ThinkEdge SE455 V3
Hardware Maintenance Guide

Machine Types: 7DBY

Note

Before using this information and the product it supports, be sure to read and understand the safety information and the safety instructions, which are available at:
https://pubs.lenovo.com/safety_documentation/

In addition, be sure that you are familiar with the terms and conditions of the Lenovo warranty for your server, which can be found at:
http://datacentersupport.lenovo.com/warrantylookup

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

在安装本产品之前，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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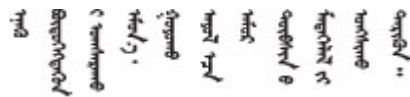
Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

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 pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

ཐོན་རྫས་འདི་བདེ་སྐྱོད་མ་བྱས་གོང་། སྐྱར་གྱི་ཡིད་གཟབ་
བྱ་འདུ་མིན་ཡོད་པའི་འོད་སྟེར་བསྐྱ་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۈر مەھسۇلاتنى ئورنتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

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

Safety inspection checklist

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

Note: This device is not intended for use in the direct field of view at visual display workplaces. To avoid incommoding reflections at visual display workplaces, this device must not be placed in the direct field of view.

Attention: This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

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.

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:

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

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

    d. Click **Power ➙ Power Cables** to see all line cords.

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

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

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

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

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

Chapter 1. Hardware replacement procedures

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

Installation Guidelines

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

Before installing optional devices, read the following notices carefully:

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

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

    https://pubs.lenovo.com/safety_documentation/
  - The following guidelines are available as well: "Working inside the server with the power on" on page 4 and "Handling static-sensitive devices" on page 4.
- Make sure the components you are installing are supported by your server.
  - For a list of supported optional components for the server, see https://serverproven.lenovo.com.
  - For the option package contents, see https://serveroption.lenovo.com/.
- For more information about ordering parts:
  1. Go to **http://datacentersupport.lenovo.com** and navigate to the support page for your server.
  2. Click **Parts**.
  3. Enter the serial number to view a listing of parts for your server.
- When you install a new server, download and apply the latest firmware. This will help ensure that any known issues are addressed, and that your server is ready to work with optimal performance. Go to https://datacentersupport.lenovo.com/products/servers/thinkedge/se455v3/7dby/downloads/driver-list/ to download firmware updates for your server.

  Important: Some cluster solutions require specific code levels or coordinated code updates. If the component is part of a cluster solution, verify the latest Best Recipe code level menu for cluster supported firmware and driver before you update the code.
- If you replace a part, such as an adapter, that contains firmware, you might also need to update the firmware for that part. For more information about updating firmware, see "Update the firmware" in *User Guide* or *System Configuration Guide*.
- It is good practice to make sure that the server is working correctly before you install an optional component.
- Keep the working area clean, and place removed components on a flat and smooth surface that does not shake or tilt.
- Do not attempt to lift an object that might be too heavy for you. If you have to lift a heavy object, read the following precautions carefully:
  - Make sure that you can stand steadily without slipping.
  - Distribute the weight of the object equally between your feet.

- Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
    - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Back up all important data before you make changes related to the disk drives.
- Have a small flat-blade screwdriver, a small Phillips screwdriver, and a T8 torx screwdriver available.
- To view the error LEDs on the system board (system board assembly) and internal components, leave the power on.
- You do not have to turn off the server to remove or install hot-swap power supplies, hot-swap drives, or hot-plug USB devices. However, you must turn off the server before you perform any steps that involve removing or installing adapter cables, and you must disconnect the power source from the server before you perform any steps that involve removing or installing a riser card.
- When replacing power supply units or fans, make sure to refer to redundancy rules for these components.
- Blue on a component indicates touch points, where you can grip to remove a component from or install it in the server, open or close a latch, and so on.
- Terra-cotta on a component or a terra-cotta 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. (Terra-cotta can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- The Red strip on the drives, adjacent to the release latch, indicates that the drive can be hot-swapped if the server and operating system support hot-swap capability. This means that you can remove or install the drive while the server is still running.

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

Safety inspection checklist

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

Note: This device is not intended for use in the direct field of view at visual display workplaces. To avoid incommoding reflections at visual display workplaces, this device must not be placed in the direct field of view.

Attention: This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

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.

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

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

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

     To view the power cords that are available for the server:
     a. Go to:

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

System reliability guidelines

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

Make sure the following requirements are met:

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

Working inside the server with the power on

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

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

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

Handling static-sensitive devices

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

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

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

Memory module installation rules and order

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

Supported memory types

For information on the types of memory module supported by this server, see "Memory" section in "Technical specifications" on page 229.

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

https://lenovopress.lenovo.com/servers/options/memory

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

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

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

Memory modules and processors layout
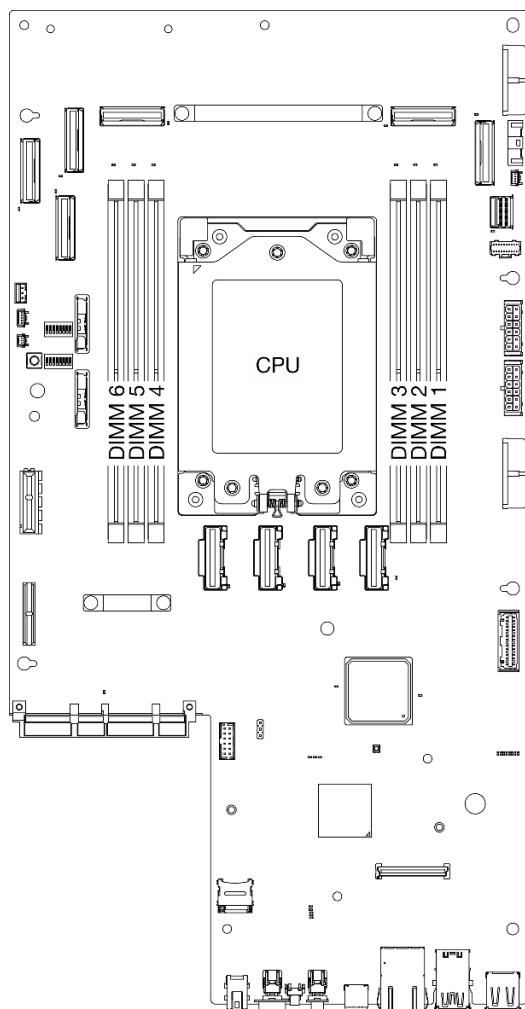
Figure 1. Memory modules and processor layout

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

Table 1. Memory slot and channel identification

Channel number	Channel A	Channel B	Channel D	Channel E	Channel F	Channel H
DIMM slot number	3	2	1	4	5	6

Memory module installation guideline

ThinkEdge SE455 V3 supports "Independent memory mode installation order" on page 7.

Consider corresponding rules and population sequence accordingly:

- A label on each DIMM identifies the DIMM type. This information is in the format **xxxxx *n*Rxxx PC4-xxxxx-xx-xx-xxx**. Where ***n*** indicates if the DIMM is single-rank (n=1) or dual-rank (n=2).

- When you replace a DIMM, the server provides automatic DIMM enablement capability without requiring you to use the Setup Utility to enable the new DIMM manually.

Attention:

- Mixing single-rank and dual-rank DIMMs is allowed.
- Install DIMMs of the same speed for optimal performance. Otherwise, the BIOS will find and run the lowest speed among all channels.

Independent memory mode installation order

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

Independent memory mode guidelines:

- Mixing x4/x8, 16Gbit (16GB, 32GB, 64GB)/24Gbit (48GB, 96GB) DIMMs are not allowed in a system.
- When installing DIMMs with different capacities, install the DIMM with the highest capacity first, and install the DIMMs in the following sequence: Slot 3, 4, 1, 6, 2, 5.

Table 2. Independent mode memory population sequence

Number of memory modules	Memory module slot number						
	6	5	4	Processor	3	2	1
1					3		
2			4		3		
4	6		4		3		1
6	6	5	4		3	2	1

PCIe adapter installation rules and order

PCIe adapters must be installed in a specific order in the server.

Notes:

- Performance may degrade when a x16 PCIe adapter is installed in a x8 lane PCIe slot.
- For a list of the supported PCIe adapters, see https://serverproven.lenovo.com.

Table 3. **PCIe riser assemblies and corresponding slots**

PCIe riser assembly	PCIe slots
PCIe riser 1	• Slot 3: x16 (Gen5 x16 lanes) • Slot 4: x16 (Gen4 x8 lanes) • Slot 5: x16 (Gen4 x8 lanes) **Notes:** • When the serial port module is installed, Slot 5 is not supported. • When a double-wide GPU is installed in Slot 3, Slot 4 is not supported.

PCIe riser 2
Note: PCIe riser 2 is optional.
	• Slot 6: x16 (Gen4 x8 lanes)
	• Slot 7: x16 (Gen5 x16 lanes)
	• Slot 8: x16 (Gen4 x8 lanes)
	Notes:
	• Slot 6 and Slot 8 are not supported in the following configurations:
	  – Front SATA drive backplane and internal NVMe drive backplane connect to the system board
	  – Front NVMe drive backplane and internal NVMe drive backplane connect to the system board
	• When a double-wide GPU is installed in Slot 7, Slot 6 is not supported.

Depending on the selected acoustic mode, the slot priorities for different PCIe adapters might be different. See the following section corresponding to the selected configuration:

PCIe adapter installation rules and order: Acoustic mode disabled

Installation priority	Component	PCIe slot priorities
1	Serial port module	5
2	RAID adapter: 1. ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter 2. ThinkSystem 4350-8i SAS/SATA 12Gb HBA 3. ThinkSystem RAID 5350-8i PCIe 12Gb Adapter 4. ThinkSystem 440-8i SAS/SATA PCIe Gen4 12Gb HBA 5. ThinkSystem RAID 540-8i PCIe Gen4 12Gb Adapter	8, 5, 4, 7
3	Double-wide GPU	7, 3

Installation priority	Component	PCIe slot priorities
4	ThinkSystem NVIDIA L4 24GB PCIe Gen4 Passive GPU	7, 3, 8, 5, 4, 6
5	ThinkSystem Qualcomm Cloud AI 100 **Notes:** • SE455 V3 supports up to three ThinkSystem Qualcomm Cloud AI 100 installed on **PCIe riser 2**. Make sure to install the adapter in the supported PCIe slot.	7, 8, 6
6	1. ThinkSystem AMD Alveo V70 Datacenter Accelerator Adapter 2. ThinkSystem NVIDIA A2 16GB PCIe Gen4 Passive GPU 3. ThinkSystem NVIDIA A2 16GB PCIe Gen4 Passive GPU w/o CEC	7, 4, 8, 5, 6, 3
7	PCIe x16 Ethernet adapter	7, 3, 8, 5, 4, 6
8	PCIe x8 or x4 Ethernet adapter	8, 5, 4, 7, 6, 3

PCIe adapter installation rules and order: Acoustic mode 1

Installation priority	Component	PCIe slot priorities
1	Serial port module	5
2	RAID adapter: 1. ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter 2. ThinkSystem 4350-8i SAS/SATA 12Gb HBA 3. ThinkSystem RAID 5350-8i PCIe 12Gb Adapter 4. ThinkSystem 440-8i SAS/SATA PCIe Gen4 12Gb HBA 5. ThinkSystem RAID 540-8i PCIe Gen4 12Gb Adapter	8, 5, 4, 7
3	Double-wide GPU	7, 3
4	1. ThinkSystem NVIDIA L4 24GB PCIe Gen4 Passive GPU 2. ThinkSystem NVIDIA A2 16GB PCIe Gen4 Passive GPU 3. ThinkSystem NVIDIA A2 16GB PCIe Gen4 Passive GPU w/o CEC	7, 4, 8, 5, 6, 3
5	PCIe x16 Ethernet adapter	7, 3, 8, 5, 4, 6
6	PCIe x8 or x4 Ethernet adapter	8, 5, 4, 7, 6, 3

PCIe adapter installation rules and order: Acoustic mode 2

Installation priority	Component	PCIe slot priorities
1	Serial port module	5
2	RAID adapter: 1. ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter 2. ThinkSystem 4350-8i SAS/SATA 12Gb HBA 3. ThinkSystem RAID 5350-8i PCIe 12Gb Adapter 4. ThinkSystem 440-8i SAS/SATA PCIe Gen4 12Gb HBA 5. ThinkSystem RAID 540-8i PCIe Gen4 12Gb Adapter	8, 5, 4, 7
3	PCIe x16 Ethernet adapter	7, 3, 8, 5, 4, 6
4	PCIe x8 or x4 Ethernet adapter	8, 5, 4, 7, 6, 3

Power on and power off the server

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

Power on the server

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

Power button location and power LED locations are specified in:

- "Server components" in *User Guide* or *System Configuration Guide*
- "Troubleshooting by system LEDs and diagnostics display" on page 244

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.

Important: Lenovo XClarity Controller (XCC) supported version varies by product. All versions of Lenovo XClarity Controller are referred to as Lenovo XClarity Controller and XCC in this document, unless specified otherwise. To see the XCC version supported by your server, go to https://pubs.lenovo.com/lxcc-overview/.

For information about powering off the server, see "Power off the server" on page 10.

Power off the server

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

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

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

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

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

Configuration guide

Follow instructions in this section to remove and install supporting mounting configurations.

ThinkEdge SE455 V3 server is designed to support the following mounting option:

- **Rack mount**: The server can be installed into rack cabinet with corresponding rail kit.

Rack mount configuration

Follow instructions in this section to remove and install the rack mount configuration.

Remove the server from the rack

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

About this task

S002

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

S036

18 - 32 kg (39 - 70 lb)

32 - 55 kg (70 - 121 lb)

CAUTION:
Use safe practices when lifting.

R006

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

CAUTION:
Make sure to have two people operate the server removal procedures to prevent injury.

Procedure

Step 1.   Disengage the server from the flanges.

a.   For the configurations with standard EIA brackets, loosen the two thumbscrews.
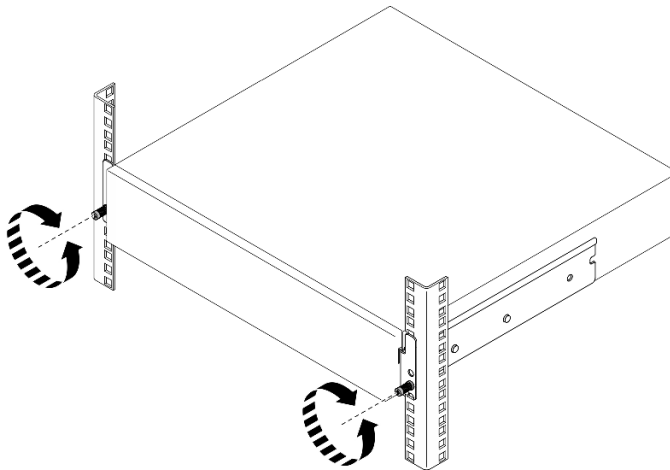
Figure 2. Disengaging server from the rack: standard EIA brackets

b.   For the configurations with security EIA brackets, loosen the two security screws with key.
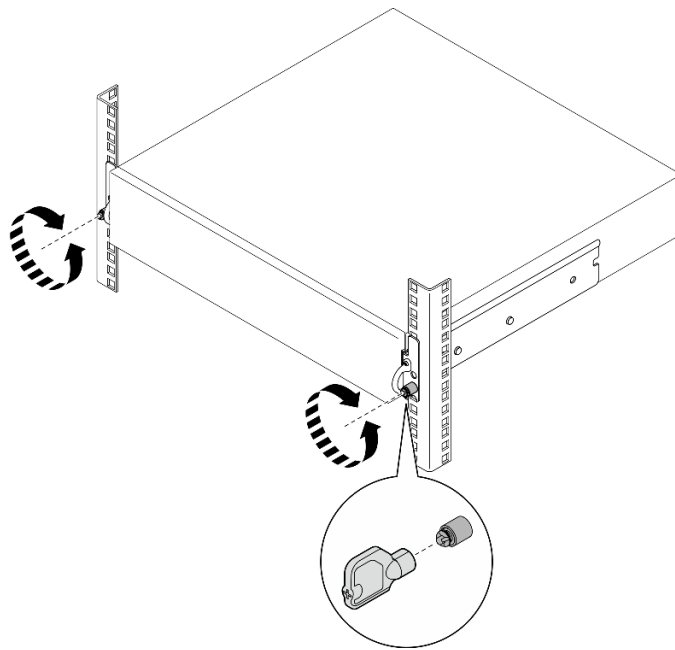
Figure 3. Disengaging server from the rack: security EIA brackets

Step 2. Remove the server from the rack.

   a. ❶ Carefully slide out the server until it stops.

   b. ❷ Depending on the rail kit, press or lift the release latches.

   c. ❸ Carefully pull the server away from the rack.
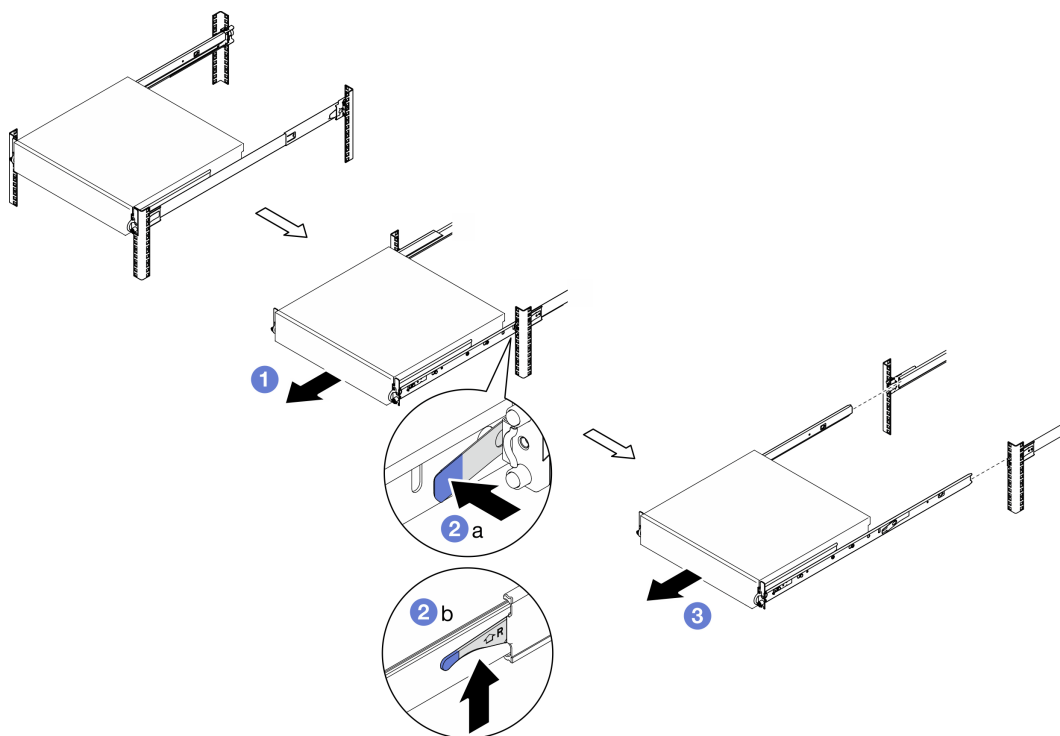
Figure 4. Removing the server from the rack

Step 3.   Remove the inner rails from the server.
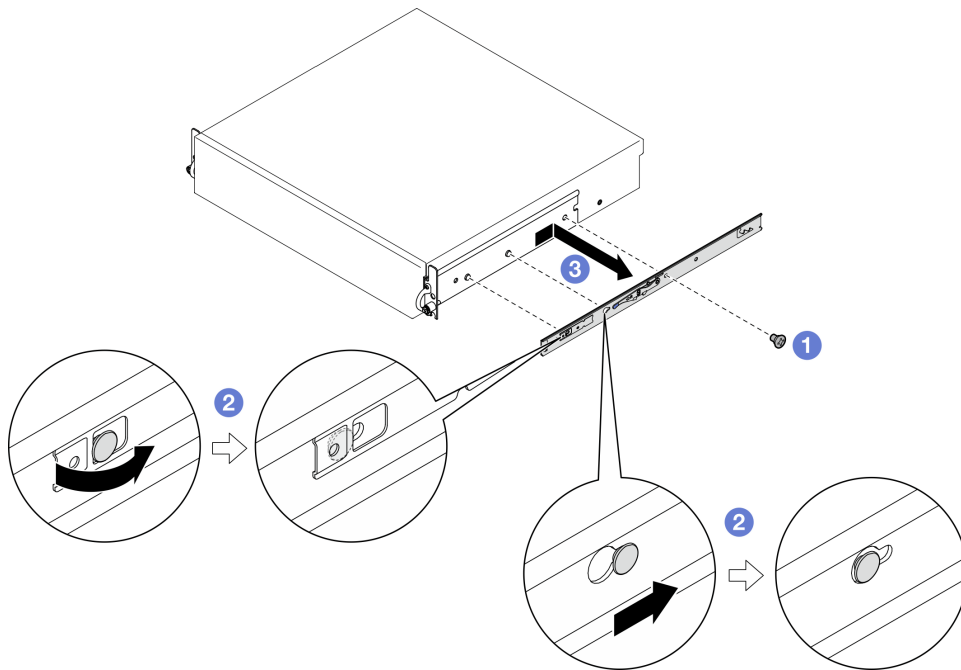
Figure 5. Removing the inner rail

a.   ❶ Loosen the M3.5 screws that secure the inner rail.

Note: The number of screws for each inner rail varies by the rail kit and the depth of EIA brackets. See the depth mark on the side of chassis to identify the depth of EIA brackets, and refer to the following information for screw locations.
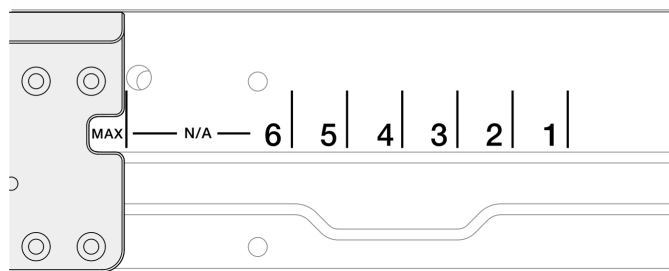
Figure 6. Depth mark for EIA brackets

Rail kit	Depth of EIA brackets	The number of screws for each inner rail
ThinkEdge 600mm Ball Bearing Rail Kit or ThinkEdge 2-Post Friction Rail Kit	Any	1
ThinkEdge 1000mm Friction Rail Kit v2	#1, #2, #3, #4	2
	#5, #6, Max	3

Figure 7. One screw for the inner rail of ThinkEdge 600mm Ball Bearing Rail Kit
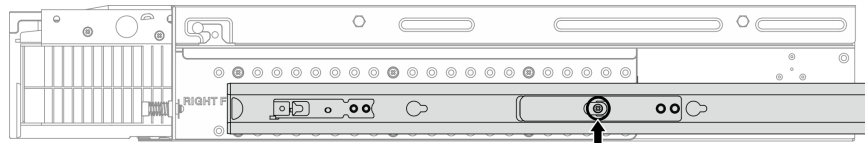
Figure 8. One screw for the inner rail of ThinkEdge 2-Post Friction Rail Kit
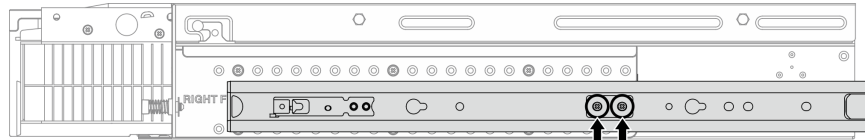
Figure 9. Two screws for the inner rail of ThinkEdge 1000mm Friction Rail Kit v2
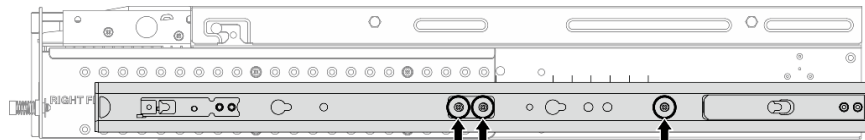
Figure 10. Three screws for the inner rail of ThinkEdge 1000mm Friction Rail Kit v2

b. ❷ Slightly push the inner rail to the right to disengage the inner rail from the mounting pins on the server.

c. ❸ Remove the inner rail from the server.

d. Repeat this procedure to remove the other inner rail.

Step 4. If necessary, remove the rail kit from the rack. See the *Rail Installation Guide* which comes with the rail kit, or download the *Rail Installation Guide* from "Documents download" on page 281.

Remove the EIA brackets

Follow instructions in this section to remove the EIA brackets.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack.

Note: Depending on the configuration, the EIA brackets might look slightly different from the illustration in this section.

Procedure

Step 1. Remove the four or six screws that secure each of the EIA brackets to the chassis, and remove the brackets from the chassis.
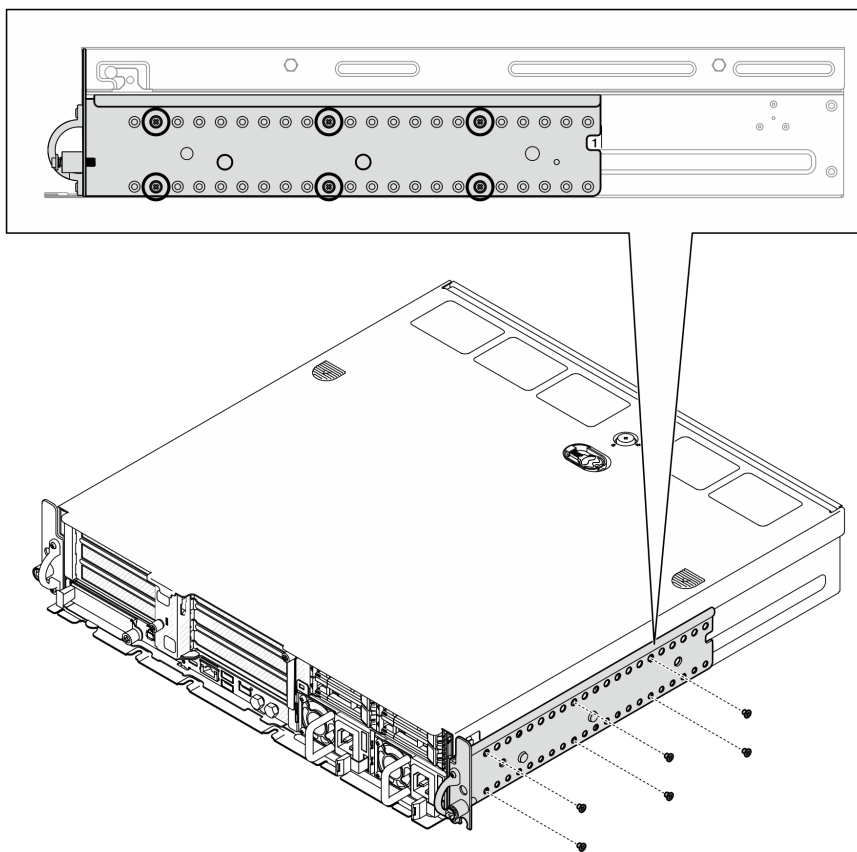
Figure 11. EIA bracket regular depth 1 to 6: six screws
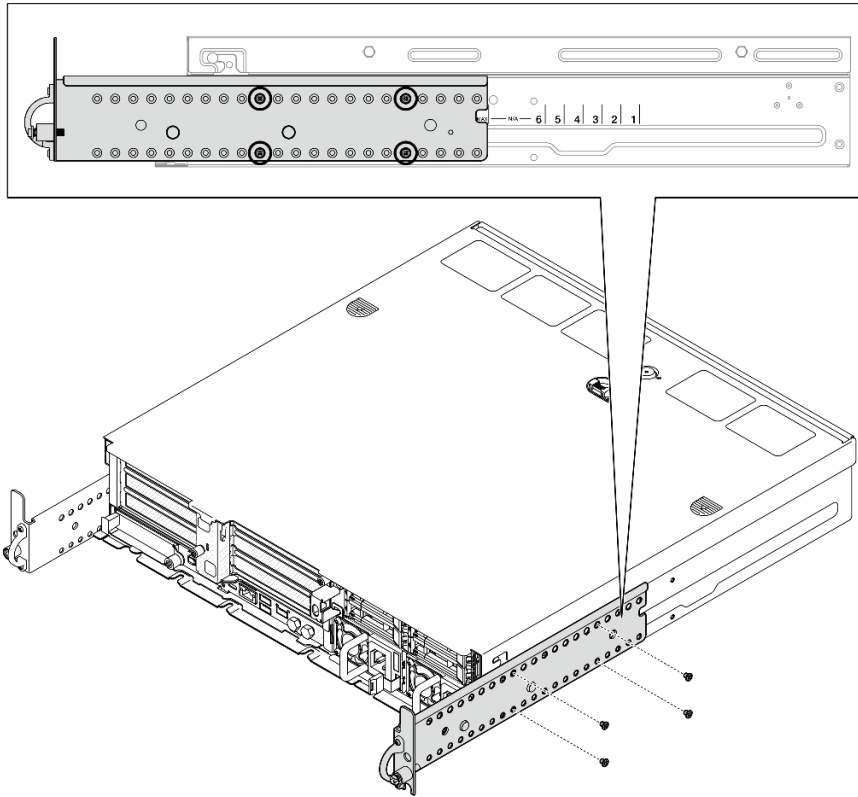
Figure 12. EIA bracket maximal depth for security bezel: four screws

After this task is completed

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

Install the EIA brackets

Follow instructions in this section to install the EIA brackets.

About this task

Attention:

*   Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

Note: Depending on the configuration, the EIA brackets might look slightly different from the illustration in this section.

Procedure

Step 1.   Secure each of the EIA brackets to the chassis with four or six screws. Make sure to align the two brackets to the same numbers (1 to 6) or the "MAX" mark on both sides of the chassis.

Note: The EIA brackets are designed as adjustable. To ensure sufficient space for security bezel or the external cables at front of the server, adjust the depth of EIA brackets according to the operation environment.
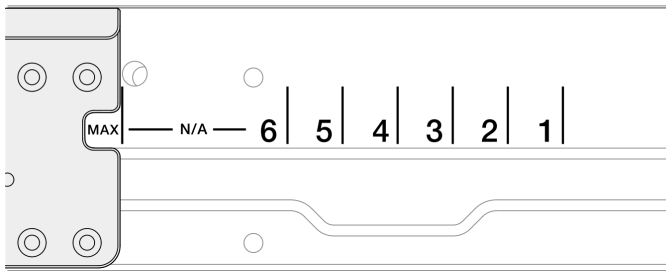
Figure 13. Depth mark for EIA brackets
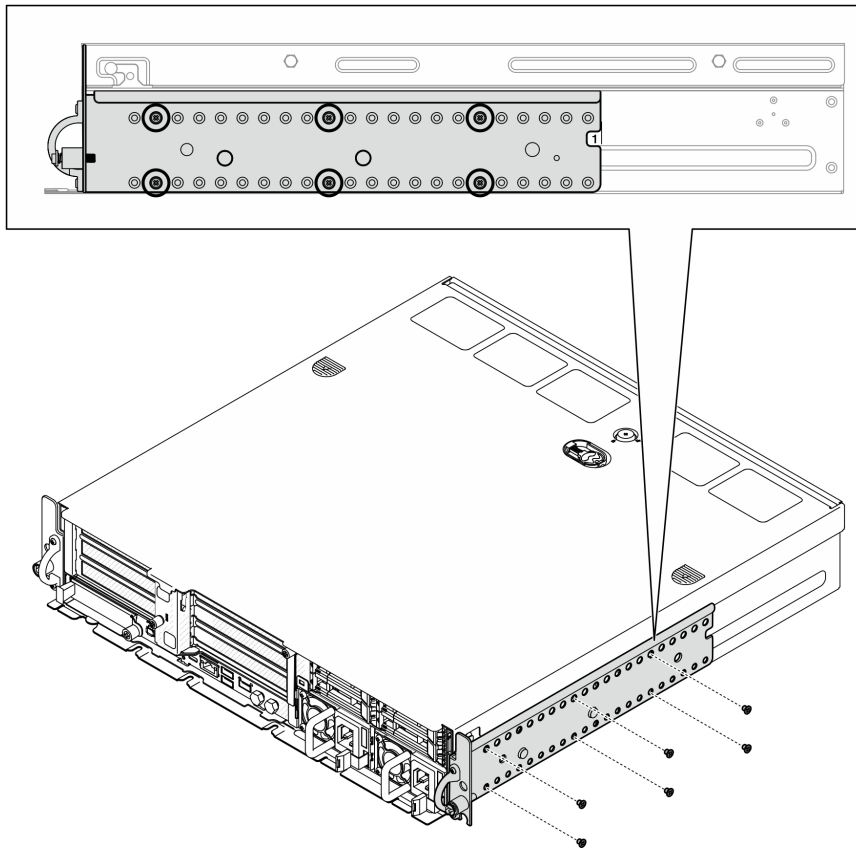
Figure 14. EIA bracket regular depth 1 to 6: six screws
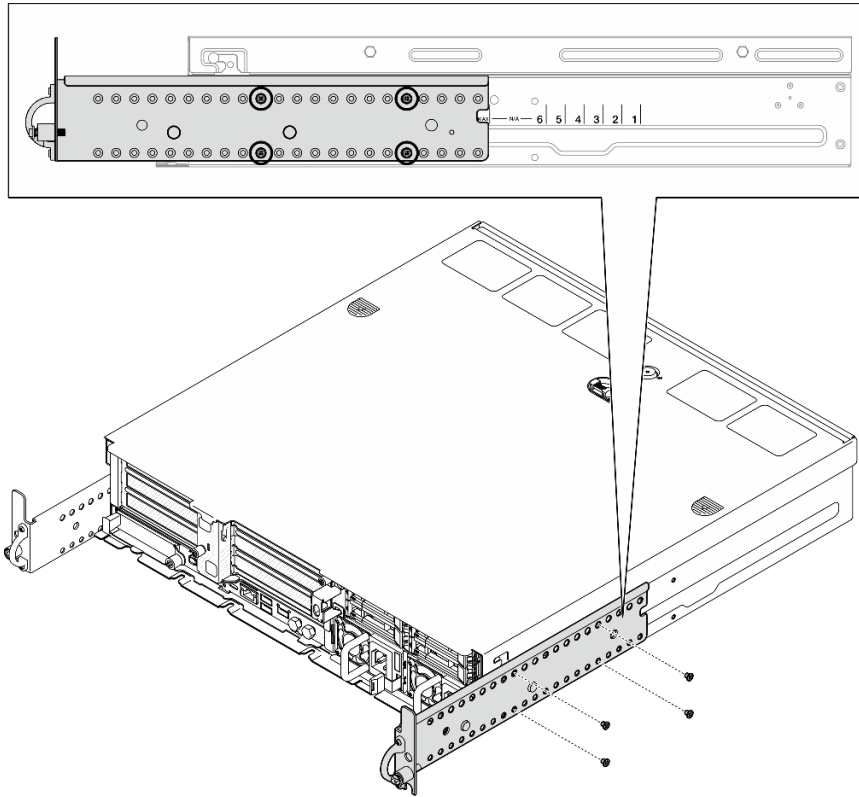
Figure 15. EIA bracket maximal depth for security bezel: four screws

After this task is completed

If the server was installed in a rack, reinstall the server into the rack. See .

Install the server to the rack

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

About this task

S002

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

S036

18 - 32 kg (39 - 70 lb)   32 - 55 kg (70 - 121 lb)

CAUTION:
Use safe practices when lifting.

<u>**R006**</u>

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

CAUTION:
Make sure to have two people operate the server removal procedures to prevent injury.

Procedure

Step 1.   Make sure the rail kit is installed to the rack properly. See the *Rail Installation Guide* which comes with the rail kit, or download the *Rail Installation Guide* from "Documents download" on page 281.

Step 2.   Make sure the EIA brackets are installed properly. See "Install the EIA brackets" on page 17.

Step 3.   Install the inner rails to the server.
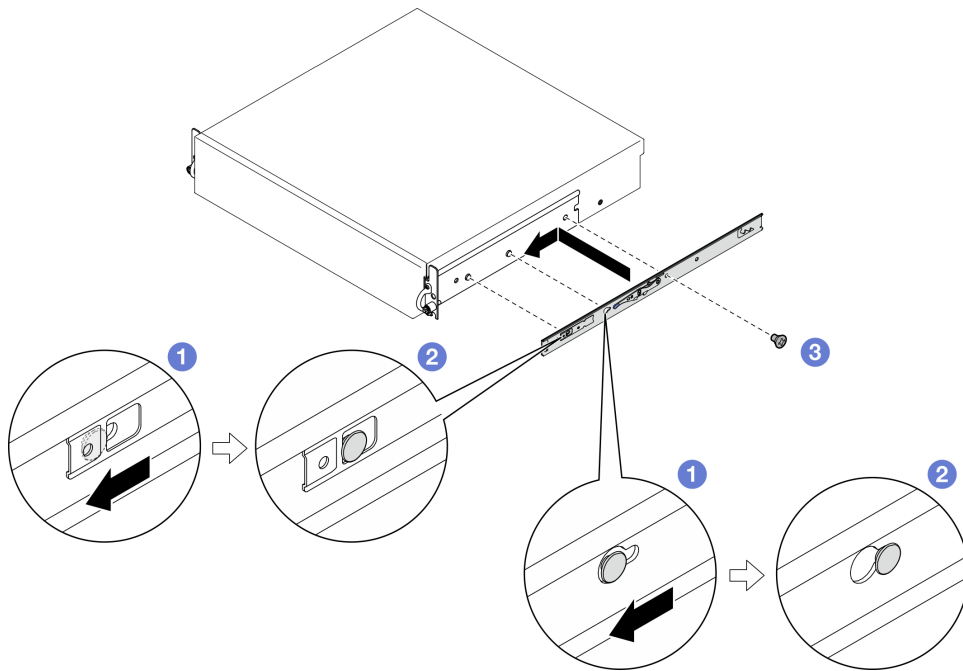
Figure 16. Installing the inner rail

Attention: There are "L" and "R" logos marked on the front of inner rails which represent the left rail and the right rail. Ensure correct rails are installed to the rack accordingly.

a. ❶ Align the mounting holes on the inner rail with the corresponding rail mounting pins on the side of the server.

b. ❷ Push the inner rail as shown until the mounting pins on the server are locked in place.

c. Tighten M3.5 screws to secure the inner rail to the server.

> **Note:** The number of screws for each inner rail varies by the rail kit and the depth of EIA brackets. See the depth mark on the side of chassis to identify the depth of EIA brackets, and refer to the following information for screw locations.
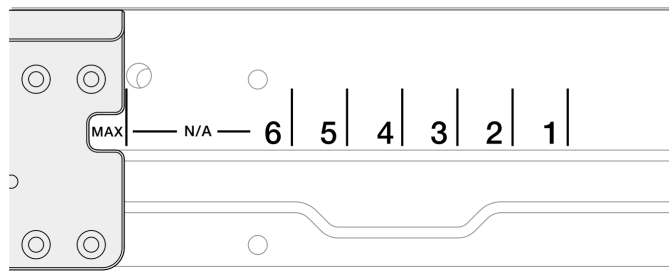
Figure 17. Depth mark for EIA brackets

Rail kit	Depth of EIA brackets	The number of screws for each inner rail
ThinkEdge 600mm Ball Bearing Rail Kit or ThinkEdge 2-Post Friction Rail Kit	Any	1
ThinkEdge 1000mm Friction Rail Kit v2	#1, #2, #3, #4	2
	#5, #6, Max	3

Figure 18. One screw for the inner rail of ThinkEdge 600mm Ball Bearing Rail Kit
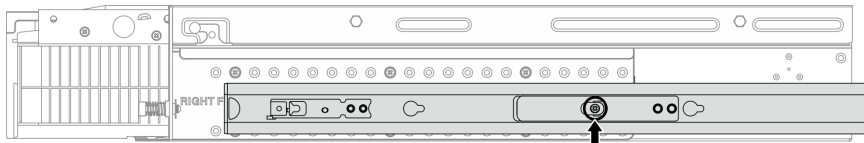
Figure 19. One screw for the inner rail of ThinkEdge 2-Post Friction Rail Kit
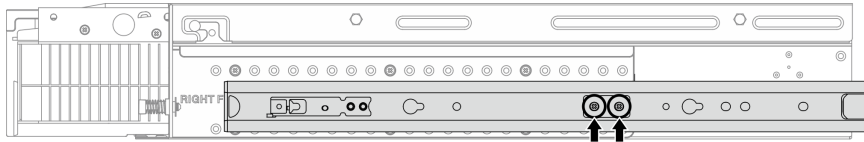
Figure 20. Two screws for the inner rail of ThinkEdge 1000mm Friction Rail Kit v2
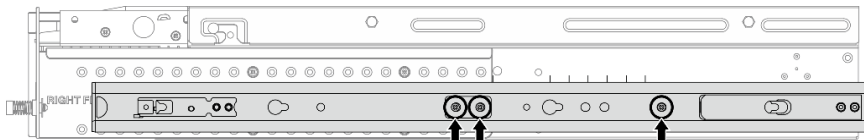
Figure 21. Three screws for the inner rail of ThinkEdge 1000mm Friction Rail Kit v2

    d.   Repeat this procedure to install the other inner rail.

Step 4.   Install the server to the rack.
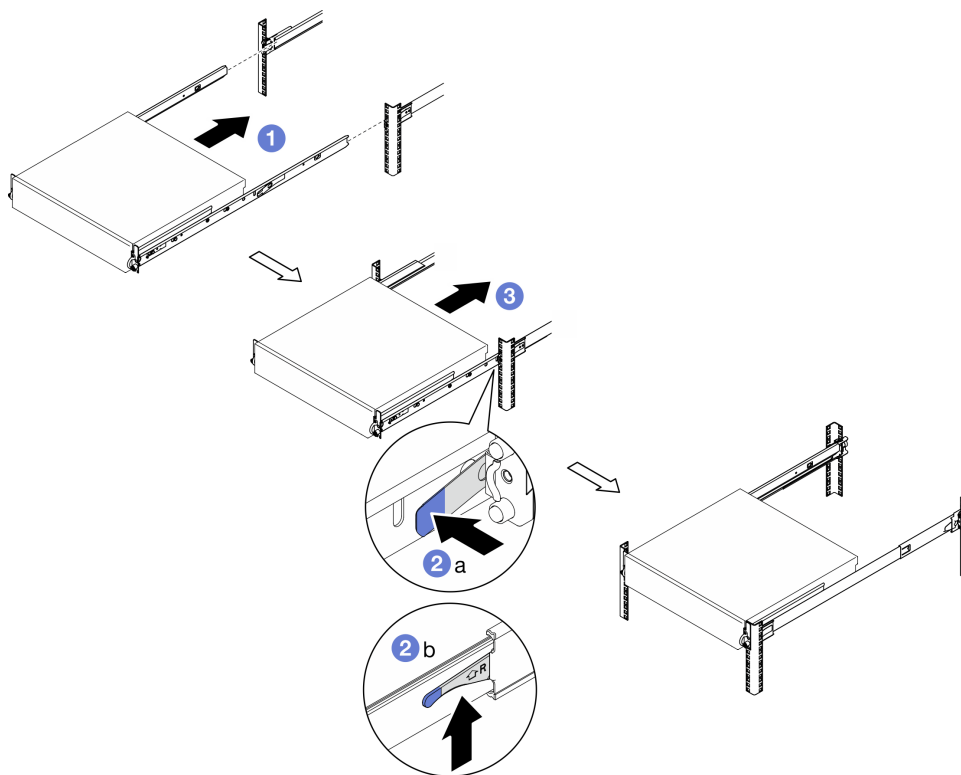
Figure 22. Installing the server to the rack

    a.   ❶ Carefully lift the server and align the server with the rails on the rack; then, position the server as shown and push it into the rack.

    b.   ❷ Depending on the rail kit, press or lift the release latches.

    c.   ❸ Push the server all the way into the rack until the server locks into place with a click.

Step 5.   Secure the server to the rack.

    a.   For the configurations with standard EIA brackets, fasten the two thumbscrews.
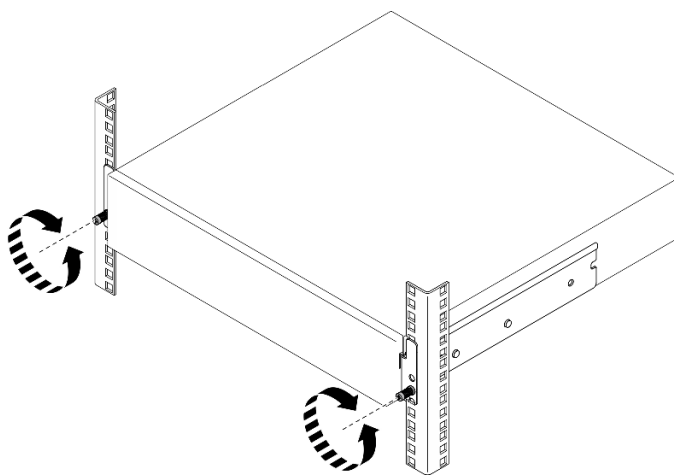
Figure 23. Securing the server to the rack: standard EIA brackets

b. For the configurations with security EIA brackets, fasten the two security screws with key. Store the key for future use.
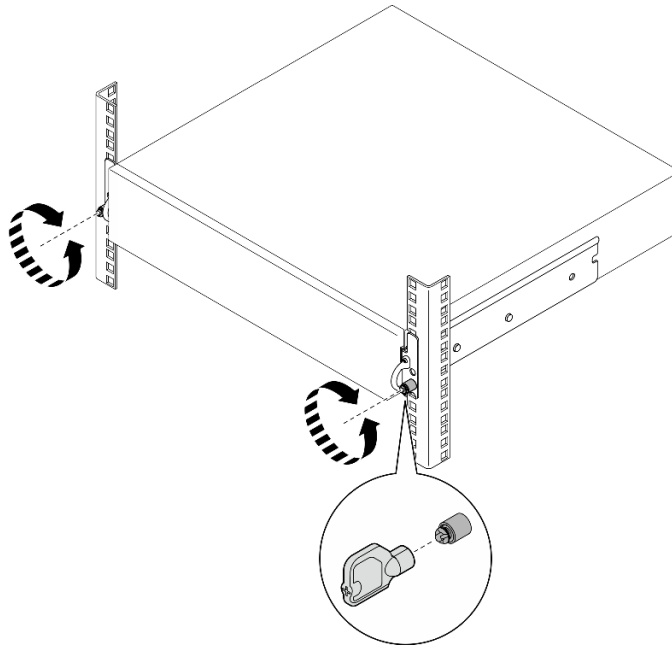
Figure 24. Securing the server to the rack: security EIA brackets

After this task is completed

1. Reconnect the power cords and any cables that you removed.
2. Power on the server and any peripheral devices. See "Power on the server" on page 10.
3. If applicable, reinstall the security bezel. See "Install the security bezel" on page 169.

Node component replacement

Follow instructions in this section to remove and install the node components.

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.

Air baffle replacement

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

Remove the M.2 air baffle

Follow instructions in this section to remove the M.2 air baffle.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1.   Make preparation for this task.

    a.   Remove the top cover. See "Remove the top cover" on page 195.

    b.   If applicable, remove all the internal drives. See "Remove an internal drive" on page 69.

    c.   If applicable, remove the internal drive backplane. See "Remove the internal drive backplane" on page 71.

    d.   If applicable, remove internal drive cage. See "Remove the internal drive cage" on page 73.

Step 2.   Loosen the two screws that secure the M.2 air baffle; then, remove the air baffle.

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

Figure 25. Removing the M.2 air baffle for configuration with internal drive cage
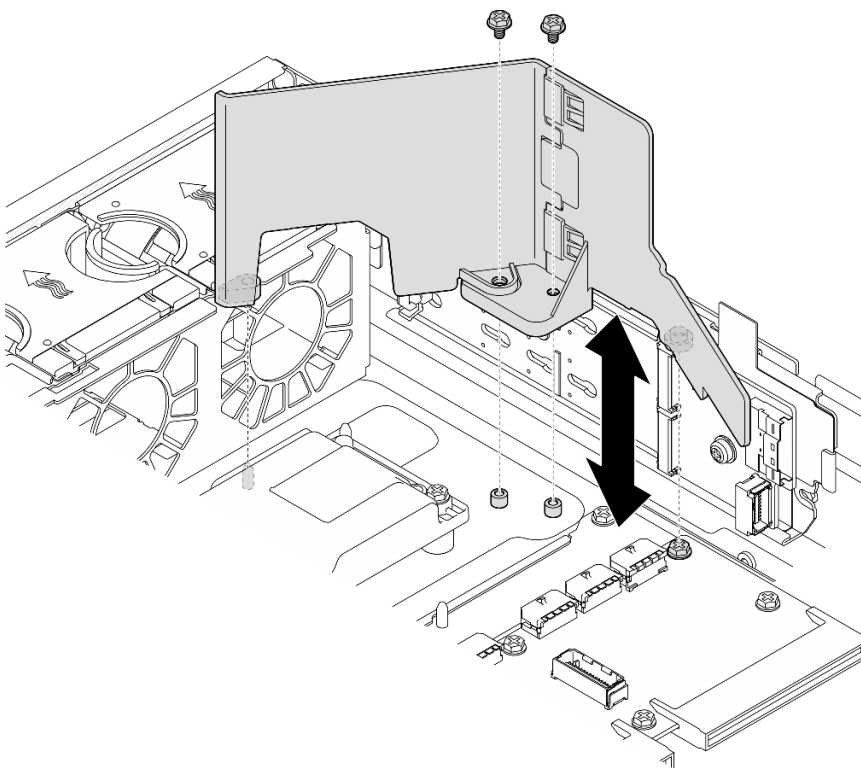
Figure 26. Removing the M.2 air baffle for configuration without internal drive cage

Step 3.   If necessary, separate the front half and rear half of the M.2 air baffle.

a. Press the nubs to disengage the rear half.

b. Separate the rear half from the front half.

Note: For the configurations with internal drive cage, install only the front half of the M.2 air baffle.
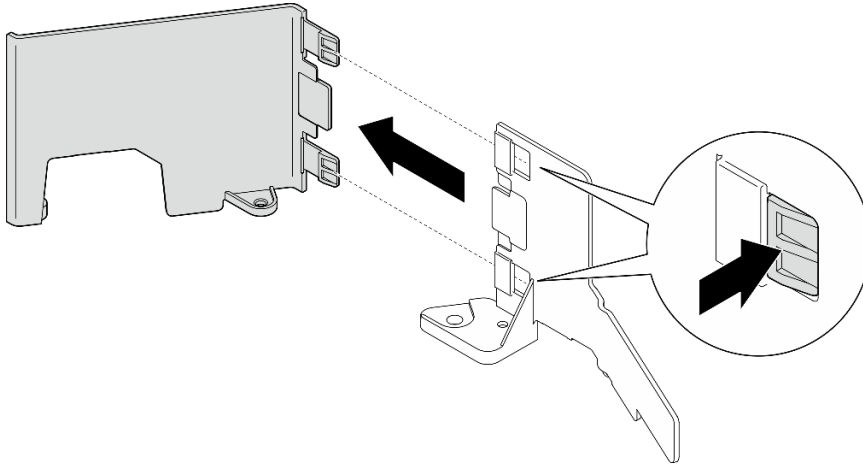
Figure 27. Separating the parts of M.2 air baffle

After this task is completed

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

Demo Video

Watch the procedure on YouTube

Install the M.2 air baffle
Follow instructions in this section to install the M.2 air baffle.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

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

Procedure

Step 1. Make sure that the M.2 air baffle is corresponding to the selected configuration. If the configuration is **without** internal drive cage, combine the front half and rear half of the M.2 air baffle.

a. Align the small tabs of the rear half with the notches of the front half as shown.

b. Slide the rear half toward the front half until the rear half clicks into place.
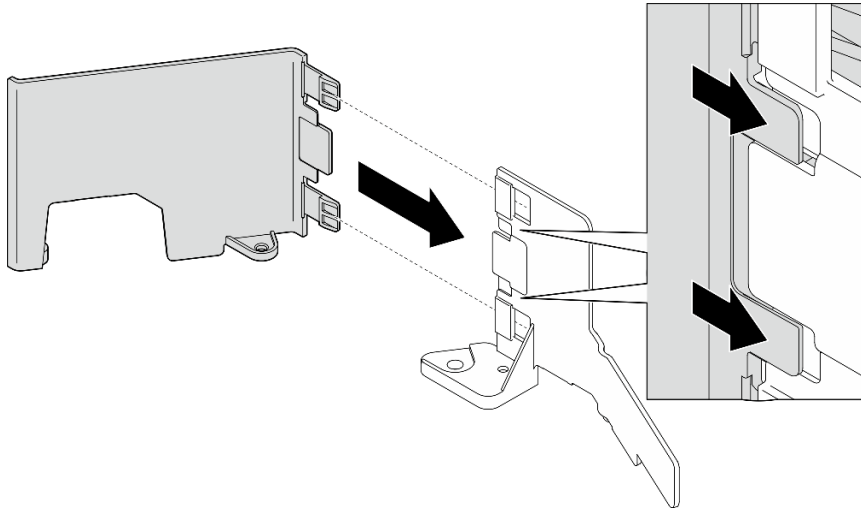
Figure 28. Combining the parts of M.2 air baffle

Step 2. Install the M.2 air baffle.

a. Align the M.2 air baffle with the guide pins on the chassis and the screw on the power distribution board; then, lower the air baffle until it is seated in place.

b. Fasten two screws to secure the air baffle.
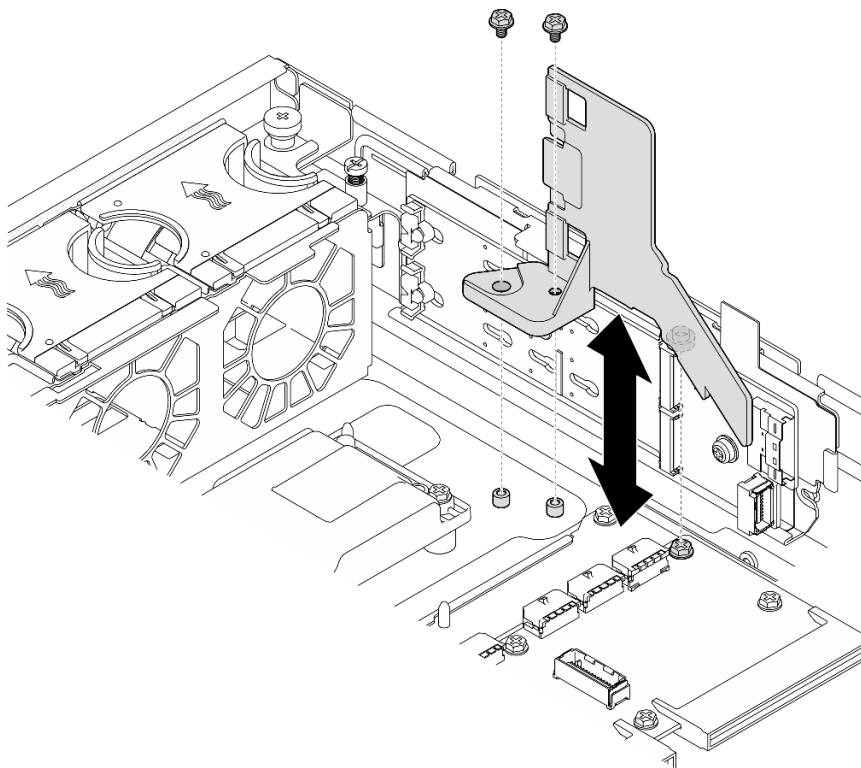
Figure 29. Installing the M.2 air baffle for configuration with internal drive cage
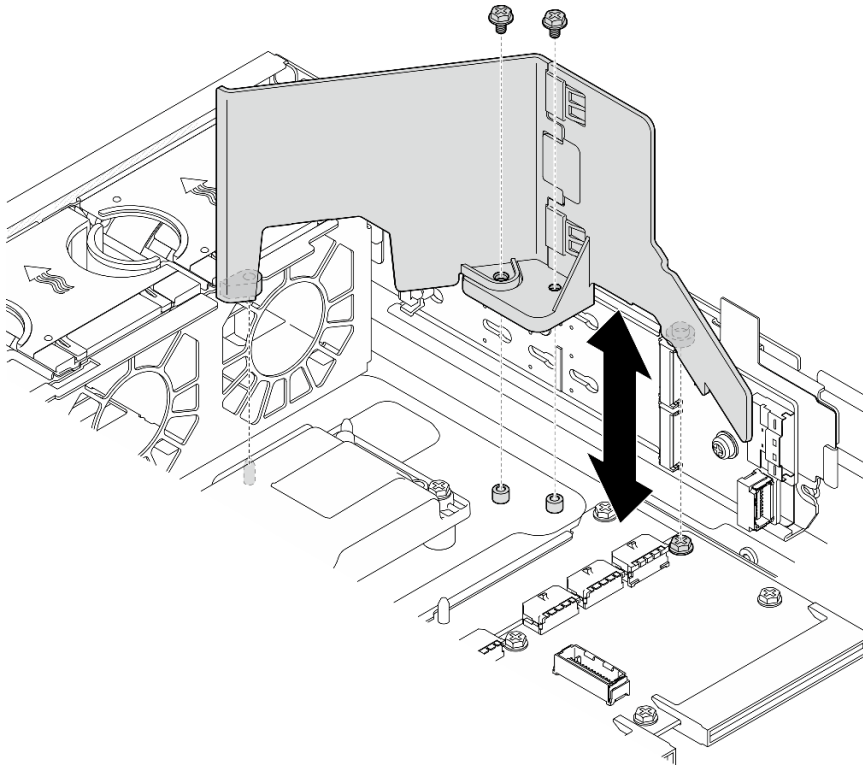
Figure 30. Installing the M.2 air baffle for configuration without internal drive cage

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Remove the processor air baffle

Follow instructions in this section to remove the processor air baffle.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Note: Depending on the configuration, the air baffle might look slightly different from the illustration in this section.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

    b. Remove all the PCIe assemblies. If the configuration comes with PCIe riser 2 and internal drives, remove all the internal drives, and lift the internal drive backplane before removing PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

    Note: For the configurations with GPU power cable, disengage all the GPU power cables from the processor air baffle before removing PCIe riser assembly.

