connector	32 Serial-port-module connector

Notes:

- ¹ Trusted Cryptography Module
- ² Trusted Platform Module

System board jumpers

The following illustration shows the location of the jumpers on the server.

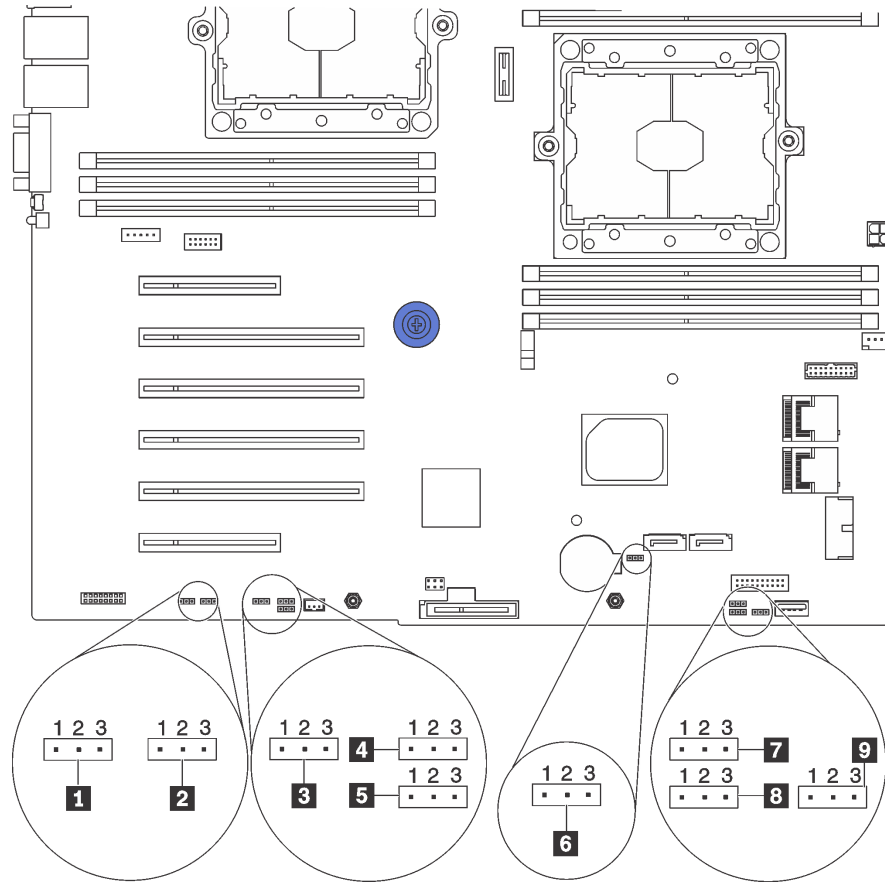


Figure 11. System board jumpers

Table 9. Jumper description

Jumper name	Jumper number	Jumper setting
1 Force XCC update jumper	JP16	<ul style="list-style-type: none"> Pins 1 and 2: The jumper is in default setting. Pins 2 and 3: Force the Lenovo XClarity Controller to update to the latest version.
2 Force XCC reset jumper	JP19	<ul style="list-style-type: none"> Pins 1 and 2: The jumper is in default setting. Pins 2 and 3: Reset the Lenovo XClarity Controller.
3 TPM/TCM physical presence jumper	JP23	<ul style="list-style-type: none"> Pins 1 and 2: The jumper is in default setting. Pins 2 and 3: TPM/TCM physical presence is asserted.
4 Power permission	JP72	<ul style="list-style-type: none"> Pins 1 and 2: The jumper is in default setting. Pins 2 and 3: Enable Power On.
5 Boot backup XClarity Controller	JP71	<ul style="list-style-type: none"> Pins 1 and 2: The jumper is in default setting. Pins 2 and 3: The tower server will boot by using a backup of the XClarity Controller firmware.
6 Clear CMOS jumper	JP76	<ul style="list-style-type: none"> Pins 1 and 2: The jumper is in default setting. Pins 2 and 3: Clear the real-time clock (RTC) registry.
7 ME recovery	JP59	<ul style="list-style-type: none"> The jumper is in default setting. ME boots to recovery.
8 ME firmware security override	JP38	<ul style="list-style-type: none"> Pins 1 and 2: The jumper is in default setting. Pins 2 and 3: Enable Flash security override.
9 Override power-on password jumper	JP61	<ul style="list-style-type: none"> Pins 1 and 2: The jumper is in default setting. Pins 2 and 3: Override the power-on password.

Important:

- Before you move the jumpers, turn 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 74
- Any system-board switch or jumper block that is not shown in the illustrations in this document are reserved.

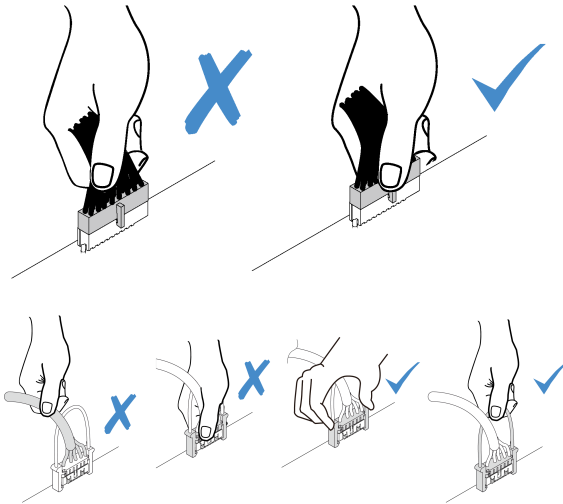
Internal cable routing

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.



Front panel

Use the section to understand the cable routing for the front panel.

Note: Ensure that all cables are routed through the correct cable clips.

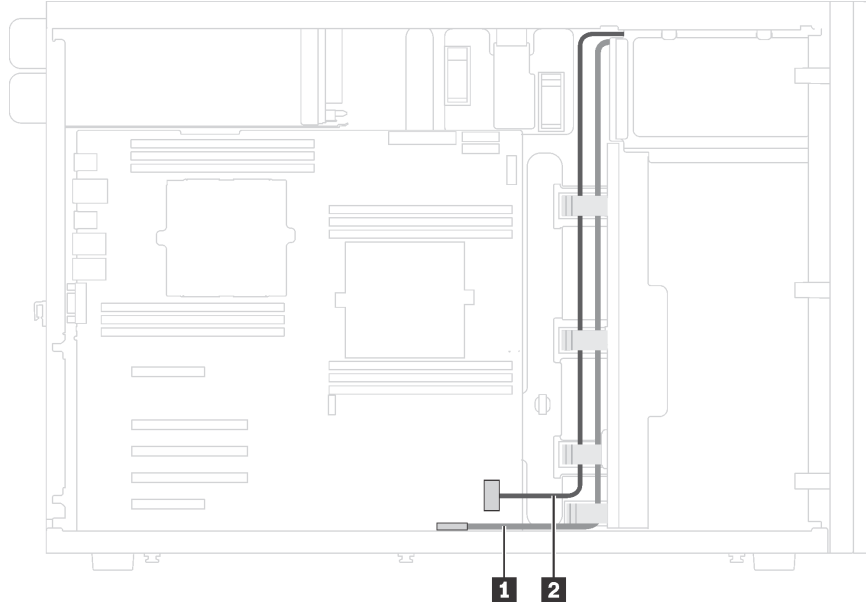


Figure 12. Cable routing for the front panel

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

Optical drive

Use the section to understand the cable routing for the optical drives.

Note: Ensure that all cables are routed through the correct cable clips.

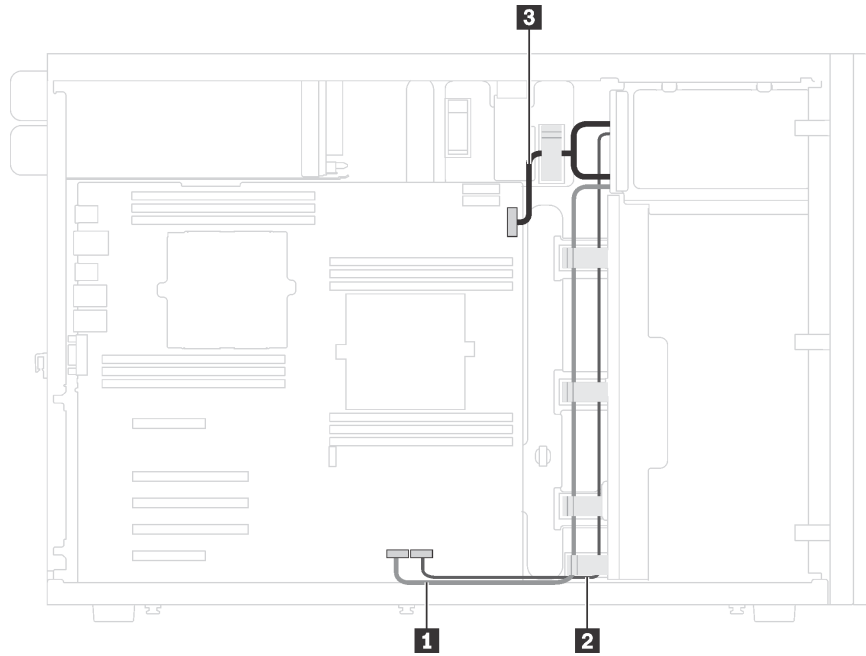


Figure 13. Cable routing for the optical drives

Cable	From	To
1 Signal cable	Signal connector on the optical drive 1	Optical-drive-1 signal connector on the system board
2 Signal cable	Signal connector on the optical drive 2	Optical-drive-2 signal connector on the system board
3 Power cable	Power connector on each optical drive	Backplane 3 power connector on the system board

Tape drive

Use the section to understand the cable routing for the tape drive.

SAS tape drive

Note: Ensure that all cables are routed through the correct cable clips.

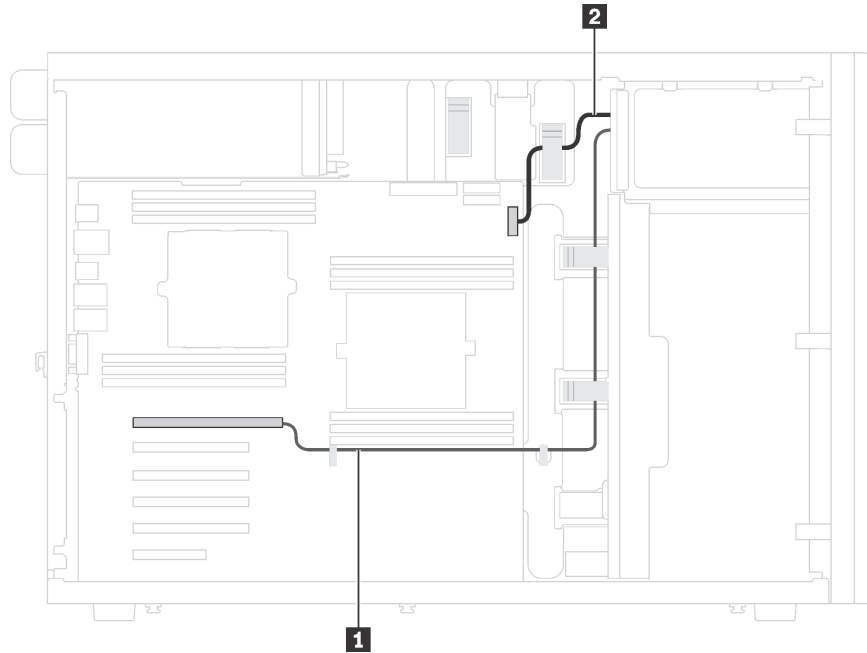


Figure 14. Cable routing for the SAS tape drive

Cable	From	To
1 Signal cable	Signal connector on the tape drive	An available connector on the RAID adapter
2 Power cable	Power connector on the tape drive	Backplane 3 power connector on the system board

USB tape drive

Note: Ensure that all cables are routed through the correct cable clips.

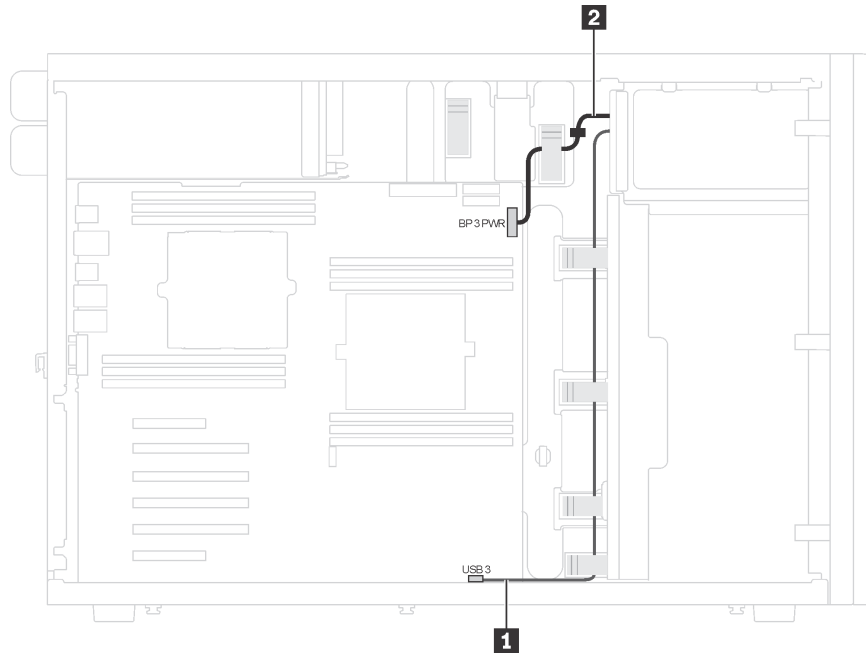


Figure 15. Cable routing for the USB tape drive

Cable	From	To
1 Signal cable	Signal connector on the tape drive	Internal USB 3.0 connector on the system board
2 Power cable	Power connector on the tape drive	Backplane 3 power connector on the system board

Power interface board

Use the section to understand the cable routing for the power interface board.

Note: Ensure that all cables are routed through the correct cable clips.

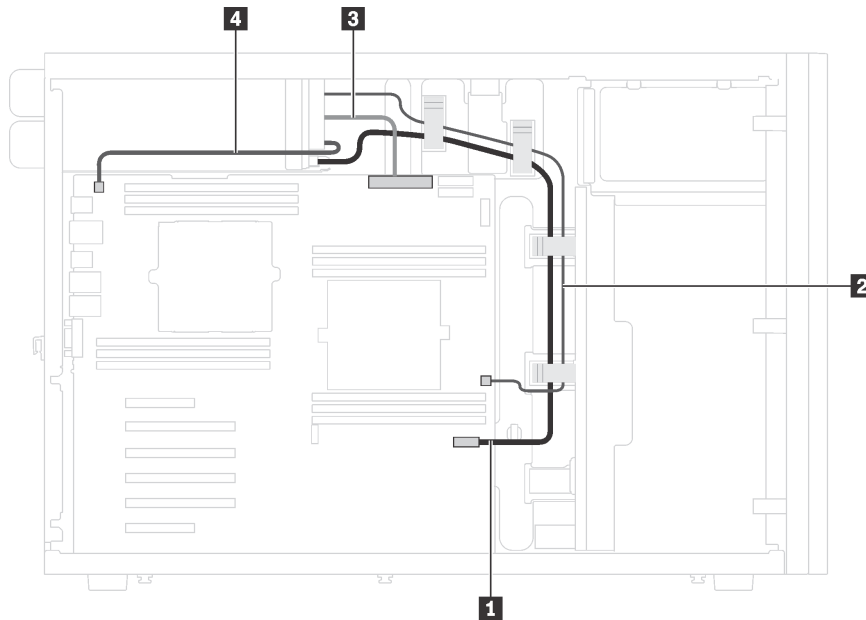


Figure 16. Cable routing for the power interface board

Cable	From	To
1 Signal cable	Signal connector on the power interface board	Power-interface-board signal connector on the system board
2 CPU 1 power cable	CPU 1 connector on the power interface board	CPU 1 power connector on the system board
3 Power cable	Main power connector on the power interface board	Main power connector on the system board
4 CPU 2 power cable	CPU 2 connector on the power interface board	CPU 2 power connector on the system board

Fixed power supply

Use the section to understand the cable routing for the fixed power supply.

Note: Ensure that all cables are routed through the correct cable clips.

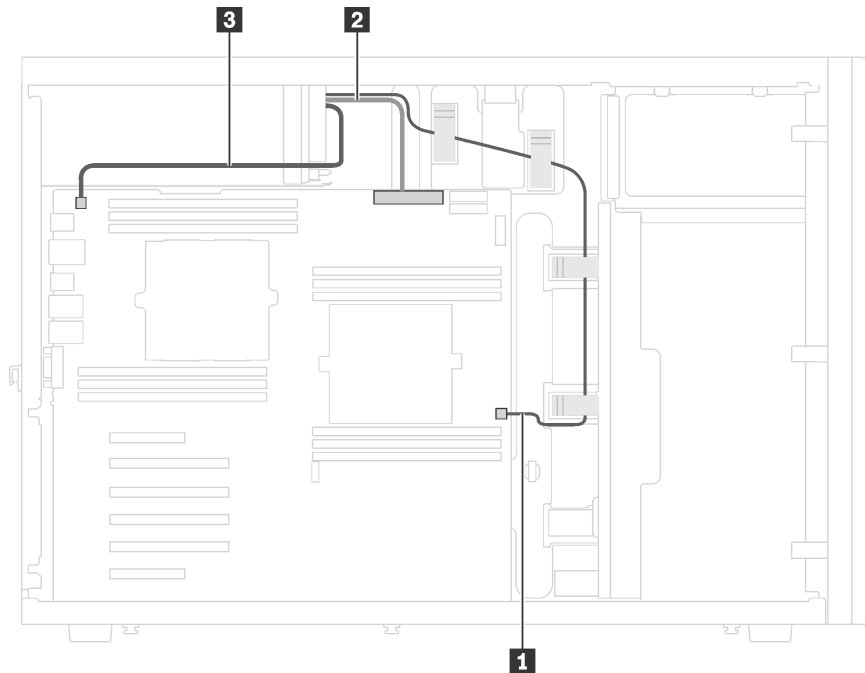


Figure 17. Cable routing for the fixed power supply

Cable	To
1 CPU 1 power cable	CPU 1 power connector on the system board
2 Main power cable	Main power connector on the system board
3 CPU 2 power cable	CPU 2 power connector on the system board

Graphics adapter

Use the section to understand the cable routing for the graphics adapters.

Note: Ensure that all cables are routed through the correct cable clips.

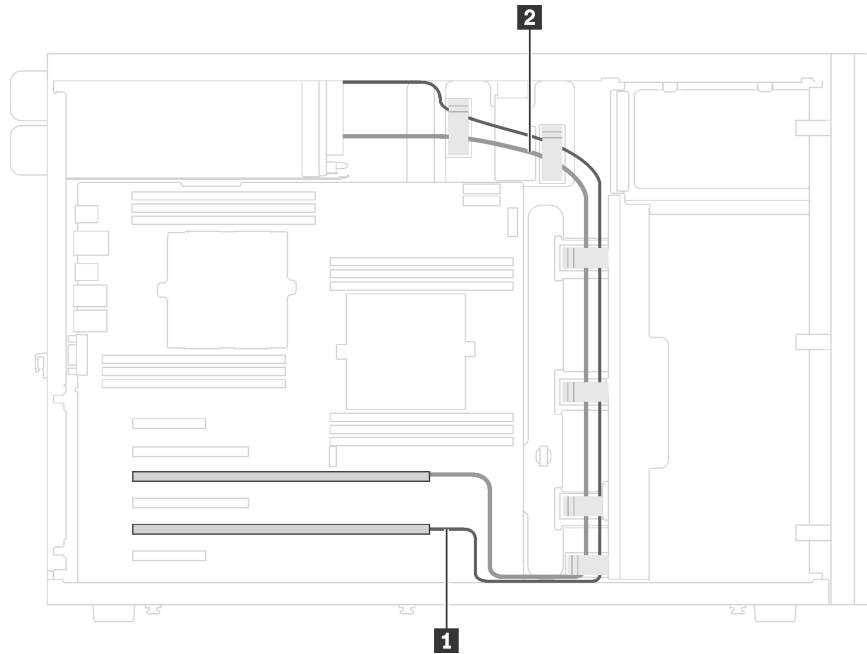


Figure 18. Cable routing for the graphics adapters

Cable	From	To
1 Power cable	Power connector on one graphics adapter	GPU 1 connector on the power interface board
2 Power cable	Power connector on another graphics adapter	GPU 2 connector on the power interface board

Simple-swap-drive backplate

Use the section to understand the cable routing for the simple-swap-drive backplate.

This topic contains the following information:

- “Server models with four 3.5-inch simple-swap drives” on page 39
- “Server models with eight 3.5-inch simple-swap drives” on page 40

Server models with four 3.5-inch simple-swap drives

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

Note: Ensure that all cables are routed through the correct cable clips.

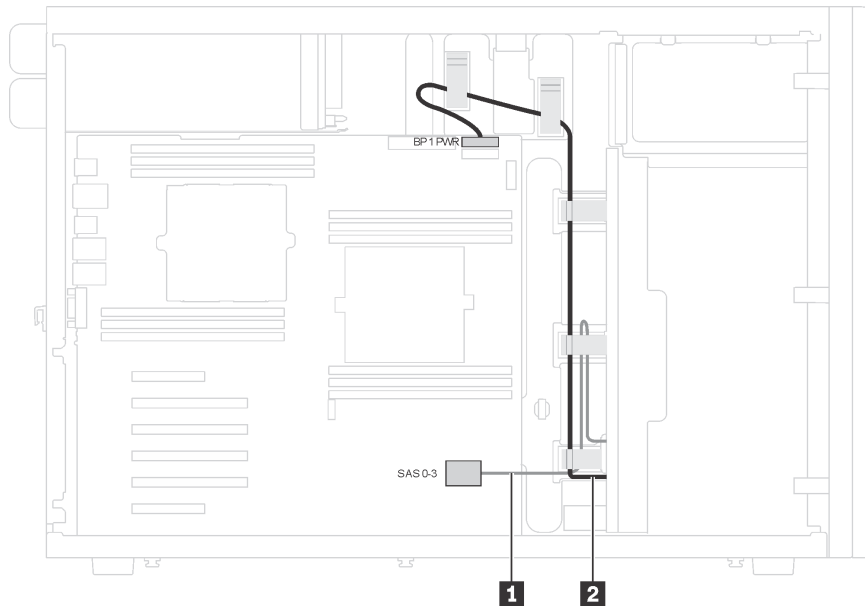


Figure 19. Cable routing for server models with four 3.5-inch simple-swap drives

Cable	To
1 Signal cable on the backplate	SAS 0–3 connector on the system board
2 Power cable on the backplate	Backplane 1 power connector on the system board

Server models with eight 3.5-inch simple-swap drives

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

Note: Ensure that all cables are routed through the correct cable clips.

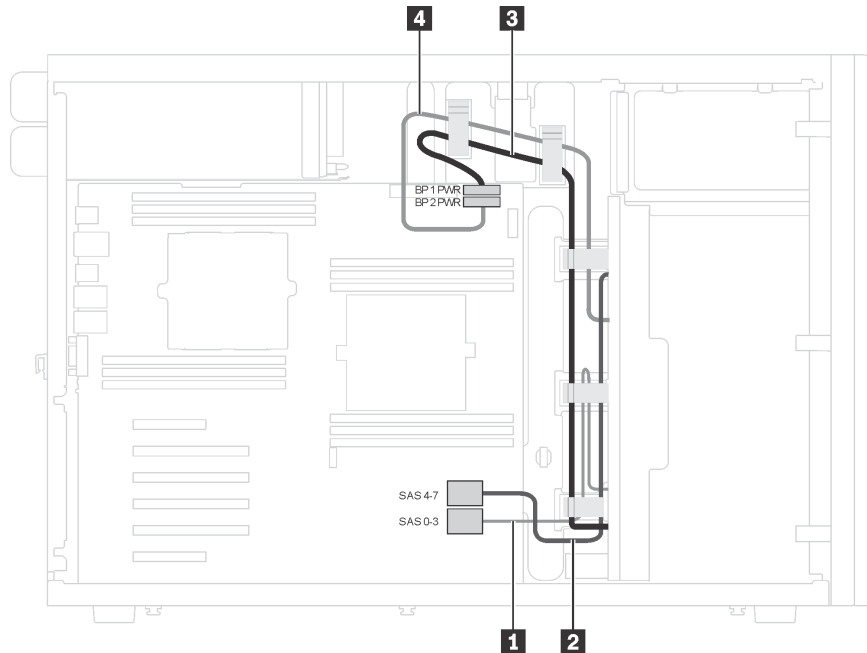


Figure 20. Cable routing for server models with eight 3.5-inch simple-swap drives

From	To
1 Signal cable on backplate 1	SAS 0–3 connector on the system board
2 Signal cable on backplate 2	SAS 4–7 connector on the system board
3 Power cable on backplate 1	Backplane 1 power connector on the system board
4 Power cable on backplate 2	Backplane 2 power connector on the system board

Hot-swap-drive backplane

Use the section to understand the cable routing for hot-swap-drive backplanes.

This topic contains the following information:

- [“Server models with eight 2.5-inch hot-swap drives” on page 42](#)
- [“Server models with sixteen 2.5-inch hot-swap drives” on page 44](#)
- [“Server models with twenty 2.5-inch hot-swap drives” on page 49](#)
- [“Server models with four 3.5-inch hot-swap drives” on page 57](#)
- [“Server models with eight 3.5-inch hot-swap drives” on page 58](#)
- [“Server models with eight 3.5-inch hot-swap drives and four 2.5-inch hot-swap drives” on page 59](#)

Before you route cables for backplanes, observe the following guidelines when select a PCIe slot:

- The NVMe adapter can be installed only in PCIe slot 2.

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

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

Server models with eight 2.5-inch hot-swap drives

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

Server model: eight 2.5-inch SAS/SATA drives, one 8i RAID adapter

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

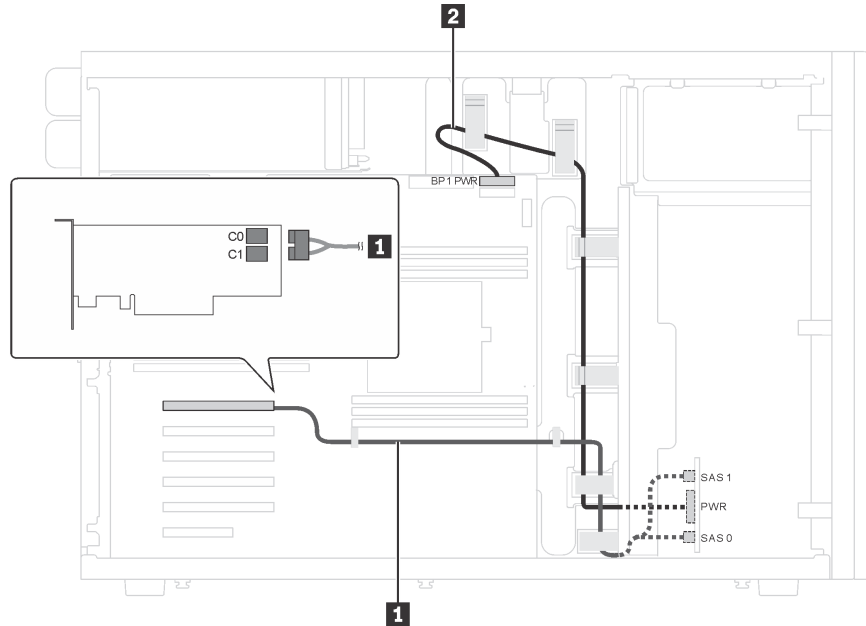


Figure 21. Cable routing for server models with eight 2.5-inch SAS/SATA drives and one 8i RAID adapter

Cable	From	To
1 SAS signal cable*	SAS 0 and SAS 1 connectors on the backplane	HBA/RAID adapter: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
2 Power cable	Power connector on the backplane	Backplane 1 power connector on the system board

Note: *When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem ST550 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

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

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

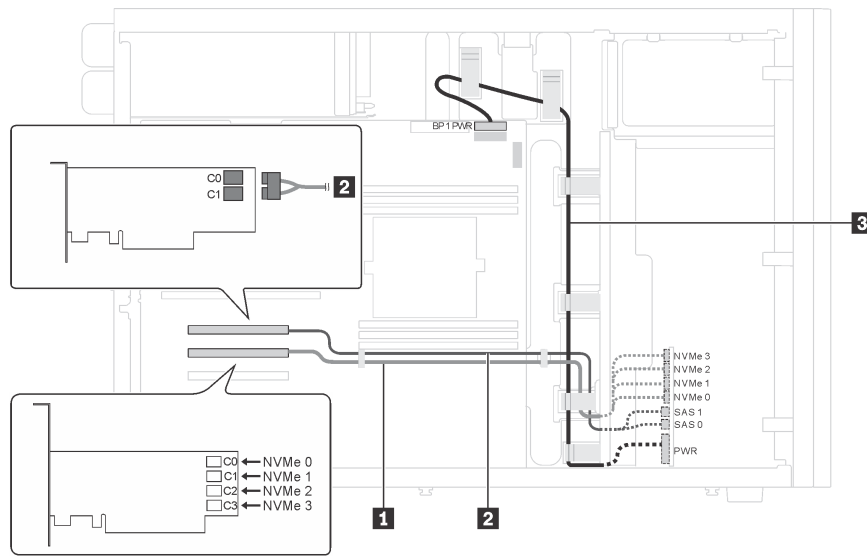


Figure 22. Cable routing for server models with four 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, one 8i RAID adapter, and one NVMe adapter

Cable	From	To
1 NVMe signal cable	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on the backplane	C0, C1, C2, and C3 connectors on the NVMe adapter
2 SAS signal cable*	SAS 0 and SAS 1 connectors on the backplane	HBA/RAID adapter: <ul style="list-style-type: none"> Gen 3: C0C1 Gen 4: C0
3 Power cable	Power connector on the backplane	Backplane 1 power connector on the system board

Note: *When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem ST550 2.5" SAS/SATA 4-Bay X40 RAID Cable Kit).

Server models with sixteen 2.5-inch hot-swap drives

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

Server model: sixteen 2.5-inch SAS/SATA drives, two 8i RAID adapters

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

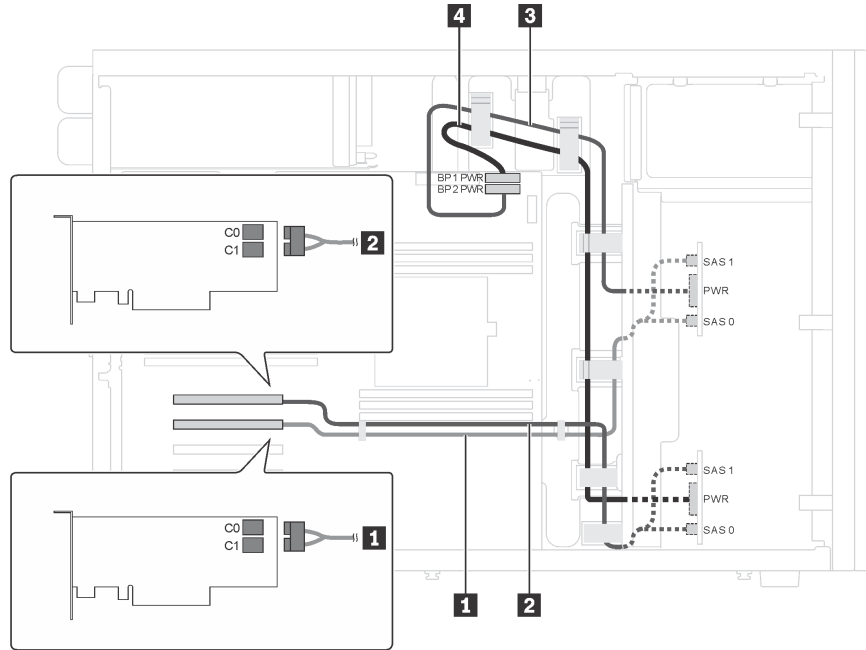


Figure 23. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives and two 8i RAID adapters

Cable	From	To
1 SAS signal cable for backplane 1*	SAS 0 and SAS 1 connectors on backplane 1	HBA/RAID adapter: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
2 SAS signal cable for backplane 2*	SAS 0 and SAS 1 connectors on backplane 2	HBA/RAID adapter: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
3 Power cable for backplane 2	Power connector on backplane 2	Backplane 2 power connector on the system board
4 Power cable for backplane 1	Power connector on backplane 1	Backplane 1 power connector on the system board

Note: *When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cables (ThinkSystem ST550 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

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

Notes:

- Ensure that all cables are routed through the correct cable clips.

- Broken lines indicate the hidden parts.

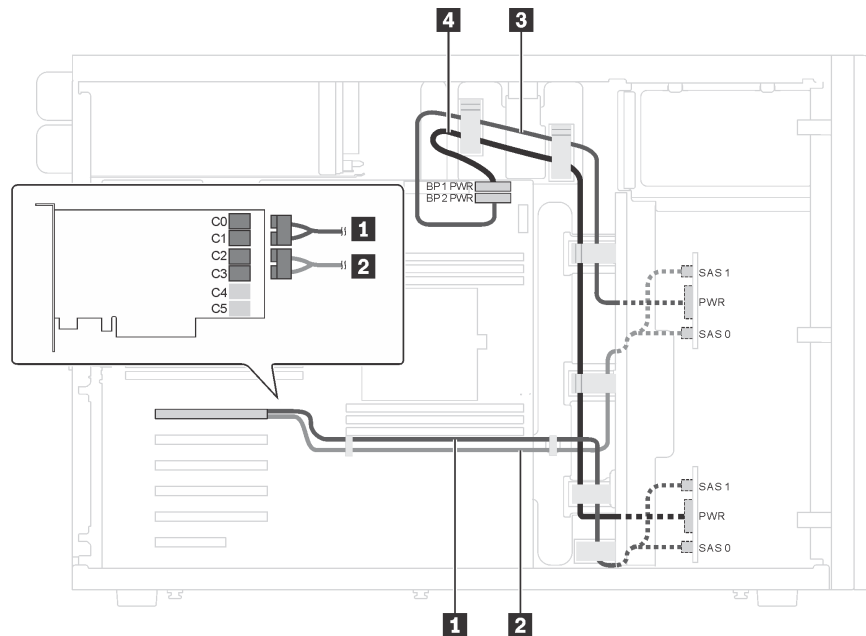


Figure 24. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives and one 24i RAID adapter

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

Server model: sixteen 2.5-inch SAS/SATA drives, one 32i RAID adapter

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

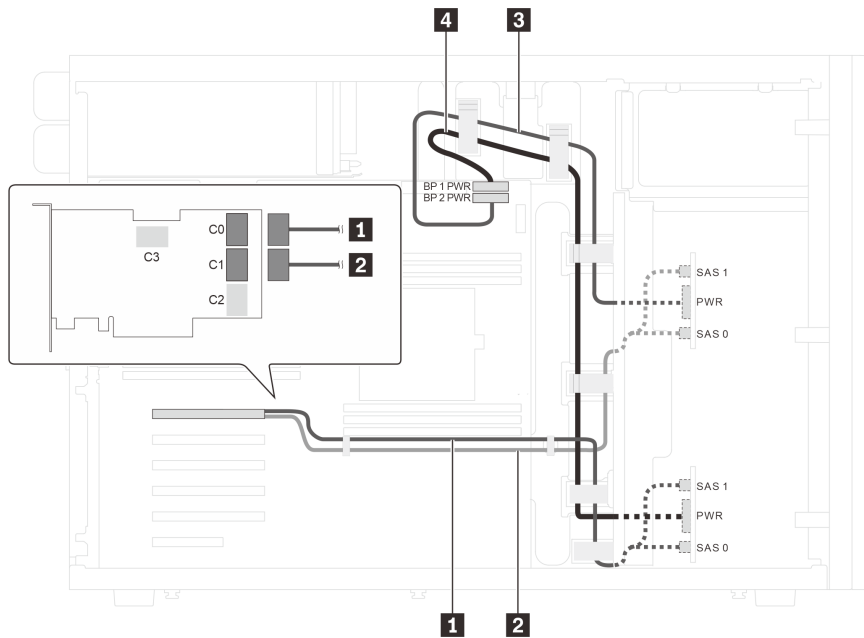


Figure 25. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives and one 32i RAID adapter

Cable	From	To
1 SAS signal cable for backplane 1*	SAS 0 and SAS 1 connectors on backplane 1	C0 connector on the 32i RAID adapter (Gen 4)
2 SAS signal cable for backplane 2*	SAS 0 and SAS 1 connectors on backplane 2	C1 connector on the 32i RAID adapter (Gen 4)
3 Power cable for backplane 2	Power connector on backplane 2	Backplane 2 power connector on the system board
4 Power cable for backplane 1	Power connector on backplane 1	Backplane 1 power connector on the system board

Note: *When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem ST550 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

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

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

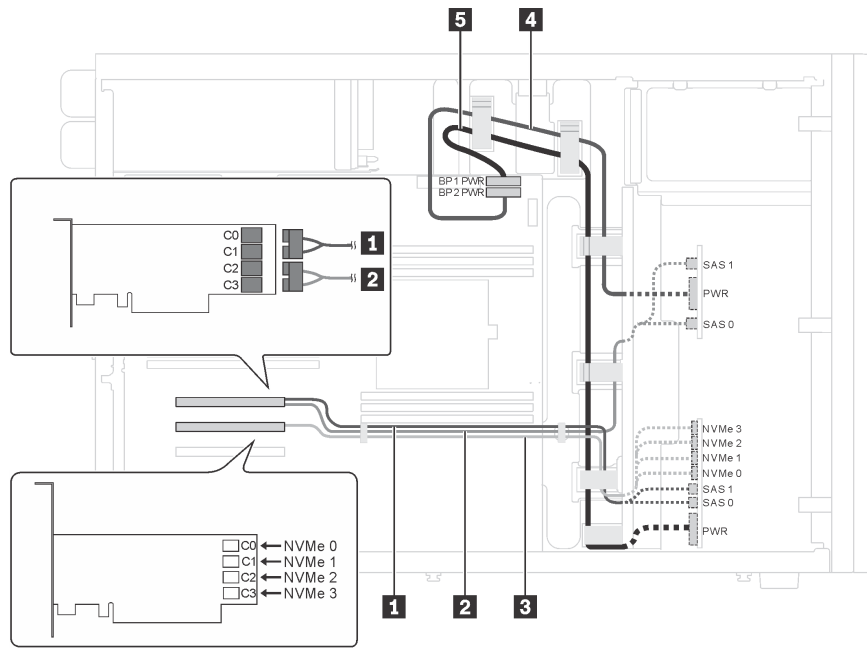


Figure 26. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, one 16i RAID adapter, and one NVMe adapter

Cable	From	To
1 SAS signal cable for backplane 1*	SAS 0 and SAS 1 connectors on backplane 1	HBA/RAID adapter: <ul style="list-style-type: none"> Gen 3: C0C1 Gen 4: C0
2 SAS signal cable for backplane 2*	SAS 0 and SAS 1 connectors on backplane 2	HBA/RAID adapter: <ul style="list-style-type: none"> Gen 3: C2C3 Gen 4: C1
3 NVMe signal cable for backplane 1	NVMe 0, NVMe 1, and NVMe 2, and NVMe 3 connectors on backplane 1	C0, C1, C2, and C3 connectors on the NVMe adapter
4 Power cable for backplane 2	Power connector on backplane 2	Backplane 2 power connector on the system board
5 Power cable for backplane 1	Power connector on backplane 1	Backplane 1 power connector on the system board