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

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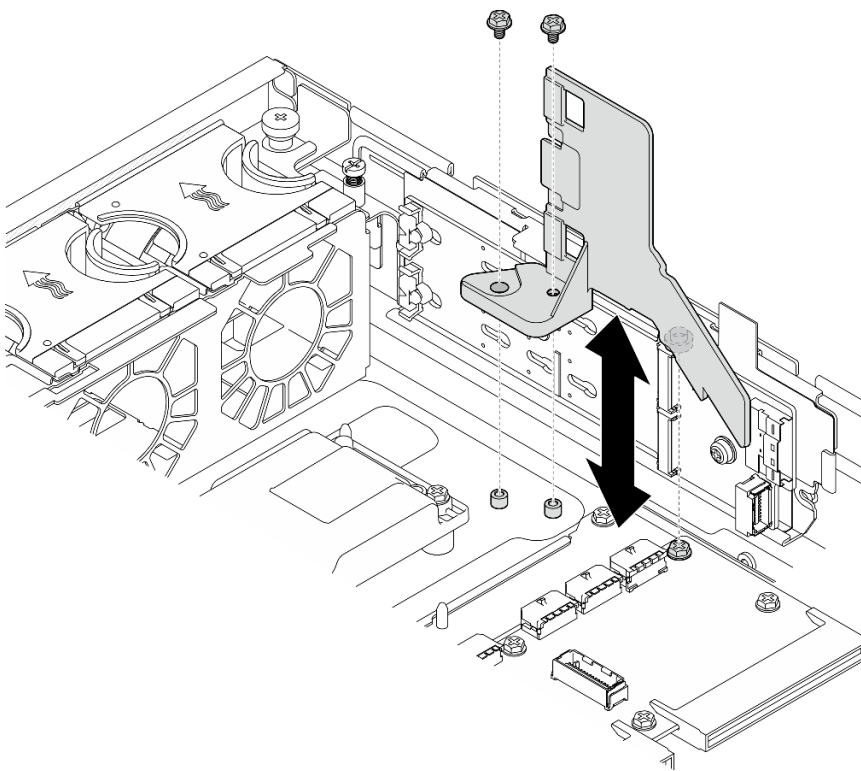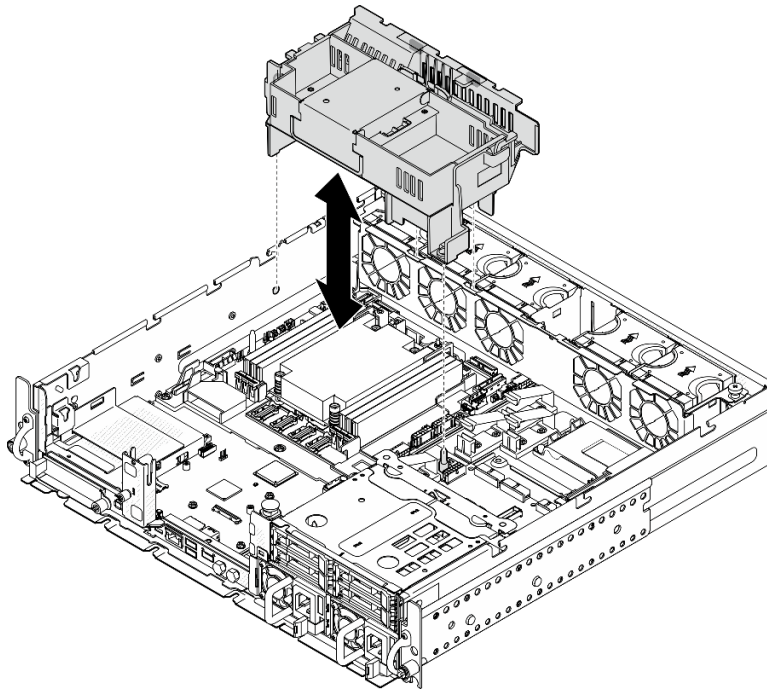

Figure 31. Removing the air baffle for 1U heat sink
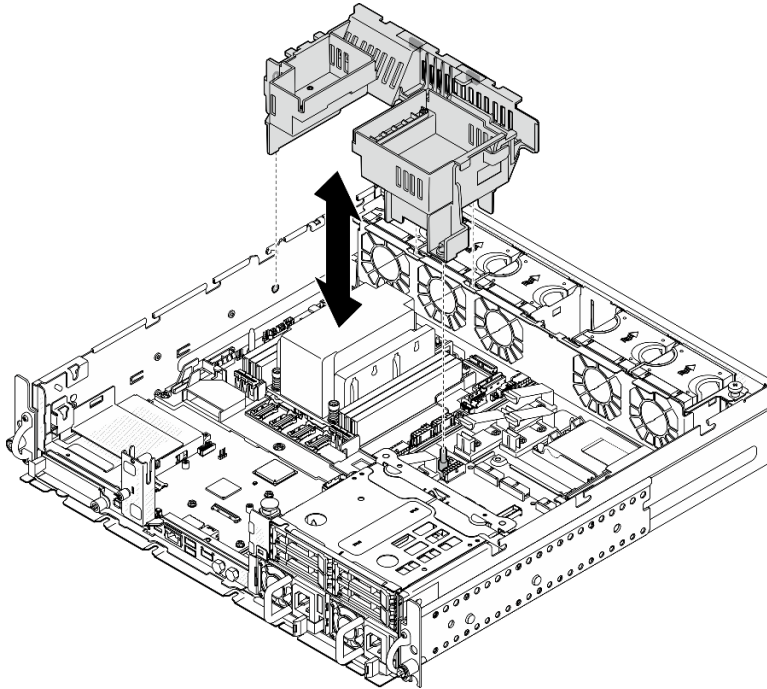
Figure 32. Removing the air baffle for 2U heat sink

After this task is completed

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

Demo Video

Watch the procedure on YouTube

Change the processor air baffle combination for 1U heat sink
Follow instructions in this section to change the processor air baffle combination for the configurations with 1U heat sink.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

Identify the parts of the processor air baffle supporting different configurations with 1U heat sink.
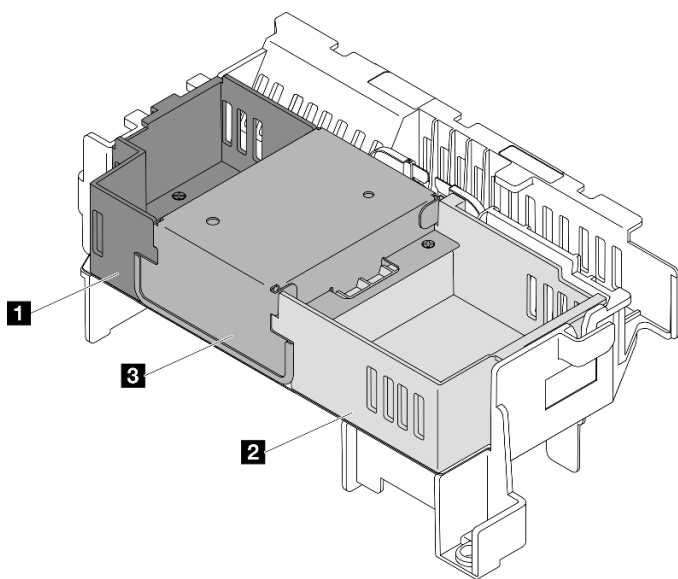
1 Riser 1 filler	**3** Middle filler
2 Riser 2 filler	

Table 4. Processor air baffle combination

		PCIe riser 2		
		With FL adapter	No FL adapter	No adapter
PCIe riser 1	With FL adapter		**2**	**2**
	No FL adapter	**1**	**1** **2** **3**	**1** **2** **3**
	No adapter	**1**	**1** **2** **3**	**1** **2** **3**

Procedure

Step 1. If necessary, remove or install the riser 1 filler.

    a. To remove the filler, loosen the screw that secures the filler; then, grasp and lift the filler from the air baffle.

    b. To install the filler, align the filler with the edge of the air baffle, and lower the filler down until the guide pins on the bottom of the filler are seated in place; then, fasten one screw to secure the filler.
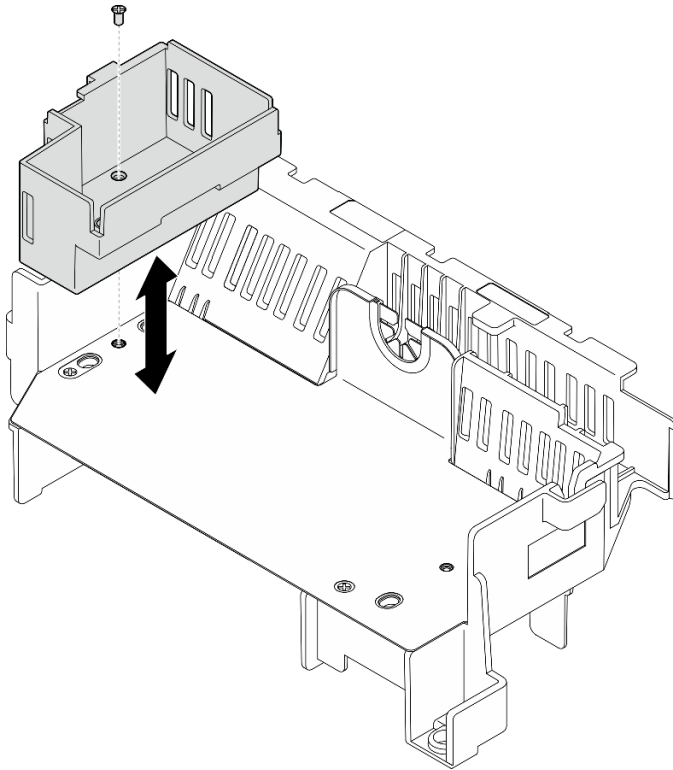
Figure 33. Replacing the riser 1 filler

Step 2.   If necessary, remove or install the riser 2 filler.

   a.   To remove the filler, loosen the screw that secures the filler; then, grasp and lift the filler from the air baffle.

   b.   To install the filler, align the filler with the edge of the air baffle, and lower the filler down until the guide pins on the bottom of the filler are seated in place; then, fasten one screw to secure the filler.
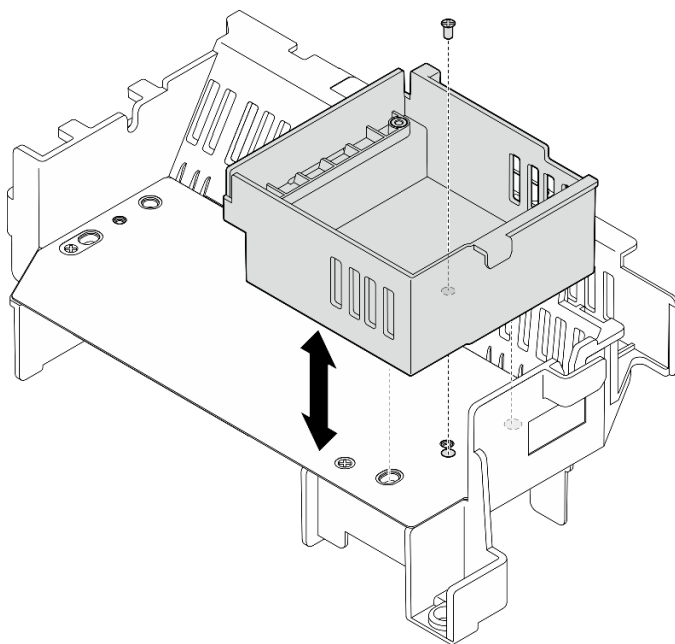
Figure 34. Replacing the riser 2 filler

Step 3. If necessary, remove or install the middle filler.

a. To remove the filler, loosen the four screws that secure the filler; then, grasp and lift the filler from the air baffle.

b. To install the filler, align the filler with the edge of the riser 1 filler and riser 2 filler, and lower the middle filler down until it is seated in place; then, fasten four screws to secure the filler.

Important: For proper cooling and airflow, make sure to install the middle filler with the orientation as shown.
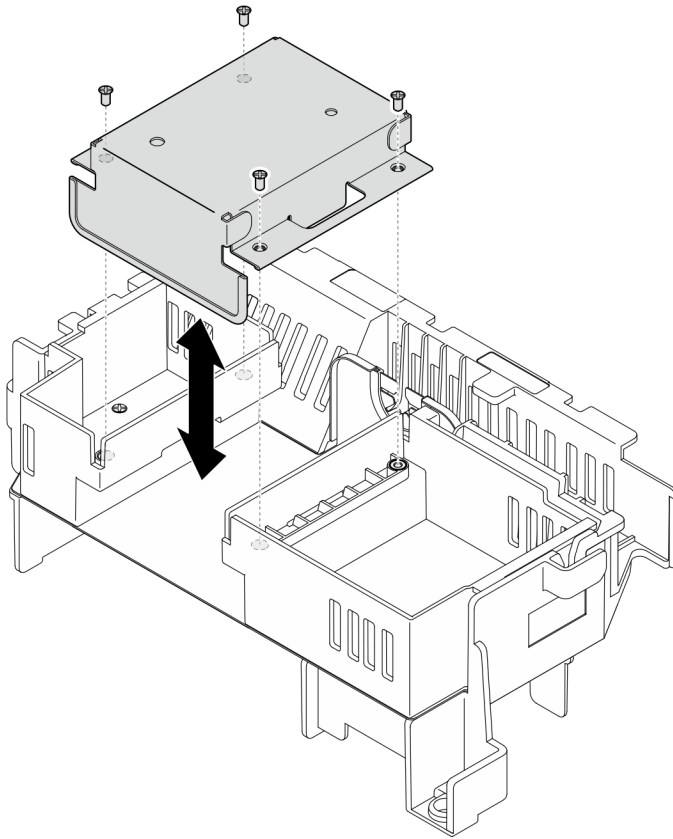
Figure 35. Replacing the middle filler

Install the processor air baffle

Follow instructions in this section to install the processor air baffle.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

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

Note: Depending on the configuration, the air baffle might look slightly different from the illustration in this section.

Procedure

Step 1.   If necessary, change the processor air baffle combination according to the selected configuration. See "Change the processor air baffle combination for 1U heat sink" on page 31.

Step 2.   Align the air baffle with guide pins on the chassis and the slots on the fan cage; then, lower the air baffle down until it is firmly seated.
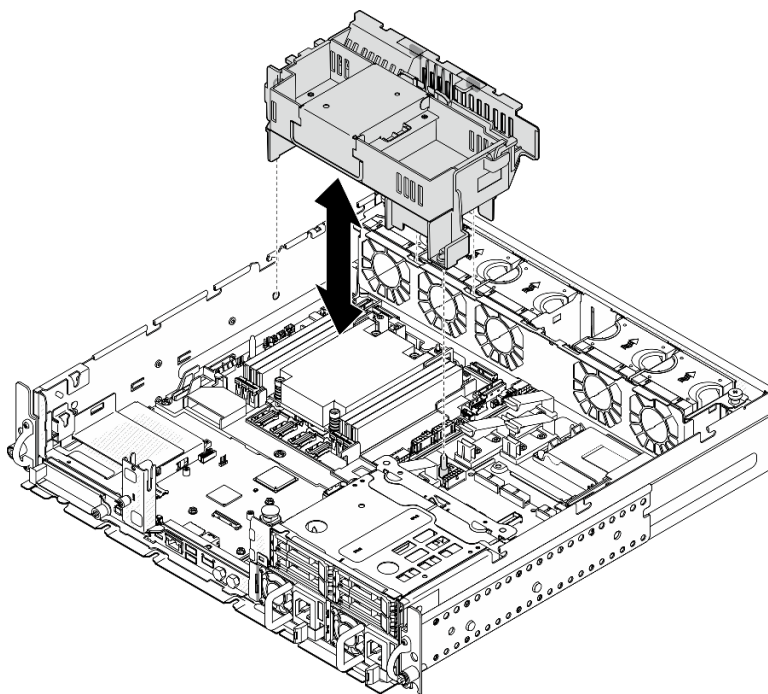
Figure 36. Installing the air baffle for 1U heat sink

Figure 37. Installing the air baffle for 2U heat sink

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Air flow sensor board replacement

Follow instructions in this section to remove and install the air flow sensor board.

Remove the air flow sensor board

Follow the instructions in this section to remove the air flow sensor board.

About this task

S002

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

  a. Remove the top cover. See "Remove the top cover" on page 195.

  b. Remove all the PCIe assemblies. If the configuration comes with PCIe riser 2 and internal drives, remove all the internal drives, and lift the internal drive backplane before removing PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

  c. Remove the processor air baffle. See "Remove the processor air baffle" on page 29.

Step 2. Loosen the two screws that secure the air flow sensor board; then, slightly slide the air flow sensor board backwards, and lift it up to remove it.
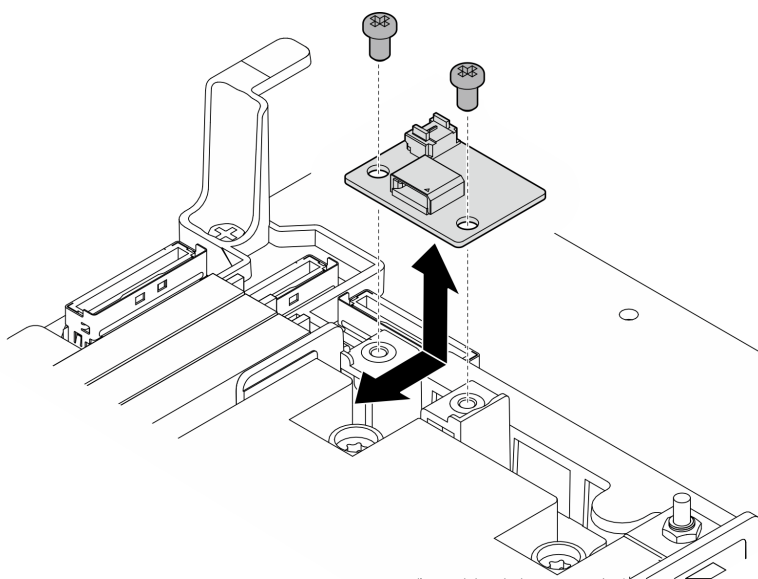
Figure 38. Removing the air flow sensor board

Step 3. Disconnect the cable from the air flow sensor board.

After this task is completed

- Install a replacement unit. See "Install the air flow sensor board" on page 38.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Install the air flow sensor board

Follow the instructions in this section to install the air flow sensor board.

About this task

S002

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Procedure

Step 1. Make sure the air flow sensor cable is connected to the system board properly. See "System-board connectors for cable routing" on page 202 to locate Air flow sensor board connector (Air Velocity Sensor).

Step 2. Connect the cable to the air flow sensor board.

Step 3. Install the air flow sensor board.

    a. Lower down the air flow sensor board to the cable wall; then, slide it forward until it is seated in place.

    b. Fasten two screws to secure the air flow sensor board.
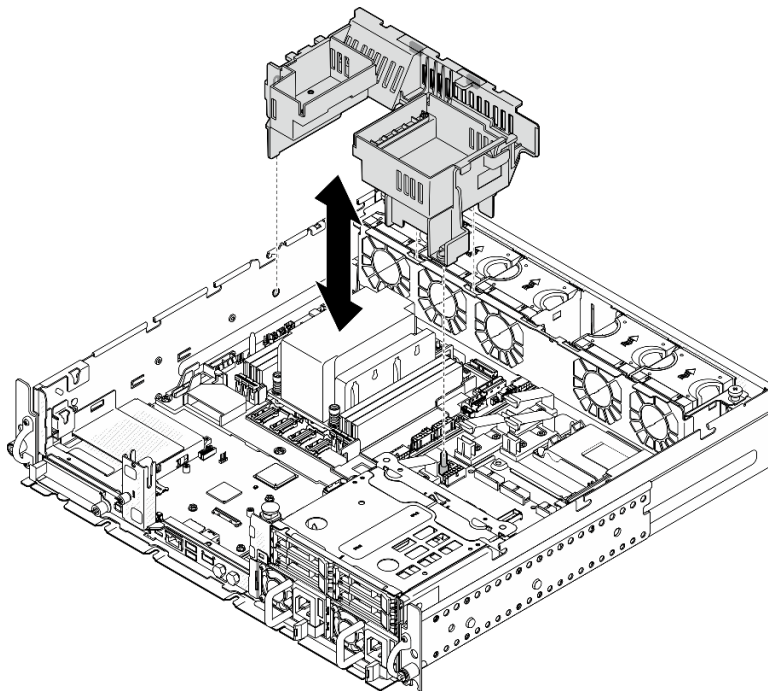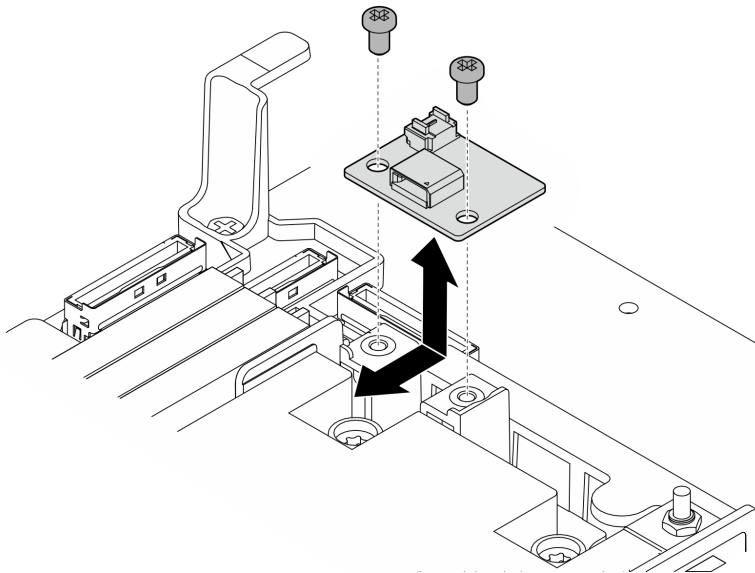

Figure 39. Installing the air flow sensor board

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Bezel detect switch with cable replacement
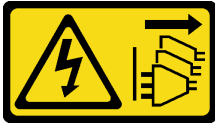
Follow instructions in this section to remove and install the bezel detect switch with cable.

Remove the bezel detect switch with cable

Follow the instructions in this section to remove the bezel detect switch with cable.

About this task

S002

CAUTION:

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1.   Make preparation for this task.

      a.   Remove the top cover. See "Remove the top cover" on page 195.

      b.   Remove all the PCIe assemblies. If the configuration comes with PCIe riser 2 and internal drives, remove all the internal drives, and lift the internal drive backplane before removing PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

      c.   Remove the processor air baffle. See "Remove the processor air baffle" on page 29.

Step 2.   Disconnect the bezel detect switch cable from the system board.

Step 3.   Remove the bezel detect switch.

      a.   ❶ Loosen the screw that secures the bezel detect switch.

      b.   ❷ Pinch and pivot the switch to disengage it from the chassis.

      c.   ❸ Slide the switch to remove it.
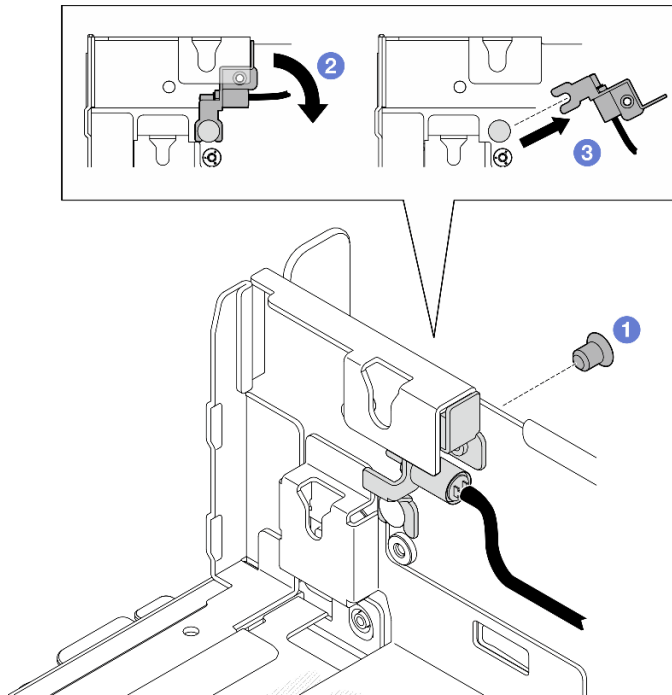
Figure 40. Removing the bezel detect switch

After this task is completed

- Install a replacement unit. See "Install the bezel detect switch with cable" on page 41.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Install the bezel detect switch with cable

Follow the instructions in this section to install the bezel detect switch with cable.

About this task

<u>S002</u>

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Procedure

Step 1. Install the bezel detect switch.

a. ❶ Align the opening of the bracket with the guide pin on the chassis; then, slide the bezel detect switch toward the guide pin.

b. ❷ Pivot the switch as shown until it is seated in place.

c. ❸ Fasten one screw to secure the switch.

Figure 41. Installing the bezel detect switch

Step 2. Connect the bezel detect switch cable to the system board. See "System-board connectors for cable routing" on page 202 to locate Bezel detect connector.

After this task is completed

- Complete the parts replacement. See "Complete the parts replacement" on page 198.
- With the bezel detect switch installed, when the system is powered on, XCC would generate a detecting message referring security bezel as "sub-chassis".

Demo Video

Watch the procedure on YouTube

Cable wall with heat sink detect switch replacement

Follow instructions in this section to remove and install the cable wall with heat sink detect switch.

Remove the cable wall with heat sink detect switch

Follow the instructions in this section to remove the cable wall with heat sink detect switch.

About this task

S002

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

    b. Remove all the PCIe assemblies. If the configuration comes with PCIe riser 2 and internal drives, remove all the internal drives, and lift the internal drive backplane before removing PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

    c. Remove the processor air baffle. See "Remove the processor air baffle" on page 29.

    d. If applicable, remove the air flow sensor board. See "Remove the air flow sensor board" on page 37.

    e. Remove the intrusion switch. See "Remove the intrusion switch with cable" on page 82.

    f. If applicable, disconnect the cables from PCIe 8, 9, 10, 11 connector on the system board, and remove the cables that are routed through the cable wall. See "System-board connectors for cable routing" on page 202 to locate the connectors.

Step 2. Disconnect the heat sink detect switch cable from the system board.

Step 3. Loosen the two screws that secure the cable wall; then, lift the cable wall to remove it.
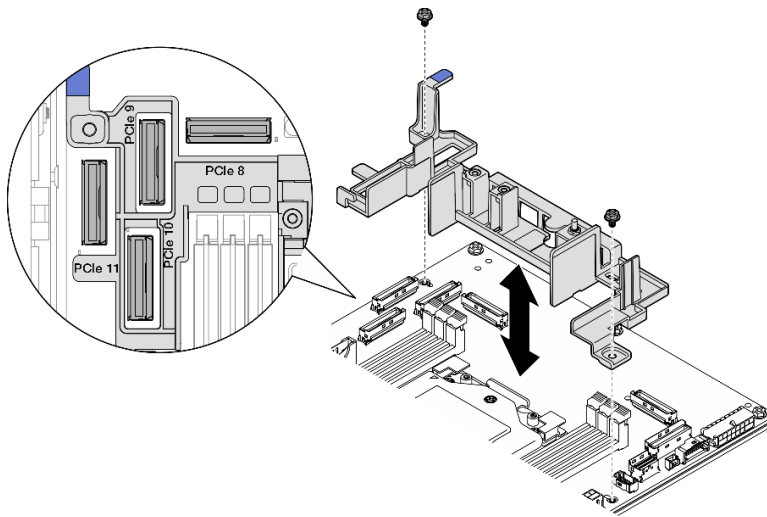
Figure 42. Removing the cable wall

After this task is completed

- Install a replacement unit. See "Install the cable wall with heat sink detect switch" on page 44.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Install the cable wall with heat sink detect switch

Follow the instructions in this section to install the cable wall with heat sink detect switch.

About this task

S002

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Procedure

Step 1. Align the cable wall with the screw holes on the system board; then, lower down the cable wall. Make sure that the PCIe 9, 10, 11 connectors are in the holes of the cable wall.
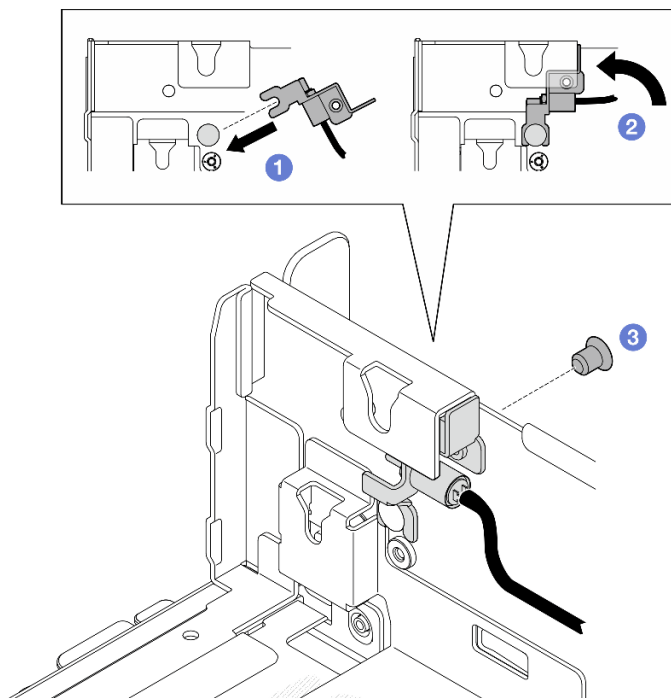
Step 2. Fasten two screws to secure the cable wall.
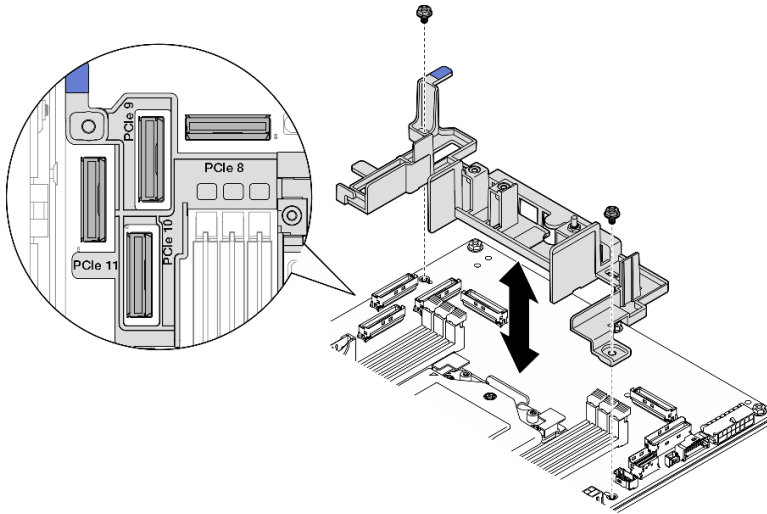
Figure 43. Installing the cable wall

Step 3. Connect the heat sink detect switch cable to the system board. See "System-board connectors for cable routing" on page 202 to locate Heat sink detect connector.

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

CMOS battery (CR2032) replacement

Follow instructions in this section to remove and install a CMOS battery (CR2032).

Remove a CMOS battery (CR2032)

Follow instructions in this section to remove a CMOS battery (CR2032).

About this task

S002

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

S004

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

Do not:

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

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

S005

CAUTION:
The battery is a lithium ion battery. To avoid possible explosion, do not burn the battery. Exchange it only with the approved part. Recycle or discard the battery as instructed by local regulations.

Consider the following when replacing the CMOS battery.

- Lenovo has designed this product with user safety in mind. The lithium battery must be handled properly to avoid potential danger. Make sure to follow instructions in this topic while replacing the battery.
- The CMOS battery must be replaced with another unit of the same type (CR2032).
- For high temperature operation environment, it is recommended to use CR2032HR instead.
- After replacement is completed, it is required to reconfigure the server and reset the system date and time.
- Dispose of the CMOS battery as required by local ordinances or regulations.
- 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.

Notes: If one of the following situations occurs, the system enters System Lockdown Mode and needs to be activated or unlocked. See *Activate or unlock the system* in *User Guide* or *System Configuration Guide*.

- The 3V security battery (CR2032) is replaced.
- When Chassis Intrusion Detection is **Enabled** in Lenovo XClarity Controller, the 3V system battery (CR2032) is replaced, or CMOS is cleared.

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

    b. Remove all the PCIe assemblies. If the configuration comes with PCIe riser 2 and internal drives, remove all the internal drives, and lift the internal drive backplane before removing PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

    c. Remove the processor air baffle. See "Remove the processor air baffle" on page 29.

Step 2. Locate the CMOS battery to be removed:
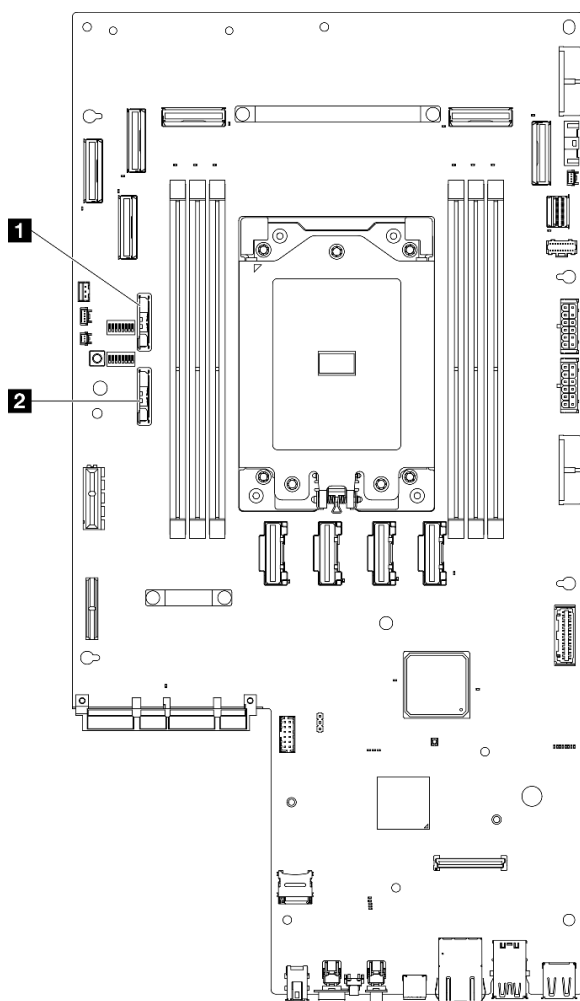
Figure 44. CMOS battery locations on the system board

1 3V security battery (CR2032)	**2** 3V system battery (CR2032)

Notes: If one of the following situations occurs, the system enters System Lockdown Mode and needs to be activated or unlocked. See *Activate or unlock the system* in *User Guide* or *System Configuration Guide*.

- The 3V security battery (CR2032) is replaced.
- When Chassis Intrusion Detection is **Enabled** in Lenovo XClarity Controller, the 3V system battery (CR2032) is replaced, or CMOS is cleared.

Step 3. Open the retaining latch to disengage the battery; then, lift the battery to remove it from the seat.

Attention: Do not lift the battery by using excessive force. Failing to remove the battery properly may damage the socket on the system board. Any damage to the socket may require replacing the system board.
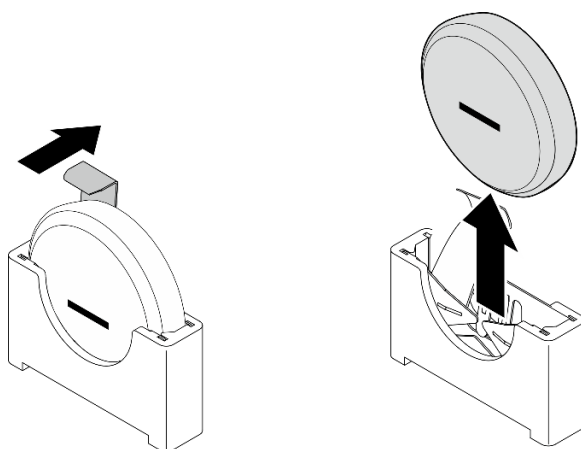
Figure 45. Removing the CMOS battery

After this task is completed

1. Dispose of the CMOS battery as required by local ordinances or regulations.
2. Install a replacement unit. See .

Demo Video

Watch the procedure on YouTube

Install a CMOS battery (CR2032)

Follow instructions in this section to install a CMOS battery (CR2032).

About this task

S002

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

S004

CAUTION:
When replacing the lithium battery, use only Lenovo specified part number or an equivalent type of battery recommended by the manufacturer. If your system has a module containing a lithium battery,

replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

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

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

<u>S005</u>

CAUTION:
The battery is a lithium ion battery. To avoid possible explosion, do not burn the battery. Exchange it only with the approved part. Recycle or discard the battery as instructed by local regulations.

Consider the following when replacing the CMOS battery.

- Lenovo has designed this product with user safety in mind. The lithium battery must be handled properly to avoid potential danger. Make sure to follow instructions in this topic while replacing the battery.
- The CMOS battery must be replaced with another unit of the same type (CR2032).
- For high temperature operation environment, it is recommended to use CR2032HR instead.
- After replacement is completed, it is required to reconfigure the server and reset the system date and time.
- Dispose of the CMOS battery as required by local ordinances or regulations.
- 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.

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.
- To avoid potential damage, **do not** let the CMOS battery contact any metal surface.
- Make sure that all the server power cords are disconnected from power source before performing this procedure.

Procedure

Step 1.   Follow any special handling and installation instructions that come with the CMOS battery.

Step 2.   Locate the CMOS battery socket on the system board.
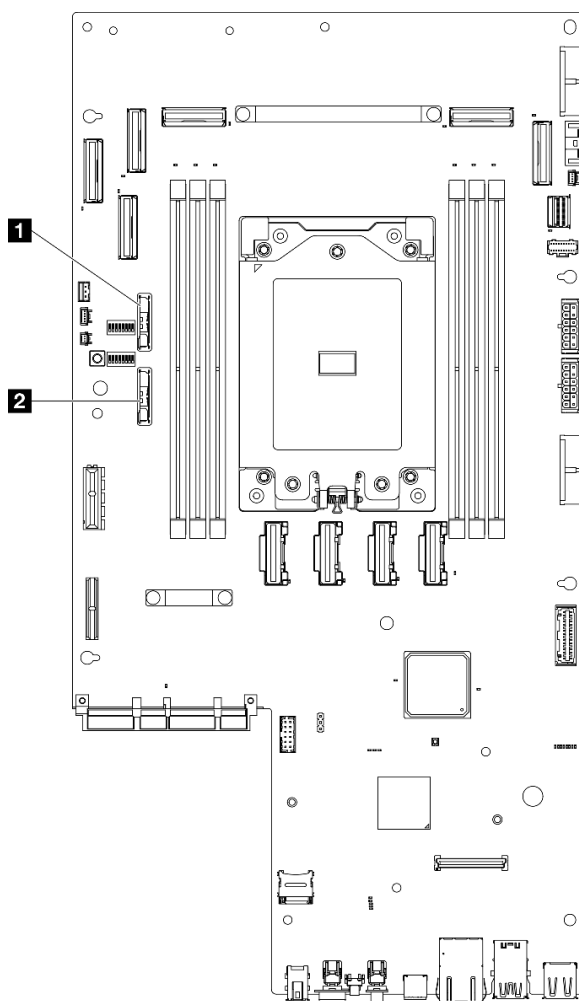
Figure 46. CMOS battery locations on the system board

1 3V security battery (CR2032)	**2** 3V system battery (CR2032)

Notes: If one of the following situations occurs, the system enters System Lockdown Mode and needs to be activated or unlocked. See *Activate or unlock the system* in *User Guide* or *System Configuration Guide*.

- The 3V security battery (CR2032) is replaced.
- When Chassis Intrusion Detection is **Enabled** in Lenovo XClarity Controller, the 3V system battery (CR2032) is replaced, or CMOS is cleared.

Step 3. Align the CMOS battery with the base of the seat, with negative (-) side faces middle of the chassis. Then, pivot the top of the battery until the battery clicks in place.
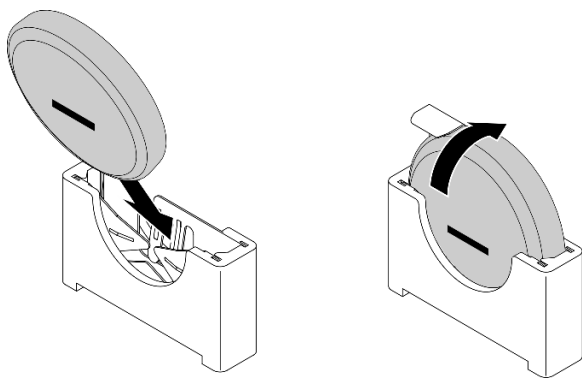
Figure 47. Installing the CMOS battery

After this task is completed

1. Complete the parts replacement. See "Complete the parts replacement" on page 198.
2. If one of the following situations occurs, the system enters System Lockdown Mode and needs to be activated or unlocked. See *Activate or unlock the system* in *User Guide* or *System Configuration Guide*.

   - The 3V security battery (CR2032) is replaced.
   - When Chassis Intrusion Detection is **Enabled** in Lenovo XClarity Controller, the 3V system battery (CR2032) is replaced, or CMOS is cleared.

3. Power on the server; then, reset date, time, and all the passwords.

Demo Video

Watch the procedure on YouTube

Fan module replacement

Follow instructions in this section to remove and install the fan modules.

Remove a fan module

Follow instructions in this section to remove a fan module.

About this task

S002

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

  a. Remove the top cover. See "Remove the top cover" on page 195.

Step 2. Remove the fan module.

  a. ❶ Pinch and hold the blue touch points on top of the fan module.

  b. ❷ Lift the fan module out of the chassis.
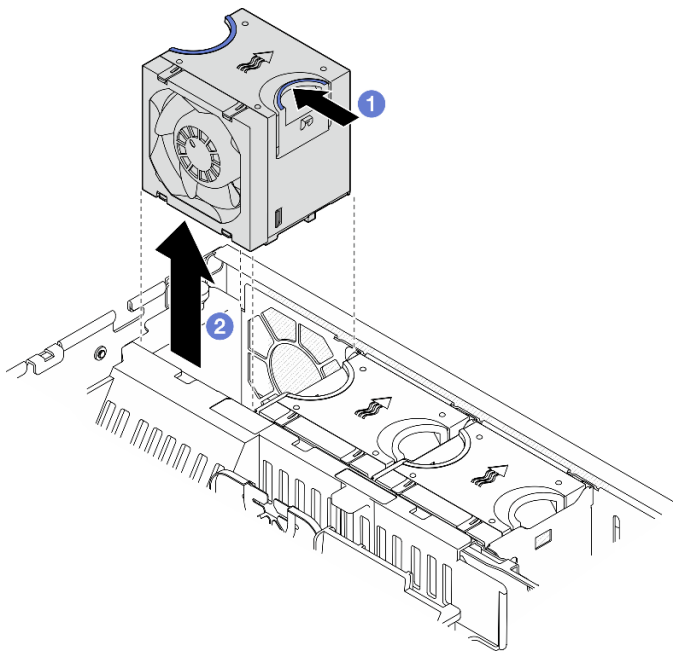
Figure 48. Removing a fan module

After this task is completed

- Install a replacement unit. See "Install a fan module" on page 53.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Install a fan module

Follow instructions in this section to install a fan module.

About this task

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Procedure

Step 1.   Align the fan to the fan slot in the fan cage; then, insert the fan into the fan cage and press it until it clicks into place.

> **Note:** Press the fan to make sure it is seated correctly on the fan control board.
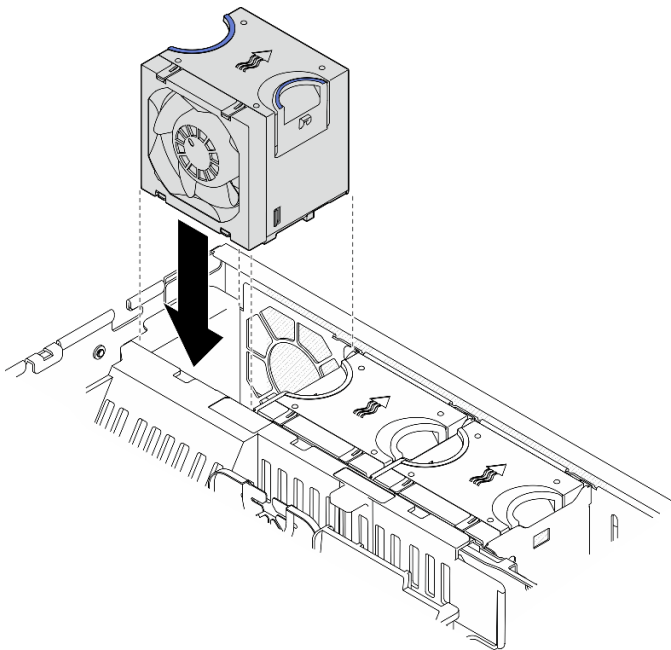
Figure 49. Installing a fan

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Fan cage and fan control board (FCB) replacement

Follow instructions in this section to remove and install the fan cage and the fan control board (FCB).

Remove the fan cage

Follow instructions in this section to remove the fan cage.

About this task

<u>S002</u>

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

    b. Remove all the PCIe assemblies. If the configuration comes with PCIe riser 2 and internal drives, remove all the internal drives, and lift the internal drive backplane before removing PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

    c. Remove the processor air baffle. See "Remove the processor air baffle" on page 29.

    d. Remove all the fan modules. See "Remove a fan module" on page 52.

Step 2. Remove the fan cage.

    a. ❶ Loosen the two thumbscrews on the sides of the fan cage.

    b. ❷ Lift the fan cage up until the guide pin on the chassis is seated in the large opening of the guiding slot on fan cage.

    c. ❸ Move the cage forward and remove it from the chassis.
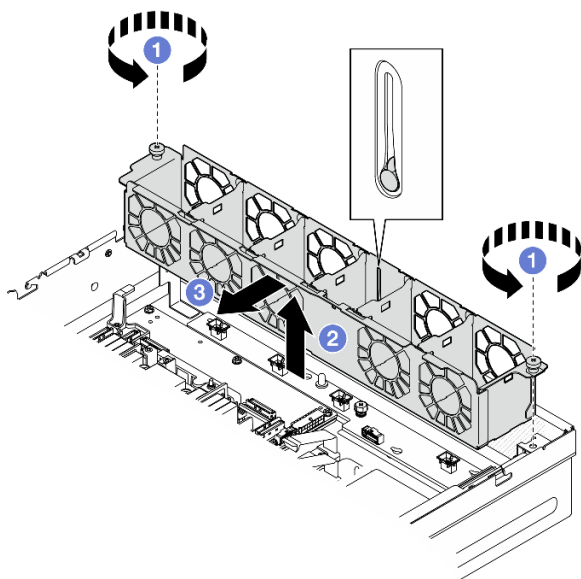
Figure 50. Removing the fan cage

After this task is completed

- If necessary, proceed to remove the fan control board. See "Remove the fan control board (FCB)" on page 56.

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

Demo Video

Watch the procedure on YouTube

Remove the fan control board (FCB)

Follow the instructions in this section to remove the fan control board (FCB).

About this task

S002

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

a. Remove the top cover. See "Remove the top cover" on page 195.

b. Remove all the fan modules. See "Remove a fan module" on page 52.

c. Remove all the PCIe assemblies. If the configuration comes with PCIe riser 2 and internal drives, remove all the internal drives, and lift the internal drive backplane before removing PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

d. Remove the processor air baffle. See "Remove the processor air baffle" on page 29.

e. Remove the fan cage. See "Remove the fan cage" on page 55.

Step 2. Disconnect all the cables from the fan control board.

Step 3. Remove the fan control board.

a. ❶ Loosen the thumbscrew that secures the fan control board.

b. ❷ Slide the fan control board until the guide pins on the chassis are seated on the large opening of the keyholes; then, lift the fan control board to remove it.
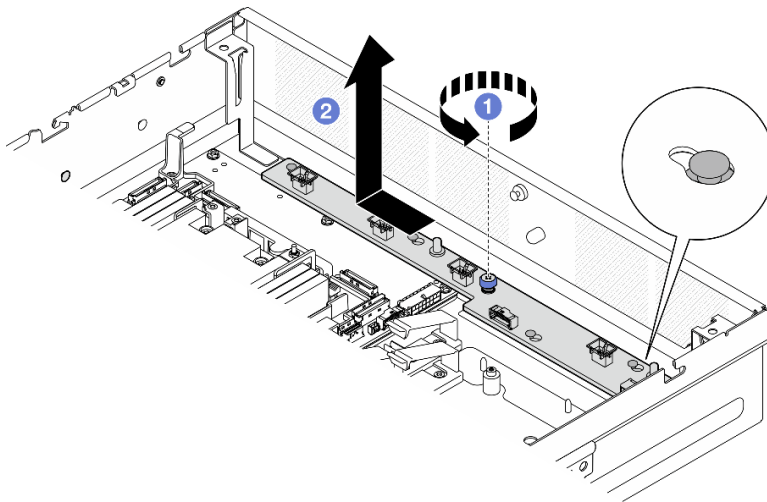
Figure 51. Removing the fan control board

After this task is completed

- Install a replacement unit. See "Install the fan control board (FCB)" on page 57.

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

Demo Video

Watch the procedure on YouTube

Install the fan control board (FCB)

Follow the instructions in this section to install the fan control board (FCB).

About this task

S002

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Procedure

Step 1. Install the fan control board.

  a. ❶ Align the fan control board with the guide pins on the chassis; then, lower down and slide the fan control board until the guide pins are seated in the small opening of the keyholes.

  b. ❷ Fasten the thumbscrew to secure the fan control board.
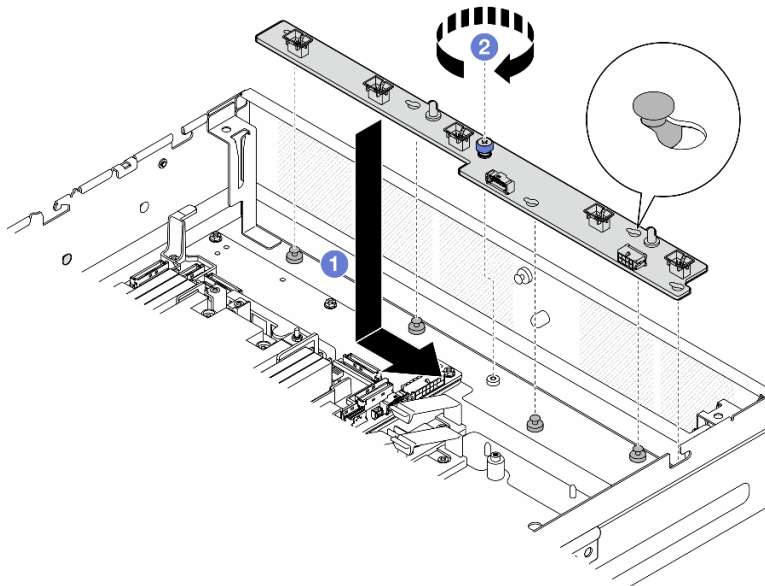
Figure 52. Installing the fan control board

Step 2. Connect the cables to the fan control board. See "Power distribution board (PDB) and fan control board (FCB) cable routing" on page 204.

After this task is completed

1. Reinstall the fan cage. See "Install the fan cage" on page 59.

2. Reinstall all the fan modules. See "Install a fan module" on page 53.

3. Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Install the fan cage

Follow instructions in this section to install the fan cage.

About this task

<u>S002</u>

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

Procedure

Step 1. Make preparation for this task.

    a. Before reinstalling the fan cage, make sure to remove all the fan modules from the fan cage. See "Remove a fan module" on page 52.

    b. Make sure the fan control board is installed properly. See "Install the fan control board (FCB)" on page 57.

Step 2. Install the fan cage.

    a. ❶ Push the fan cage toward the chassis until the guide pin is seated in the large opening of the guiding slot on fan cage.

    b. ❷ Lower the fan cage down into the chassis.

    c. ❸ Fasten the two thumbscrews to secure the fan cage.
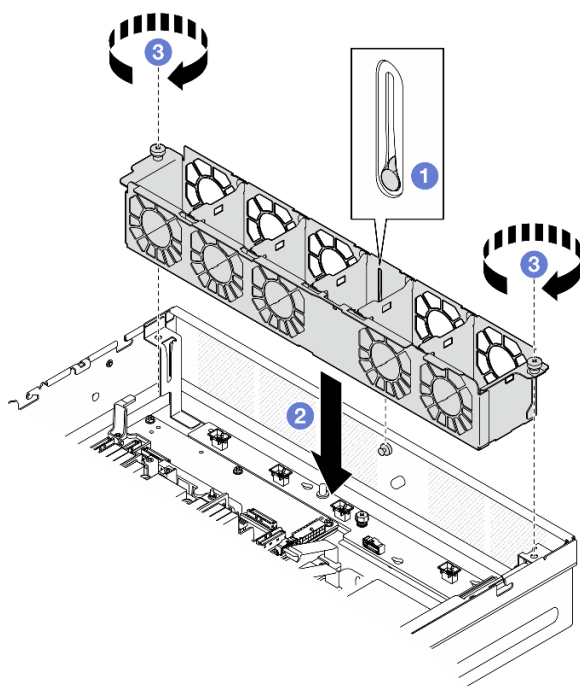
Figure 53. Installing the fan cage

After this task is completed

1. Reinstall all the fan modules. See "Install a fan module" on page 53.

2. Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Front hot-swap drive and front drive backplane replacement

Follow instructions in this section to remove and install the front hot-swap drives and the front drive backplane.

Remove a front hot-swap drive

Follow instructions in this section to remove a front hot-swap drive.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

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

- If one or more NVMe solid-state drives are to be removed, it is recommended to disable them beforehand via the operating system.

- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board), drive backplanes or drive cables, back up all important data that is stored on drives.

- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.

Notes:

- Make sure you have the drive bay fillers available if some drive bays will be left empty after the removal.
- When SED encryption is enabled, it is necessary to power cycle the system after installing an SED; without power cycling, the SED will not be recognized by the host OS. See "Manage the Self Encryption Drive Authentication Key (SED AK)" on page 182 for more information.

Procedure

Step 1.   Locate the front hot-swap drive to be removed.

Table 5. Front drive bay numbering (viewed from the front)

Bay 0	Bay 2
Bay 1	Bay 3

Step 2.   Remove the hot-swap drive.

   a.   ❶ Slide the release latch to unlock the drive handle.

   b.   ❷ Rotate the drive handle to the open position.

   c.   ❸ Grasp the handle and slide the drive out of the drive bay.
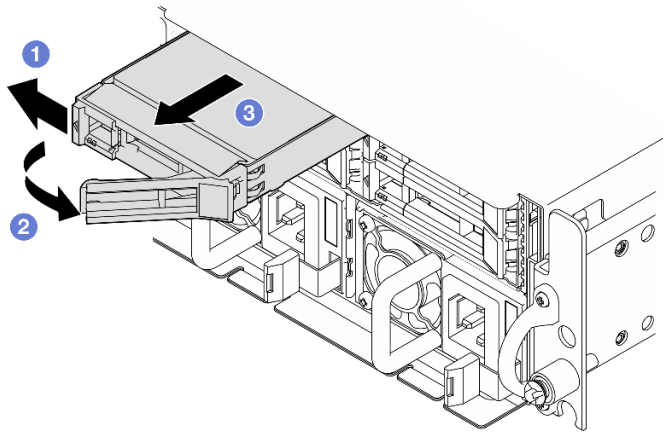
Figure 54. Removing a front hot-swap drive

After this task is completed

- Install a new drive or drive filler into the vacant drive bay. See "Install a front hot-swap drive" on page 67.

   Note: To make sure that there is adequate system cooling, do not operate the server for more than two minutes without either a drive or a filler installed in each bay.
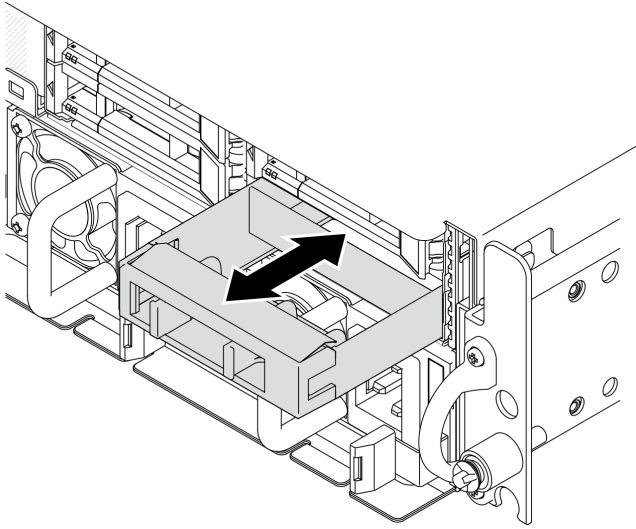
Figure 55. Installing a drive filler

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

Demo Video

Watch the procedure on YouTube

Remove the front drive backplane

Follow instructions in this section to remove the front drive backplane.

About this task

S002

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Note: Depending on the configuration, the drive backplane might look slightly different from the illustration in this section.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

    b. Remove all the front drives. See "Remove a front hot-swap drive" on page 60.

Step 2. Pinch the blue touch points on the backplane bracket as shown; then, lift the backplane to remove it.
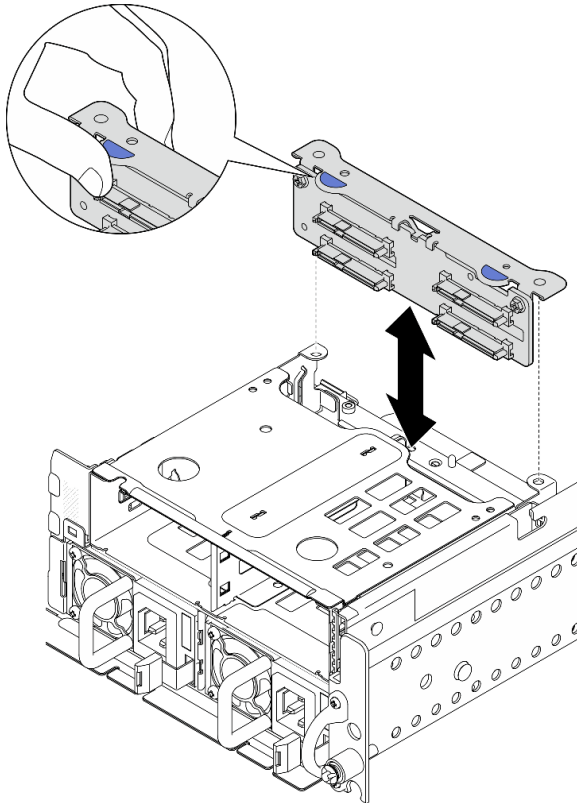
Figure 56. Removing the front drive backplane

Step 3. Disconnect the cables from the drive backplane.

Step 4. If necessary, loosen the two screws to separate the drive backplane from the backplane bracket.
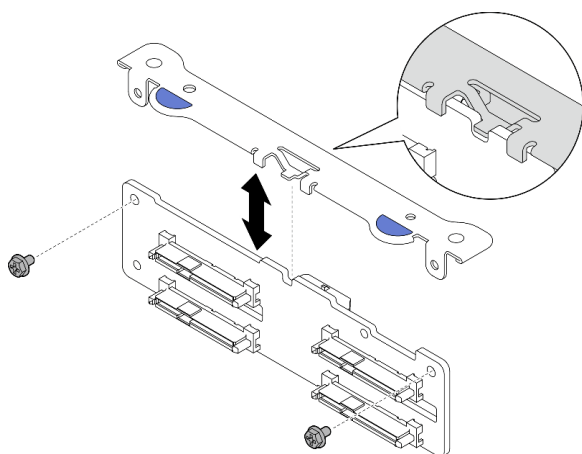
Figure 57. Separating the drive backplane from the backplane bracket

After this task is completed

- Install a replacement unit. See "Install the front drive backplane" on page 64.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Install the front drive backplane

Follow instructions in this section to install the front drive backplane.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Note: Depending on the configuration, the drive backplane might look slightly different from the illustration in this section.

Procedure

Step 1. If necessary, assemble the backplane with the backplane bracket.

    a. Align the notch of the backplane with the nub of the bracket; then, insert the backplane to the bracket until the backplane is seated in place.

    b. Secure the backplane with two screws.

Figure 58. Securing the backplane to the backplane bracket

Step 2. Connect the power and signal cables to the drive backplane.

    Note: For configurations with front and internal drive backplanes, and both the backplanes connect to x350 RAID adapter, make sure to connect the signal cable from C0 connector of the RAID adapter to the front backplane.

Step 3. Pinch the blue touch points on the backplane bracket as shown; then, press the backplane into the slot until it clicks into place.
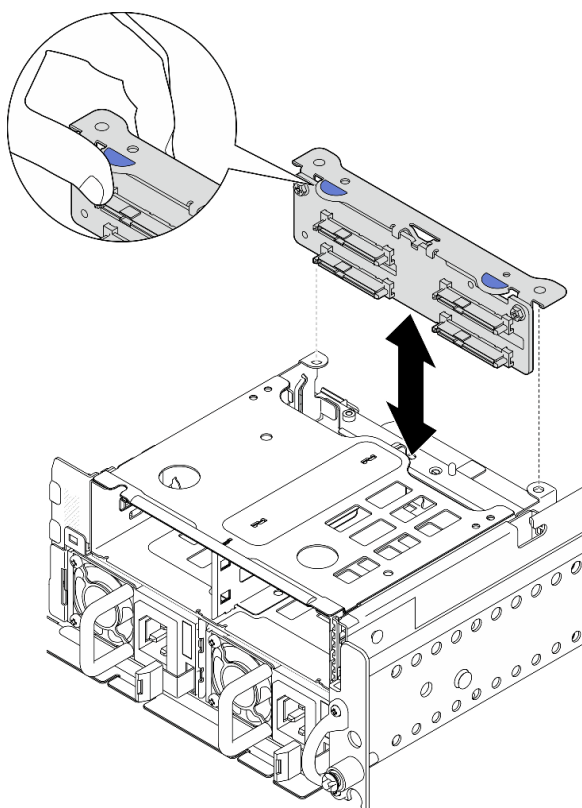
Figure 59. Installing the front drive backplane

Step 4.   Make sure the front drive backplane cables are secured in the cable clip on the front drive cage. If necessary, route the front backplane power cable into the cable clip; then, route the front backplane signal cable into the cable clip.
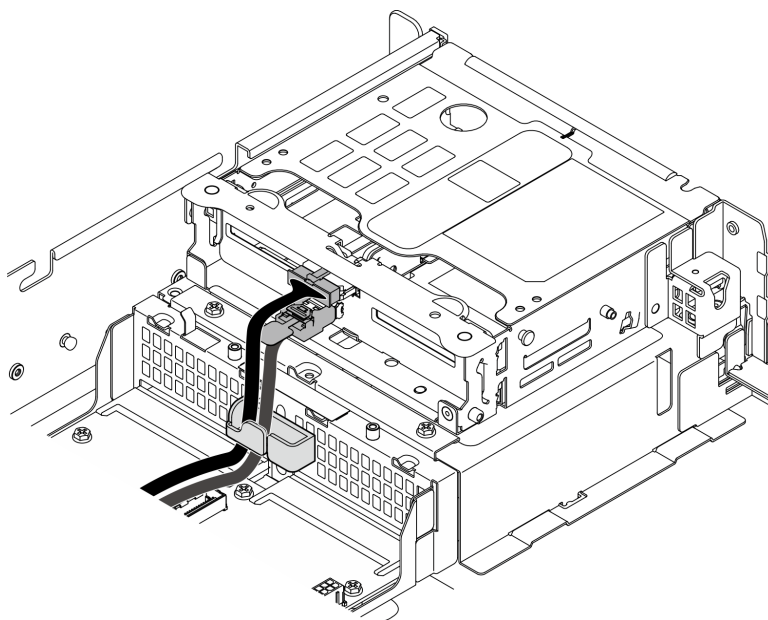
Figure 60. Front drive backplane cable routing

After this task is completed

1. Reinstall the drives and drive bay fillers (if any) into the front drive bays. See "Install a front hot-swap drive" on page 67.

2. Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Install a front hot-swap drive
Follow instructions in this section to install a front hot-swap drive.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- Touch the static-protective package that contains the drive to any unpainted metal surface on the solution; then, remove the drive from the package and place it on a static-protective surface.

- Make sure you save the data on your drive, especially if it is part of a RAID array, before you remove it from the server.

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

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

- Before you make changes to drives, drive controllers (including controllers that are integrated on the system board), drive backplanes, or drive cables, back up all important data that is stored on drives.

- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.

The following notes describe the type of drives that the server supports and other information that you must consider when you install a drive. For a list of supported drives, see https://serverproven.lenovo.com.

- Locate the documentation that comes with the drive and follow those instructions in addition to the instructions in this chapter.

- The drive bays are numbered to indicate the installation order (starting from number "0"). Follow the installation order when you install a drive.

Table 6. Front drive bay numbering (viewed from the front)

Bay 0	Bay 2
Bay 1	Bay 3

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

- Go to https://datacentersupport.lenovo.com/products/servers/thinkedge/se455v3/7dby/downloads/driver-list/ to see the latest firmware and driver updates for your server.

- Go to "Update the firmware" in *User Guide* or *System Configuration Guide* for more information on firmware updating tools.