Note: *When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem ST550 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

Server model: twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, two 8i RAID adapters, one NVMe adapter

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

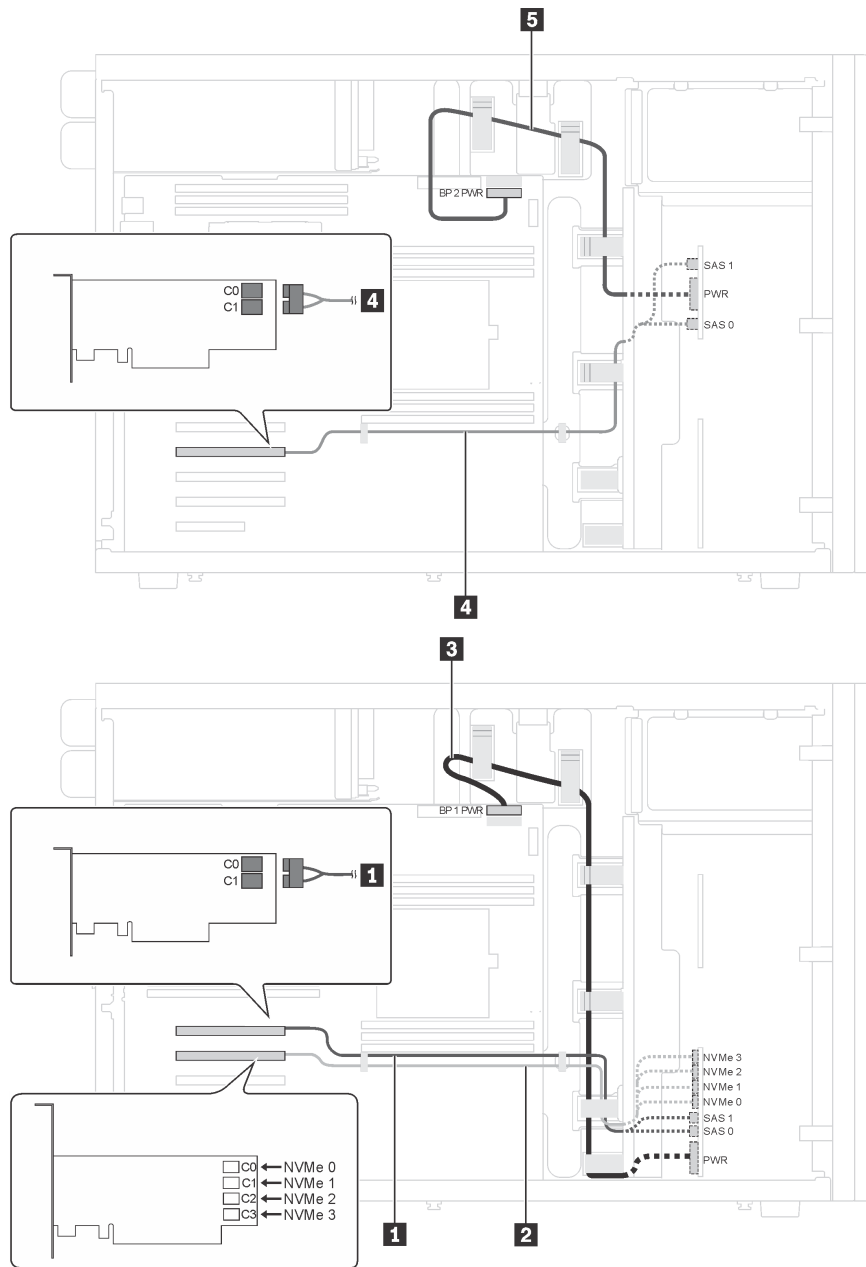


Figure 27. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, two 8i RAID adapters, and one NVMe adapter

Cable	From	To
1 SAS signal cable for backplane 1*	SAS 0 and SAS 1 connectors on backplane 1	HBA/RAID adapter: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
2 NVMe signal cable for backplane 1	NVMe 0, NVMe 1, and NVMe 2, and NVMe 3 connectors on backplane 1	C0, C1, C2, and C3 connectors on the NVMe adapter
3 Power cable for backplane 1	Power connector on backplane 1	Backplane 1 power connector on the system board

Cable	From	To
4 SAS signal cable for backplane 2*	SAS 0 and SAS 1 connectors on backplane 2	HBA/RAID adapter: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
5 Power cable for backplane 2	Power connector on backplane 2	Backplane 2 power connector on the system board

Note: *When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem ST550 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

Server models with twenty 2.5-inch hot-swap drives

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

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

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

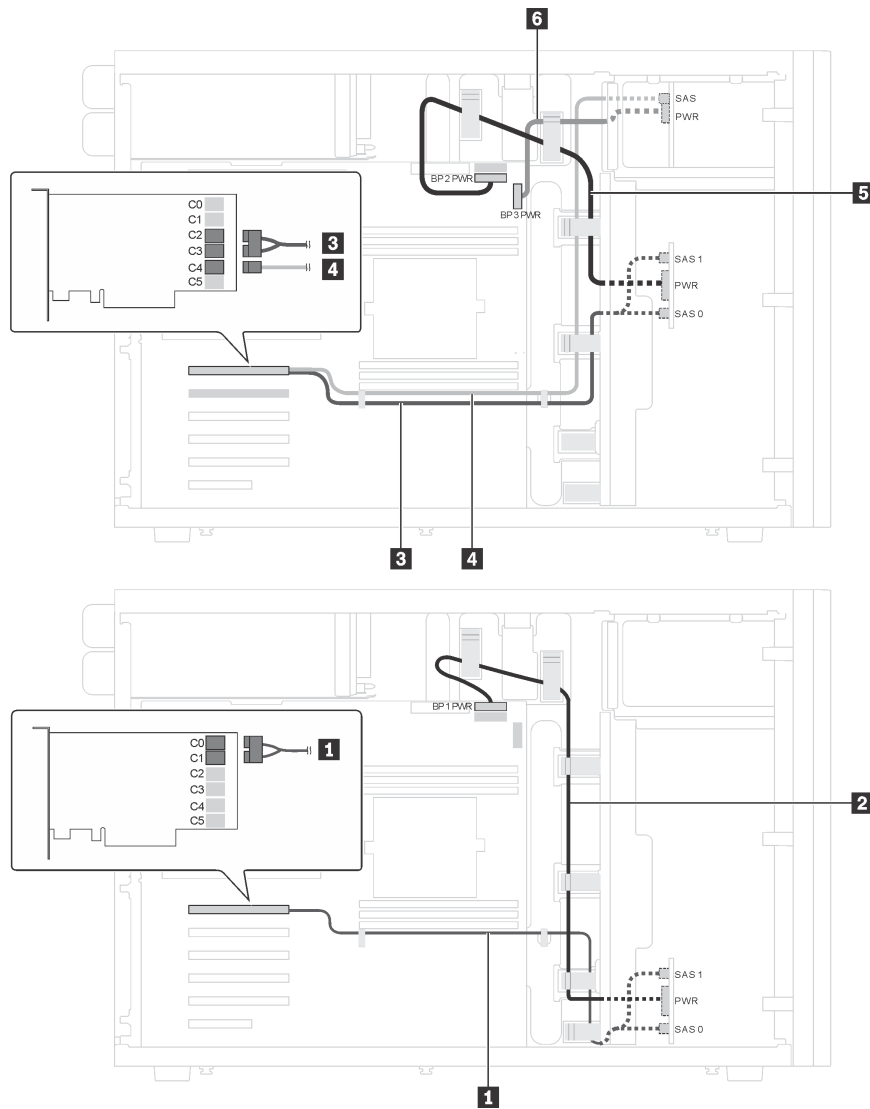


Figure 28. Cable routing for server models with twenty 2.5-inch SAS/SATA drives and one 24i RAID adapter

Cable	From	To
1 SAS signal cable for backplane 1	SAS 0 and SAS 1 connectors on backplane 1	C0 and C1 connectors on the 24i RAID adapter
2 Power cable for backplane 1	Power connector on backplane 1	Backplane 1 power connector on the system board
3 SAS signal cable for backplane 2	SAS 0 and SAS 1 connectors on backplane 2	C2 and C3 connectors on the 24i RAID adapter
4 SAS signal cable for backplane 3	SAS connector on backplane 3	C4 connector on the 24i RAID adapter
5 Power cable for backplane 2	Power connector on backplane 2	Backplane 2 power connector on the system board
6 Power cable for backplane 3	Power connector on backplane 3	Backplane 3 power connector on the system board

Server model: twenty 2.5-inch SAS/SATA drives, one 32i RAID adapter

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

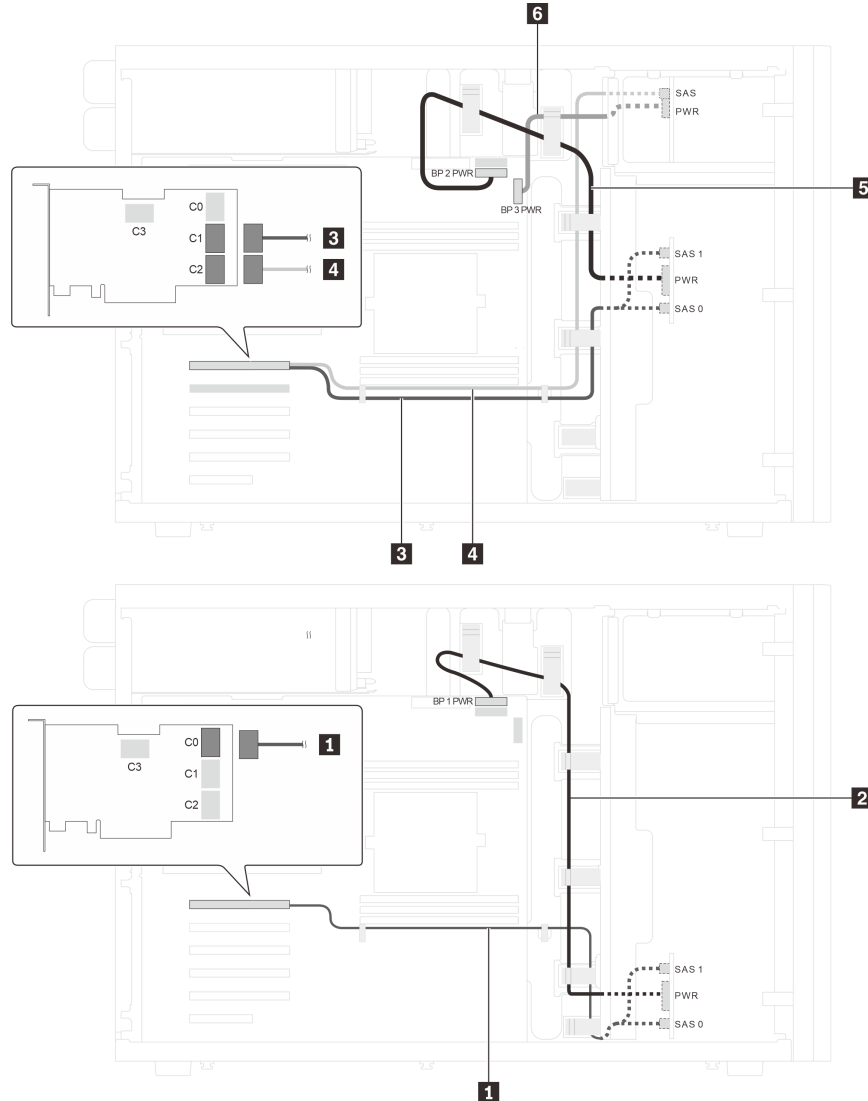


Figure 29. Cable routing for server models with twenty 2.5-inch SAS/SATA drives and one 32i RAID adapter

Cable	From	To
1 SAS signal cable for backplane 1*	SAS 0 and SAS 1 connectors on backplane 1	C0 connector on the 32i RAID adapter
2 Power cable for backplane 1	Power connector on backplane 1	Backplane 1 power connector on the system board
3 SAS signal cable for backplane 2*	SAS 0 and SAS 1 connectors on backplane 2	C1 connector on the 32i RAID adapter
4 SAS signal cable for backplane 3*	SAS connector on backplane 3	C2 connector on the 32i RAID adapter

Cable	From	To
5 Power cable for backplane 2	Power connector on backplane 2	Backplane 2 power connector on the system board
6 Power cable for backplane 3	Power connector on backplane 3	Backplane 3 power connector on the system board

Notes: *When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:

- Cables **1** and **3**: ThinkSystem ST550 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
- Cable **4**: ThinkSystem ST550 2.5" SAS/SATA 4-Bay X40 RAID Cable Kit

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

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

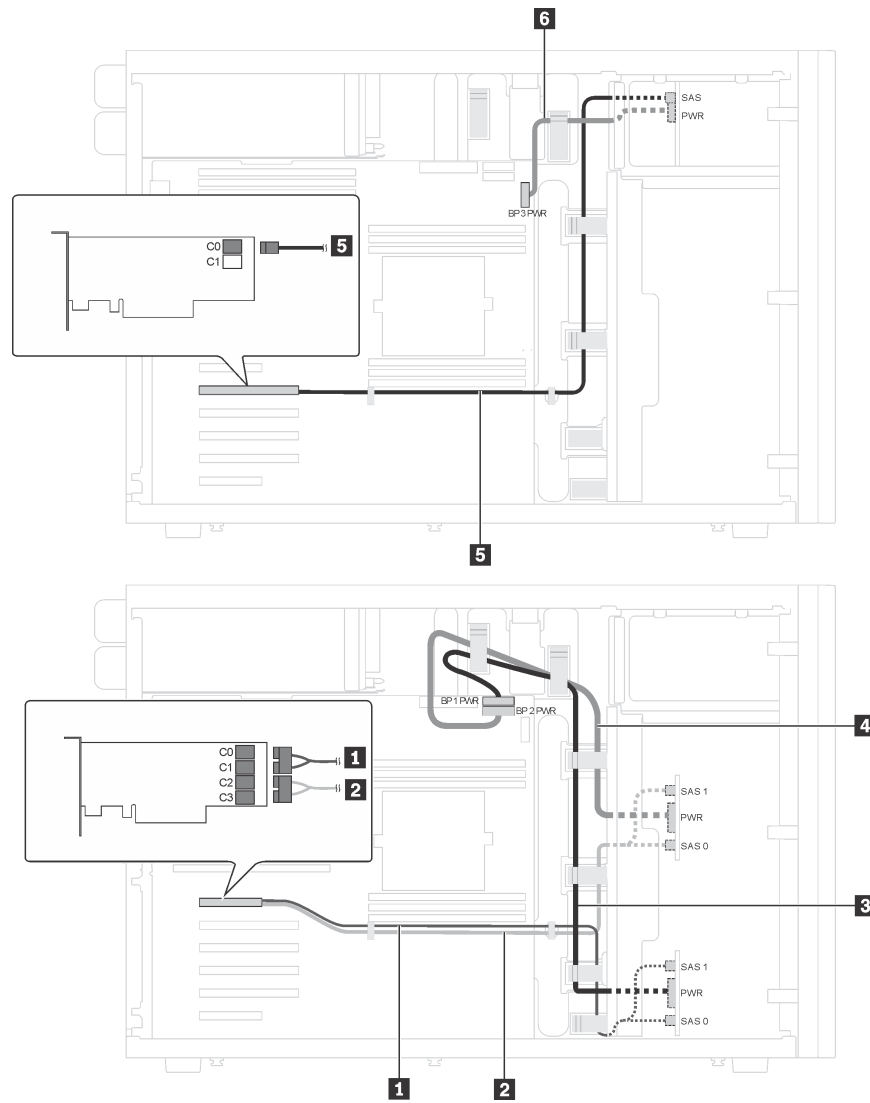


Figure 30. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, one 8i RAID adapter and one 16i RAID adapter

Cable	From	To
1 SAS signal cable for backplane 1*	SAS 0 and SAS 1 connectors on backplane 1	HBA/RAID adapter: <ul style="list-style-type: none"> • Gen 3: C0C1 • Gen 4: C0
2 SAS signal cable for backplane 2*	SAS 0 and SAS 1 connectors on backplane 2	HBA/RAID adapter: <ul style="list-style-type: none"> • Gen 3: C2C3 • Gen 4: C1
3 Power cable for backplane 1	Power connector on backplane 1	Backplane 1 power connector on the system board
4 Power cable for backplane 2	Power connector on backplane 2	Backplane 2 power connector on the system board

Cable	From	To
5 SAS signal cable for backplane 3*	SAS connector on backplane 3	HBA/RAID adapter: <ul style="list-style-type: none"> • Gen 3: C0 • Gen 4: C0
6 Power cable for backplane 3	Power connector on backplane 3	Backplane 3 power connector on the system board

Notes: *When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:

- Cables **1** and **2**: ThinkSystem ST550 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
- Cable **5**: ThinkSystem ST550 2.5" SAS/SATA 4-Bay X40 RAID Cable Kit

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

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

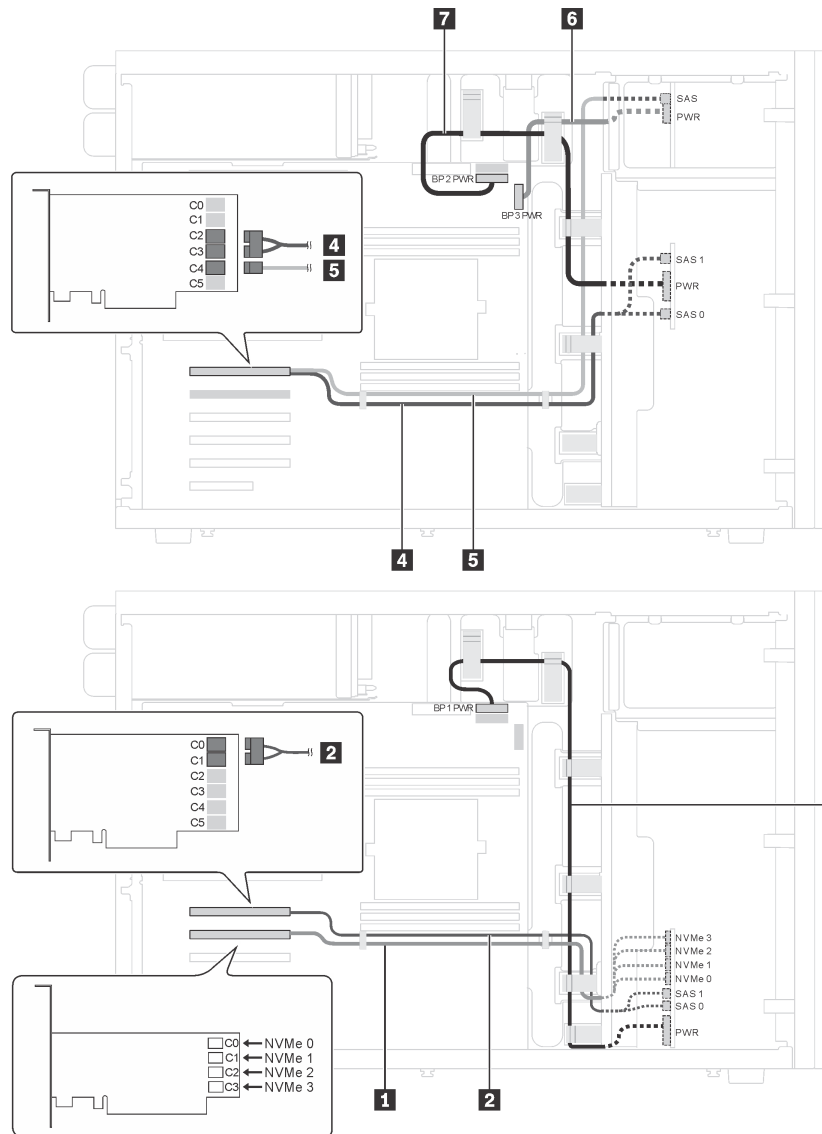


Figure 31. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, one 24i RAID adapter, and one NVMe adapter

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

Cable	From	To
6 Power cable for backplane 3	Power connector on backplane 3	Backplane 3 power connector on the system board
7 Power cable for backplane 2	Power connector on backplane 2	Backplane 2 power connector on the system board

Server model: sixteen 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, one 32i RAID adapter, one NVMe adapter

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

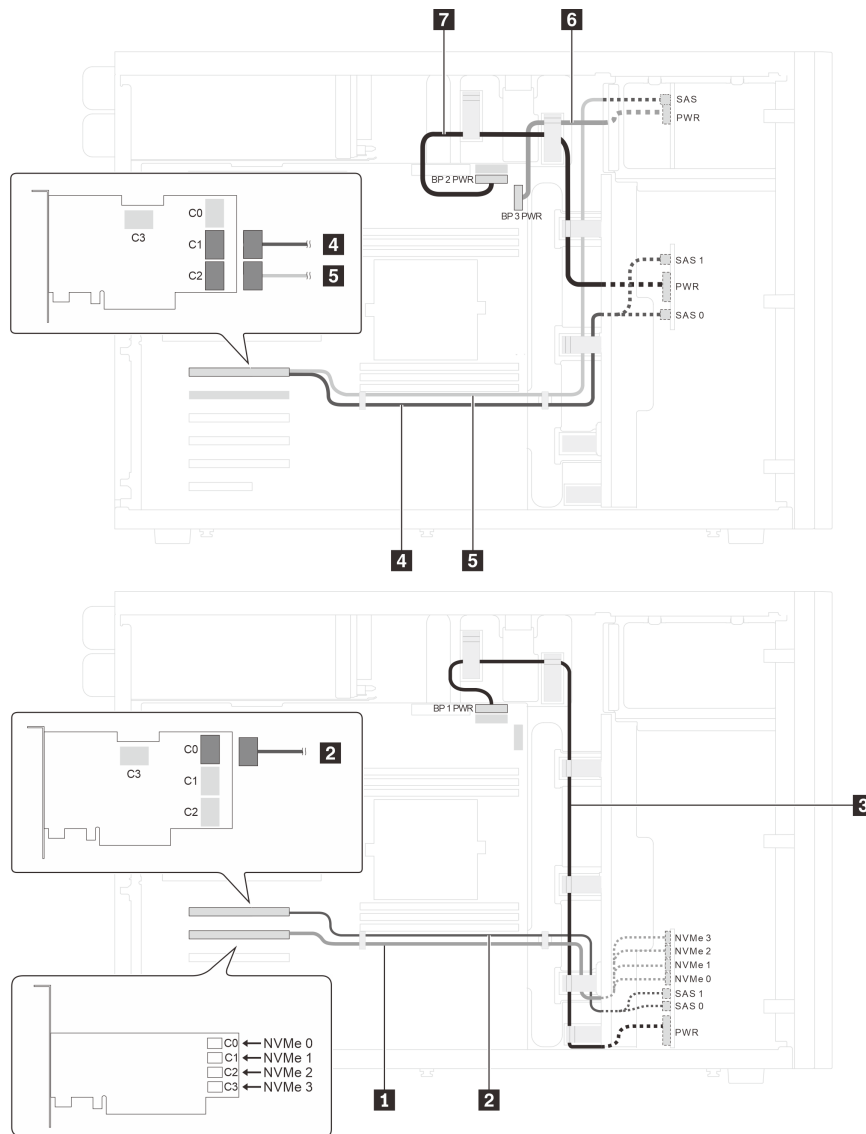


Figure 32. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, one 32i RAID adapter, and one NVMe adapter

Cable	From	To
1 NVMe signal cable for backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on backplane 1	C0, C1, C2, and C3 connectors on the NVMe adapter
2 SAS signal cable for backplane 1*	SAS 0 and SAS 1 connectors on backplane 1	HBA/RAID adapter: • Gen 4: C0
3 Power cable for backplane 1	Power connector on backplane 1	Backplane 1 power connector on the system board
4 SAS signal cable for backplane 2*	SAS 0 and SAS 1 connectors on backplane 2	HBA/RAID adapter: • Gen 4: C1
5 SAS signal cable for backplane 3*	SAS connector on backplane 3	HBA/RAID adapter: • Gen 4: C2
6 Power cable for backplane 3	Power connector on backplane 3	Backplane 3 power connector on the system board
7 Power cable for backplane 2	Power connector on backplane 2	Backplane 2 power connector on the system board

Notes: *When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:

- Cables **2** and **4**: ThinkSystem ST550 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
- Cable **5**: ThinkSystem ST550 2.5" SAS/SATA 4-Bay X40 RAID Cable Kit

Server models with four 3.5-inch hot-swap drives

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

Server model: four 3.5-inch SAS/SATA drives, one 8i RAID adapter

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

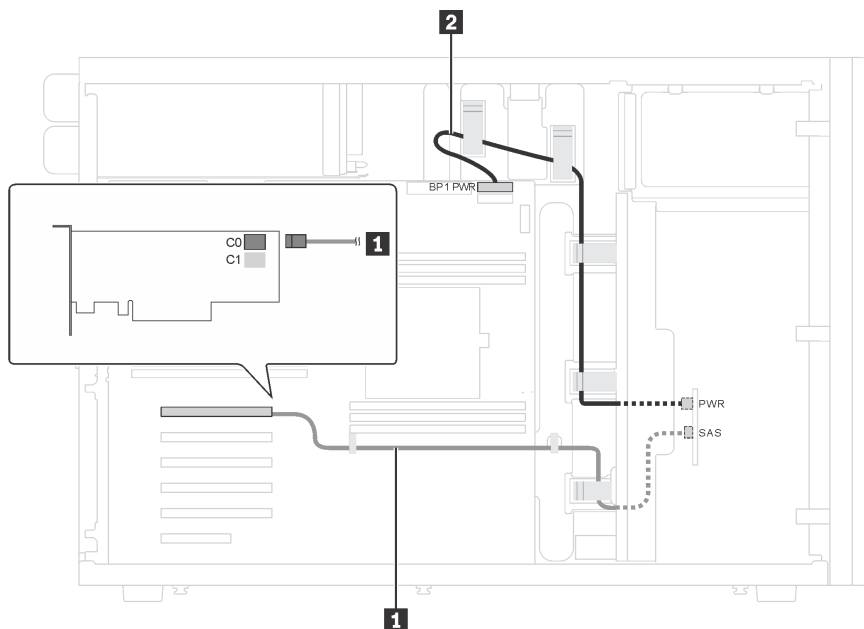


Figure 33. Cable routing for server models with four 3.5-inch SAS/SATA drives and one 8i RAID adapter

Cable	From	To
1 SAS signal cable*	SAS connector on the backplane	HBA/RAID adapter: <ul style="list-style-type: none"> • Gen 3: C0 • Gen 4: C0
2 Power cable	Power connector on the backplane	Backplane 1 power connector on the system board

Note: *When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem ST550 3.5" SAS/SATA 4-Bay X40 RAID Cable Kit).

Server models with eight 3.5-inch hot-swap drives

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

Server model: eight 3.5-inch SAS/SATA drives, one 8i RAID adapter

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

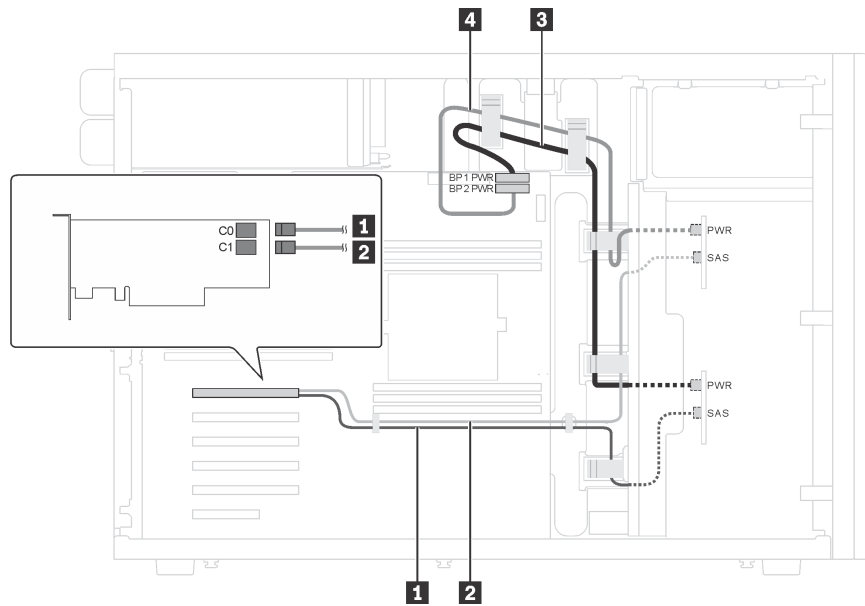


Figure 34. Cable routing for server models with eight 3.5-inch SAS/SATA drives and one 8i RAID adapter

Cable	From	To
1 SAS signal cable for backplane 1*	SAS connector on backplane 1	HBA/RAID adapter: <ul style="list-style-type: none"> • Gen 3: C0 • Gen 4: C0
2 SAS signal cable for backplane 2*	SAS connector on backplane 2	HBA/RAID adapter: <ul style="list-style-type: none"> • Gen 3: C1 • Gen 4: C0
3 Power cable for backplane 1	Power connector on backplane 1	Backplane 1 power connector on the system board
4 Power cable for backplane 2	Power connector on backplane 2	Backplane 2 power connector on the system board

Note: *When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem ST550 3.5" SAS/SATA 4-Bay X40 RAID Cable Kit). Cable **1** and cable **2** are combined into one cable for Gen 4.

Server models with eight 3.5-inch hot-swap drives and four 2.5-inch hot-swap drives

Use this section to understand the cable routing for server models with eight 3.5-inch hot-swap SAS/SATA drives and four 2.5-inch hot-swap SAS/SATA drives.

Server model: eight 3.5-inch hot-swap SAS/SATA drives, four 2.5-inch hot-swap SAS/SATA drives, two 8i RAID adapters

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

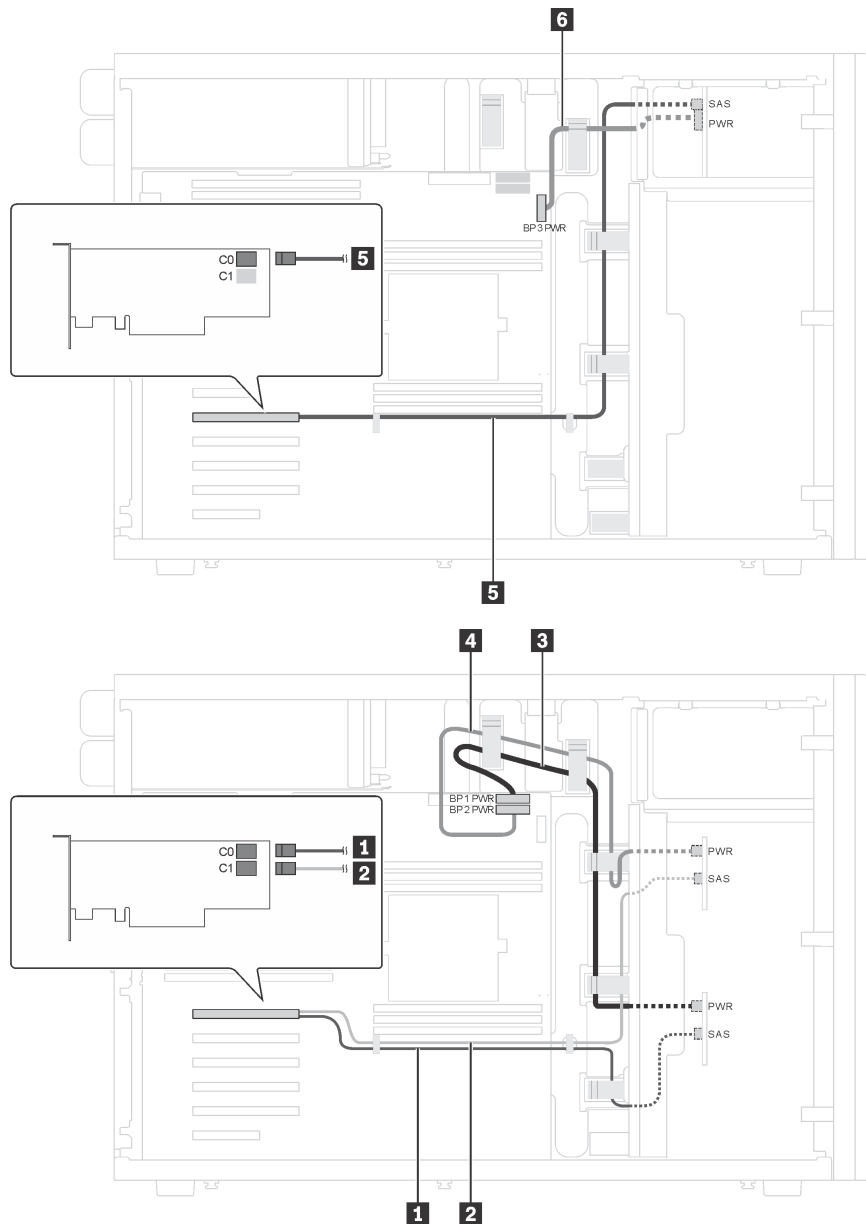


Figure 35. Cable routing for server models with eight 3.5-inch hot-swap SAS/SATA drives, four 2.5-inch hot-swap SAS/SATA drives, and two 8i RAID adapters

Cable	From	To
1 SAS signal cable for backplane 1*	SAS connector on backplane 1	HBA/RAID adapter: <ul style="list-style-type: none"> • Gen 3: C0 • Gen 4: C0
2 SAS signal cable for backplane 2*	SAS connector on backplane 2	HBA/RAID adapter: <ul style="list-style-type: none"> • Gen 3: C1 • Gen 4: C0
3 Power cable for backplane 1	Power connector on backplane 1	Backplane 1 power connector on the system board

Cable	From	To
4 Power cable for backplane 2	Power connector on backplane 2	Backplane 2 power connector on the system board
5 SAS signal cable for backplane 3*	SAS connector on backplane 3	HBA/RAID adapter: <ul style="list-style-type: none"> • Gen 3: C0 • Gen 4: C0
6 Power cable for backplane 3	Power connector on backplane 3	Backplane 3 power connector on the system board

Notes: *When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cables:

- Cable **1** and cable **2** are combined into one cable for Gen 4 (ThinkSystem ST550 3.5" SAS/SATA 4-Bay X40 RAID Cable Kit).
- Cable **3**: ThinkSystem ST550 2.5" SAS/SATA 4-Bay X40 RAID Cable Kit

Server model: eight 3.5-inch hot-swap SAS/SATA drives, four 2.5-inch hot-swap SAS/SATA drives, one 24i RAID adapter

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

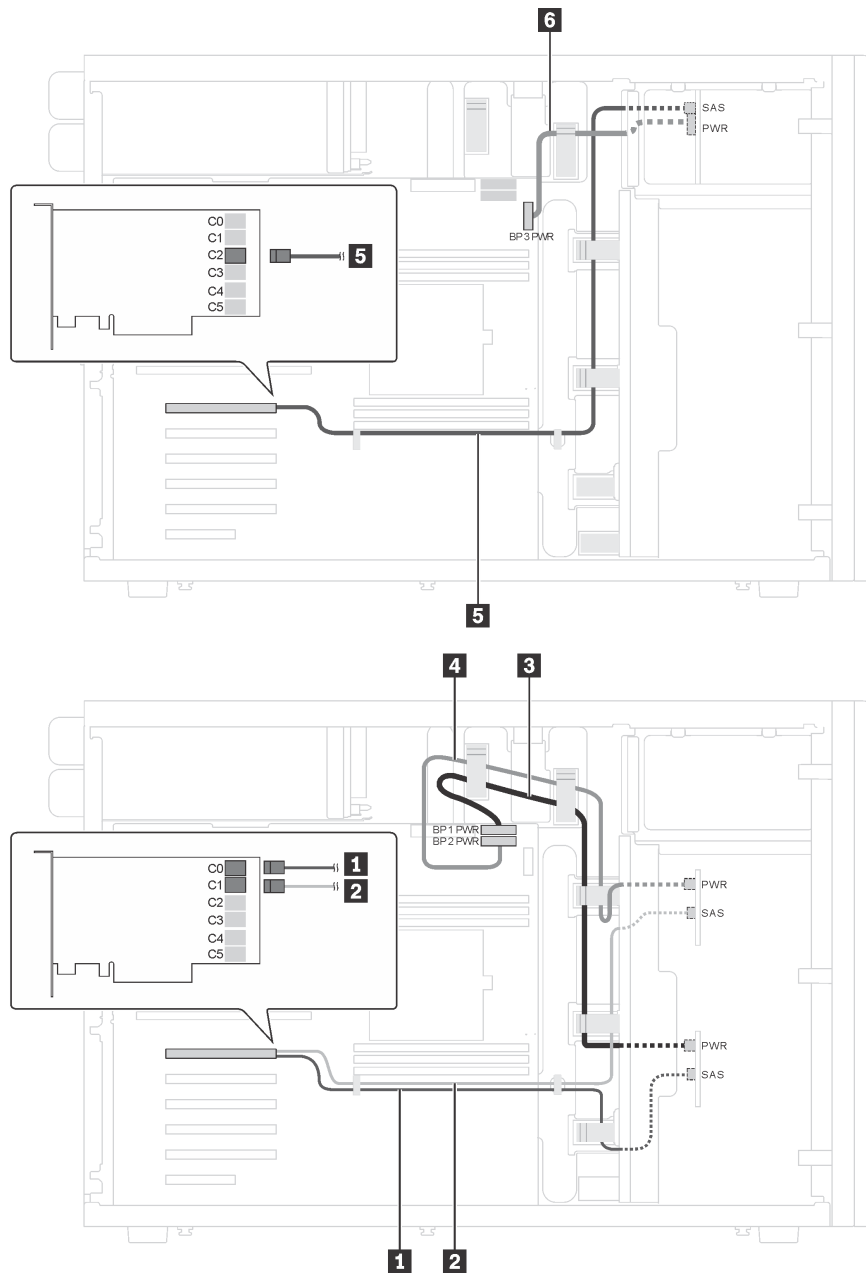


Figure 36. Cable routing for server models with eight 3.5-inch hot-swap SAS/SATA drives, four 2.5-inch hot-swap SAS/SATA drives, and one 24i RAID adapter

Cable	From	To
1 SAS signal cable for backplane 1	SAS connector on backplane 1	C0 connector on the 24i RAID adapter
2 SAS signal cable for backplane 2	SAS connector on backplane 2	C1 connector on the 24i RAID adapter
3 Power cable for backplane 1	Power connector on backplane 1	Backplane 1 power connector on the system board
4 Power cable for backplane 2	Power connector on backplane 2	Backplane 2 power connector on the system board

Cable	From	To
5 SAS signal cable for backplane 3	SAS connector on backplane 3	C2 connector on the 24i RAID adapter
6 Power cable for backplane 3	Power connector on backplane 3	Backplane 3 power connector on the system board

Server model: eight 3.5-inch hot-swap SAS/SATA drives, four 2.5-inch hot-swap SAS/SATA drives, one 32i RAID adapter

Notes:

- Ensure that all cables are routed through the correct cable clips.
- Broken lines indicate the hidden parts.

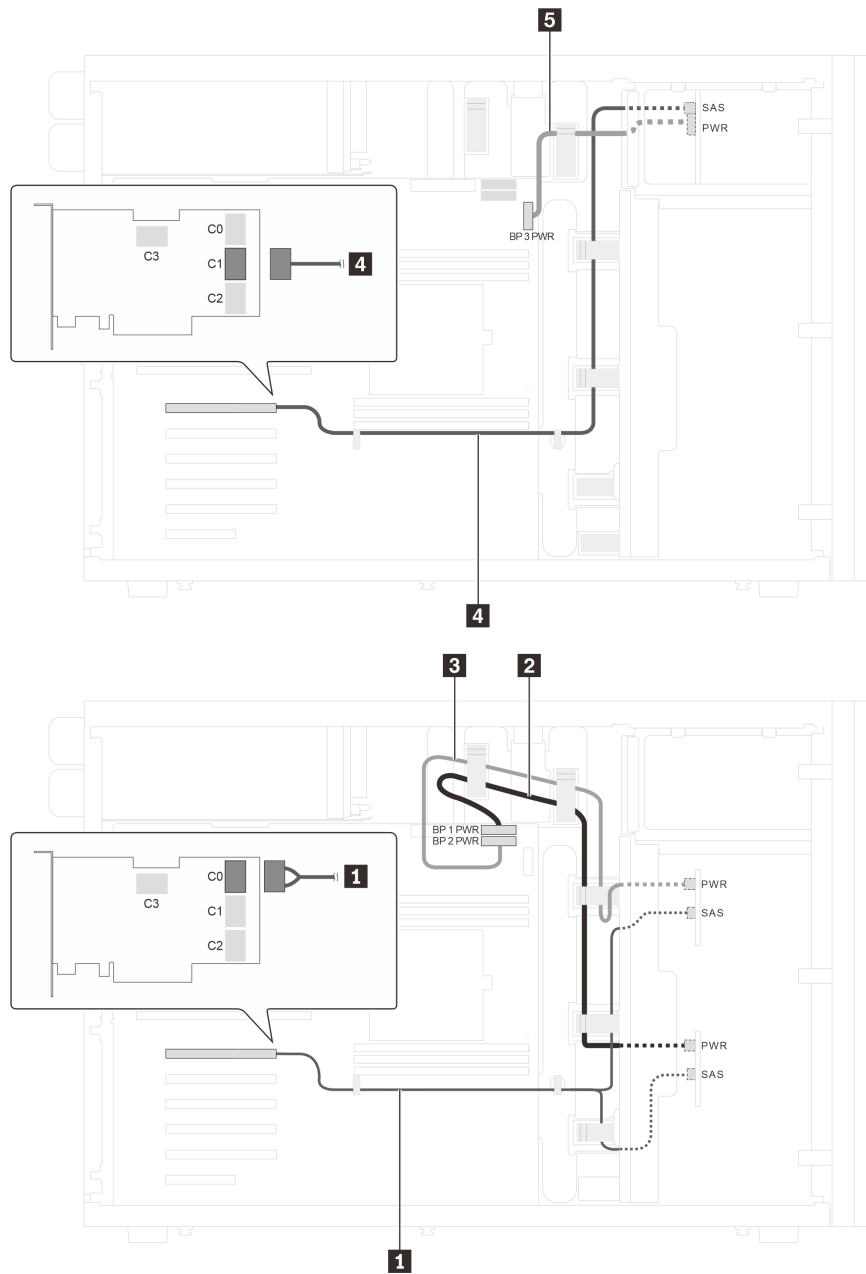


Figure 37. Cable routing for server models with eight 3.5-inch hot-swap SAS/SATA drives, four 2.5-inch hot-swap SAS/SATA drives, and one 32i RAID adapter

Cable	From	To
1 SAS signal cable for backplane 1 and 2*	SAS connectors on backplane 1 and 2	C0 connector on the 32i RAID adapter (Gen 4)
2 Power cable for backplane 1	Power connector on backplane 1	Backplane 1 power connector on the system board
3 Power cable for backplane 2	Power connector on backplane 2	Backplane 2 power connector on the system board

Cable	From	To
4 SAS signal cable for backplane 3*	SAS connector on backplane 3	C1 connector on the 32i RAID adapter (Gen 4)
5 Power cable for backplane 3	Power connector on backplane 3	Backplane 3 power connector on the system board

Notes: *When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cables:

- Cable 1: ThinkSystem ST550 3.5" SAS/SATA 4-Bay X40 RAID Cable Kit
- Cable 4: ThinkSystem ST550 2.5" SAS/SATA 4-Bay X40 RAID Cable Kit

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 38 “Server components” on page 66](#):

<http://datacentersupport.lenovo.com/us/en/products/servers/thinksystem/st550/7x09/parts>

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

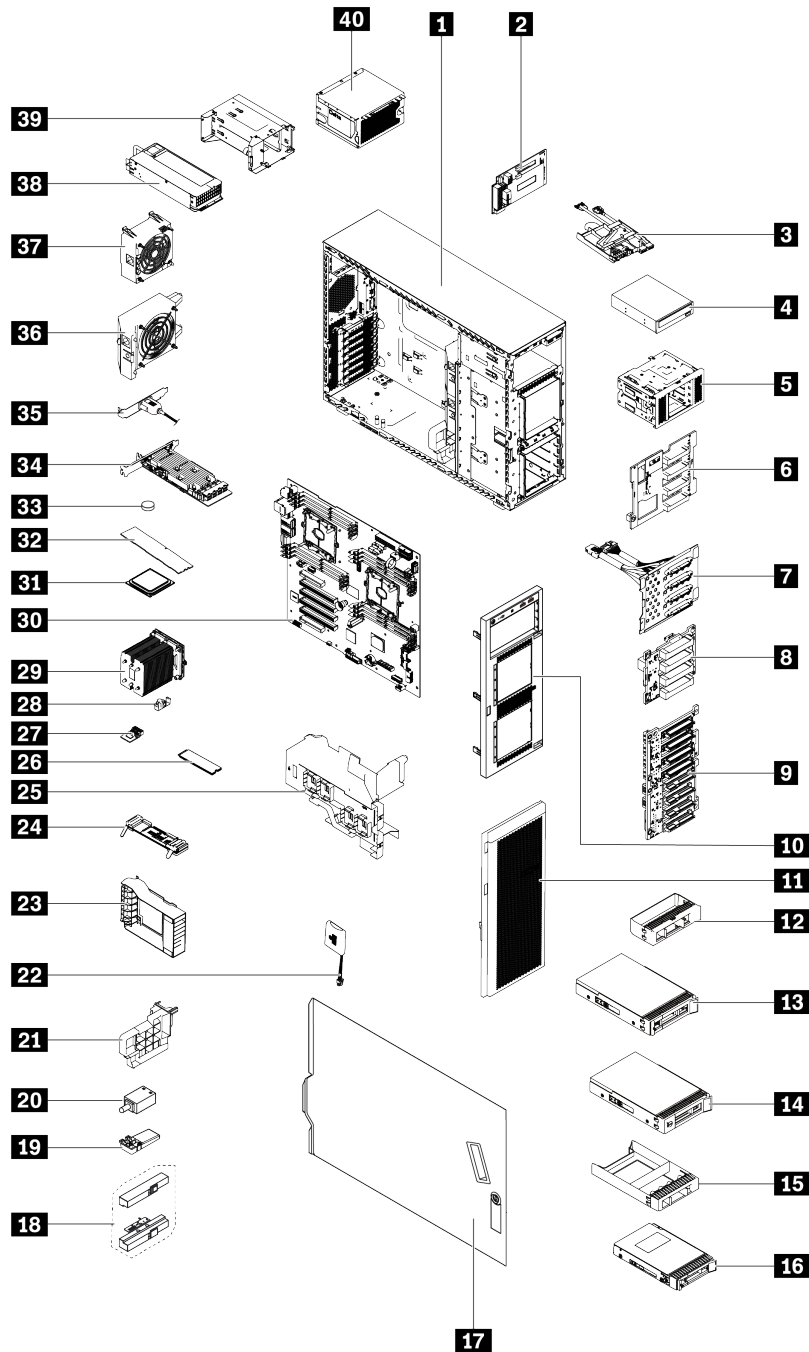


Figure 38. Server components

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 10. 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 38 “Server components” on page 66: http://datacentersupport.lenovo.com/us/en/products/servers/thinksystem/st550/7x09/parts					
1	Chassis			√	
2	Power interface board	√			
3	Front panel		√		
4	Optical drive / tape drive	√			
5	Expansion drive cage				√
6	Backplane, four 3.5-inch hot-swap drives	√			
7	Backplate, four 3.5-inch simple-swap drives	√			
8	Backplane, four 2.5-inch hot-swap drives	√			
9	Backplane, eight 2.5-inch hot-swap drives	√			
10	Front bezel				√
11	Front door				√
12	Filler, 3.5-inch storage drive				√
13	Storage drive, 3.5-inch, hot-swap	√			
14	Storage drive, 3.5-inch, simple-swap	√			
15	Filler, 2.5-inch storage drive				√
16	Storage drive, 2.5-inch, hot-swap	√			
17	Server cover				√
18	Rack latches				√
19	Foot stand				√
20	Intrusion switch	√			
21	PCIe adapter holder				√
22	RAID super capacitor module	√			
23	PCIe adapter retainer				√
24	M.2 backplane	√			
25	Air baffle				√

Table 10. Parts listing (continued)

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and Structural parts
26	M.2 drive	√			
27	TCM/TPM adapter (only available in Chinese Mainland)			√	
28	M.2 retainer clip	√			
29	Heat sink			√	
30	System board			√	
31	CPU			√	
32	DIMM	√			
33	CMOS battery (CR2032)				√
34	PCIe adapter	√			
35	Serial port module	√			
36	Front fan	√			
37	Rear fan	√			
38	Hot-swap power supply	√			
39	Hot-swap power supply cage				√
40	Fixed power supply	√			

Power cords

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

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

1. Go to:

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

2. Click **Preconfigured Model** or **Configure to order**.

3. Enter the machine type and model for your server to display the configurator page.

4. Click **Power** → **Power Cables** to see all line cords.

Notes:

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

Chapter 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/st550/7x09/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 11.

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
 - “[Handling static-sensitive devices](#)” on page 74
- Make sure the components you are installing are supported by the server. For a list of supported optional components for the server, see <https://static.lenovo.com/us/en/serverproven/index.shtml>.
- When you install a new server, download and apply the latest firmware. This will help ensure that any known issues are addressed, and that your server is ready to work with optimal performance. Go to [ThinkSystem ST550 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.
- You do not have to turn off the server to remove or install hot-swap power supplies 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 DIMM.
- Blue on a component indicates touch points, where you can grip to remove a component from or install it in the server, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped if the server and operating system support hot-swap capability, which means that you can remove or install the component while the server is still running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- The Red strip on the drives, adjacent to the release latch, indicates that the drive can be hot-swapped if the server and operating system support hot-swap capability. This means that you can remove or install the drive while the server is still running.

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

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

Safety inspection checklist

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

Notes:

1. The product is not suitable for use at visual display workplaces according to §2 of the Workplace Regulations.
2. The set-up of the server is made in the server room only.

CAUTION:

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

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

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

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

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

- a. Go to:
<http://dcsc.lenovo.com/#/>
 - b. 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.

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 drive must be replaced within two minutes after removal.
- A removed hot-swap power supply must be replaced within two minutes after removal.
- Every air baffle that comes with the server must be installed when the server starts (some servers might come with more than one air baffle). Operating the server with a missing air baffle might damage the processor.
- All processor sockets must contain either a socket cover or a processor with heat sink.
- When more than one processor is installed, fan population rules for each server must be strictly followed.

Working inside the server with the power on

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

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

- Avoid loose-fitting clothing, particularly around your forearms. Button or roll up long sleeves before working inside the server.

- Prevent your necktie, scarf, badge rope, or hair from dangling into the server.
- Remove jewelry, such as bracelets, necklaces, rings, cuff links, and wrist watches.
- Remove items from your shirt pocket, such as pens and pencils, in case they fall into the server as you lean over it.
- Avoid dropping any metallic objects, such as paper clips, hairpins, and screws, into the server.

Handling static-sensitive devices

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

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

- Limit your movement to prevent building up static electricity around you.
- Take additional care when handling devices during cold weather, for heating would reduce indoor humidity and increase static electricity.
- Always use an electrostatic-discharge wrist strap or other grounding system.
- 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.

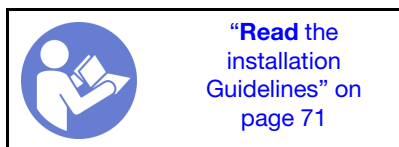
Front door replacement

Use this information to remove and install the front door.

Note: This section applies only to server models that have a front door installed.

Remove the front door

Use this information to remove the front door.



To remove the front door, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

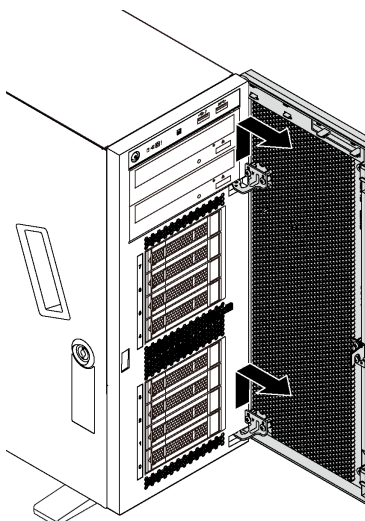


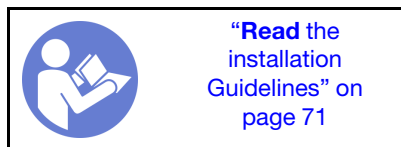
Figure 39. Front door removal

Step 1. Open the front door.

Step 2. Lift the front door slightly upward until you can completely remove it.

Install the front door

Use this information to install the front door.



Before installing the front door, if the server comes with rubber blocks to cover the holes for installing the front door, remove the rubber blocks first. Store the rubber blocks in case that you later remove the front door and need the rubber blocks to cover the holes in the front bezel.

To install the front door, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

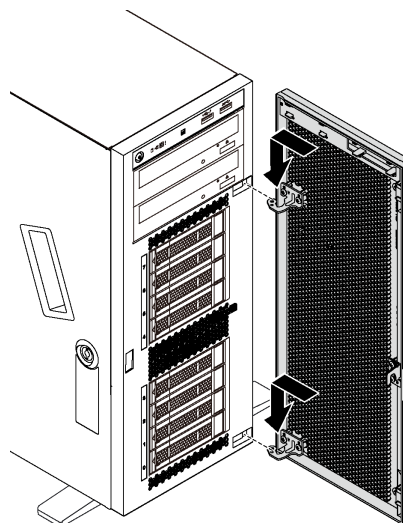


Figure 40. Front door installation

- Step 1. Align the two hooks on the front door with the corresponding holes in the front bezel. Then, move the front door inward and then pull it slightly downward until it is secured in place by the hooks.
- Step 2. Close the front door.

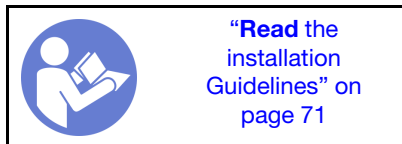
Foot stands replacement

Use this information to remove and install the foot stands.

Note: This section applies only to server models that have foot stands installed.

Remove the foot stands

Use this information to remove the foot stands.



To remove the foot stands, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

- Step 1. Lay the server on its side for easier operation.

Step 2. For each foot stand, press the release tab and then pivot the foot stand outward to remove it from the chassis.

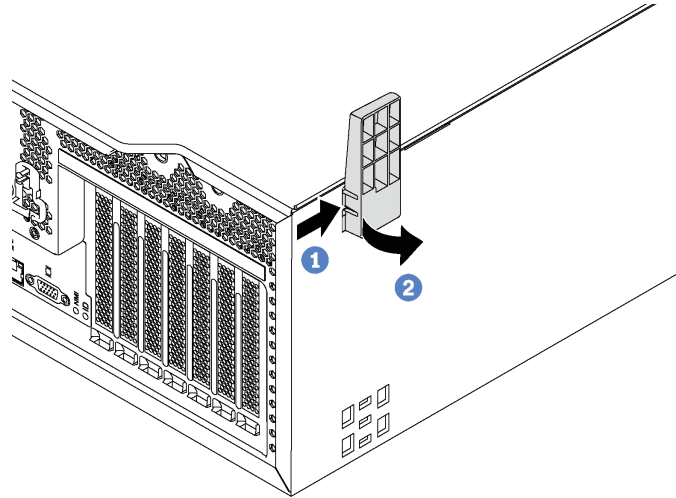


Figure 41. Foot stand removal

Install the foot stands

Use this information to install the foot stands.



To install the foot stands, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

Step 1. Lay the server on its side for easier operation.

Step 2. For each foot stand, carefully insert the two tabs on the foot stand into the corresponding holes in the chassis. Then, pivot the foot stand inward until the other side clicks into place.

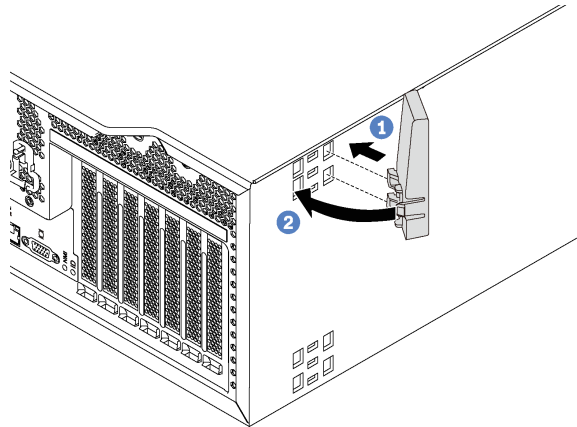


Figure 42. Foot stand installation

Important: To help the server stand steadily, ensure that the foot stands are installed outward as shown in “[Front view](#)” on page 17.

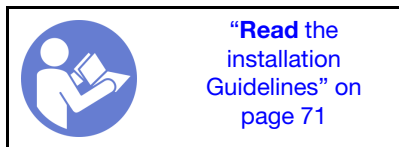
Rack latch replacement

Use this information to remove and install a rack latch of the server in rack form factor.

Note: This section applies only to server models that have the rack latches installed.

Remove a rack latch

Use this information to remove a rack latch.



Before removing a rack latch, if the server is installed in a rack, remove the server from the rack and place it on a stable work surface.

To remove a rack latch, complete the following steps:

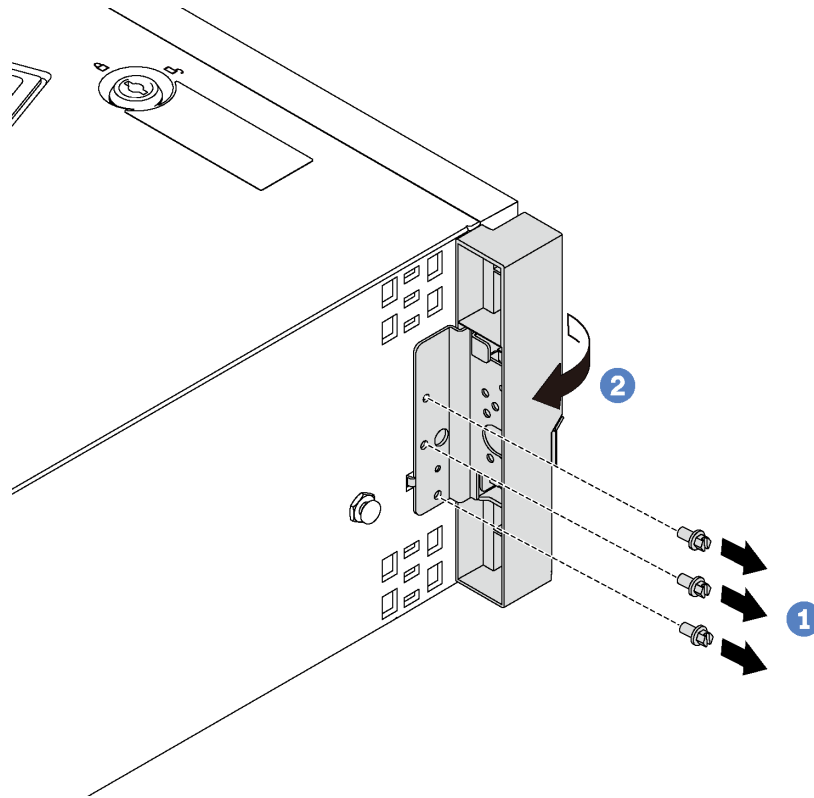


Figure 43. Rack latch removal

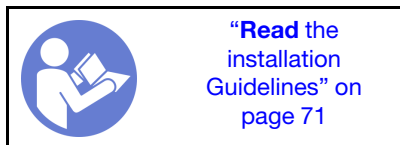
Step 1. Remove the screws that secure the rack latch.

Step 2. Pivot the rack latch as shown until the rack latch is disengaged from the chassis. Then, remove the rack latch from the chassis.

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

Install a rack latch

Use this information to install a rack latch.



To install a rack latch, complete the following steps:

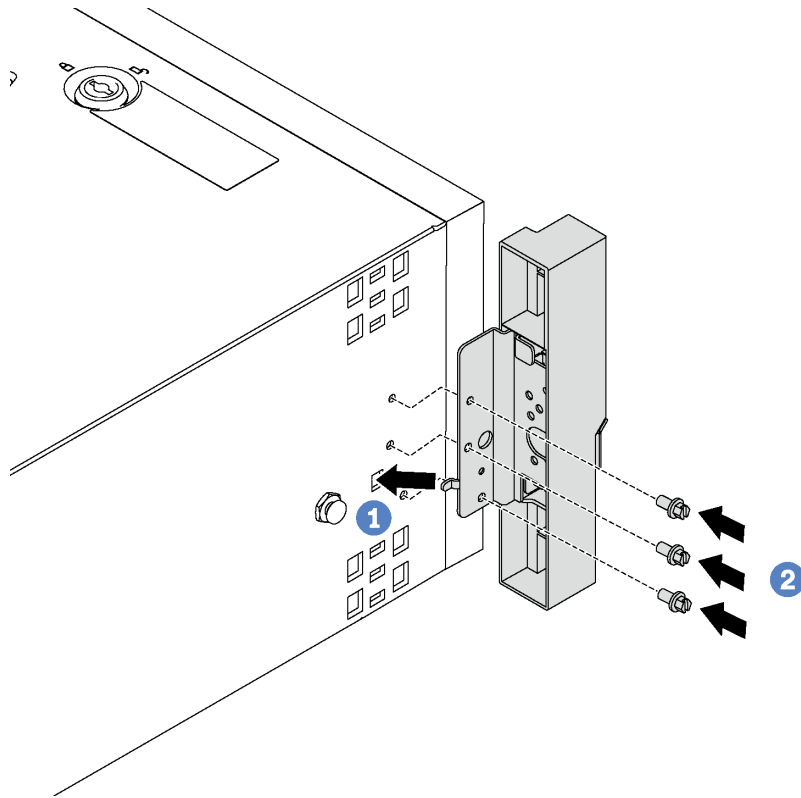


Figure 44. Rack latch installation

Step 1. Insert the rack latch tab into the hole in the chassis as shown. Then, align the holes in the rack latch with the corresponding holes in the chassis underside.

Step 2. Install the screws to secure the rack latch.

After installing the rack latch, reinstall the server to the rack.

Server cover replacement

Use this information to remove and install the server 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

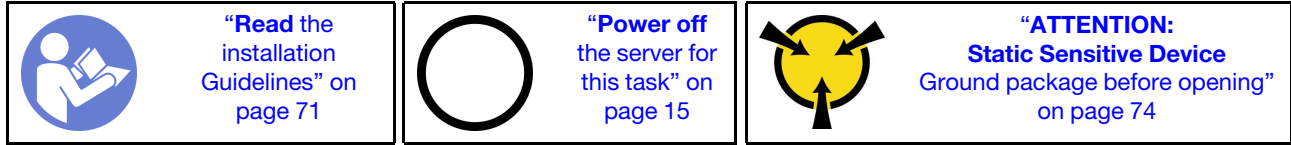


CAUTION:

Hazardous voltage, current, and energy levels might be present. Only a qualified service technician is authorized to remove the covers where the label is attached.

Remove the server cover

Use this information to remove the server 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 label is attached.

To remove the server cover, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

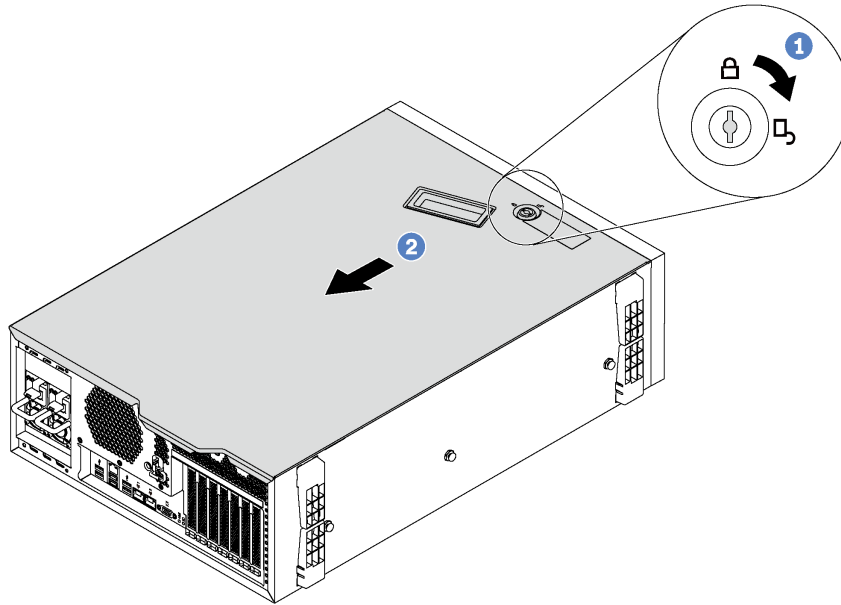



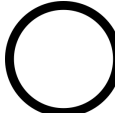

Figure 45. Server cover removal

- Step 1. Use the key attached on the rear of the server to turn the cover lock to the open position.
- Step 2. Slide the server cover toward the rear of the server until the server cover is disengaged from the chassis. Then, lift the server cover off the chassis and place it on a flat clean surface.

Attention: For proper cooling and airflow, install the server cover before turning on the server. Operating the server with the server cover removed might damage server components.

Install the server cover

Use this information to install the server cover.

	<p>“Read the installation Guidelines” on page 71</p>		<p>“Power off the server for this task” on page 15</p>		<p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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Before installing the server cover:

1. Ensure that all 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 correctly routed. See [“Internal cable routing”](#) on page 31.
3. If you are installing a new server cover, attach the service label to the inside of the new server cover first if necessary.

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

To install the server cover, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

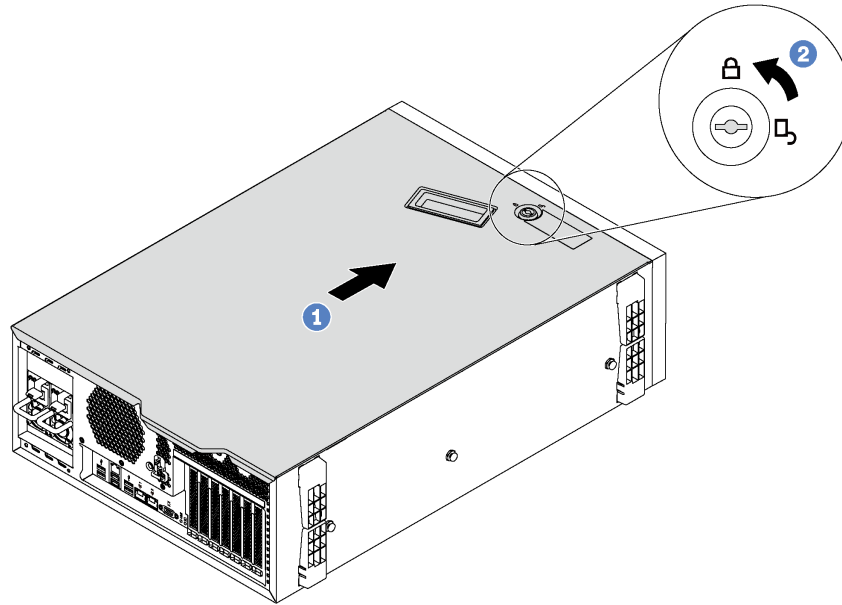


Figure 46. Server cover installation

Step 1. Lower the server cover onto the chassis until all tabs on both sides of the server cover engage the chassis. Then, slide the server cover toward the front of the chassis until the server cover stops and the front edge of the cover aligns with the edge of the front bezel.

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

Step 2. Use the key to turn the cover lock to the locked position.

After installing the server cover, reconnect external cables if necessary.

RAID super capacitor module replacement

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




Note: This topic applies only to server models that have RAID super capacitor modules installed.

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

Remove a RAID super capacitor module

Use this information to remove a RAID super capacitor module on the air baffle.

 <p>“Read the installation Guidelines” on page 71</p>	 <p>“Power off the server for this task” on page 15</p>	 <p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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Before removing a RAID super capacitor module:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See “Remove the server cover” on page 81.

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

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

- Step 1. Disconnect the RAID super capacitor module from the extension cable.
- Step 2. Gently press the tab on the air baffle and then remove the RAID super capacitor module from the air baffle as shown.

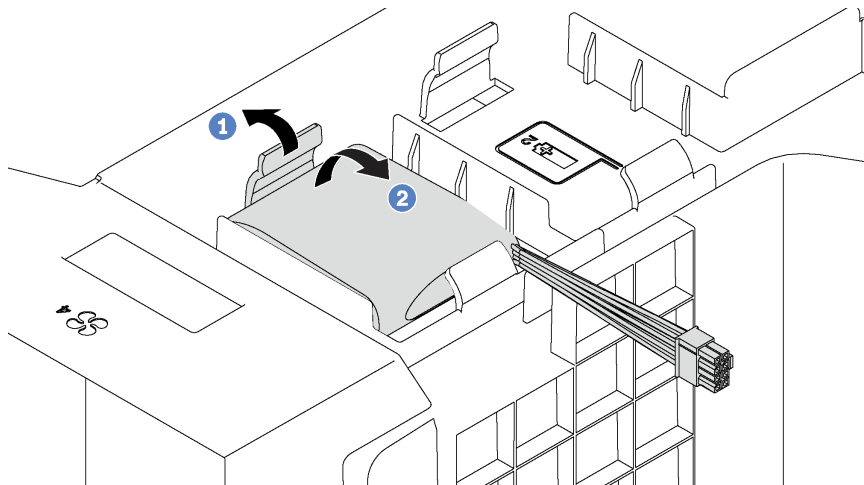
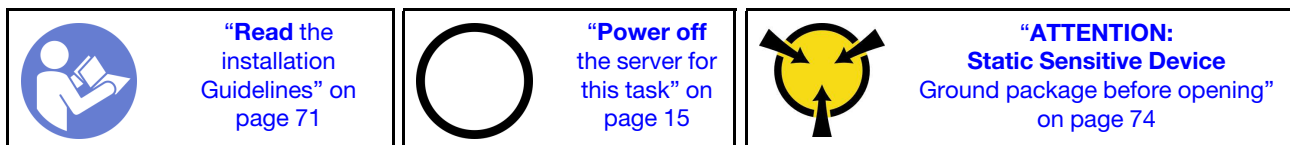


Figure 47. RAID super capacitor module removal

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 on the air baffle.



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

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

- Step 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.

Step 2. Insert one end of the RAID super capacitor module into the slot of the air baffle. Then, press down the other end of the RAID super capacitor module until it snaps in place.

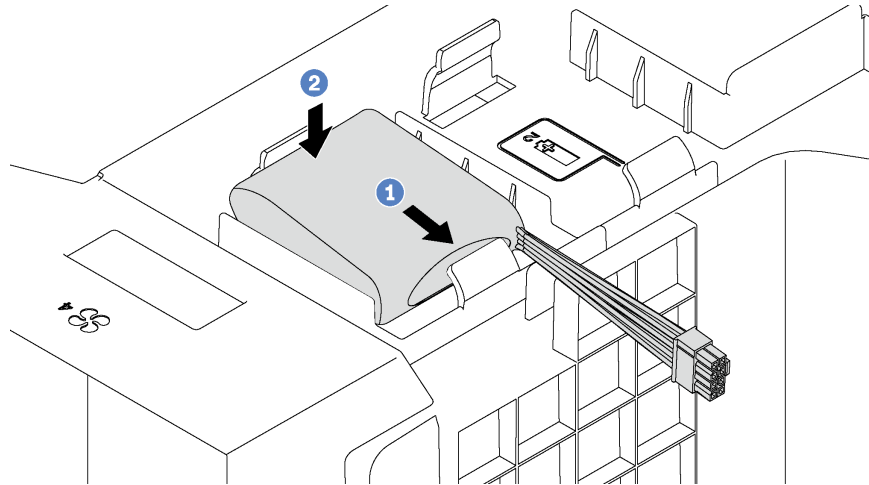


Figure 48. RAID super capacitor module installation

Step 3. Connect the RAID super capacitor module to the extension cable.

After installing the RAID super capacitor module, complete the parts replacement. See [“Complete the parts replacement” on page 186](#).

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.

S017

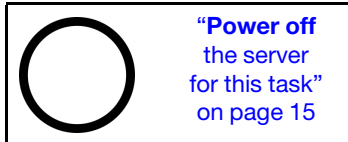
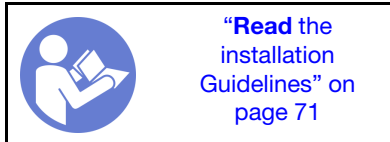


CAUTION:

Hazardous moving fan blades nearby. Keep fingers and other body parts away.

Remove the air baffle

Use this information to remove the air baffle.



Before removing the air baffle:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See “Remove the server cover” on page 81.
3. If there is a RAID super capacitor module installed on the air baffle, disconnect the RAID super capacitor module cable first.

To remove the air baffle, complete the following step:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

- Step 1. Lift up the front end of the air baffle until the rear end of the air baffle is disengaged from the chassis. Then, remove the air baffle out of the chassis.

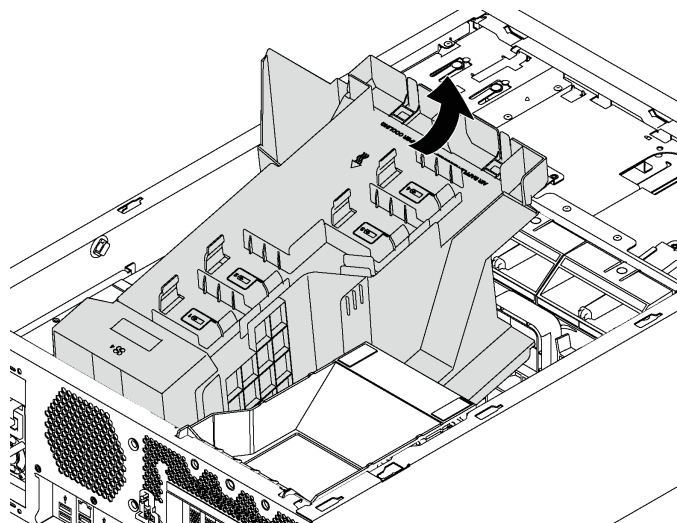
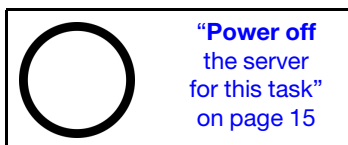
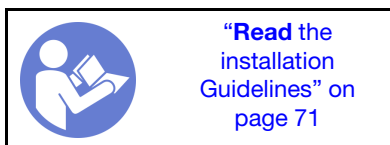


Figure 49. Air baffle removal

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

Install the air baffle

Use this information to install the air baffle.



Before installing the air baffle, ensure that all cables inside the server have been properly routed so that they will not interfere with the air baffle.

To install the air baffle, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

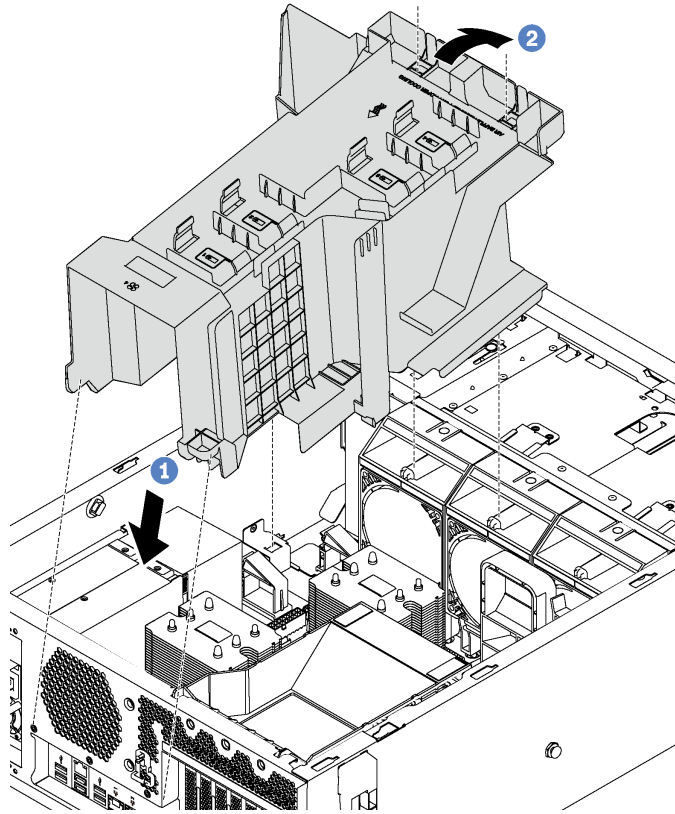


Figure 50. Air baffle installation

Step 1. Carefully insert the rear end of the air baffle into the chassis.

Step 2. Press the front end of the air baffle downward until it snaps into place.

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 186.

Front fan replacement

Use this information to remove and install a front fan.

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.

S009



CAUTION:

To avoid personal injury, disconnect the fan cables before removing the fan from the device.

S002

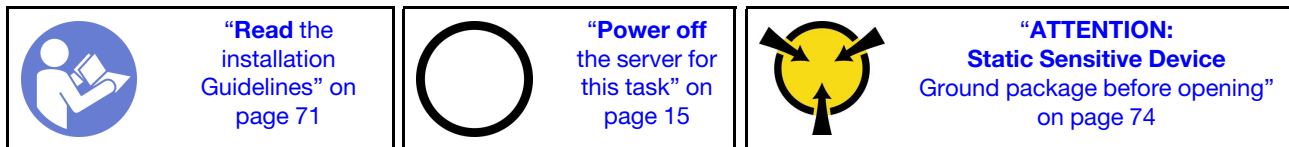


CAUTION:

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

Remove a front fan

Use this information to remove a front fan.



Before removing a front fan:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See "Remove the server cover" on page 81.
3. Remove the air baffle. See "Remove the air baffle" on page 85.

To remove a front fan, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

Step 1. Disconnect the fan cable from the system board.

Step 2. Press down the release tab and pivot the front fan as shown. Then, take the front fan out of the chassis.

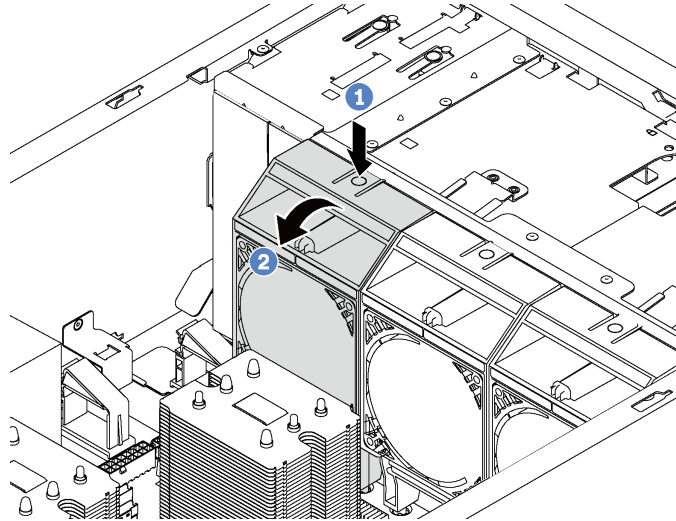



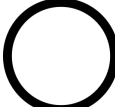

Figure 51. Front fan removal

After removing the front fan:

1. Install either a new front fan or a fan filler for proper air flow. See “Install a front fan” on page 89.
2. If you are instructed to return the old front fan, follow all packaging instructions and use any packaging materials that are provided.