Procedure

Step 1. If a drive filler is installed in the drive bay, remove it first. Keep the drive filler in a safe place for future use.
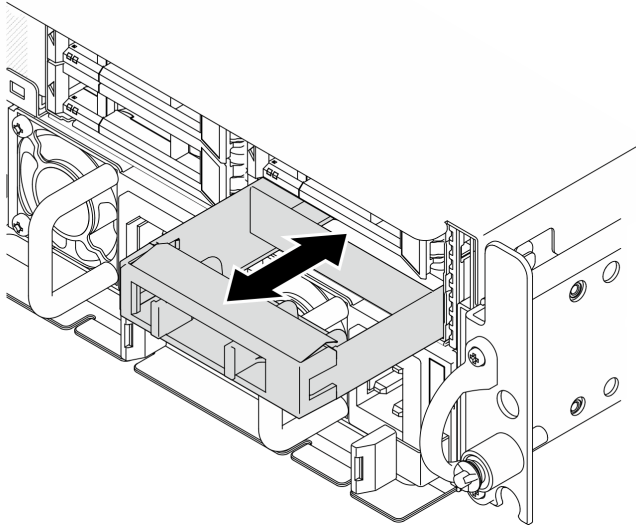
Figure 61. Removing a drive filler

Step 2. Install the drive.

    a. ❶ Slide the drive into the drive bay, and push it until it stops.

    b. ❷ Rotate the handle back to the locked position.
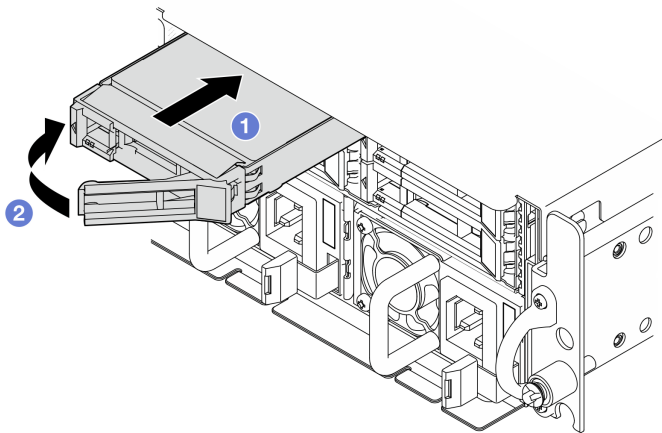
Figure 62. Installing a front hot-swap drive

Step 3. If there are additional drives to install, do so now; if any of the drive bays is left empty, fill it with a drive bay filler.

After this task is completed

1. After an SED is installed, if SED encryption is enabled on the system, reboot the system.

Note: When SED encryption is enabled, it is necessary to power cycle the system after installing an SED; without power cycling, the SED will not be recognized by the host OS. See "Manage the Self Encryption Drive Authentication Key (SED AK) " on page 182 for more information.

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

   - If the yellow drive status LED of a drive is lit continuously, that drive is faulty and must be replaced.

   - If the green drive activity LED is flashing, the drive is being accessed.

3. If the server is configured for RAID operation through a RAID adapter, you might have to reconfigure your disk arrays after you install drives. See "RAID configuration" in *User Guide* or *System Configuration Guide* for more information.

Demo Video

Watch the procedure on YouTube

Internal drive, drive cage, and drive backplane replacement

Follow instructions in this section to remove and install the internal drives, drive cage, and drive backplane.

Remove an internal drive

Follow instructions in this section to remove an internal drive.

<u>S002</u>

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

- If one or more NVMe solid-state drives are to be removed, it is recommended to disable them beforehand via the operating system.

- Before you remove or make changes to drives, drive controllers (including controllers that are integrated on the system board), drive backplanes or drive cables, back up all important data that is stored on drives.

- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

Step 2. Pinch and lift the handles to pivot the internal drive cage up.
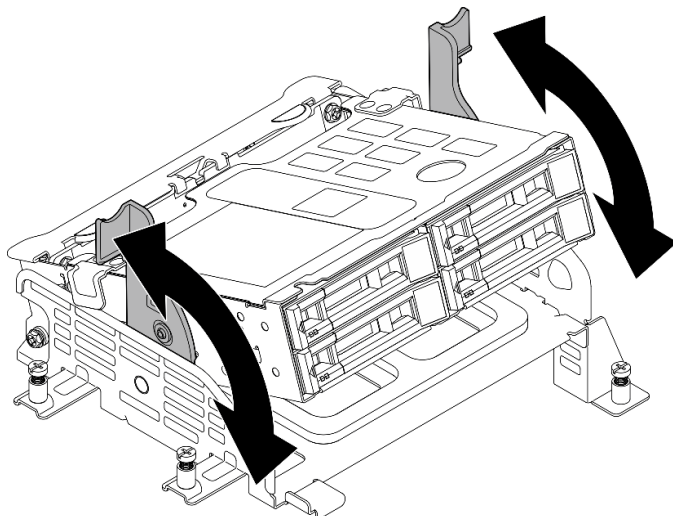
Figure 63. Pivoting the internal drive cage

Step 3. Locate the internal drive to be removed.

Table 7. Internal drive bay numbering (viewed from the front of the internal drive cage)

Bay 4	Bay 6
Bay 5	Bay 7

Step 4. Remove the internal drive.

    a. ❶ Slide the release latch to unlock the drive handle.

    b. ❷ Rotate the drive handle to the open position.

    c. ❸ Grasp the handle and slide the drive out of the drive bay.
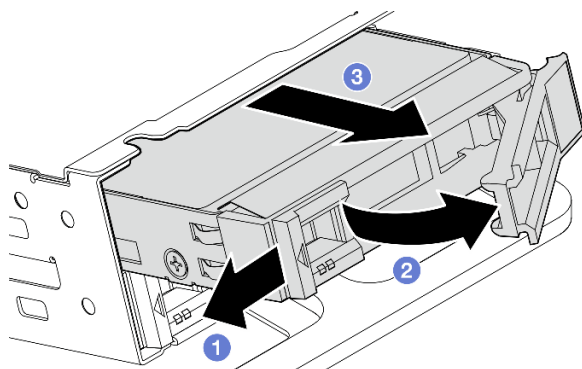
Figure 64. Removing an internal drive

After you finish

- Install a replacement unit. See "Install an internal drive" on page 80.
- If there is no replacement internal drive to be installed, pinch the handles and press the internal drive cage down; then, complete the parts replacement. See "Complete the parts replacement" on page 198.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Remove the internal drive backplane

Follow instructions in this section to remove the internal drive backplane.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Note: Depending on the configuration, the drive backplane might look slightly different from the illustration in this section.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

    b. Remove all the internal drives. See "Remove an internal drive" on page 69.

    c. Pinch the handles and press the internal drive cage down.

Step 2. If applicable, disengage the following cables from the cable clip of the processor air baffle.

    1. The blue signal cable of PCIe riser 2

    2. Power cable of internal drive backplane

    3. Signal cable of internal drive backplane
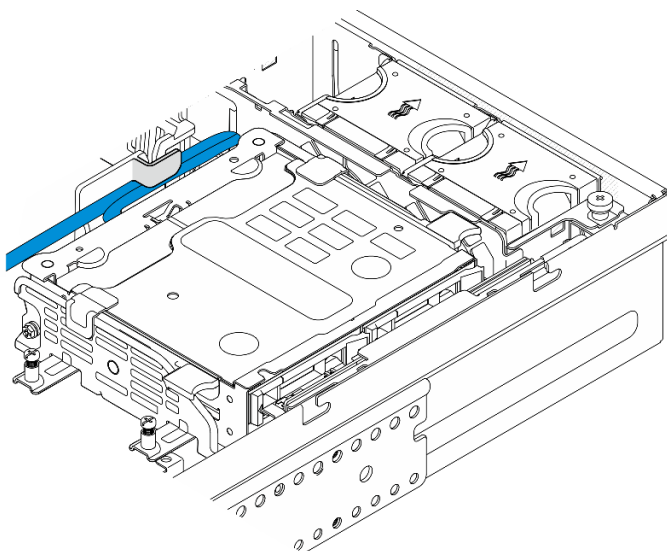
Figure 65. Cables secured by the cable clip of processor air baffle

Step 3. Pinch the blue touch points on the backplane bracket as shown; then, lift the backplane to remove it.
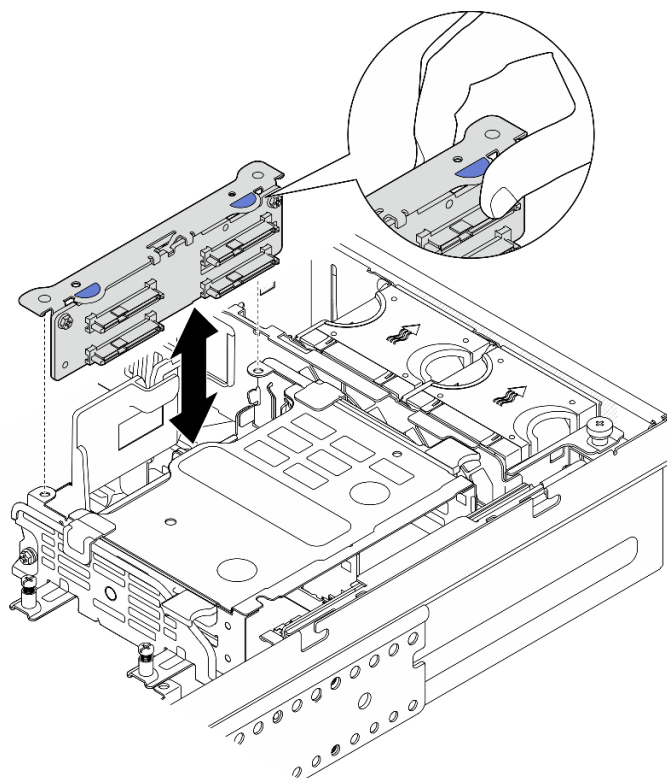
Figure 66. Removing the internal drive backplane

Step 4. Disconnect the cables from the drive backplane.

Step 5. If necessary, loosen the two screws to separate the drive backplane from the backplane bracket.
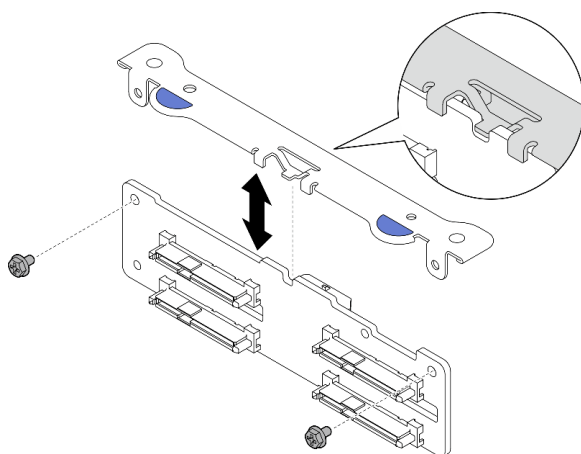
Figure 67. Separating the drive backplane from the backplane bracket

After this task is completed

- Install a replacement unit. See "Install the internal drive backplane" on page 76.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Remove the internal drive cage

Follow instructions in this section to the internal drive cage.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

 a. Remove the top cover. See "Remove the top cover" on page 195.

 b. Remove all the internal drives. See "Remove an internal drive" on page 69.

 c. Remove the internal drive backplane. See "Remove the internal drive backplane" on page 71.

Step 2. Loosen the four captive screws on the internal drive cage; then, lift the internal drive cage to remove it.
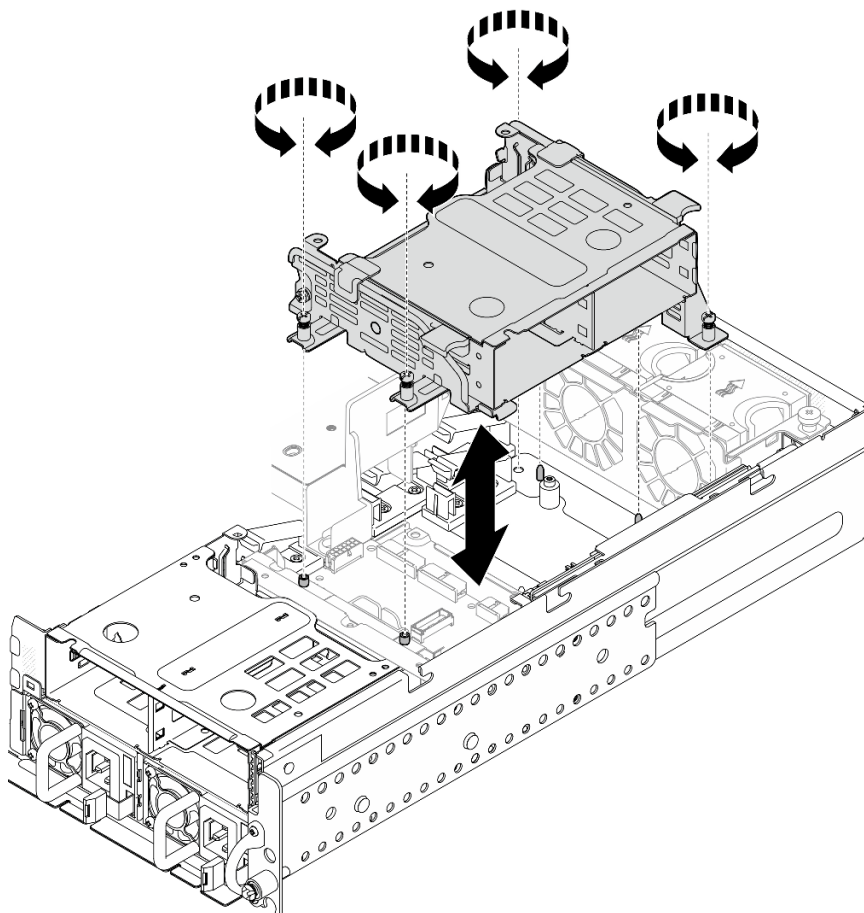
Figure 68. Removing the internal drive cage

After this task is completed

- IInstall a replacement unit. See "Install the internal drive cage" on page 74.

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

Demo Video

Watch the procedure on YouTube

Install the internal drive cage

Follow instructions in this section to install the internal drive cage.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

Procedure

Step 1.   To avoid interfering the internal drive cage, route the cables for internal drive backplane to the cable clip on the processor air baffle to fix the cables.
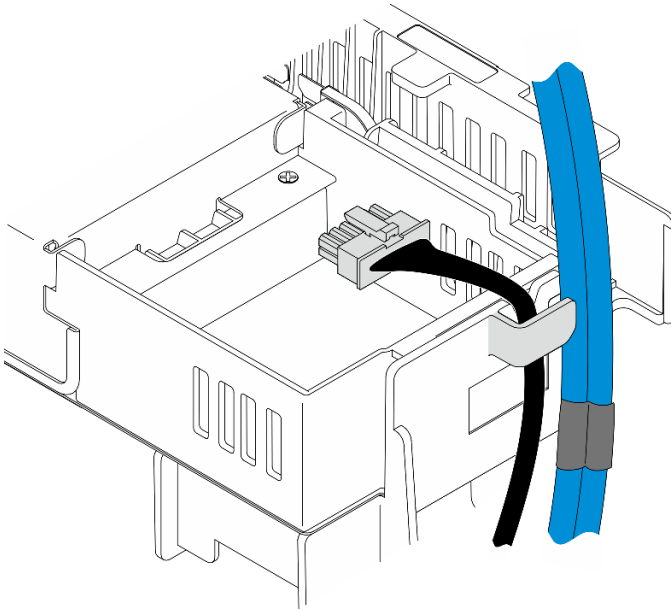
Figure 69. Internal backplane cables on cable clip

Step 2.   Install the internal drive cage.

    a.   Align the internal drive cage with the guide pins on the chassis; then, lower the internal drive cage down.

       Note: Make sure the cables of PCIe riser 2 and front drive backplane are not covered by the internal drive cage.

b. Fasten the four captive screws to secure the internal drive cage.
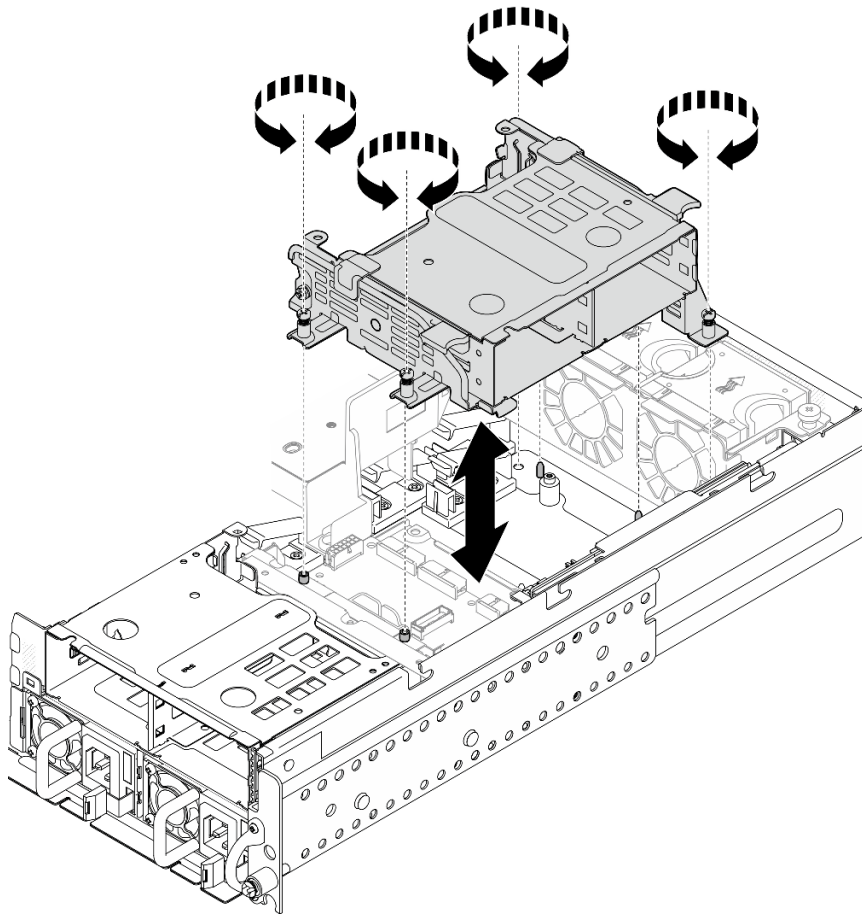
Figure 70. Installing the internal drive cage

After this task is completed

1. Proceed to install the internal drive backplane. See "Install the internal drive backplane" on page 76.
2. Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Install the internal drive backplane

Follow instructions in this section to install the internal drive backplane.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Note: Depending on the configuration, the drive backplane might look slightly different from the illustration in this section.

Procedure

Step 1. If necessary, assemble the backplane with the backplane bracket.

   a. Align the notch of the backplane with the nub of the bracket; then, insert the backplane to the bracket until the backplane is seated in place.

   b. Secure the backplane with two screws.

Figure 71. Securing the backplane to the backplane bracket

Step 2. Release the internal backplane power and signal cables from the cable clip on the processor air baffle.

   Note: The number of internal backplane signal cables varies by configurations.
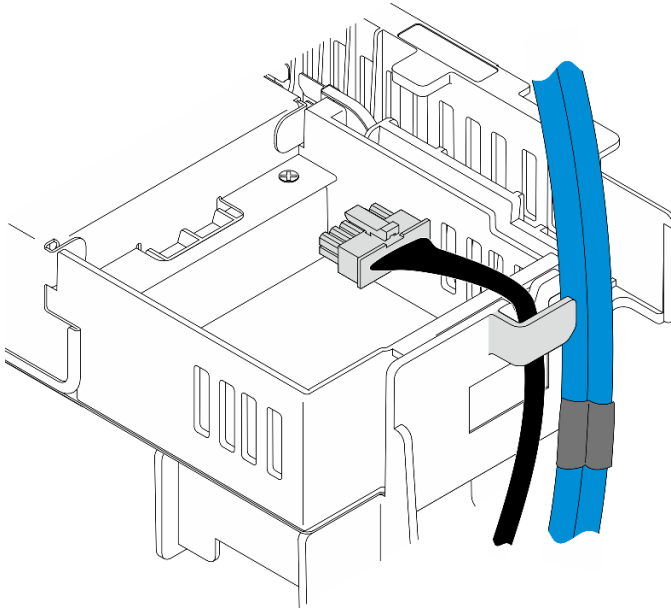
Figure 72. Internal backplane cables on cable clip

Step 3. Connect the power and signal cables to the drive backplane.

Step 4. Pinch the blue touch points on the backplane bracket as shown; then, press the backplane into the slot until it clicks into place.
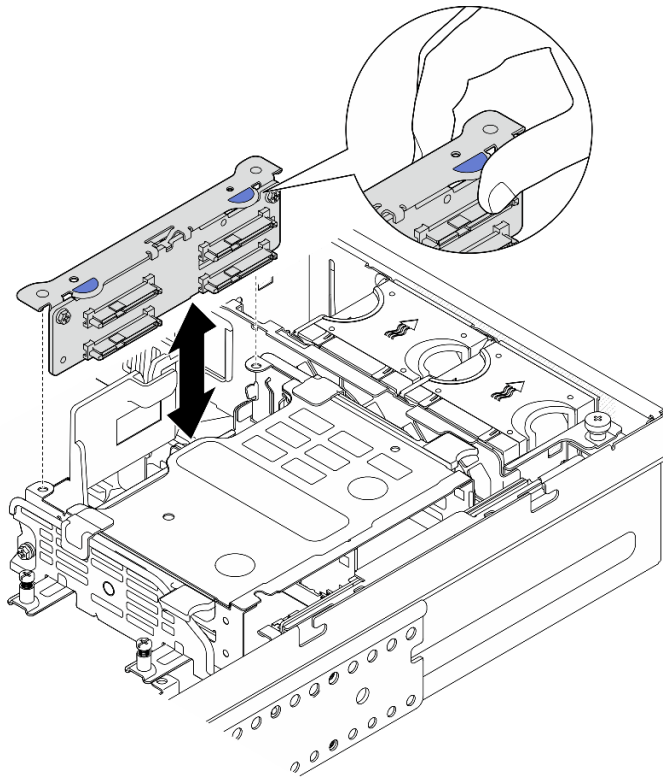
Figure 73. Installing the internal drive backplane

Step 5. Manage the cables.

a. If applicable, press the following cables down and make sure that the cables are under the cable clip of the processor air baffle.

   1. Signal cable of internal drive backplane

   2. Power cable of internal drive backplane

   3. The blue signal cable of PCIe riser 2
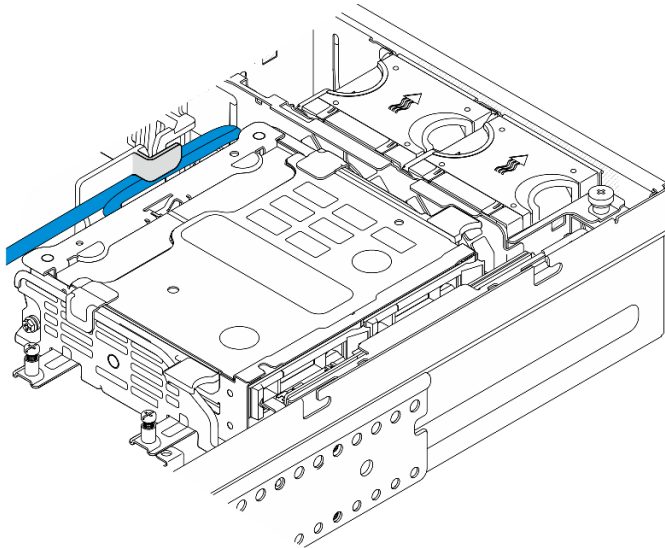
Figure 74. Internal drive backplane cable routing

b. Press the silver signal cable of PCIe riser 2 down to the space between the front drive backplane and the internal drive cage.
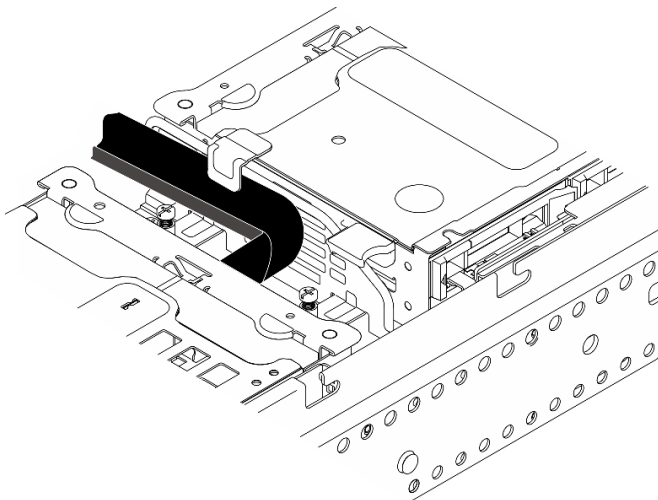
Figure 75. Front drive backplane cable routing

After this task is completed

1. Reinstall the drives into the internal drive bays. See "Install an internal drive" on page 80.

2. Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Install an internal drive

Follow instructions in this section to install an internal drive.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- Touch the static-protective package that contains the drive to any unpainted metal surface on the solution; then, remove the drive from the package and place it on a static-protective surface.
- Make sure you save the data on your drive, especially if it is part of a RAID array, before you remove it from the server.
- To avoid damage to the drive connectors, make sure that the server top cover is in place and fully closed whenever you install or remove a drive.
- Before you make changes to drives, drive controllers (including controllers that are integrated on the system board), drive backplanes, or drive cables, back up all important data that is stored on drives.
- Before you remove any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.

The following notes describe the type of drives that the server supports and other information that you must consider when you install a drive. For a list of supported drives, see https://serverproven.lenovo.com.

- Locate the documentation that comes with the drive and follow those instructions in addition to the instructions in this chapter.
- The drive bays are numbered to indicate the installation order. Follow the installation order when you install a drive.

Table 8. Internal drive bay numbering (viewed from the front of the internal drive cage)

Bay 4	Bay 6
Bay 5	Bay 7

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

- Go to https://datacentersupport.lenovo.com/products/servers/thinkedge/se455v3/7dby/downloads/driver-list/ to see the latest firmware and driver updates for your server.
- Go to "Update the firmware" in *User Guide* or *System Configuration Guide* for more information on firmware updating tools.

Procedure

Step 1. If applicable, pinch and lift the handles to pivot the internal drive cage up.
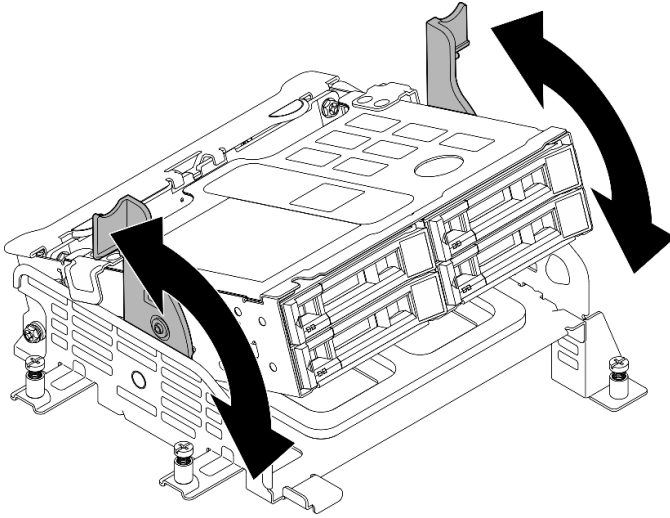
Figure 76. Pivoting the internal drive cage

Step 2. Install the drive.

    a. ❶ Slide the drive into the drive bay, and push it until it stops.

    b. ❷ Rotate the handle back to the locked position.
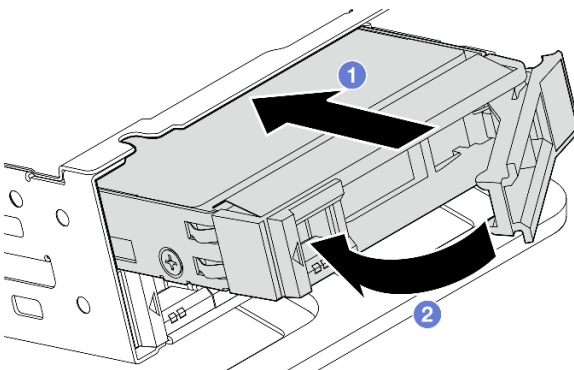
Figure 77. Installing an internal drive

Note: If necessary, repeat this procedure to other internal drives to be installed.

Step 3. Pinch the handles and press the internal drive cage down.
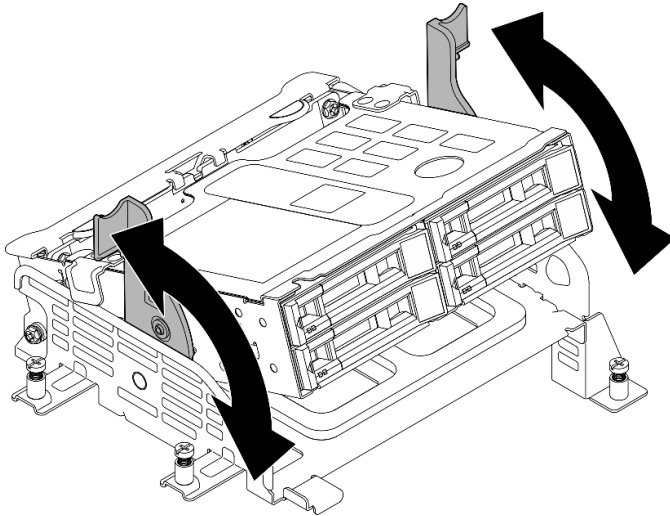
Figure 78. Pivoting the internal drive cage

After this task is completed

1. Complete the parts replacement. See "Complete the parts replacement" on page 198.
2. If the server is configured for RAID operation through a RAID adapter, you might have to reconfigure your disk arrays after you install drives. See "RAID configuration" in *User Guide* or *System Configuration Guide* for more information.

Demo Video

Watch the procedure on YouTube

Intrusion switch with cable replacement

Follow instructions in this section to remove and install the intrusion switch with cable.

Remove the intrusion switch with cable

Follow the instructions in this section to remove the intrusion switch with cable.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1.   Make preparation for this task.

    a.   Remove the top cover. See "Remove the top cover" on page 195.

    b.   Remove all the PCIe assemblies. If the configuration comes with PCIe riser 2 and internal drives, remove all the internal drives, and lift the internal drive backplane before removing PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

    c.   Remove the processor air baffle. See "Remove the processor air baffle" on page 29.

Step 2.   Disconnect the intrusion switch cable from the system board.

Step 3.   Loosen the captive screw that secures the intrusion switch, and pull the intrusion switch up to remove it.
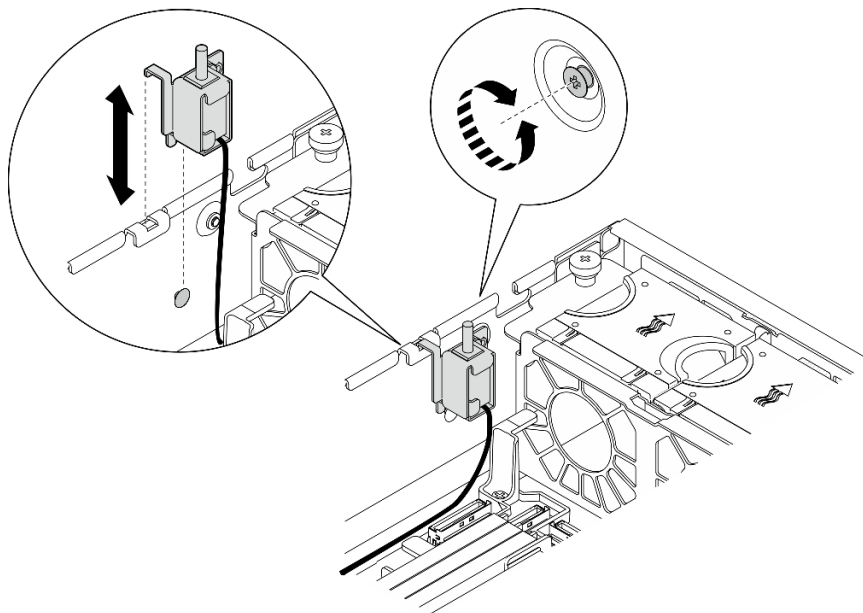
Figure 79. Removing the intrusion switch with cable

After this task is completed

- Install a replacement unit. See "Install the intrusion switch with cable" on page 84.

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

Demo Video

Watch the procedure on YouTube

Install the intrusion switch with cable

Follow the instructions in this section to install the intrusion switch with cable.

<u>S002</u>

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- 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.

- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Procedure

Step 1. Align the intrusion switch with the guide slot and shoulder pin on the chassis; then, insert the intrusion switch until it is seated in place.

Step 2. Press the intrusion switch toward the chassis; meanwhile, fasten the captive screw to secure the intrusion switch.
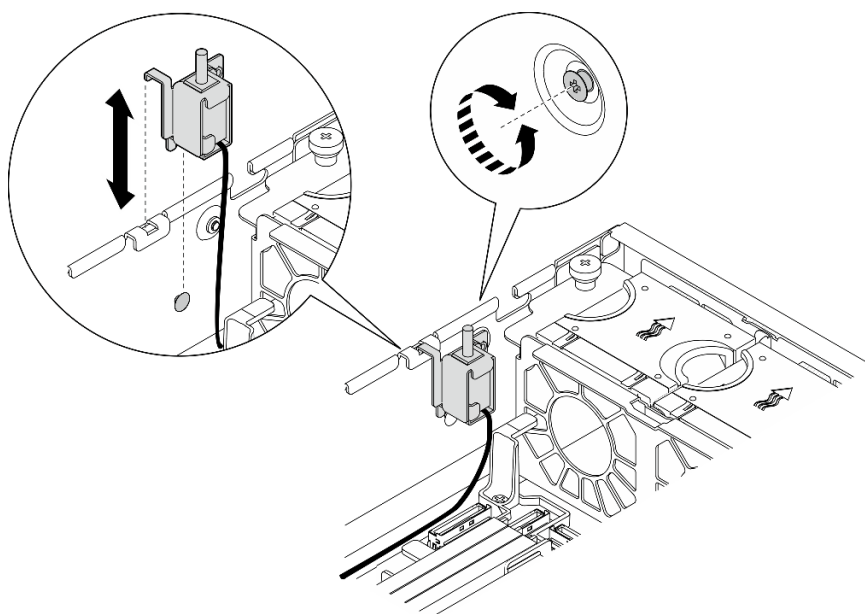
Figure 80. Installing the intrusion switch

Step 3. Connect the intrusion switch cable to the system board. See "System-board connectors for cable routing" on page 202 to locate Intrusion switch connector.

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

M.2 backplane assembly and M.2 drive replacement

Follow instructions in this section to remove and install the M.2 backplane assembly, M.2 drive and M.2 backplane.

Remove the M.2 backplane assembly

Follow instructions in this section to remove the M.2 backplane assembly.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

Step 2. Remove the M.2 backplane assembly.

    a. ❶ Loosen the captive screw that secures the M.2 backplane assembly.

    b. ❷ Pinch the pull tape and the blue touch point, and slide the M.2 backplane assembly backward to disengage it from the chassis; then, lift the assembly up to remove it.
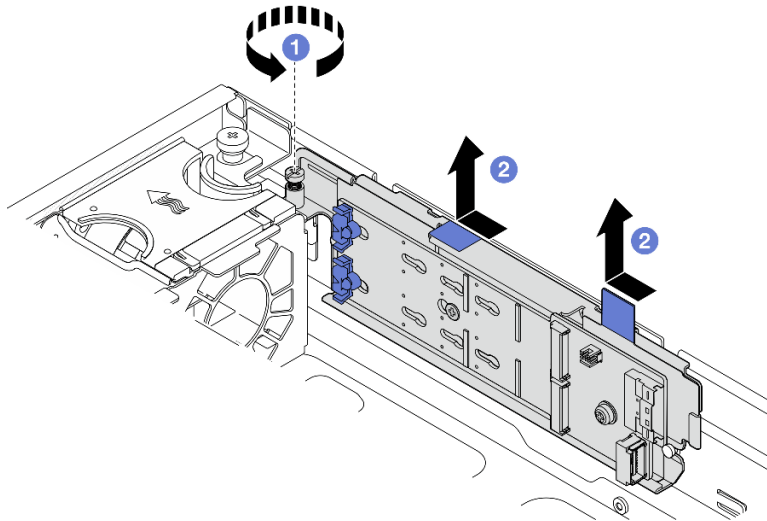
Figure 81. Removing the M.2 backplane assembly

Step 3. Disconnect the cables from the M.2 backplane.

SATA/x4 NVMe M.2 backplane
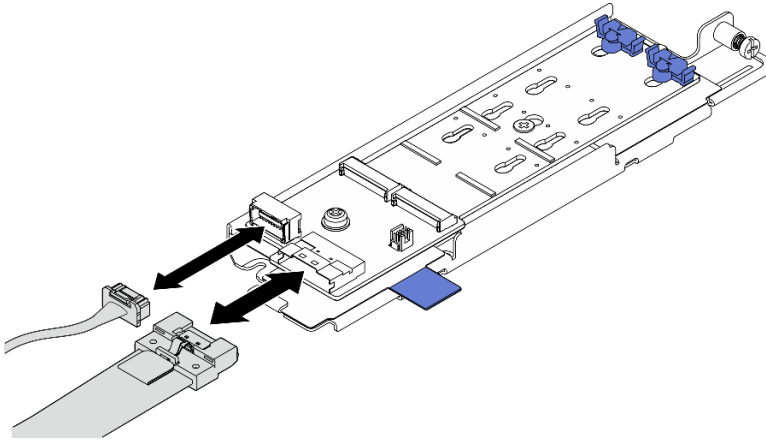
Figure 82. Disconnecting cable from SATA/x4 NVMe M.2 backplane

SATA/NVMe M.2 backplane
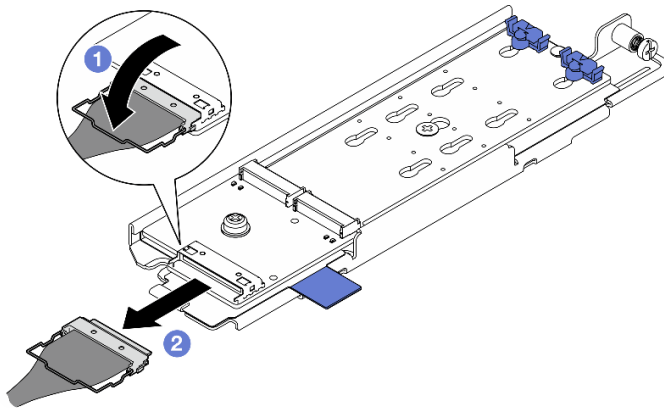
Figure 83. Disconnecting cable from SATA/NVMe M.2 backplane

1. ❶ Unhook the wire bail on the cable from the connector.
2. ❷ Disconnect the cable from the M.2 backplane.

After this task is completed

- If necessary, proceed to remove the M.2 drives. See "Remove an M.2 drive" on page 87.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Remove an M.2 drive

Follow instructions in this section to remove an M.2 drive.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

    b. Remove the M.2 backplane assembly. See "Remove the M.2 backplane assembly" on page 85.

Step 2. Locate the M.2 drive to be removed.
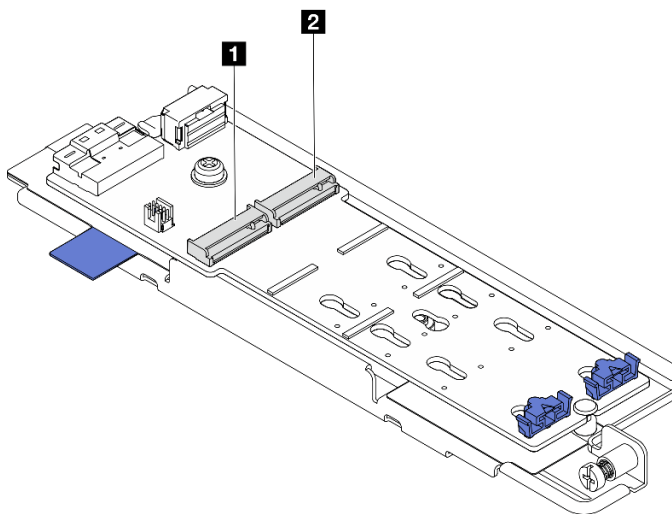
Figure 84. M.2 drive slot numbering

1 M.2 Bay 0 / Slot 1	**1** M.2 Bay 1 / Slot 2

Step 3. Remove the M.2 drive.

a. ❶ Press both sides of the retainer **2**.

b. ❷ Slide the retainer away from the M.2 drive.

c. ❸ Lift the rear end of M.2 drive up.

d. ❹ Pull the M.2 drive away from the slot **1**.
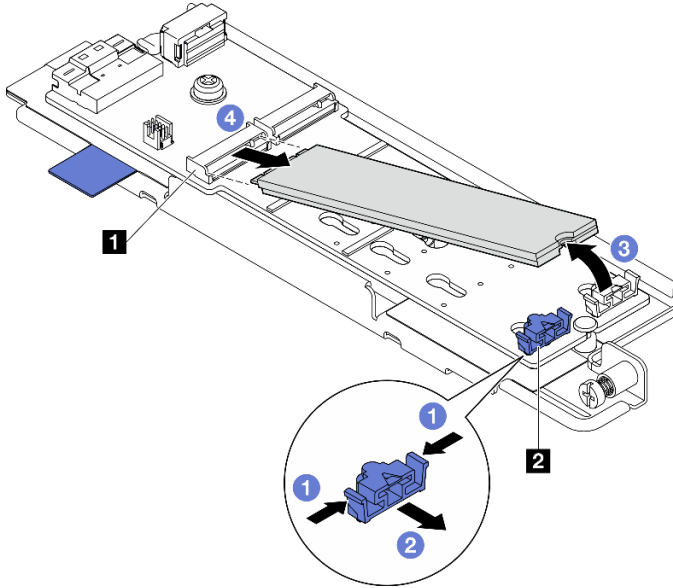
Figure 85. Removing an M.2 drive

Note: If necessary, repeat this procedure to the other M.2 drive to be removed.

After this task is completed

- Install a replacement unit. See "Install an M.2 drive" on page 94.

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

Demo Video

Watch the procedure on YouTube

Remove the M.2 backplane

Follow instructions in this section to remove the M.2 backplane.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

    b. Remove the M.2 backplane assembly. See "Remove the M.2 backplane assembly" on page 85.

    a. If necessary, remove the M.2 drives. See "Remove an M.2 drive" on page 87.

Step 2. Remove the M.2 backplane from the tray.

    a. ❶ Loosen the screw that secures the M.2 backplane.

    b. ❷ Loosen the captive screw on the M.2 backplane.
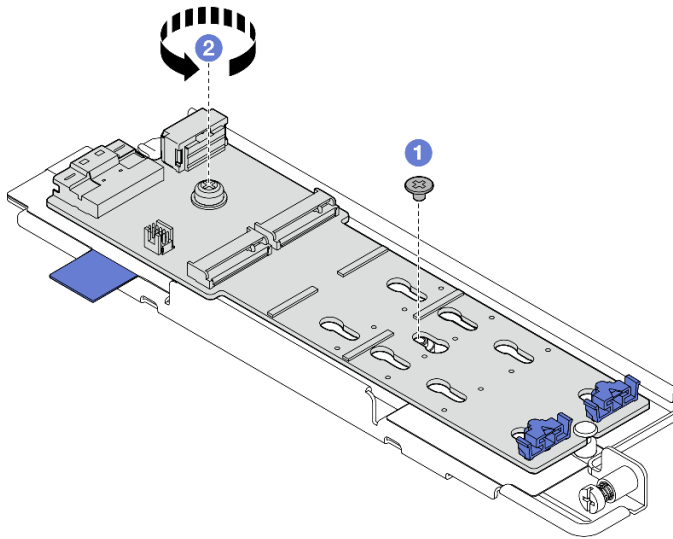
Figure 86. Removing the M.2 backplane

    a. ❶ Lift the connector side of the M.2 backplane up at an angle.

    b. ❷ Remove the M.2 backplane
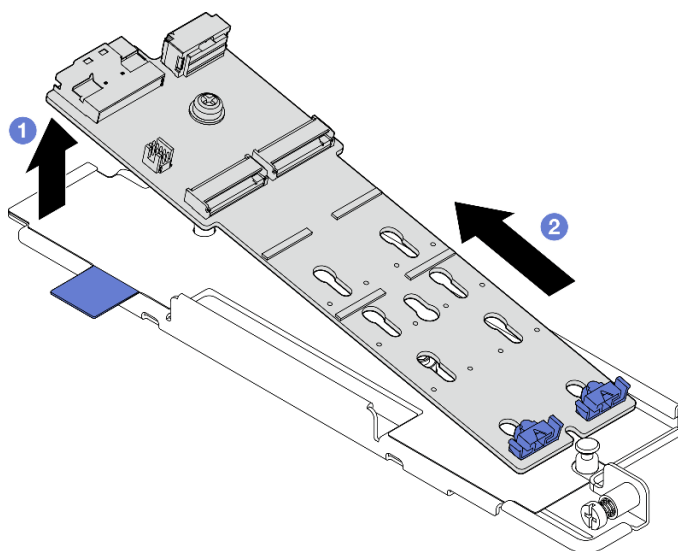
Figure 87. Removing the M.2 backplane

After this task is completed

- Install a replacement unit. See "Install the M.2 backplane" on page 91.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Install the M.2 backplane

Follow instructions in this section to install the M.2 backplane.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Procedure

Step 1.   Install the M.2 backplane to the tray.

     a.   ❶ Align the notch of the M.2 backplane with the guide pin on the tray; then, insert the backplane at an angle.

     b.   ❷ Lower down the connector side of the M.2 backplane to the tray.
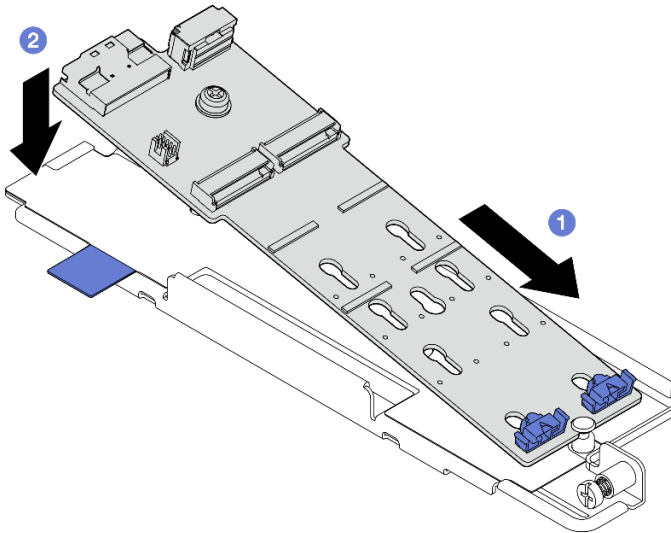
Figure 88. Installing the M.2 backplane

     a.   ❶ Fasten the captive screw on the M.2 backplane.

     b.   ❷ Fasten one screw to secure the M.2 backplane.
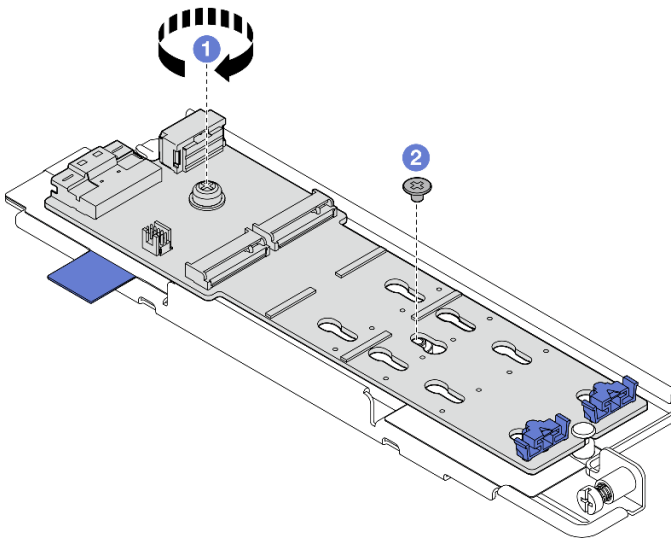
Figure 89. Installing the M.2 backplane

After this task is completed

1. If necessary, install the M.2 drives. See "Install an M.2 drive" on page 94.

2. Proceed to install the M.2 backplane assembly. See "Install the M.2 backplane assembly" on page 96.

3. Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Adjust the retainer on the M.2 backplane

Follow instructions in this section to adjust the retainer on the M.2 backplane.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

Procedure

Step 1. Locate the retainer to be adjusted.

Step 2. Select the correct keyhole that can accommodate the particular size of the M.2 drive to be installed.

Step 3. Adjust the M.2 retainer.

 a. ❶ Press and hold both sides of the retainer.

 b. ❷ Move the retainer forward until it is in the large opening of the keyhole.

 c. ❸ Take the retainer out of the keyhole.

 d. ❹ Insert the retainer into the correct keyhole.

 e. ❺ Press and hold both sides of the retainer.

 f. ❻ Slide the retainer toward the small opening of the keyhole until it is seated in place.
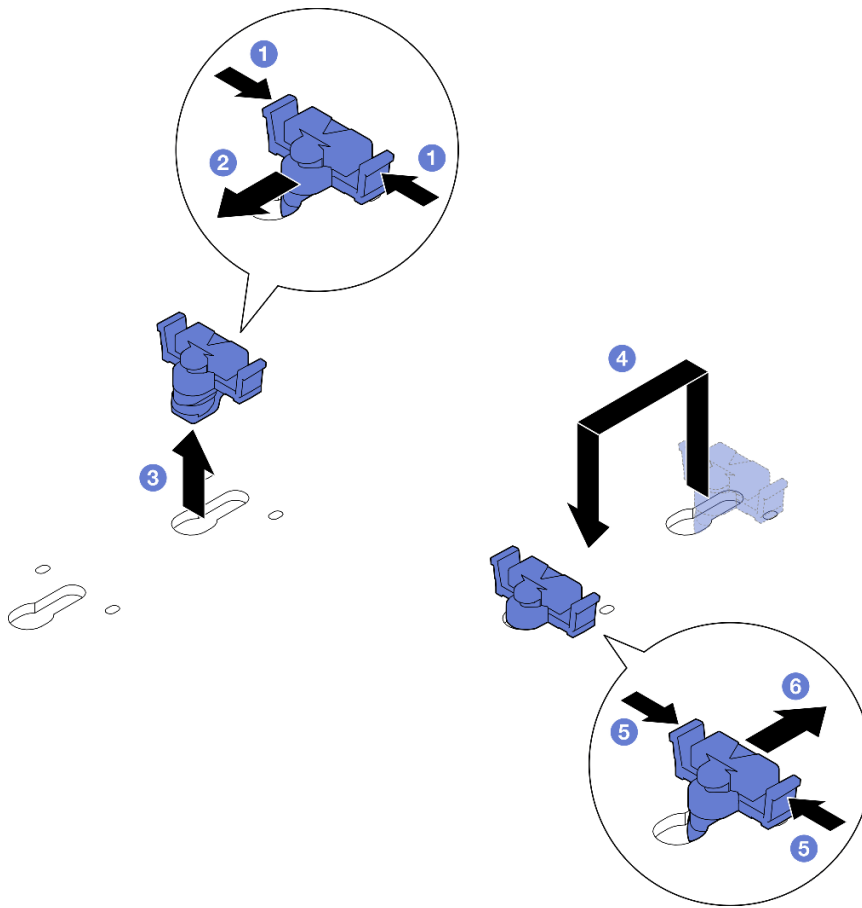
Figure 90. Adjusting the M.2 retainer

Install an M.2 drive

Follow instructions in this section to install an M.2 drive.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Procedure

Step 1. Locate the M.2 drive slot to install the M.2 drive.
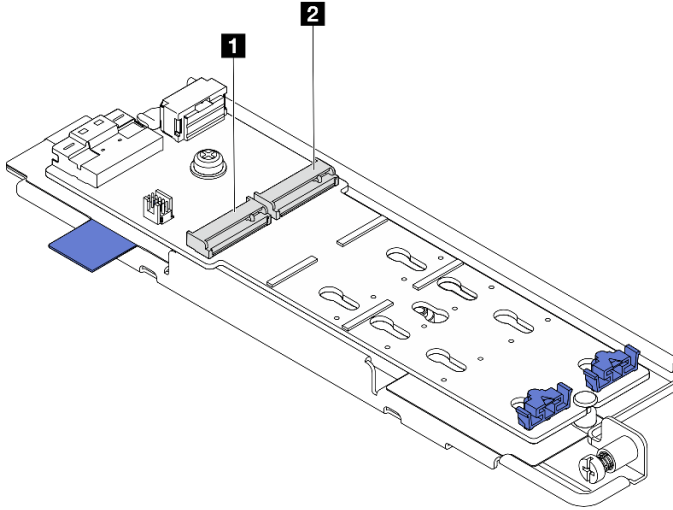
Figure 91. M.2 drive slot numbering

1 M.2 Bay 0 / Slot 1	**1** M.2 Bay 1 / Slot 2

Note: If the configuration is with only one M.2 drive, install the M.2 drive in **M.2 Bay 0 / Slot 1**.

Step 2. If necessary, adjust the retainer on the M.2 backplane to accommodate the particular size of the M.2 drive to be installed. See "Adjust the retainer on the M.2 backplane" on page 93.

Step 3. Install the M.2 drive.

a. ❶ Hold the M.2 drive at an angle of approximately 30 degrees, and insert it into the M.2 slot.

b. ❷ Lower the M.2 drive down to the M.2 backpalne.

c. ❸ Slide the retainer toward the M.2 drive to secure the drive in place.
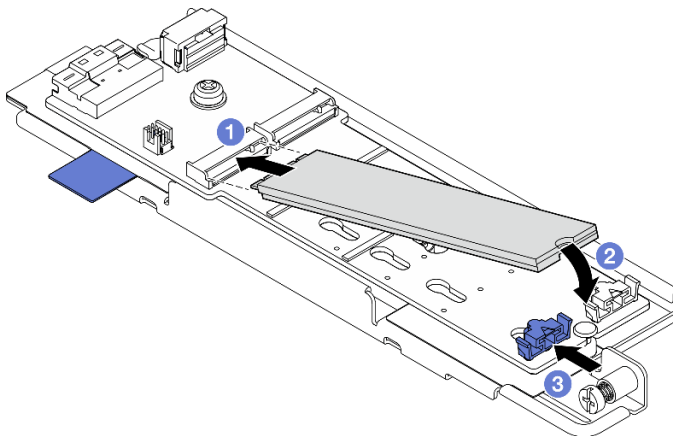
Figure 92. Installing an M.2 drive

Note: If necessary, repeat this procedure to the other M.2 drive to be installed.

After this task is completed

- Proceed to install the M.2 backplane assembly. See "Install the M.2 backplane assembly" on page 96.
- Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Install the M.2 backplane assembly

Follow instructions in this section to install the M.2 backplane assembly.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

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

- Go to https://datacentersupport.lenovo.com/products/servers/thinkedge/se455v3/7dby/downloads/driver-list/ to see the latest firmware and driver updates for your server.
- Go to "Update the firmware" in *User Guide* or *System Configuration Guide* for more information on firmware updating tools.

Procedure

Step 1. Connect the M.2 signal and power cables to the M.2 backplane.

SATA/x4 NVMe M.2 backplane
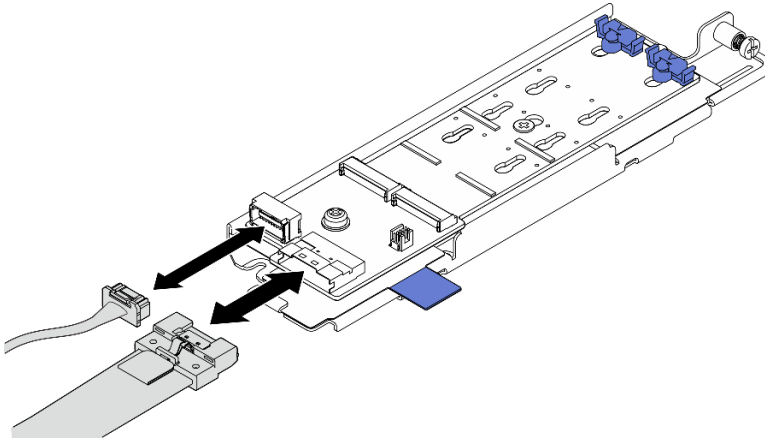
Figure 93. Connecting cable to SATA/x4 NVMe M.2 backplane

SATA/NVMe M.2 backplane
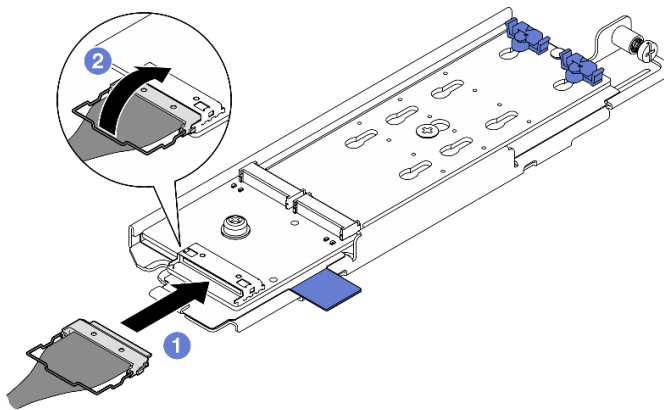
Figure 94. Connecting cable to SATA/NVMe M.2 backplane

1. ❶ Connect the cable to the M.2 backplane.
2. ❷ Hook the wire bail on the cable onto the connector.

Note: When installing the M.2 backplane assembly for the first time, do the cable routing for M.2 backplane. See "M.2 backplane cable routing" on page 206.

Step 2. Install the M.2 backplane assembly.

a. ❶ Pinch the pull tape and the blue touch point, and align the M.2 backplane assembly with the guide pins on the chassis; then, lower the assembly down to the chassis, and push the assembly forward until it clicks into place.

b. ❷ Fasten the thumbscrew to secure the M.2 backplane assembly.
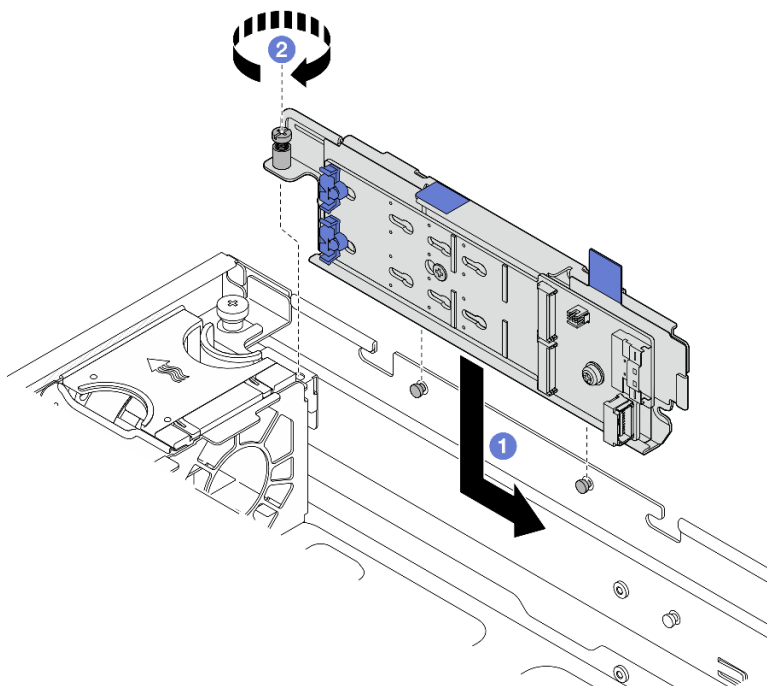
Figure 95. Installing the M.2 backplane assembly

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Memory module replacement

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

Remove a memory module

Use this information to remove a memory module.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

- Make sure to remove or install memory module 20 seconds after disconnecting power cords from the system. It allows the system to be completely discharged of electricity and safe for handling memory module.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

- Memory modules are sensitive to static discharge and require special handling. Refer to the standard guidelines for "Handling static-sensitive devices" on page 4.

  – Always wear an electrostatic-discharge strap when removing or installing memory modules. Electrostatic-discharge gloves can also be used.

  – Never hold two or more memory modules together so that they do not touch each other. Do not stack memory modules directly on top of each other during storage.

  – Never touch the gold memory module connector contacts or allow these contacts to touch the outside of the memory module connector housing.

  – Handle memory modules with care: never bend, twist, or drop a memory module.

  – Do not use any metal tools (such as jigs or clamps) to handle the memory modules, because the rigid metals may damage the memory modules.

  – Do not insert memory modules while holding packages or passive components, which can cause package cracks or detachment of passive components by the high insertion force.

Procedure

Attention: Make sure to remove or install memory module 20 seconds after disconnecting power cords from the system. It allows the system to be completely discharged of electricity and safe for handling memory module.

Step 1. Make preparation for this task.

   a. Remove the top cover. See "Remove the top cover" on page 195.

   b. Remove all the PCIe assemblies. If the configuration comes with PCIe riser 2 and internal drives, remove all the internal drives, and lift the internal drive backplane before removing PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

   c. Remove the processor air baffle. See "Remove the processor air baffle" on page 29.

   d. Locate the memory module slots and determine which memory module you want to remove from the server.
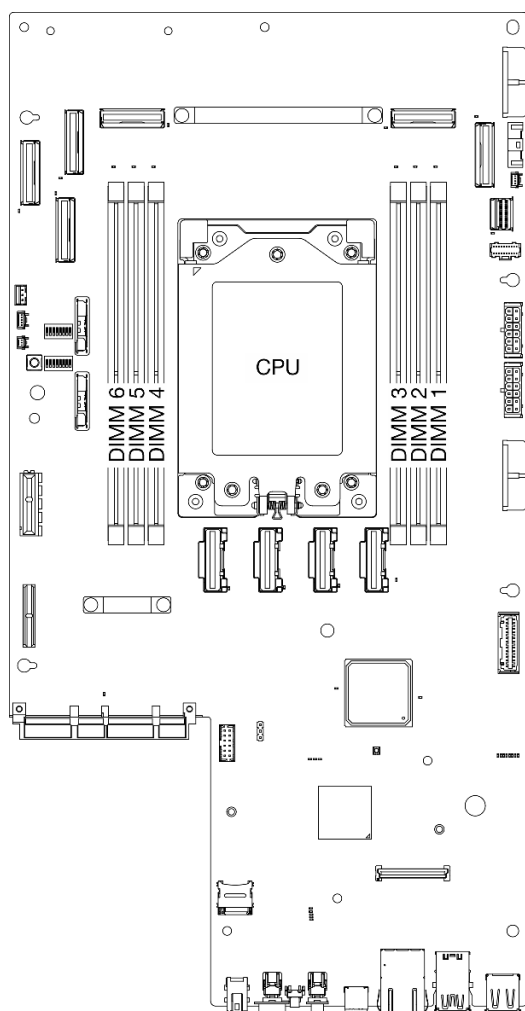
Figure 96. Memory modules and processor layout

Step 2. Remove the memory module from the slot.

   a. ❶ Open the retaining clip to disengage the memory module.

   b. ❸ Grasp the memory module at both ends and carefully lift it out of the slot.