Install a front fan

Use this information to install a front fan.

	<p>“Read the installation Guidelines” on page 71</p>		<p>“Power off the server for this task” on page 15</p>		<p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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To install a front fan, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

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

Step 2. Align the pins on the front fan with the corresponding holes in the chassis. Then, pivot the front fan forward until it snaps into place.

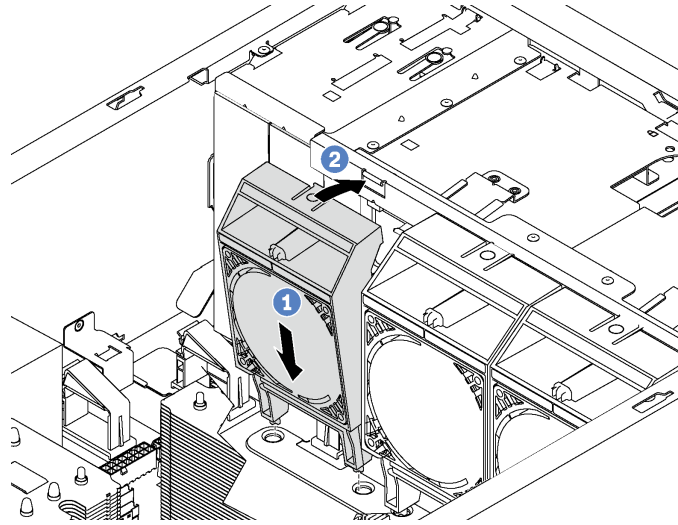


Figure 52. Front fan installation

Step 3. Connect the front fan cable to the corresponding fan connector on the system board. For the location of the system fan connectors, see [“System board components” on page 28](#).

After installing the front fan, complete the parts replacement. See [“Complete the parts replacement” on page 186](#).

Rear fan replacement

Use this information to remove and install the rear fan.

Note: This section applies only to server models that have the rear fan installed.

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.

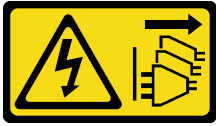
S009



CAUTION:

To avoid personal injury, disconnect the fan cables before removing the fan from the device.

S002

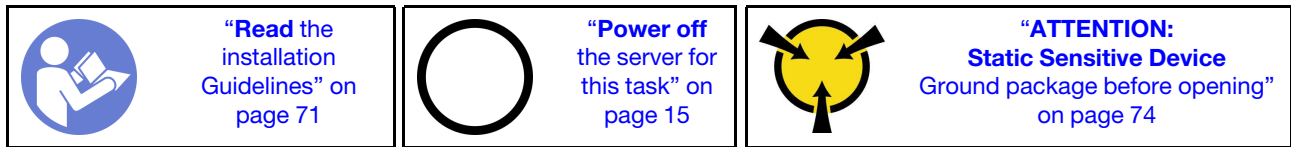


CAUTION:

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

Remove the rear fan

Use this information to remove the rear fan.



Before removing the rear fan:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See “Remove the server cover” on page 81.
3. Remove the air baffle. See “Remove the air baffle” on page 85.

To remove the rear fan, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

Step 1. Disconnect the fan cable from the system board.

Step 2. Press down the release tab and pivot the rear fan away from the chassis. Then, take the rear fan out of the chassis.

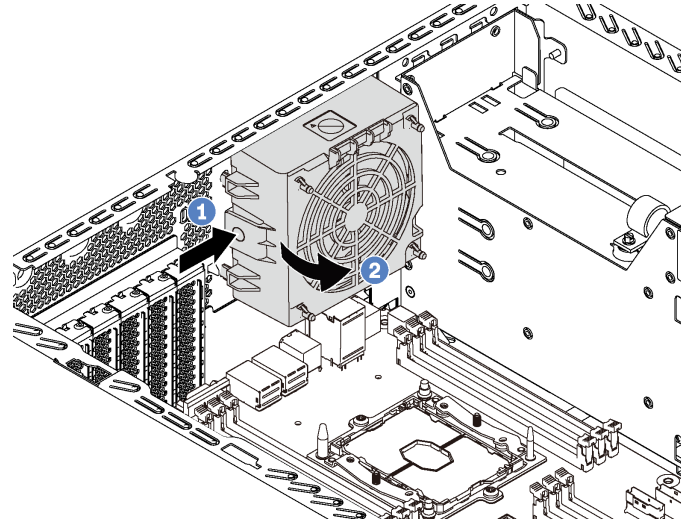



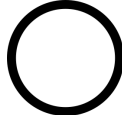

Figure 53. Rear fan removal

After removing the rear fan:

1. Install a new rear fan to replace the old one. See “Install the rear fan” on page 92.
2. If you are instructed to return the old rear fan, follow all packaging instructions and use any packaging materials that are provided.

Install the rear fan

Use this information to install the rear fan.

	“Read the installation Guidelines” on page 71		“Power off the server for this task” on page 15		“ATTENTION: Static Sensitive Device Ground package before opening” on page 74
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To install the rear fan, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

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

Step 2. Align the pins on the rear fan with the corresponding holes in the chassis. Then, pivot the rear fan toward the rear of the chassis until it snaps into place.

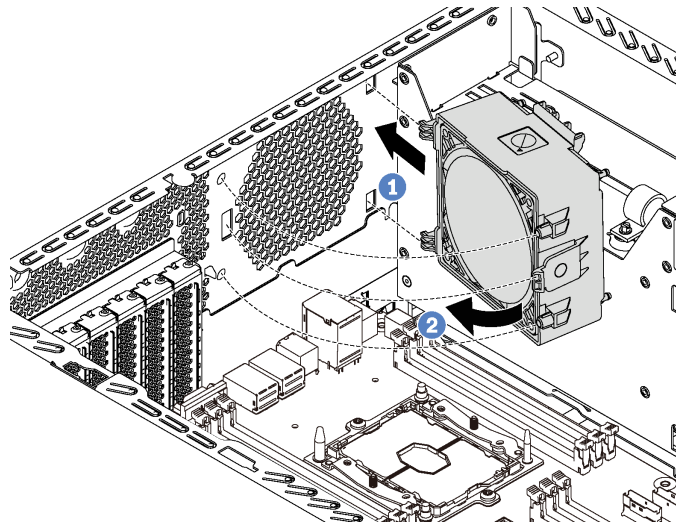


Figure 54. Rear fan installation

Step 3. Connect the rear fan cable to the system fan 4 connector on the system board. For the location of the system fan 4 connector, see [“System board components”](#) on page 28.

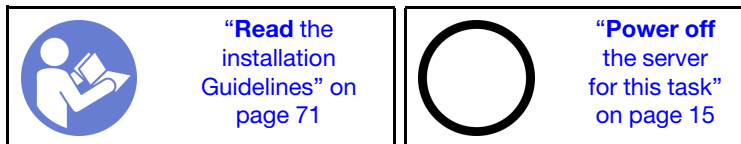
After installing the rear fan, complete the parts replacement. See [“Complete the parts replacement”](#) on page 186.

PCIe adapter holder replacement

Use this information to remove and install the PCIe adapter holder, which helps to hold the full-length PCIe adapters.

Remove the PCIe adapter holder

Use this information to remove the PCIe adapter holder.



Before removing the PCIe adapter holder:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See [“Remove the server cover”](#) on page 81.
3. Remove the air baffle. See [“Remove the air baffle”](#) on page 85.
4. If a full-length PCIe adapter is held by the PCIe adapter holder, remove the full-length PCIe adapter first. See [“Remove a PCIe adapter”](#) on page 131.

To remove the PCIe adapter holder, complete the following steps:

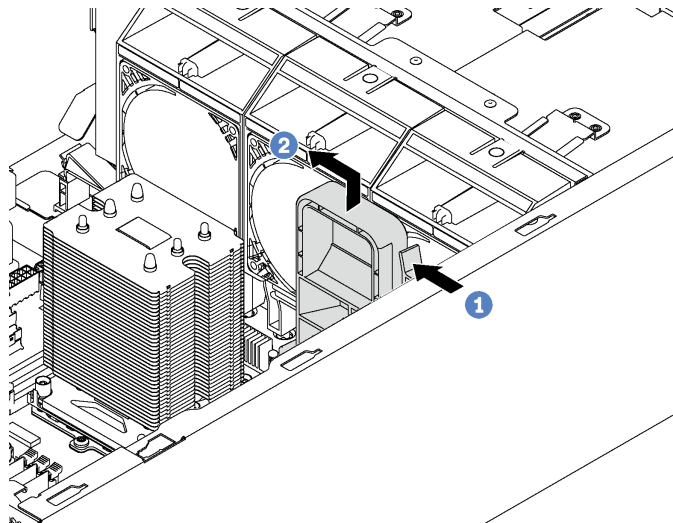


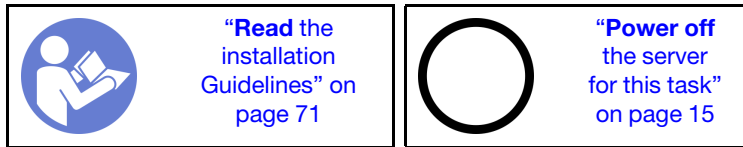
Figure 55. PCIe adapter holder removal

Step 1. Press the tab.

Step 2. Remove the PCIe adapter holder in the direction as shown.

Install the PCIe adapter holder

Use this information to install the PCIe adapter holder.



To install the PCIe adapter holder, complete the following steps:

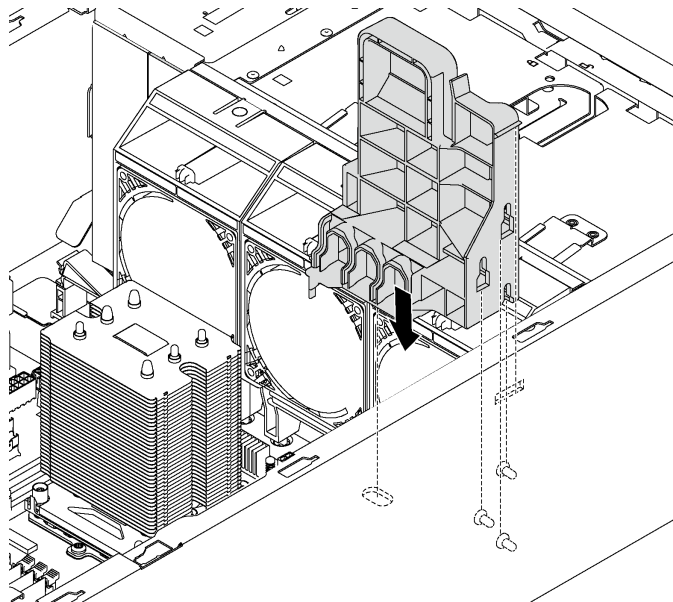


Figure 56. PCIe adapter holder installation

- Step 1. Insert the PCIe-adapter-holder post into the corresponding recess in the chassis.
- Step 2. Secure the three notches on the PCIe adapter holder with the three mounting studs on the chassis.
- Step 3. Secure the PCIe-adapter-holder tab with the corresponding hole in the chassis.

After installing the PCIe adapter holder:

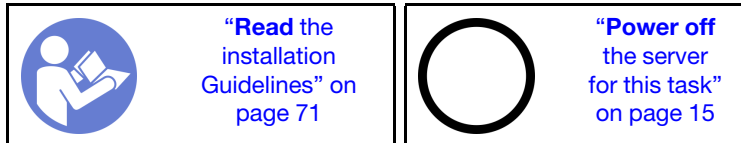
1. If you have removed a full-length PCIe adapter, reinstall it. See [“Install a PCIe adapter” on page 132](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 186](#).

Front bezel replacement

Use this information to remove and install the front bezel.

Remove the front bezel

Use this information to remove the front bezel.



Before removing the front bezel:

1. If the server is installed in a rack, remove the server from the rack. Then, remove the rack latches. See [“Remove a rack latch” on page 78](#).
2. If your server has the front door installed, remove the front door. See [“Remove the front door” on page 74](#).
3. Remove the server cover. See [“Remove the server cover” on page 81](#).

To remove the front bezel, complete the following step:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

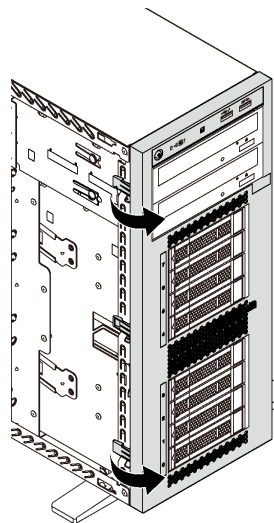
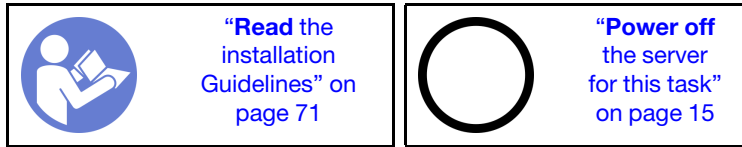


Figure 57. Front bezel removal

Step 1. Pivot the two plastic tabs outward until you can remove the front bezel completely.

Install the front bezel

Use this information to install the front bezel.



To install the front bezel, complete the following step:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

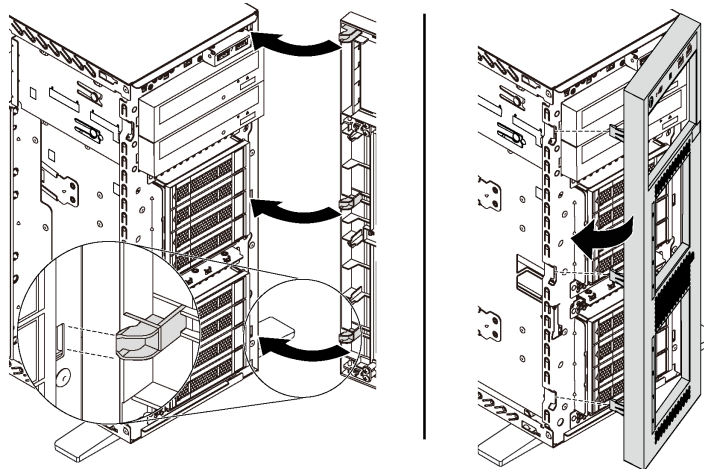


Figure 58. Front bezel installation

Step 1. Align the three plastic tabs with the corresponding holes in the chassis. Then, pivot the front bezel inward until it snaps into place.

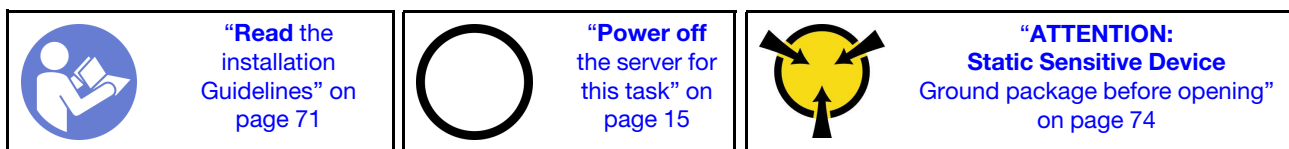
After installing the front bezel, complete the parts replacement. See [“Complete the parts replacement” on page 186](#).

Front panel replacement

Use this information to remove and install the front panel.

Remove the front panel

Use this information to remove the front panel.



Before removing the front panel:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See “Remove the server cover” on page 81.
3. Remove the air baffle. See “Remove the air baffle” on page 85.
4. Remove the front fans. See “Remove a front fan” on page 88.
5. Remove the PCIe adapter holder. See “Remove the PCIe adapter holder” on page 93.

To remove the front panel, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

- Step 1. Disconnect the front panel cables from the system board. For detailed cable routing, see “Front panel” on page 32.
- Step 2. Press the release tab in the direction as shown and then pull the front panel out of the dedicated bay.

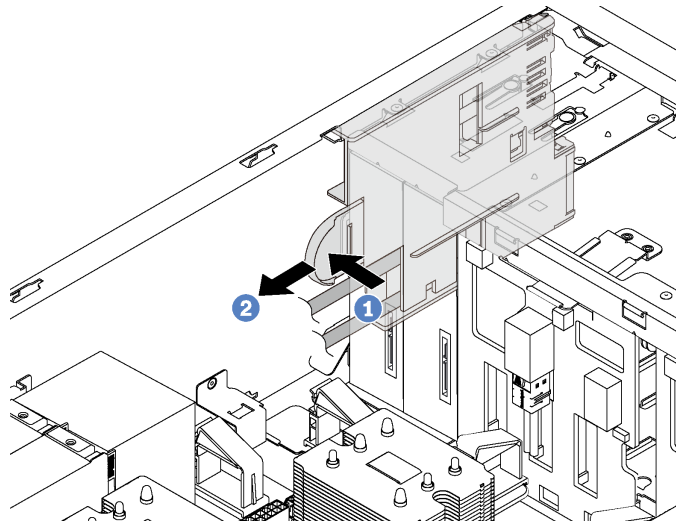


Figure 59. Front panel removal




- Step 3. Take the front panel out of the chassis.

Note: Adjust any cables that might impede your operation.

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

Install the front panel

Use this information to install the front panel.

	<p>“Read the installation Guidelines” on page 71</p>		<p>“Power off the server for this task” on page 15</p>		<p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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To install the front panel, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

- Step 1. Touch the static-protective package that contains the new front panel to any unpainted metal surface on the server. Then, take the new front panel from the package and place it on a static-protective surface.
- Step 2. Insert the front panel into the dedicated bay as shown. Then, carefully slide the front panel into the bay until it snaps into place.

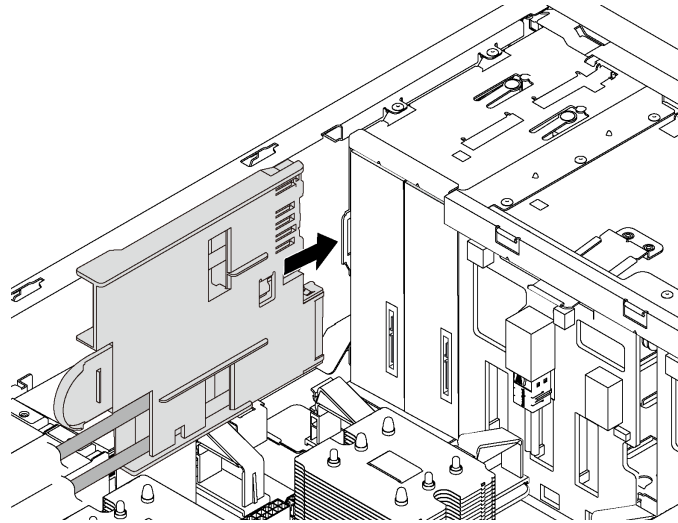


Figure 60. Front panel installation

- Step 3. Carefully route the two front panel cables from the secured front panel along the back side of the storage drive bays. Manage the cables so that they are secured by the clips under the front fans or fan fillers.

Important: The front panel cables and all other cables in this space must be secured by the clips so that it is possible to install the fans or fan fillers over the cables.

- Step 4. Connect the front panel cables to the corresponding connectors on the system board. For more information, see “[Front panel](#)” on page 32.

After installing the front panel, complete the parts replacement. See “[Complete the parts replacement](#)” on page 186.

Optical drive or tape drive replacement

Use this information to remove and install the optical drive or tape drive.

Note: This section applies only to server models that have an optical drive or a tape drive installed.

S006



CAUTION:

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

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

S007



CAUTION:

This product contains a Class 1M laser. Do not view directly with optical instruments.


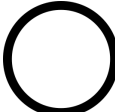

S008



Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following: Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Remove an optical drive or a tape drive

Use this information to remove an optical drive or a tape drive.

	<p>“Read the installation Guidelines” on page 71</p>		<p>“Power off the server for this task” on page 15</p>		<p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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Note: The following illustrations are based on the scenario that you remove an optical drive. The procedure is similar for removing a tape drive.

Before removing an optical drive or a tape drive:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See [“Remove the server cover”](#) on page 81.
3. If your server has the front door installed, remove the front door. See [“Remove the front door”](#) on page 74.
4. Remove the front bezel. See [“Remove the front bezel”](#) on page 95.
5. Remove the air baffle. See [“Remove the air baffle”](#) on page 85.

6. If the Fan 3 impedes your access to the optical drive or tape drive, remove it. See [“Remove a front fan” on page 88](#).

To remove an optical drive or a tape drive, complete the following steps:

- Step 1. Disconnect the cables from the rear of the optical drive or the tape drive.
- Step 2. Press and hold the release tab and push the optical drive or the tape drive forward to remove it from the chassis.

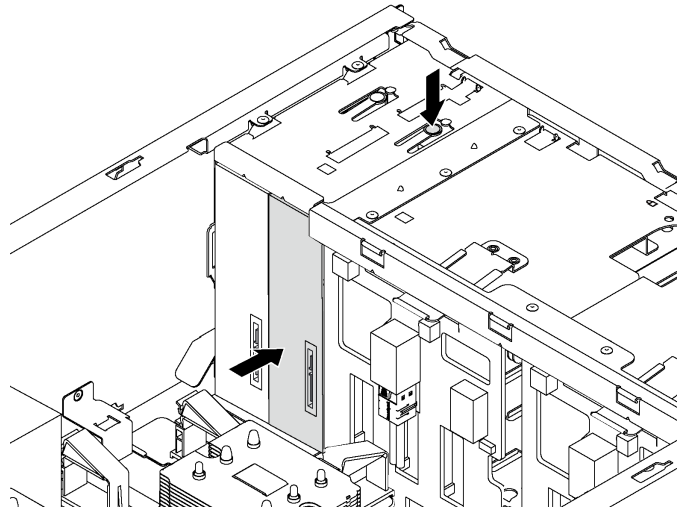


Figure 61. Optical drive removal

After removing an optical drive or a tape drive:

1. Install a new optical drive or tape drive, or install a filler to cover the drive bay. To install a new optical drive or a tape drive, see [“Install an optical drive or a tape drive” on page 101](#). To install a filler, complete the following steps:
 - a. Insert the filler to the vacant drive bay.

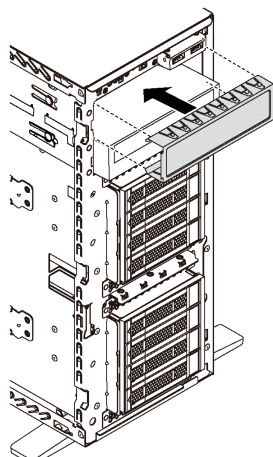


Figure 62. Drive bay filler installation

- b. Install the cover of the drive bay filler to the front bezel. Then, install the front bezel to the chassis.

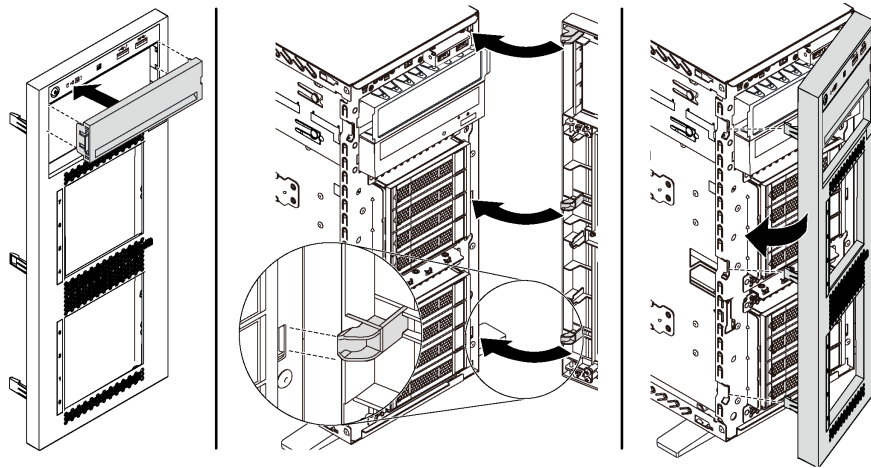


Figure 63. Drive-bay-filler cover installation

2. Remove the retainer from the removed optical drive or tape drive, and then install the retainer to the chassis.

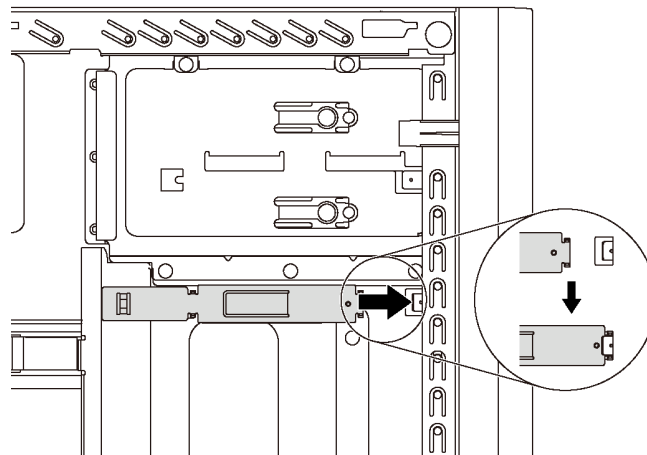





Figure 64. Drive retainer installation

3. If you are instructed to return the old optical drive or tape drive, follow all of the packaging instructions and use any packaging materials that are provided.

Install an optical drive or a tape drive

Use this information to install an optical drive or a tape drive.

 <p>“Read the installation Guidelines” on page 71</p>	 <p>“Power off the server for this task” on page 15</p>	 <p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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Note: The following illustrations are based on the scenario that you install an optical drive. The procedure is similar for installing a tape drive.

Before installing an optical drive or a tape drive:

1. If the drive bay is covered by a filler, remove it first. Store the filler in case that you later remove the optical drive or the tape drive and need the filler to cover the place. To remove the filler, complete the following steps:
 - a. Remove the front bezel and then remove the cover of the drive bay filler from the front bezel.

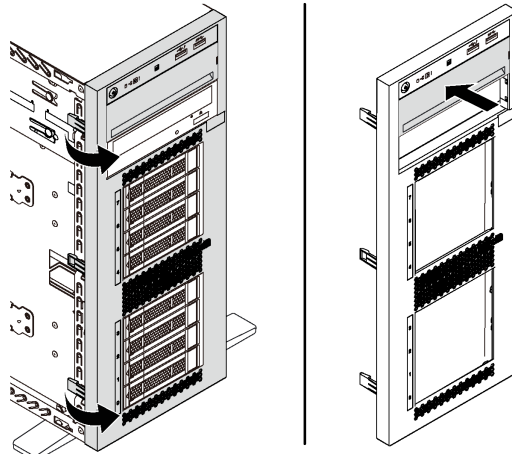


Figure 65. Drive-bay-filler cover removal

- b. Remove the drive bay filler out of the chassis.

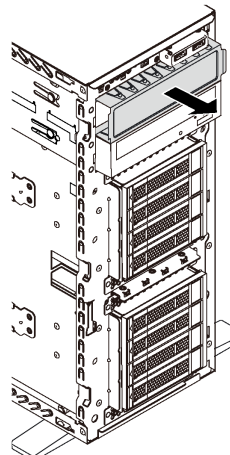


Figure 66. Drive bay filler removal

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

To install an optical drive or a tape drive, complete the following steps:

Step 1. Remove the retainer from the chassis.

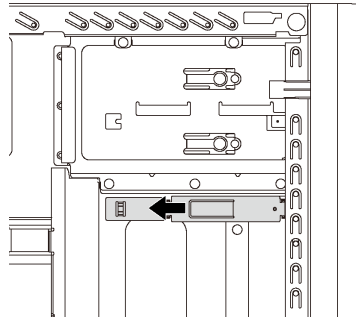


Figure 67. Drive retainer removal

Step 2. Install the retainer on only the left side of the optical drive or tape drive.

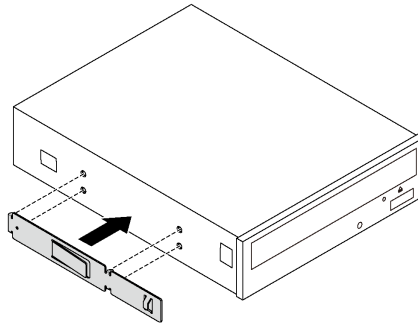


Figure 68. Optical drive retainer installation

Step 3. Hold the optical drive or tape drive in correct orientation and then slide it into the drive bay until it snaps into position.

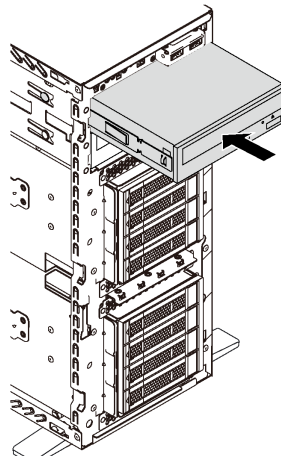


Figure 69. Optical drive installation

Step 4. Connect the power cable and the signal cable to the rear of the new optical drive or tape drive. For more information about the cable routing, see [“Optical drive” on page 33](#) and [“Tape drive” on page 34](#).

After installing the optical drive or tape drive, complete the parts replacement. See [“Complete the parts replacement” on page 186](#).

Simple-swap drive replacement


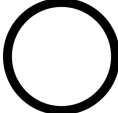

Use this information to remove and install a simple-swap drive.

Notes:

- This section applies only to server models that support simple-swap drives.
- The term “simple-swap drive” refers to all the supported types of simple-swap hard disk drives and simple-swap solid-state drives.
- You must turn off the server before installing or removing a simple-swap drive to avoid data loss.
- 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.

Remove a simple-swap drive

Use this information to remove a simple-swap drive.

	“Read the installation Guidelines” on page 71		“Power off the server for this task” on page 15		“ATTENTION: Static Sensitive Device Ground package before opening” on page 74
---	--	---	--	--	--

Before removing a simple-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, 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 the server is installed in a rack, extend the server from the rack.
3. If the server has the front door installed, open it.

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

Step 1. Use a screwdriver to turn the handle lock **1** to the unlocked position. Then, the tray handle opens automatically.

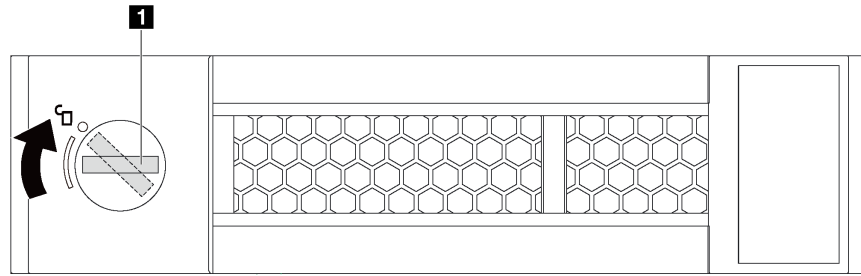


Figure 70. Opening the tray handle of a 3.5-inch simple-swap drive

Step 2. Pull the tray handle and carefully slide the simple-swap drive out of the drive bay.

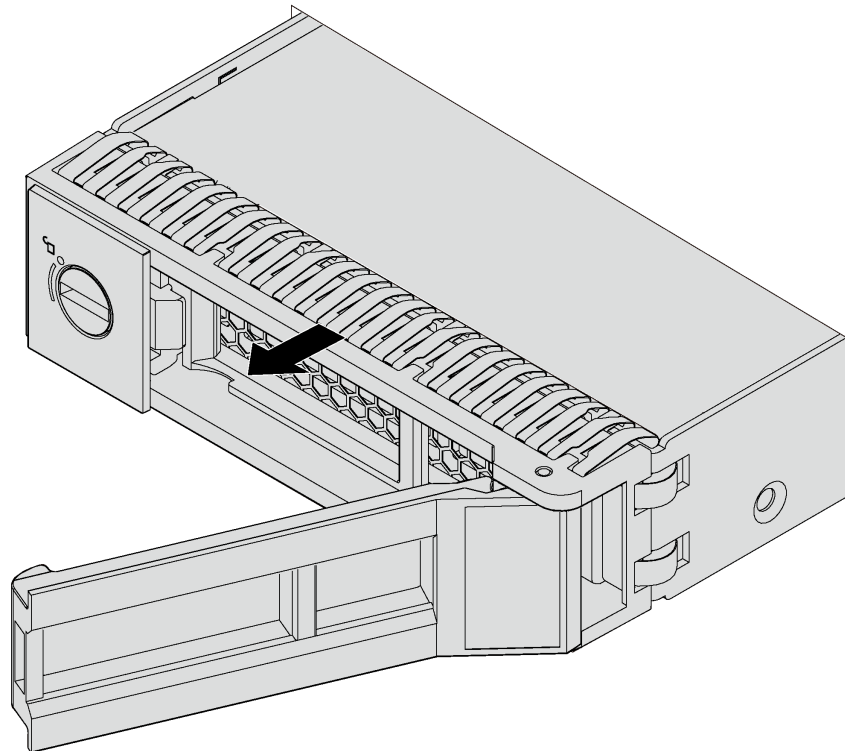


Figure 71. 3.5-inch simple-swap drive removal

After removing a simple-swap drive:

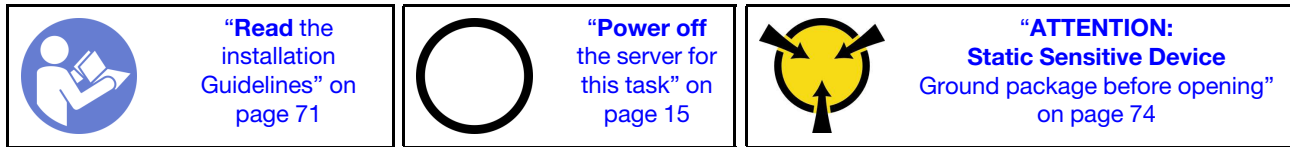
1. Install a new drive or install the drive filler to cover the drive bay. See [“Install a simple-swap drive” on page 106](#).

Note: 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.

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

Install a simple-swap drive

Use this information to install a simple-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.

- For a complete list of supported optional devices for the server, see: <https://static.lenovo.com/us/en/serverproven/index.shtml>
- 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 17.
- 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: SSD, SATA HDD
 - Drive capacity priority: the lowest capacity first
- The drives in a single RAID array must be the same type, same size, and same capacity.

Before installing a simple-swap drive:

1. If the drive bay has a drive filler installed, remove it. Keep the drive filler in a safe place for future use.

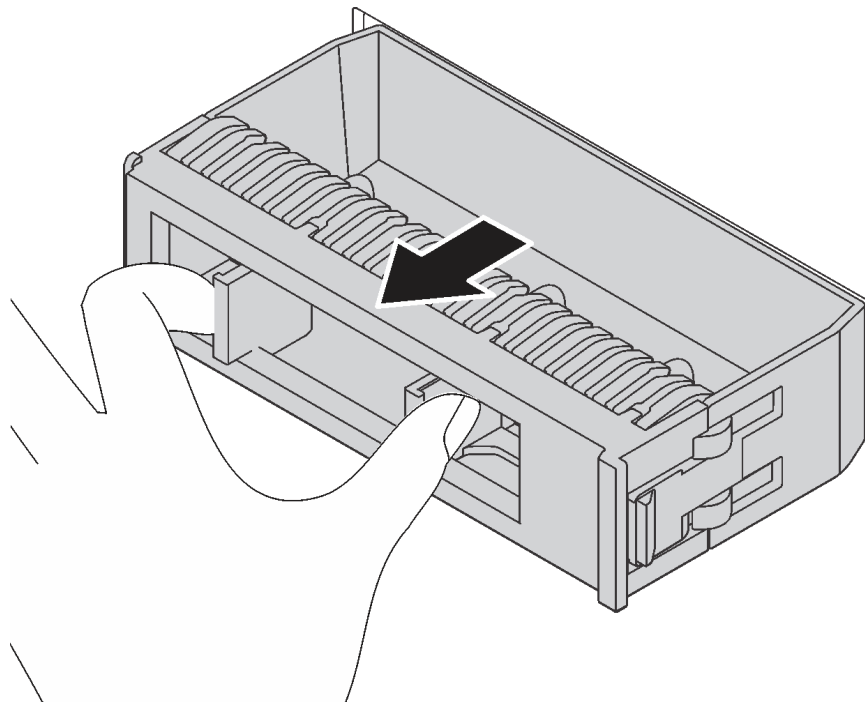


Figure 72. 3.5-inch drive filler removal

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

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

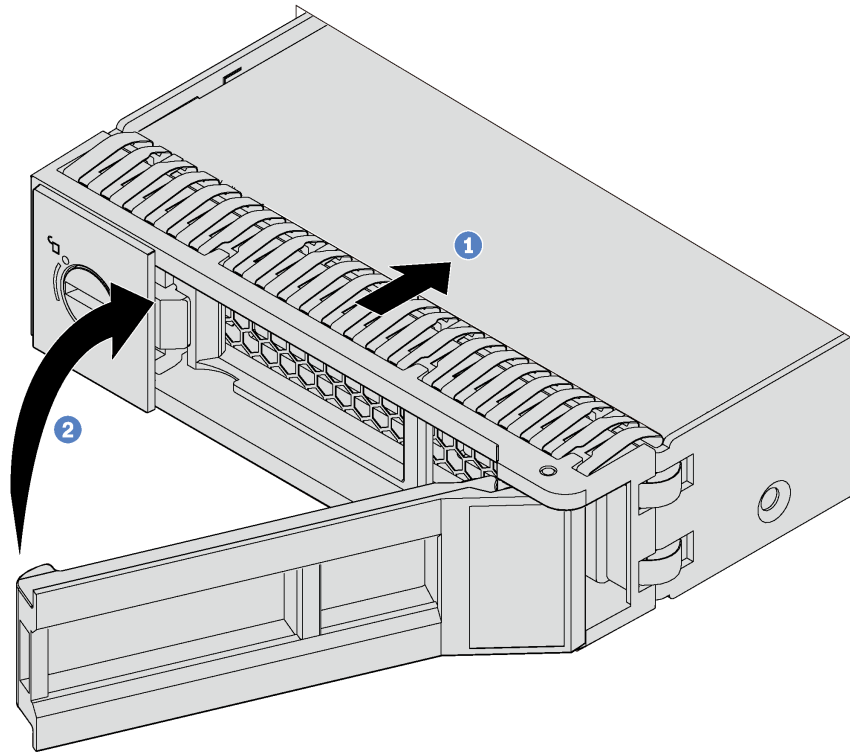


Figure 73. 3.5-inch simple-swap drive installation

Step 1. Ensure that the tray handle is in the open position. Align the drive with the guide rails in the bay. Then, gently push the drive into the bay until the drive stops.

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

After installing a simple-swap drive:

1. Continue to install additional simple-swap drives if necessary.
2. Complete the parts replacement. See “[Complete the parts replacement](#)” on page 186.
3. Check the simple-swap-drive activity LED on the front panel to verify that the drive is operating correctly.

Simple-swap-drive activity LED	Color	Description
Solid on	Green	The simple-swap drive is active.
Off	None	The simple-swap drive is not active.