   Attention:

   • To avoid breaking the retaining clips or damaging the memory module slots, handle the clips gently.

   Note: If necessary, due to space constraints, use a pointed tool to open the retaining clips. Place the tip of the tool in the recess on the top of the retaining clip; then, carefully rotate the retaining clip away from the memory module slot. Make sure to use firm and solid pointed tool to open the latch. Do not use pencils or other fragile tools.
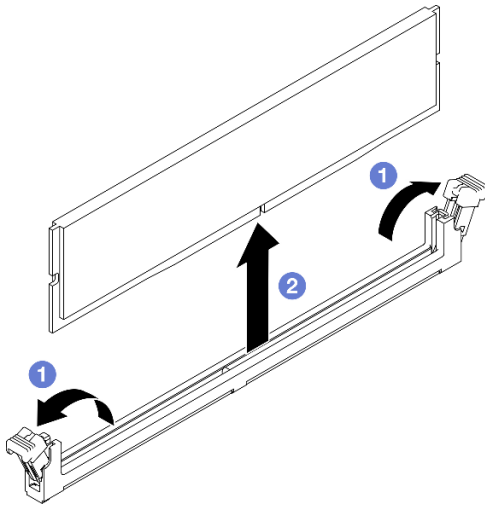
Figure 97. Removing a memory module

After this task is completed

1. Install a replacement unit. See "Install a memory module" on page 101.

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

Demo Video

Watch the procedure on YouTube

Install a memory module

Follow instructions in this section to install a memory module.

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.

About this task

See "Memory module installation rules and order" on page 5 for detailed information about memory configuration and setup.

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Make sure to remove or install memory module 20 seconds after disconnecting power cords from the system. It allows the system to be completely discharged of electricity and safe for handling memory module.
- Make sure to adopt one of the supported configurations listed in "Memory module installation rules and order" on page 5.
- Memory modules are sensitive to static discharge and require special handling. Refer to the standard guidelines at "Handling static-sensitive devices" on page 4:
  - Always wear an electrostatic-discharge strap when removing or installing memory modules. Electrostatic-discharge gloves can also be used.
  - Never hold two or more memory modules together so that they do not touch each other. Do not stack memory modules directly on top of each other during storage.
  - Never touch the gold memory module connector contacts or allow these contacts to touch the outside of the memory module connector housing.
  - Handle memory modules with care: never bend, twist, or drop a memory module.
  - Do not use any metal tools (such as jigs or clamps) to handle the memory modules, because the rigid metals may damage the memory modules.
  - Do not insert memory modules while holding packages or passive components, which can cause package cracks or detachment of passive components by the high insertion force.

Important:

- Mixing x4/x8, 16Gbit (16GB, 32GB, 64GB)/24Gbit (48GB, 96GB) DIMMs are not allowed in a system.
- Before installing 24 Gb DRAM RDIMMs, make sure to update the UEFI firmware to the latest version first, then remove all existing 16 Gb DRAM RDIMMs.

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

- Go to https://datacentersupport.lenovo.com/products/servers/thinkedge/se455v3/7dby/downloads/driver-list/ to see the latest firmware and driver updates for your server.
- Go to "Update the firmware" in *User Guide* or *System Configuration Guide* for more information on firmware updating tools.

Procedure

Attention: Make sure to remove or install memory module 20 seconds after disconnecting power cords from the system. It allows the system to be completely discharged of electricity and safe for handling memory module.

Step 1. Make preparation for this task.

    a.   Remove the top cover. See "Remove the top cover" on page 195.

    b.   Remove all the PCIe assemblies. If the configuration comes with PCIe riser 2 and internal drives, remove all the internal drives, and lift the internal drive backplane before removing PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

    c.   Remove the processor air baffle. See "Remove the processor air baffle" on page 29.

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

Step 3. Locate the required memory module slot on the system board.

Note: Ensure that you observe the installation rules and sequence order in "Memory module installation rules and order" on page 5.
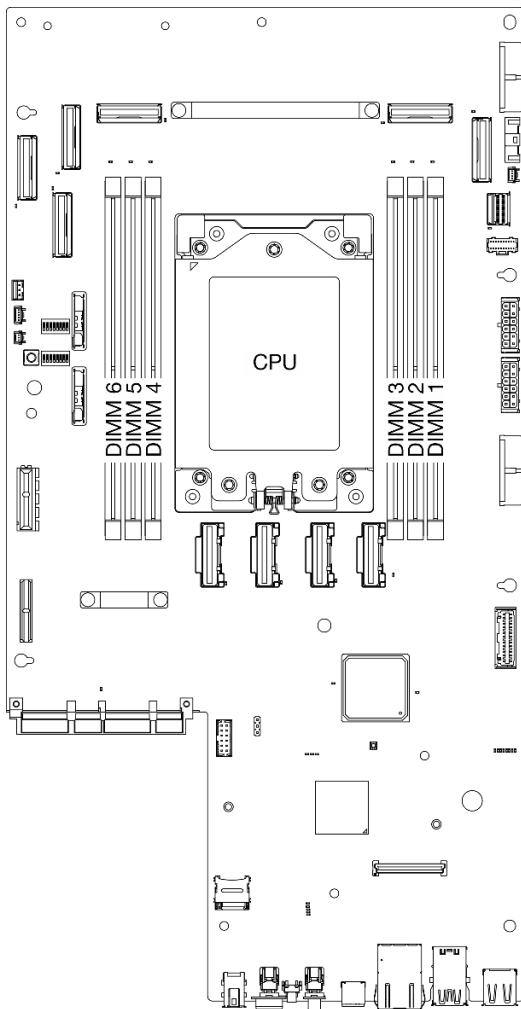
Figure 98. Memory modules and processor layout

Step 4. Install the memory module into the slot.

   a. Make sure the retaining clips are in the fully-open position.

   b. ❶ Align the memory module with the slot, and gently place the memory module on the slot with both hands.

   c. ❷ Firmly press both ends of the memory module straight down into the slot until the retaining clips snap into the locked position.

Attention:

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

- If there is a gap between the memory module and the retaining clips, the memory module has not been correctly inserted. In this case, open the retaining clips, remove the memory module, and then reinsert it.
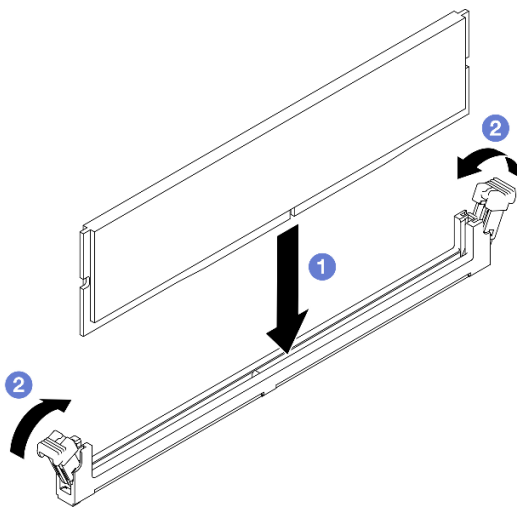
Figure 99. Installing a memory module

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

MicroSD card replacement

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

Remove the MicroSD card

Follow instructions in this section to remove the MicroSD card.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

    b. Remove all the PCIe assemblies. If the configuration comes with PCIe riser 2 and internal drives, remove all the internal drives, and lift the internal drive backplane before removing PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

    c. Remove the firmware and RoT security module. See "Remove the firmware and RoT security module" on page 178.

Step 2. Locate the MicroSD socket on the system board. See "System-board connectors" on page 242.

Step 3. Remove the MicroSD card

    a. ❶ Slide the socket lid to the open position.

    b. ❷ Lift open the socket lid.

    c. ❸ Remove the MicroSD card from the socket.
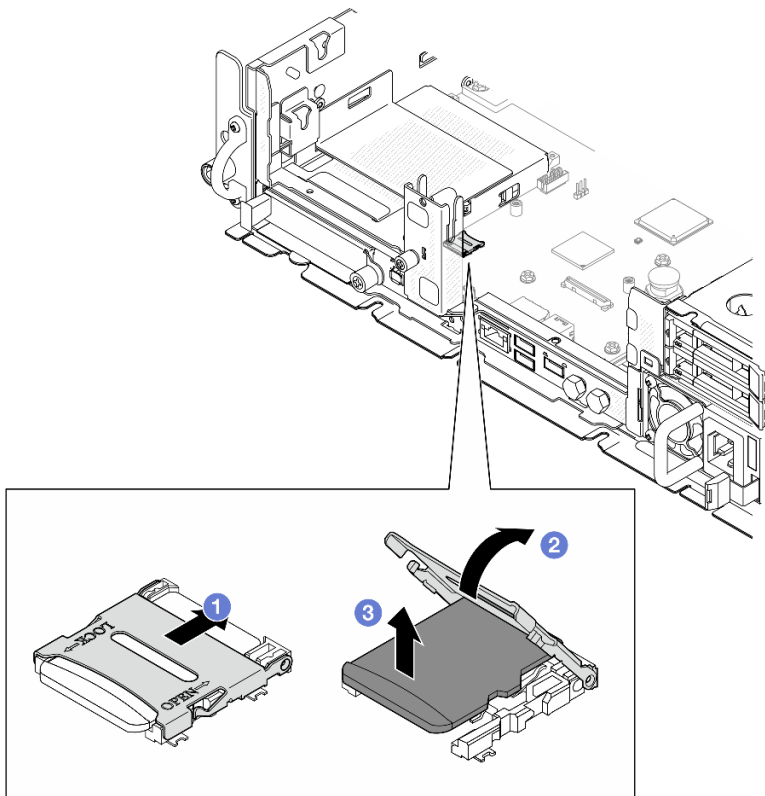
Figure 100. Removing the MicroSD card

After this task is completed

- Install a replacement unit. See "Install the MicroSD card" on page 106.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Install the MicroSD card

Follow instructions in this section to install the MicroSD card.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- 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.

- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Procedure

Step 1. Locate the MicroSD socket on the system board. See "System-board connectors" on page 242.

Step 2. Install the MicroSD card.

    a. ❶ Place the MicroSD card into the socket.

    b. ❷ Close the socket lid.

    c. ❸ Slide the socket lid to the lock position.
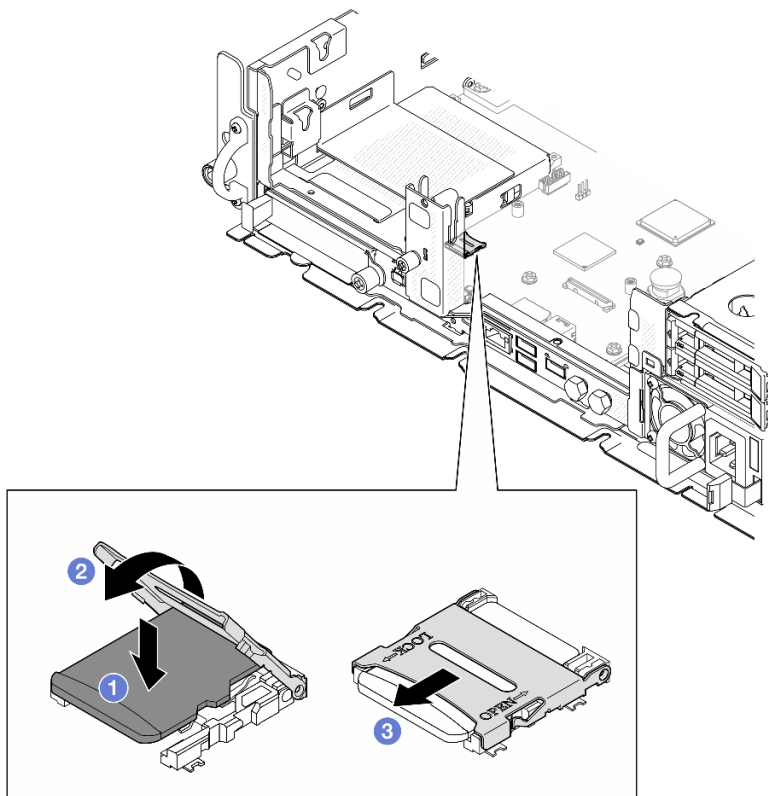
Figure 101. Installing the MicroSD card

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

OCP module replacement

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

Remove the OCP module

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

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Remove the OCP module.

　　a. ❶ Loosen the thumbscrew that secures the OCP module. Use a screwdriver if necessary.

　　b. ❷ Grasp the handle, and slide the OCP module out.
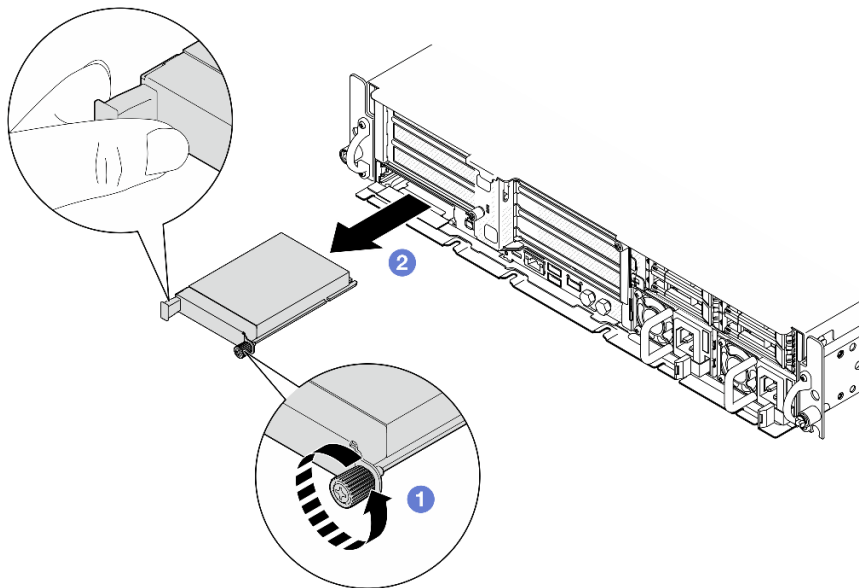
Figure 102. Removing the OCP module

After this task is completed

1. Install a replacement unit or an OCP filler into the empty slot. See "Install the OCP module" on page 109.
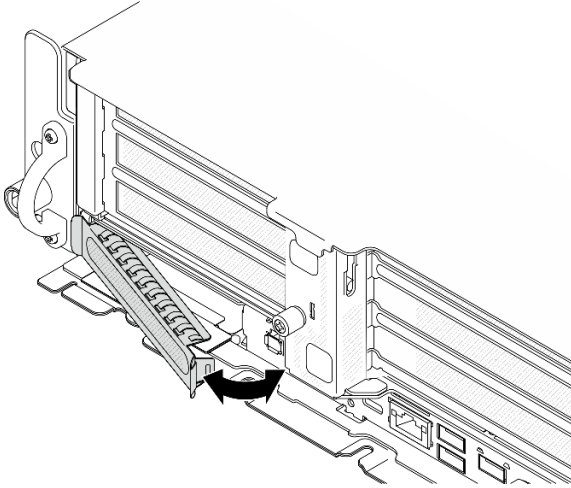
Figure 103. Installing the OCP filler

To install an OCP filler, insert one side of the filler into the slot; then, pivot the other side into the slot until the filler is firmly seated.

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

Demo Video

[Watch the procedure on YouTube](#)

Install the OCP module

Follow the instructions in this section to install the OCP module.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.
- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

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

- Go to https://datacentersupport.lenovo.com/products/servers/thinkedge/se455v3/7dby/downloads/driver-list/ to see the latest firmware and driver updates for your server.
- Go to "Update the firmware" in *User Guide* or *System Configuration Guide* for more information on firmware updating tools.

Procedure

Step 1.   If an OCP filler is installed in the slot, remove the filler.

a.   Disengage one side of the filler from of the slot. Use a flat-head screwdriver if necessary.

b. Remove the filler from of the slot.
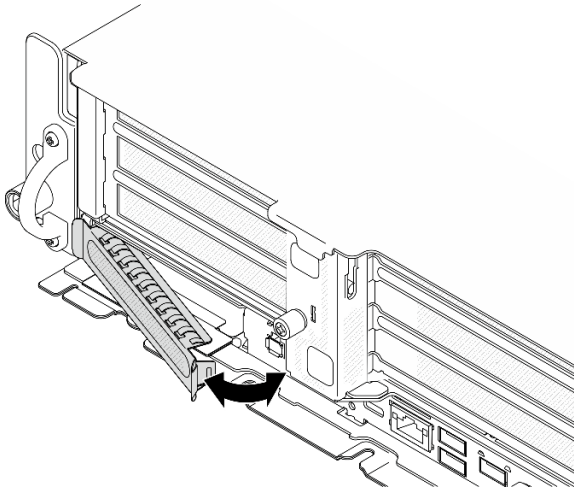
Figure 104. Removing the OCP filler

Step 2. Install the OCP module.

a. ❶ Slide the OCP module into the slot until it is fully seated.

b. ❷ Tighten the thumbscrew to secure the OCP module. Use a screwdriver if necessary.

Note: Ensure that the module is fully seated and the thumbscrew is securely tightened. Otherwise, the OCP module will not get full connection and may not function.
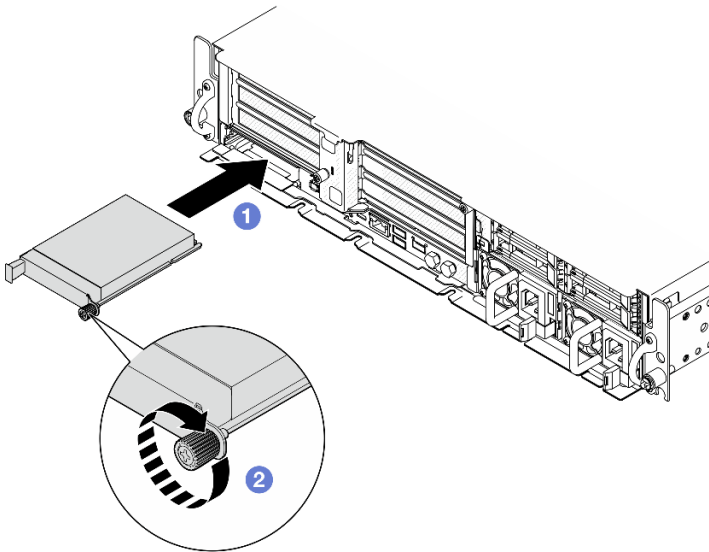
Figure 105. Installing the OCP module

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

PCIe riser assembly and adapter replacement

Follow instructions in this section to remove and install the PCIe riser assemblies and adapters.

Remove the PCIe riser assembly

Follow the instructions in this section to remove the PCIe riser assemblies.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Note: Depending on the configuration, the PCIe riser assembly might look slightly different from the illustration in this section.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

Step 2. Proceed to the section corresponding to the PCIe riser assembly to be removed:

- "Remove PCIe riser 1" on page 111
- "Remove PCIe riser 2" on page 113

Remove PCIe riser 1

Procedure

Step 1. If applicable, disengage all the GPU power cables from the cable guide of the processor air baffle.
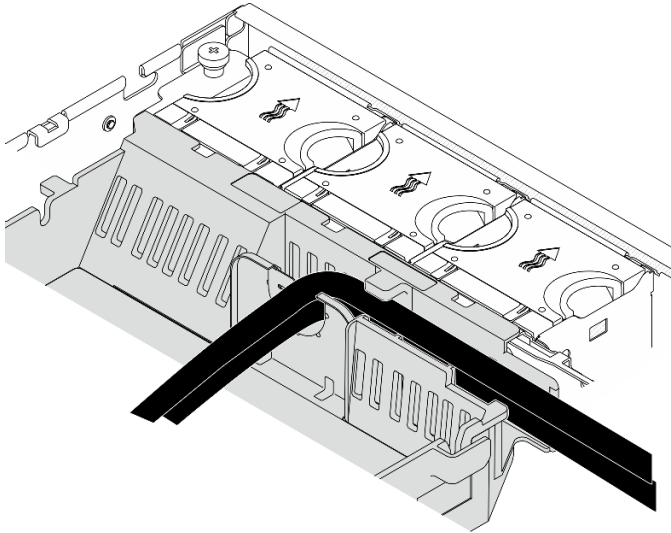
Figure 106. GPU power cables on processor air baffle

Step 2. Disengage the signal cable from the space between the processor air baffle and the chassis.
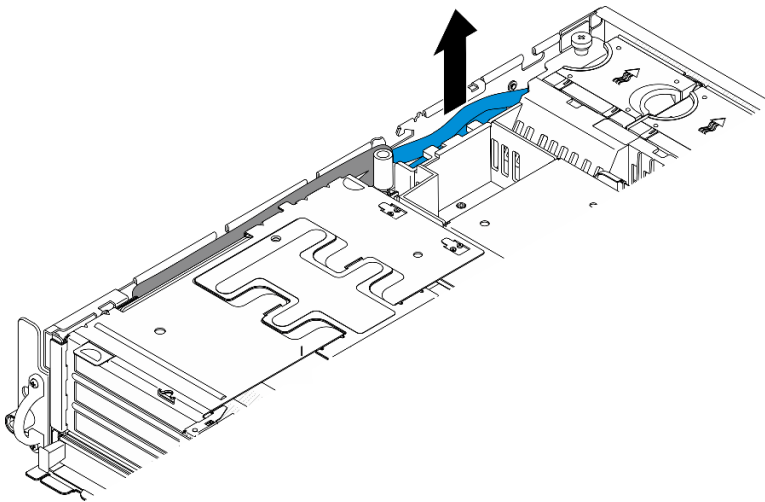
Figure 107. Disengaging PCIe riser 1 signal cable

Step 3. Loosen the two captive screws; then, lift the riser assembly from the chassis.
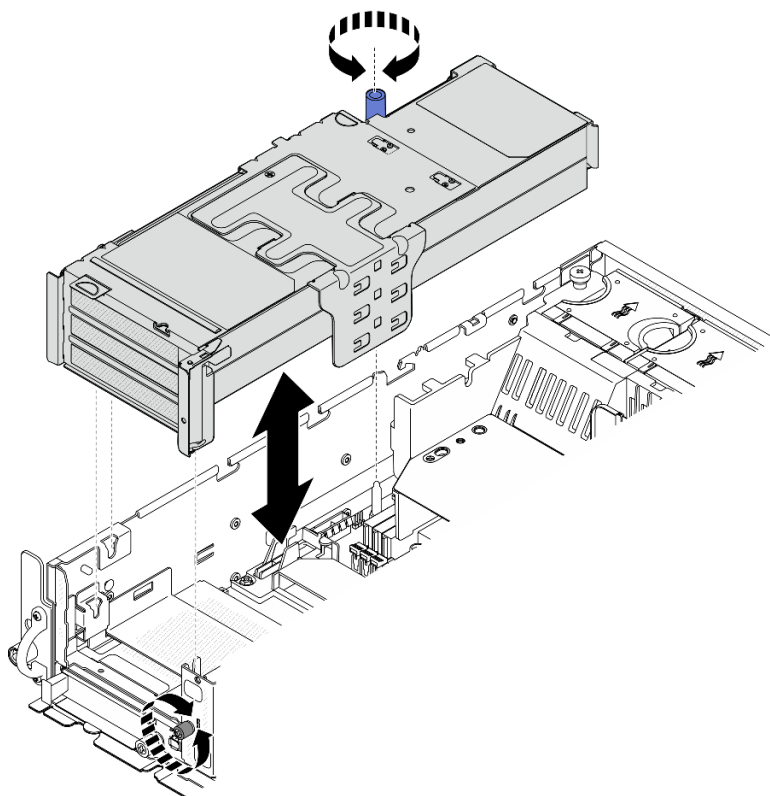
Figure 108. Lifting PCIe riser 1

Step 4. Disconnect all the cables from the PCIe adapters; if the serial port module is installed, disconnect the serial port cable from the system board. Then, place PCIe riser 1 aside the chassis.

Note: Do not disconnect the cables from the riser card.
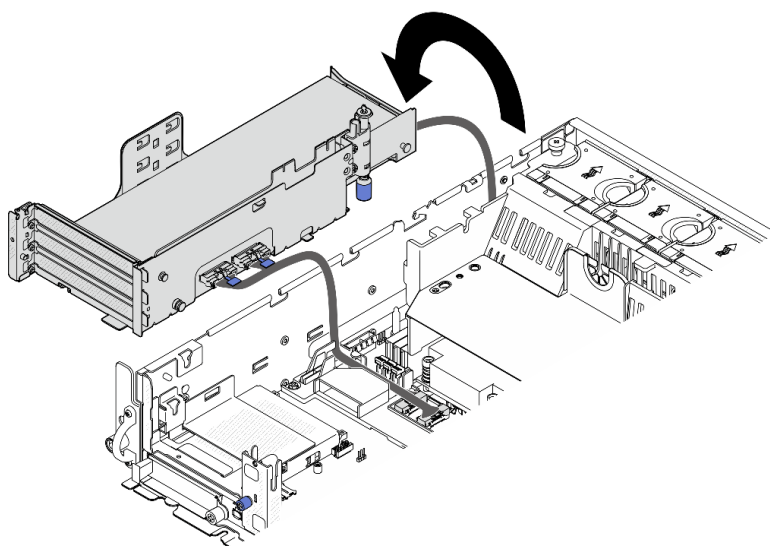
Figure 109. Placing PCIe riser 1 aside the chassis

Remove PCIe riser 2

Procedure

Step 1. If applicable, remove all the internal drives. See "Remove an internal drive" on page 69.

Step 2. If applicable, lift the internal drive backplane from the chassis.

a. If applicable, disengage the following cables from the cable clip of the processor air baffle.

  1. The blue signal cable of PCIe riser 2

  2. Power cable of internal drive backplane

  3. Signal cable of internal drive backplane
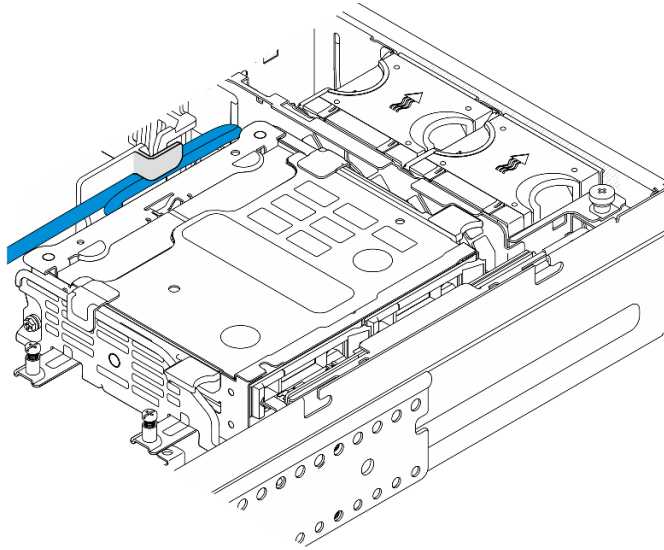
Figure 110. Cables secured by the cable clip of processor air baffle

b. Pinch the blue touch points on the backplane bracket; then, lift the backplane.

c. Place the internal drive backplane on the top of the fan cage for easier operation.
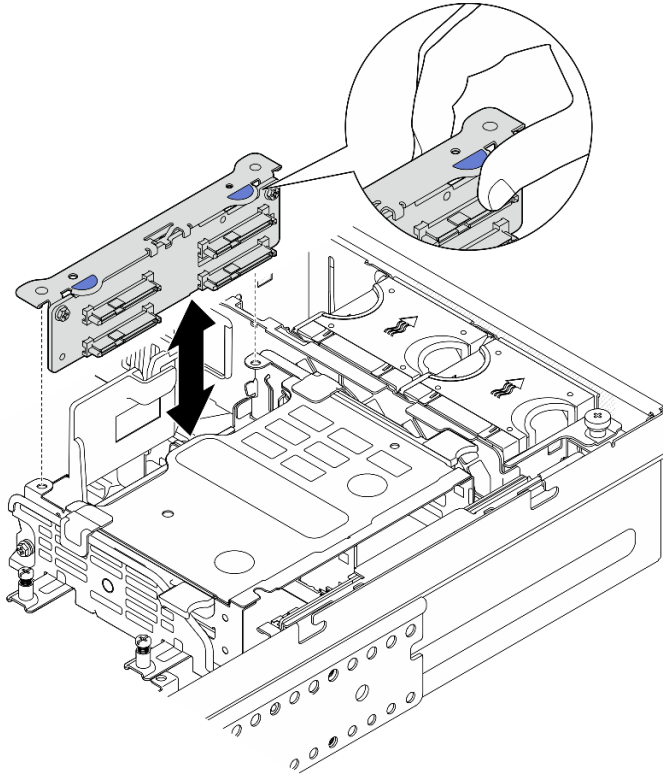
Figure 111. Removing the internal drive backplane

Step 3. If applicable, disengage all the GPU power cables from the cable guide of the processor air baffle.
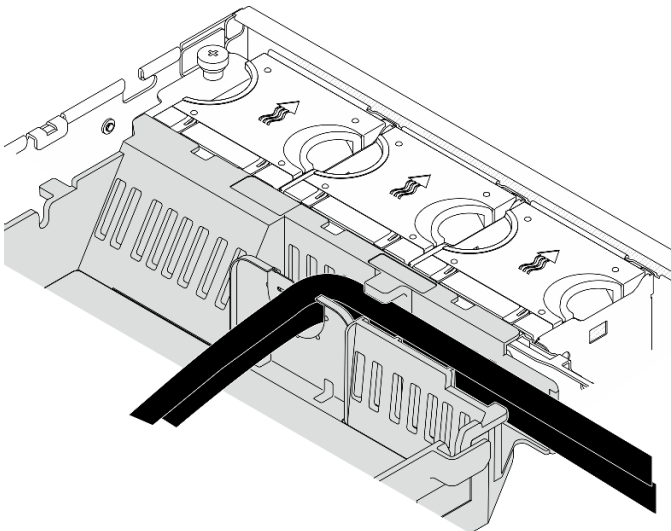
Figure 112. GPU power cables on processor air baffle

Step 4. Loosen the two captive screws; then, lift the riser assembly from the chassis.
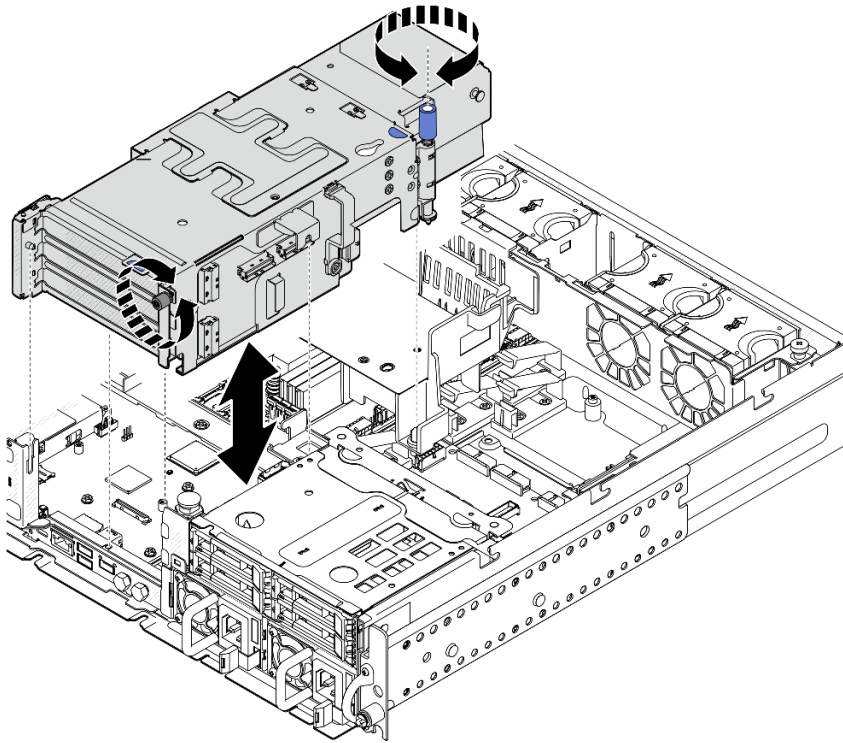
Figure 113. Lifting PCIe riser 2

Step 5. Disconnect all the cables from the PCIe adapters; then, place PCIe riser 2 on the front drive cage.

Note: Do not disconnect the cables from the riser card.
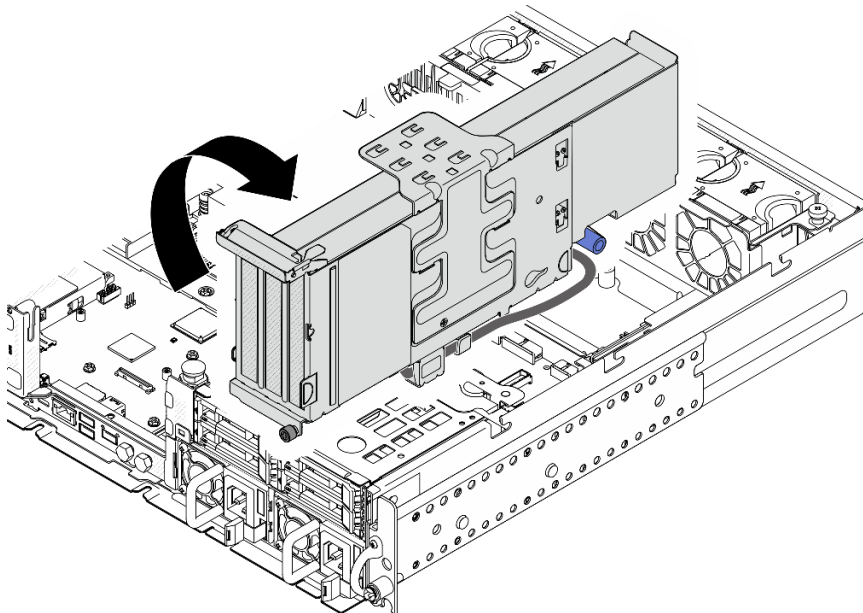
Figure 114. Placing PCIe riser 2 aside the chassis

After this task is completed

• If necessary, proceed to remove the PCIe adapter. See "Remove a PCIe adapter" on page 117.

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

Demo Video

[Watch the procedure on YouTube](#)

Remove a PCIe adapter

Follow the instructions in this section to remove a PCIe adapter.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Note: Identify the parts of the PCIe riser assembly supporting PCIe adapters with different length and height.

	Low-profile PCIe adapter	Full-length PCIe adapter
Side support bracket (for all configurations)	√	√
Low-profile filler	√ (one for each slot)	
Extender		√

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

    b. Remove PCIe riser 1 or PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

Step 2. Remove the side support bracket.

    a. ❶ Loosen the screw that secures the bracket.

b. ❷ Slightly push the bracket outward to disengage it; then, lift it from the riser assembly.
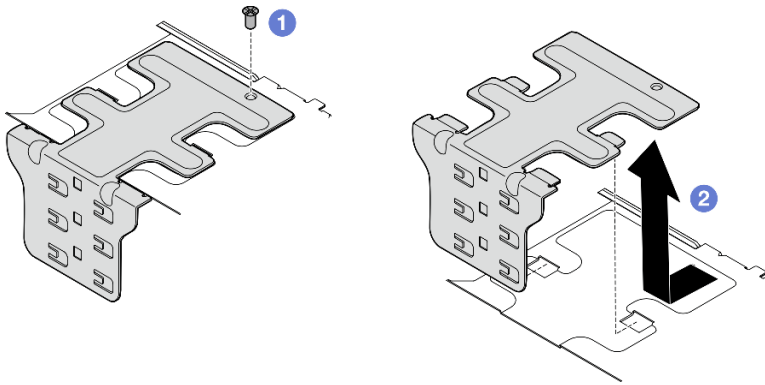
Figure 115. Removing the side support bracket

Step 3. If necessary, remove the low-profile fillers.

    a. ❶ Press the tab of the filler to disengage it from the side support bracket. Use a pointed tool if necessary.

       Note: If necessary, use firm and solid pointed tool. Do not use pencils or other fragile tools.

    b. ❷ Remove the filler from the side support bracket.
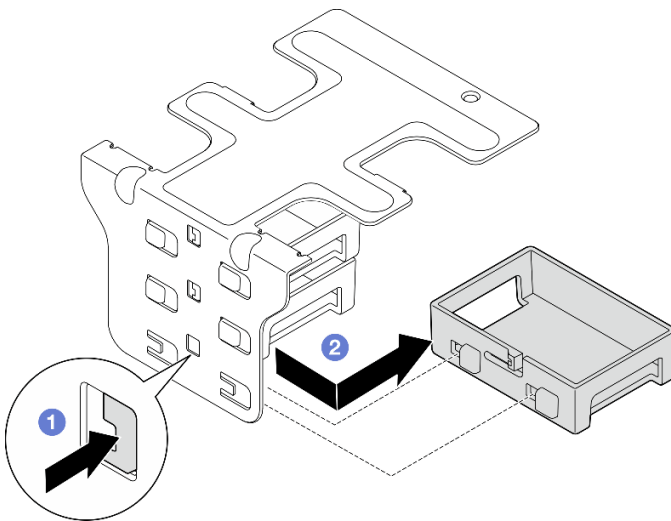
Figure 116. Removing a low-profile filler

Step 4. Open the retainer, and remove the screw that secures the adapter if applicable.
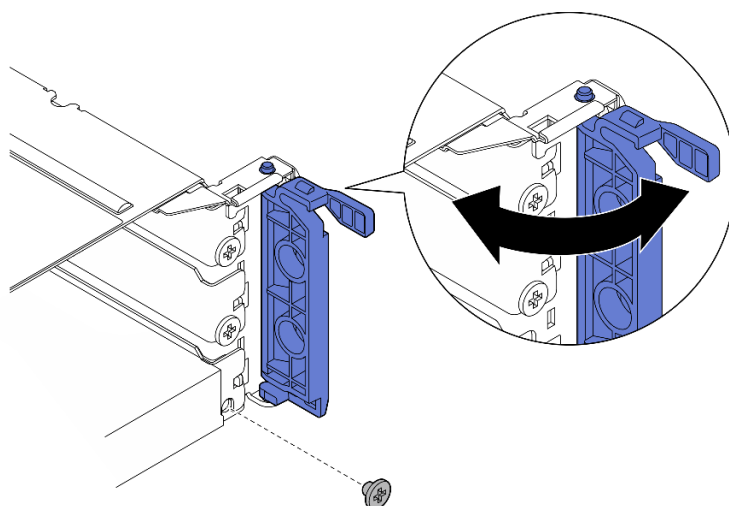
Figure 117. Removing the retaining screw

Step 5. Carefully slide the adapter out of the slot.

> **Note:** If no replacement adapter is to be installed in the slot, install the slot filler.
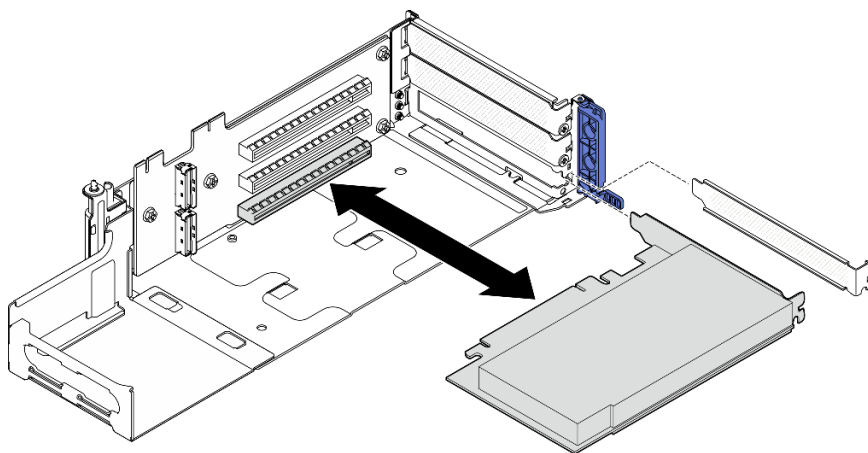
Figure 118. Removing a PCIe adapter from PCIe riser 1
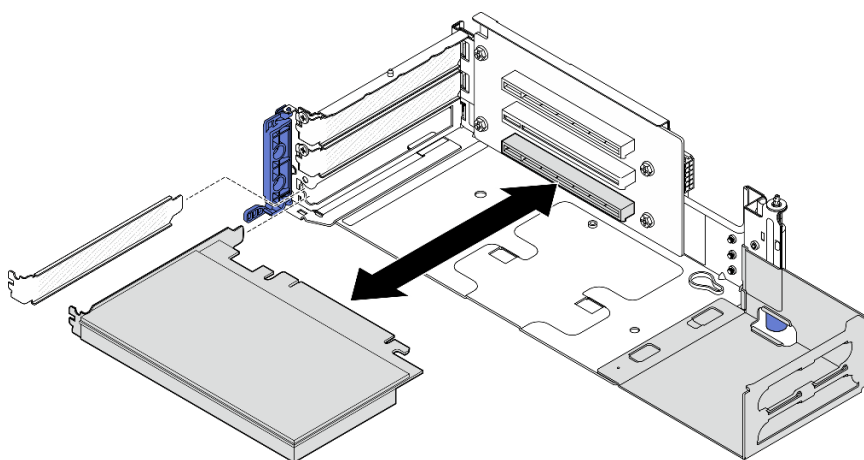
Figure 119. Removing a PCIe adapter from PCIe riser 2

Step 6. If no full-length adapter is to be installed in the riser assembly, remove the extender.

   a.   ❶ Loosen the two screws that secure the extender.

   b.   ❷ Slightly push the extender outward to disengage it; then, remove it from the riser assembly.
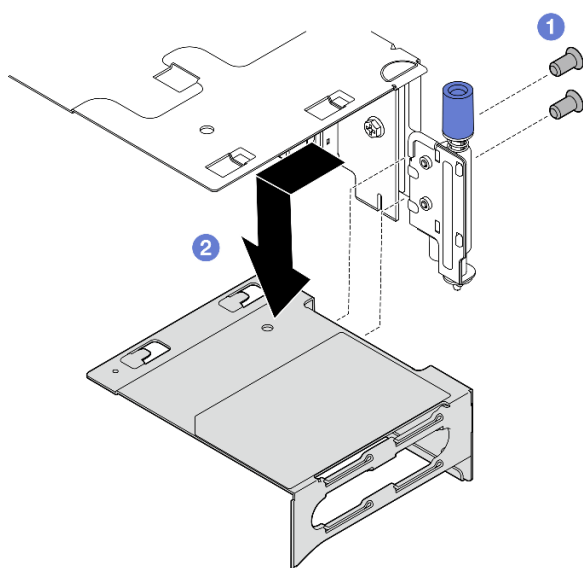
Figure 120. Removing the extender from PCIe riser 1
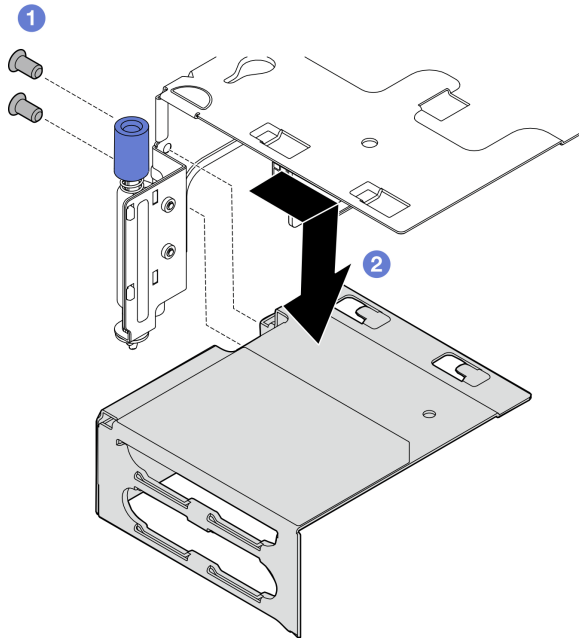
Figure 121. Removing the extender from PCIe riser 2

After this task is completed

- If necessary, proceed to remove the PCIe riser card. See "Remove the PCIe riser card" on page 134.
- Install a replacement unit. See "Install a PCIe adapter" on page 121.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Install a PCIe adapter

Follow the instructions in this section to install a PCIe adapter.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.
- Make sure to follow the PCIe adapter installation rules and order. See "PCIe adapter installation rules and order" on page 7.

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

- Go to https://datacentersupport.lenovo.com/products/servers/thinkedge/se455v3/7dby/downloads/driver-list/ to see the latest firmware and driver updates for your server.
- Go to "Update the firmware" in *User Guide* or *System Configuration Guide* for more information on firmware updating tools.

Note: Identify the parts of the PCIe riser assembly supporting PCIe adapters with different length and height.

	Low-profile PCIe adapter	**Full-length PCIe adapter**
Side support bracket (for all configurations)	√	√
Low-profile filler	√ (one for each slot)	
Extender		√

Procedure

Step 1. If any full-length adapter is to be installed in the riser assembly, install the extender.

    a. ❶ Align the extender with the slots on the riser cage; then, insert and push the extender until it is seated in place.

    b. ❷ Fasten two screws to secure the extender.

Figure 122. Installing the extender to PCIe riser 1
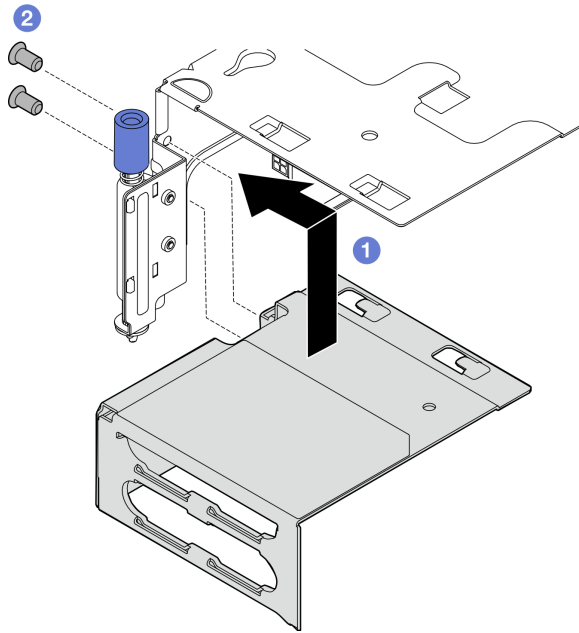
Figure 123. Installing the extender to PCIe riser 2

Step 2. Install the PCIe adapter to the riser assembly.

Important: Make sure to follow the PCIe adapter installation rules and order. See "PCIe adapter installation rules and order" on page 7.

a. If a slot filler is installed, remove the filler.

b. Align the adapter with the slot; then, carefully slide the adapter into the slot until it is firmly seated.
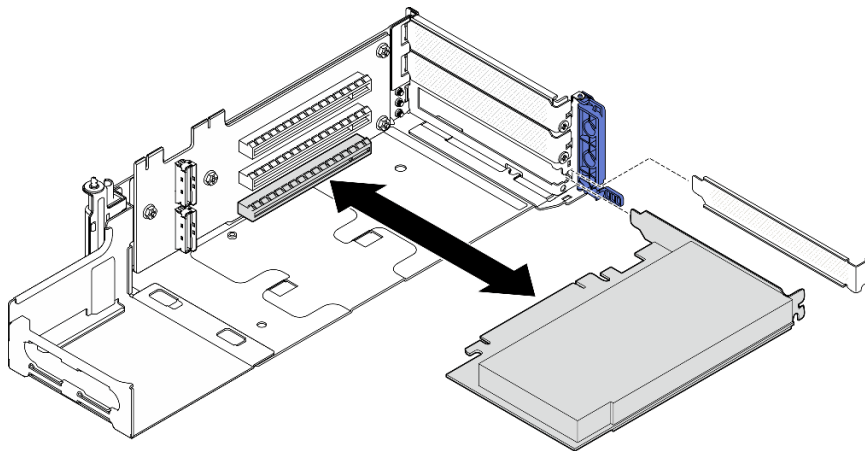
Figure 124. Installing a PCIe adapter to PCIe riser 1
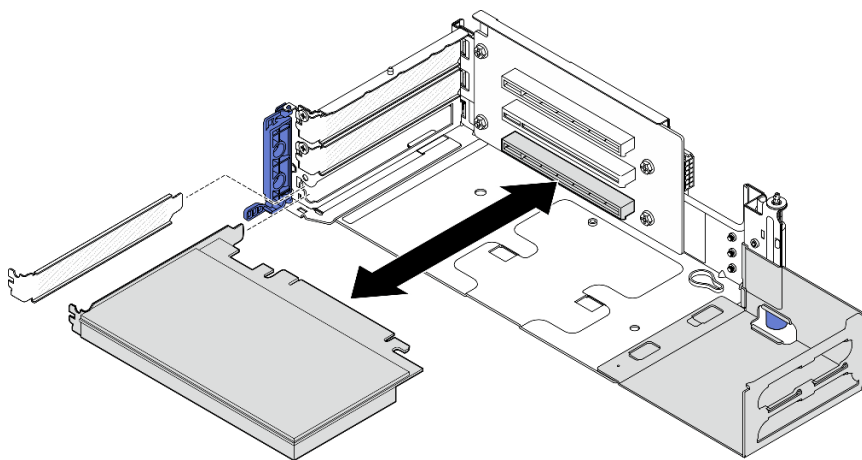
Figure 125. Installing a PCIe adapter to PCIe riser 2

Step 3. Fasten one screw to secure the adapter; then, close the retainer.
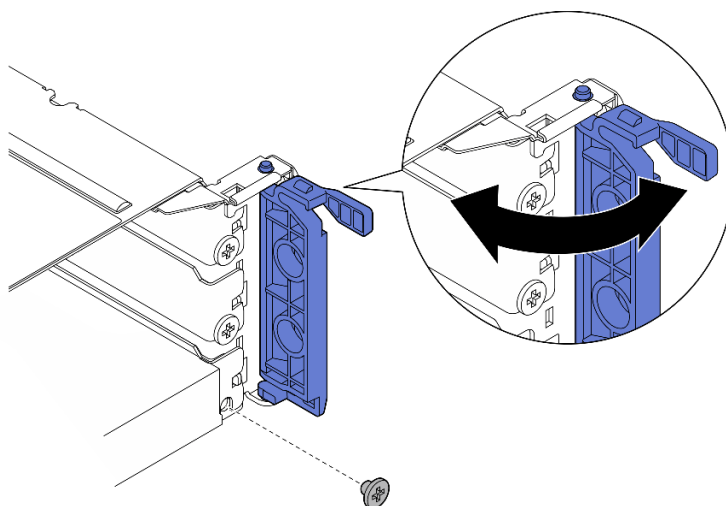
Figure 126. Installing the retaining screws

Note: Depending on the configuration, spared screws might be available on the side of the riser assembly. Use the spared screw to secure the adapter if necessary.
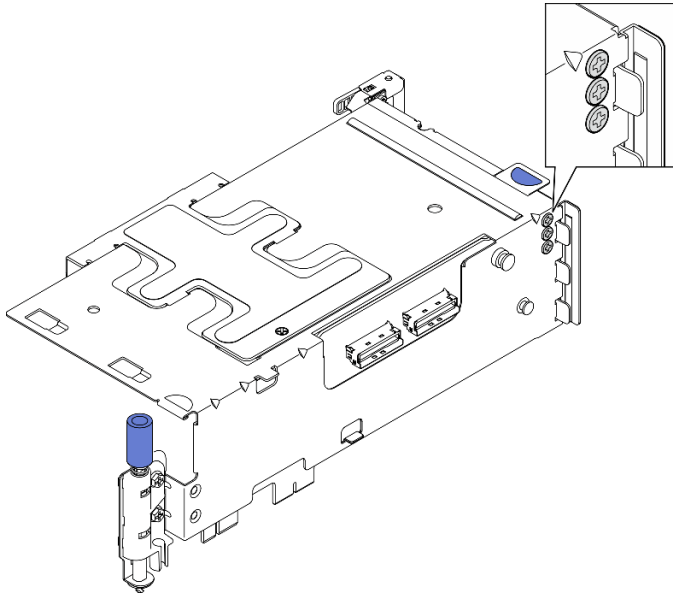
Figure 127. Spared screws on PCIe riser 1
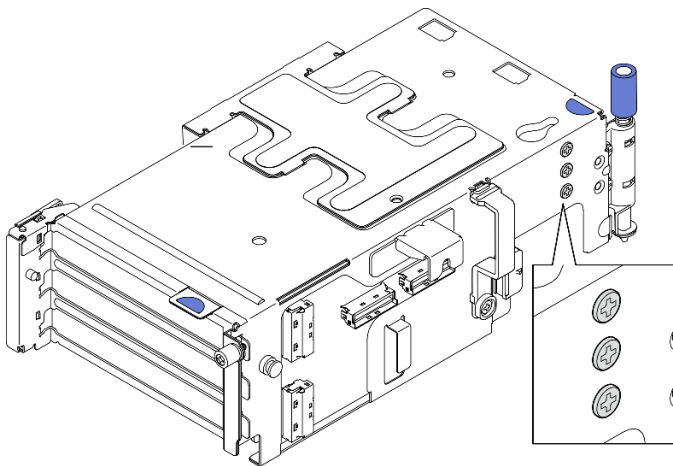
Figure 128. Spared screws on PCIe riser 2

Step 4. For low-profile adapters, install the low-profile fillers.

    a.   Push the filler toward the side support bracket.

    b.   Slide the filler as shown until it is seated in place.
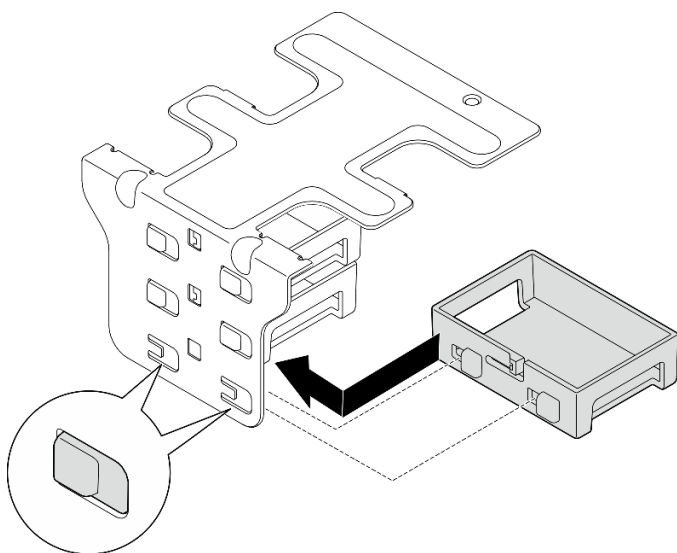
Figure 129. Installing a low-profile filler

Step 5. Install the side support bracket.

    a.   ❶ Lower the bracket down to the riser assembly; then, push the bracket toward the riser assembly until it is seated in place.

    b.   ❷ Fasten one screw to secure the bracket.

       Note: Make sure that the two tabs on the side of side support bracket are seated under the edge of riser cage.
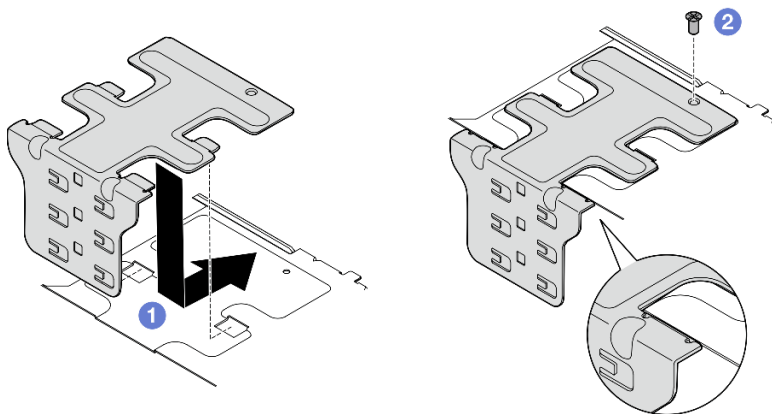
Figure 130. Installing the side support bracket

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Install the PCIe riser assembly

Follow the instructions in this section to install the PCIe riser assembly.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Note: Depending on the configuration, the PCIe riser assembly might look slightly different from the illustration in this section.

Procedure

Step 1. Make preparation for this task.

    a.   Make sure the processor air baffle is installed properly. See "Install the processor air baffle" on page 35

    b.   If ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter is installed, make sure the RAID flash power module is installed properly. See "Install a RAID flash power module to the holder" on page 161.

Step 2. Proceed to the section corresponding to the PCIe riser assembly to be installed:

- "Install PCIe riser 1" on page 127
- "Install PCIe riser 2" on page 130

Install PCIe riser 1

Procedure

Step 1. Make sure the signal cables of PCIe riser 1 are routed properly.

    a.   Route the **blue** signal cable along the intrusion switch as shown.

    b.   Route the **silver** signal cable through the cable wall. Press the cable down toward the system board to avoid interfering the retaining clips of memory module slots.
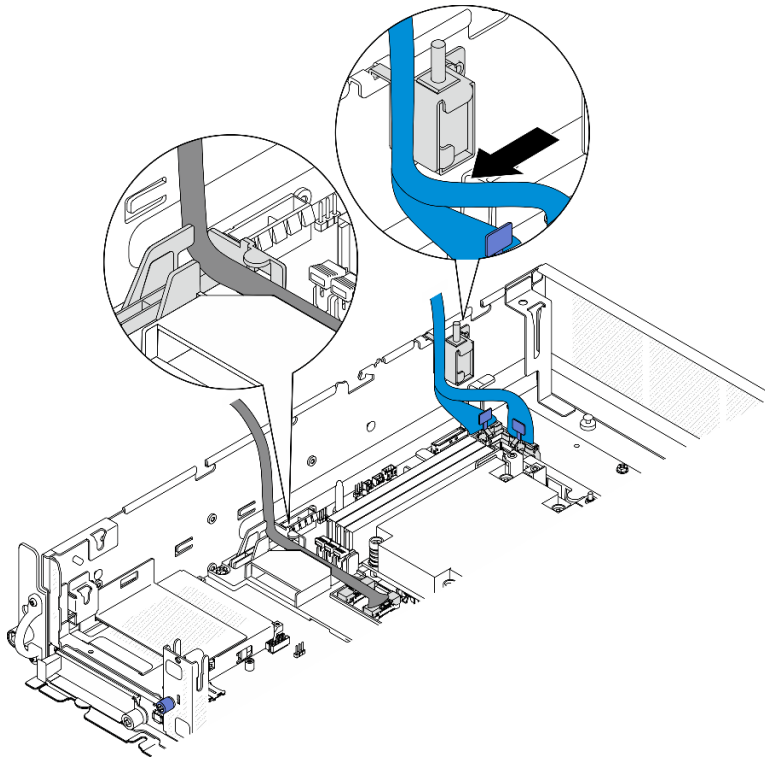
Figure 131. PCIe riser 1 cable routing

Step 2. Connect all the required cables to the PCIe adapters.

> **Notes:** Depending on the configuration, connect the following cables to the PCIe adapters if necessary:
>
> - GPU power cable to double-wide GPU adapter
> - RAID flash power module extension cable to ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter
> - Backplane signal cable to RAID adapter/HBA
>   - Front BP + internal BP to x350 RAID adapter:
>   - C0 connector to front BP
>   - C1 connector to internal BP
>   - For other configurations with drive backplane connecting to RAID adapter, connect the backplane signal cable to C0 connector of RAID adapter.
> - M.2 signal cable to C0 connector of RAID adapter/HBA

Step 3. If the serial port module is installed, connect the serial port cable to the system board. See "System-board connectors for cable routing" on page 202 to locate Serial port connector (COM).

Step 4. Install PCIe riser 1.

   a. Align the riser assembly with the guide slots on the chassis; then, lower the riser assembly until it is firmly seated.

   > **Note:** When lowering the riser assembly down, make sure to route the PCIe adapter cables away from the heat sink.

   b. Fasten the two captive screws to secure the riser assembly.

Figure 132. Installing PCIe riser 1

Step 5.   Manage the signal cables.

   a.   ❶ Manage the blue signal cable into the space between the processor air baffle and the chassis.