4. If the server has the front door installed, close it.
5. 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

Hot-swap drive replacement

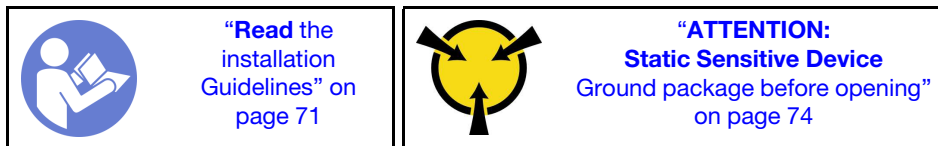
Use this information to remove and install a hot-swap drive. You can remove or install a hot-swap drive without turning off the server, which helps you avoid significant interruption to the operation of the system.

Notes:

- This section applies only to server models that support hot-swap drives.
- 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.

Remove a hot-swap drive

Use this information to remove a hot-swap drive.



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 the server is installed in a rack, extend the server from the rack.
3. If the server has the front door installed, open it.

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

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

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

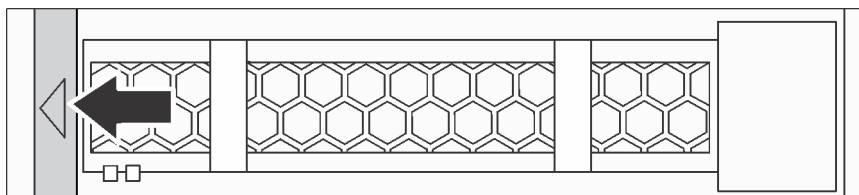


Figure 74. Opening the tray handle

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

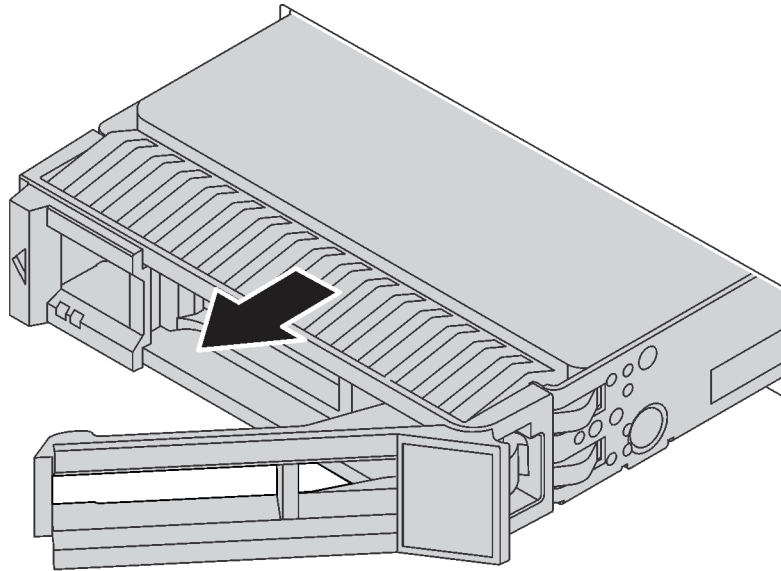


Figure 75. Hot-swap drive removal

After removing a hot-swap drive:

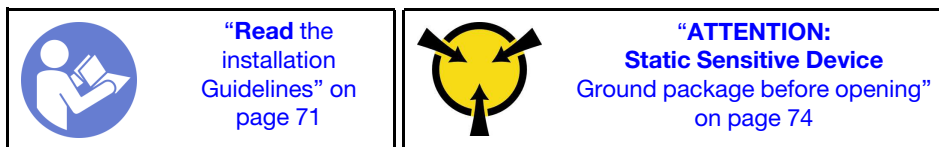
1. Install a new drive or install the drive filler to cover the drive bay. See “[Install a hot-swap drive](#)” on page 109.

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.

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 complete list of supported optional devices for the server, see:

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

- 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 17.
- 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.

Before installing a hot-swap drive:

1. If the drive bay has a drive filler installed, remove it. Keep the drive filler in a safe place for future use.

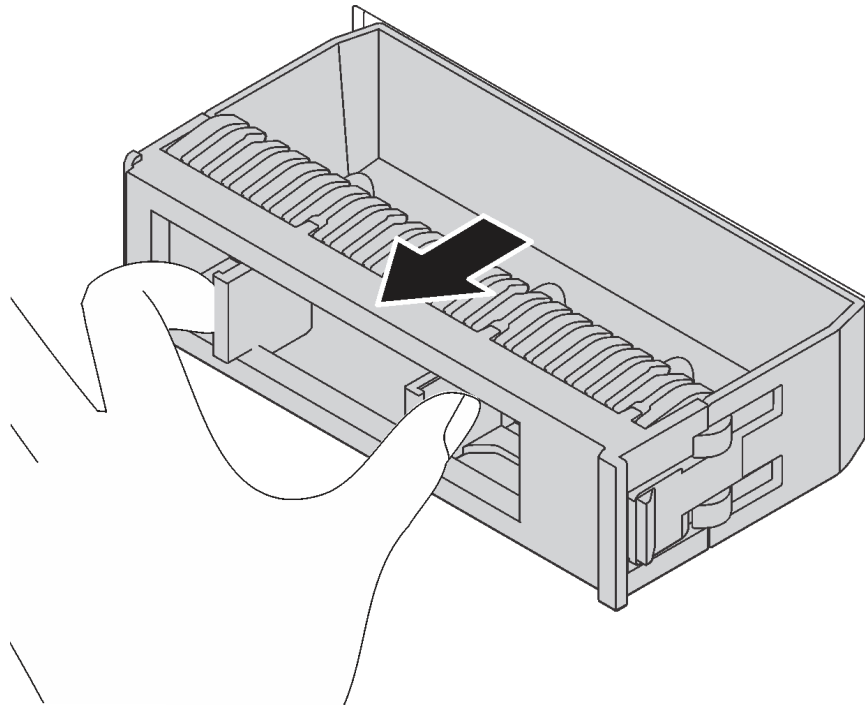


Figure 76. Drive filler removal

2. Touch the static-protective package that contains the new hot-swap drive to any unpainted surface on the outside of the server. Then, take the new hot-swap 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 this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

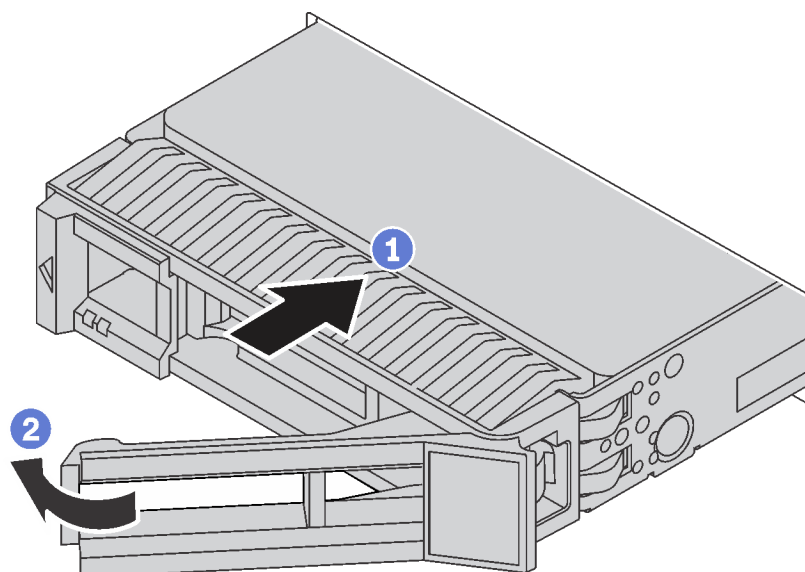


Figure 77. Hot-swap drive installation

- Step 1. Ensure that the tray handle is in the open position. Slide the drive into the drive bay until it snaps into position.
- Step 2. Close the tray handle to lock the drive in place.
- Step 3. The hot-swap drive should be powered up and begin initialization. Check the drive LEDs to verify that the drive is operating correctly.

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

After installing a hot-swap drive:

1. Continue to install additional hot-swap drives if necessary.
2. Complete the parts replacement. See “[Complete the parts replacement](#)” on page 186.
3. Close the front door.
4. Use the Lenovo XClarity Provisioning Manager to configure the RAID if necessary. For more information, see:
http://sysmgmt.lenovofiles.com/help/topic/LXPM/RAID_setup.html

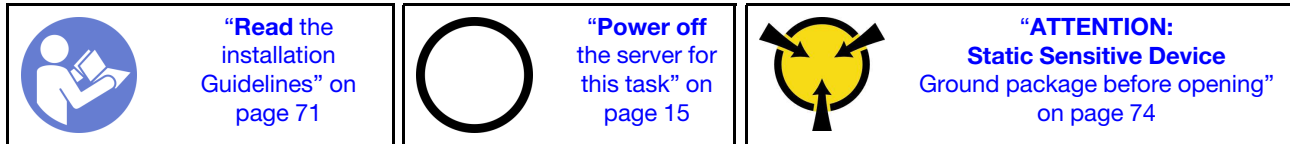
Simple-swap-drive backplate replacement

Use this information to remove and install a simple-swap-drive backplate.

Note: This section applies only to server models that have simple-swap-drive backplates installed.

Remove a simple-swap-drive backplate

Use this information to remove a simple-swap-drive backplate.



Before removing the simple-swap-drive backplate:

1. Remove the server cover. See [“Remove the server cover”](#) on page 81.
2. Remove the air baffle. See [“Remove the air baffle”](#) on page 85.
3. Remove the front fans. See [“Remove a front fan”](#) on page 88.
4. If the PCIe adapter holder impedes your access to the backplate, remove it. See [“Remove the PCIe adapter holder”](#) on page 93.
5. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a simple-swap drive”](#) on page 104.
6. Record the cable connections on the backplate and then disconnect all cables from the system board. For information about the backplate cable connection, see [“Simple-swap-drive backplate”](#) on page 39.

To remove the simple-swap-drive backplate, complete the following steps:

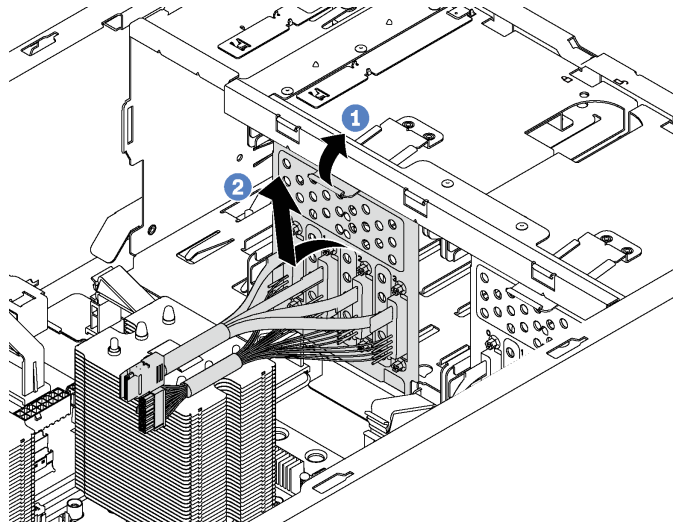


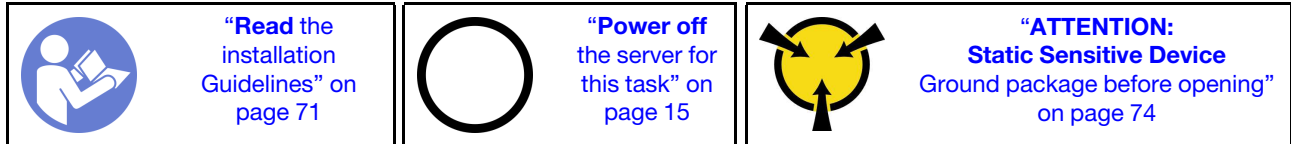
Figure 78. Simple-swap-drive backplate removal

- Step 1. Lift the release tab to disengage the backplate.
- Step 2. Rotate the top edge of the backplate away from the drive cage, and then remove the backplate.

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

Install a simple-swap-drive backplate

Use this information to install a simple-swap-drive backplate.



Before installing the simple-swap-drive backplate, touch the static-protective package that contains the new backplate to any unpainted surface on the outside of the server. Then, take the new backplate out of the package and place it on a static-protective surface.

To install the simple-swap-drive backplate, complete the following steps:

- Step 1. Note the orientation of the new simple-swap-drive backplate.
- Step 2. Lower the new backplate into the chassis and insert the new backplate into the backplate slot. Then, carefully push the new backplate inward until it is secured by the release tab.

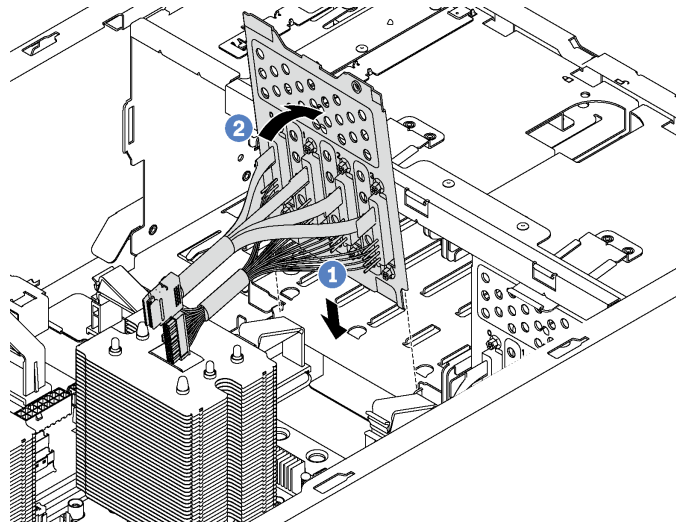


Figure 79. Simple-swap-drive backplate installation

- Step 3. Connect the cables on the backplate to the system board. See [“Simple-swap-drive backplate” on page 39](#).

After installing the simple-swap-drive backplate:

1. Reinstall all the drives and fillers (if any) in the drive cage. See [“Install a simple-swap drive” on page 106](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 186](#).

Hot-swap-drive backplane replacement

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

Note: This section applies only to server models that have hot-swap-drive backplanes installed.

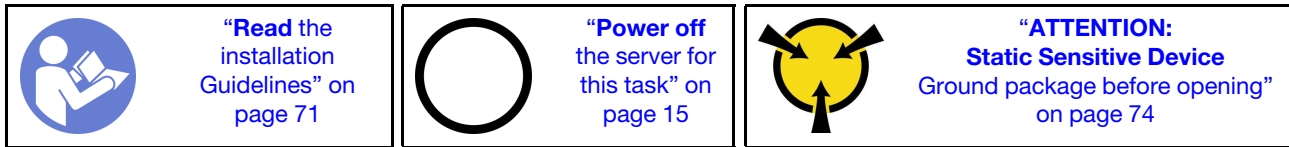
This section contains the following information:

- [“Remove the backplane for four 2.5-inch hot-swap drives” on page 114](#)
- [“Install the backplane for four 2.5-inch hot-swap drives” on page 115](#)
- [“Remove the backplane for eight 2.5-inch hot-swap drives” on page 115](#)
- [“Install the backplane for eight 2.5-inch hot-swap drives” on page 116](#)

- “Remove the backplane for four 3.5-inch hot-swap drives” on page 117
- “Install the backplane for four 3.5-inch hot-swap drives” on page 118

Remove the backplane for four 2.5-inch hot-swap drives

Use this information to remove the backplane for four 2.5-inch hot-swap drives.



Before removing the backplane for four 2.5-inch hot-swap drives:

1. Remove the server cover. See “Remove the server cover” on page 81.
2. Remove the air baffle. See “Remove the air baffle” on page 85.
3. If the Fan 3 impedes your access to the backplane, remove it. See “Remove a front fan” on page 88.
4. Remove all the installed drives and fillers (if any) from the drive bays. See “Remove a hot-swap drive” on page 108.
5. Record the cable connections on the backplane and then disconnect all cables from the backplane. For information about the backplane cable connection, see “Hot-swap-drive backplane” on page 40.

To remove the backplane for four 2.5-inch hot-swap drives, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

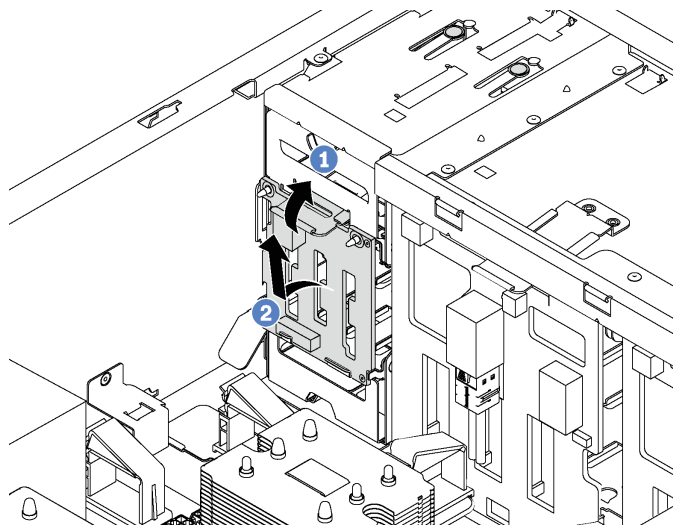


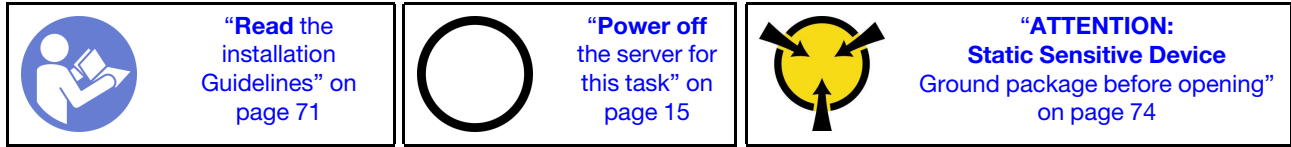
Figure 80. Removal of the backplane for four 2.5-inch hot-swap drives

- Step 1. Lift the release tab to disengage the backplane.
- Step 2. Remove the backplane from the chassis.

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

Install the backplane for four 2.5-inch hot-swap drives

Use this information to install the backplane for four 2.5-inch hot-swap drives.



Before installing the backplane for four 2.5-inch hot-swap drives, 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 backplane for four 2.5-inch hot-swap drives, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

- Step 1. Note the orientation of the new backplane.
- Step 2. Lower the new backplane into the chassis and insert the new backplane into the backplane slot. Then, carefully push the new backplane inward until it is secured by the release tab and the two mounting studs on the chassis are inserted into the two holes in the backplane.

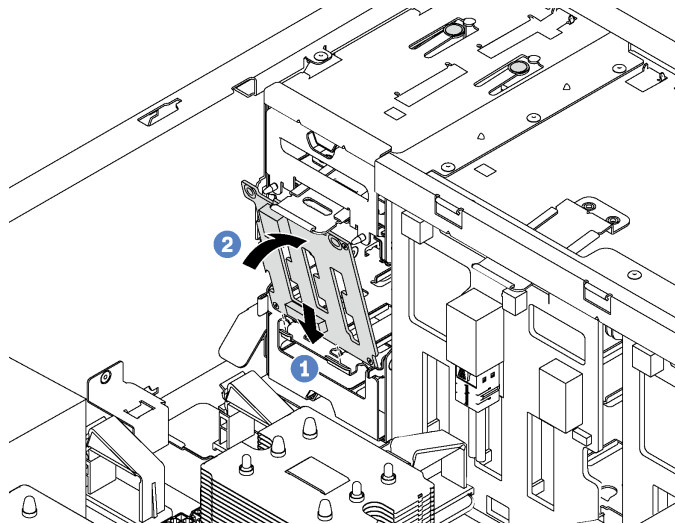


Figure 81. Installation of the backplane for four 2.5-inch hot-swap drives

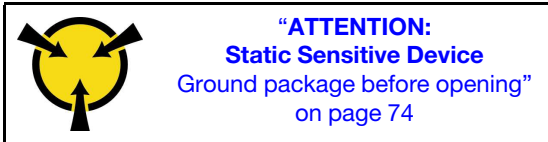
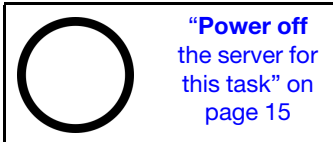
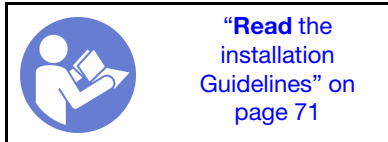
- Step 3. Connect the cables to the new backplane. See “Hot-swap-drive backplane” on page 40.

After installing the backplane for four 2.5-inch hot-swap drives:

1. Reinstall all the drives and fillers (if any) in the drive cage. See “Install a hot-swap drive” on page 109.
2. Complete the parts replacement. See “Complete the parts replacement” on page 186.

Remove the backplane for eight 2.5-inch hot-swap drives

Use this information to remove the backplane for eight 2.5-inch hot-swap drives.



Before removing the backplane for eight 2.5-inch hot-swap drives:

1. Remove the server cover. See “Remove the server cover” on page 81.
2. Remove the air baffle. See “Remove the air baffle” on page 85.
3. Remove the front fans. See “Remove a front fan” on page 88.
4. If the PCIe adapter holder impedes your access to the backplane, remove it. See “Remove the PCIe adapter holder” on page 93.
5. Remove all the installed drives and fillers (if any) from the drive bays. See “Remove a hot-swap drive” on page 108.
6. Record the cable connections on the backplane and then disconnect all cables from the backplane. For information about the backplane cable connection, see “Hot-swap-drive backplane” on page 40.

To remove the backplane for eight 2.5-inch hot-swap drives, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

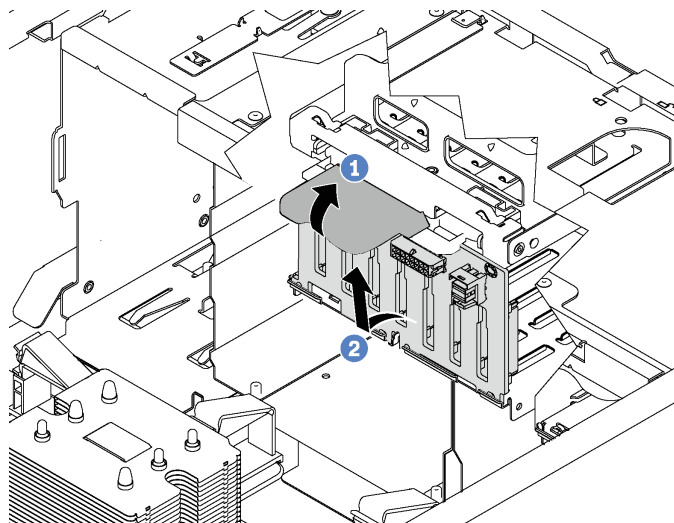



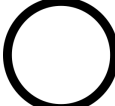

Figure 82. Removal of the backplane for eight 2.5-inch hot-swap drives

- Step 1. Lift the release tab to disengage the backplane.
- Step 2. Rotate the top edge of the backplane away from the drive cage, and then remove the backplane.

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

Install the backplane for eight 2.5-inch hot-swap drives

Use this information to install the backplane for eight 2.5-inch hot-swap drives.

 <p>“Read the installation Guidelines” on page 71</p>	 <p>“Power off the server for this task” on page 15</p>	 <p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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Before installing the backplane for eight 2.5-inch hot-swap drives, 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 backplane for eight 2.5-inch hot-swap drives, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

- Step 1. Note the orientation of the new backplane.
- Step 2. Lower the new backplane into the chassis and insert the new backplane into the backplane slot. Then, carefully rotate the top edge of the new backplane toward the drive cage until it is secured by the release tab.

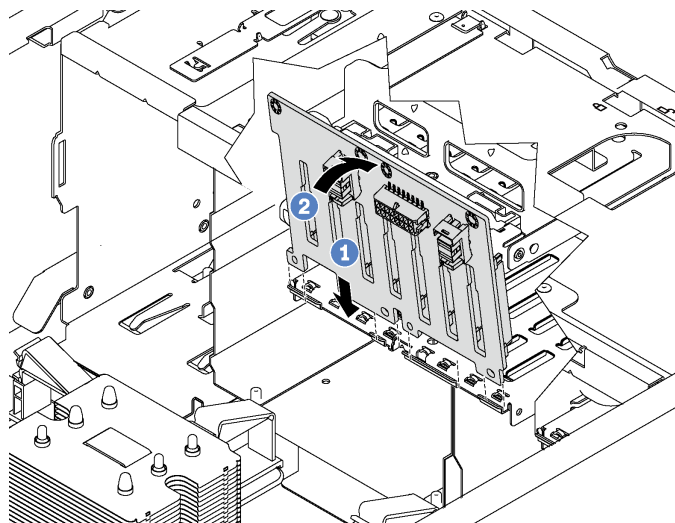


Figure 83. Installation of the backplane for eight 2.5-inch hot-swap drives


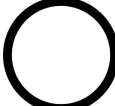

- Step 3. Connect the cables to the new backplane. See [“Hot-swap-drive backplane” on page 40](#).

After installing the backplane for eight 2.5-inch hot-swap drives:

1. Reinstall all the drives and fillers (if any) in the drive cage. See [“Install a hot-swap drive” on page 109](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 186](#).

Remove the backplane for four 3.5-inch hot-swap drives

Use this information to remove the backplane for four 3.5-inch hot-swap drives.

 <p>“Read the installation Guidelines” on page 71</p>	 <p>“Power off the server for this task” on page 15</p>	 <p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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Before removing the backplane for four 3.5-inch hot-swap drives:

1. Remove the server cover. See “Remove the server cover” on page 81.
2. Remove the air baffle. See “Remove the air baffle” on page 85.
3. Remove the front fans. See “Remove a front fan” on page 88.
4. If the PCIe adapter holder impedes your access to the backplane, remove it. See “Remove the PCIe adapter holder” on page 93.
5. Remove all the installed drives and fillers (if any) from the drive bays. See “Remove a hot-swap drive” on page 108.
6. Record the cable connections on the backplane and then disconnect all cables from the backplane. For information about the backplane cable connection, see “Hot-swap-drive backplane” on page 40.

To remove the backplane for four 3.5-inch hot-swap drives, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

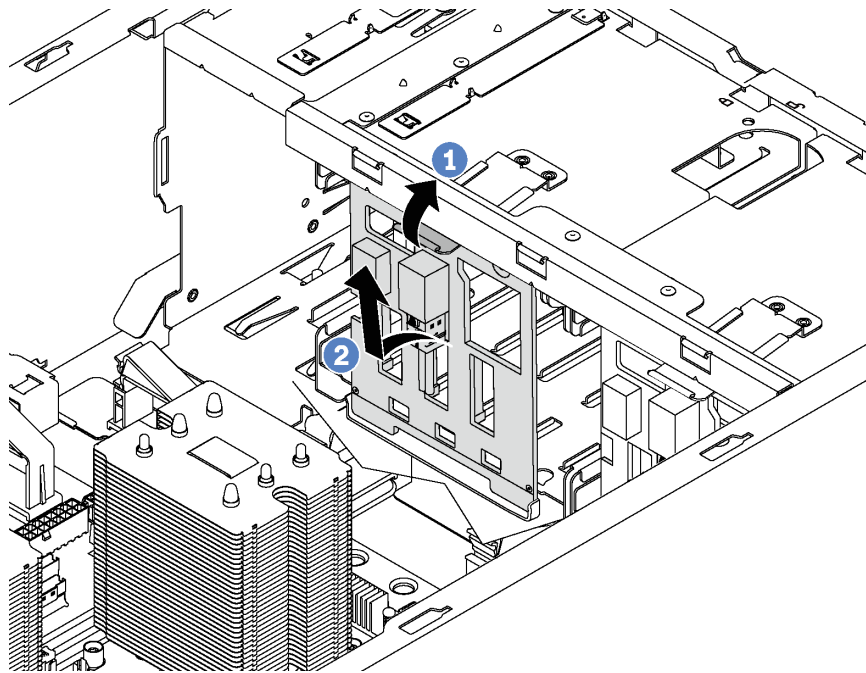


Figure 84. Removal of the backplane for four 3.5-inch hot-swap drives

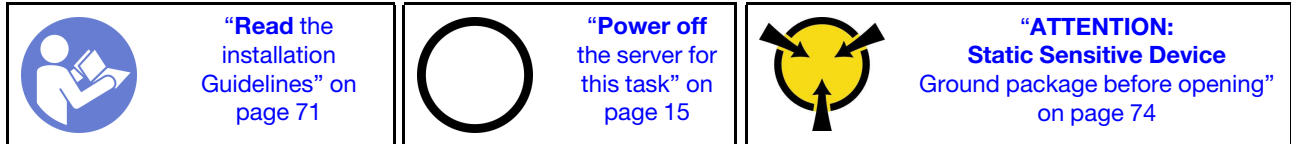
Step 1. Lift the release tab to disengage the backplane.

Step 2. Rotate the top edge of the backplane away from the drive cage, and then remove the backplane.

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

Install the backplane for four 3.5-inch hot-swap drives

Use this information to install the backplane for four 3.5-inch hot-swap drives.



Before installing the backplane for four 3.5-inch hot-swap drives, 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 backplane for four 3.5-inch hot-swap drives, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

- Step 1. Note the orientation of the new backplane.
- Step 2. Lower the new backplane into the chassis and insert the new backplane into the backplane slot. Then, carefully rotate the top edge of the new backplane toward the drive cage until it is secured by the release tab.

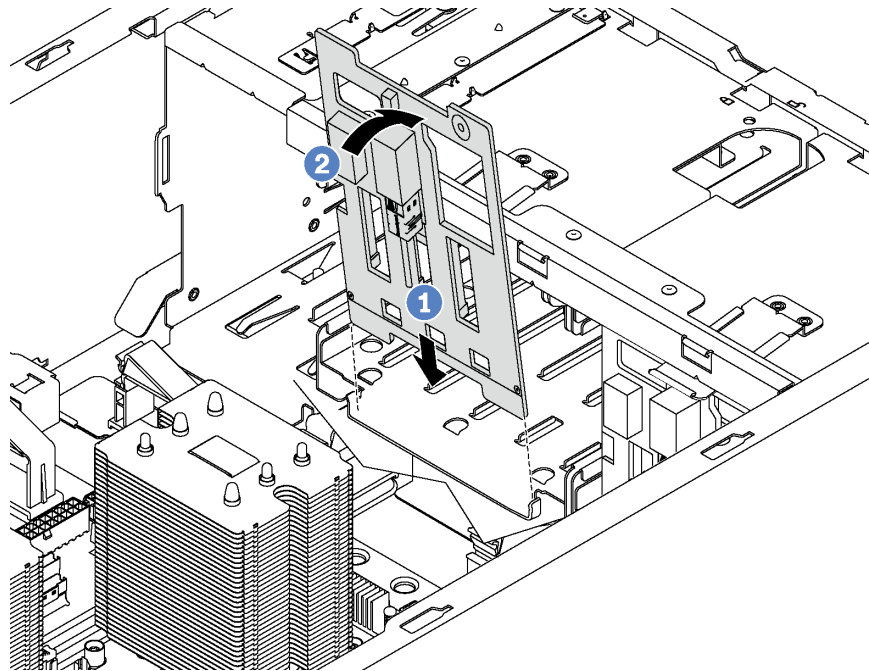


Figure 85. Installation of the backplane for four 3.5-inch hot-swap drives

- Step 3. Connect the cables to the new backplane. See [“Hot-swap-drive backplane” on page 40](#).

After installing the backplane for four 3.5-inch hot-swap drives:

1. Reinstall all the drives and fillers (if any) in the drive cage. See [“Install a hot-swap drive” on page 109](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 186](#).

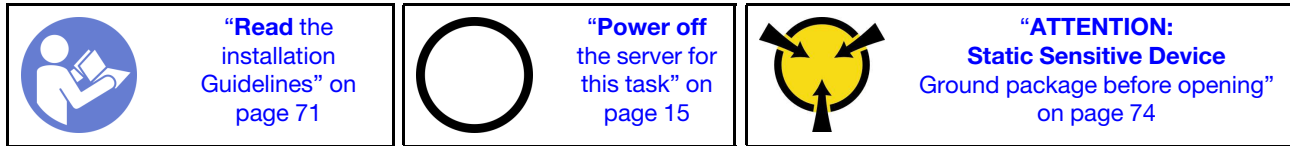
Expansion drive cage replacement

Use this information to remove and install the expansion drive cage.

Note: This section applies only server models that have the expansion drive cage installed.

Remove the expansion drive cage

Use this information to remove the expansion drive cage.



Before removing the expansion drive cage:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See [“Remove the server cover”](#) on page 81.
3. If your server has the front door installed, remove the front door. See [“Remove the front door”](#) on page 74.
4. Remove the front bezel. See [“Remove the front bezel”](#) on page 95.
5. Remove the air baffle. See [“Remove the air baffle”](#) on page 85.
6. If the Fan 3 impedes your access to the expansion drive cage, remove it. See [“Remove a front fan”](#) on page 88.
7. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive”](#) on page 108
8. Remove the backplane for four 2.5-inch hot-swap drives. See [“Remove the backplane for four 2.5-inch hot-swap drives”](#) on page 114.

To remove the expansion drive cage, complete the following steps:

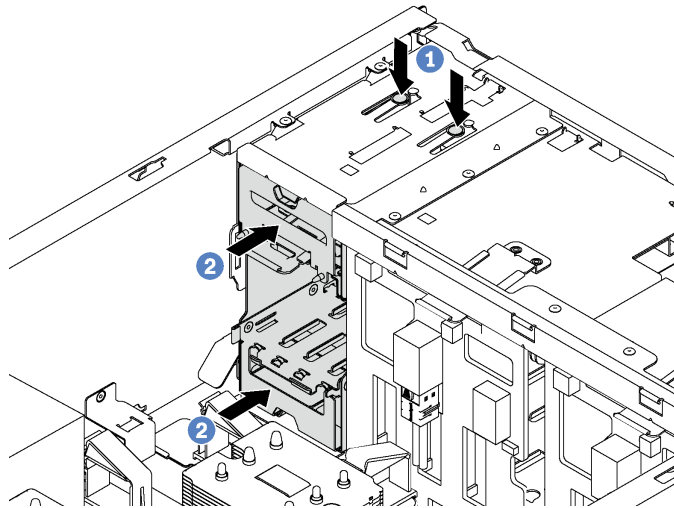


Figure 86. Expansion drive cage removal

Step 1. Press and hold the two release tabs.

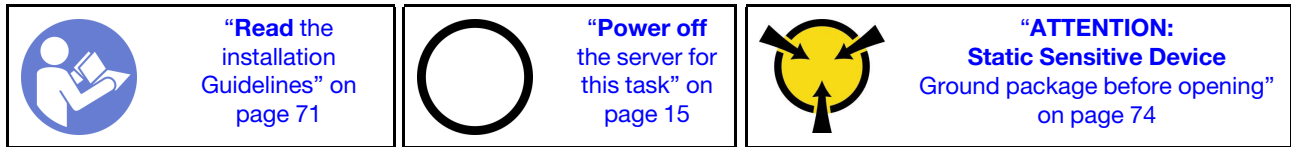
Step 2. Push the expansion drive cage forward to remove it from the chassis.

After removing the expansion drive cage:

1. Depending on your needs, you can install a new expansion drive cage, a filler, an optical drive, or a tape drive to cover the bay for proper air flow.
2. If you are instructed to return the old expansion drive cage, follow all packaging instructions and use any packaging materials that are provided.

Install the expansion drive cage

Use this information to install the expansion drive cage.



Before installing the expansion drive cage:

1. If there is a filler, an optical drive, or a tape drive installed in the bay, remove it. Keep the filler in a safe place for future use. For instructions on how to remove the optical drive or tape drive, see [“Remove an optical drive or a tape drive”](#) on page 99.
2. Touch the static-protective package that contains the new expansion drive cage to any unpainted surface on the outside of the server. Then, take the new expansion drive cage out of the package and place it on a static-protective surface.

Note: Fan 3 is required if the expansion drive cage is installed.

To install the expansion drive cage, complete the following step:

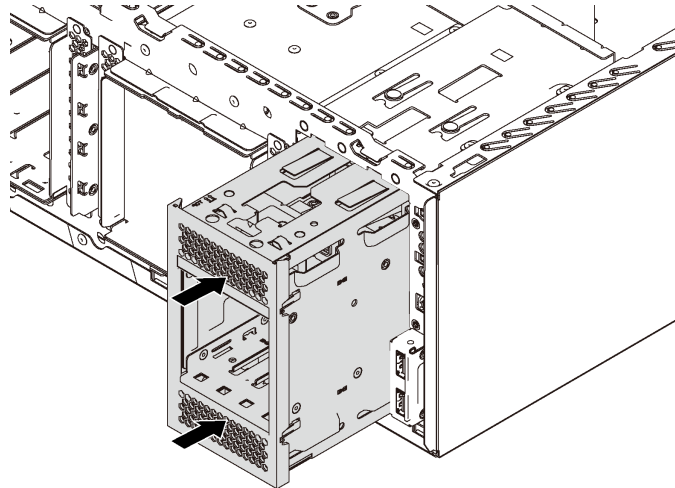


Figure 87. Expansion drive cage installation

Step 1. Slide it into the bay until it snaps into position.

After installing the expansion drive cage:

1. Ensure that the signal cables are secured by the clips **1** and are bound correctly by the Velcro strap.

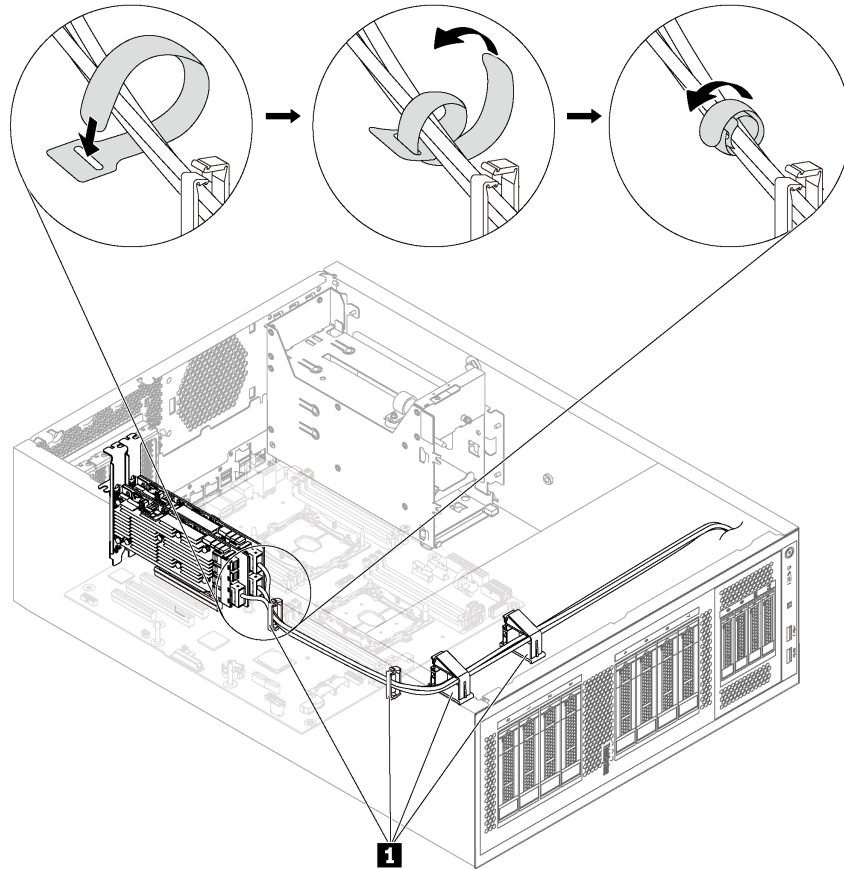


Figure 88. Securing and binding the signal cables correctly


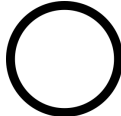

2. Complete the parts replacement. See [“Complete the parts replacement” on page 186](#).

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” on page 71		“Power off the server for this task” on page 15		“ATTENTION: Static Sensitive Device Ground package before opening” on page 74
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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. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See “Remove the server cover” on page 81.
3. Remove the air baffle. See “Remove the air baffle” on page 85.