       Note: Make sure that the blue signal cable does not cover the guide slot for the top cover.

   b.   ❷ Manage the silver signal cable into the space between PCIe riser 1 and the chassis.
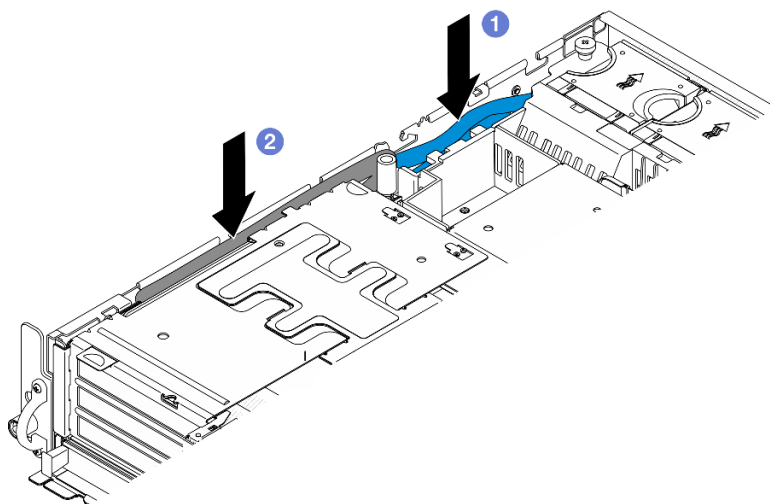
Figure 133. Managing PCIe riser 1 signal cables

Step 6.   If applicable, manage all the GPU power cables into the cable guide of the processor air baffle.
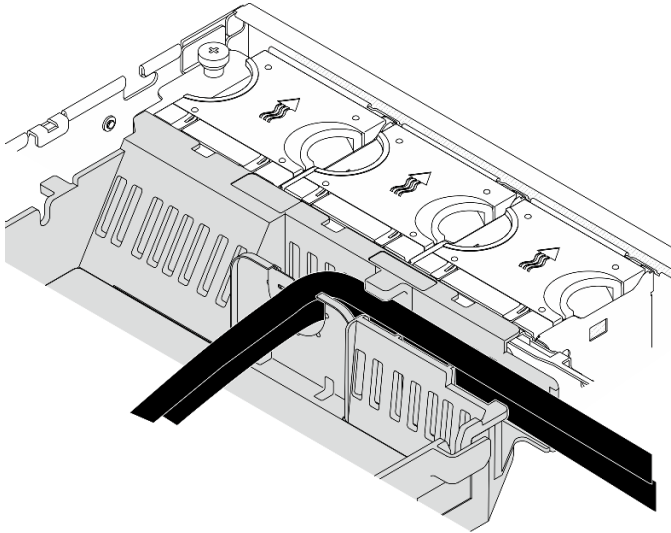
Figure 134. GPU power cables on processor air baffle

Install PCIe riser 2

Procedure

Step 1.   If the riser blank filler is installed, remove the riser blank filler.
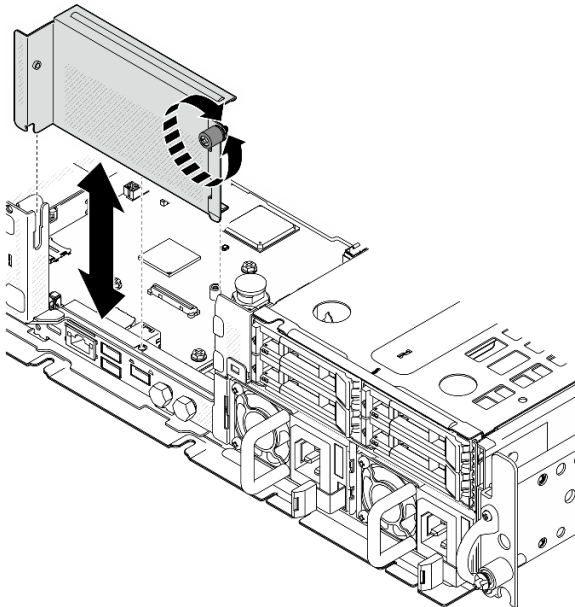
Figure 135. Removing the riser blank filler

Step 2.   Make sure the signal cables of PCIe riser 2 are routed properly.

   a.   If applicable, secure the **blue** signal cable in cable clip **A**.

   b.   Route the **silver** signal cable through the cable wall; then, secure the cable in cable clip **C**. Press the cable down toward the system board to avoid interfering the retaining clips of memory module slots.
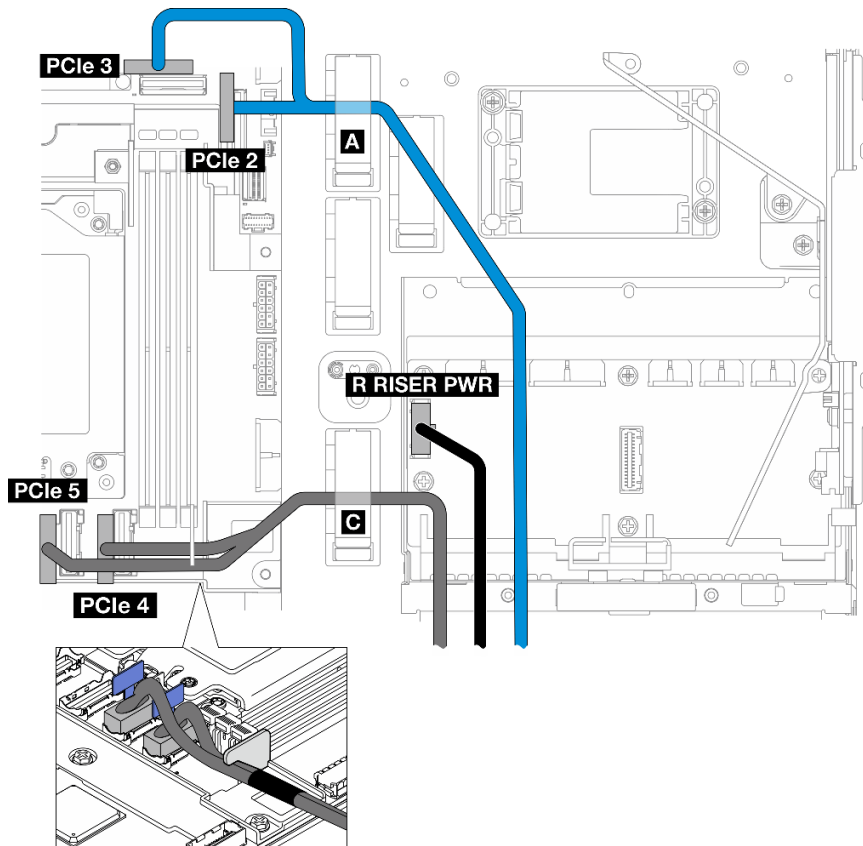
Figure 136. PCIe riser 2 cable routing

Step 3. Connect all the required cables to the PCIe adapters.

Notes: Depending on the configuration, connect the following cables to the PCIe adapters if necessary:

- GPU power cable to double-wide GPU adapter
- RAID flash power module extension cable to ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter
- Backplane signal cable to RAID adapter/HBA
  - Front BP + internal BP to x350 RAID adapter:
    - C0 connector to front BP
    - C1 connector to internal BP
  - For other configurations with drive backplane connecting to RAID adapter, connect the backplane signal cable to C0 connector of RAID adapter.
- M.2 signal cable to C0 connector of RAID adapter/HBA

Step 4. Install PCIe riser 2.

a. Align the riser assembly with the guide slots on the chassis; then, lower the riser assembly until it is firmly seated.

Note: When lowering the riser assembly down, make sure to route the PCIe adapter cables away from the heat sink.

b. Fasten the two captive screws to secure the riser assembly.
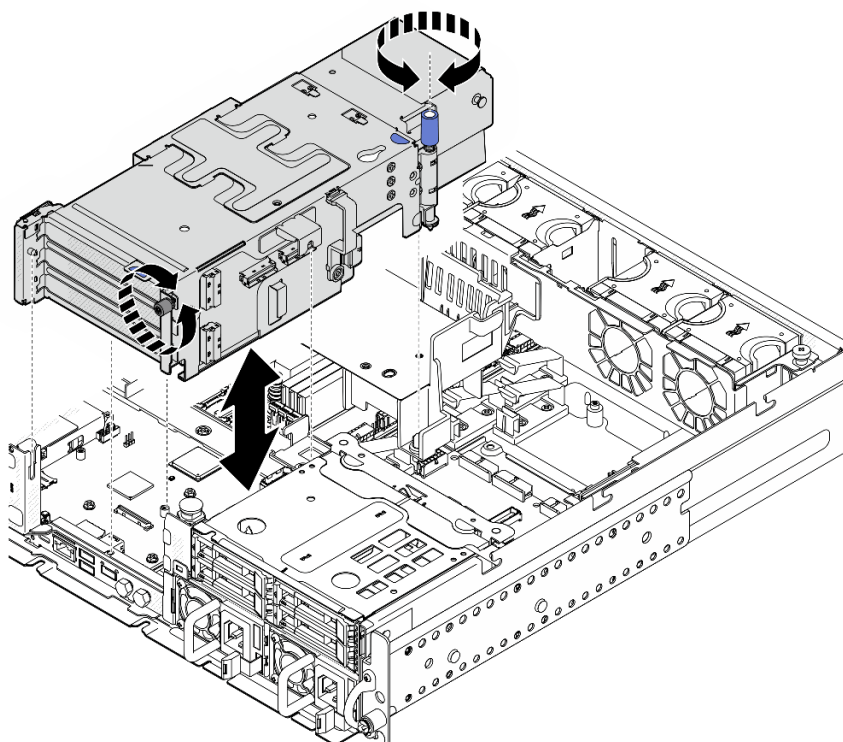
Figure 137. Installing PCIe riser 2

Step 5.   If applicable, manage all the GPU power cables into the cable guide of the processor air baffle.
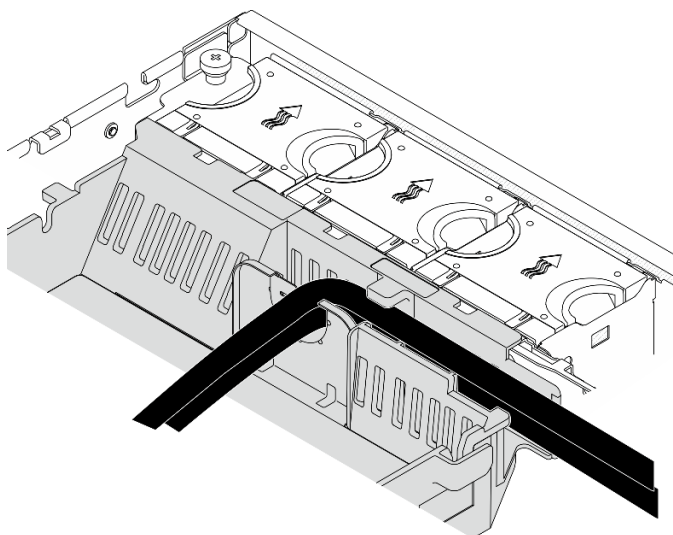
Figure 138. GPU power cables on processor air baffle

Step 6.   If applicable, reinstall the internal drive backplane. Pinch the blue touch points on the backplane bracket as shown; then, press the backplane into the slot until it clicks into place.
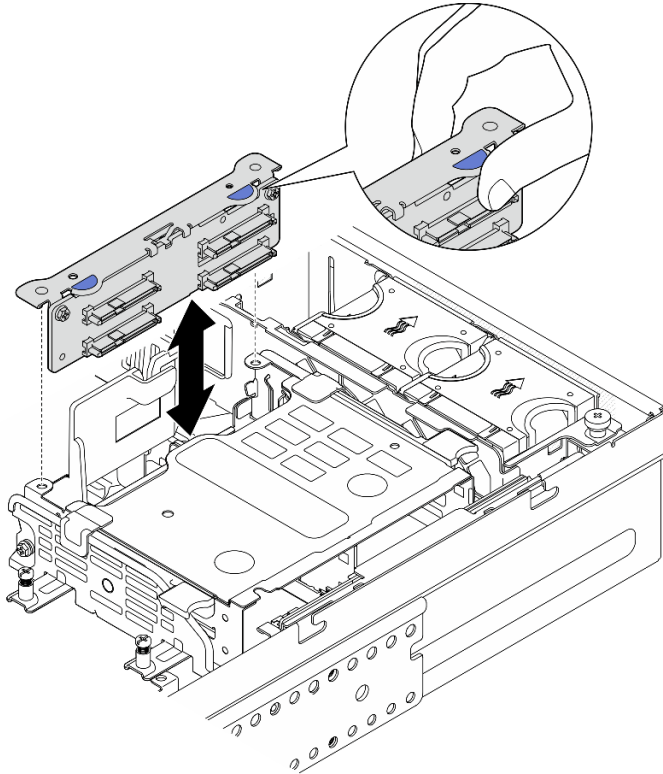
Figure 139. Installing the internal drive backplane

Step 7. If applicable, press the following cables down and make sure that the cables are under the cable clip of the processor air baffle.

- Signal cable of internal drive backplane
- Power cable of internal drive backplane
- The blue signal cable of PCIe riser 2
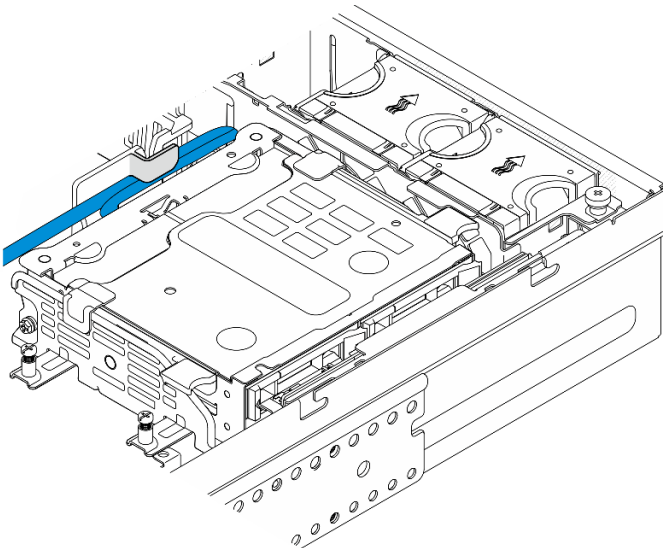
Figure 140. Managing the cables

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

PCIe riser card replacement

Follow instructions in this section to remove and install the PCIe riser cards.

Remove the PCIe riser card

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

<u>S002</u>

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.
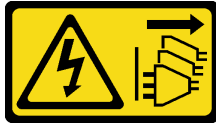
About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

   a. Remove the top cover. See "Remove the top cover" on page 195.

   b. Remove PCIe riser 1 or PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

   c. Remove all the PCIe adapters from the riser assembly. See "Remove a PCIe adapter" on page 117.

Step 2. Disconnect all the cables from the riser card.

Notes: To remove the blue signal cable from PCIe riser 2, after disconnecting the cable, press **2** the cable clip to disengage it from the slot; then, remove the cable. Insert the cable clip back to the slot if necessary.
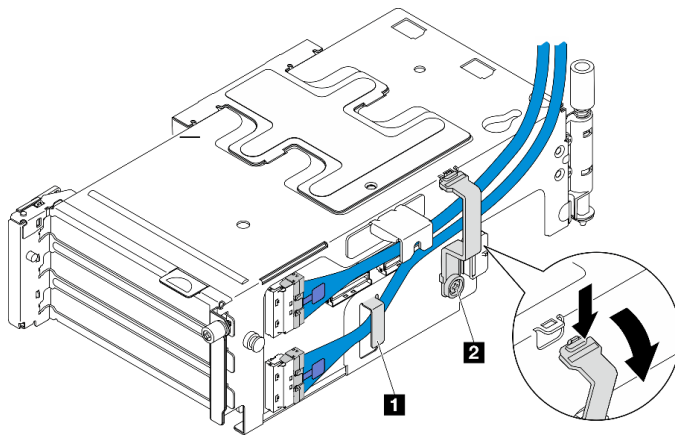
Figure 141. PCIe riser 2 cable routing

The blue signal cable is not supported in the following configurations:

- Front SATA drive backplane and internal NVMe drive backplane connect to the system board
- Front NVMe drive backplane and internal NVMe drive backplane connect to the system board

Step 3. Loosen the four screws that secure the riser card; then, remove the riser card.
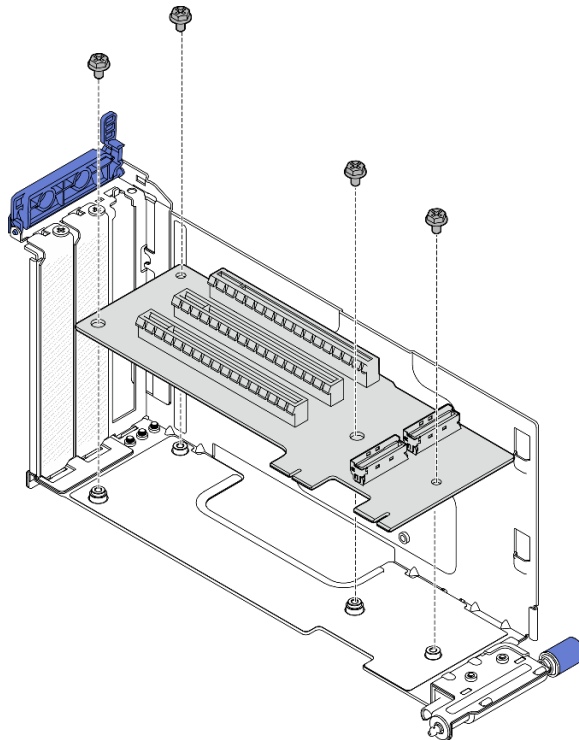
Figure 142. Removing the riser card from PCIe riser 1
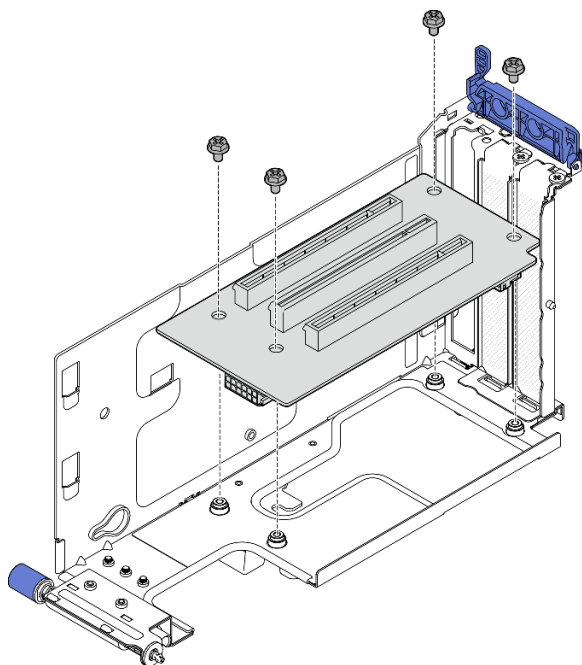
Figure 143. Removing the riser card from PCIe riser 2

After this task is completed

- Install a replacement unit. See "Install the PCIe riser card" on page 136.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Install the PCIe riser card

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

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

See the section corresponding to the PCIe riser card to be installed.

- "Install the PCIe riser card to PCIe riser 1" on page 137
- "Install the PCIe riser card to PCIe riser 2" on page 139

Install the PCIe riser card to PCIe riser 1

Procedure

Step 1. Align the holes on the riser card with the guide pins on the riser cage; then, fasten four screws to secure the riser card.
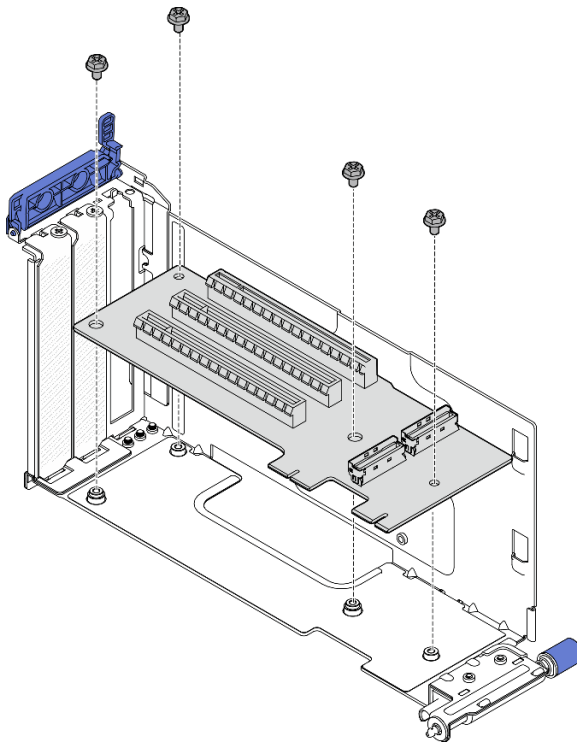
Figure 144. Installing the riser card

Step 2. Connect the **blue** signal cable to PCIe riser 1.

    a. ❶ Connect the cable to MCIO3 connector.

    b. ❷ Connect the cable to MCIO4 connector.

    c. ❸ Route the cable as shown.
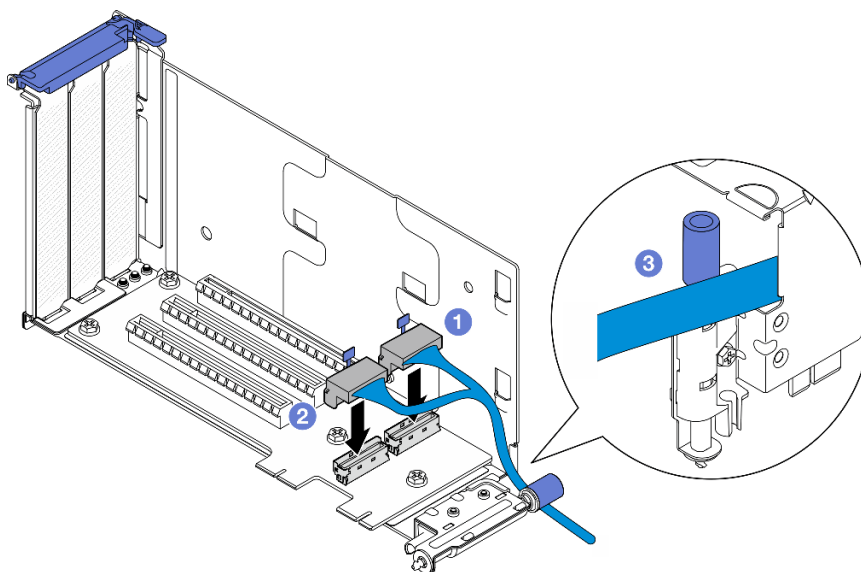
Figure 145. PCIe riser 1 cable routing

Step 3.   Connect the **silver** signal cable to PCIe riser 1.

    a.   ❶ Connect the cable to MCIO2 connector.

    b.   ❷ Connect the cable to MCIO1 connector.
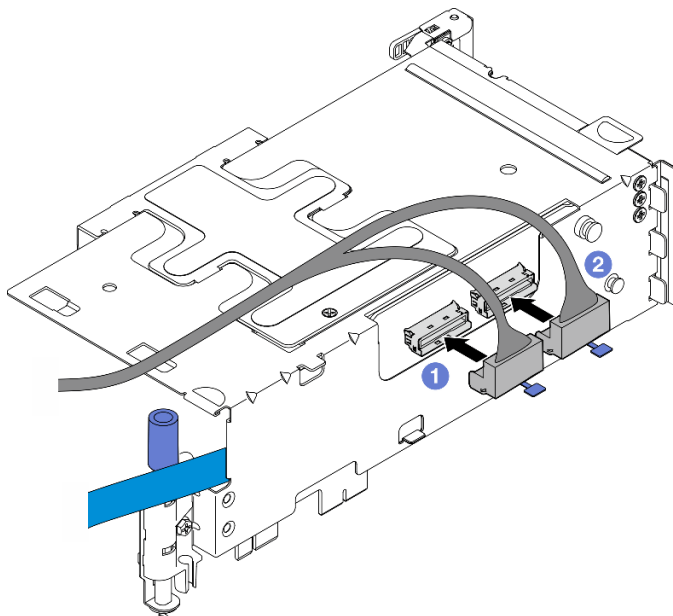
Figure 146. PCIe riser 1 cable routing

After this task is completed

1. Proceed to install PCIe adapters. See "Install a PCIe adapter" on page 121.

2. Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Install the PCIe riser card to PCIe riser 2

Procedure

Step 1. Align the holes on the riser card with the guide pins on the riser cage; then, fasten four screws to secure the riser card.
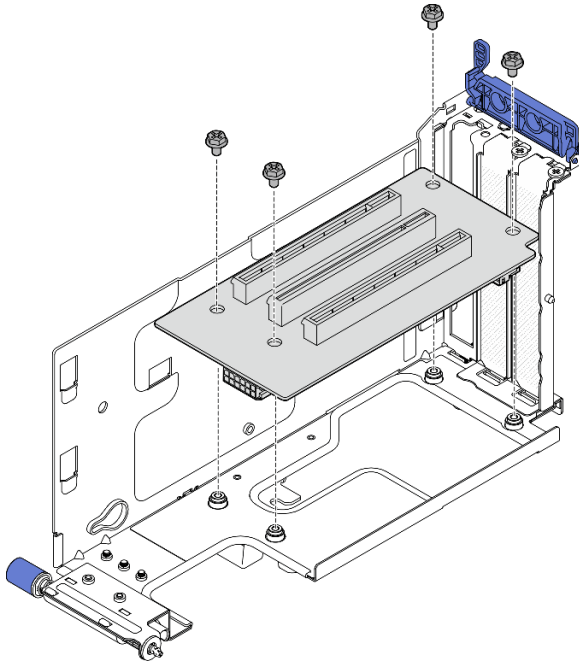
Figure 147. Installing the riser card

Step 2. Connect power and signal cables to PCIe riser 2. The number of signal cables varies by configuration.

    a. (Optional) Connect the **blue** signal cable to MCIO3 and MCIO4 connectors. Press **2** the cable clip to disengage it from the slot; then, route the cable into the cable clips.

        Notes: The blue signal cable is not supported in the following configurations:

        • Front SATA drive backplane and internal NVMe drive backplane connect to the system board

        • Front NVMe drive backplane and internal NVMe drive backplane connect to the system board
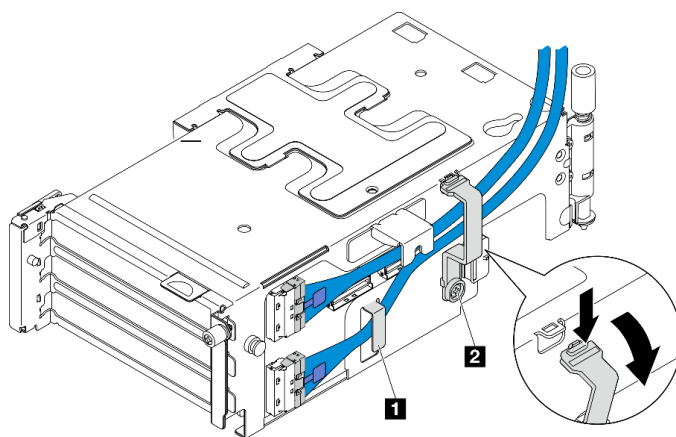
Figure 148. PCIe riser 2 cable routing

1 **2** Cable clips

b. Route the **silver** signal cable into the cable clip, and connect the cable to MCIO2 connector; then, connector the cable to MCIO1 connector.

c. Press and hold **1** the cable clip, and move it toward the riser cage; then, release the cable clip to restore it back to the slot. Make sure the cables are secured in the cable clip as shown.

d. Connect **2** the power cable to the power connector.

   Note: Route the power cable inwards as shown. Do not place the silver signal cable between the power cable and the riser cage.
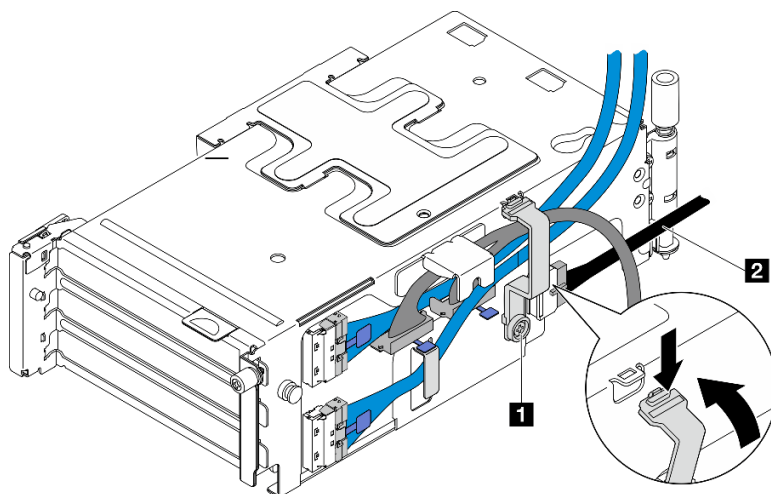
Figure 149. PCIe riser 2 cable routing

1 Cable clip	**2** Power cable

After this task is completed

1. Proceed to install PCIe adapters. See "Install a PCIe adapter" on page 121.

2. Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Power distribution board and PDB cage replacement

Follow instructions in this section to remove and install the power distribution board and the PDB cage.

Remove the power distribution board and PDB cage

Follow the instructions in this section to remove the power distribution board and PDB cage.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1.   Make preparation for this task.

    a.   Remove all the power supply units. See "Remove a hot-swap power supply unit" on page 146.

    b.   Remove the top cover. See "Remove the top cover" on page 195.

    c.   If applicable, remove all the internal drives. See "Remove an internal drive" on page 69.

    d.   If applicable, remove the internal drive backplane. See "Remove the internal drive backplane" on page 71.

    e.   If applicable, remove internal drive cage. See "Remove the internal drive cage" on page 73.

    f.   Remove the M.2 air baffle. See "Remove the M.2 air baffle" on page 25.

    g.   If applicable, remove the M.2 backplane assembly. See "Remove the M.2 backplane assembly" on page 85.

    h.   Disconnect all the cables from the front drive backplane.

    i.   Place PCIe riser 2.

        1.   Remove PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

        2.   If applicable, disengage the silver signal cable of PCIe riser 2 from cable clips.

3. Place PCIe riser 2 to the left hand side, away from the power distribution board.

Note: If necessary, remove the RAID flash power module holder for easier operation. See "Remove the RAID flash power module holder" on page 163.

Step 2.   Disconnect all the cables from the power distribution board.

Note: When disconnecting cables, make a list of each cable and record the connectors the cable is connected to, and use the record as a cabling checklist after installing the power distribution board.

Step 3.   Loosen the six screws that secure the power distribution board; then, remove the power distribution board from the PDB cage.
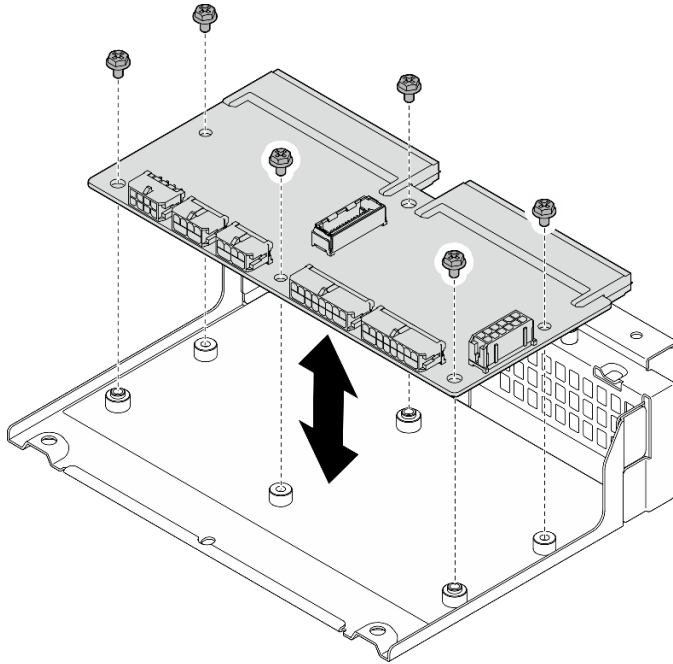
Figure 150. Removing the power distribution board

Step 4.   Loosen the four screws that secure the PDB cage; then, lift the PDB cage to remove it.
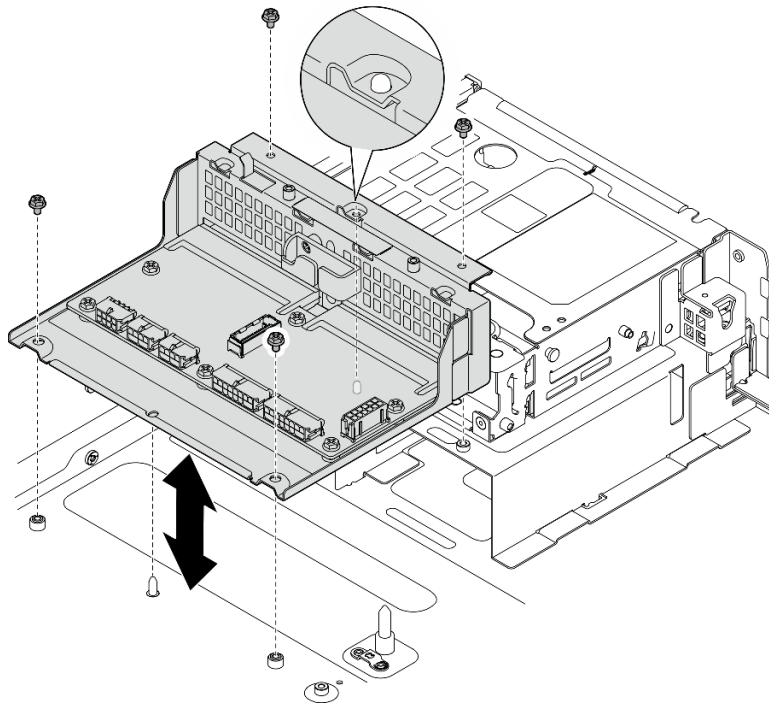
Figure 151. Removing the PDB cage

After this task is completed

1. Install a replacement unit. See "Install the power distribution board and PDB cage" on page 143.
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Install the power distribution board and PDB cage

Follow the instructions in this section to install the power distribution board and PDB cage.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Procedure

Step 1. Install the PDB cage to the chassis.

    a. Align the PDB cage with the guide pins on the chassis; then, lower the PDB cage down to the chassis.

    b. Fasten four screws to secure the PDB cage.
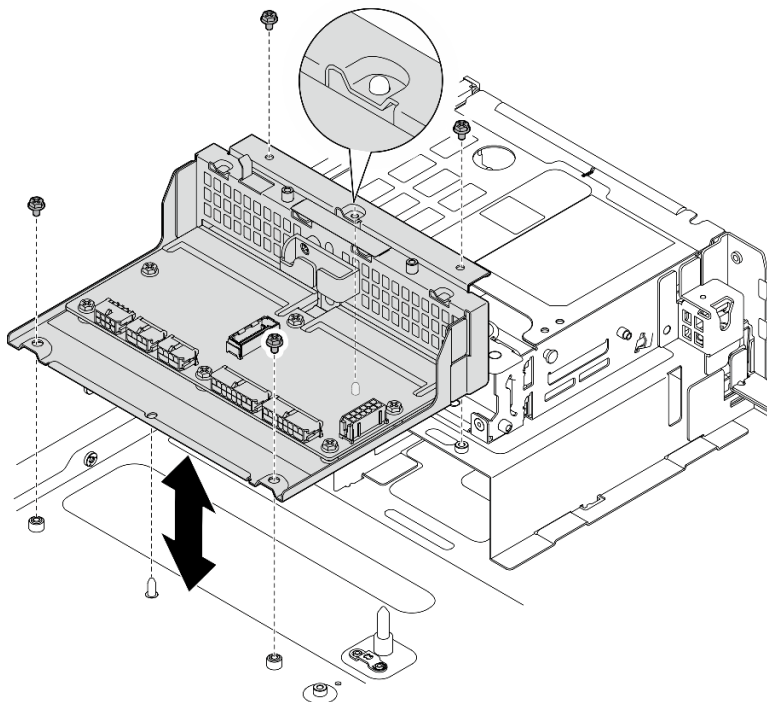
Figure 152. Installing the PDB cage

Step 2. Fasten six screws to secure the power distribution board onto the PDB cage.
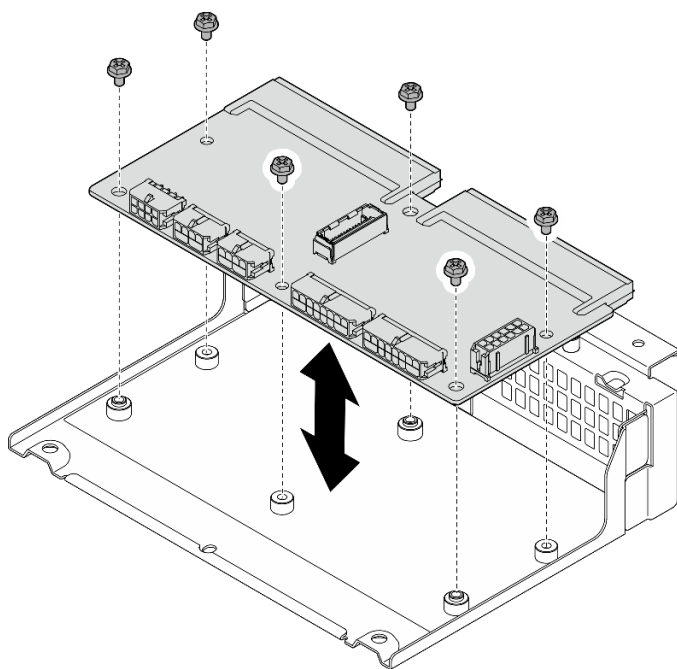
Figure 153. Installing the power distribution board

Step 3. Connect the cables to the power distribution board.

Notes:

- Reconnect all the required cables to the same connectors on the power distribution board as the defective power distribution board.
- To replace the PDB cables, do the cable routing for power distribution board. See "Power distribution board (PDB) and fan control board (FCB) cable routing" on page 204.

After this task is completed

1. If the RAID flash power module holder is removed, reinstall the holder. See "Install the RAID flash power module holder" on page 164.

2. If applicable, secure the silver signal cable of PCIe riser 2 into cable clips. See "PCIe riser card cable routing" on page 209.

3. Reinstall PCIe riser 2. See "Install the PCIe riser assembly" on page 126.

4. Reconnect the cables to the front drive backplane.

5. If applicable, reinstall the M.2 backplane assembly. See "Install the M.2 backplane assembly" on page 96.

6. Reinstall the M.2 air baffle. See "Install the M.2 air baffle" on page 27.

7. If applicable, reinstall the internal drive cage. See "Install the internal drive cage" on page 74.

8. If applicable, reinstall the internal drive backplane. See "Install the internal drive backplane" on page 76.

9. If applicable, reinstall all the internal drives. See "Install an internal drive" on page 80.

10. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside the server.

11. Reinstall the top cover. See "Install the top cover" on page 196.

12. Reinstall all the power supply units. See "Install a hot-swap power supply unit" on page 148.

13. Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Power supply unit replacement

Follow instructions in this section to remove and install a power supply unit.

Remove a hot-swap power supply unit

Follow instructions in this section to remove a hot-swap power supply unit.

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.**

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.

S029

DANGER

**For -48V dc power supply, electrical current from power cords is hazardous.
To avoid a shock hazard:**

- **To connect or disconnect -48V dc power cords when you need to remove/install redundancy power supply unit(s).**

To Connect:

1. Turn OFF subject dc power source(s) and equipment (s) that are attached to this product.

2. Install the power supply unit(s) into the system housing.

3. Attach dc power cord(s) to the product.

   - Ensure correct polarity of -48 V dc connections: RTN is + and -Vin (typical -48 V) dc is -. Earth ground should be connected very well.

4. Connect dc power cord(s) to subject power source (s).

5. Turn ON all the power source(s).

To Disconnect:

1. Disconnect or turn off the subject dc power source(s) (at the breaker panel) before removing the power supply unit(s).

2. Remove the subject dc cord(s) and make sure the wire terminal of power cord(s) is insulated.

3. Unplug the subject power supply unit(s) from the system housing.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

- Make sure you have a power supply unit filler available if some power supply bays will be left empty after the removal.

Procedure

Step 1. ❶ Press and hold the terra-cotta release tab.

Step 2. ❷ Grasp the handle, and pull the power supply unit out of the server.
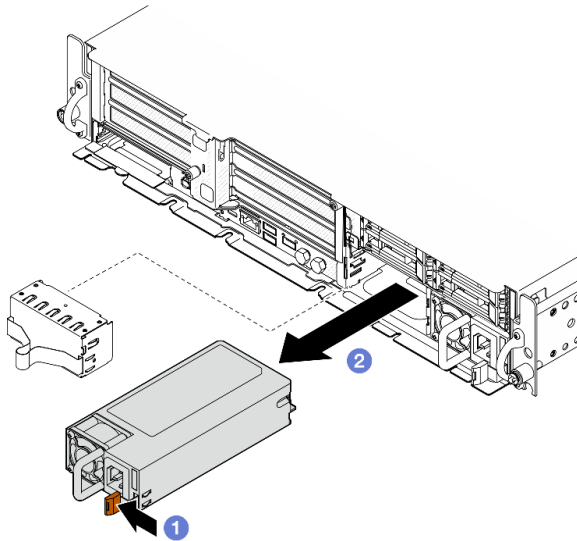
Figure 154. Power supply unit removal

After this task is completed

1. Install a power supply or power supply filler as soon as possible. See "Install a hot-swap power supply unit" on page 148.

   Important: During normal operation, each power supply bay must contain either a power supply unit or a power supply filler for proper cooling.

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

Demo Video

Watch the procedure on YouTube

Install a hot-swap power supply unit

Follow instructions in this section to install a hot-swap power supply unit.

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.**

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.

S029

DANGER

For -48V dc power supply, electrical current from power cords is hazardous.
To avoid a shock hazard:

- **To connect or disconnect -48V dc power cords when you need to remove/install redundancy power supply unit(s).**

To Connect:	To Disconnect:
1. Turn OFF subject dc power source(s) and equipment (s) that are attached to this product.	1. Disconnect or turn off the subject dc power source(s) (at the breaker panel) before removing the power supply unit(s).
2. Install the power supply unit(s) into the system housing.	2. Remove the subject dc cord(s) and make sure the wire terminal of power cord(s) is insulated.
3. Attach dc power cord(s) to the product.	3. Unplug the subject power supply unit(s) from the system housing.
• Ensure correct polarity of -48 V dc connections: RTN is + and -Vin (typical -48 V) dc is -. Earth ground should be connected very well.	
4. Connect dc power cord(s) to subject power source (s).	
5. Turn ON all the power source(s).	

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

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

- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Procedure

Step 1. Make preparation for this task.

   a. If the configuration is with only one power supply unit, install the power supply unit in **PSU bay 1** (the right bay).

   b. If the configuration is with two power supply units, make sure the power supply units are with the same brand, power rating, wattage and efficiency level.

   c. If a power supply filler is installed in the bay, pull the filler out of the bay.

   Note: During normal operation, each power supply bay must contain either a power supply unit or a power supply filler for proper cooling.

Step 2. Make sure the label on the power supply is facing up; then, grasp the handle and slide it into the power supply bay until it clicks into place.
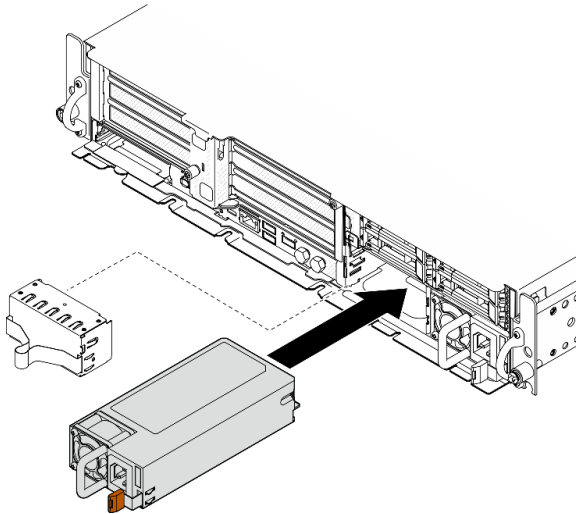
Figure 155. Installing a power supply unit

Step 3. Connect the power supply unit to a properly grounded electrical socket with a power cord.

Step 4. Make sure that the AC power LED on the power supply unit is lit, indicating that the power supply unit is operating correctly.

After this task is completed

- Check the PSU LEDs to verify that the PSU is operating correctly. See "Power supply LEDs" on page 247.
- Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Processor and heat sink replacement (trained technician only)

Follow the instruction in this section to remove or install a processor or a heat sink.

Important:

- This task must be operated by trained technicians that are certified by Lenovo Service. Do no attempt to remove or install the part without proper training and qualification.
- Before replacing a processor, check the current PSB fuse policy. (Lenovo service technician only) See *Service process before replacement* at Service process for updating PSB fuse state.
- After replacing a processor, ensure that the processor fuse status is expected without unexpected XCC event logs. (Lenovo service technician only) See *Service process after replacing a processor* at Service process for updating PSB fuse state.

Attention:

- Before reusing a processor or heat sink, make sure you use Lenovo proven alcohol cleaning pad and thermal grease.
- Each processor socket must always contain a cover or a processor. When replacing a processor, protect the empty processor socket with a cover.
- Do not touch the processor socket or processor contacts. Processor-socket contacts are very fragile and easily damaged. Contaminants on the processor contacts, such as oil from your skin, can cause connection failures.
- Do not allow the thermal grease on the processor or heat sink to come in contact with anything. Contact with any surface can compromise the thermal grease, rendering it ineffective. Thermal grease can damage components, such as the electrical connectors in the processor socket.

Remove a heat sink

Follow instructions in this section to remove a heat sink. This task requires a Torx T20 driver. The procedure must be executed by a trained technician.

About this task

S002

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

   a. Remove the top cover. See "Remove the top cover" on page 195.

   b. Remove all the PCIe assemblies. If the configuration comes with PCIe riser 2 and internal drives, remove all the internal drives, and lift the internal drive backplane before removing PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

   c. Remove the processor air baffle. See "Remove the processor air baffle" on page 29.

Step 2. Remove the heat sink.

   Notes:

   - Do not touch the contacts on the bottom of the processor.

   - Keep the processor socket clean from any object to prevent possible damages.

   a. ❶ Fully loosen all the screws on the heat sink *in the removal sequence shown* on the heat-sink label.

   b. ❷ Carefully lift the heat sink from the processor socket.
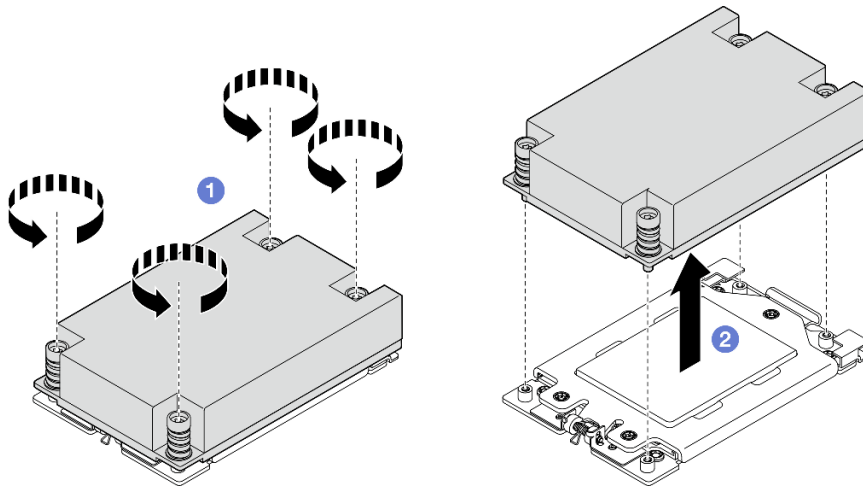
Figure 156. 1U heat sink removal
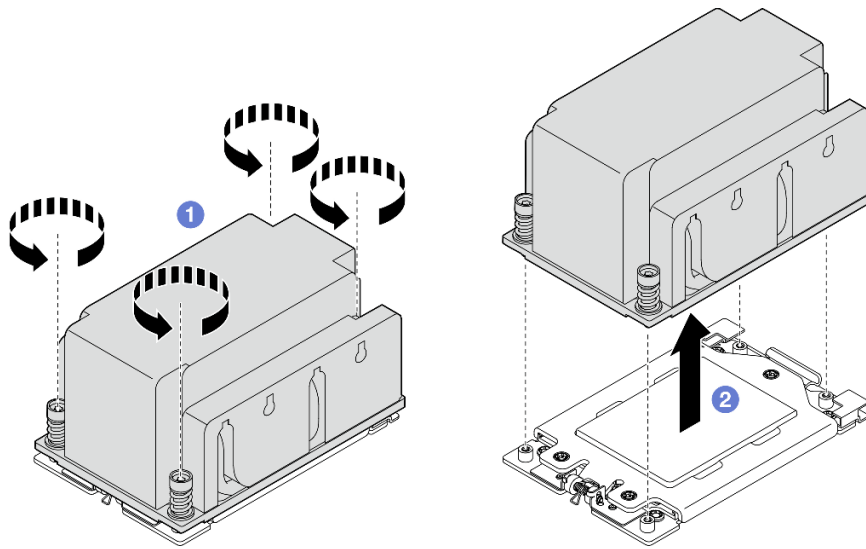
Figure 157. 2U heat sink removal

After this task is completed

1. If you are replacing a heat sink, install a new heat sink. See "Install a heat sink" on page 157.

2. If you are replacing a processor, remove the processor. See "Remove a processor" on page 154.

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

Demo Video

Watch the procedure on YouTube

Remove a processor

Follow instructions in this section to remove a processor. This task requires a Torx T20 driver. The procedure must be executed by a trained 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.

About this task

Attention:

• Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

• If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See .
- If the server is installed in a rack, remove the server from the rack. See .
- The system will load factory default UEFI settings when the processor is removed. Back up the UEFI setting before processor removal.

Procedure

Step 1.   Make preparation for this task.

   a.   Back up the UEFI setting.

   b.   Remove the top cover. See .

   c.   Remove all the PCIe assemblies. If the configuration comes with PCIe riser 2 and internal drives, remove all the internal drives, and lift the internal drive backplane before removing PCIe riser 2. See .

   d.   Remove the processor air baffle. See .

   e.   Remove the heat sink. See .

Step 2.   ❶ Use a Torx T20 screwdriver to loosen the three captive screws; then, slightly lift up the retention frame.

Step 3.   ❷ Slightly lift up the rail frame in the direction shown. The processor in the rail frame is spring-loaded.

Step 4.   ❸ Hold the tab of the processor carrier and slide the processor carrier out of the rail frame.
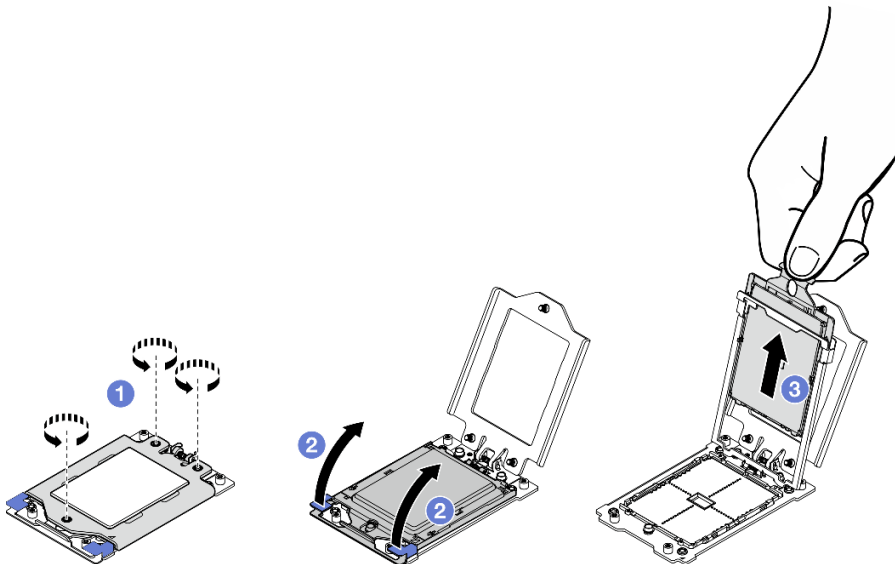
Figure 158. Processor removal

After this task is completed

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

Demo Video

Install a processor

Follow instructions in this section to install a processor. This task requires a Torx T20 driver. The procedure must be executed by a trained 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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Notes:

- See https://serverproven.lenovo.com for a list of processors supported for your server.
- Before you install a new processor, update your system firmware to the latest level. See "Update the firmware" in *User Guide* and *System Configuration Guide*.

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

- Go to https://datacentersupport.lenovo.com/products/servers/thinkedge/se455v3/7dby/downloads/driver-list/ to see the latest firmware and driver updates for your server.
- Go to "Update the firmware" in *User Guide* or *System Configuration Guide* for more information on firmware updating tools.

Procedure

Step 1. Remove the processor socket cover.

Step 2. Install the processor.

      a. ❶ Slide the processor carrier into the rail frame.

      b. ❷ Push the rail frame down until the blue latches lock into place.

      c. ❸ Close the retention frame.

      d. ❹ Use a Torx T20 screwdriver to tighten the three captive screws.
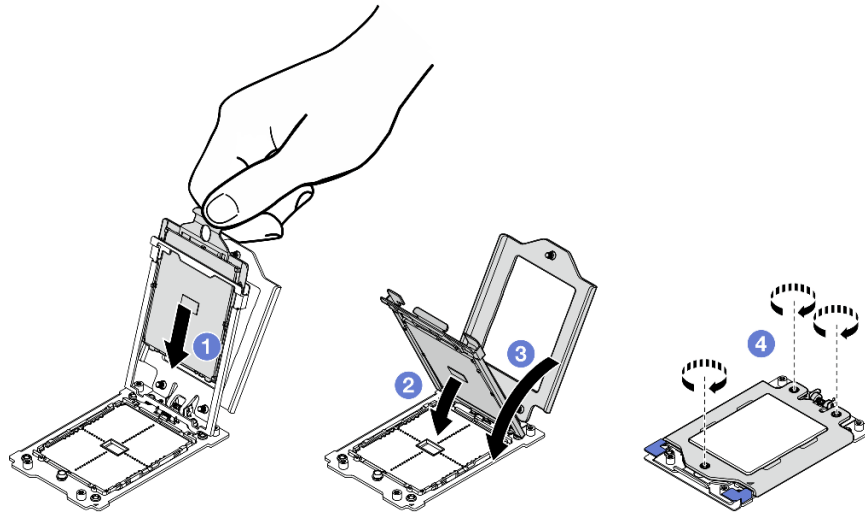
Figure 159. Processor installation

After this task is completed

1. Install the heat sink. See "Install a heat sink" on page 157.

2. Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Install a heat sink

Follow the instructions in this section to install a heat sink. This task requires a Torx T20 driver. The procedure must be executed by a trained 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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Procedure

Step 1. Record the processor identification label.

To replace a processor and reuse the heat sink:

1. Remove the processor identification label from the heat sink and replace it with the new label that comes with the replacement processor.
2. Wipe off old thermal grease on the heat sink with an alcohol cleaning pad.

To replace a heat sink and reuse the processor:

1. Remove the processor identification label from the old heat sink and place it on the new heat sink in the same location.

   Note: If you are unable to remove the label and place it on the new heat sink, or if the label is damaged during transfer, write the processor serial number from the processor identification label on the new heat sink in the same location as the label would be placed using a permanent marker.

2. Wipe off old thermal grease on the heat sink with an alcohol cleaning pad.
3. Check whether the manufacturing date on the new heat sink exceeds two years.

   - If yes, wipe off the thermal grease on the new heat sink with an alcohol cleaning pad, and go to Step 2 on page 158
   - If no, go to Step 3 on page 158

Step 2. Apply new thermal grease on the top of the processor with a syringe by forming four uniformly spaced dots, while each dot consists of about 0.1 ml of thermal grease.
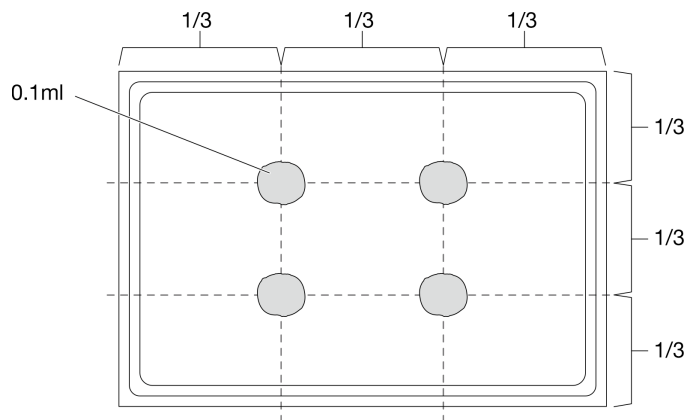
Figure 160. Thermal grease application

Step 3. Install the heat sink.

a. ❶ Align the captive screws on the heat sink with the screw holes on the processor socket; then install the heat sink on the processor socket.

b. ❷ Partially tighten all the screws with proper torque *in the installation sequence shown* on the heat-sink label, and repeat the procedure until all the screws are fully-tightened.

   Note: For reference, the torque required to tighten the screws is 12.0+/- 1.2 lbf-in, 1.36+/- 0.14 N-M.
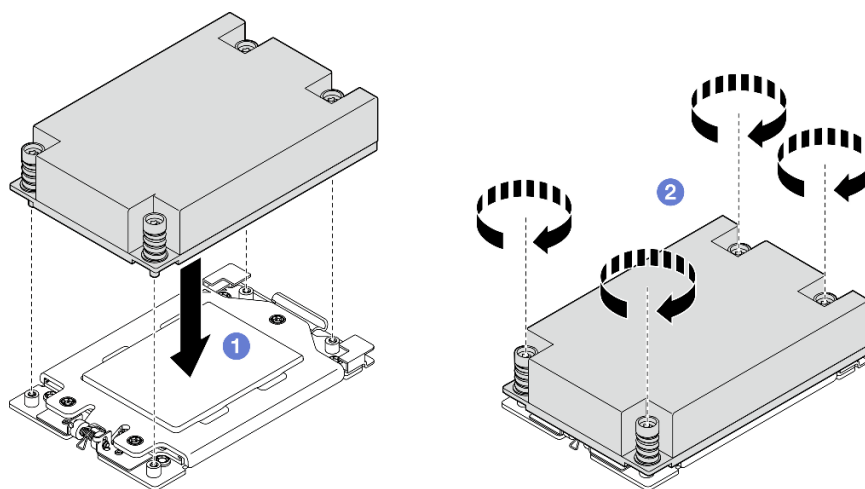
Figure 161. 1U heat sink installation
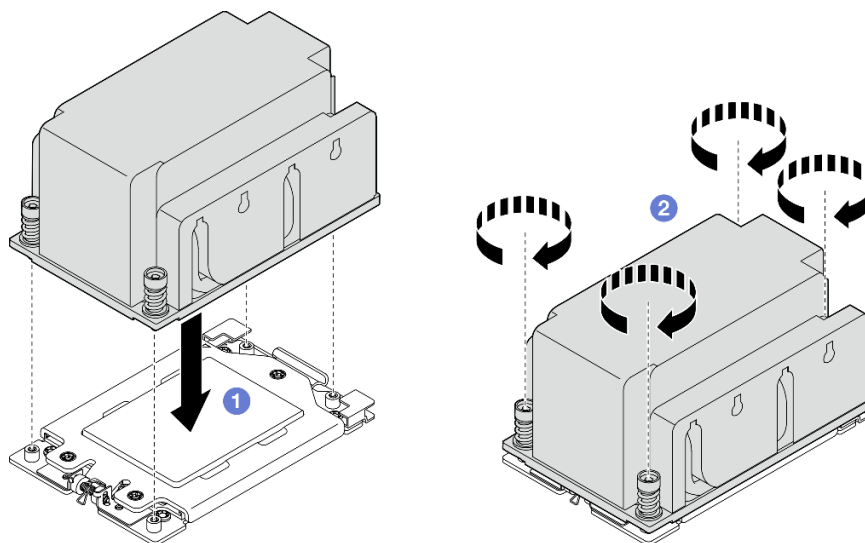
Figure 162. 2U heat sink installation

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

RAID flash power module (supercap) replacement

Follow instructions in this section to remove and install a RAID flash power module (supercap).

Remove a RAID flash power module from the holder

Follow the instructions in this section to remove a RAID flash power module from the holder.

About this task

<u>**S002**</u>

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

    b. If applicable, remove all the internal drives. See "Remove an internal drive" on page 69.

    c. If applicable, remove the internal drive backplane. See "Remove the internal drive backplane" on page 71.

    d. If applicable, remove internal drive cage. See "Remove the internal drive cage" on page 73.

Step 2. Remove the RAID flash power module from the holder.

    a. ❶ Pull back the retention clips; meanwhile, hold the RAID flash power module, and pivot the cable side of the module to disengage it from the holder.

    b. ❷ Remove the RAID flash power module from the holder.

    Note: Be careful **not to** grasp the cables of the RAID flash power module.
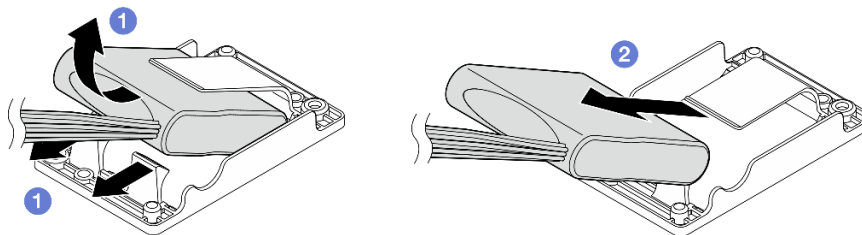
Figure 163. Removing the RAID flash power module

Step 3. Disconnect the RAID flash power module from the extension cable.
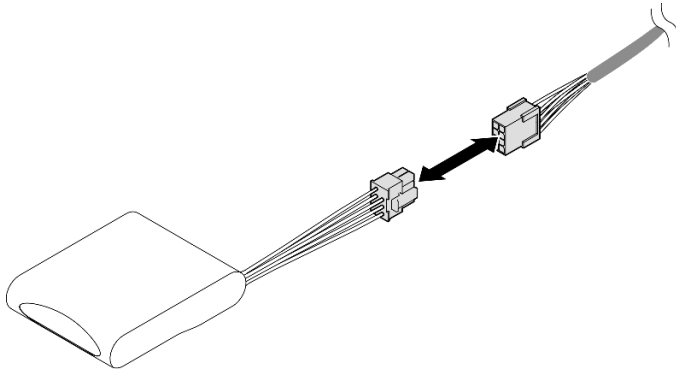
Figure 164. Disconnecting the extension cable

After this task is completed

- Install a replacement unit. See "Install a RAID flash power module to the holder" on page 161.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.
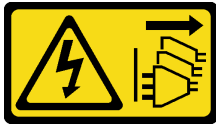
Demo Video

Watch the procedure on YouTube

Install a RAID flash power module to the holder

Follow the instructions in this section to install a RAID flash power module to the holder.

About this task

S002

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Procedure

Step 1. Connect the extension cable to the RAID flash power module.

Notes:

- Make sure that the extension cable is secured in cable clip **C**.

See "RAID flash power module (supercap) cable routing" on page 212 for details.
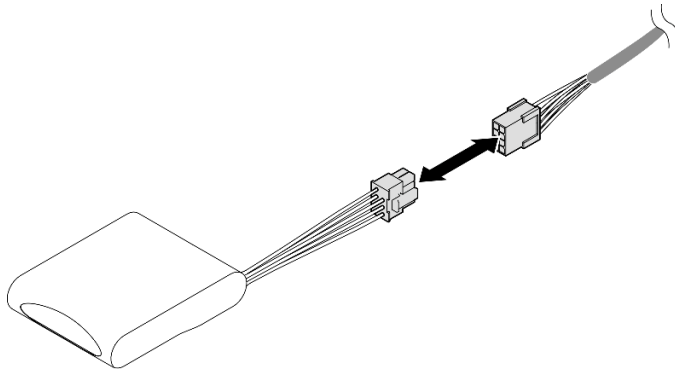
Figure 165. Connecting the extension cable

Step 2. Install the RAID flash power module.

    a. ❶ Insert the RAID flash power module into the holder with the orientation shown in the illustration. Make sure that the end of the module is placed as shown.

    b. ❷ Pull back the retention clips; meanwhile, press the cable side of the flash power module down until it is seated in place.
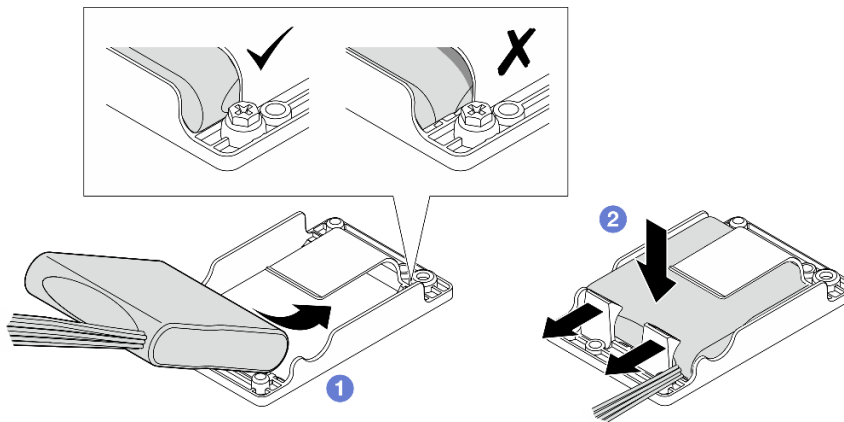
Figure 166. Installing the RAID flash power module

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

RAID flash power module holder replacement

Follow instructions in this section to remove and install the RAID flash power module holder.

Remove the RAID flash power module holder

Follow the instructions in this section to remove the RAID flash power module holder.

About this task

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

    b. If applicable, remove all the internal drives. See "Remove an internal drive" on page 69.

    c. If applicable, remove the internal drive backplane. See "Remove the internal drive backplane" on page 71.

    d. If applicable, remove internal drive cage. See "Remove the internal drive cage" on page 73.

    e. If applicable, disconnect the RAID flash power module from the extension cable.
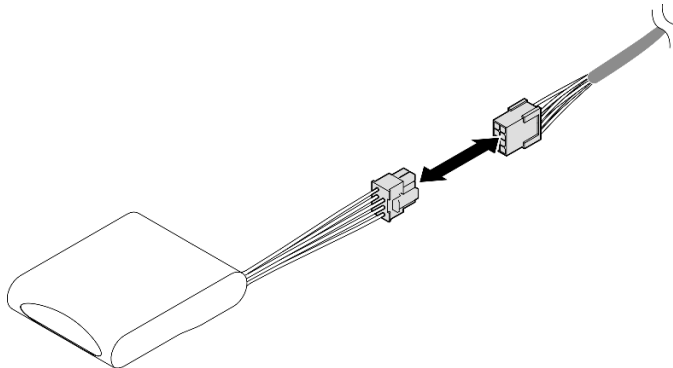
Figure 167. Disconnecting the extension cable

Step 2. Loosen the two screws that secure the RAID flash power module holder; then, lift the holder to remove it from the chassis.
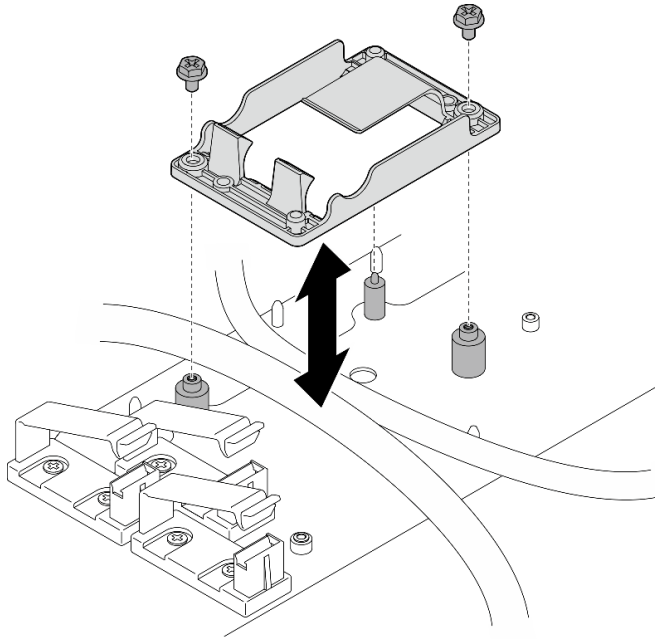
Figure 168. Removing the RAID flash power module holder

After this task is completed

- Install a replacement unit. See "Install the RAID flash power module holder" on page 164.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Install the RAID flash power module holder

Follow the instructions in this section to install the RAID flash power module holder.

About this task

S002

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

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Procedure

Step 1. Install the RAID flash power module holder.

a. Align the RAID flash power module holder with the guide pins on the chassis; then, lower the holder down to the chassis.

Notes: Make sure that the holder secures the following cables:

- System-board power 2 cable
- FCB power cable

b. Fasten two screws to secure the RAID flash power module holder.
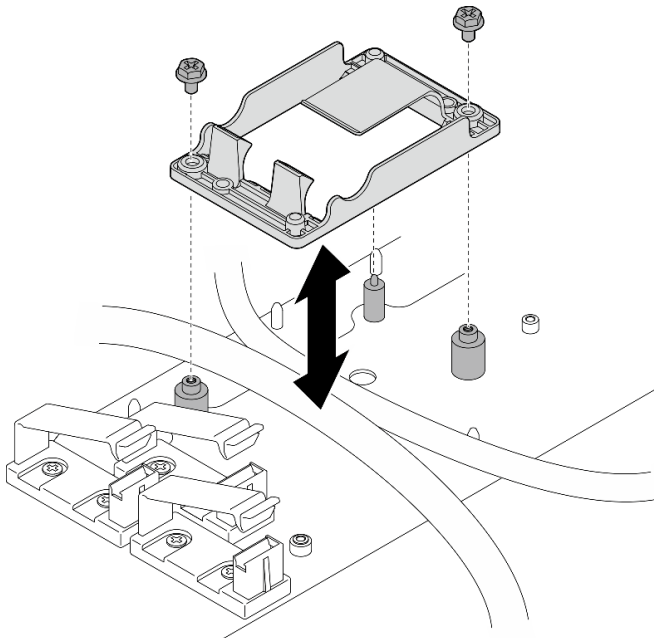
Figure 169. Installing the RAID flash power module holder

After this task is completed

- If applicable, connect the RAID flash power module to the extension cable.
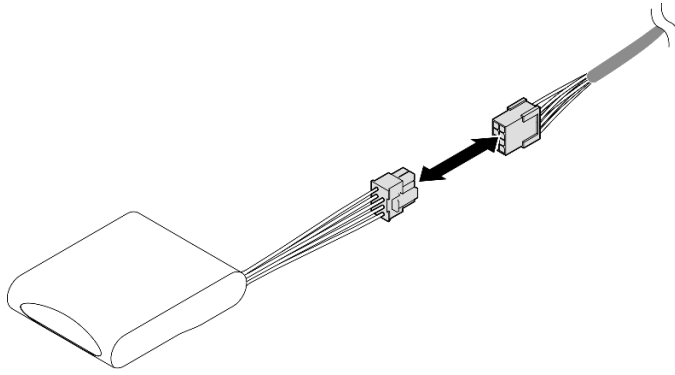
Figure 170. Connecting the extension cable

- Complete the parts replacement. See "Complete the parts replacement" on page 198.

Security bezel and dust filter replacement

Follow instructions in this section to remove or install the security bezel and the dust filter.

Remove the security bezel

Follow instructions in this section to remove the security bezel.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

Procedure

Step 1.   Unlock the security bezel with the corresponding key.

Step 2.   Remove the security bezel.

      a.   ❶ Press and hold the release latches on both sides.

      b.   ❷ Slide the security bezel away from the chassis.
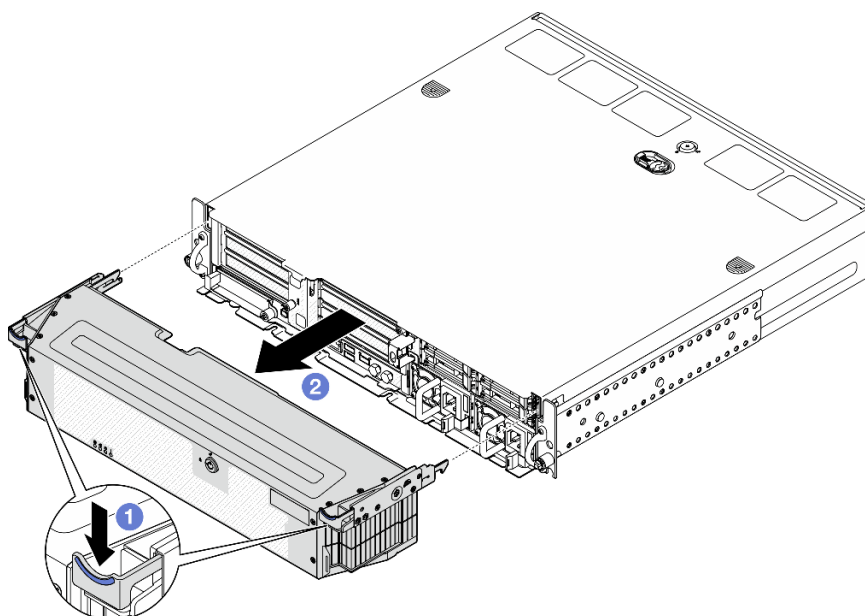
Figure 171. Removing the security bezel

After this task is completed

- If necessary, proceed to replace the dust filter. See "Remove the dust filter" on page 167.
- If the server will operate without security bezel, install security bezel slot fillers to protect the slots. See "Front I/O fillers" section of "Front View" in *User Guide* or *System Configuration Guide* to identify the fillers.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Remove the dust filter

Follow instructions in this section to remove the dust filter.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

Procedure

Step 1. Make preparation for this task.

    a. Remove the security bezel. See "Remove the security bezel" on page 166.

Step 2. Remove the dust filter.

    a. ❶ Press the release latch.

    b. ❷ Rotate the dust filter away from the security bezel.

Note: For optimal server operation, make sure to install a replacement dust filter.
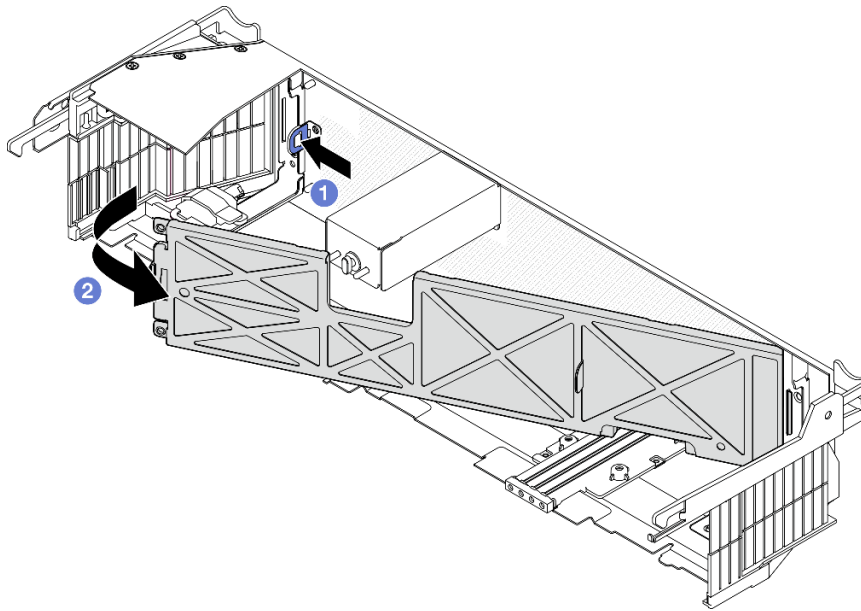
Figure 172. Removing the dust filter

After this task is completed

- Install a replacement unit. See "Install the dust filter" on page 168.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Install the dust filter

Follow instructions in this section to install the dust filter.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Depends on the operating environment, check the status of the dust filter at least every 3 months to make sure it is functional.

Important: With air flow sensor board installed, SE455 V3 BMC supports dust filter measurement to check the status of the dust filter. Log in to Lenovo XClarity Controller web interface, and go to **Utilization ➔ Fan Speed (RPM) ➔ Dust Filter Measurement** to take the measurement by selecting **Run immediately (once)**, or by setting a regular schedule. See "Set dust filter measurement" in *User Guide* or *System Configuration Guide* for more information.

- When taking the measurement, the fans will operate at full fan speed for about 30 seconds.

- After taking the measurement, see Lenovo XClarity Controller Event Log for the status of dust filter. For proper operation, replace the dust filter according to the action suggestions in the generated event.

Procedure

Step 1. Install the dust filter.

- a. ❶ Insert the right side of the dust filter into the slot in the security bezel.
- b. ❷ Pivot the dust filter towards the security bezel until it is seated in place. Make sure the guide pins on the security bezel is seated in the holes on the dust filter.
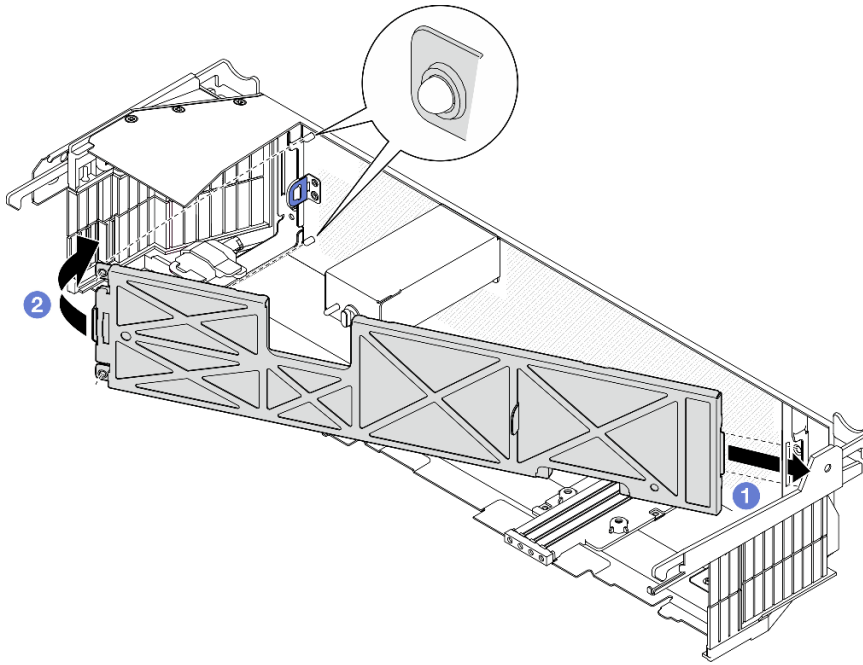
Figure 173. Installing the dust filter

After this task is completed

Proceed to install the security bezel. See "Install the security bezel" on page 169.

Demo Video

Watch the procedure on YouTube

Install the security bezel

Follow instructions in this section to install the security bezel.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

Important: When installing the security bezel for the first time, the key that is required to lock the security bezel is stored at the location as illustrated:
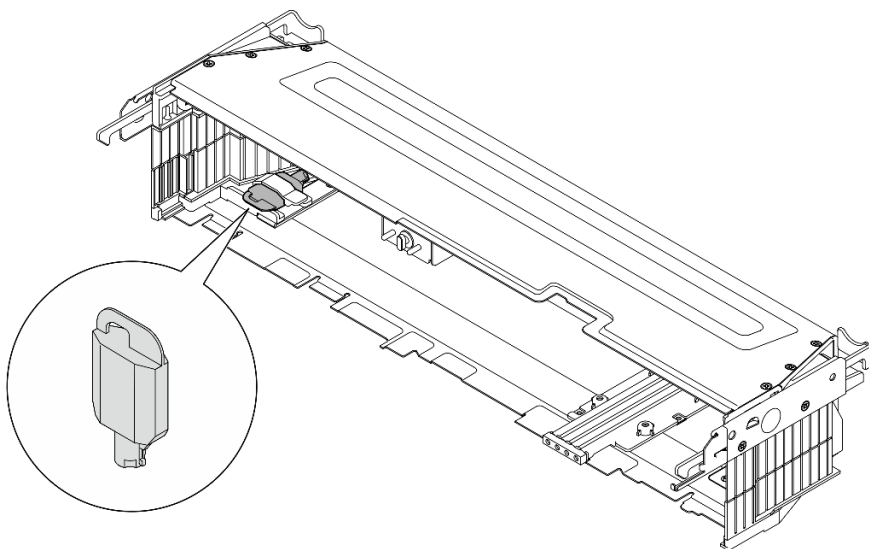
Figure 174. Security bezel key storage location

Procedure

Step 1. Make preparation for this task.

　　a. Make sure the following components are installed properly:

　　　• Air flow sensor board (see "Install the air flow sensor board" on page 38)

　　　• Bezel detect switch with cable (see "Install the bezel detect switch with cable" on page 41)

　　　• Security bezel keylock bracket (see "Install the security bezel keylock bracket" on page 173)

　　b. Connect the power cable and other necessary external cables to the node.

　　c. Power on the server and any peripheral devices. See "Power on the server" on page 10.

　　Note: When the security bezel is installed, the buttons and connectors on the front of the server are not accessible.

Step 2. If the security bezel slot fillers are installed, remove the fillers. See "Front I/O fillers" section of "Front View" in *User Guide* or *System Configuration Guide* to identify the fillers.

Step 3. Align the bottom guide pins of the security bezel with the slots on the chassis, and insert the bezel hooks in the slots on both sides.

　　Note: Make sure that the external cables go through both sides of the security bezel.
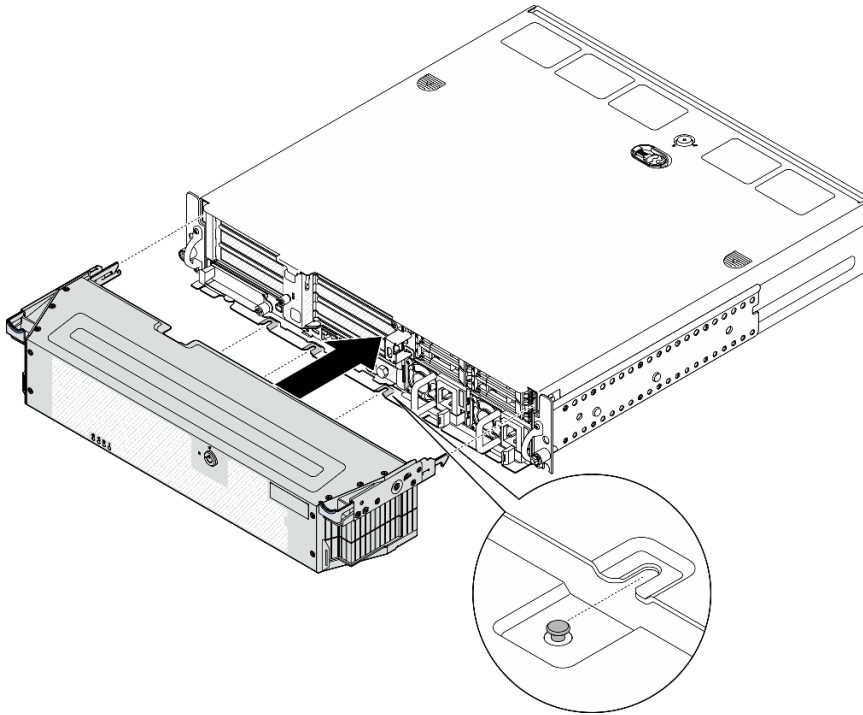
Figure 175. Installing the security bezel

Step 4.   Lock the security bezel with the key, and store the key for future use.

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Security bezel keylock bracket replacement

Follow instructions in this section to remove or install the security bezel keylock bracket.

Remove the security bezel keylock bracket

Follow instructions in this section to remove the security bezel keylock bracket.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1.   Loosen the screw that secures the security bezel keylock bracket.
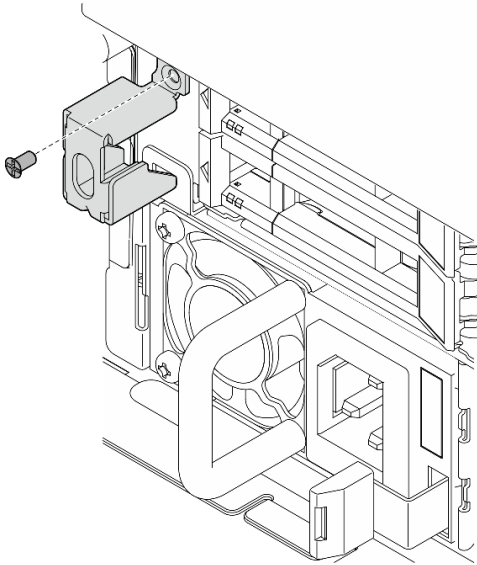
Figure 176. Removing the security bezel keylock bracket

Step 2.   Pinch and pivot the security bezel keylock bracket away from the chassis; then, remove the bracket.
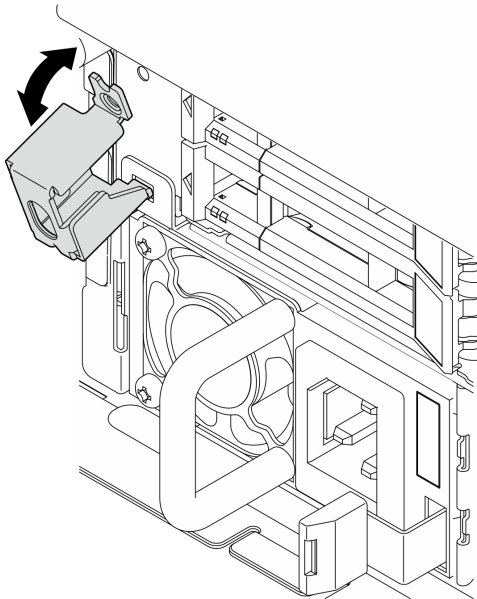
Figure 177. Removing the security bezel keylock bracket

After this task is completed

- Install a replacement unit. See "Install the security bezel keylock bracket" on page 173.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Install the security bezel keylock bracket

Follow instructions in this section to install the security bezel keylock bracket.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

Procedure

Step 1. Insert the lower end of security bezel keylock bracket into the slot on the chassis; then, push the bracket toward the chassis.
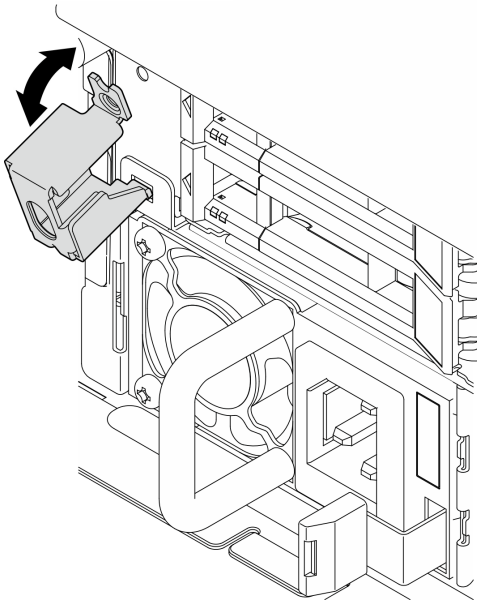
Figure 178. Installing the security bezel keylock bracket

Step 2. Fasten one screw to secure the bracket.
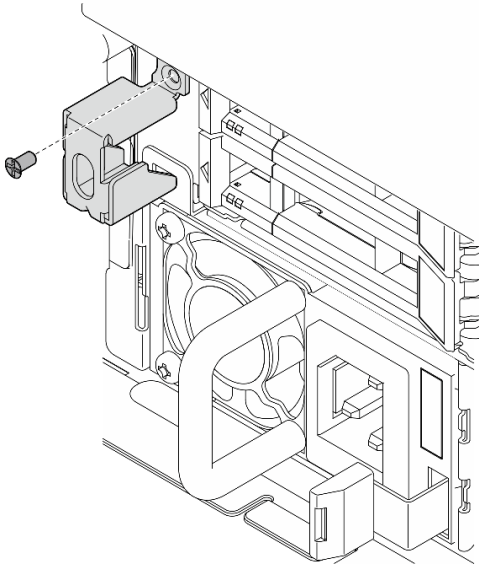
Figure 179. Installing the security bezel keylock bracket

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Serial port module replacement

Follow instructions in this section to remove or install the serial port module.

Remove the serial port module

Follow instructions in this section to remove the serial port module.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

    a. Remove the top cover. See "Remove the top cover" on page 195.

    b. Remove PCIe riser 1. See "Remove the PCIe riser assembly" on page 111. The serial port cable is disconnected from the system board when removing PCIe riser 1.

Step 2. Open the retainer, and remove the screw that secures the module.
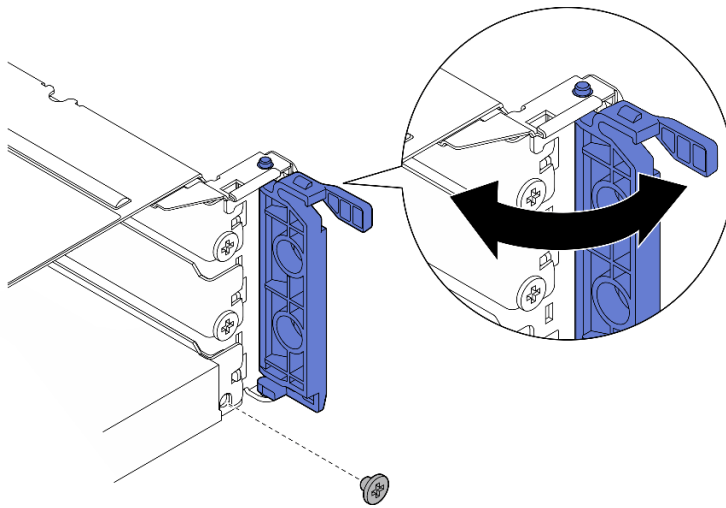
Figure 180. Removing the retaining screw

Step 3. Carefully slide the module out of the slot.

    Note: If no replacement module or adapter is to be installed in Slot 5, install the slot filler.
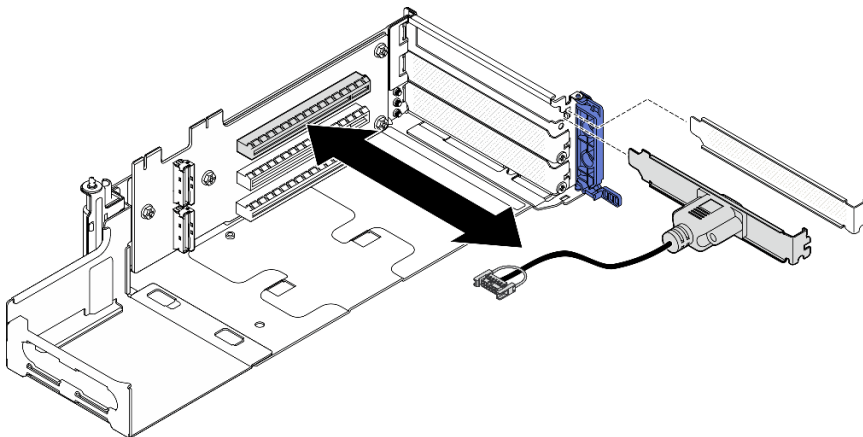
Figure 181. Removing the serial port module

After this task is completed

- Install a replacement unit. See "Install the serial port module" on page 176.
- If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo Video

Watch the procedure on YouTube

Install the serial port module

Follow instructions in this section to install the serial port module.

<u>S002</u>

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

Note: The serial port module can only be installed to Slot 5 in PCIe riser 1.

Procedure

Step 1.   Install the serial port module.

      a.   If a slot filler is installed, remove the filler.

      b.   Align the module with the slot; then, carefully slide the module into the slot until it is firmly seated.
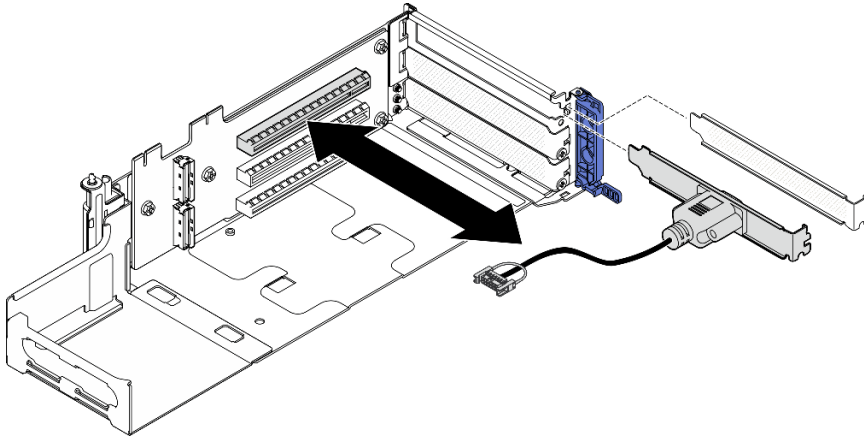
Figure 182. Installing the serial port module

Step 2. Fasten one screws to secure the module; then, close the retainer.
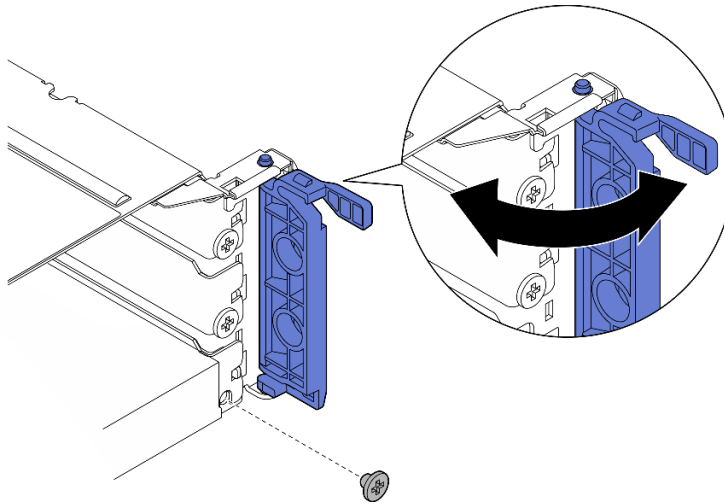
Figure 183. Installing the retaining screws

Step 3. Proceed to install PCIe riser 1. Connect the serial port cable to the system board when installing PCIe riser 1. See "Install the PCIe riser assembly" on page 126.

After this task is completed

1. Complete the parts replacement. See "Complete the parts replacement" on page 198.

2. To enable the serial port module on Linux or Microsoft Windows, do one of the followings according to the installed operating system:

   Note: If the Serial over LAN (SOL) or Emergency Management Services (EMS) feature is enabled, the serial port will be hidden on Linux and Microsoft Windows. Therefore, it is required to disable SOL and EMS to use the serial port on operating systems for serial devices.

   • For Linux:

     Open the ipmitool and enter the following command to disable the Serial over LAN (SOL) feature:

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

   • For Microsoft Windows:

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

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

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

```
Bcdedit /ems off
```

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

Demo Video

Watch the procedure on YouTube

System board replacement (trained technician only)

Follow instructions in this section to remove and install the system board.

Important:

- This task must be operated by trained technicians.
- If you need to replace a processor board and a firmware and RoT security module together, do the following:
  - Check the current PSB fuse policy before replacement. (Lenovo service technician only) See *Service process before replacement* at Service process for updating PSB fuse state.
  - Ensure that the processor fuse status is expected without unexpected XCC event logs after replacement. (Lenovo service technician only) See *Service process after replacing a processor board and a firmware and RoT security module together* at Service process for updating PSB fuse state.

CAUTION:
Hazardous moving parts. Keep fingers and other body parts away.

CAUTION:

The heat sinks and processors might be very hot. Turn off the server and wait several minutes to let the server cool before removing the server cover.

Remove the firmware and RoT security module

Follow instructions in this section to remove the Firmware and Root of Trust Security Module (firmware and RoT security module).

About this task
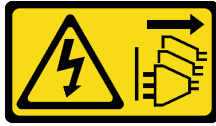
<u>S002</u>

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.

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do no attempt to remove or install the part without proper training and qualification.

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

- 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.

- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

- After replacing the firmware and RoT security module, update the firmware to the specific version supported by the server. Make sure that you have the required firmware or a copy of the pre-existing firmware before you proceed.

Procedure

Step 1. Make preparation for this task.

    a. Perform OneCLI commands to back up the UEFI settings. See https://pubs.lenovo.com/lxce-onecli/onecli_r_save_command.

    b. Perform both OneCLI commands and XCC actions to back up the XCC settings. See https://pubs.lenovo.com/lxce-onecli/onecli_r_save_command and https://pubs.lenovo.com/xcc2/NN1ia_c_backupthexcc.html.

    c. Remove the top cover. See "Remove the top cover" on page 195.

    d. Remove all the PCIe assemblies. If the configuration comes with PCIe riser 2 and internal drives, remove all the internal drives, and lift the internal drive backplane before removing PCIe riser 2. See "Remove the PCIe riser assembly" on page 111.

Step 2. Remove the firmware and RoT security module.
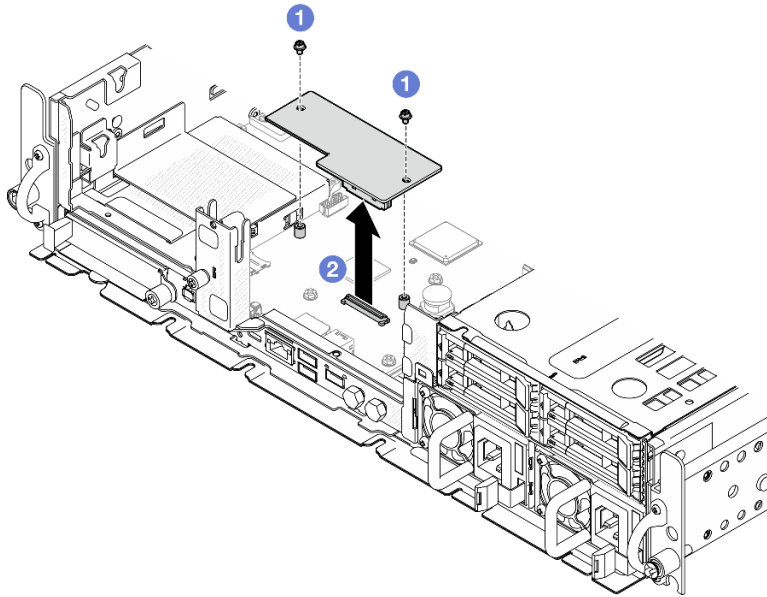
Figure 184. Firmware and RoT security module removal

a. ❶ Loosen the two screws on the firmware and RoT security module.

b. ❷ Lift the firmware and RoT security module out of the chassis.

After this task is completed

1. Install a replacement unit. See "Install the firmware and RoT security module" on page 180.

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

Demo Video

Watch the procedure on YouTube

Install the firmware and RoT security module

Follow instructions in this section to install the Firmware and Root of Trust Security Module (firmware and RoT security module).

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.

About this task

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do no attempt to remove or install the part without proper training and qualification.

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- 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.

- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

- After replacing the firmware and RoT security module, update the firmware to the specific version supported by the server. Make sure that you have the required firmware or a copy of the pre-existing firmware before you proceed.

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

- Go to https://datacentersupport.lenovo.com/products/servers/thinkedge/se455v3/7dby/downloads/driver-list/ to see the latest firmware and driver updates for your server.

- Go to "Update the firmware" in *User Guide* or *System Configuration Guide* for more information on firmware updating tools.

Procedure

Step 1. Install the firmware and RoT security module to the server.
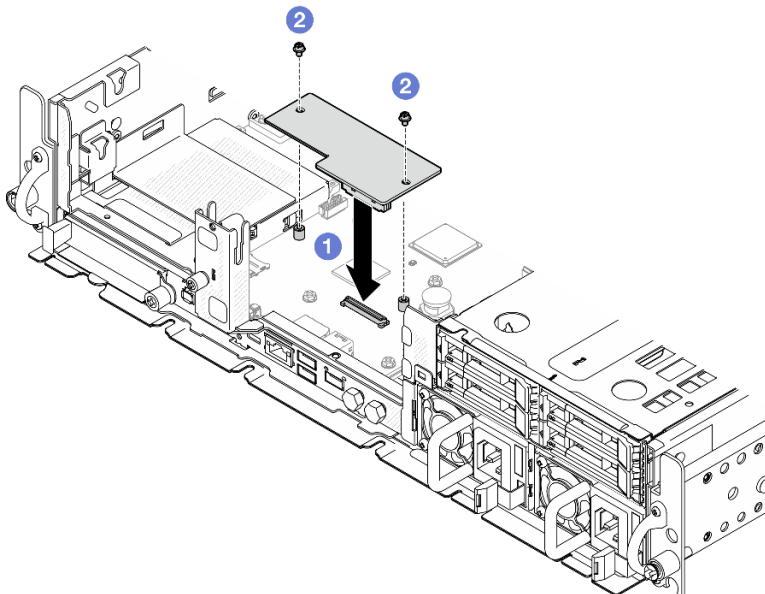
Figure 185. Firmware and RoT security module installation

    a. ❶ Lower the firmware and RoT security module onto the system board and ensure that the connector on the module is correctly inserted into the slot on the system board.

    b. ❷ Tighten the two screws to secure the firmware and RoT security module in place.

After this task is completed

1. Complete the parts replacement. See "Complete the parts replacement" on page 198.

2. Update the UEFI, XCC and LXPM firmware to the specific version supported by the server. (Lenovo service technician only) See https://glosse4lenovo.lenovo.com/wiki/glosse4lenovo/view/How%20To/System%20related/How%20to%20do%20RoT%20Module%20FW%20update%20on%20ThinkSystem%20V3%20machines/.

3. Perform OneCLI commands to restore the UEFI settings. See https://pubs.lenovo.com/lxce-onecli/onecli_r_restore_command.

4. Perform both OneCLI commands and XCC actions to restore the XCC settings. See https://pubs.lenovo.com/lxce-onecli/onecli_r_restore_command and https://pubs.lenovo.com/xcc2/NN1ia_c_restorethexcc.html.

5. Optionally, do the following if needed:

   • Hide TPM. See "Hide/observe TPM" on page 192.

   • Update the TPM firmware. See "Update the TPM firmware" on page 193.

   • Enable UEFI Secure Boot. See "Enable UEFI Secure Boot" on page 194.

Demo Video

Watch the procedure on YouTube

Manage the Self Encryption Drive Authentication Key (SED AK)

For ThinkEdge SE455 V3 with SED installed, the SED AK can be managed in Lenovo XClarity Controller. After setting up the server or making changes to the configuration, backing up the SED AK is a must operation to prevent data loss in the hardware failure case.

SED Authentication Key (AK) Manager

Log in to Lenovo XClarity Controller web interface, and go to **BMC Configuration ➙ Security ➙ SED Authentication Key (AK) Manager** to manage the SED AK.

Notes: The operation of SED AK Manager is not allowed in the following conditions:

• System Lockdown Mode is in **Active** state. SED AK is locked until the system is activated or unlocked. See "Activate or unlock the system" in *User Guide* or *System Configuration Guide* to activate or unlock the system.

• Current user does not have the authority to manage SED AK.

   – To generate, backup, and recover the SED AK with passphrase or backup file, the role of XCC user should be **Administrator**.

   – To recover the SED AK from automatic backup, the role of XCC user should be **Administrator+**.

SED encryption

The status of SED encryption can be changed from Disabled to Enabled. Complete the following process to enable SED encryption.

1. Press **Enabled** button.

2. Select the SED AK generation method:

   • **Generate key using Passphrase:** Set the password and re-enter it for the confirmation.

   • **Generate key randomly:** A Random SED AK will be generated.

3. Press **Apply** button.

Attention:

- Once SED encryptoin is Enabled, it cannot be changed back to Disabled.
- When SED encryption is enabled, it is necessary to power cycle the system after installing an SED; without power cycling, the SED will not be recognized by the host OS.

Change the SED AK

- **Generate key using Passphrase:** Set the password and re-enter it for the confirmation. Click **Re-generate** to get the new SED AK.
- **Generate key randomly:** Click **Re-generate** to get a Random SED AK.

Backup the SED AK

Set the password and re-enter it for the confirmation. Click **Start Backup** to backup the SED AK; then, download the SED AK file and store it safely for future use.

Note: If you use the backup SED AK file to restore a configuration, the system will ask for the password that you set here.

Recover the SED AK

- **Recover SED AK using Passphrase:** Use the password that was set in **Generate key using Passphrase** to recover the SED AK.
- **Recover SED AK from Backup file:** Upload the backup file generated in **Backup the SED AK** mode and enter the corresponding backup file password to recover the SED AK.
- **Recover SED AK from Automatic backup:** After system board replacement, use automatic backup to recover the SED AK for the installed SED.

  Note: To recover the SED AK from automatic backup, the role of XCC user should be **Administrator+**.

Remove the system board

Follow instructions in this section to remove the system board.

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.

S012

CAUTION:
Hot surface nearby.

About this task

Important:

- Removing and installing this component requires trained technicians. **Do not** attempt to remove or install the part without proper training.

- When replacing the system board, always update the server with the latest firmware or restore the pre-existing firmware. Make sure that you have the latest firmware or a copy of the pre-existing firmware before you proceed.

- When removing the memory modules, label the slot number on each memory module, remove all the memory modules from the system board, and set them aside on a static-protective surface for reinstallation.

- **When disconnecting cables, make a list of each cable and record the connectors the cable is connected to, and use the record as a cabling checklist after installing the new system board.**

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.

- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.

- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.

Procedure

Step 1. Make preparation for this task.

    a. Record all system configuration information, such as Lenovo XClarity Controller IP addresses, vital product data, and the machine type, model number, serial number, Universally Unique Identifier, and asset tag of the server.

    b. If SED encryption is enabled, maintain a backup of SED AK. See "Manage the Self Encryption Drive Authentication Key (SED AK) " on page 182.

    c. If applicable, export Lenovo Features on Demand activation key. See the "License Management" section in the XCC documentation compatible with the server at https://pubs.lenovo.com/lxcc-overview/.

    d. Save the system configuration to an external device with Lenovo XClarity Essentials.

    e. Save the system event log to external media.

    f. If applicable, remove the OCP module. See "Remove the OCP module" on page 108.

    g. Remove the top cover. See "Remove the top cover" on page 195.

    h. If applicable, remove all the internal drives. See "Remove an internal drive" on page 69.

    i. If applicable, remove the internal drive backplane. See "Remove the internal drive backplane" on page 71.

    j. If applicable, remove internal drive cage. See "Remove the internal drive cage" on page 73.

    k. Remove all the PCIe assemblies. See "Remove the PCIe riser assembly" on page 111.

    l. Remove the processor air baffle. See "Remove the processor air baffle" on page 29.

    m. Remove the intrusion switch. See "Remove the intrusion switch with cable" on page 82.

    n. Remove all the fan modules. See "Remove a fan module" on page 52.

    o. Remove the fan cage. See "Remove the fan cage" on page 55.

    p. Remove the fan control board (FCB). See "Remove the fan control board (FCB)" on page 56.

q. If applicable, remove the air flow sensor board. See "Remove the air flow sensor board" on page 37.

r. Make sure to label the slot number on each memory module, remove all the memory modules from the system board assembly, and set them aside on a static-protective surface for reinstallation. See "Remove a memory module" on page 98.

s. Remove the firmware and RoT security module. See "Remove the firmware and RoT security module" on page 178.

t. If applicable, remove the MicroSD card from the system board to install it onto the new system board. See "Remove the MicroSD card" on page 104.

u. Remove the heat sink and the processor. See "Remove a heat sink" on page 152 and "Remove a processor" on page 154.

Step 2. Disconnect all the cables from the system board. While disconnecting the cables, make a list of each cable and record the connectors the cable is connected to, and use the record as a cabling checklist after installing the new system board.

Step 3. Pull the plunger up; then, hold the plunger and the handle, and slide the system board slightly backward to disengage it from the chassis.
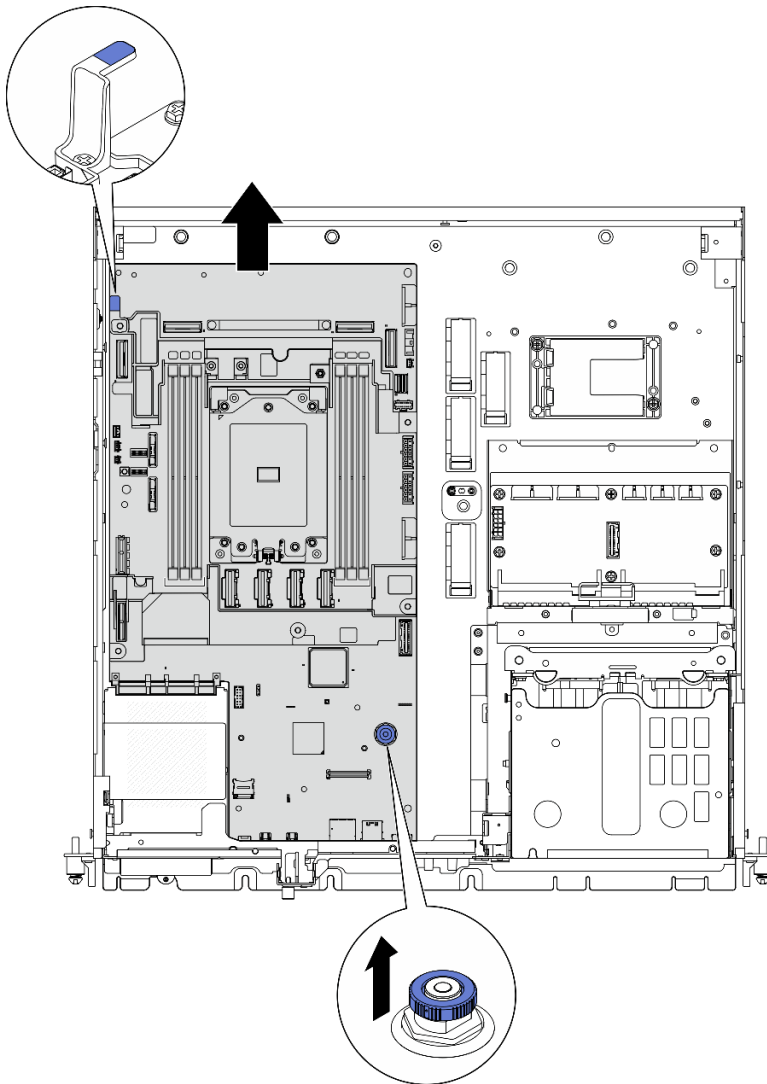
Figure 186. Disengaging the system board

Step 4.   Rotate the left end of the system board up to remove the system board from the chassis.
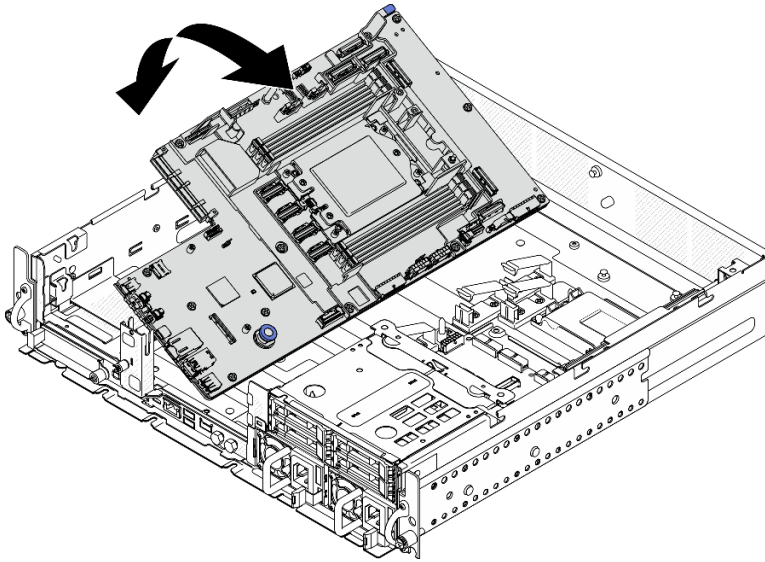
Figure 187. Removing the system board

After this task is completed

- Install a replacement unit. See "Install the system board" on page 186.

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

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

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

   2. Gently press down the socket cover legs to the processor socket assembly, pressing on the edges to avoid damage to the socket pins. You might hear a click on the socket cover is securely attached.

   3. **Make sure** that the socket cover is securely attached to the processor socket assembly.

- If you plan to recycle the component, see "Disassemble the system board for recycle" in *User Guide*.

Demo Video

Watch the procedure on YouTube

Install the system board

Follow instructions in this section to install the system board.

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.

S012

CAUTION:
Hot surface nearby.

About this task

Important: Removing and installing this component requires trained technicians. **Do not** attempt to remove or install the part without proper training.

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- Touch the static-protective package that contains the component to any unpainted metal surface on the server; then, remove it from the package and place it on a static-protective surface.

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

- Go to https://datacentersupport.lenovo.com/products/servers/thinkedge/se455v3/7dby/downloads/driver-list/ to see the latest firmware and driver updates for your server.
- Go to "Update the firmware" in *User Guide* or *System Configuration Guide* for more information on firmware updating tools.

Procedure

Step 1.   Place the right end of the system board into the chassis; then, lower the left end of the system board into the chassis.

   Note: Make sure that the system board does not cover any cables in the chassis.
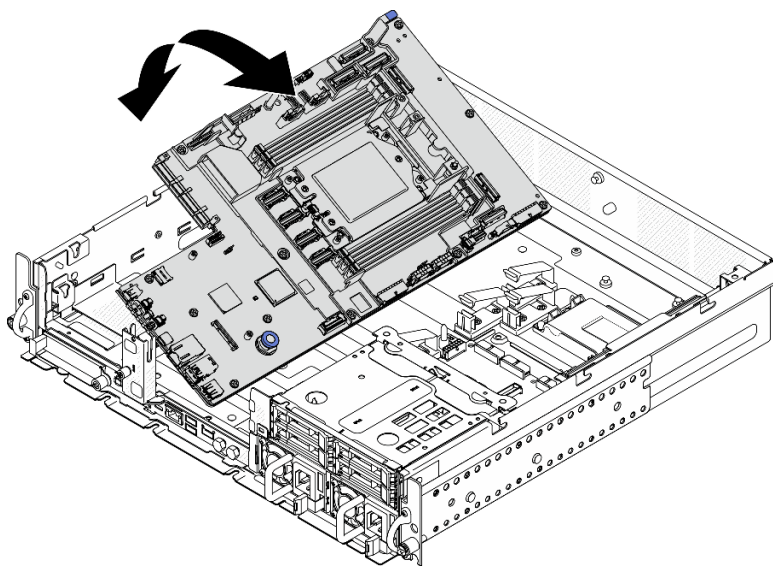
Figure 188. Installing the system board

Step 2.   Hold the handle and the plunger, and slide the system board slightly forward until it clicks into place.
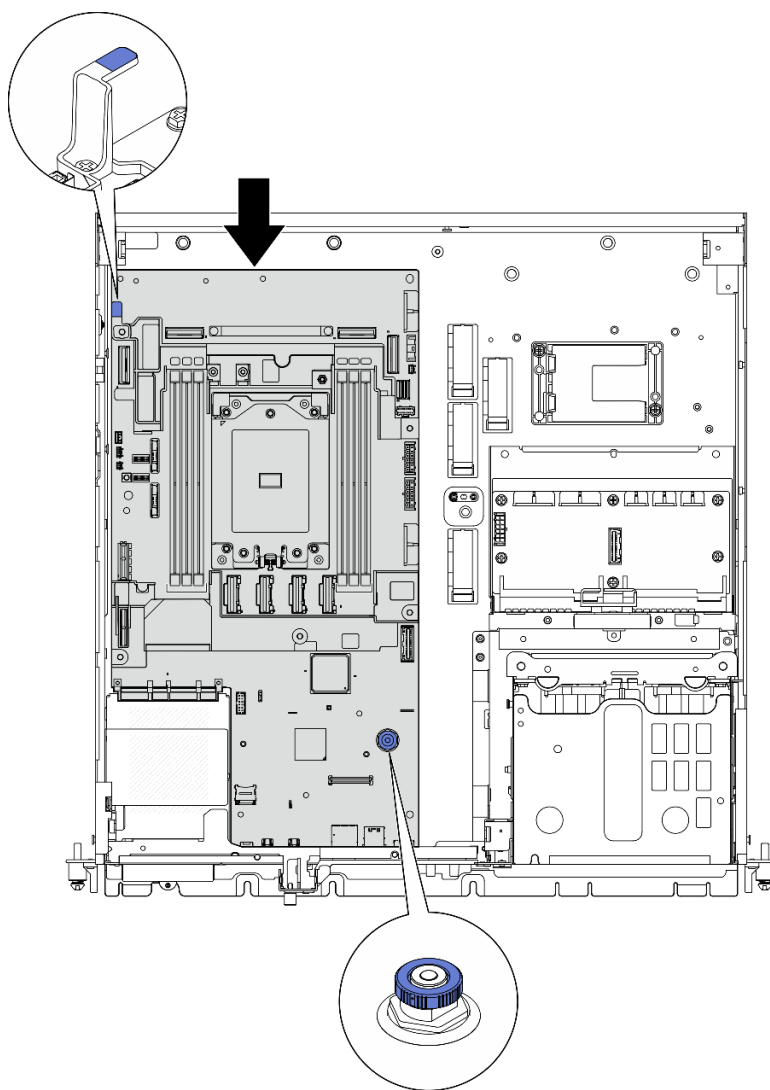
Figure 189. Securing the system board

Step 3. Peel away the XClarity Controller network access label on the processor socket cover, and attach it to the network access tag on the front of the server.
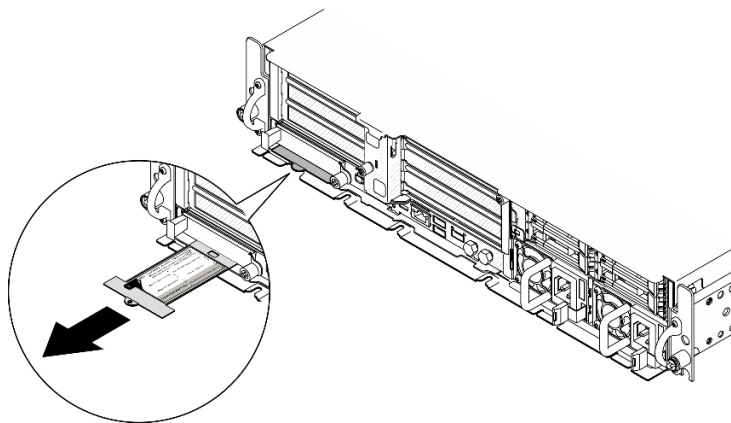
Figure 190. Lenovo XClarity Controller network access label on the pull-out information tab

After this task is completed

1. Reinstall the processor and the heat sink. See "Install a heat sink" on page 157 and "Install a processor" on page 156.

2. Reconnect all the required cables to the same connectors on the system board as the defective system board.

3. If applicable, reinstall the MicroSD card. See "Install the MicroSD card" on page 106.

4. Reinstall the firmware and RoT security module. See "Install the firmware and RoT security module" on page 180.

5. Reinstall all the memory modules. See "Install a memory module" on page 101.

6. If applicable, reinstall the air flow sensor board. See "Install the air flow sensor board" on page 38.

7. Reinstall the fan control board. See "Install the fan control board (FCB)" on page 57.

8. Reinstall the fan cage. See "Install the fan cage" on page 59.

9. Reinstall all the fan modules. See "Install a fan module" on page 53.

10. Reinstall the intrusion switch. See "Install the intrusion switch with cable" on page 84.

11. Reinstall the processor air baffle. See "Install the processor air baffle" on page 35

12. Reinstall PCIe riser 1 and PCIe riser 2. See "Install the PCIe riser assembly" on page 126.

13. If applicable, reinstall the internal drive cage. See "Install the internal drive cage" on page 74.

14. If applicable, reinstall the internal drive backplane. See "Install the internal drive backplane" on page 76.

15. If applicable, reinstall all the internal drives. See "Install an internal drive" on page 80.

16. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside the server.

17. Reinstall the top cover. See "Install the top cover" on page 196.

18. If applicable, reinstall the OCP module. See "Install the OCP module" on page 109.

19. If the server was installed in a rack, reinstall the server into the rack. See "Install the server to the rack" on page 19.

20. Reconnect the power cords and any cables that you removed.

21. Reset the system date and time.

22. Update the vital product data (VPD). See "Update the Vital Product Data (VPD)" on page 191.

    Machine type number and serial number can be found on the ID label, see "Identify the server and access to the Lenovo XClarity Controller" in *User Guide* or *System Configuration Guide*.

23. Update the UEFI, XCC and LXPM firmware to the specific version supported by the server. See "Update the firmware" in *User Guide* or *System Configuration Guide*..

24. If applicable, install Lenovo Features on Demand activation key. See the "License Management" section in the XCC documentation compatible with the server at https://pubs.lenovo.com/lxcc-overview/.

25. Update the public key. See the "Update Device Key" section of https://download.lenovo.com/servers_pdf/thinkshield-web-application-user-guide-v2.pdf for more details.

    Notes:

    - The role of Lenovo ID should be **Maintenance User** to update the public key in ThinkShield Key Vault Portal web interface or ThinkShield mobile app.

    - (Lenovo service technician only) See https://glosse4lenovo.lenovo.com/wiki/glosse4lenovo/view/How%20To/System%20related/ThinkEdge/HowTo_update_PublicKey_after_board_replacement/ for the details.

26. If hiding TPM or updating TPM firmware is needed, see "Hide/observe TPM" on page 192 or "Update the TPM firmware" on page 193.

27. Optionally, enable UEFI Secure Boot. See "Enable UEFI Secure Boot" on page 194.

28. Reconfigure the following ThinkEdge security features if necessary.

    a. Change System Lockdown Control status to ThinkShield Portal. See "Activate or unlock the system" in *User Guide* or *System Configuration Guide*.

    b. Enable SED encryption. See "Manage the Self Encryption Drive Authentication Key (SED AK) " on page 182.

    c. Recover SED AK. See "Manage the Self Encryption Drive Authentication Key (SED AK) " on page 182.

    d. Enable security features. See "System Lockdown Mode" in *User Guide* or *System Configuration Guide*.

Demo Video

Watch the procedure on YouTube

Update the Vital Product Data (VPD)

Use this topic to update the Vital Product Data (VPD).

- **(Required)** Machine type
- **(Required)** Serial number
- **(Required)** System model
- (Optional) Asset tag
- (Optional) UUID

Recommended tools:

- Lenovo XClarity Provisioning Manager
- Lenovo XClarity Essentials OneCLI commands

Using Lenovo XClarity Provisioning Manager

Steps:

1. Start the server and press the key according to the on-screen instructions. The Lenovo XClarity Provisioning Manager interface is displayed by default.

2. Click ⚙ on the top right corner of the Lenovo XClarity Provisioning Manager main interface.

3. Click **Update VPD**; then, follow on-screen instructions to update the VPD.

Using Lenovo XClarity Essentials OneCLI commands

- Updating **machine type**
  `onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model> [access_method]`

- Updating **serial number**
  `onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n> [access_method]`

- Updating **system model**
  `onecli config set SYSTEM_PROD_DATA.SysInfoProdIdentifier <system model> [access_method]`
  `onecli config set SYSTEM_PROD_DATA.SysInfoProdIdentifierEx <system model> --override [access_method]`

- Updating **asset tag**
  `onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag> [access_method]`

- Updating **UUID**
  `onecli config createuuid SYSTEM_PROD_DATA.SysInfoUUID` *[access_method]*

Variable	Description
<m/t_model>	The server machine type and model number. Type `xxxxyyy`, where `xxxx` is the machine type and `yyy` is the server model number.
<s/n>	The serial number on the server. Type `zzzzzzz`, where `zzzzzzz` is the serial number.
<system model>	The system model on the server. Type `system yyyyyyyy`, where *yyyyyyyy* is the product identifier.
<asset_tag>	The server asset tag number. Type `aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa`, where `aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa` is the asset tag number.
[access_method]	The access method that you select to access the target server. • Online KCS (unauthenticated and user restricted): You can directly delete *[access_method]* from the command. • Online authenticated LAN: In this case, specify below LAN account information at the end of the OneCLI command: `--bmc-username` *<user_id>* `--bmc-password` *<password>* • Remote WAN/LAN: In this case, specify below XCC account information and IP address at the end of the OneCLI command: `--bmc` *<bmc_user_id>*:*<bmc_password>*@*<bmc_external_IP>* **Notes:** – *<bmc_user_id>* The BMC account name (1 of 12 accounts). The default value is USERID. – *<bmc_password>* The BMC account password (1 of 12 accounts).

Hide/observe TPM

TPM is enabled by default to encrypt data transfer for system operation. Optionally, you can disable TPM using Lenovo XClarity Essentials OneCLI.

To disable TPM, do the following:

1. Download and install Lenovo XClarity Essentials OneCLI.

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

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

2. Run the following command:
   `OneCli.exe config set TrustedComputingGroup.HideTPMfromOS "Yes" --imm` *<userid>*:*<password>*@*<ip_address>*
   `--override`

   where:

- *<userid>:<password>* are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSW0RD (zero, not an uppercase o)

- *<ip_address>* is the IP address of the BMC.