To remove a DIMM, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

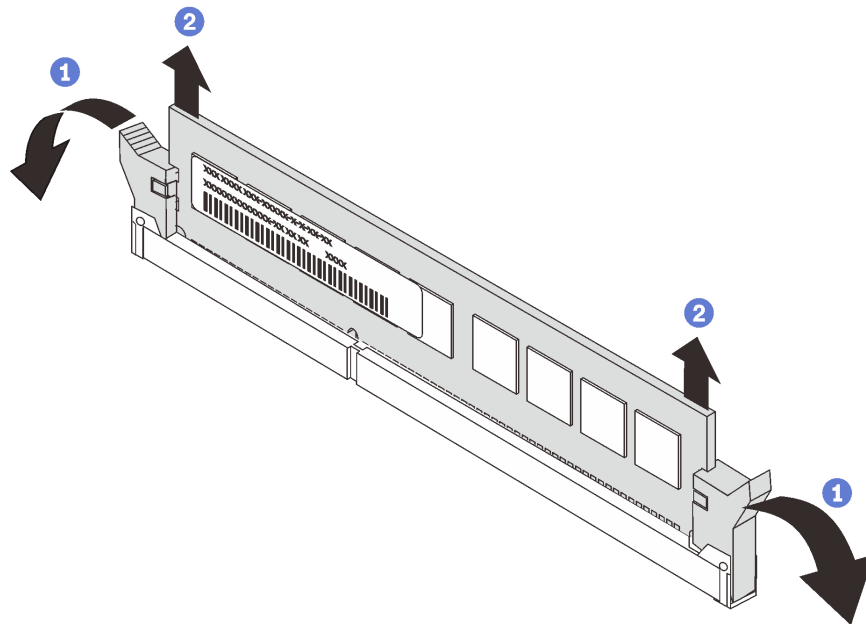


Figure 89. DIMM removal

Step 1. Carefully 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. Remove the DIMM.

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 12 DIMM slots. It supports up to 6 DIMMs when one processor is installed, and up to 12 DIMMs when two processors are installed. It has the following features:

For Intel Xeon SP Gen 1 processors

- Minimum: 8 GB (one processor and one 8GB registered DIMM (RDIMM) installed)
- Maximum:
 - 384 GB using RDIMMs (two processors and twelve 32 GB registered DIMMs (RDIMMs) installed)
 - 768 GB using LRDIMMs (two processors and twelve 64 GB load-reduced DIMMs (LRDIMMs) installed)
- Type:
 - TruDDR4 2666, single-rank/dual-rank, 8 GB/16 GB/32 GB registered DIMMs (RDIMMs)
 - TruDDR4 2666, quad-rank, 64 GB load-reduced DIMMs (LRDIMMs)

For Intel Xeon SP Gen 2 processors

- Minimum: 8 GB (one processor and one 8GB registered DIMM (RDIMM) installed)
- Maximum: 768 GB (two processors and twelve 64 GB registered DIMMs (RDIMMs) installed)
- Type:
 - TruDDR4 2666, single-rank/dual-rank, 16 GB/32 GB registered DIMMs (RDIMMs)
 - TruDDR4 2933, single-rank/dual-rank, 8 GB/16 GB/32 GB/64 GB registered DIMMs (RDIMMs)

For a list of supported DIMM options, see:

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

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 (not supported for Intel Xeon SP Gen 2 processors) with ECC technology

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

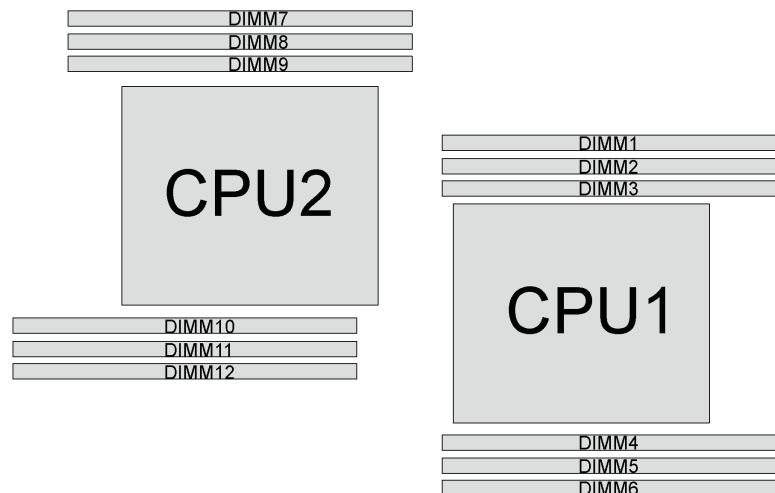


Figure 90. DIMM slots on the system board

The following memory modes are available:

- “Independent mode” on page 125
- “Mirroring mode” on page 126
- “Rank sparing mode” on page 127

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.

Note: If there are three identical DIMMs to be installed for CPU1, and the three DIMMs have the same Lenovo part number, install the three DIMMs in slots 1, 2, and 3.

Table 11. Independent mode with one processor

Total DIMMs	Processor 1						Total DIMMs
	1	2	3	4	5	6	
1			3				1
2			3	4			2
3		2	3	4			3
4		2	3	4	5		4
5	1	2	3	4	5		5
6	1	2	3	4	5	6	6

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, install the three DIMMs in slots 1, 2, and 3.
- If there are three identical DIMMs to be installed for CPU2, and the three DIMMs have the same Lenovo part numbers, install the three DIMMs in slots 10, 11, and 12.

Table 12. Independent mode with two processors

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

Table 12. Independent mode with two processors (continued)

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

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 memory modules to be installed must be the same type with the same capacity, frequency, voltage, and number of ranks.

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

Table 13. Mirroring mode with one processor

Total DIMMs	Processor 1						Total DIMMs
	1	2	3	4	5	6	
2		2	3				2
3	1	2	3				3
4		2	3	4	5		4
6	1	2	3	4	5	6	6

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

Table 14. Mirroring mode with two processors

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

Table 14. Mirroring mode with two processors (continued)

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

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, rank sparing mode is not supported. If the rank of installed DIMMs is more than one rank, follow the installation rules listed in the following tables.

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

Table 15. Rank sparing mode with one processor

Total DIMMs	Processor 1						Total DIMMs
	1	2	3	4	5	6	
1			3				1
2			3	4			2
3		2	3	4			3
4		2	3	4	5		4
5	1	2	3	4	5		5
6	1	2	3	4	5	6	6

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

Table 16. Rank sparing mode with two processors


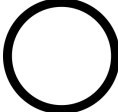

Total DIMMs	Processor 1						Processor 2						Total DIMMs
	1	2	3	4	5	6	7	8	9	10	11	12	
2			3							10			2
3			3	4						10			3
4			3	4					9	10			4
5		2	3	4					9	10			5
6		2	3	4					9	10	11		6
7		2	3	4	5				9	10	11		7
8		2	3	4	5			8	9	10	11		8
9	1	2	3	4	5			8	9	10	11		9
10	1	2	3	4	5			8	9	10	11	12	10

Table 16. Rank sparing mode with two processors (continued)

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

Install a DIMM

Use this information to install a DIMM.

	<p>“Read the installation Guidelines” on page 71</p>		<p>“Power off the server for this task” on page 15</p>		<p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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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. Ensure that you consider and follow the DIMM installation rules when performing the operation. See [“DIMM installation rules”](#) on page 124.

To install a DIMM, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

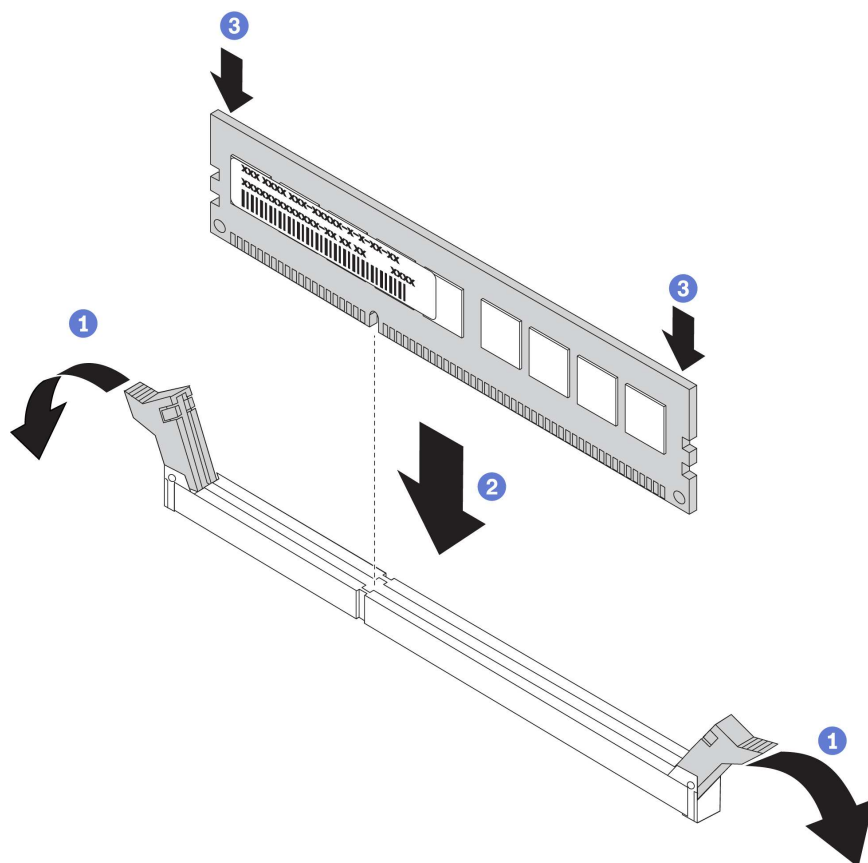


Figure 91. DIMM installation

Step 1. Open the retaining clips on each end of the DIMM slot. Then, install the DIMM into the slot.

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

Step 2. Firmly press the DIMM straight down into the slot by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the slot.

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.

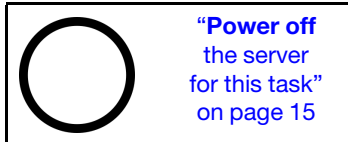
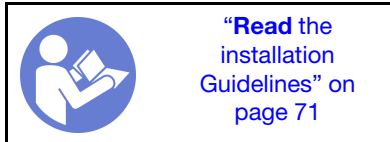
After installing a DIMM, complete the parts replacement. See [“Complete the parts replacement” on page 186](#).

PCIe adapter retainer replacement

Use this information to remove and install the PCIe adapter retainer, which helps to secure PCIe adapters.

Remove the PCIe adapter retainer

Use this information to remove the PCIe adapter retainer.



Before removing the PCIe adapter retainer:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See [“Remove the server cover” on page 81](#).

To remove the PCIe adapter retainer, complete the following step:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

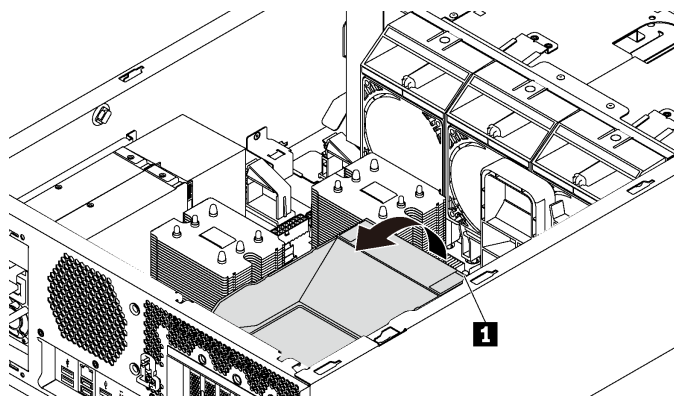
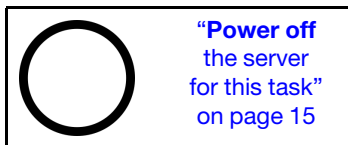
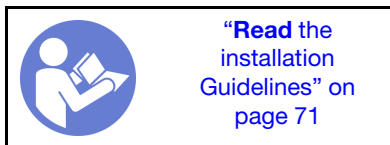


Figure 92. PCIe adapter retainer removal

Step 1. Grab the touch point **1** to lift the retainer from the chassis.

Install the PCIe adapter retainer

Use this information to install the PCIe adapter retainer.



To install the PCIe adapter retainer, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

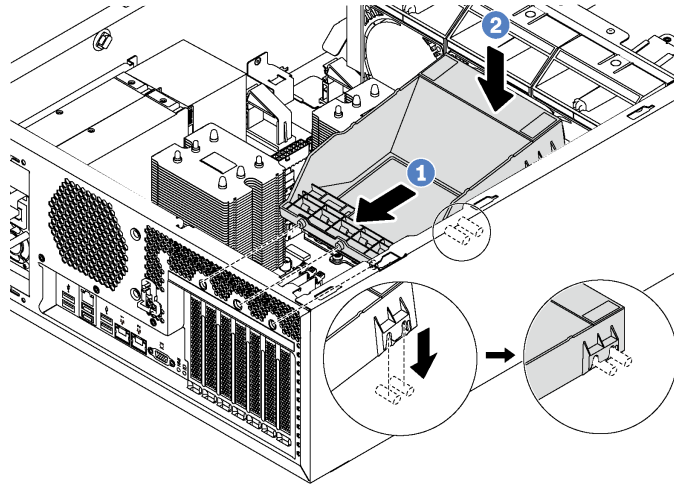


Figure 93. PCIe adapter retainer installation

- Step 1. Position the new PCIe adapter retainer over PCIe slots. Then, align the three pins on the retainer with the corresponding holes on the chassis and insert the pins into the holes.
- Step 2. Pivot the PCIe adapter retainer downward until the notches on the PCIe adapter retainer catch on the mounting studs on the chassis.

After installing the PCIe adapter retainer, complete the parts replacement. See [“Complete the parts replacement” on page 186](#).

PCIe adapter replacement


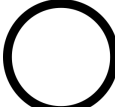

Use this information to remove and install a PCIe adapter.

Your server comes with six PCIe slots. Depending on your needs, you can install a PCIe adapter to obtain the corresponding function or remove the adapter if necessary. The PCIe adapter can be an Ethernet adapter, a host bus adapter, a RAID adapter, a graphics adapter, 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:
<https://static.lenovo.com/us/en/serverproven/index.shtml>

Remove a PCIe adapter

Use this information to remove a PCIe adapter.

 <p>“Read the installation Guidelines” on page 71</p>	 <p>“Power off the server for this task” on page 15</p>	 <p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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Before removing a PCIe adapter:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See “[Remove the server cover](#)” on page 81.
3. Remove the air baffle. See “[Remove the air baffle](#)” on page 85.
4. Remove the PCIe adapter retainer. See “[Remove the PCIe adapter retainer](#)” on page 129.
5. Record the cable connections on the PCIe adapter and then disconnect all cables from the PCIe adapter.

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.

To remove a PCIe adapter, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

Step 1. Grasp the PCIe adapter by its edges and carefully pull it out of the PCIe slot.

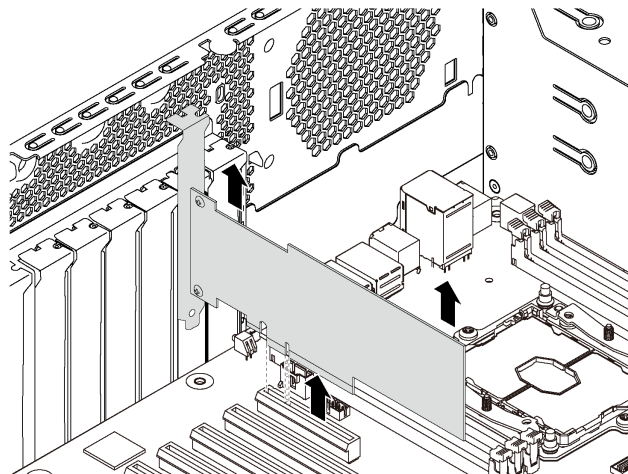


Figure 94. PCIe adapter removal

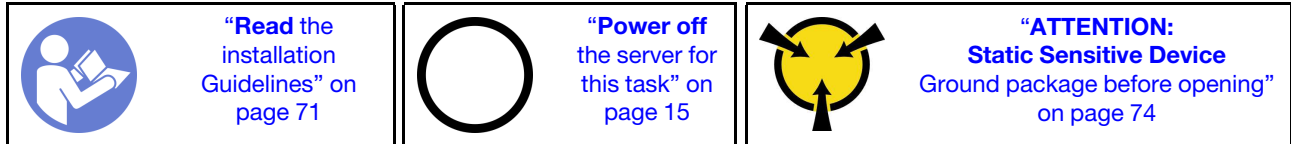
Note: The PCIe adapter might fit tightly into the PCIe slot. If necessary, alternatively move each side of the PCIe adapter a small and equal amount until it is removed from the slot.

After removing the PCIe adapter:

1. Install a new PCIe adapter to replace the old one. See “[Install a PCIe adapter](#)” on page 132. Otherwise, install the bracket for the PCIe slot to cover the place.
2. 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.



Observe the following guidelines when select a PCIe slot:

- For server models that support NVMe drives, the NVMe adapter can be installed only in PCIe slot 2.
- For RAID adapters or host bus adapters, you can install them in either PCIe slot 1 or PCIe slot 2.
- For server models with one processor, you can install a double-width graphics adapter only in PCIe slot 3. For server models with two processors, you can install up to two double-width graphics adapters in PCIe slot 3 and PCIe slot 5. After any double-width graphics adapter is installed, PCIe slot 4 or PCIe slot 6 becomes unavailable because the space is occupied by the double-width adapter.

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:

1. If a bracket is installed in the PCIe slot, remove it. Store the bracket for the PCIe slot in case that you later remove the PCIe adapter and need the bracket to cover the place.
2. 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.

To install a PCIe adapter, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

- Step 1. Locate the appropriate PCIe slot. For information about the PCIe slot, see “Specifications” on page 3.

- Step 2. Position the new PCIe adapter over the PCIe slot. Then, carefully press the PCIe adapter straight down until it is securely seated in the slot.

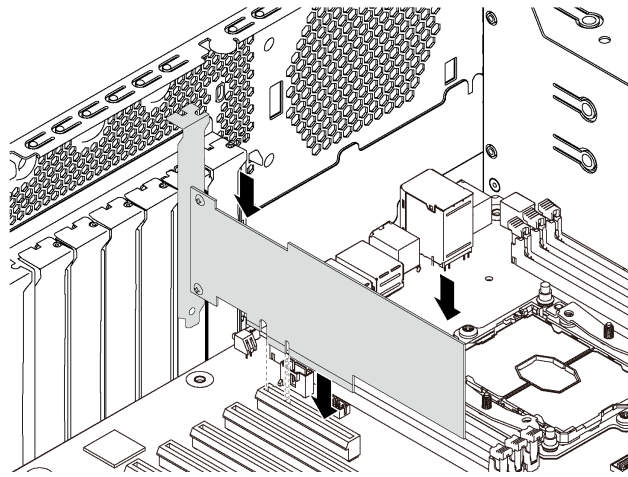


Figure 95. PCIe adapter installation

- Step 3. Depending on the type of the PCIe adapter, you might need to connect any required cables. Refer to [“Internal cable routing” on page 31](#) or the documentation that comes with the PCIe adapter for specific information.

After installing the PCIe adapter:


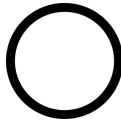

1. Install the PCIe adapter retainer to help secure the PCIe adapter. See [“Install the PCIe adapter retainer” on page 130](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 186](#).

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.

	<p>“Read the installation Guidelines” on page 71</p>		<p>“Power off the server for this task” on page 15</p>		<p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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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 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. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See [“Remove the server cover” on page 81](#).
3. 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 this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

Step 1. Locate the CMOS battery. See [“System board components” on page 28](#).

Step 2. Remove the CMOS battery.

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.

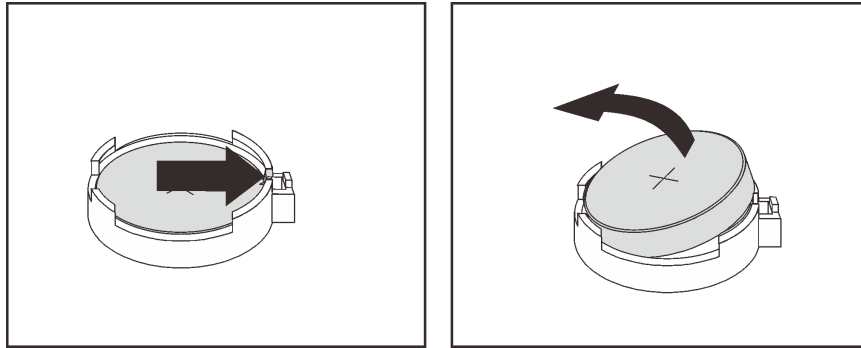



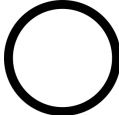

Figure 96. CMOS battery removal

After removing the CMOS battery:

1. Install a new CMOS battery. See [“Install the CMOS battery” on page 136](#).
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.

 <p>“Read the installation Guidelines” on page 71</p>	 <p>“Power off the server for this task” on page 15</p>	 <p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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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 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 this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

- 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 retainer holds the battery securely.

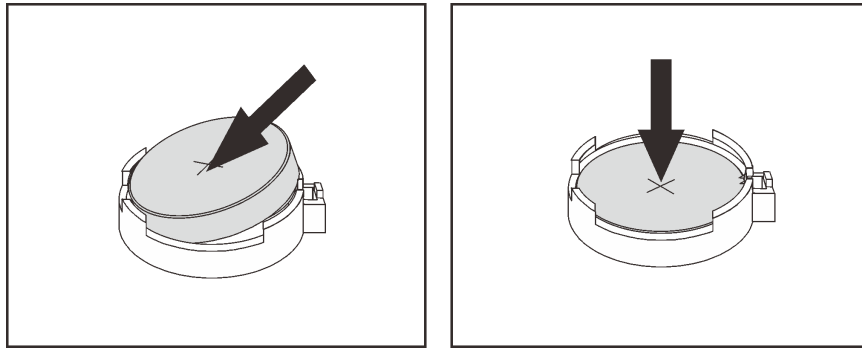


Figure 97. CMOS battery installation

After installing the CMOS battery, do the following:

1. Complete the parts replacement. See [“Complete the parts replacement” on page 186](#).
2. Start the Setup utility program to reset the date, time, and any passwords.

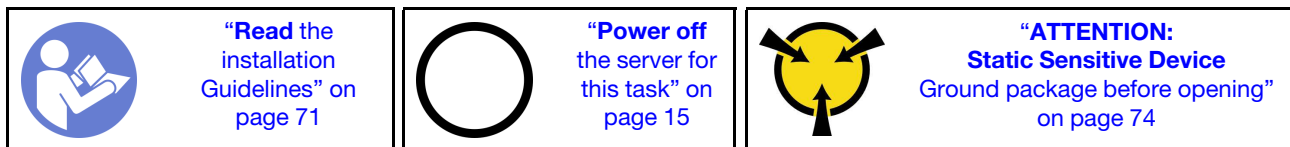
Serial port module replacement

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

Note: Depending on the model, your server might come with a serial port module.

Remove the serial port module

Use this information to remove the serial port module.



Before removing the serial port module:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See [“Remove the server cover” on page 81](#).
3. Remove the air baffle. See [“Remove the air baffle” on page 85](#).
4. Remove the PCIe adapter retainer. See [“Remove the PCIe adapter retainer” on page 129](#).

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

- Step 1. Disconnect the cable of the serial port module from the system board.
- Step 2. Lift the serial port module out of the chassis.

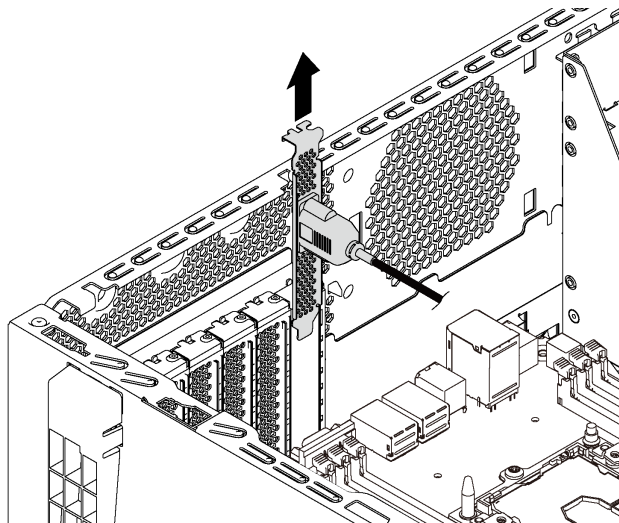



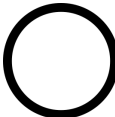

Figure 98. Serial port module removal

After removing the serial port module:

1. Install a new serial port module or a 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.

 <p>“Read the installation Guidelines” on page 71</p>	 <p>“Power off the server for this task” on page 15</p>	 <p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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Before installing the serial port module:

1. If the slot is covered with a slot bracket, 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:

Step 1. Insert the serial port module into the dedicated slot.

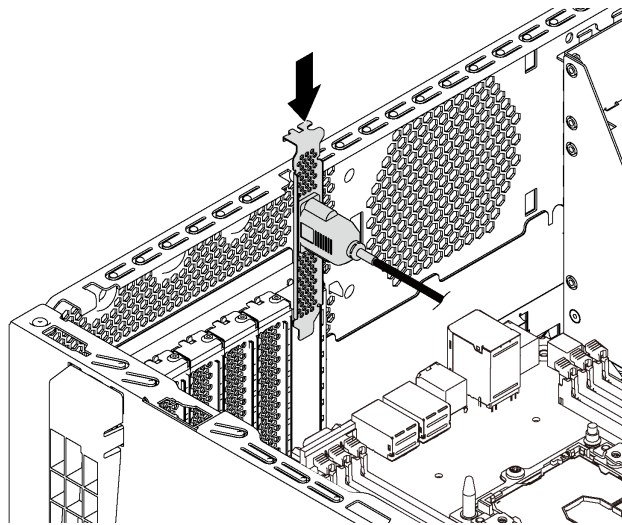


Figure 99. Serial port module installation

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, see [“System board components” on page 28](#).

After installing the serial port module:

1. Complete the parts replacement. See [“Complete the parts replacement” on page 186](#).
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
```


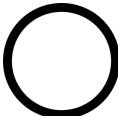

- c. Restart the server to ensure that the EMS setting takes effect.

M.2 backplane and M.2 drive replacement

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

 <p>“Read the installation Guidelines” on page 71</p>	 <p>“Power off the server for this task” on page 15</p>	 <p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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Before removing the M.2 backplane and M.2 drive:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See “[Remove the server cover](#)” on page 81.
3. For easier operation, remove the PCIe adapter retainer. See “[Remove the PCIe adapter retainer](#)” on page 129.
4. Remove any parts and disconnect any cables that might impede your access to the M.2 backplane and M.2 drive.

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

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

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

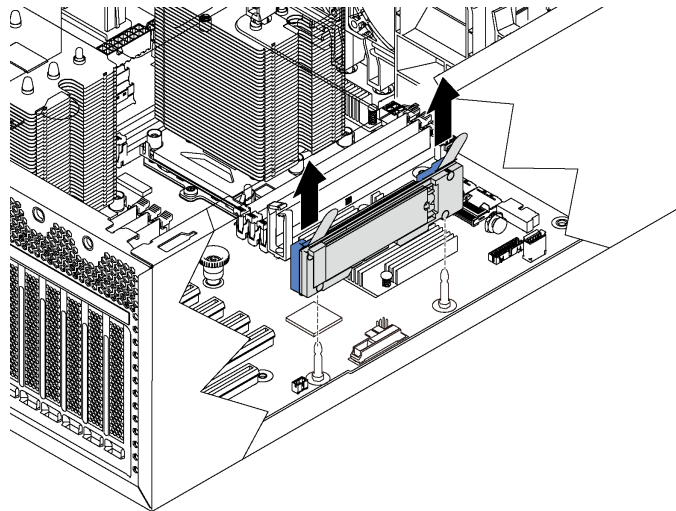


Figure 100. M.2 backplane removal

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

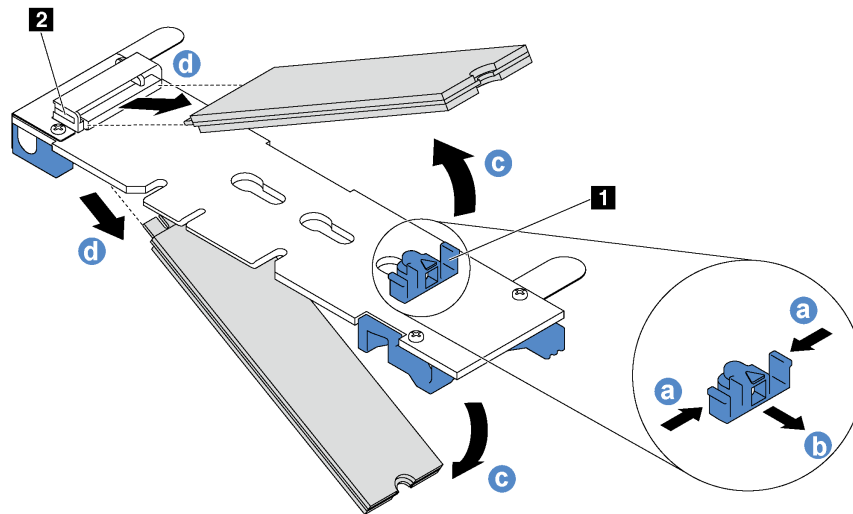


Figure 101. M.2 drive removal

- Press both sides of the retainer **1**.
- Slide the retainer backward to loosen the M.2 drive from the M.2 backplane.


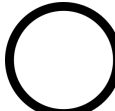

Note: If the M.2 backplane has two M.2 drives, they will both release outward when you slide the retainer backward.

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

	“Read the installation Guidelines” on page 71		“Power off the server for this task” on page 15		“ATTENTION: Static Sensitive Device Ground package before opening” on page 74
---	--	---	--	--	---

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:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

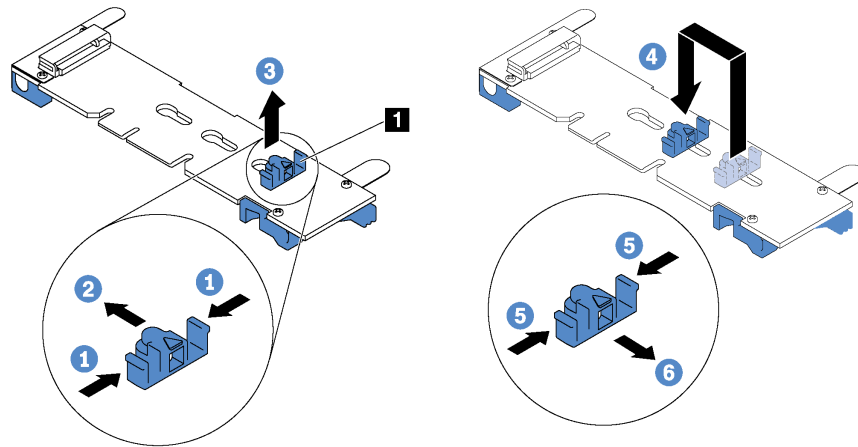





Figure 102. M.2 retainer adjustment

- 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.

 <p>“Read the installation Guidelines” on page 71</p>	 <p>“Power off the server for this task” on page 15</p>	 <p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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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 142.

3. Locate the connector on each side of the M.2 backplane.

Notes:

- Some M.2 backplanes support two identical M.2 drives. When two M.2 drives are installed, align and support both M.2 drives when sliding the retainer forward to secure the M.2 drives.
- Install the M.2 drive in slot 0 first.

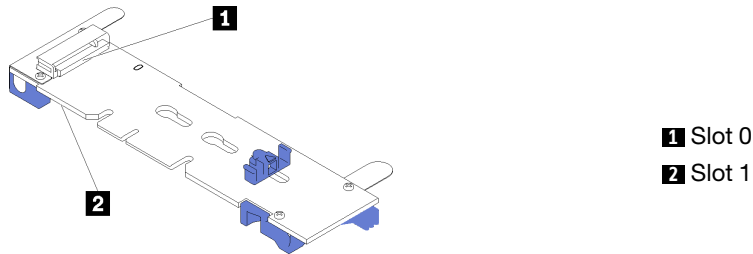


Figure 103. M.2 drive slot

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

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

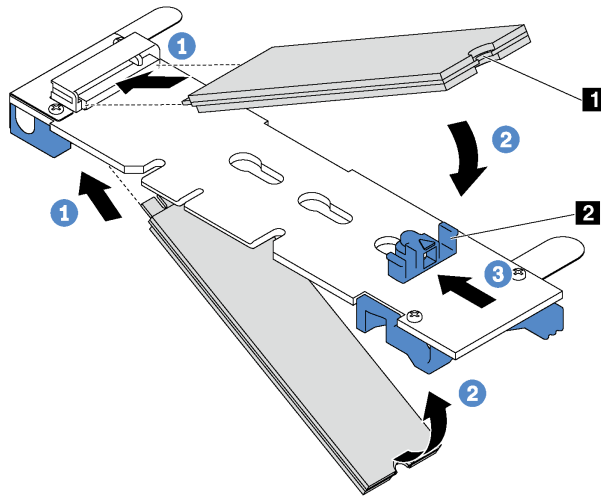


Figure 104. M.2 drive installation

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.

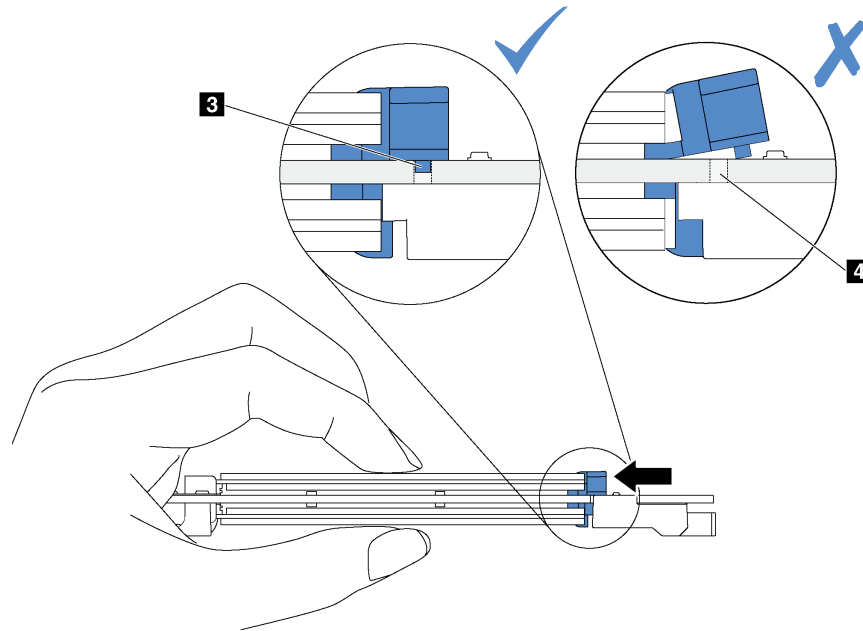


Figure 105. Instruction for sliding the retainer

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.

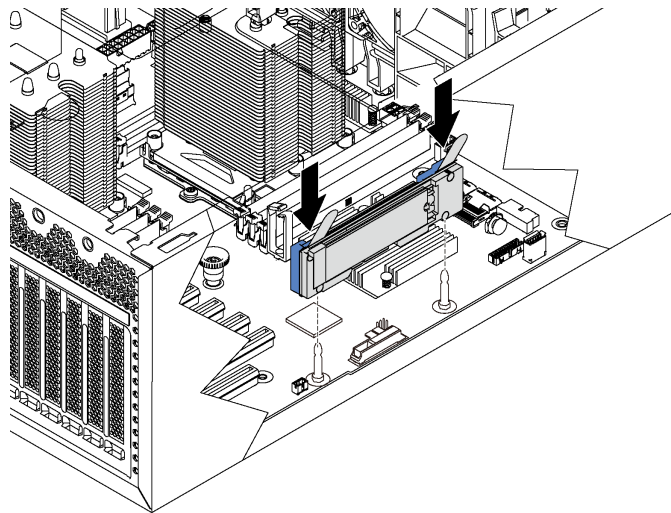


Figure 106. M.2 backplane installation

After installing the M.2 backplane and M.2 drive:

1. Install the PCIe adapter retainer. See [“Install the PCIe adapter retainer” on page 130](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 186](#).
3. Use the Lenovo XClarity Provisioning Manager to configure the RAID. For more information, see: http://sysmgmt.lenovofiles.com/help/topic/LXPM/RAID_setup.html

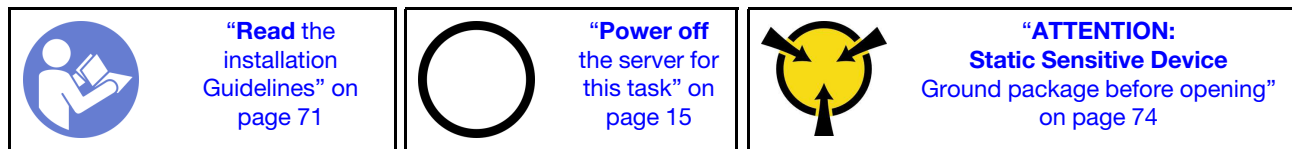
TCM/TPM adapter replacement (for Chinese Mainland only)

Use this information to remove and install the TCM/TPM adapter (sometimes called a daughter card).

For customers in Chinese Mainland, integrated TPM is not supported. However, customers in Chinese Mainland can install a Trusted Cryptographic Module (TCM) adapter or a TPM adapter (sometimes called a daughter card).

Remove the TCM/TPM adapter (for Chinese Mainland only)

Use this information to remove the TCM/TPM adapter.



Before removing the TCM/TPM adapter:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See [“Remove the server cover” on page 81](#).
3. Remove the PCIe adapter retainer. See [“Remove the PCIe adapter retainer” on page 129](#).

To remove the TCM/TPM adapter, complete the following steps:

Step 1. Locate the TCM/TPM connector on the system board.

Step 2. Press and hold the release latch, and then lift the TCM/TPM adapter straight up.

Notes:

- Carefully handle the TCM/TPM adapter by its edges.
- Your TCM/TPM adapter might look slightly different from the illustration.

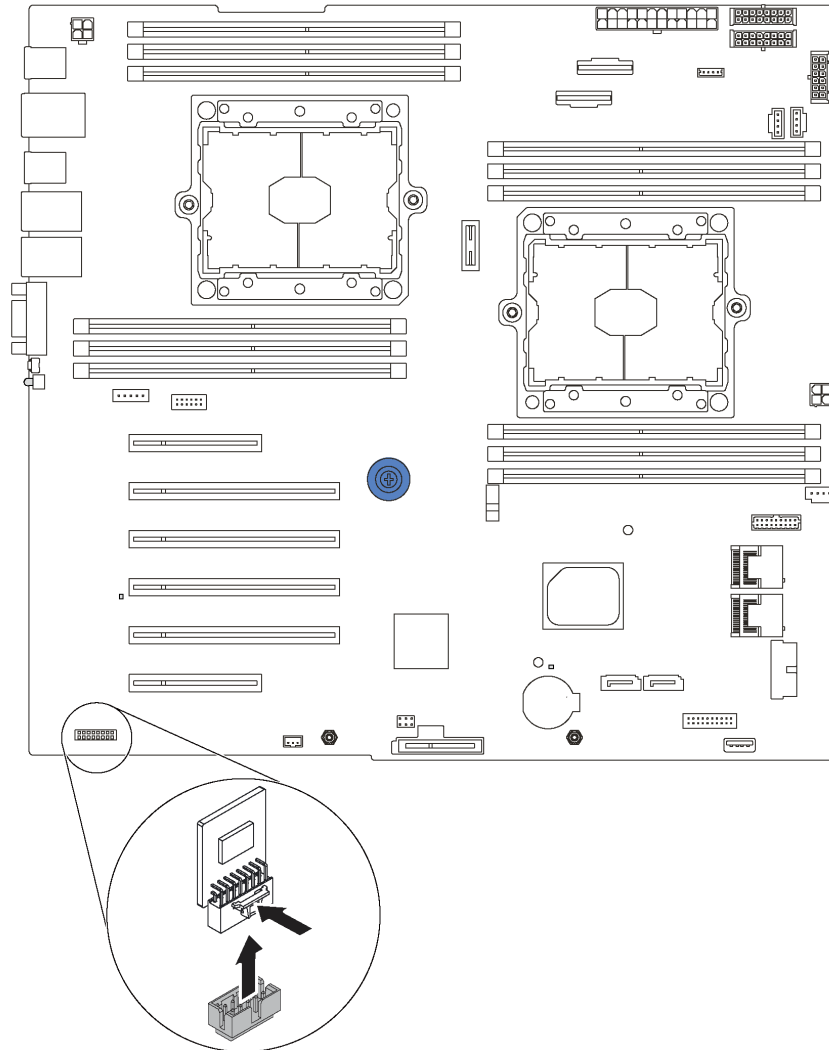





Figure 107. TCM/TPM adapter removal

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

Install the TCM/TPM adapter (for Chinese Mainland only)

Use this information to install the TCM/TPM adapter.

 <p>“Read the installation Guidelines” on page 71</p>	 <p>“Power off the server for this task” on page 15</p>	 <p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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Before installing the TCM/TPM adapter, touch the static-protective package that contains the new TCM/TPM adapter to any unpainted surface on the outside of the server. Then, take the new TCM/TPM adapter out of the package and place it on a static-protective surface.

To install the TCM/TPM adapter, complete the following step:

Step 1. Locate the TCM/TPM connector on the system board.

Step 2. Insert the TCM/TPM adapter into the TCM/TPM connector on the system board.

Notes:

- Carefully handle the TCM/TPM adapter by its edges.
- Your TCM/TPM adapter might look slightly different from the illustration.

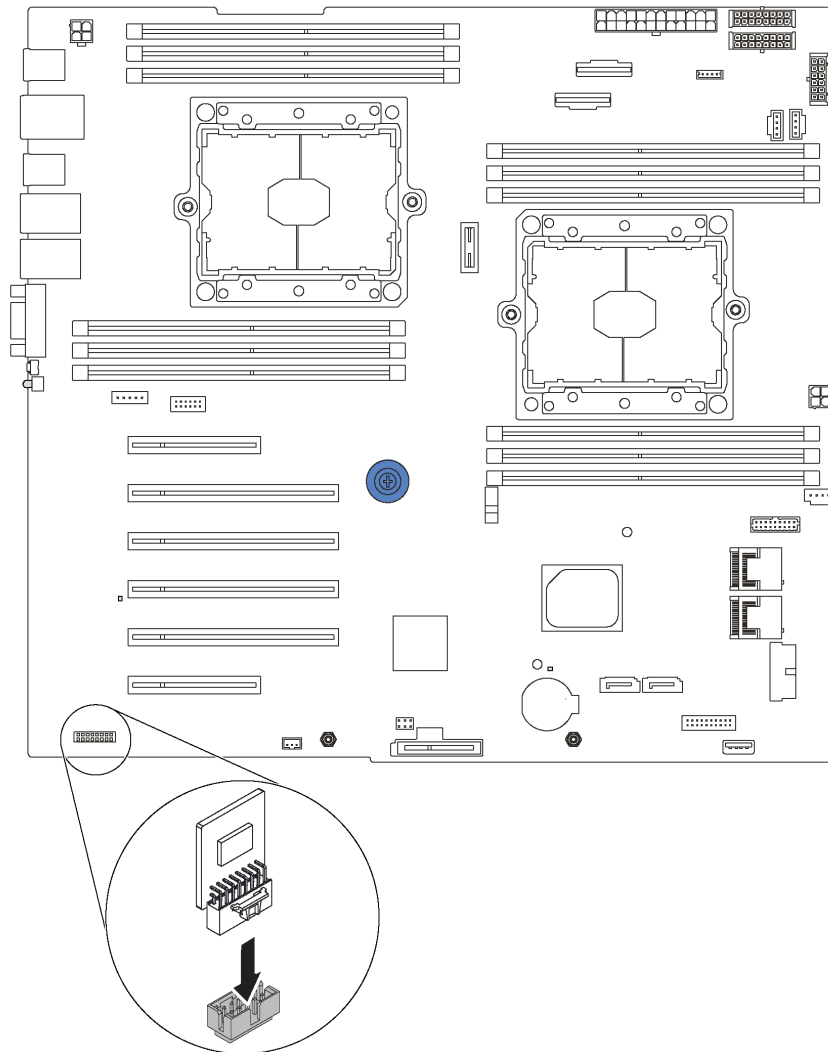


Figure 108. TCM/TPM adapter installation

After installing the TCM/TPM adapter:

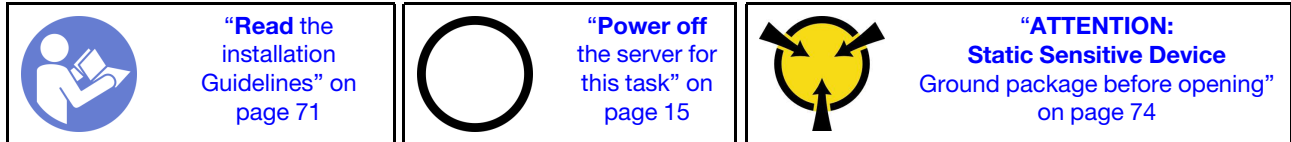
1. Install the PCIe adapter retainer. See [“Install the PCIe adapter retainer”](#) on page 130.
2. Complete the parts replacement. See [“Complete the parts replacement”](#) on page 186.

Intrusion switch replacement

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

Remove the intrusion switch

Use this information to remove the intrusion switch.



Before removing the intrusion switch:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See [“Remove the server cover”](#) on page 81.
3. Remove the PCIe adapter retainer. See [“Remove the PCIe adapter retainer”](#) on page 129.

To remove the intrusion switch, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

- Step 1. Disconnect the cable of the intrusion switch from the system board.
- Step 2. Slide the intrusion switch as shown to remove it from the chassis.

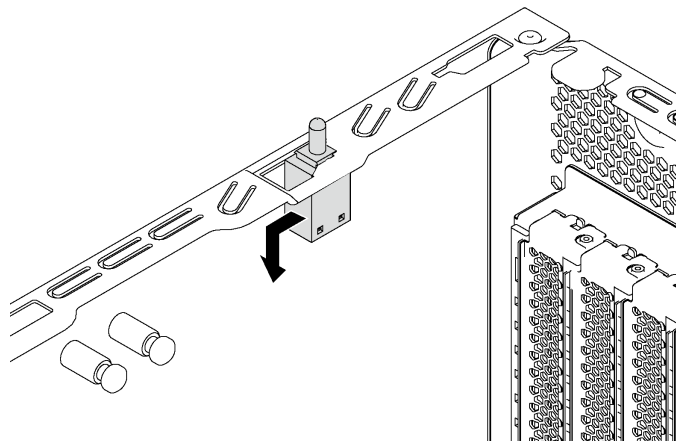
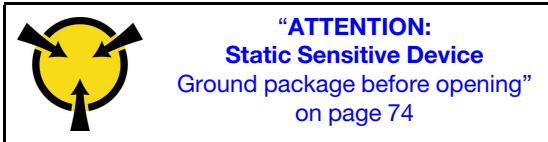
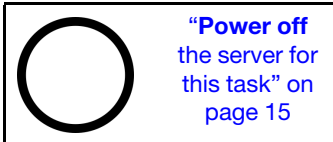


Figure 109. Intrusion switch removal

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

Install the intrusion switch

Use this information to install the intrusion switch.



Before installing the intrusion switch, touch the static-protective package that contains the new intrusion switch to any unpainted surface on the outside of the server. Then, take the new intrusion switch out of the package and place them on a static-protective surface.

To install the intrusion switch, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

Step 1. Insert the intrusion switch into the chassis and push it in the direction as shown until it is fully seated.

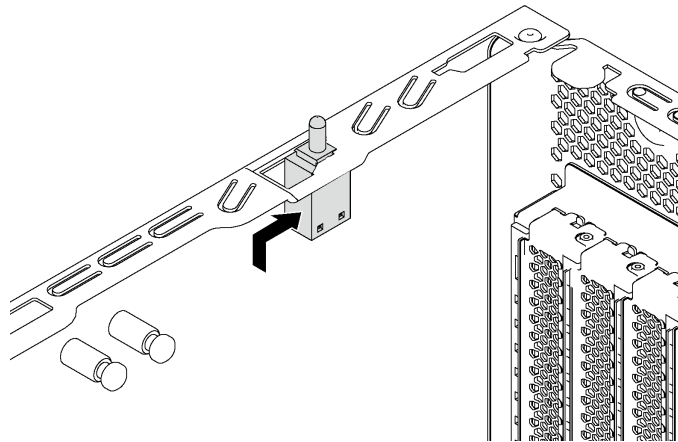


Figure 110. Intrusion switch installation

Step 2. Connect the cable of the intrusion switch to the intrusion switch connector on the system board. For the location of the intrusion switch connector, refer to “System board components” on page 28.

After installing the intrusion switch:

1. Install the PCIe adapter retainer. See “Install the PCIe adapter retainer” on page 130.
2. Complete the parts replacement. See “Complete the parts replacement” on page 186.

Fixed power supply replacement

Use this information to remove and install the fixed power supply.

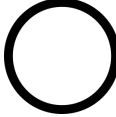
Note: This section applies only to server models that have a fixed power supply installed.

Remove the fixed power supply


Use this information to remove the fixed power supply.



“Read the installation Guidelines” on page 71

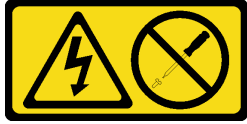


“Power off the server for this task” on page 15



“ATTENTION: Static Sensitive Device Ground package before opening” on page 74

S035



CAUTION:

Never remove the cover on a power supply or any part that has this label attached. Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

S002



CAUTION:

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

S001



 **DANGER**

Electrical current from power, telephone, and communication cables is hazardous.
To avoid a shock hazard:

- Connect all power cords to a properly wired and grounded electrical outlet/source.
- Connect any equipment that will be attached to this product to properly wired outlets/sources.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- The device might have more than one power cord, to remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Figure 111. Fixed power supply label on the cover

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



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.

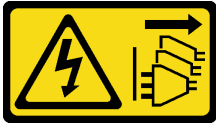
S035



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.

Before removing the fixed power supply:

1. If the server is installed in a rack, extend the server from the rack.
2. Disconnect the power cord from the fixed power supply.
3. Remove the server cover. See [“Remove the server cover” on page 81](#).
4. Remove the air baffle. See [“Remove the air baffle” on page 85](#).
5. Remove all cables on the fixed power supply from the system board.

To remove the fixed power supply, complete the following steps:

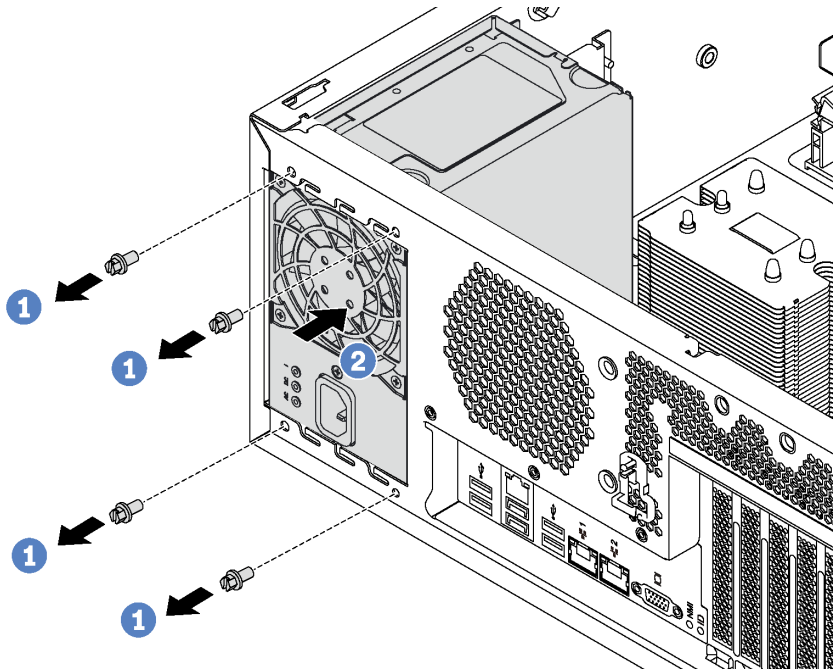


Figure 112. Fixed power supply removal


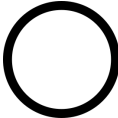

Step 1. Remove the screws that secure the fixed power supply.

Step 2. Push the fixed power supply toward the front of the server. Then, remove the fixed power supply out of the chassis.

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

Install the fixed power supply

Use this information to install the fixed power supply.

 <p>“Read the installation Guidelines” on page 71</p>	 <p>“Power off the server for this task” on page 15</p>	 <p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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S035



CAUTION:

Never remove the cover on a power supply or any part that has this label attached. Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

S002



CAUTION:

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

S001



Electrical current from power, telephone, and communication cables is hazardous. To avoid a shock hazard:

- Connect all power cords to a properly wired and grounded electrical outlet/source.
- Connect any equipment that will be attached to this product to properly wired outlets/sources.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- The device might have more than one power cord, to remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Figure 113. Fixed power supply label on the cover

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



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.

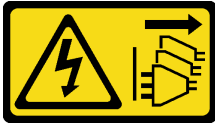
S035



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.

Before installing the fixed power supply, touch the static-protective package that contains the new fixed power supply to any unpainted surface on the outside of the server. Then, take the new fixed power supply out of the package and place them on a static-protective surface.

To install the fixed power supply, complete the following steps:

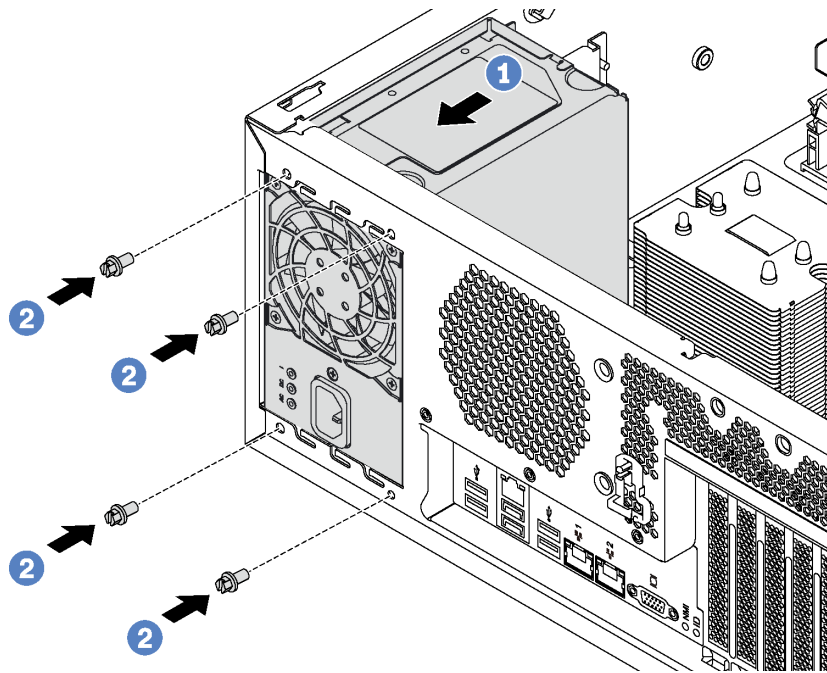


Figure 114. Fixed power supply installation

Step 1. Slide the new fixed power supply into the bay as shown until it snaps into position.

Step 2. Install the screws to secure the fixed power supply.

After installing the fixed power supply:

1. Connect all cables on the fixed power supply to corresponding connectors on the system board. See [“Fixed power supply” on page 37](#).
2. Connect the power cable to the power supply and a properly grounded electrical outlet.
3. 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.
4. Complete the parts replacement. See [“Complete the parts replacement” on page 186](#).

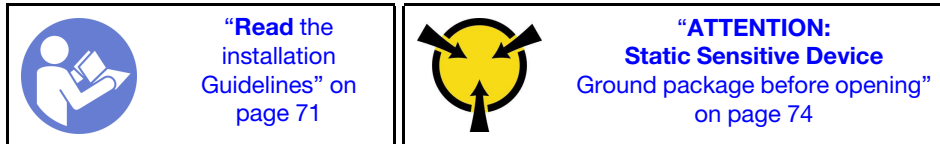
Hot-swap power supply replacement

Use this information to remove and install a hot-swap power supply.

Note: This section applies only to server models that have hot-swap power supplies installed.

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 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:

- Connect all power cords to a properly wired and grounded electrical outlet/source.
- Connect any equipment that will be attached to this product to properly wired outlets/sources.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- The device might have more than one power cord, to remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

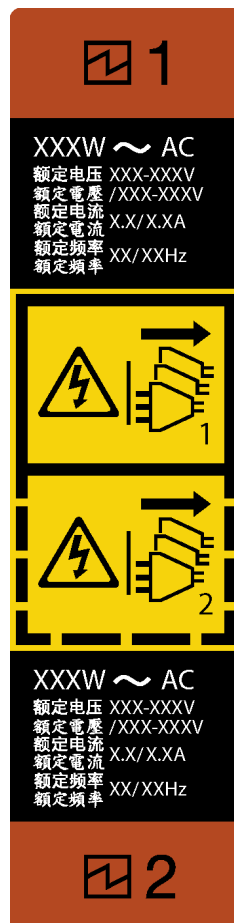


Figure 115. Hot-swap power supply label

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



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.

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

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

- Step 1. If the server is in a rack, pull back the cable management arm to gain access to the rear of the server and the power supply.

Step 2. Locate the failing power supply in the rear of your server.

Note: 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 26](#).

Step 3. Disconnect the power cord from the failing hot-swap redundant 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.

Step 4. Press the release tab toward the handle and carefully pull the handle at the same time to slide the failing hot-swap power supply out of the chassis.

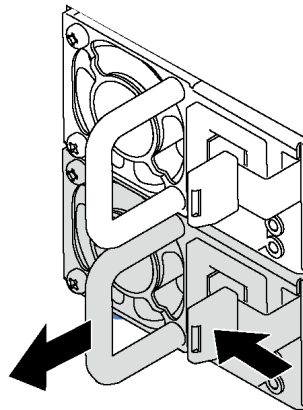


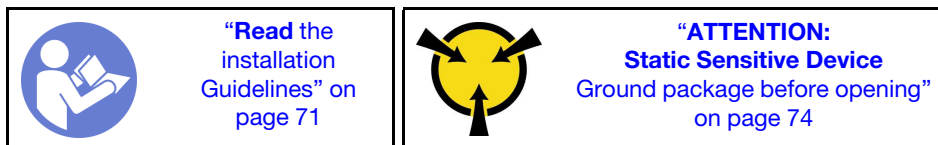
Figure 116. Hot-swap power supply removal

After removing the power supply, do the following:

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 160](#).
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:

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.

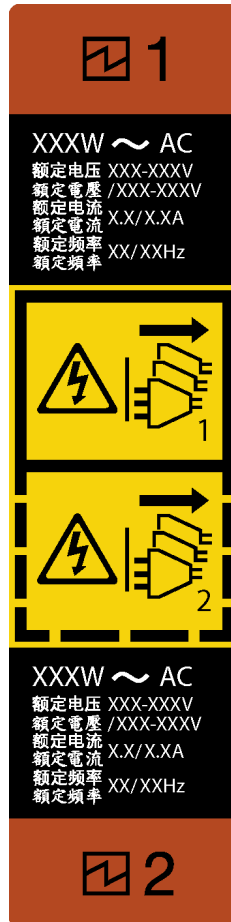


Figure 117. Hot-swap power supply label

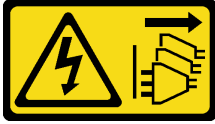
S035



CAUTION:

Never remove the cover on a power supply or any part that has this label attached. Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

S002



CAUTION:

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

S001



**Electrical current from power, telephone, and communication cables is hazardous.
To avoid a shock hazard:**

- **Connect all power cords to a properly wired and grounded electrical outlet/source.**
- **Connect any equipment that will be attached to this product to properly wired outlets/sources.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **The device might have more than one power cord, to remove all electrical current from the device, ensure that all power cords are disconnected from the power source.**

The following tips describe the information that you must consider when you install a power supply with dc input.

CAUTION:

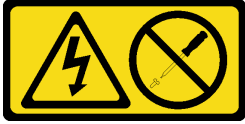
240 V dc input (input range: 180-300 V dc) is supported in Chinese Mainland ONLY. Power supply with 240 V dc input cannot support hot plugging power cord function. Before removing the power supply with dc input, please turn off server or disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the power cord.



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.

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 this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

Step 1. If there is a power-supply-bay filler installed, remove it.

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.

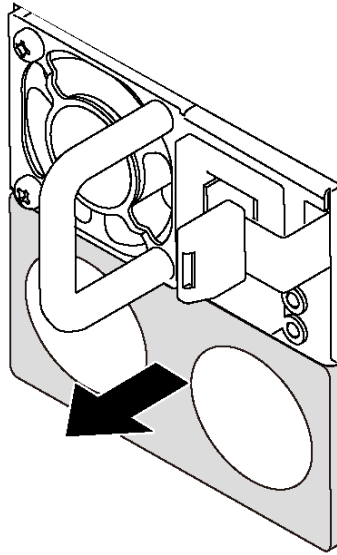


Figure 118. Hot-swap power supply filler removal

Step 2. Slide the new hot-swap power supply into the bay until it snaps into position.

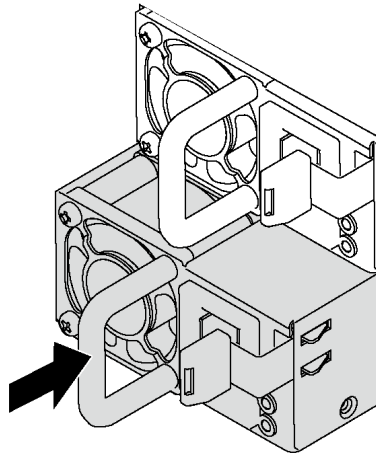


Figure 119. Hot-swap power supply installation

After installing the hot-swap power supply:

1. Connect the power cable to the power supply and 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.

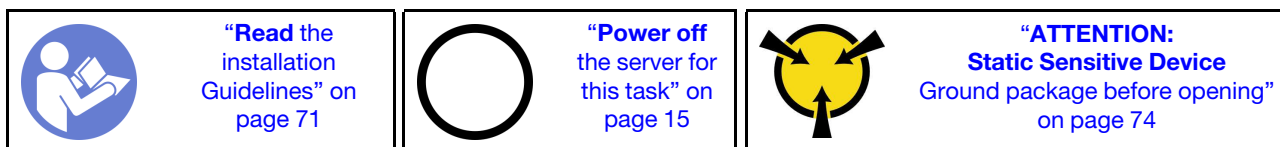
Power interface board replacement

Use this information to remove and install the power interface board.

Note: This section applies only to server models that have the power interface board installed.

Remove the power interface board

Use this information to remove the power interface board.



Before removing the power interface board:

1. If the server is installed in a rack, remove the server from the rack.
2. Remove the server cover. See [“Remove the server cover”](#) on page 81.
3. Remove the air baffle. See [“Remove the air baffle”](#) on page 85.
4. Remove all hot-swap power supplies. See [“Remove a hot-swap power supply”](#) on page 157.
5. Disconnect all cables from the power interface board.

To remove the power interface board, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

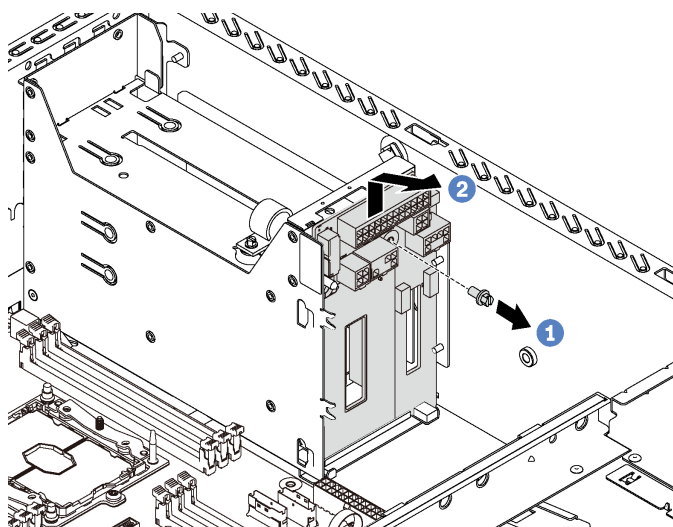


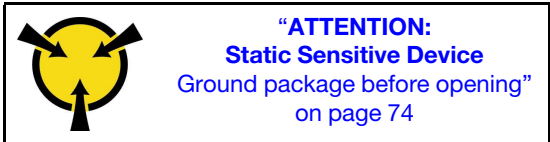
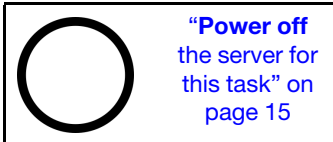
Figure 120. Power interface board removal

- Step 1. Remove the screw that secures the power interface board.
- Step 2. Gently lift the power interface board upward so that the power interface board is disengaged from the mounting stud on the chassis. Then, carefully remove the power interface board out of the chassis.

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

Install the power interface board

Use this information to install the power interface board.



Before installing the power interface board, touch the static-protective package that contains the new power interface board to any unpainted surface on the outside of the server. Then, take the new power interface board out of the package and place it on a static-protective surface.

To install the power interface board, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

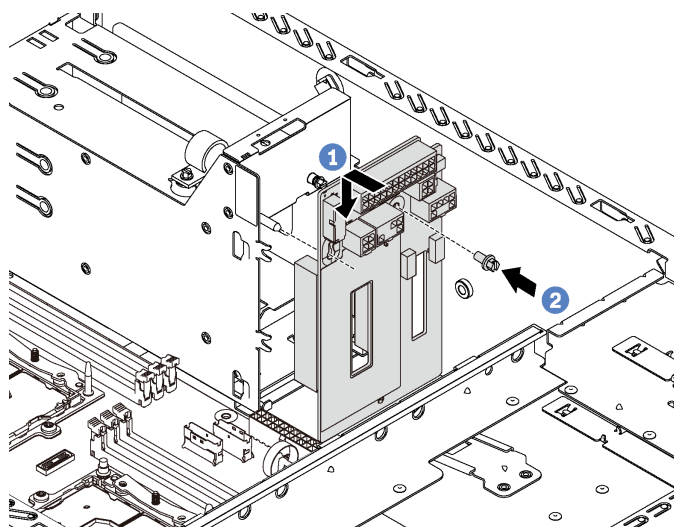


Figure 121. Power interface board installation

- Step 1. Insert the hole in the power interface board into the corresponding mounting stud on the chassis. Then, gently move the power interface board downward so that it is engaged with the mounting stud.
- Step 2. Install the screw to secure the power interface board in place.

After installing the power interface board:

1. Reconnect all cables to the power interface board. See “Power interface board” on page 36.
2. Complete the parts replacement. See “Complete the parts replacement” on page 186.


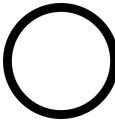

Hot-swap power supply cage replacement

Use this information to remove and install the hot-swap power supply cage.

Note: This section applies only to server models that have the hot-swap power supply cage installed.

Remove the hot-swap power supply cage

Use this information to remove the hot-swap power supply cage.

 <p>“Read the installation Guidelines” on page 71</p>	 <p>“Power off the server for this task” on page 15</p>	 <p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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Before removing the hot-swap power supply cage:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See [“Remove the server cover”](#) on page 81.
3. Remove the air baffle. See [“Remove the air baffle”](#) on page 85.
4. Remove the hot-swap power supplies. See [“Remove a hot-swap power supply”](#) on page 157.
5. Remove the power interface board. See [“Remove the power interface board”](#) on page 164.

To remove the hot-swap power supply cage, complete the following steps:

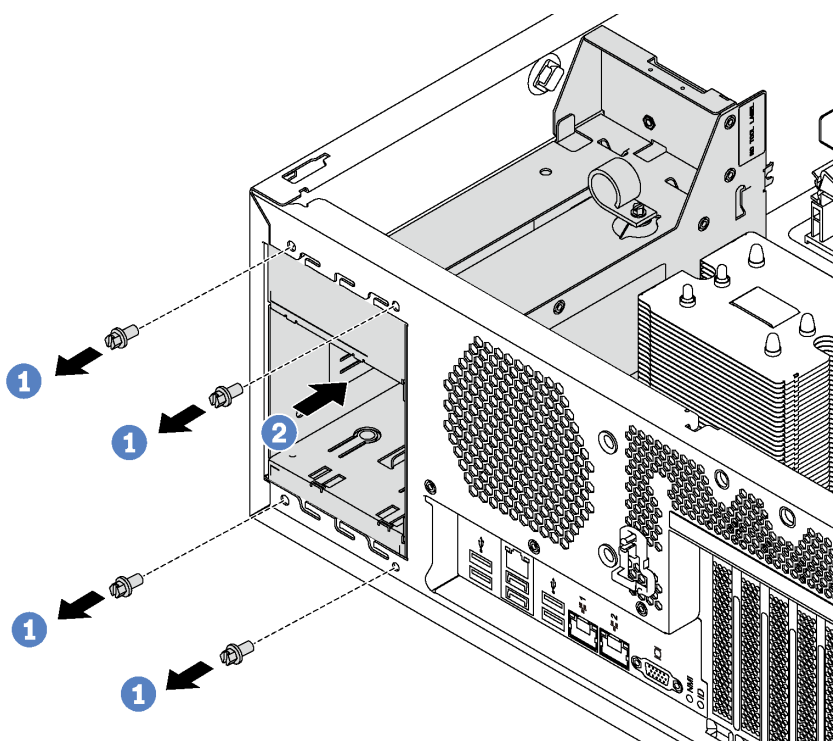

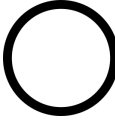



Figure 122. Hot-swap power supply cage removal

- Step 1. Remove the screws that secure the hot-swap power supply cage.
- Step 2. Push the hot-swap power supply cage toward the front of the server. Then, remove the hot-swap power supply cage out of the chassis.

Install the hot-swap power supply cage

Use this information to install the hot-swap power supply cage.

 <p>“Read the installation Guidelines” on page 71</p>	 <p>“Power off the server for this task” on page 15</p>	 <p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 74</p>
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Before installing the hot-swap power supply cage, touch the static-protective package that contains the new hot-swap power supply cage to any unpainted surface on the outside of the server. Then, take the new cage out of the package and place them on a static-protective surface.

To install the hot-swap power supply cage, complete the following steps:

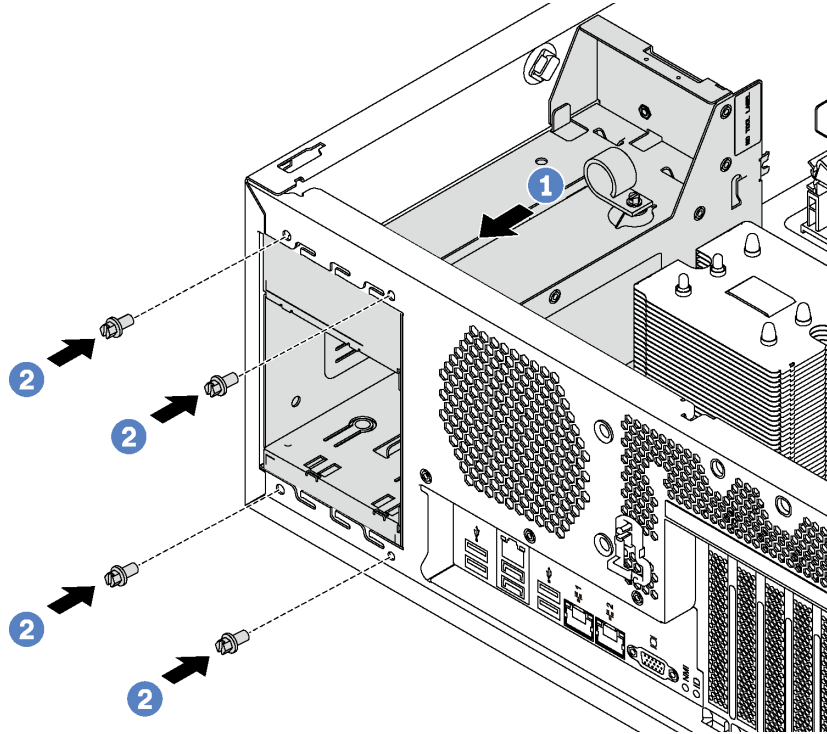


Figure 123. Hot-swap power supply cage installation

Step 1. Slide the new hot-swap power supply cage into the bay as shown until it snaps into position.

Step 2. Install the screws to secure the hot-swap power supply cage.

After installing the hot-swap power supply cage:

1. Install the power interface board. See [“Install the power interface board”](#) on page 165.
2. Install the hot-swap power supplies. See [“Install a hot-swap power supply”](#) on page 160.
3. Complete the parts replacement. See [“Complete the parts replacement”](#) on page 186.

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.

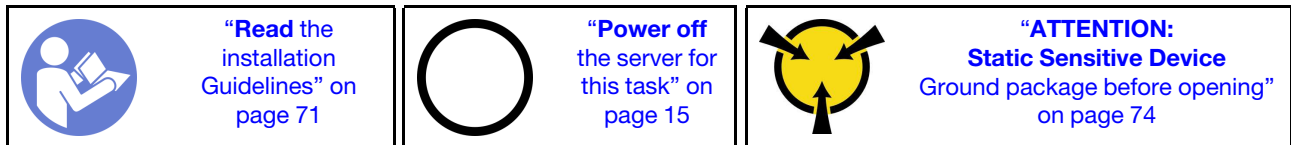
Attention:

- Before you begin replacing a processor, make sure that you have an alcohol cleaning pad (part number 00MP352) and gray thermal grease (part number 41Y9292).
- Cascade Lake processors are supported on the system board with part number 01PE840. If you use the system board with part number 00MX681, update your system firmware to the latest level before installing a Cascade Lake processor. Otherwise, the system cannot be powered on.

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

Processors are in the compute system boards that are accessed from the front of the server. 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 long-shank, Torx T30 screwdriver with a minimum shank length of 105 mm (4.1 inches).



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.
- To ensure the best performance, check the manufacturing date on the new heat sink and make sure it does not exceed 2 years. Otherwise, wipe off the existing thermal grease and apply the new grease onto it for optimal thermal performance.

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. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See [“Remove the server cover” on page 81](#).

3. Remove the air baffle. See “Remove the air baffle” on page 85.
4. 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 this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

Step 1. Remove the PHM from the system board.

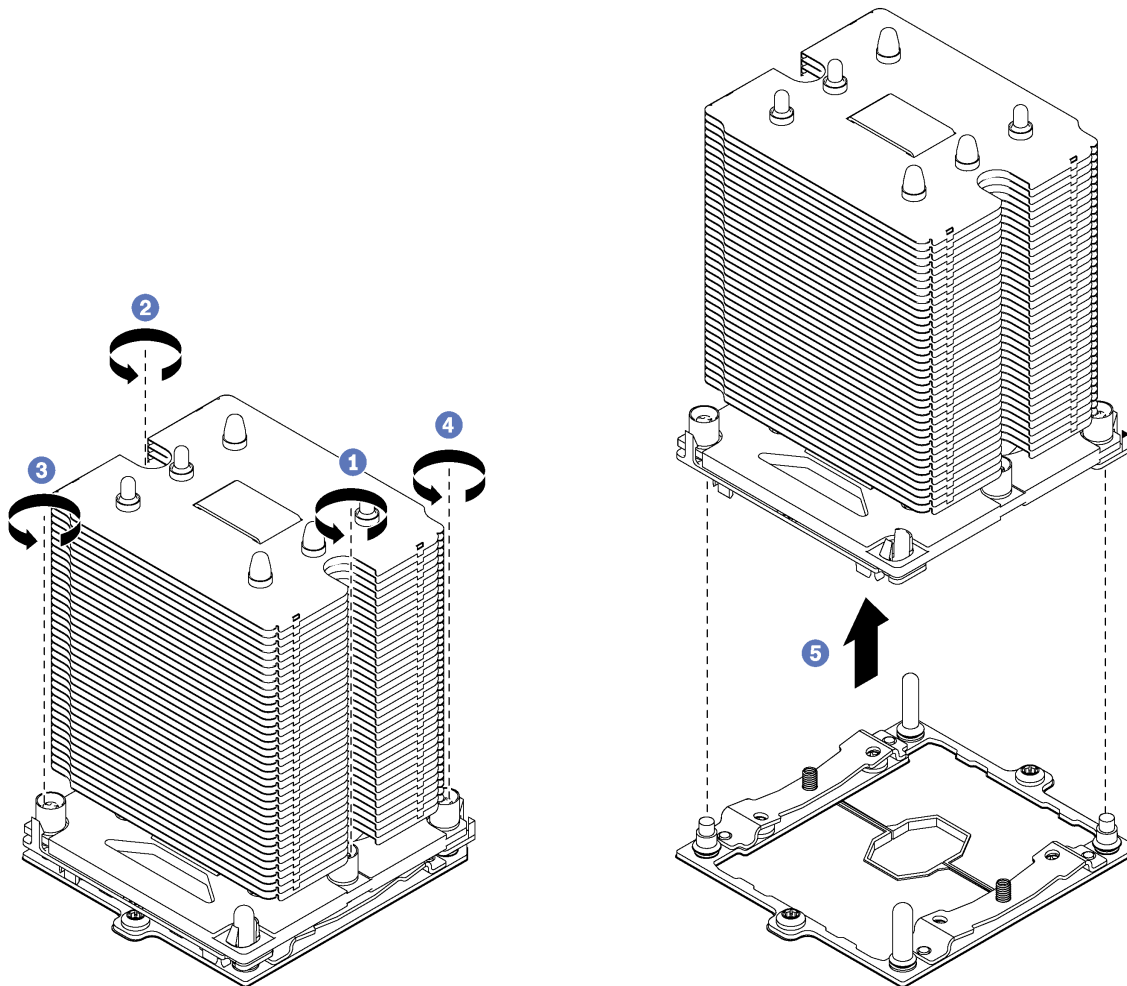


Figure 124. Removing a PHM

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 extra system fans accordingly and install fan fillers to cover the place. For information about the system fan configuration, see “Specifications” on page 3.
- If you are replacing the processor or heat sink, separate the processor and its retainer from the heat sink.

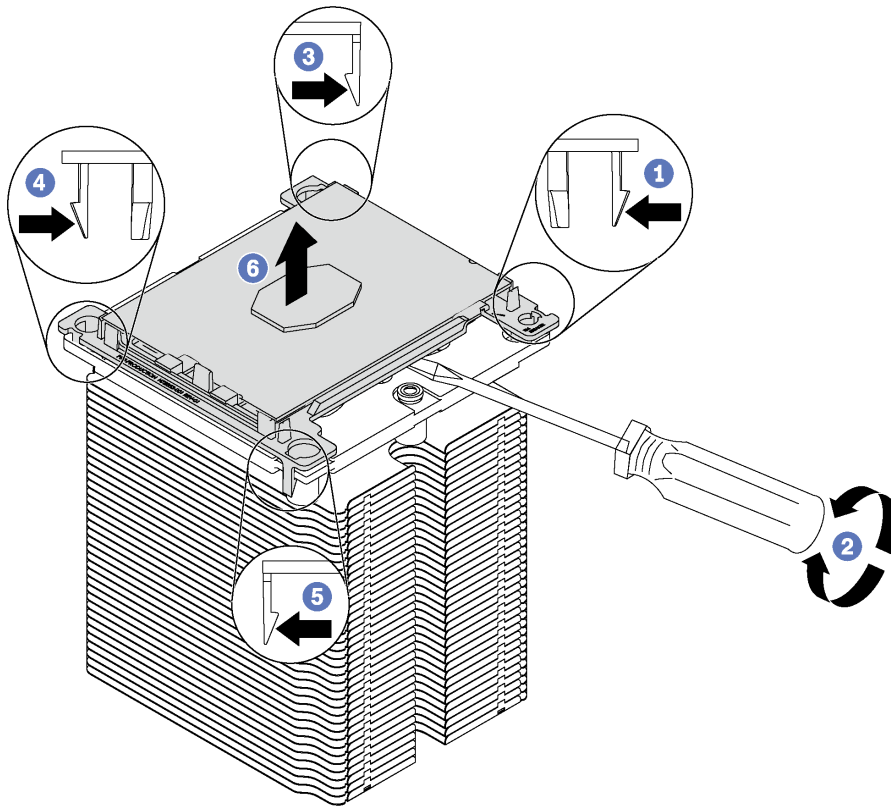


Figure 125. Separating a heat sink from a processor

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.

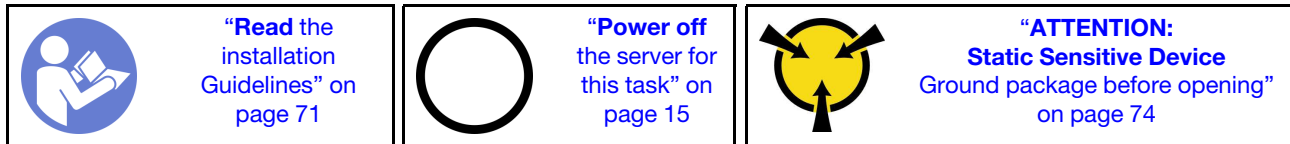
Note: The processor retainer will be removed and discarded in a later step and replaced with a new one.

- 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 long-shank, Torx T30 screwdriver with a minimum shank length of 105 mm (4.1 inches).



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.
- To ensure the best performance, check the manufacturing date on the new heat sink and make sure it does not exceed 2 years. Otherwise, wipe off the existing thermal grease and apply the new grease onto it for optimal thermal performance.

Notes:

- PHMs are keyed for the socket where they can be installed and for their orientation in the socket.
- See <https://static.lenovo.com/us/en/serverproven/index.shtml> for a list of processors supported for your server. All processors on the system board must have the same speed, number of cores, and frequency.
- Before you install a new PHM or replacement processor, update your system firmware to the latest level. See **“Firmware updates”** on page 11.
- Installing an additional PHM can change the memory requirements for your system. See **“DIMM installation rules”** on page 124 for a list of processor-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.

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 169.
2. Replace the processor retainer of the replacement processor.

Note: Replacement processors come with both rectangular and square processor retainers. A rectangular retainer comes attached to the processor. You must remove the rectangular retainer and replace it with a square retainer. The rectangular retainer can be discarded.

- a. Remove the rectangular processor retainer.

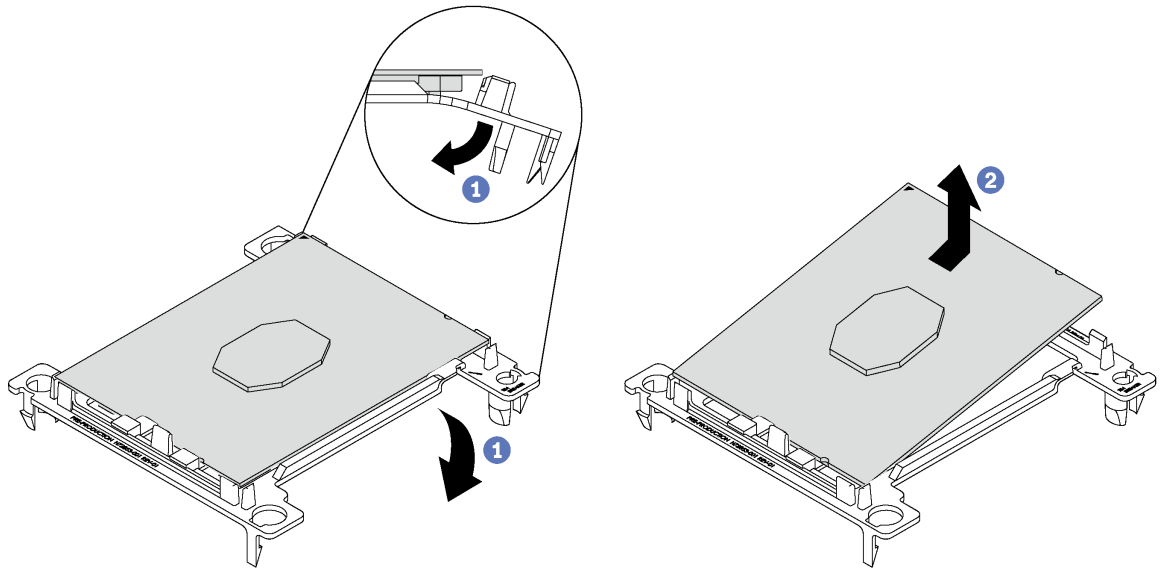


Figure 126. Removing a processor retainer

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 the square retainer.

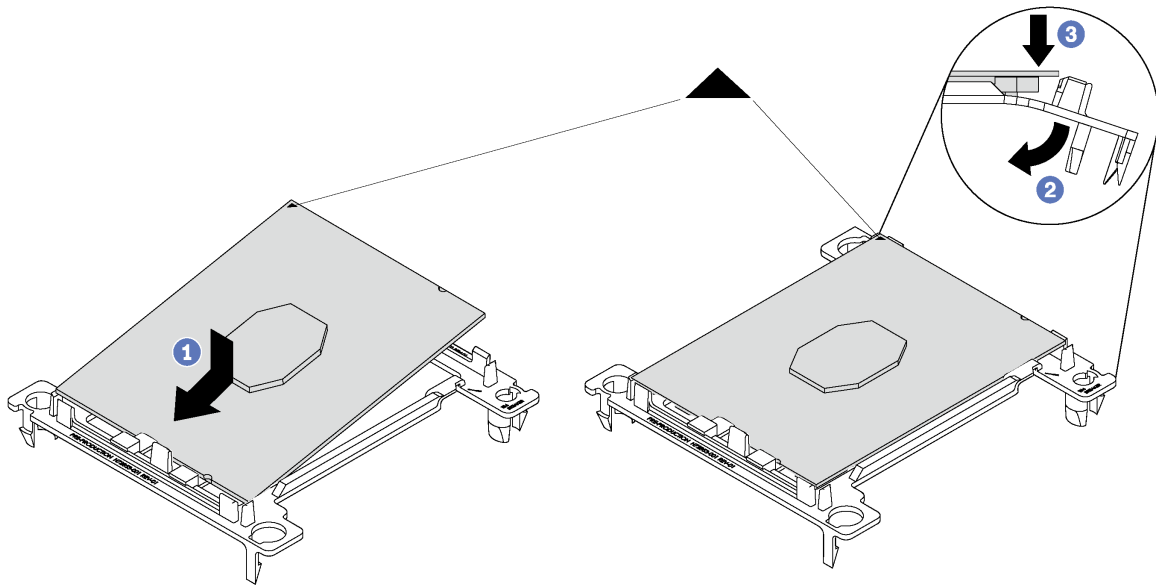


Figure 127. Installing a processor retainer

- 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 the thermal grease on the top of the processor with syringe by forming four uniformly spaced dots, while each dot consists of about 0.1 ml of thermal grease.

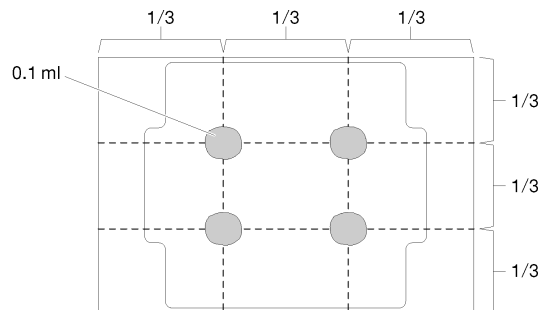


Figure 128. Proper shape of the thermal grease

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 closest 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 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.
- If you are replacing a processor where you have changed the processor retainer, you will install the heat sink onto the processor and retainer outside of the shipping tray. To prevent the processor from falling out of the retainer, hold the processor-retainer assembly by its sides with the processor-contact side.

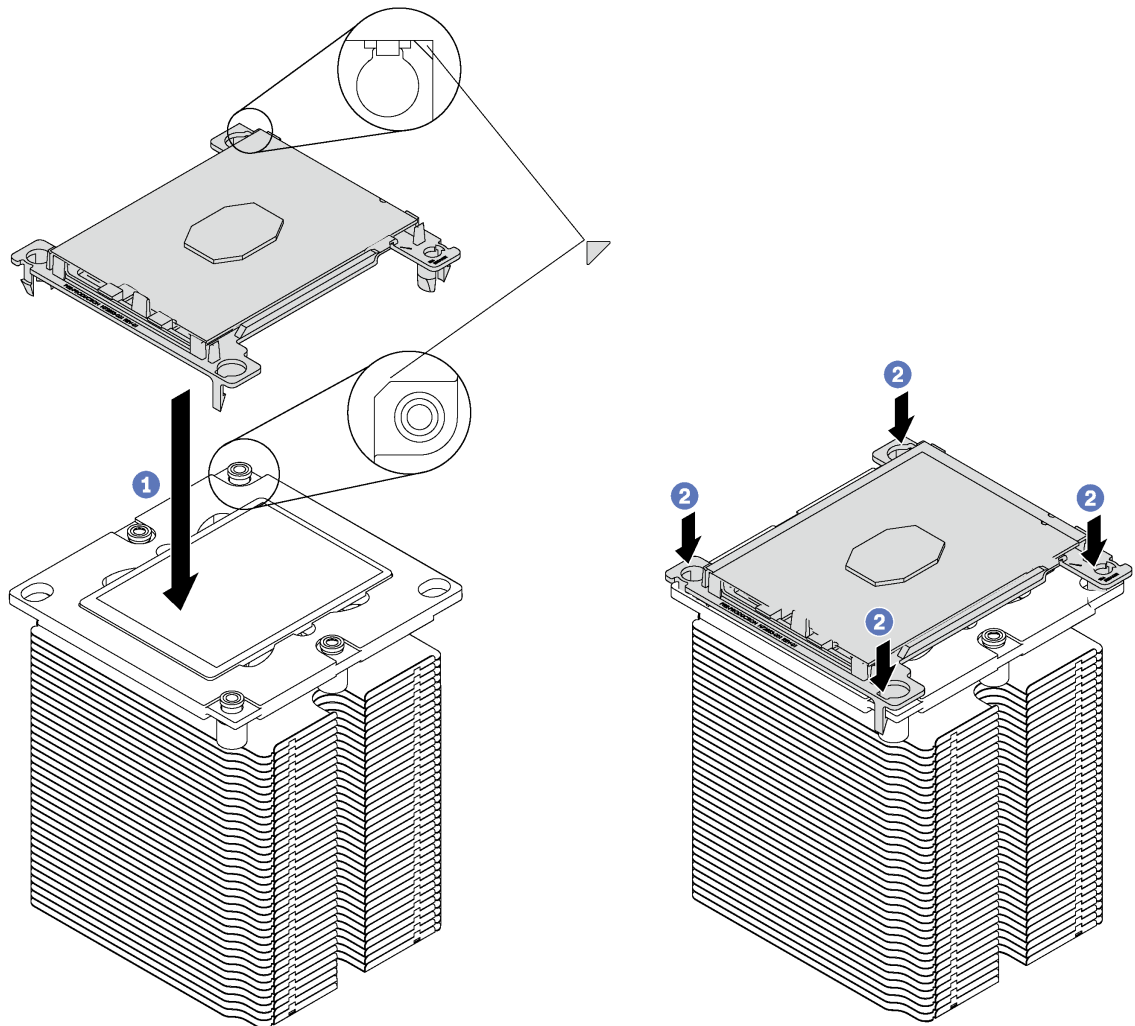


Figure 129. Assembling a PHM outside of a shipping tray

- 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 this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

- 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.

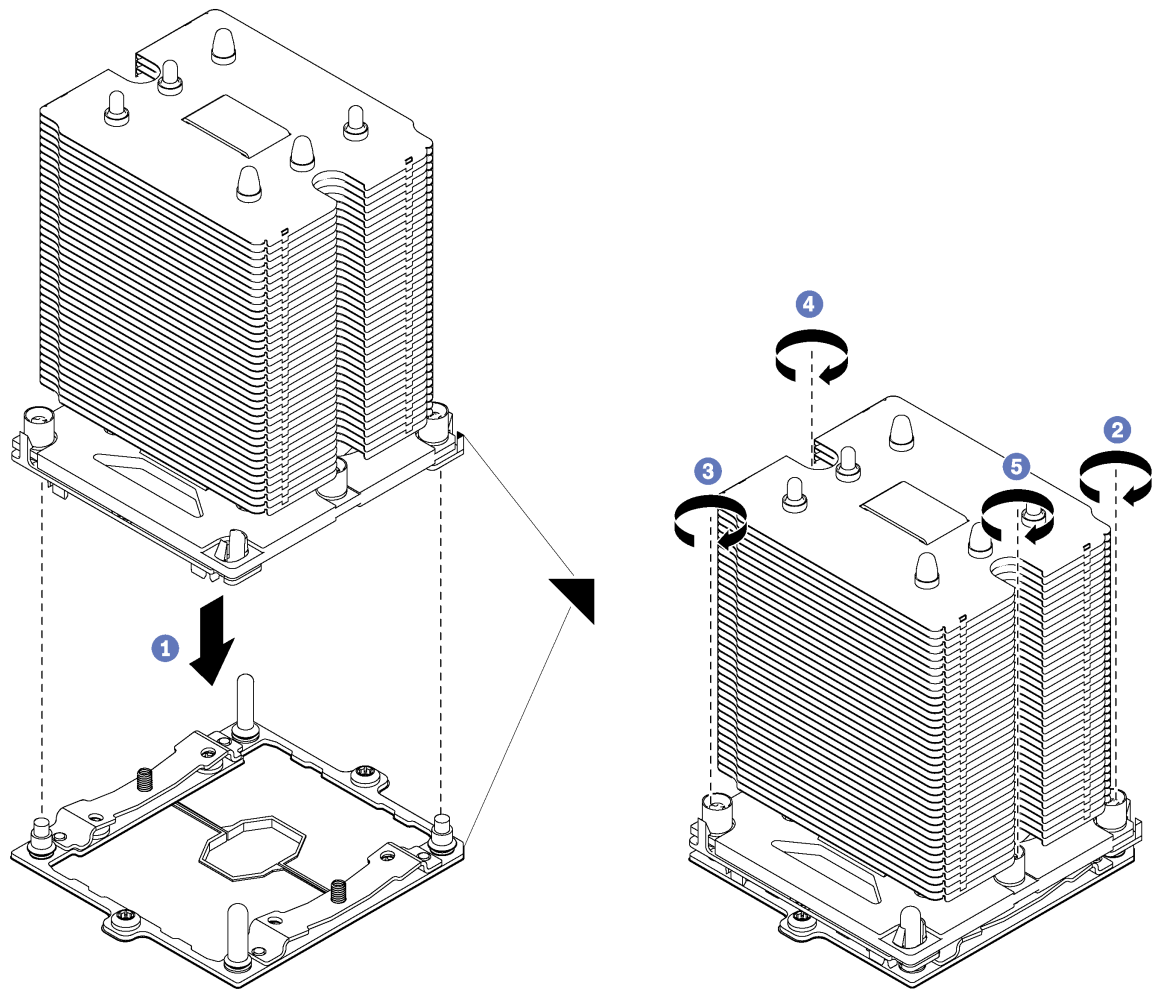


Figure 130. Installing a PHM

- 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 [“Complete the parts replacement” on page 186](#).

System board replacement

Use this information to remove and install the system board.

Important: Before you return the system board, make sure that you install the CPU socket dust covers from the new system board. To replace a CPU socket dust cover:

1. Take a dust cover from the CPU socket assembly on the new system board and orient it correctly above the CPU socket assembly on the removed system board.
2. Gently press down the dust cover legs to the CPU socket assembly, pressing on the edges to avoid damage to the socket pins. You might hear a click on the dust cover is securely attached.
3. **Make sure** that the dust cover is securely attached to the CPU socket assembly.

S017



CAUTION:

Hazardous moving fan blades nearby. Keep fingers and other body parts away.

S012

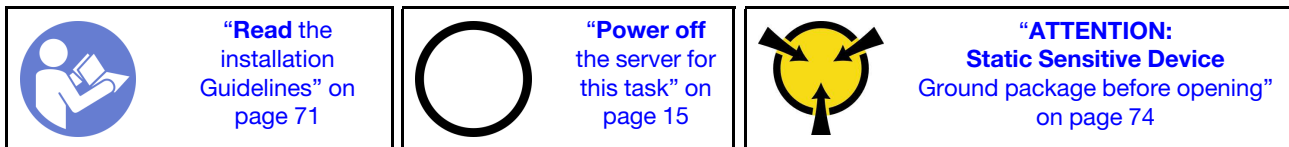


CAUTION:

Hot surface nearby.

Remove the system board

Use this information to remove the system board.



Before removing the system board:

1. If the server is installed in a rack, extend the server from the rack.
2. Remove the server cover. See ["Remove the server cover" on page 81](#).
3. 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.

4. 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 [Chapter 3 "Hardware replacement procedures" on page 71](#).
 - System fans
 - DIMMs
 - PCIe adapters

- M.2 backplane
- Serial port module
- CMOS battery
- TCM/TPM (for Chinese Mainland only)
- Intrusion switch
- PHM

Important: Do not disassemble the PHM.

To remove the system board, complete the following steps:

Watch the procedure

A video of this procedure is available at YouTube: <https://www.youtube.com/playlist?list=PLYV5R7hVcs-Acsjj4tU79GzKnWG316BYn>

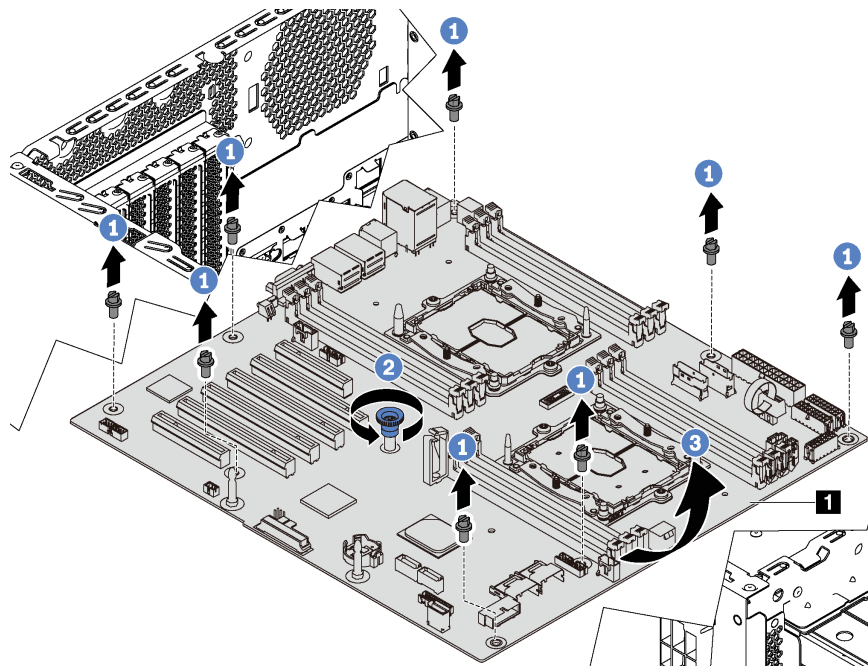


Figure 131. System board removal

Step 1. Remove the eight screws that secure the system board. Put the screws in a safe place.

Step 2. Loosen the thumb screw.

Step 3. Gently lift the thumb screw and grasp the system board by its edge **1** to remove the system board in the direction as shown.

If you are instructed to return the system board, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Important: Before you return the system board, make sure that you install the CPU socket dust covers from the new system board. To replace a CPU socket dust cover:

1. Take a dust cover from the CPU socket assembly on the new system board and orient it correctly above the CPU socket assembly on the removed system board.

After installing the system board:

1. Push the power supplies into the bays until they click into place.
2. Install any components that you removed from the failing system board. See the related topics in [Chapter 3 “Hardware replacement procedures” on page 71](#).
3. Update the machine type and serial number with new vital product data (VPD). Use the Lenovo XClarity Provisioning Manager to update the machine type and serial number. See [“Update the machine type and serial number” on page 181](#).
4. Enable TPM/TCM. See [“Enable TPM/TCM” on page 182](#).
5. Optionally, enable Secure Boot. See [“Enable UEFI Secure Boot” on page 186](#).

Update the machine type and serial number

After the system board is replaced by trained service technicians, the machine type and serial number must be updated.

There are two methods available to update the machine type and serial number:

- From Lenovo XClarity Provisioning Manager

To update the machine type and serial number from Lenovo XClarity Provisioning Manager:

1. Start the server and press F1 to display the Lenovo XClarity Provisioning Manager interface.
2. If the power-on Administrator password is required, enter the password.
3. From the System Summary page, click **Update VPD**.
4. Update the machine type and serial number.

- From Lenovo XClarity Essentials OneCLI

Lenovo XClarity Essentials OneCLI sets the machine type and serial number in the Lenovo XClarity Controller. Select one of the following methods to access the Lenovo XClarity Controller and set the machine type and serial number:

- Operate from the target system, such as LAN or keyboard console style (KCS) access
- Remote access to the target system (TCP/IP based)

To update the machine type and serial number from Lenovo XClarity Essentials OneCLI:

1. Download and install Lenovo XClarity Essentials OneCLI.

To download Lenovo XClarity Essentials OneCLI, go to the following site:

<https://datacentersupport.lenovo.com/solutions/HT116433>

2. Copy and unpack the OneCLI package, which also includes other required files, to the server. Make sure that you unpack the OneCLI and the required files to the same directory.
3. After you have Lenovo XClarity Essentials OneCLI in place, type the following commands to set the machine type and serial number:

```
onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model> [access_method]
onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n> [access_method]
```

Where:

<m/t_model>

The server machine type and model number. Type m t m xxxxyyy, where xxxx is the machine type and yyy is the server model number.

<s/n>

The serial number on the server. Type s n zzzzzzz, where zzzzzzz is the serial number.

[*access_method*]

The access method that you select to use from the following methods:

- Online authenticated LAN access, type the command:

```
[--bmc-username <xcc_user_id> --bmc-password <xcc_password>]
```

Where:

xcc_user_id

The BMC/IMM/XCC account name (1 of 12 accounts). The default value is USERID.

xcc_password

The BMC/IMM/XCC account password (1 of 12 accounts).

Example commands are as follows:

```
onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model> --bmc-username <xcc_user_id>
--bmc-password <xcc_password>
onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n> --bmc-username <xcc_user_id>
--bmc-password <xcc_password>
```

- Online KCS access (unauthenticated and user restricted):

You do not need to specify a value for *access_method* when you use this access method.

Example commands are as follows:

```
onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model>
onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n>
```

Note: The KCS access method uses the IPMI/KCS interface, which requires that the IPMI driver be installed.

- Remote LAN access, type the command:

```
[--bmc <xcc_user_id>:<xcc_password>@<xcc_external_ip>]
```

Where:

xcc_external_ip

The BMC/IMM/XCC IP address. There is no default value. This parameter is required.

xcc_user_id

The BMC/IMM/XCC account (1 of 12 accounts). The default value is USERID.

xcc_password

The BMC/IMM/XCC account password (1 of 12 accounts).

Note: BMC, IMM, or XCC internal LAN/USB IP address, account name, and password are all valid for this command.

Example commands are as follows:

```
onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model>
--bmc <xcc_user_id>:<xcc_password>@<xcc_external_ip>
onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n>
--bmc <xcc_user_id>:<xcc_password>@<xcc_external_ip>
```

4. Reset the Lenovo XClarity Controller to the factory defaults. Go to https://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/NN1ia_c_resettingthexcc.html for more information.

Enable TPM/TCM

The server supports Trusted Platform Module (TPM), Version 1.2 or Version 2.0

Note: For customers in Chinese Mainland, integrated TPM is not supported. However, customers in Chinese Mainland can install a Trusted Cryptographic Module (TCM) adapter or a TPM 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.

There are two methods available to set the TPM policy:

- From Lenovo XClarity Provisioning Manager

To set the TPM policy from Lenovo XClarity Provisioning Manager:

1. Start the server and press F1 to display the Lenovo XClarity Provisioning Manager interface.
2. If the power-on Administrator password is required, enter the password.
3. From the System Summary page, click **Update VPD**.
4. Set the policy to one of the following settings.
 - **TCM enabled - Chinese Mainland only.** Customers in Chinese Mainland should choose this setting if a TCM adapter is installed.
 - **TPM 2.0 enabled - Chinese Mainland only.** Customers in Chinese Mainland should choose this setting if a TPM 2.0 adapter is installed.
 - **TPM enabled - ROW.** Customers outside of Chinese Mainland should choose this setting.
 - **Permanently disabled.** Customers in Chinese Mainland should use this setting if no TPM or TCM adapter is installed.

Note: Although the setting **undefined** is available as a policy setting, it should not be used.

- From Lenovo XClarity Essentials OneCLI

Note: Please note that a Local IPMI user and password must be setup in Lenovo XClarity Controller for remote accessing to the target system.

To set the TPM policy from Lenovo XClarity Essentials OneCLI:

1. Read TpmTcmPolicyLock to check whether the TPM_TCM_POLICY has been locked:
`OneCli.exe config show imm.TpmTcmPolicyLock --override --imm <userid>:<password>@<ip_address>`

Note: The imm.TpmTcmPolicyLock value must be 'Disabled', which means TPM_TCM_POLICY is NOT locked and changes to the TPM_TCM_POLICY are permitted. If the return code is 'Enabled' then no changes to the policy are permitted. The planar may still be used if the desired setting is correct for the system being replaced.

2. Configure the TPM_TCM_POLICY into XCC:

- For the customer in Chinese Mainland with no TCM/TPM:
`OneCli.exe config set imm.TpmTcmPolicy "NeitherTpmNorTcm" --override --imm <userid>:<password>@<ip_address>`
- For the customer in Chinese Mainland that has installed TCM/TPM module on the original system (TCM/TPM module should be moved to the FRU prior to changing policy)
`OneCli.exe config set imm.TpmTcmPolicy "TcmOnly" --override --imm <userid>:<password>@<ip_address>`
- For the customer outside of Chinese Mainland:

```
OneCli.exe config set imm.TpmTcmPolicy "TpmOnly" --override --imm <userid>:<password>@<ip_address>
```

3. Issue reset command to reset system:

```
OneCli.exe misc ospower reboot --imm <userid>:<password>@<ip_address>
```

4. Read back the value to check whether the change has been accepted:

```
OneCli.exe config show imm.TpmTcmPolicy --override --imm <userid>:<password>@<ip_address>
```

Notes:

- If the read back value is matched it means the TPM_TCM_POLICY has been set correctly.

imm.TpmTcmPolicy is defined as below:

- Value 0 use string “Undefined” , which means UNDEFINED policy.
 - Value 1 use string “NeitherTpmNorTcm”, which means TPM_PERM_DISABLED.
 - Value 2 use string “TpmOnly”, which means TPM_ALLOWED.
 - Value 4 use string “TcmOnly”, which means TCM_ALLOWED.
- Below 4 steps must also be used to ‘lock’ the TPM_TCM_POLICY when using OneCli/ASU commands:
5. Read TpmTcmPolicyLock to check whether the TPM_TCM_POLICY has been locked , command as below:

```
OneCli.exe config show imm.TpmTcmPolicyLock --override --imm <userid>:<password>@<ip_address>
```

The value must be 'Disabled', it means TPM_TCM_POLICY is NOT locked and must be set.

6. Lock the TPM_TCM_POLICY:

```
OneCli.exe config set imm.TpmTcmPolicyLock "Enabled"--override --imm <userid>:<password>@<ip_address>
```

7. Issue reset command to reset system, command as below:

```
OneCli.exe misc ospower reboot --imm <userid>:<password>@<ip_address>
```

During the reset, UEFI will read the value from imm.TpmTcmPolicyLock, if the value is 'Enabled' and the imm.TpmTcmPolicy value is invalid, UEFI will lock the TPM_TCM_POLICY setting.

The valid value for imm.TpmTcmPolicy includes 'NeitherTpmNorTcm', 'TpmOnly' and 'TpmOnly'.

If the imm.TpmTcmPolicy is set as 'Enabled' but imm.TpmTcmPolicy value is invalid, UEFI will reject the 'lock' request and change imm.TpmTcmPolicy back to 'Disabled'.

8. Read back the value to check whether the ‘Lock’ is accepted or rejected. command as below:

```
OneCli.exe config show imm.TpmTcmPolicy --override --imm <userid>:<password>@<ip_address>
```

Note: If the read back value is changed from 'Disabled' to 'Enabled' that means the TPM_TCM_POLICY has been locked successfully. There is no method to unlock a policy once it has been set other than replacing system board.

imm.TpmTcmPolicyLock is defined as below:

Value 1 use string “Enabled” , which means lock the policy. Other values are not accepted.

Procedure also requires that Physical Presence is enabled. The Default value for FRU will be enabled. PhysicalPresencePolicyConfiguration.PhysicalPresencePolicy=Enable

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://sysmgmt.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 29.

Set the TPM version

To be able to set the TPM version, Physical Presence must be asserted.

The Lenovo XClarity Provisioning Manager or the Lenovo XClarity Essentials OneCLI can be used to set the TPM version.

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 TrustedComputingGroup.DeviceOperation "Update to TPM2.0 compliant"
--bmc userid:password@ip_address
```

To set the TPM version to version 1.2:

```
OneCli.exe config set TrustedComputingGroup.DeviceOperation "Update to TPM1.2 compliant"
--bmc userid:password@ip_address
```

where:

- `<userid>:<password>` are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSWORD (zero, not an uppercase o)
- `<ip_address>` is the IP address of the BMC.

For more information about the Lenovo XClarity Essentials OneCLI `set` command, see:

http://sysmgmt.lenovofiles.com/help/topic/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 PASSWORD (zero, not an uppercase o)
- <ip_address> is the IP address of the BMC.

Enable UEFI Secure Boot

Optionally, you can enable UEFI Secure Boot.

There are two methods available to enable UEFI Secure Boot:

- From Lenovo XClarity Provisioning Manager

To enable UEFI Secure Boot from Lenovo XClarity Provisioning Manager:

1. Start the server and press F1 to display the Lenovo XClarity Provisioning Manager interface.
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.

To download Lenovo XClarity Essentials OneCLI, go to the following site:

<https://datacentersupport.lenovo.com/solutions/HT116433>

2. Run the following command to enable Secure Boot:

```
OneCli.exe config set SecureBootConfiguration.SecureBootSetting Enabled --bmc <userid>:<password>@<ip_address>
```

where:

- <userid>:<password> are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSWORD (zero, not an uppercase o)
- <ip_address> is the IP address of the BMC.

For more information about the Lenovo XClarity Essentials OneCLI `set` command, see:

http://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_set_command.html

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 server cover” on page 82](#).
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 11](#).
 - 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

Note: Make sure the latest version of ThinkSystem M.2 with Mirroring Enablement Kit Firmware is applied to avoid virtual disk/array missing after system board replacement.

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/7X09/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.

Logs

Severity	Serviceability	Date and Time	System	Event	System Type	Source Date
Warning	Support	Jan 30, 2017, 7:48:07 AM	Chassis114:...	Node Node 08 device	Chassis	Jan 30, 20
Warning	Support	Jan 30, 2017, 7:48:07 AM	Chassis114:...	Node Node 02 device	Chassis	Jan 30, 20
Warning	User	Jan 30, 2017, 7:48:07 AM	Chassis114:...	I/O module IO Module	Chassis	Jan 30, 20
Warning	User	Jan 30, 2017, 7:48:07 AM	Chassis114:...	Node Node 08 incom	Chassis	Jan 30, 20

Figure 133. 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.

Severity	Source	Event ID	Message	Date
Error	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
Warning	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
Info	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
Info	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM

Figure 134. 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

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. Turn off the server.
2. Ensure that the server is cabled correctly.
3. Remove or disconnect the following devices, one at a time, until you find the failure. Turn 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
 - Storage drives
 - Memory modules until you reach the minimum configuration that is supported for the server

Note: For minimal configuration for debugging, see [“Specification” on page 3](#)

4. Turn 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 189](#).

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, reseal 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.
- Note:** The onboard Gigabit ports do not support 10 Mbps or 100 Mbps Ethernet connections.
- 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 189](#).

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 209).

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](#)” on page 193
- “[The power button does not work \(server does not start\)](#)” on page 193
- “[Server does not power on](#)” on page 194
- “[Server does not power off](#)” on page 194

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 <https://static.lenovo.com/us/en/serverproven/index.shtml> 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://sysmgmt.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 194](#)
- [“Multiple rows of DIMMs in a branch identified as failing” on page 195](#)

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 195](#)
- [“Multiple hard drives fail” on page 196](#)
- [“Multiple hard drives are offline” on page 196](#)
- [“A replacement hard disk drive does not rebuild” on page 196](#)
- [“Green hard disk drive activity LED does not represent actual state of associated drive” on page 197](#)
- [“Yellow hard disk drive status LED does not represent actual state of associated drive” on page 197](#)

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 197](#)
- [“Screen is blank” on page 197](#)
- [“Screen goes blank when you start some application programs” on page 198](#)
- [“The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted.” on page 198](#)
- [“The wrong characters appear on the screen” on page 198](#)

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 11](#).

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 11](#).
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 11](#).

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 198](#)
- [“Mouse does not work.” on page 199](#)
- [“USB-device does not work.” on page 199](#)

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 199](#)
- [“PCIe adapter is not recognized or is not functioning” on page 199](#)
- [“A Lenovo optional device that worked previously does not work now. ” on page 200](#)
- [“A Lenovo optional device that was just installed does not work.” on page 200](#)
- [“A Lenovo optional device that worked previously does not work now. ” on page 200](#)

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 <https://static.lenovo.com/us/en/serverproven/index.shtml>).
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 <https://static.lenovo.com/us/en/serverproven/index.shtml>).
 - You followed the installation instructions that came with the device and the device is installed correctly.
 - You have not loosened any other installed devices or cables.
 - You updated the configuration information in system setup. When you start a server and press F1 to display the 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” on page 201](#)
- [“Serial device does not work” on page 201](#)

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” on page 201](#)
- [“Intermittent KVM problems” on page 202](#)
- [“Intermittent unexpected reboots” on page 202](#)

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 189](#) 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 202](#)
- [“Could not log in using LDAP account with SSL enabled” on page 203](#)

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 189), make sure:
 - a. The room temperature is not too high (see “Specifications” on page 3).
 - b. The air vents are not blocked.
 - c. 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 203
- “Server is unresponsive (POST is complete and operating system is running)” on page 203
- “Server is unresponsive (cannot press F1 to start System Setup)” on page 204
- “Voltage planar fault is displayed in the event log” on page 204
- “Unusual smell” on page 205
- “Server seems to be running hot” on page 205
- “Cracked parts or cracked chassis” on page 205

The server immediately displays the POST Event Viewer when it is turned on

Complete the following steps until the problem is solved.

1. Correct any errors that are indicated by the light path diagnostics LEDs.
2. Make sure that the server supports all the processors and that the processors match in speed and cache size.

You can view processor details from system setup.

To determine if the processor is supported for the server, see <https://static.lenovo.com/us/en/serverproven/index.shtml>.

3. (Trained technician only) Make sure that processor 1 is seated correctly.
4. (Trained technician only) Remove processor 2 and restart the server.
5. Replace the following components one at a time, in the order shown, restarting the server each time:
 - a. (Trained technician only) Processor
 - b. (Trained technician only) System board

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

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://support.lenovo.com/servicerequest> to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to the service technicians. The Lenovo service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

Collecting service data

To clearly identify the root cause of a server issue or at the request of Lenovo Support, you might need collect service data that can be used for further analysis. Service data includes information such as event logs and hardware inventory.

Service data can be collected through the following tools:

- **Lenovo XClarity Provisioning Manager**

Use the Collect Service Data function of Lenovo XClarity Provisioning Manager to collect system service data. You can collect existing system log data or run a new diagnostic to collect new data.

- **Lenovo XClarity Controller**

You can use the Lenovo XClarity Controller web interface or the CLI to collect service data for the server. The file can be saved and sent to Lenovo Support.

- For more information about using the web interface to collect service data, see 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 has inventory application to collect service data. It can run both in-band and out-of-band. When running in-band within the host operating system on the server, OneCLI can collect information about the operating system, such as the operating system event log, in addition to the hardware service data.

To obtain service data, you can run the `getinfor` command. For more information about running the `getinfor`, see http://sysmgmt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_getinfor_command.html.

Contacting Support

You can contact Support to obtain help for your issue.

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Important notes

Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1 024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard-disk-drive bays with the largest currently supported drives that are available from Lenovo.

Maximum memory might require replacement of the standard memory with an optional memory module.

Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write cycles that it can be subjected to, expressed as total bytes written (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. Lenovo is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

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Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

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Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

Additional electronic emissions notices are available at:

<http://thinksystem.lenovofiles.com/help/index.jsp>

Taiwan Region BSMI RoHS declaration

單元 Unit	限用物質及其化學符號 Restricted substances and its chemical symbols					
	鉛Lead (PB)	汞Mercury (Hg)	鎘Cadmium (Cd)	六價鉻 Hexavalent chromium (Cr ⁺⁶)	多溴聯苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
機架	○	○	○	○	○	○
外部蓋板	○	○	○	○	○	○
機械組零件	-	○	○	○	○	○
空氣傳動設備	-	○	○	○	○	○
冷卻組零件	-	○	○	○	○	○
內存模組	-	○	○	○	○	○
處理器模組	-	○	○	○	○	○
電纜組零件	-	○	○	○	○	○
電源供應器	-	○	○	○	○	○
儲備設備	-	○	○	○	○	○
電路卡	-	○	○	○	○	○
光碟機	-	○	○	○	○	○

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 0.1 wt%” 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 Region import and export contact information

Contacts are available for Taiwan Region import and export information.

委製商/進口商名稱: 台灣聯想環球科技股份有限公司
進口商地址: 台北市南港區三重路 66 號 8 樓
進口商電話: 0800-000-702

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