Example:

```
D:\onecli>OneCli.exe config set TrustedComputingGroup.HideTPMfromOS "Yes" --imm USERID:PASSW0RD=1@10.245.39.79 --override

Lenovo XClarity Essentials OneCLI 1xce_onecli01p-2.3.0
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(C) Copyright Lenovo Corp. 2013-2018 All Rights Reserved
If the parameters you input includes password, please Note that:
* The password must consist of a sequence of characters from `0-9a-zA-Z_-+.$%@!^&*()=` set
* Use "" to quote when password parameters include special characters
* Do not use reserved characters in path name when parameter contains path
Invoking SET command ...
Connected to BMC at IP address 10.245.39.79 by IPMI
TrustedComputingGroup.HideTPMfromOS=Yes
Success.
```

3. Reboot the system.

If you want to enable TPM again, run the following command and reboot the system:
`OneCli.exe config set TrustedComputingGroup.HideTPMfromOS "No" --imm <userid>:<password>@<ip_address> --override`

Example:

```
D:\onecli3>OneCli.exe config set TrustedComputingGroup.HideTPMfromOS "No" --imm USERID:PASSW0RD=11@10.245.39.79 --override

Lenovo XClarity Essentials OneCLI 1xce_onecli01h-3.0.1
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OneCLI License Agreement and OneCLI Legal Information can be found at the following location:
    "D:\onecli3\Lic"

[1s]Certificate check finished [100%][========================================================================================

Invoking SET command ...
Connected to BMC at IP address 10.245.39.79 by IPMI
TrustedComputingGroup.HideTPMfromOS=No
Configure successfully, please reboot system.
Succeed.
```

Update the TPM firmware

Optionally, you can update the TPM firmware using Lenovo XClarity Essentials OneCLI.

Note: TPM firmware update is irreversible. After update, the TPM firmware cannot be downgraded to earlier versions.

TPM firmware version

Follow the procedure below to see the TPM firmware version:

From Lenovo XClarity Provisioning Manager

1. Start the server and press the key specified in the on-screen instructions to display the Lenovo XClarity Provisioning Manager interface. (For more information, see the "Startup" section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.)

2. If the power-on Administrator password is required, enter the password.

3. From the UEFI Setup page, click **System Settings** ➙ **Security** ➙ **Trusted Platform Module** ➙ **TPM 2.0** ➙ **TPM Firmware Version**.

Update the TPM firmware

To update the TPM firmware, do the following:

1. Download and install Lenovo XClarity Essentials OneCLI.

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

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

2. Run the following command:
   `OneCli.exe config set TrustedComputingGroup.DeviceOperation "Update to TPM 2.0 firmware version <x.x.x.x>" --bmc` *<userid>:<password>@<ip_address>*

   where:

   - *<x.x.x.x>* is the target TPM version.

     e.g. TPM 2.0 (7.2.1.0) -> TPM 2.0 (7.2.2.0):

     `OneCli.exe config set TrustedComputingGroup.DeviceOperation "Update to TPM 2.0 firmware version 7.2.2.0" --bmc` *<userid>:<password>@<ip_address>*

   - *<userid>:<password>* are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSW0RD (zero, not an uppercase o).

   - *<ip_address>* is the IP address of the BMC.

Enable UEFI Secure Boot

Optionally, you can enable UEFI Secure Boot.

There are two methods available to enable UEFI Secure Boot:

- From Lenovo XClarity Provisioning Manager

  To enable UEFI Secure Boot from Lenovo XClarity Provisioning Manager:

  1. Start the server and press the key specified in the on-screen instructions to display the Lenovo XClarity Provisioning Manager interface. (For more information, see the "Startup" section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.)

  2. If the power-on Administrator password is required, enter the password.

  3. From the UEFI Setup page, click **System Settings ➙ Security ➙ Secure Boot**.

  4. Enable Secure Boot and save the settings.

  Note: If disabling UEFI secure boot is needed, select Disable in step 4.

- From Lenovo XClarity Essentials OneCLI

  To enable UEFI Secure Boot from Lenovo XClarity Essentials OneCLI:

  1. Download and install Lenovo XClarity Essentials OneCLI.

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

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

  2. Run the following command to enable Secure Boot:
     `OneCli.exe config set SecureBootConfiguration.SecureBootSetting Enabled --bmc` *<userid>:<password>@<ip_address>*

     where:

     - *<userid>:<password>* are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSW0RD (zero, not an uppercase o)

     - *<ip_address>* is the IP address of the BMC.

     For more information about the Lenovo XClarity Essentials OneCLI `set` command, see:

Note: If disabling UEFI secure boot is needed, run the following command:
OneCli.exe config set SecureBootConfiguration.SecureBootSetting Disabled --bmc *<userid>:<password>@<ip_ address>*

Top cover replacement

Follow instructions in this section to remove and install the top cover.

Remove the top cover

Follow instructions in this section to remove the top cover.

S014

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

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 10.
- If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 11.
- If applicable, remove the security bezel. See "Remove the security bezel" on page 166.

Procedure

Step 1.   Remove the top cover.

a.   ❶ Unlock the top cover with the key that is stored in the key holder on the top cover.

Important: Before moving the top cover, make sure that the keylock is in the unlock position.
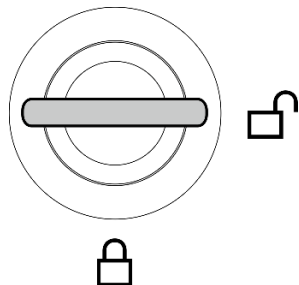
Figure 191. Unlock position of the keylock

b.   ❷ Press and hold on the button and the blue touch point to disengage the top cover.

c.   ❸ Slide and lift the cover to remove it from the chassis; then, place it on a flat clean surface.

Attention:

- Service label is located on the inside of the top cover.
- For proper cooling and air flow, install the top cover before you power on the server. Operating the server with the top cover removed might damage server components.
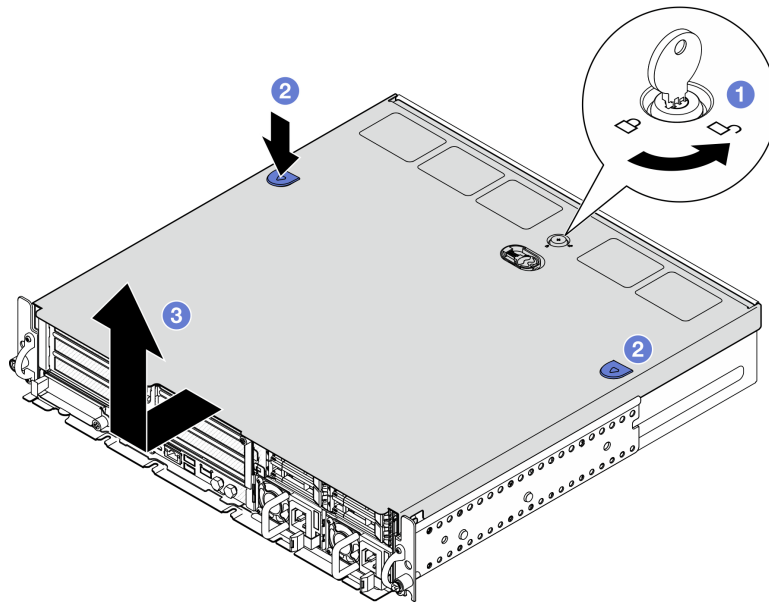
Figure 192. Removing top cover

After this task is completed

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

Demo Video

Watch the procedure on YouTube

Install the top cover

Follow instructions in this section to install the top cover.

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.

About this task

Attention:

- Read "Installation Guidelines" on page 1 and "Safety inspection checklist" on page 2 to ensure that you work safely.
- Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside the server.
- Make sure that all internal cables are correctly routed. See Chapter 2 "Internal cable routing" on page 199.

Procedure

Step 1. Install the top cover.

    a. ❶ Align the top cover with the guiding slots on both sides of the chassis; then, slide it backwards until it is firmly seated.

    b. ❷ Lock the top cover with the key, and store the key to the key holder on the top cover for future use.
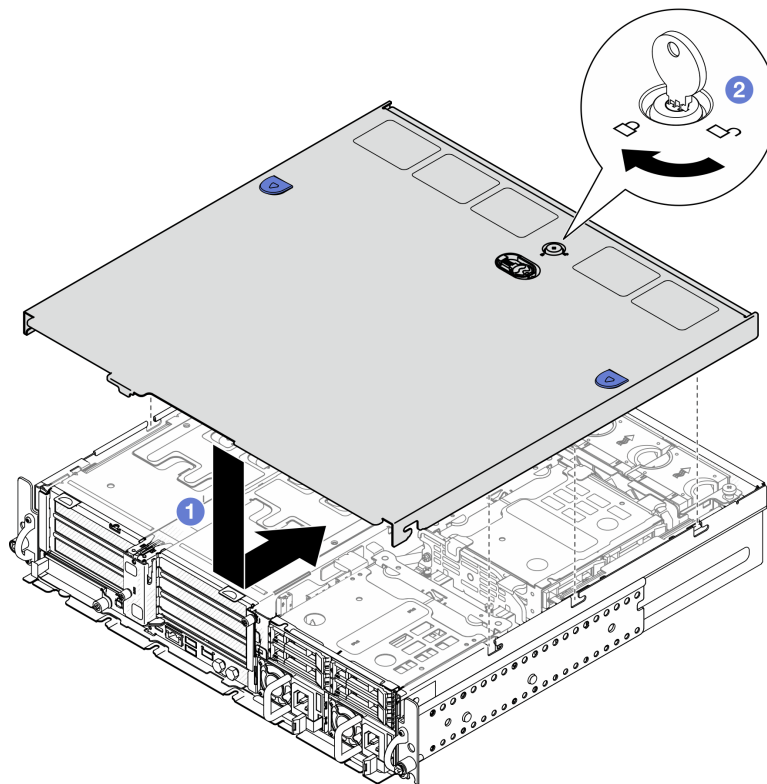
Figure 193. Installing top cover

After this task is completed

Complete the parts replacement. See "Complete the parts replacement" on page 198.

Demo Video

Watch the procedure on YouTube

Complete the parts replacement

Go through the checklist to complete parts replacement

To complete the parts replacement, do the following:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your server.

2. Properly route and secure the cables in the server. Refer to the cable connecting and routing information for each component.

3. If applicable, reinstall the air baffles. See "Install the processor air baffle" on page 35 and "Install the M.2 air baffle" on page 27.

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

4. Reinstall the top cover. See "Install the top cover" on page 196.

5. If the server was installed in a rack, reinstall the server into the rack. See "Install the server to the rack" on page 19.

6. Reconnect the power cords and any cables that you removed.

   Attention: To avoid component damage, connect the power cords last.

7. Install the I/O fillers when the connectors are not used. The connectors could be damaged without proper protection of the fillers. See "Front I/O fillers" in *User Guide* or *System Configuration Guide*.

8. Activate or unlock the server if necessary. See "Activate or unlock the system" in *User Guide* or *System Configuration Guide*.

9. Power on the server and any peripheral devices. See "Power on the server" on page 10.

10. If applicable, reinstall the security bezel. See "Install the security bezel" on page 169.

11. Update the server configuration.

    - Download and install the latest device drivers: http://datacentersupport.lenovo.com.

    - Update the system firmware. See "Update the firmware" in *User Guide* or *System Configuration Guide*.

    - Update the UEFI configuration. See https://pubs.lenovo.com/uefi-overview/.

    - Reconfigure the disk arrays if you have installed or removed a hot-swap drive or a RAID adapter. See https://pubs.lenovo.com/lxpm-overview/ for the LXPM documentation compatible with your server.

Chapter 2. Internal cable routing

See this section to do cable routing for specific components.

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.

Identifying connectors

See this section to locate and identify the connectors on the electric boards.

Drive backplane connectors

See this section to locate the connectors on the drive backplanes.

Two types of drive backplanes are supported in this server:

SAS/SATA backplane

See this section to locate the connectors on the SAS/SATA drive backplane.

1 Power connector
2 SAS/SATA connector
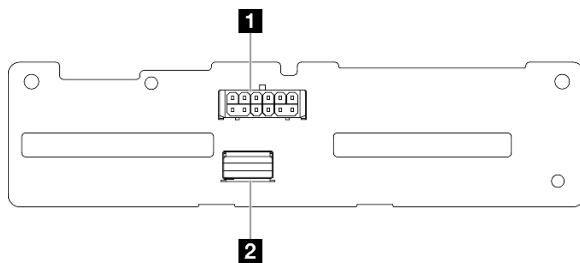
Figure 194. SAS/SATA backplane connectors

NVMe backplane

See this section to locate the connectors on the NVMe drive backplane.

1 NVMe 2-3
2 NVMe 0-1
3 Power connector
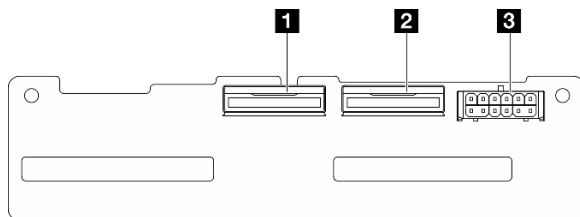
Figure 195. NVMe backplane

Fan control board (FCB) connectors

See this section to locate the connectors on the fan control board.

1 Fan 1 connector
2 Fan 2 connector
3 Fan 3 connector
4 Fan 4 connector
5 Fan 5 connector
6 Fan power connector
7 Fan sideband connector
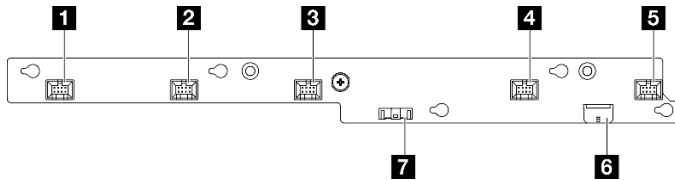
Figure 196. Fan control board connectors

Power distribution board connectors

See this section to locate the connectors on the power distribution board.

1 System board power connector 1
2 System board power connector 2
3 GPU 1 power connector
4 GPU 2 power connector
5 Fan power connector
6 PDB sideband connector
7 PSU 1 power connector
8 PSU 2 power connector
9 Riser 2 power connector (R RISER PWR)
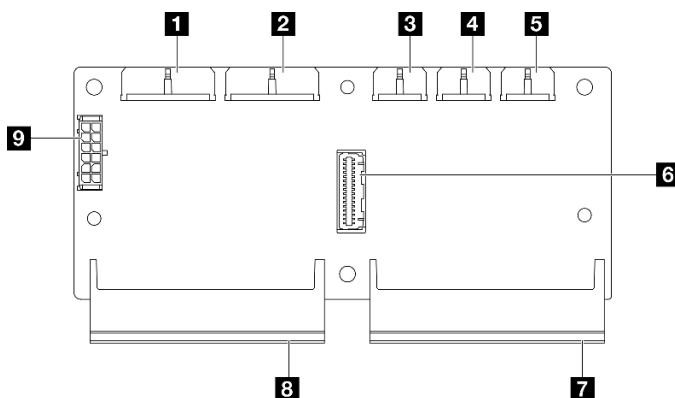
Figure 197. Power distribution board connectors

PCIe riser card connectors

See this section to locate the connectors on the PCIe riser cards.

Two types of PCIe riser cards are supported in this server:

PCIe riser 1 riser card

See this section to locate the connectors on the PCIe riser 1 riser card.

1 MCIO 2 connector
2 MCIO 1 connector
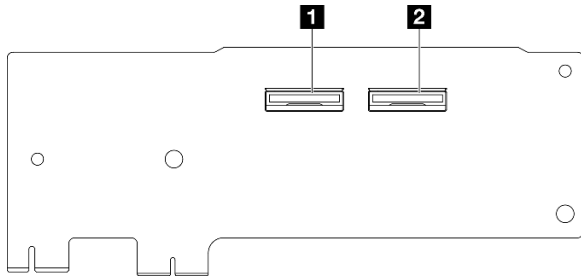
Figure 198. PCIe riser 1 riser card

1 PCIe x16 (Gen5 x16) slot
2 PCIe x16 (Gen4 x8) slot
3 PCIe x16 (Gen4 x8) slot
4 MCIO 3 connector
5 MCIO 4 connector
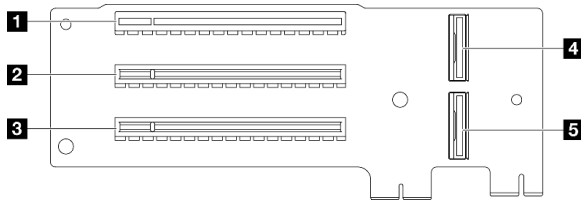
Figure 199. PCIe riser 1 riser card

PCIe riser 2 riser card

See this section to locate the connectors on the PCIe riser 2 riser card.

1 MCIO 3 connector
2 MCIO 4 connector
3 MCIO 1 connector
4 MCIO 2 connector
5 Riser 2 power connector
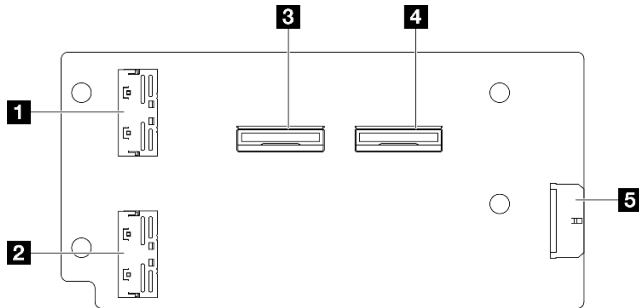
Figure 200. PCIe riser 2 riser card

1 PCIe x16 (Gen4 x8) slot
2 PCIe x16 (Gen5 x16) slot
3 PCIe x16 (Gen4 x8) slot
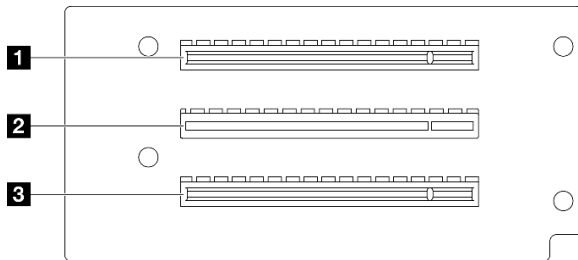
Figure 201. PCIe riser 2 riser card

System-board connectors for cable routing

The following illustrations show the internal connectors on the system board that are used for internal cable routing.
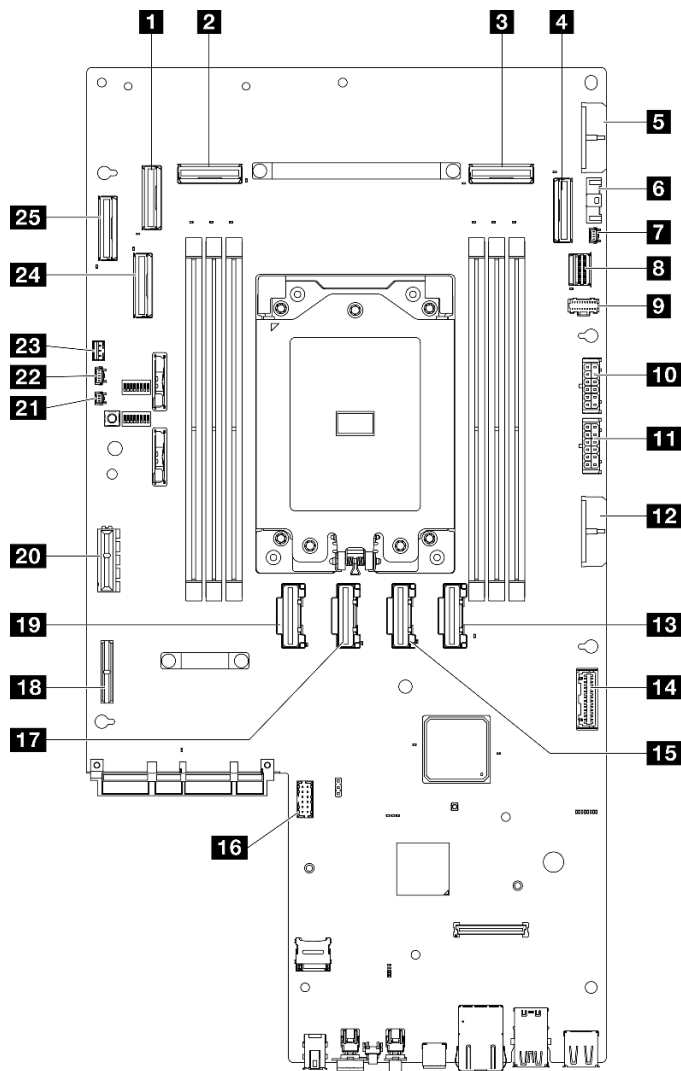
Figure 202. System-board connectors

Table 9. System-board connectors

1 PCIe 9 connector	**14** Power distribution board signal connector (PDB Sideband)
2 PCIe 8 connector	**15** PCIe 5 connector
3 PCIe 3 connector	**16** Serial port connector (COM)
4 PCIe 2 connector	**17** PCIe 6 connector
5 System board power 2 connector (PDB PWR 2)	**18** Riser 1 power connector
6 Fan signal connector (FCB Sideband)	**19** PCIe 7 connector
7 Heat sink detect connector	**20** Riser 1 signal connector (Riser1 Sideband)
8 M.2 signal connector (PCIe 1)	**21** Bezel detect connector
9 M.2 power connector (M.2 Sideband)	**22** Air flow sensor board connector (Air Velocity Sensor)
10 Internal backplane power connector	**23** Intrusion switch connector

Table 9. System-board connectors (continued)

11 Front backplane power connector	**24** PCIe 10 connector
12 System board power 1 connector (PDB PWR 1)	**25** PCIe 11 connector
13 PCIe 4 connector	

Power distribution board (PDB) and fan control board (FCB) cable routing

Follow the instructions in this section to learn how to do cable routing for the power distribution board (PDB) and fan control board (FCB).

This section provides cable routing instructions for the following cables:

Cable	From	To
1 FCB sideband cable, 120mm	FCB: Fan sideband connector	System board: Fan signal connector (FCB Sideband)
2 System-board power 2 cable, 220mm	PDB: System board power connector 2	System board: System board power 2 connector (PDB PWR 2)
3 FCB power cable, 150mm	FCB: Fan power connector	PDB: Fan power connector
4 PDB sideband cable, 250mm	PDB: PDB sideband connector	System board: Power distribution board signal connector (PDB Sideband)
5 System-board power 1 cable, 200mm	PDB: System board power connector 1	System board: System board power 1 connector (PDB PWR 1)

Complete the following procedure to route the cables properly.

Procedure
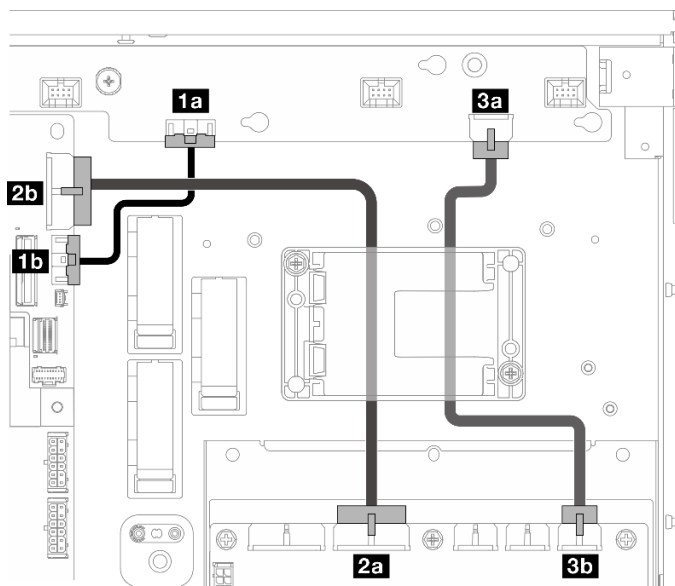
Figure 203. PDB and FCB cable routing

Step 1. Connect **1** FCB sideband cable to the following connectors:

- **1a** Fan sideband connector on the fan control board
- **1b** Fan signal connector (FCB Sideband) on the system board

    Note: Do not route cable **1** into any cable clip.

Step 2. Connect **2** System-board power 2 cable to the following connectors:

- **2a** System board power connector 2 on the PDB
- **2b** System board power 2 connector (PDB PWR 2) on the system board

    Note: Place cable **2** above cable **1**.

Step 3. Connect **3** FCB power cable to the following connectors:

- **3a** Fan power connector on the fan control board
- **3b** Fan power connector on the PDB

Step 4. Install the flash power module holder to secure cable **2** and **3** under the holder. See "Install a RAID flash power module to the holder" on page 161.
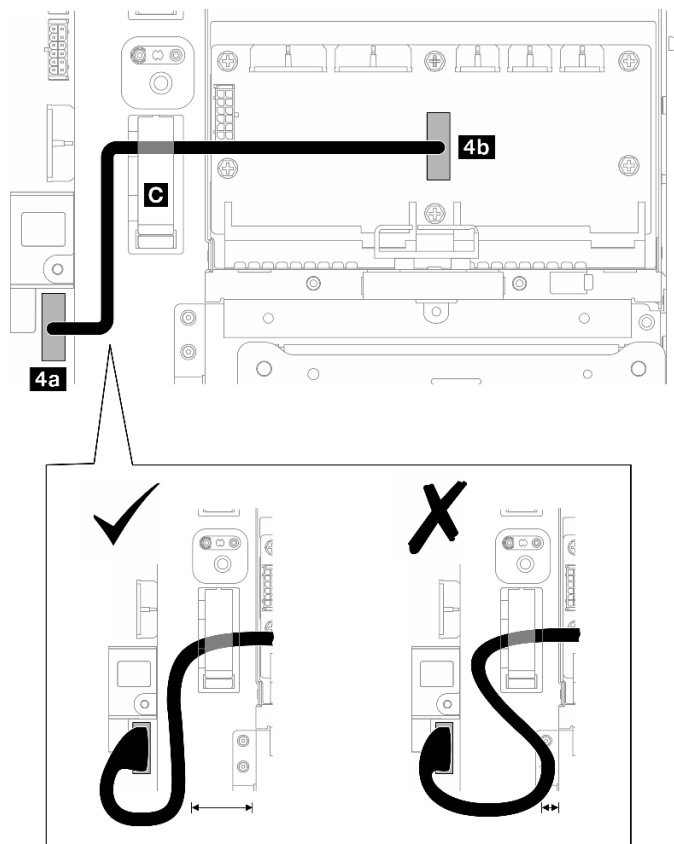
Figure 204. PDB sideband cable routing

Step 5. Connect **4** PDB sideband cable.

- a. Open cable clip **C**.
- b. Connect the cable to **4a** Power distribution board signal connector (PDB Sideband) on the system board.
- c. Route the cable into cable clip **C**.

d. Connect the cable to **4b** PDB sideband connector on the PDB.

e. Route the cable away from the PSU cage as shown.
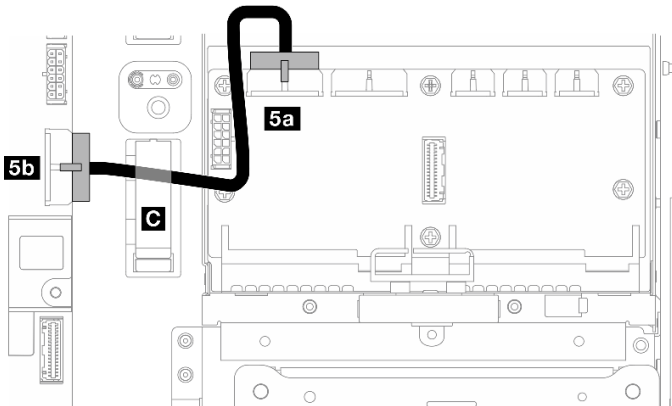
Figure 205. System-board power 1 cable routing

Step 6. Connect **5** System-board power 1 cable.

a. Connect the cable to **5a** System board power connector 1 on the PDB.

b. Route the cable into cable clip **C**.

c. Twist the cable as shown, and connect it to **5b** System board power 1 connector (PDB PWR 1) on the system board.

d. Close cable clip **C** to secure the cables.

M.2 backplane cable routing

Follow the instructions in this section to learn how to do cable routing for the M.2 backplane.

Proceed to the section corresponding to the selected configuration.

Configuration	Cable
"M.2 backplane to system board" on page 207	For SATA/x4 NVMe M.2 backplane: • One M.2 power cable, 350mm • One M.2 signal cable, Slimline-LP x4 to Slimline x8, 400mm For SATA/NVMe M.2 backplane: • One M.2 signal and power cable, 400mm
"M.2 backplane to RAID adapter" on page 208	For SATA/x4 NVMe M.2 backplane: • One M.2 power cable, 350mm • One of the following M.2 signal cable: – To x350 RAID adapter: One M.2 signal cable, MiniSAS-HD x4 to Slimline x8, 500mm – To x40 RAID adapter: One M.2 signal cable, Slimline x8 to Slimline x8, 500mm

To system board
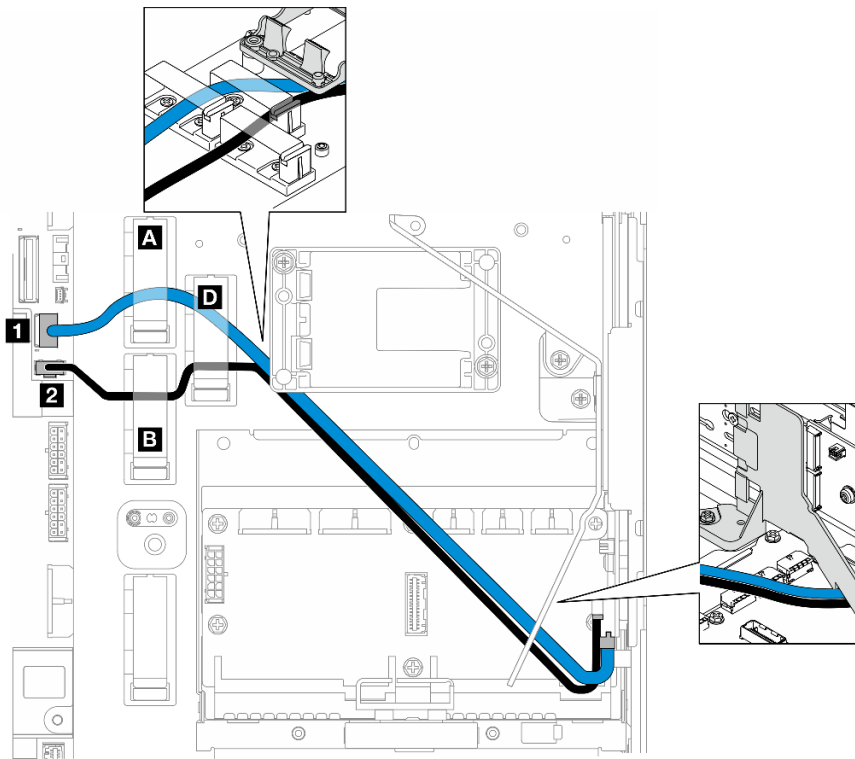
Complete the following procedure to route the cables properly.

Procedure

Step 1. Connect the cables to the connectors on the system board.

- M.2 signal cable / signal branch of M.2 signal and power cable to **1** M.2 signal connector (PCIe 1)

- M.2 power cable / power branch of M.2 signal and power cable to **2** M.2 power connector (M.2 Sideband)

Step 2. Route the M.2 signal cable / signal branch of M.2 signal and power cable through the retainers in the following order.

    a. Cable clip **A**

    b. Cable clip **D**

    c. Corner of the RAID flash power module holder (as shown in the top callout in the above illustration)

    d. Under the M.2 air baffle (as shown in the right callout in the above illustration)

Step 3. Route the M.2 power cable / power branch of M.2 signal and power cable through the retainers in the following order.

    a. Cable clip **B**

    b. Cable clip **D**

    c. Corner of the RAID flash power module holder (as shown in the top callout in the above illustration)

    d. Under the M.2 air baffle (as shown in the right callout in the above illustration)

Step 4. Proceed to connect the cables to the M.2 backplane assembly and install the assembly. See "Install the M.2 backplane assembly" on page 96.

To RAID adapter
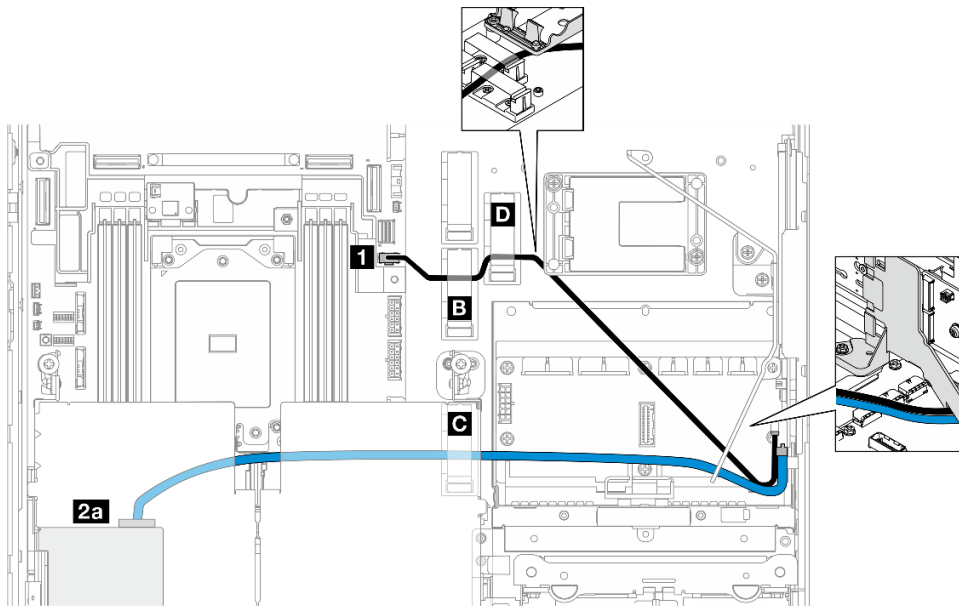
Figure 206. RAID adapter on PCIe riser 1
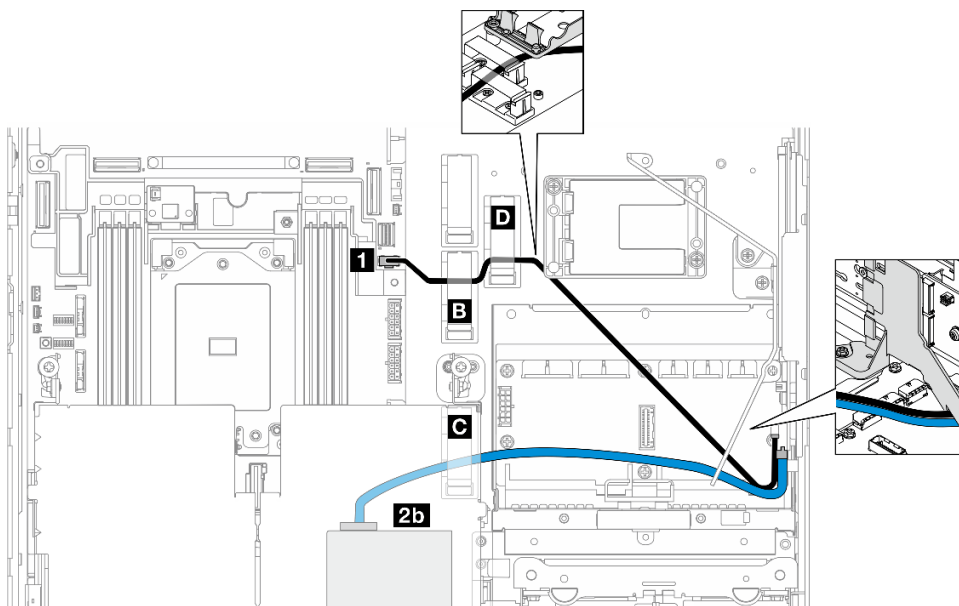
Figure 207. RAID adapter on PCIe riser 2

Complete the following procedure to route the cables properly.

Procedure

Step 1. Connect M.2 power cable to **1** M.2 power connector (M.2 Sideband) on the system board.

Step 2. Route the M.2 power cable through the retainers in the following order.

a. Cable clip **B**

    b. Cable clip **D**

    c. Corner of the RAID flash power module holder (as shown in the top callout in the above illustration)

    d. Under the M.2 air baffle (as shown in the right callout in the above illustration)

Step 3. Route M.2 signal cable through cable clip **C**.

Step 4. Proceed to connect M.2 signal cable to C0 connector of the RAID adapter on PCIe riser assembly, and install the assembly. See "Install the PCIe riser assembly" on page 126.

- **2a** C0 connector of RAID adapter on PCIe riser 1
- **2b** C0 connector of RAID adapter on PCIe riser 2

Step 5. Proceed to connect the cables to the M.2 backplane assembly and install the assembly. See "Install the M.2 backplane assembly" on page 96.

PCIe riser card cable routing

Follow the instructions in this section to learn how to do cable routing for the PCIe riser cards.

See the corresponding section to complete the PCIe riser card cable routing:

- "PCIe riser 1 riser card cable routing" on page 209
- "PCIe riser 2 riser card cable routing" on page 210

PCIe riser 1 riser card cable routing

This section provides cable routing instructions for the following cables:

Cable	Color	From: PCIe riser 1	To: system board
Riser 1 signal cable, 280mm/320mm	Blue	MCIO3, MCIO4	PCIe 8, PCIe 9
Riser 1 signal cable, 375mm/360mm	Silver	MCIO1, MCIO2	PCIe 6, PCIe 7

Complete the following procedure to route the cables properly.

Procedure

Step 1. Make sure the riser card is installed on the riser cage, and the required cables are connected to the riser card properly. See "Install the PCIe riser card" on page 136.

Step 2. Connect the signal cables to the system board and route the cables.

    a. Connect the **blue** signal cable to PCIe 8 and PCIe 9 connectors on the system board.

    b. Connect the **silver** signal cable to PCIe 6 and PCIe 7 connectors on the system board.

    c. Route the **blue** signal cable along the intrusion switch as shown.

    d. Route the **silver** signal cable through the cable wall. Press the cable down toward the system board to avoid interfering the retaining clips of memory module slots.
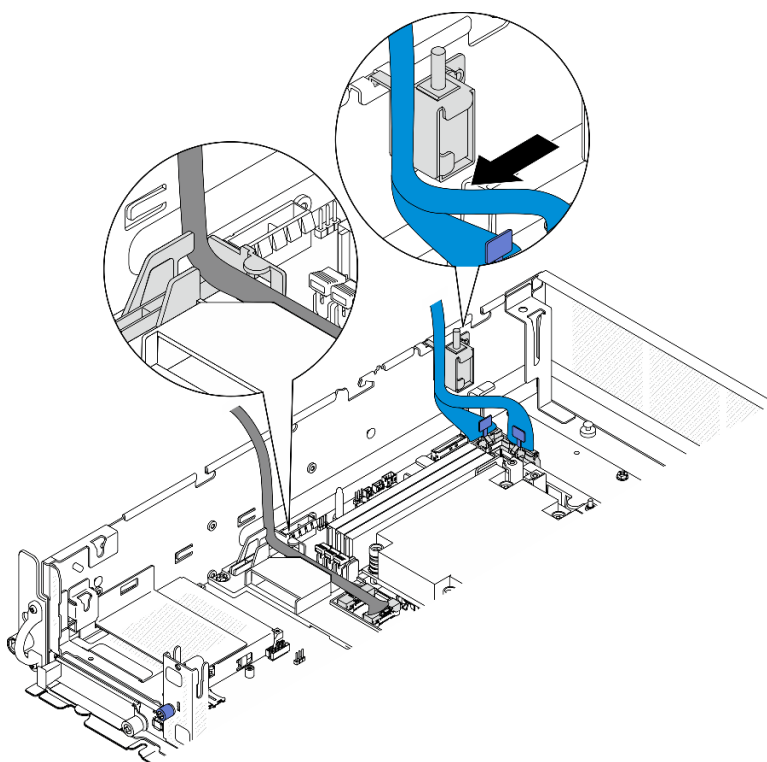
Figure 208. PCIe riser 1 cable routing

PCIe riser 2 riser card cable routing

This section provides cable routing instructions for the following cables:

Cable	Color	From: PCIe riser 2	To: system board
Riser 2 signal cable, 450mm/450mm*	Blue	MCIO3, MCIO4	PCIe 2, PCIe 3
Riser 2 signal cable, 400mm/385mm	Silver	MCIO1, MCIO2	PCIe 4, PCIe 5

*The blue signal cable is not supported in the following configurations:

- Front SATA drive backplane and internal NVMe drive backplane connect to the system board
- Front NVMe drive backplane and internal NVMe drive backplane connect to the system board

Complete the following procedure to route the cables properly.

Procedure

Step 1. Make sure the riser card is installed on the riser cage, and the required cables are connected to the riser card properly. See "Install the PCIe riser card" on page 136.

Step 2. Connect the power and signal cables to the system board and route the cables
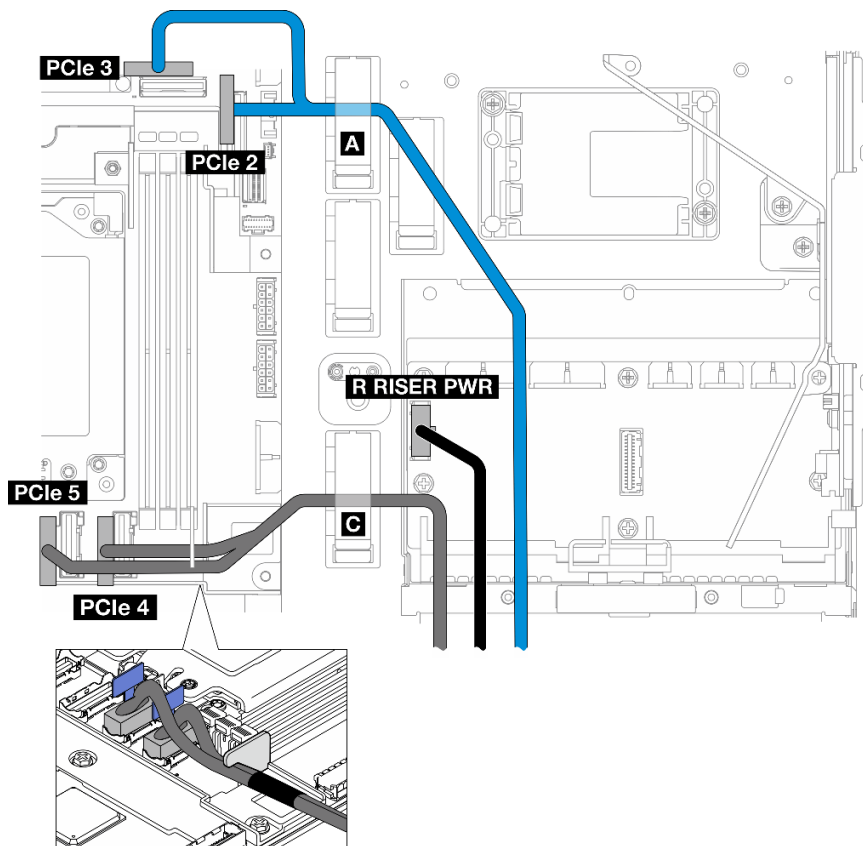
Figure 209. PCIe riser 2 cable routing

a. If applicable, connect the **blue** signal cable to PCIe 2 and PCIe 3 connectors on the system board.

b. Connect the power cable to Riser 2 power connector (R RISER PWR) on the power distribution board.

c. Connect the **silver** signal cable to PCIe 4 and PCIe 5 connectors on the system board.

d. If applicable, secure the **blue** signal cable in cable clip **A**.

e. Route the **silver** signal cable through the cable wall; then, secure the cable in cable clip **C**. Press the cable down toward the system board to avoid interfering the retaining clips of memory module slots.

GPU power cable routing

Follow the instructions in this section to learn how to do cable routing for the GPU power cables.

This section provides cable routing instruction for GPU power cable, 450mm.
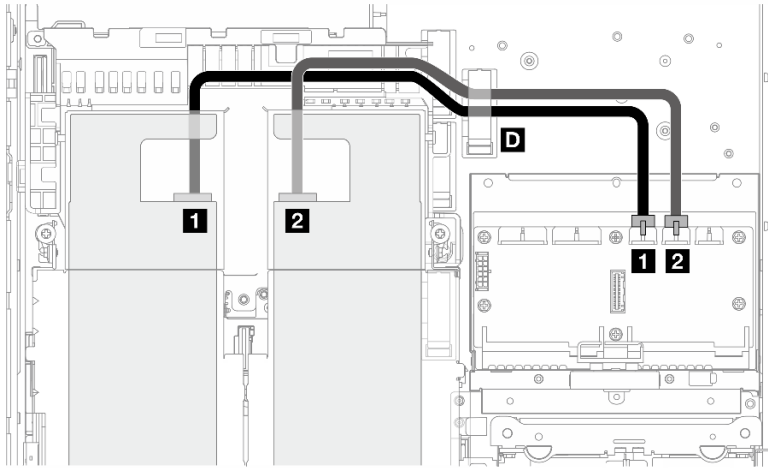
Complete the following procedure to route the cables properly.

Procedure

Step 1.   Connect the GPU power cable to the corresponding connector on the power distribution board.

- For GPU adapter on PCIe riser 1: **1** GPU 1 power connector
- For GPU adapter on PCIe riser 2: **2** GPU 2 power connector

Step 2.   Secure the GPU power cable in cable clip **D**.

Step 3.   Proceed to connect the cable to the GPU adapter on PCIe riser assembly, and install the assembly. See "Install the PCIe riser assembly" on page 126.

Note: Make sure to manage all the GPU power cables into the cable guide of the processor air baffle when installing the PCIe assembly.
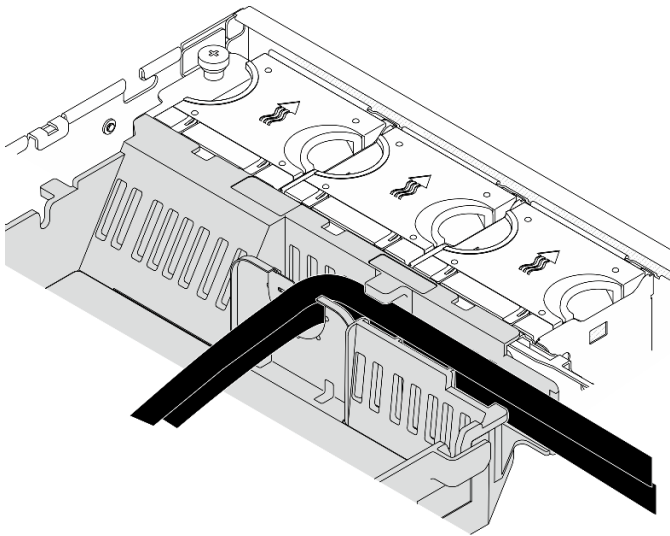
Figure 210. GPU power cables on processor air baffle

RAID flash power module (supercap) cable routing

Follow the instructions in this section to learn how to do cable routing for the RAID flash power module (supercap).

This section provides cable routing instruction for RAID flash power module extension cable (supercap cable), 330mm.

Note: Install the RAID flash power module when ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter is installed.
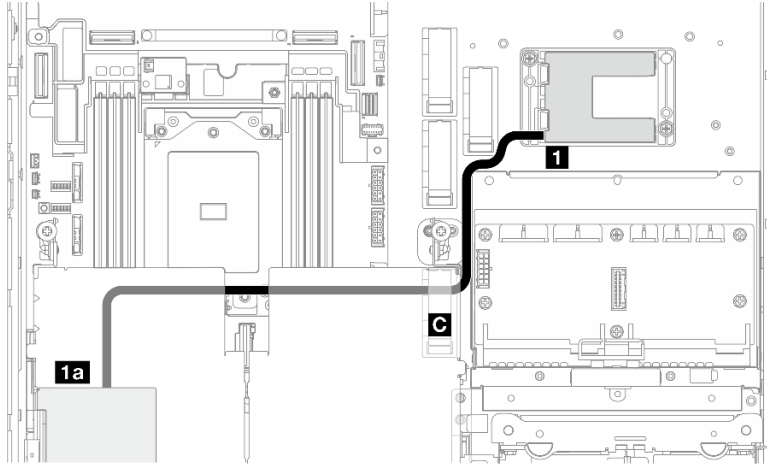
Figure 211. RAID adapter on PCIe riser 1
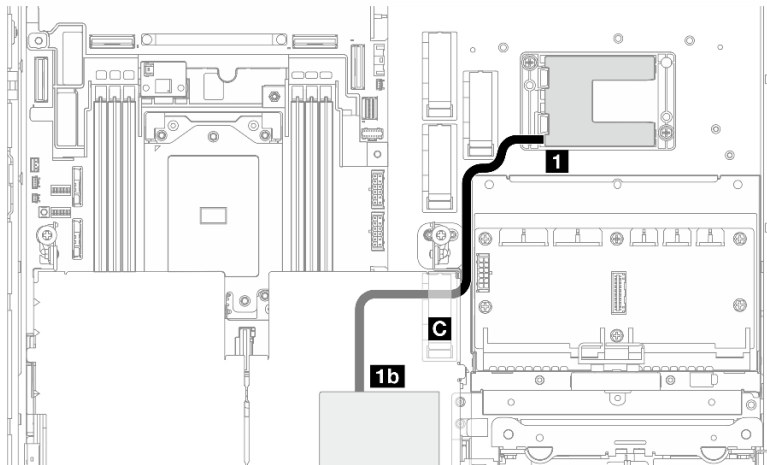
Figure 212. RAID adapter on PCIe riser 2

Complete the following procedure to route the cables properly.

Procedure

Step 1.   Connect the extension cable to **1** RAID flash power module.

Step 2.   Secure the extension cable in cable clip **C**.

Step 3.   Proceed to connect the cable to the 940-9i RAID adapter on PCIe riser assembly, and install the assembly. See "Install the PCIe riser assembly" on page 126.

- **1a** 940-8i RAID adapter on PCIe riser 1
- **1b** 940-8i RAID adapter on PCIe riser 2

Drive backplane cable routing

Follow the instructions in this section to learn how to do cable routing for the drive backplanes.

Complete the following procedure to route the cables properly.

Connect BP power cables to the system board
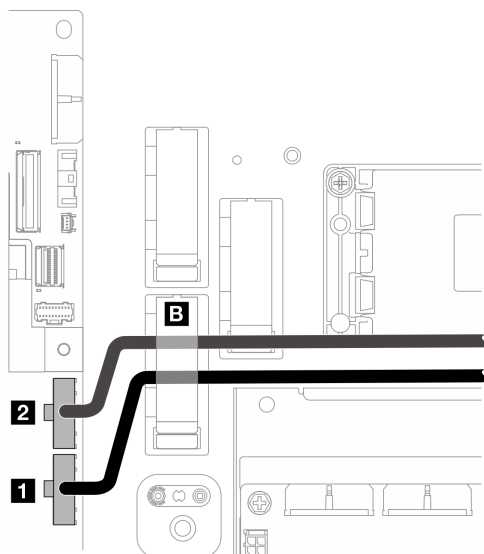
Figure 213. BP power cables

Cable	From: system board	To
1 Front BP power cable, 320mm	Front backplane power connector	Front drive backplane: power connector
2 Internal BP power cable, 200mm	Internal backplane power connector	Internal drive backplane: power connector

1. Connect the BP power cable(s) to the system board.

   a. Connect the front BP power cable to **1** Front backplane power connector.

   b. For configuration with internal drive backplane, connect the internal BP power cable to **2** Internal backplane power connector.

2. Secure the power cables in cable clip **B**.

Note: Make sure to place BP power cables **under** the blue signal cable of PCIe riser 2.

BP signal cable routing

Proceed to the section corresponding to the selected configuration.

Configuration	BP signal cable
"RAID to front SATA + internal SATA BP" on page 215	Front BP + internal BP to x350 RAID adapter: • Two SAS/SATA cables for x350 adapters, MiniSAS-HD x4 to Slimline x4, 400mm

Configuration	BP signal cable
	Front BP + internal BP to x40 RAID adapter: • One SAS/SATA Y-cable for x40 adapters, 400mm/350mm
	Front BP to x350 RAID adapter: • One SAS/SATA cable for x350 adapters, MiniSAS-HD x4 to Slimline x4, 400mm
	Front BP to x40 RAID adapter: • One SAS/SATA cable for x40 adapters, Slimline x8 to Slimline x4, 400mm
"System board to front NVMe + internal NVMe BP" on page 216	• Front BP: One NVMe cable for front BP, 560mm/540mm • Internal BP: One NVMe cable for internal BP, 300mm/250mm
"System board to front SATA + internal SATA BP" on page 218	One SATA Y-cable, 520mm/400mm
"System board to front SATA + internal NVMe BP" on page 218	• Front BP: One SATA cable for front BP, 520mm • Internal BP: One NVMe cable for internal BP, 300mm/250mm
"System board to front NVMe BP" on page 219	One NVMe cable for front BP, 560mm/540mm
"System board to front SATA BP" on page 220	One SATA cable for front BP, 520mm

"RAID to front SATA + system board to internal NVMe BP" on page 221	• Front BP
	  – to x350 RAID adapter: One SAS/SATA cable for x350 adapters, MiniSAS-HD x4 to Slimline x4, 400mm
	  – to x40 RAID adapter: One SAS/SATA cable for x40 adapters, Slimline x8 to Slimline x4, 400mm
	• Internal BP: One NVMe cable for internal BP, 400mm/400mm

"System board to front NVMe + RAID to internal SATA BP" on page 222	• Front BP: One NVMe cable for front BP, 560mm/540mm
	• Internal BP
	  – to x350 RAID adapter: One SAS/SATA cable for x350 adapters, MiniSAS-HD x4 to Slimline x4, 400mm
	  – to x40 RAID adapter: One SAS/SATA cable for x40 adapters, Slimline x8 to Slimline x4, 400mm

RAID to front SATA + internal SATA BP

1. Install the processor air baffle. See "Install the processor air baffle" on page 35.
2. Secure the required BP signal cables in cable clip C.
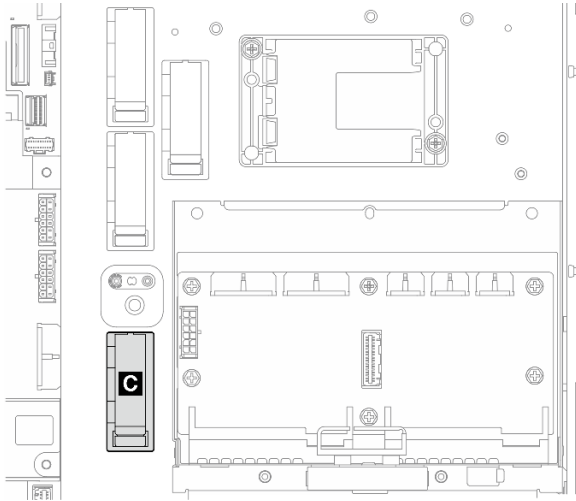
Figure 214. Cable clip C

- x40 RAID adapter: one signal cable to C0 connector
- x350 RAID adapter:
  - Front BP only: one signal cable to C0 connector
  - Front and internal BP: two signal cables
    - C0 connector to front BP
    - C1 connector to internal BP

3. Proceed to connect the BP signal cable(s) to the RAID adapter on PCIe riser assembly, and install the assembly. See "Install the PCIe riser assembly" on page 126.

4. Proceed to "Complete the BP cable routing" on page 223.

System board to front NVMe + internal NVMe BP

Note: This configuration does not support Slot 6 and Slot 8 on PCIe riser 2.

1. Connect the internal BP signal cable to the connectors on the system board in the following order:
   a. PCIe 2
   b. PCIe 3
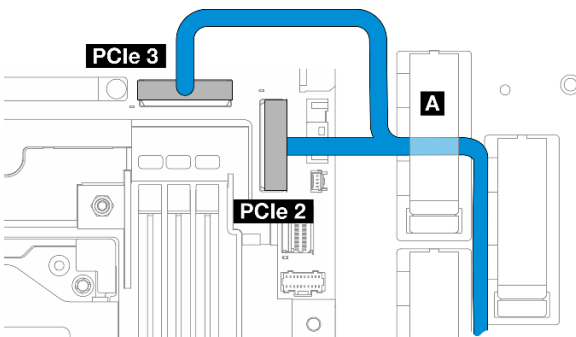
Figure 215. Internal BP signal cable

Note: Bend the cable as shown.
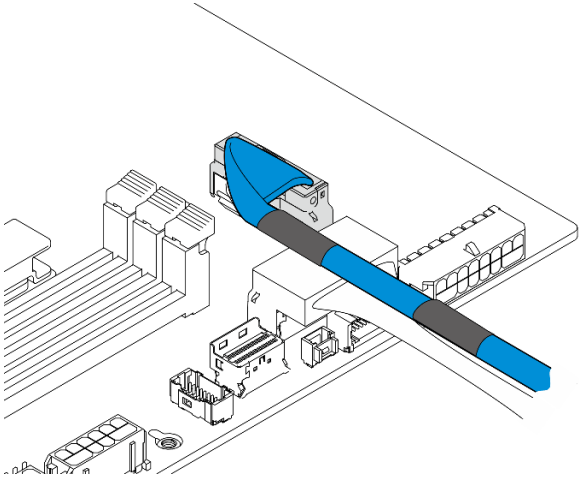
Figure 216. Internal BP signal cable

2. Secure the internal BP signal cable into cable clip **A**.

3. Connect the front BP signal cable to the connectors on the system board in the following order:

   a. PCIe 11

   b. PCIe 10
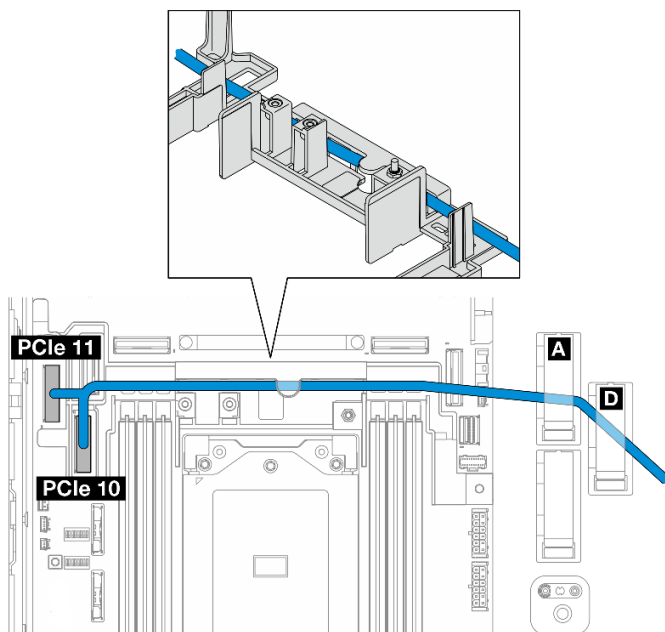
Figure 217. Front BP signal cable

4. Route the front BP signal cable through the cable wall; then, secure the cable into cable clip **A** and **D**.

5. Install the processor air baffle. See "Install the processor air baffle" on page 35.

6. Install the PCIe riser assemblies. See "Install the PCIe riser assembly" on page 126.

7. Proceed to "Complete the BP cable routing" on page 223.

System board to front SATA + internal SATA BP
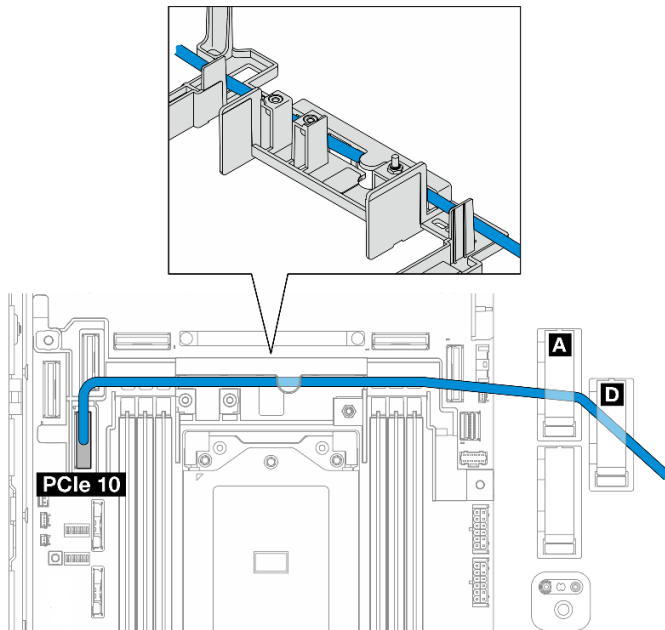
1. Connect the BP signal cable to PCIe 10 connector on the system board.
2. Route the BP signal cable through the cable wall.
3. Secure the internal BP signal cable into cable clip **A**.
4. Secure the front BP signal cable into cable clip **A** and **D**.
5. Install the processor air baffle. See "Install the processor air baffle" on page 35.
6. Install the PCIe riser assemblies. See "Install the PCIe riser assembly" on page 126.
7. Proceed to "Complete the BP cable routing" on page 223.

System board to front SATA + internal NVMe BP

Note: This configuration does not support Slot 6 and Slot 8 on PCIe riser 2.

1. Connect the internal BP signal cable to the connectors on the system board in the following order:
   a. PCIe 2
   b. PCIe 3
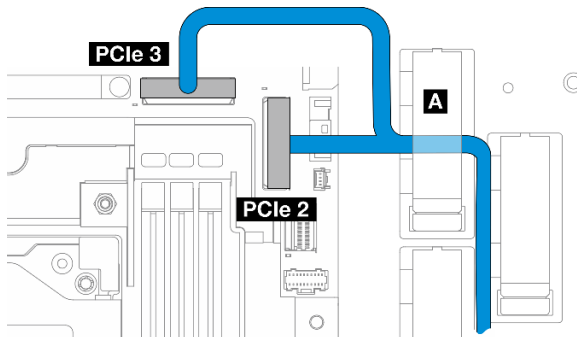
Figure 218. Internal BP signal cable

Note: Bend the cable as shown.
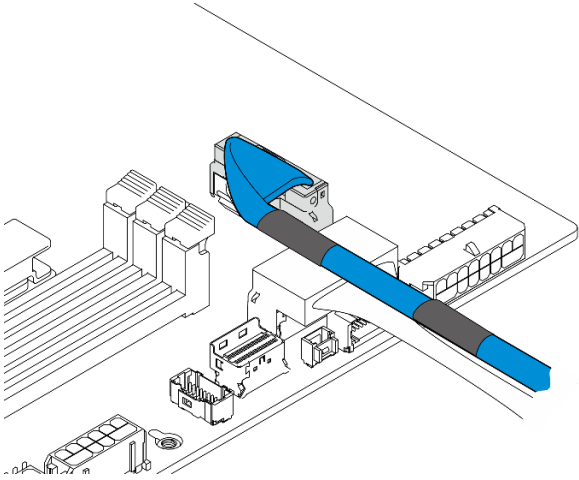
Figure 219. Internal BP signal cable

2. Secure the internal BP signal cable into cable clip ◼A.
3. Connect the front BP signal cable to PCIe 10 connector on the system board.
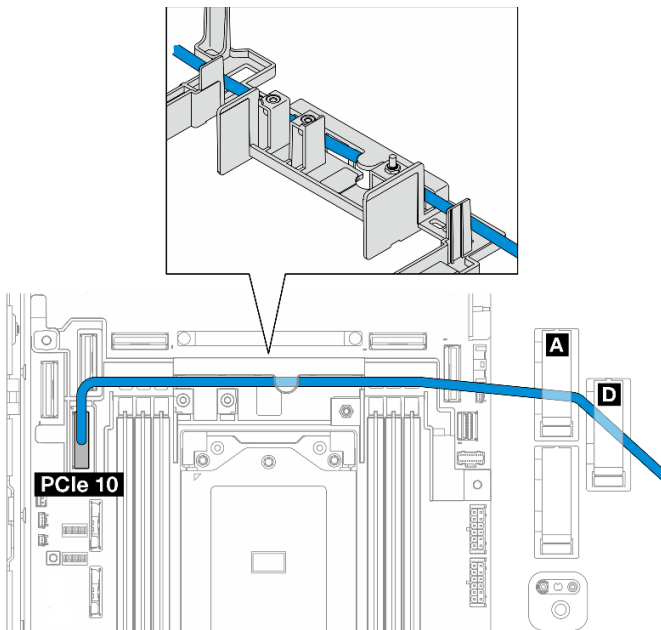
4. Route the front BP signal cable through the cable wall; then, secure the cable into cable clip ◼A and ◼D.
5. Install the processor air baffle. See "Install the processor air baffle" on page 35.
6. Install the PCIe riser assemblies. See "Install the PCIe riser assembly" on page 126.
7. Proceed to "Complete the BP cable routing" on page 223.

System board to front NVMe BP

1. Connect the front BP signal cable to the connectors on the system board in the following order:
   a. PCIe 11
   b. PCIe 10
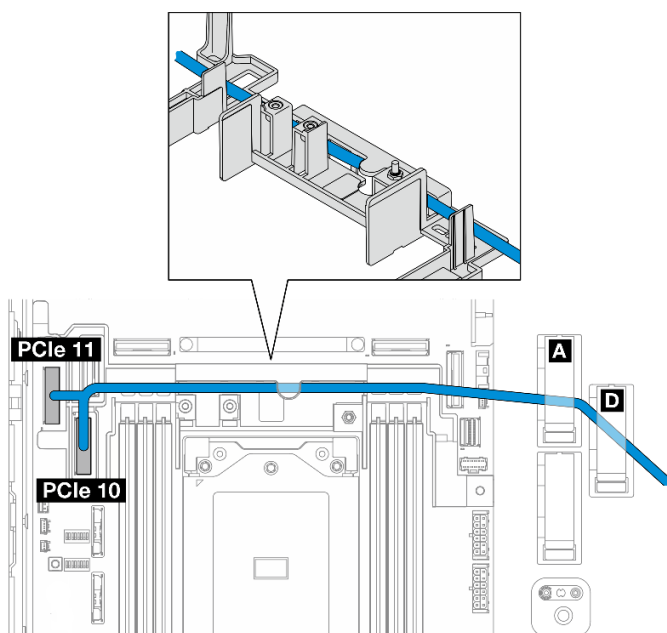
Figure 220. Front BP signal cable

2. Route the front BP signal cable through the cable wall; then, secure the cable into cable clip **A** and **D**.

3. Install the processor air baffle. See "Install the processor air baffle" on page 35.

4. Install the PCIe riser assemblies. See "Install the PCIe riser assembly" on page 126.

5. Proceed to "Complete the BP cable routing" on page 223.

System board to front SATA BP

1. Connect the front BP signal cable to PCIe 10 connector on the system board.
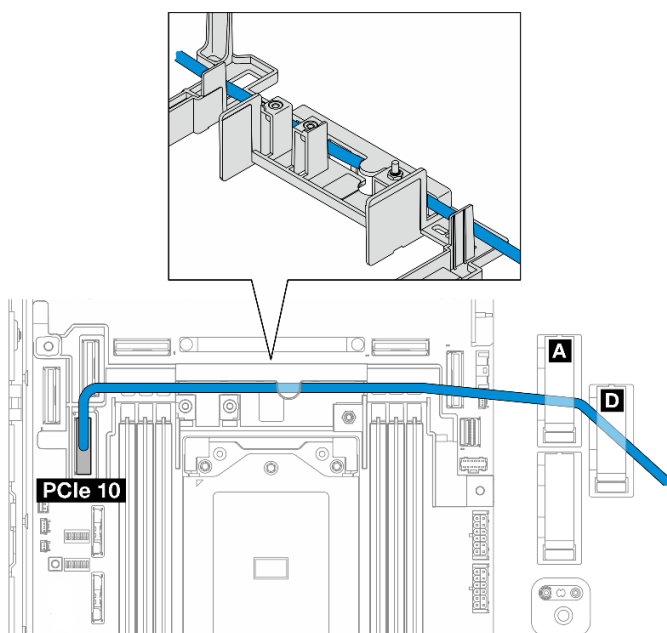
2. Route the front BP signal cable through the cable wall; then, secure the cable into cable clip **A** and **D**.

3. Install the processor air baffle. See "Install the processor air baffle" on page 35.

4. Install the PCIe riser assemblies. See "Install the PCIe riser assembly" on page 126.

5. Proceed to "Complete the BP cable routing" on page 223.

RAID to front SATA + system board to internal NVMe BP

1. Connect the internal BP signal cable to the connectors on the system board in the following order:

   a. PCIe 11

   b. PCIe 10
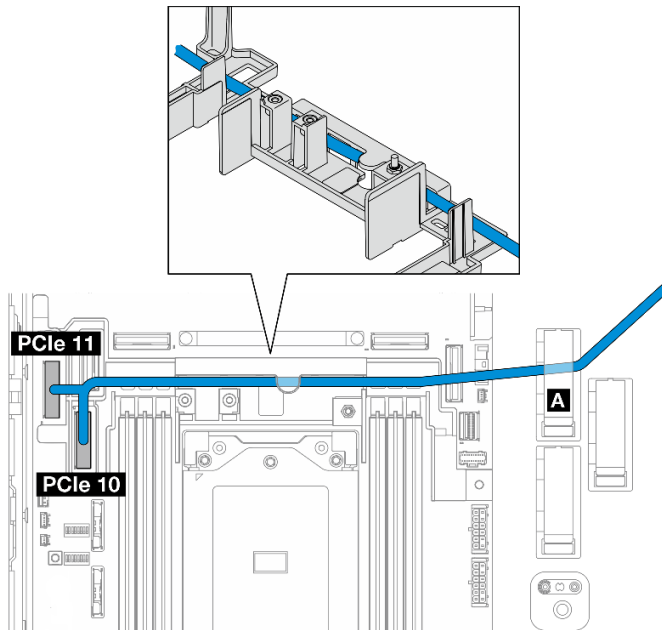
2. Route the internal BP signal cable through the cable wall; then, secure the cable into cable clip **A**.

   Note: Route one cable branch through the cable wall first; then, route the other through the cable wall.

3. Secure the front BP signal cable in cable clip **C**.
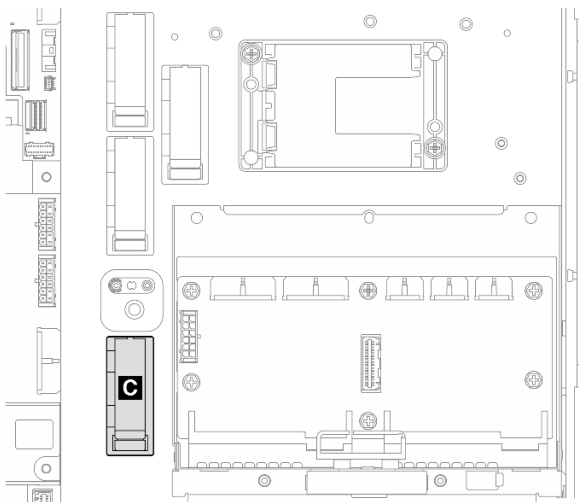
Figure 221. Cable clip C

4. Install the processor air baffle. See "Install the processor air baffle" on page 35.

5. Proceed to connect the front BP signal cable to C0 connector of the RAID adapter on PCIe riser assembly, and install the assembly. See "Install the PCIe riser assembly" on page 126.

6. Proceed to "Complete the BP cable routing" on page 223.

System board to front NVMe + RAID to internal SATA BP

1. Connect the front BP signal cable to the connectors on the system board in the following order:

   a. PCIe 11

   b. PCIe 10
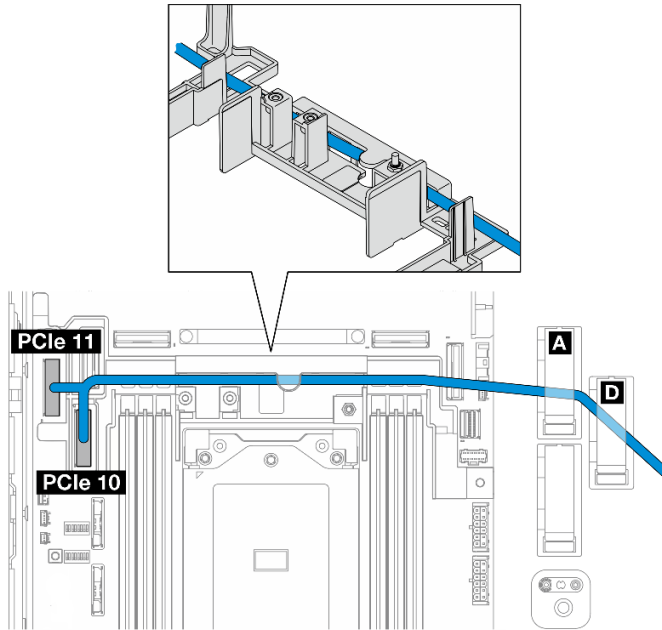
Figure 222. Front BP signal cable

2. Route the front BP signal cable through the cable wall; then, secure the cable into cable clip **A** and **D**.

   Note: Route one cable branch through the cable wall first; then, route the other through the cable wall.

3. Secure the internal BP signal cable in cable clip **C**.
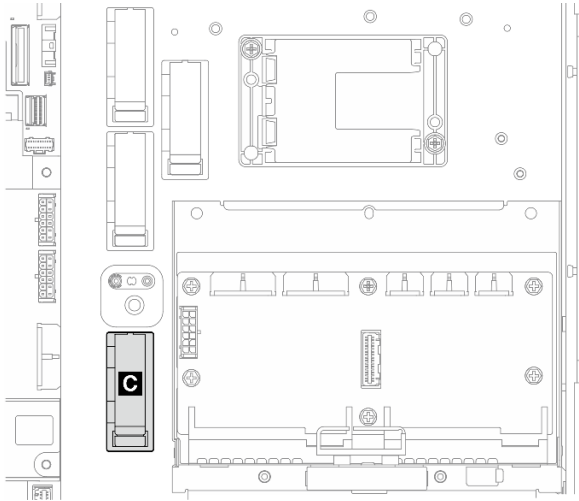
Figure 223. Cable clip C

4. Install the processor air baffle. See "Install the processor air baffle" on page 35.

5. Proceed to connect the internal BP signal cable to C0 connector of the RAID adapter on PCIe riser assembly, and install the assembly. See "Install the PCIe riser assembly" on page 126.

6. Proceed to "Complete the BP cable routing" on page 223.

Complete the BP cable routing

Manage the front backplane cables

1. Install the front drive backplane. See "Install the front drive backplane" on page 64.

   Note: For configurations with front and internal drive backplanes, and both the backplanes connect to x350 RAID adapter, make sure to connect the signal cable from C0 connector of the RAID adapter to the front backplane.

   •
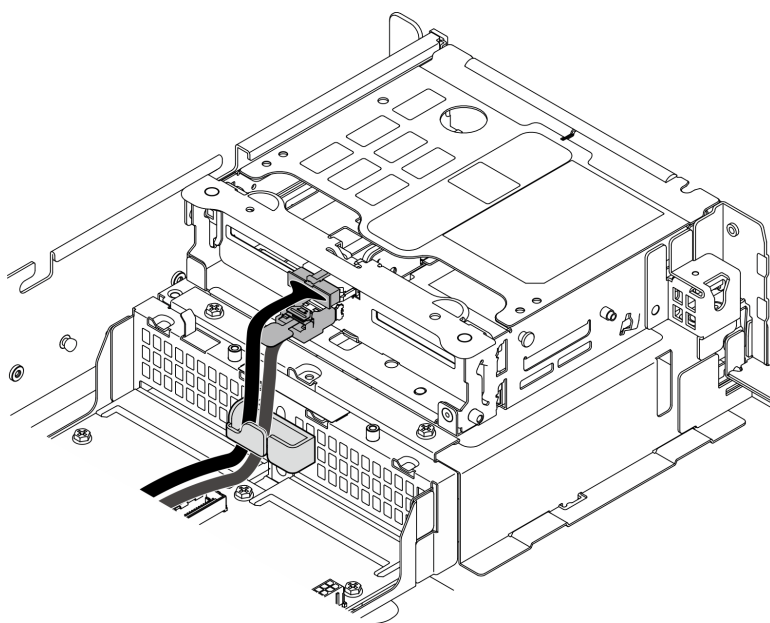
Figure 224. Front drive backplane cable routing

Make sure the front drive backplane cables are secured in the cable clip on the front drive cage. If necessary, route the front backplane power cable into the cable clip; then, route the front backplane signal cable into the cable clip.

2.
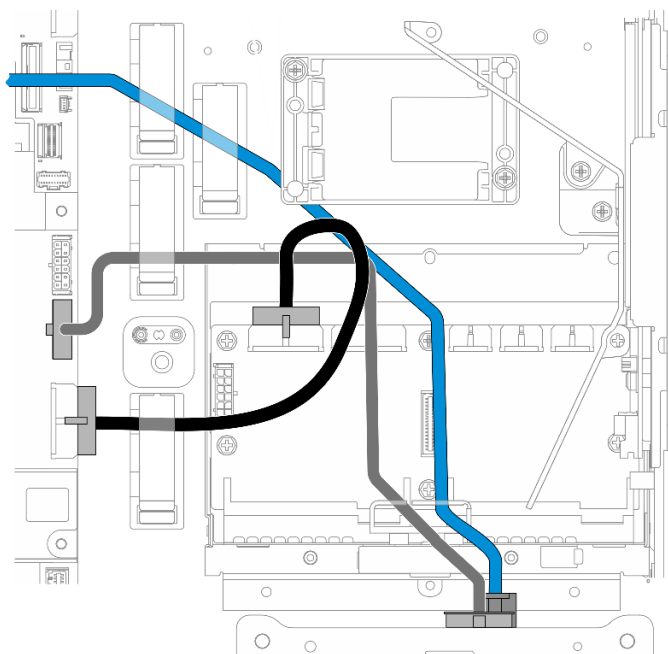
Figure 225. Front drive backplane cable routing

Route the front BP cables.

a. For the configuration with front BP signal cable connected to the system board, route the front BP signal cable under the corner of the flash power module holder.

b. Route the front BP power cable under System-board power 1 cable.

3. For configuration with internal drive backplane, proceed to

4. For configuration without internal drive backplane, press down the blue signal cable of PCIe riser 2, and make sure the cable is under the cable clip on the processor air baffle.

(Optional) Manage the internal BP cables

Complete the following procedures in the listed order to manage the internal BP cables.

1. Install the internal drive cage. See .

2. Install the internal drive backplane. See .

Chapter 3. Problem determination

Use the information in this section to isolate and resolve issues that you might encounter while using your server.

Lenovo servers can be configured to automatically notify Lenovo Support if certain events are generated. You can configure automatic notification, also known as Call Home, from management applications, such as the Lenovo XClarity Administrator. If you configure automatic problem notification, Lenovo Support is automatically alerted whenever a server encounters a potentially significant event.

To isolate a problem, you should typically begin with the event log of the application that is managing the server:

- If you are managing the server from the Lenovo XClarity Administrator, begin with the Lenovo XClarity Administrator event log.
- If you are using some other management application, begin with the Lenovo XClarity Controller event log.

Web resources

- **Tech tips**

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

  To find the Tech Tips available for your server:

  1. Go to http://datacentersupport.lenovo.com and navigate to the support page for your server.
  2. Click on **How To's** from the navigation pane.
  3. Click **Article Type → Solution** from the drop-down menu.

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

- **Lenovo Data Center Forum**

  - Check https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg to see if someone else has encountered a similar problem.

Event logs

An *alert* is a message or other indication that signals an event or an impending event. Alerts are generated by the Lenovo XClarity Controller or by UEFI in the servers. These alerts are stored in the Lenovo XClarity Controller Event Log. If the server is managed by the 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 https://pubs.lenovo.com/se455-v3/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

Figure 226. Lenovo XClarity Administrator event log

For more information about working with events from XClarity Administrator, see:

https://pubs.lenovo.com/lxca/events_vieweventlog

Lenovo XClarity Controller event log

The Lenovo XClarity Controller monitors the physical state of the server and its components using sensors that measure internal physical variables such as temperature, power-supply voltages, fan speeds, and component status. The Lenovo XClarity Controller provides various interfaces to systems management software and to system administrators and users to enable remote management and control of a server.

The Lenovo XClarity Controller monitors all components of the server and posts events in the Lenovo XClarity Controller event log.

Figure 227. Lenovo XClarity Controller event log

For more information about accessing the Lenovo XClarity Controller event log, see:

"Viewing Event Logs" section in the XCC documentation compatible with your server at https://pubs.lenovo.com/lxcc-overview/

Specifications

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

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

Specification category	Technical specifications	Mechanical specifications	Environmental specifications
Content	- Processor - Memory - M.2 Drive - Storage expansion - Expansion slots - Graphics processing units (GPU) and accelerator - Integrated functions and I/O connectors - Network - RAID adapter - Host bus adapter - System fan - Electrical input - Minimal configuration for debugging - Operating systems	- Dimension - Weight	- Acoustical noise emissions - Ambient temperature management - Environmental

Technical specifications

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

Processor
Supports AMD® EPYC™ 8004 series processors. • Scalable up to 64 cores • Designed for LGA 4844 (SP6) socket • Supports 96 lanes of high speed I/O • Thermal Design Power (TDP): up to 200 watts • Configurable Thermal Design Power (cTDP): up to 225 watts For a list of supported processors, see: https://serverproven.lenovo.com.

Memory

See "Memory module installation rules and order" on page 5 for detailed information about memory configuration and setup.
- Capacity
  - Minimum: 16 GB
  - Maximum: 576 GB
- Memory module types: Double-data-rate 5 (TruDDR5) error correcting code (ECC) 4800 MT/s registered DIMM (RDIMM)
- Slots: 6 dual inline memory module (DIMM) connectors

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

M.2 Drive

Supports up to two SATA/NVMe M.2 drives.

- Capacity

  - 128 GB

  - 240 GB

  - 480 GB

  - 960 GB

Notes: Depending on the M.2 backplane installed, SE455 V3 supports different RAID configurations.

- With SATA/x4 NVMe M.2 backplane (ThinkSystem M.2 SATA/x4 NVMe 2-Bay Enablement Kit) installed:

  - The non-RAID configuration of M.2 drives supports NVMe only.

  - The RAID configuration of M.2 drives is supported with one of the following RAID adapters:

    - ThinkSystem RAID 5350-8i PCIe 12Gb Adapter: SATA

    - ThinkSystem RAID 540-8i PCIe Gen4 12Gb Adapter: NVMe

- With SATA/NVMe M.2 backplane (ThinkSystem M.2 RAID B540i-2i SATA/NVMe Adapter) installed:

  - The non-RAID configuration of M.2 drives supports SATA/NVMe.

  - The RAID configuration of M.2 drives supports SATA/NVMe.

For a list of supported M.2 drives, see: https://serverproven.lenovo.com.

Storage expansion

Front drives

- Up to four 2.5-inch SAS/SATA/NVMe hot-swap drives

  Note: When SED encryption is enabled, it is necessary to power cycle the system after installing an SED; without power cycling, the SED will not be recognized by the host OS.

Internal drives (optional)

- Up to four 2.5-inch SAS/SATA/NVMe non-hot-swap drives

Note: RAID adapter/HBA is required for SAS drives.

Expansion slots

Supported expansion slots vary by configuration.

- **M.2 drive bay (optional)**: support up to two M.2 SATA/NVMe drives

  – Slot 1 / M.2 bay 0

  – Slot 2 / M.2 bay 1

  Note: RAID adapter/HBA is required for M.2 SATA drives.

- **PCIe slots:** all PCIe slots support 75W

  Note: Performance may degrade when a x16 PCIe adapter is installed in a x8 lane PCIe slot.

  – **PCIe riser 1**

    – Slot 3: x16 (Gen5 x16 lanes)

    – Slot 4: x16 (Gen4 x8 lanes)

    – Slot 5: x16 (Gen4 x8 lanes)

    Notes:

    – When the serial port module is installed, Slot 5 is not supported.

    – When a double-wide GPU is installed in Slot 3, Slot 4 is not supported.

  – **PCIe riser 2 (optional)**

    – Slot 6: x16 (Gen4 x8 lanes)

    – Slot 7: x16 (Gen5 x16 lanes)

    – Slot 8: x16 (Gen4 x8 lanes)

    Notes:

    – Slot 6 and Slot 8 are not supported in the following configurations:

      - Front SATA drive backplane and internal NVMe drive backplane connect to the system board

      - Front NVMe drive backplane and internal NVMe drive backplane connect to the system board

    – When a double-wide GPU is installed in Slot 7, Slot 6 is not supported.

- **OCP module slot**

  – Slot 9: Gen5 x16 lanes (with NC-SI support)

Graphics processing unit (GPU) and accelerator

Supports one of the following:

- Up to two double-wide 330W GPUs (Slot 3 and Slot 7)
- Up to six single-wide 75W GPUs/accelerators

Integrated functions and I/O connectors

- Lenovo XClarity Controller (XCC), which provides service processor control and monitoring functions, video controller, and remote keyboard, video, mouse, and remote drive capabilities.
  - The server supports Lenovo XClarity Controller 2 (XCC2). For additional information about Lenovo XClarity Controller 2 (XCC2), refer to https://pubs.lenovo.com/lxcc-overview/.
- **Front I/O connectors**
  - One XCC system management port on the front to connect to a systems-management network. This RJ-45 connector is dedicated to the Lenovo XClarity Controller functions and runs at 1 GB speed.
  - A group of two or four Ethernet connectors on OCP module
  - One USB 2.0 Type-A connector with Lenovo XClarity Controller management
  - Two USB 3.2 Gen 1 (5 Gbps) Type-A connectors
  - One USB 3.2 Gen 1 (5 Gbps) Type-C connector with display support
  - One external diagnostics connector

Network

- OCP 3.0 module: Supports one OCP 3.0 Ethernet network adapter in Slot 9 (with NC-SI support)
- Supports up to six PCIe Ethernet adapters

RAID adapter

- ThinkSystem RAID 5350-8i PCIe 12Gb Adapter: RAID 0, 1, 10, 5
- ThinkSystem RAID 540-8i PCIe Gen4 12Gb Adapter: RAID 0, 1, 10
- ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter: RAID 0, 1, 10, 5, 50, 6, 60

Important: Do not enable the SED management of RAID adapter, and **do not** connect encryption-enabled SEDs to RAID adapters. The SED management of RAID adapter might conflict with system AK management.

Notes:
Depending on the M.2 backplane installed, SE455 V3 supports different RAID configurations.

- With SATA/x4 NVMe M.2 backplane (ThinkSystem M.2 SATA/x4 NVMe 2-Bay Enablement Kit) installed:
  - The non-RAID configuration of M.2 drives supports NVMe only.
  - The RAID configuration of M.2 drives is supported with one of the following RAID adapters:
    - ThinkSystem RAID 5350-8i PCIe 12Gb Adapter: SATA
    - ThinkSystem RAID 540-8i PCIe Gen4 12Gb Adapter: NVMe
- With SATA/NVMe M.2 backplane (ThinkSystem M.2 RAID B540i-2i SATA/NVMe Adapter) installed:
  - The non-RAID configuration of M.2 drives supports SATA/NVMe.
  - The RAID configuration of M.2 drives supports SATA/NVMe.

Host bus adapter

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

System fan

- Five 60 mm x 60 mm x 56 mm dual-rotor fans

Electrical input

Supports up to two units of power supplies with N+N redundancy. Following is the list of supported types:

- 1800-watt Platinum, input power 230 VAC
- 1100-watt Titanium, input power 230 VAC
- 1100-watt Platinum, input power 115-230 VAC
- 1100-watt -48V DC power supply unit

Important: Power supplies installed in the server must be with the same power rating, wattage or level.

Minimal configuration for debugging

- One processor
- One DDR5 DRAM memory modules in slot 3 (DIMM3)
- One power supply unit in PSU bay 1 (PSU1)
- One M.2 boot drive (if OS is needed for debugging)
- Five system fans

Operating systems

Supported and certified operating systems:

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

References:

- Complete list of available operating systems: https://lenovopress.lenovo.com/osig.
- OS deployment instructions, see "Deploy the operating system" in *User Guide* or *System Configuration Guide*.

Mechanical specifications

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

Dimension

- Depth:
  - Without security bezel (from the EIA brackets to the rear end of the chassis): 440.0 mm (17.32 inches)
  - With security bezel: 546.5 mm (21.51 inches)
- Height: 86.5 mm (3.41 inches)
- Width:
  - Without EIA brackets: 444.6 mm (17.50 inches)
  - With EIA brackets: 480.5 mm (18.92 inches)

Weight

Maximum: 19.36 kg (42.68 lbs)

Environmental specifications

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

Acoustical noise emissions

The server has the following acoustic noise emissions declaration:

- Sound power level (L$_{WAd}$)
  - Idling:
    - Minimum: 5.5 Bel
    - GPU Rich: 5.5 Bel
    - Storage Rich: 5.8 Bel
  - Operating profile 1:
    - Minimum: 5.5 Bel
    - GPU Rich: 5.5 Bel
    - Storage Rich: 5.8 Bel
  - Operating profile 2:
    - Minimum: 5.5 Bel
    - GPU Rich: 7.4 Bel
    - Storage Rich: 6.0 Bel
- Sound pressure level (L$_{pAm}$):
  - Idling:
    - Minimum: 39.0 dBA
    - GPU Rich: 39.0 dBA
    - Storage Rich: 42.8 dBA
  - Operating profile 1:
    - Minimum: 39.0 dBA
    - GPU Rich: 39.0 dBA
    - Storage Rich: 42.8 dBA
  - Operating profile 2:
    - Minimum: 39.0 dBA
    - GPU Rich: 58.2 dBA
    - Storage Rich: 44.6 dBA

Notes:

- These sound levels were measured in controlled acoustical environments according to procedures specified by ISO7779 and are reported in accordance with ISO 9296. Operating profile 1 is represented by 50% CPU TDP. Operating profile 2 is represented by 100% CPU TDP or 70%/30% storage write/read or 100% GPU. Testing was conducted at 23°C ± 2°C to align with ISO7779 procedures.

- The declared acoustic sound levels are based on the specified configurations, which may change depending on configuration/conditions.
  - Minimum: 1x AMD EPYC 8024P (8 core, 90W) CPU, 1x 2U heat sink, 4x ThinkSystem 32GB TruDDR5 4800MHz (2Rx8) RDIMMs, 1x ThinkSystem Intel X710-T2L 10GBASE-T 2-port OCP Ethernet Adapter, 2x 5400 Pro 2280 M.2 SATA SSD 960GB boot drive with 1x ThinkSystem RAID 5350-8i PCIe 12Gb Adapter for M.2 RAID, 4x ThinkSystem 2.5" 5400 MAX 3.84TB Mixed Use SATA 6Gb HS SSD data drives with 1x ThinkSystem RAID 5350-8i PCIe 12Gb Adapter for SATA RAID, 2x AC PSU 1100W
  - GPU Rich: 1x AMD EPYC 8224P (24 core, 160W) CPU, 1x 2U heat sink, 4x ThinkSystem 32GB TruDDR5 4800MHz (2Rx8) RDIMMs, 1x ThinkSystem Intel X710-T2L 10GBASE-T 2-port OCP Ethernet Adapter, 2x 5400 Pro 2280 M.2 SATA SSD 960GB boot drive with 1x ThinkSystem RAID 5350-8i PCIe 12Gb Adapter for M.2 RAID, 4x ThinkSystem 2.5" 5400 MAX 3.84TB Mixed Use SATA 6Gb HS SSD data drives with 1x ThinkSystem RAID 5350-8i PCIe 12Gb Adapter for SATA RAID, 4x ThinkSystem NVIDIA L4 24GB PCIe Gen4 Passive GPU, 2x AC PSU 1100W

Acoustical noise emissions
– Storage Rich: 1x AMD EPYC 8124P (16 core, 125W) CPU, 1x 2U heat sink, 4x ThinkSystem 32GB TruDDR5 4800MHz (2Rx8) RDIMMs, 1x ThinkSystem Intel X710-T2L 10GBASE-T 2-Port PCIe Ethernet Adapter, 2x 5400 Pro 2280 M.2 SATA SSD 960GB boot drive with M.2 RAID B540i-2i adapter for M.2 RAID, 8x ThinkSystem 2.5" 5400 PRO 7.68TB Read Intensive SATA 6Gb HS SSD, 2x AC PSU 1100W • Government regulations (such as those prescribed by OSHA or European Community Directives) may govern noise level exposure in the workplace and may apply to you and your server installation. The actual sound pressure levels in your installation depend upon a variety of factors, including the number of racks in the installation; the size, materials, and configuration of the room; the noise levels from other equipment; the room ambient temperature, and employee's location in relation to the equipment. Further, compliance with such government regulations depends on a variety of additional factors, including the duration of employees' exposure and whether employees wear hearing protection. Lenovo recommends that you consult with qualified experts in this field to determine whether you are in compliance with the applicable regulations.

Acoustic modes and ambient temperature

Depending on the selected acoustic mode, specific components require proper ambient temperature to prevent performance degradation.
 	
• ThinkEdge SE455 V3 supports three acoustic modes with different acoustic performance.
 	
   – **Disabled**: The server operates at default fan speeds.
 	
   – **Mode 1**: The server operates with sound pressure level of 45 dBA at 25°C or lower ambient temperature with proper configuration.
 	
   – **Mode 2**: The server operates with sound pressure level of 40 dBA at 25°C or lower ambient temperature with proper configuration.
 	
Notes: For Acoustic mode 1 and mode 2:
 	
   – 2U heat sink is necessary.
 	
   – Throttling might momentarily occur.
 	
• To change the acoustic mode, enter the Setup Utility and go to **System settings ➙ Operating Modes ➙ Acoustic mode**.
 	
• See the corresponding table for more information of different acoustic modes and ambient temperature:
 	
   – Table 10 "Acoustic mode Disabled" on page 236
 	
   – Table 11 "Acoustic mode 1" on page 238
 	
   – Table 12 "Acoustic mode 2" on page 239

Table 10. Acoustic mode Disabled

Component		Maximum ambient temperature
• The components not listed in this table are recommended to operate with ambient temperature lower than 55°C. • If the ambient temperature is the maximum ambient temperature, performance degradation or throttled event might occur.		
Processor		
	AMD EPYC 8124P processor	50°C
	AMD EPYC 8434PN, 8534PN processor with PCIe riser 2 installed **Note:** In configurations without PCIe riser 2, AMD EPYC 8434PN/8534PN processor supports ambient temperature up to 55°C.	50°C
	AMD EPYC 8224P, 8324P, 8434P, 8534P processor	45°C
Memory modules		

Table 10. Acoustic mode Disabled (continued)

Component		Maximum ambient temperature
	64GB	50°C
	96GB	45°C
PCIe adapters		
	• ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter • ThinkSystem Broadcom 57508 100GbE QSFP56 2-port PCIe 4 Ethernet Adapter • ThinkSystem Mellanox ConnectX-6 Dx 100GbE QSFP56 2-port PCIe Ethernet Adapter • ThinkSystem Nvidia ConnectX-7 NDR200/HDR QSFP112 2-port PCIe Gen5 x16 InfiniBand Adapter	50°C
	Single-wide GPU adapter or accelerator	45°C
	Double-wide GPU adapter	40°C
OCP module		
	ThinkSystem Broadcom 57508 100GbE QSFP56 2-Port OCP Ethernet Adapter	50°C
Front NVMe drives		
	• U.2 P5520 SSD (3.84TB or smaller) • U.2 P5620 SSD (3.2TB or smaller) • U.3 7450 PRO SSD (1.92TB or smaller) • U.3 7450 MAX SSD (800GB)	50°C
	• U.2 P5520 SSD (7.68TB or larger) • U.2 P5620 SSD (6.4TB or larger)	45°C
	• U.3 7450 PRO SSD (3.84TB or larger) • U.3 7450 MAX SSD (1.6TB or larger)	35°C
Internal SATA drives		45°C

Internal NVMe drives
 Notes:
 	
 • The following internal NVMe drives might be throttled when ambient temperature is higher than 30°C:
  – U.2 P5520 SSD (7.68TB)
  – U.2 P5620 SSD (6.4TB)
 • The following NVMe drives of specific capacity are not supported as internal drives:
  – U.2 P5520 SSD (15.36TB)
  – U.2 P5620 SSD (12.8TB)
  – U.3 7450 PRO SSD (3.84TB or larger)
  – U.3 7450 MAX SSD (1.6TB or larger)
		35°C

Table 10. Acoustic mode Disabled (continued)

Component	Maximum ambient temperature
M.2 SATA drives	50°C
M.2 NVMe drives	45°C

Table 11. Acoustic mode 1

In Acoustic mode 1, the server operates with sound pressure level of 45 dBA at 25°C or lower ambient temperature with proper configuration. • 2U heat sink is necessary. • Throttling might momentarily occur. See the following information for configurations supported in Acoustic mode 1. **Note:** When one of the components listed as "not recommended" is installed, system fan speed will impact acoustic performance. However, if the not-recommended component is lightly loaded, it may still be possible to run the server in the acoustic mode and lower the system noise.	
Processor	• AMD EPYC 8024P, 8124P processor • AMD EPYC 8024PN, 8124PN, 8224PN, 8324PN processor
Memory modules	16, 32, 48GB

PCIe adapters	• Supports up to two single-wide GPU adapters. The following GPU adapters are supported:
	  – ThinkSystem NVIDIA L4 24GB PCIe Gen4 Passive GPU
	  – ThinkSystem NVIDIA A2 16GB PCIe Gen4 Passive GPU
	  – ThinkSystem NVIDIA A2 16GB PCIe Gen4 Passive GPU w/o CEC
	• RAID adapter and Ethernet adapter are supported.

Front SATA drives	Supported
Front NVMe drives	• U.2 P5520 SSD (3.84TB or smaller) • U.2 P5620 SSD (3.2TB or smaller) • U.3 7450 PRO SSD (1.92TB or smaller) • U.3 7450 MAX SSD (800GB)
Internal SATA drives	Supported
Internal NVMe drives	Not recommended
M.2 SATA drives	Supported
M.2 NVMe drives	Not recommended

Table 12. Acoustic mode 2

In Acoustic mode 2, the server operates with sound pressure level of 40 dBA at 25°C or lower ambient temperature with proper configuration.	
• 2U heat sink is necessary. • Throttling might momentarily occur. See the following information for configurations supported in Acoustic mode 2. **Note:** When one of the components listed as "not recommended" is installed, system fan speed will impact acoustic performance. However, if the not-recommended component is lightly loaded, it may still be possible to run the server in the acoustic mode and lower the system noise.	
Processor	• AMD EPYC 8024P processor • AMD EPYC 8024PN, 8124PN processor
Memory modules	16, 32, 48GB
PCIe adapters	• GPU adapter and accelerator are not recommended. • RAID adapter and Ethernet adapter are supported, except for ThinkSystem Nvidia ConnectX-7 NDR200/HDR QSFP112 2-port PCIe Gen5 x16 InfiniBand Adapter.
Front SATA drives	Supported
Front NVMe drives	• U.2 P5520 SSD (3.84TB or smaller) • U.2 P5620 SSD (3.2TB or smaller) • U.3 7450 PRO SSD (1.92TB or smaller) • U.3 7450 MAX SSD (800GB)
Internal SATA drives	Not recommended
Internal NVMe drives	Not recommended
M.2 SATA drives	Supported
M.2 NVMe drives	Not recommended

Environment

ThinkEdge SE455 V3 complies with ASHRAE Class A2 specifications with most configurations, and depending on the hardware configuration, also complies with ASHRAE Class A3, and Class A4 specifications. System performance may be impacted when operating temperature is outside AHSARE A2 specification.
• Air temperature:
  – Operating
    – ASHARE Class A2: 10°C to 35°C (50°F to 95°F); the maximum ambient temperature decreases by 1°C for every 300 m (984 ft) increase in altitude above 900 m (2,953 ft).
    – ASHARE Class A3: 5°C to 40°C (41°F to 104°F); the maximum ambient temperature decreases by 1°C for every 175m (574 ft) increase in altitude above 900 m (2,953 ft).
    – ASHARE Class A4: 5°C to 45°C (41°F to 113°F); the maximum ambient temperature decreases by 1°C for every 125m (410 ft) increase in altitude above 900 m (2,953 ft).
  – Server off: 5°C to 45°C (41°F to 113°F)
  – Shipment/storage: -40°C to 60°C (-40°F to 140°F)
  – Extended operation temperature (with limited configuration):
    – Server on: 5°C to 55°C (41°F to 131°F)
    – Server off: 5°C to 55°C (41°F to 131°F)
 	
  Note: See Table 10 "Acoustic modes and ambient temperature" on page 236 for the supported components at different ambient temperature.
• Maximum altitude: 3,050 m (10,000 ft)
• Relative Humidity (non-condensing):
  – Operating
    – ASHRAE Class A2: 8% to 80%; maximum dew point: 21°C (70°F)
    – ASHRAE Class A3: 8% to 85%; maximum dew point: 24°C (75°F)
    – ASHRAE Class A4: 8% to 90%; maximum dew point: 24°C (75°F)
  – Shipment/storage: 8% to 90%
• Particulate contamination
  – SE455 V3 supports use of a dust filter that is installed inside the security bezel. The dust fitler has a Minimum Efficiency Rating Value (MERV) of 2, per ASHRAE Standard 52.2-2017.
 	
  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 241.

Shock and vibration specifications

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

Table 13. Shock and vibration specifications

ThinkEdge SE455 V3	Vibration	Shock	Drop
Operation shock & vibration	0.21Grms, 5-500 Hz, 15 min/axis	15G, 3ms, half-sine, ±X, ±Y, ±Z	-
Fragility shock & vibration (when the server is not in operation, such as in shipping)	1.04Grms, 2-200 Hz	52G, 152in/sec	-
Rack-load vibration & drop	0.8Grms, 2-200 Hz	-	Free-fall drop height: 40-100mm Equivalent shock: 40-70 inch/sec, 2-3 ms

Table 14. Environmental criteria (NEBs GR63)

ThinkEdge SE455 V3 Environmental criteria (NEBs GR63)	Bench handling drop	Office vibration	Earthquake test
	Edge drop height (each edge): 100mm Free-fall drop height: 75mm	0.21Grms, 5-100 Hz, 30 min/axis	GR63 earthquake zone 4

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 15. Limits for particulates and gases

Contaminant	Limits
Reactive gases	Severity level G1 as per ANSI/ISA 71.04-1985[1]: • The copper reactivity level shall be less than 200 Angstroms per month (Å/month ≈ 0.0035 µg/cm^2-hour weight gain).[2] • The silver reactivity level shall be less than 200 Angstroms per month (Å/month ≈ 0.0035 µg/cm^2-hour weight gain).[3] • The reactive monitoring of gaseous corrosivity must be conducted approximately 5 cm (2 in.) in front of the rack on the air inlet side at one-quarter and three-quarter frame height off the floor or where the air velocity is much higher.
Airborne particulates	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: • 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. • The deliquescent relative humidity of the particulate contamination should be more than 60% RH.[4] • Data centers must be free of zinc whiskers.[5]

[1] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.

[2] The derivation of the equivalence between the rate of copper corrosion growth in the thickness of the corrosion product in Å/month and the rate of weight gain assumes that Cu_2S and Cu_2O grow in equal proportions.

[3] The derivation of the equivalence between the rate of silver corrosion growth in the thickness of the corrosion product in Å/month and the rate of weight gain assumes that Ag_2S is the only corrosion product.

[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.

[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.

System-board connectors

The following illustrations show the internal connectors on the system board.

Figure 228. System-board connectors

Table 16. System-board connectors

1 PCIe 9 connector	**18** PCIe 5 connector
2 PCIe 8 connector	**19** Firmware and RoT security module connector
3 Memory module slots (DIMM 4-6, right to left)	**20** MicroSD socket
4 Processor	**21** Serial port connector (COM)
5 Memory module slots (DIMM 1-3, right to left)	**22** OCP module connector
6 PCIe 3 connector	**23** PCIe 6 connector
7 PCIe 2 connector	**24** Riser 1 power connector
8 System board power 2 connector (PDB PWR 2)	**25** PCIe 7 connector
9 Fan signal connector (FCB Sideband)	**26** Riser 1 signal connector (Riser1 Sideband)
10 Heat sink detect connector	**27** 3V system battery (CR2032)
11 M.2 signal connector (PCIe 1)	**28** Bezel detect connector

Table 16. System-board connectors (continued)

12 M.2 power connector (M.2 Sideband)	**29** Air flow sensor board connector (Air Velocity Sensor)
13 Internal backplane power connector	**30** Intrusion switch connector
14 Front backplane power connector	**31** 3V security battery (CR2032)
15 System board power 1 connector (PDB PWR 1)	**32** PCIe 10 connector
16 PCIe 4 connector	**33** PCIe 11 connector
17 Power distribution board signal connector (PDB Sideband)	

Troubleshooting by system LEDs and diagnostics display

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

Drive LEDs

This topic provides information on drive LEDs.

The following table describes the problems that are indicated by drive activity LED and drive status LED.
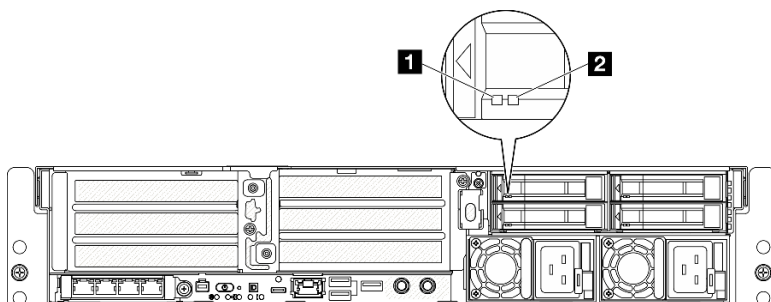
Figure 229. Drive LEDs

LED	Description
1 Drive activity LED (green)	Each hot-swap drive comes with an activity LED. When this LED is flashing, it indicates that the drive is in use.
2 Drive status LED (yellow)	The drive status LED indicates the following status: • The LED is lit: the drive has failed. • The LED is flashing slowly (once per second): the drive is being rebuilt. • The LED is flashing rapidly (three times per second): the drive is being identified.

Front LEDs

This topic provides information about the buttons and LEDs at front of the server.
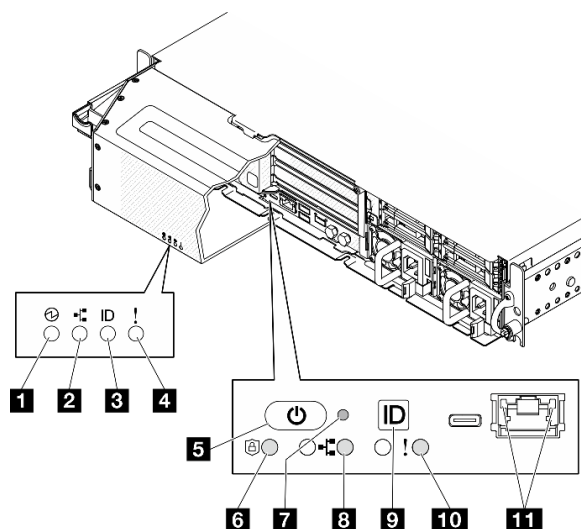
Figure 230. Front LEDs

Table 17. Front LEDs

LEDs visible from	
Security bezel	**Server front view**
1 "Power status LED (green)" on page 245	**5** "Power button with power status LED (green)" on page 245
2 "Network activity LED (green)" on page 246	**6** "Security LED (green)" on page 246
3 "System ID LED (blue)" on page 246	**7** "NMI button" on page 246
4 "System error LED (yellow)" on page 246	**8** "Network activity LED (green)" on page 246
	9 "System ID button with system ID LED (blue)" on page 246
	10 "System error LED (yellow)" on page 246
	11 "XCC system management port" on page 246

1 Power status LED (green) / 5 Power button with power status LED (green)

You can press the power button to power on the server when you finish setting up the server. You also can hold the power button for several seconds to power off the server if you cannot shut down the server from the operating system. The states of the power LED are as follows:

Status	Color	Description
Off	None	No power supply is properly installed, or the LED itself has failed.
Flashing rapidly (four times per second)	Green	The server is turned off and is not ready to be turned on. The power button is disabled. This will last approximately 5 to 10 seconds.
Flashing slowly (once per second)	Green	The server is turned off and is ready to be turned on. You can press the power button to turn on the server.
Lit	Green	The server is turned on.

2 / 8 Network activity LED (green)

When this LED is flashing, it indicates that the server is transmitting to or receiving signals from the Ethernet LAN.

3 System ID LED (blue) / 9 System ID button with system ID LED (blue)

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

4 / 10 System Error LED (yellow)

The system error LED helps you to determine if there are any system errors.

Status	Color	Description	Action
On	Yellow	An error has been detected on the server. Causes might include one or more of the following errors: • The temperature of the server reached the non-critical temperature threshold. • The voltage of the server reached the non-critical voltage threshold. • A fan has been detected to be running at low speed. • 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 Security LED (green)

The states of security LED are as following:

> **Solid on:** The server is operating with security feature enabled.

> **Blinking:** The server is in System Lockdown Mode. Activate or unlock the system for operation.

> **Off:** No security feature is enabled on the server.

7 NMI button

Press this button to force a nonmaskable interrupt to the processor. You might have to use a pen or the end of a straightened paper clip to press the button. You can also use it to force a blue-screen memory dump. Use this button only when you are directed to do so by Lenovo Support.

11 XCC system management port LEDs
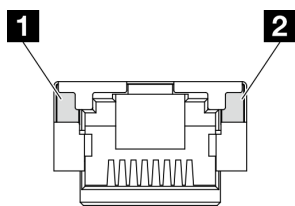
Figure 231. XCC system management port LEDs

LED	Description
1 XCC system management port (1GB RJ-45) Ethernet port link LED	Use this green LED to distinguish the network connectivity status: • Off: The network link is disconnected. • Green: The network link is established.
2 XCC system management port (1GB RJ-45) Ethernet port activity LED	Use this green LED to distinguish the network activity status: • Off: The server is disconnected from a LAN. • Blinking: The network is connected and active.

Power supply LEDs

This topic provides information about various power supply LED status and corresponding action suggestions.

The following minimal configuration is required for the server to start:

- One processor
- One DDR5 DRAM memory modules in slot 3 (DIMM3)
- One power supply unit in PSU bay 1 (PSU1)
- One M.2 boot drive (if OS is needed for debugging)
- Five system fans

The following table describes the problems that are indicated by various combinations of the power-supply LEDs and the power-on LED and suggested actions to correct the detected problems.
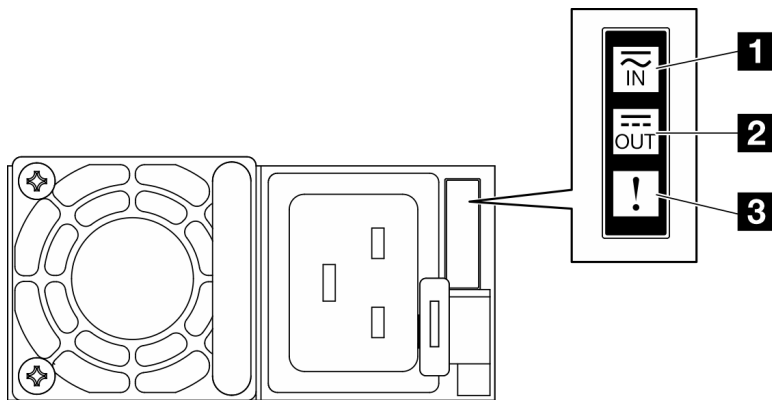
Figure 232. Power supply LEDs

LED	Description
1 Input status	The input status LED can be in one of the following states: • Off: The power supply is disconnected from the AC power source. • Green: The power supply is connected to the AC power source.
2 Output status	The output status LED can be in one of the following states: • Off: The server is powered off, or the power supply is not working properly. If the server is powered on but the output status LED is off, replace the power supply. • Blinking green (about one flash each second): 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. Zero-output mode can be disabled via Lenovo XClarity Controller web interface. If you disable zero-output mode, both power supplies will be in the active state. – Log in to the Lenovo XClarity Controller web interface, choose **Server Configuration ➙ Power Policy**, disable **Zero Output Mode**, and then click **Apply**. • Green: The server is on and the power supply is working normally.
3 Fault LED	• Off: The power supply is working normally • Amber: The power supply may have failed. Dump the FFDC log from the system and contact Lenovo back end support team for PSU data log reviewing.

System-board LEDs

The following illustrations show the light-emitting diodes (LEDs) on the system board.
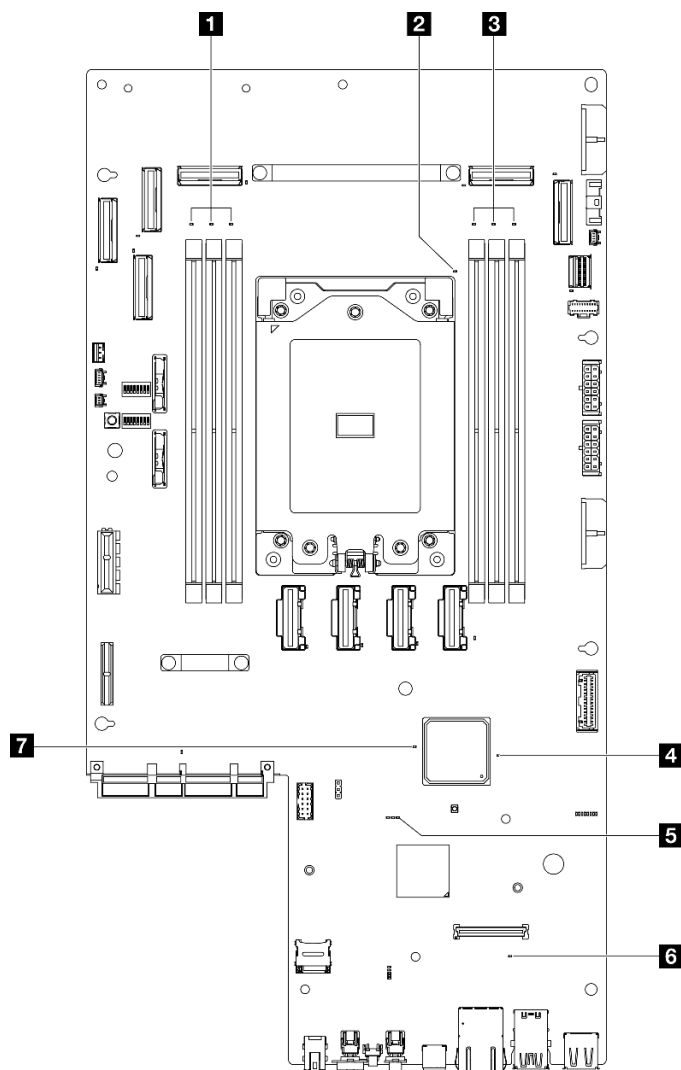
Figure 233. System-board LEDs

Table 18. System board LEDs description and actions

LED	Description	Action
1 DIMM 4-6 error LED (amber)	LED on: an error has occurred to the DIMM the LED represents.	For more information, see "Memory problems" on page 263.
2 Processor error LED (amber)	LED on: an error has occurred to the processor the LED represents.	Replace the processor.
3 DIMM 1-3 error LED (amber)	LED on: an error has occurred to the DIMM the LED represents.	For more information, see "Memory problems" on page 263.

Table 18. System board LEDs description and actions (continued)

LED	Description	Action

4 FPGA power status LED (green)	The FPGA power LED helps to identify different FPGA errors.
	
	• **LED blinking rapidly (four times per second):** The FPGA permission is delayed.
	• **LED blinking slowly (once per second):** The FPGA is ready to power on.
	• **LED on:** The FPGA power is on.
		If FPGA power status LED is always blinking rapidly over 5 minutes, do the following:
		
		• If XCC can be accessed:
		  1. Check the Lenovo XClarity Controller event log and the system error log for information about the error.
		  2. Save the log if necessary, and clear the log afterwards.
		• If XCC cannot be accessed:
		  1. Re-plug the power cord.
		  2. Check and ensure that the system board is installed correctly. (Trained technician only) Reinstall it if needed.
		  3. If the problem remains, contact Lenovo Support.

5 XCC heartbeat LED (green)	The XCC heartbeat LED helps to identify the XCC status.
	
	• Blinking (about one flash per second) : XCC is working normally.
	• Blinking at other speeds or always on: XCC is at the initial phase or is working abnormally.
	• Off: XCC is not working.
		• If the XCC heartbeat LED is always off or always on, do the following:
		  – If XCC cannot be accessed:
		    1. Re-plug the power cord.
		    2. Check and ensure that the system board is installed correctly. (Trained technician only) Reinstall it if needed.
		    3. (Trained technician only) Replace the system board.
		  – If XCC can be accessed:
		    1. Check the Lenovo XClarity Controller event log and the system error log for information about the error.
		    2. Save the log if necessary, and clear the log afterwards.
		• If the XCC heartbeat LED is always blinking fast over 5 minutes, do the following:
		  1. Re-plug the power cord.
		  2. Check and ensure that the system board is installed correctly. (Trained technician only) Reinstall it if needed.
		  3. (Trained technician only) Replace the system board.
		• If the XCC heartbeat LED is always blinking slow for over 5 minutes, do the following:

Table 18. System board LEDs description and actions (continued)

LED	Description	Action
		1. Re-plug the power cord.
		2. Check and ensure that the system board is installed correctly. (Trained technician only) Reinstall it if needed.
		3. If the problem remains, contact Lenovo Support.
6 System error LED (amber)	LED on: an error has occurred.	Complete the following steps:
		1. Check the identification LED and check log LED and follow the instructions.
		2. Check the Lenovo XClarity Controller event log and the system error log for information about the error.
		3. Save the log if necessary, and clear the log afterwards.
7 FPGA heartbeat LED (green)	The FPGA heartbeat LED helps to identify the FPGA status. • Blinking (about one flash per second): FPGA is working normally. • On or off: FPGA is not working.	If FPGA heartbeat LED is always off or always on, do the following: 1. (Trained technician only) Replace the system board. 2. If the problem remains, contact Lenovo Support.

Firmware and RoT security module LEDs

The following illustrations show the light-emitting diodes (LEDs) on the Firmware and Root of Trust Security Module (firmware and RoT security module).
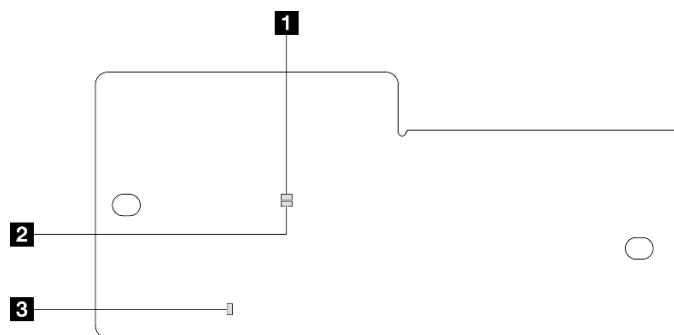
Figure 234. LEDs on the firmware and RoT security module

1 AP0 LED (Green)	**2** AP1 LED (Green)	**3** Fatal Error LED (Amber)

Table 19. LEDs description

Scenario	AP0 LED	AP1 LED	Fatal Error LED	FPGA heart-beat LED[note]	XCC heart-beat LED[note]	Actions
RoT security module fatal firmware failure	Off	Off	On	N/A	N/A	Replace the firmware and RoT security module.
	Blink	N/A	On	N/A	N/A	Replace the firmware and RoT security module.
	Blink	N/A	On	On	N/A	Replace the firmware and RoT security module.
No system power (FPGA heartbeat LED off)	Off	Off	Off	Off	Off	If the AC power is on, but the system board assembly does not have power, then: 1. Check the power supply unit (PSU) or power backplane. If the PSU or power backplane has any error, replace it. 2. If the PSU or power backplane is good, replace the system board.
XCC firmware recoverable error	Blink	N/A	Off	N/A	N/A	Information only. No action is required.
XCC firmware is recovered from error	On	N/A	Off	N/A	N/A	Information only. No action is required.
UEFI firmware authentication failure	N/A	Blink	Off	N/A	N/A	Information only. No action is required.
UEFI firmware is recovered from authentication failure	N/A	On	Off	N/A	N/A	Information only. No action is required.
System is OK (FPGA heartbeat LED is On)	On	On	Off	On	On	Information only. No action is required.

Note: For locations of the FPGA LED and XCC heartbeat LED, see "System-board LEDs" on page 248.

XCC system management port LEDs

This topic provides information on LEDs of XCC system management port.

The following table describes the problems that are indicated by LEDs on XCC system management port.
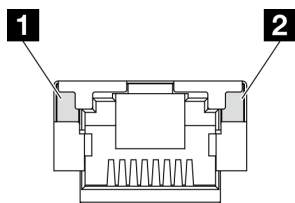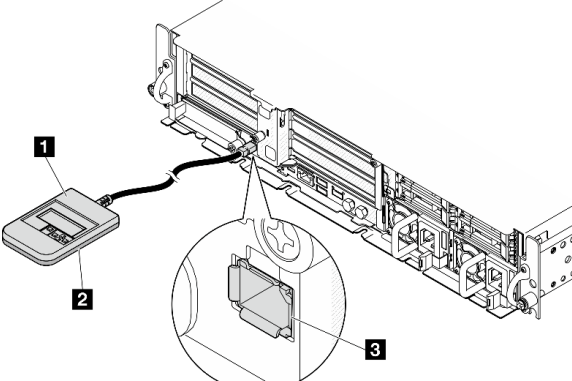
Figure 235. XCC system management port LEDs

LED	Description
1 XCC system management port (1GB RJ-45) Ethernet port link LED	Use this green LED to distinguish the network connectivity status: • Off: The network link is disconnected. • Green: The network link is established.
2 XCC system management port (1GB RJ-45) Ethernet port activity LED	Use this green LED to distinguish the network activity status: • Off: The server is disconnected from a LAN. • Blinking: The network is connected and active.

External Diagnostics Handset

The External Diagnostics Handset is an external device that is connected to the server with a cable, and it allows quick access to system information such as errors, system status, firmware, network, and health information.

Location of the External Diagnostics Handset

Location	Callouts
The External Diagnostics Handset is connected to the server with an external cable. 	**1** External Diagnostics Handset
	2 Magnetic bottom With this component, the diagnostic handset can be attached to the top or side of the rack with hands spared for service tasks.
	3 External diagnostics connector This connector is located on the front of the server, and is used to connect an External Diagnostics Handset.

Note: When unplugging the External Diagnostics Handset, see the following instructions:
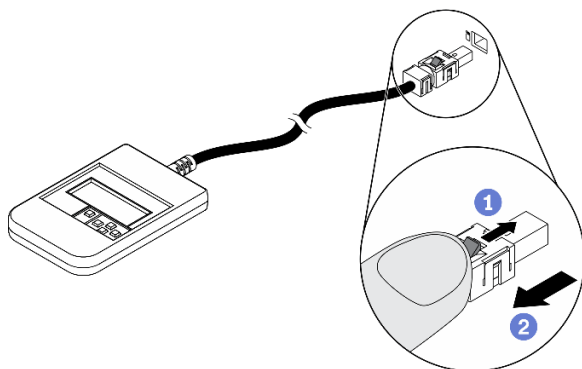
❶ Press the plastic clip on the plug forward.

❷ Hold the clip and remove the cable from the connector.

Display panel overview

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

Status Dashboard
System Name   Ambient Temp
System Status   Power
Active Alerts   Checkpoint Code | Active Session
 	
Menu: • Active Alerts
        • Status Dashboard
        • VPD
        • System Firmware
        • XCC Network
        • Environmental
        • Active Sessions
        • Actions
	1 LCD display

	2 Scroll buttons (up/down/left/right) Press the scroll buttons to locate and select system information.
	3 Select button Press the select button to select from the options in the menu.

Option flow diagram

The LCD panel displays various system information. Navigate through the options with the scroll keys.

Depending on the model, the options and entries on the LCD display might be different.
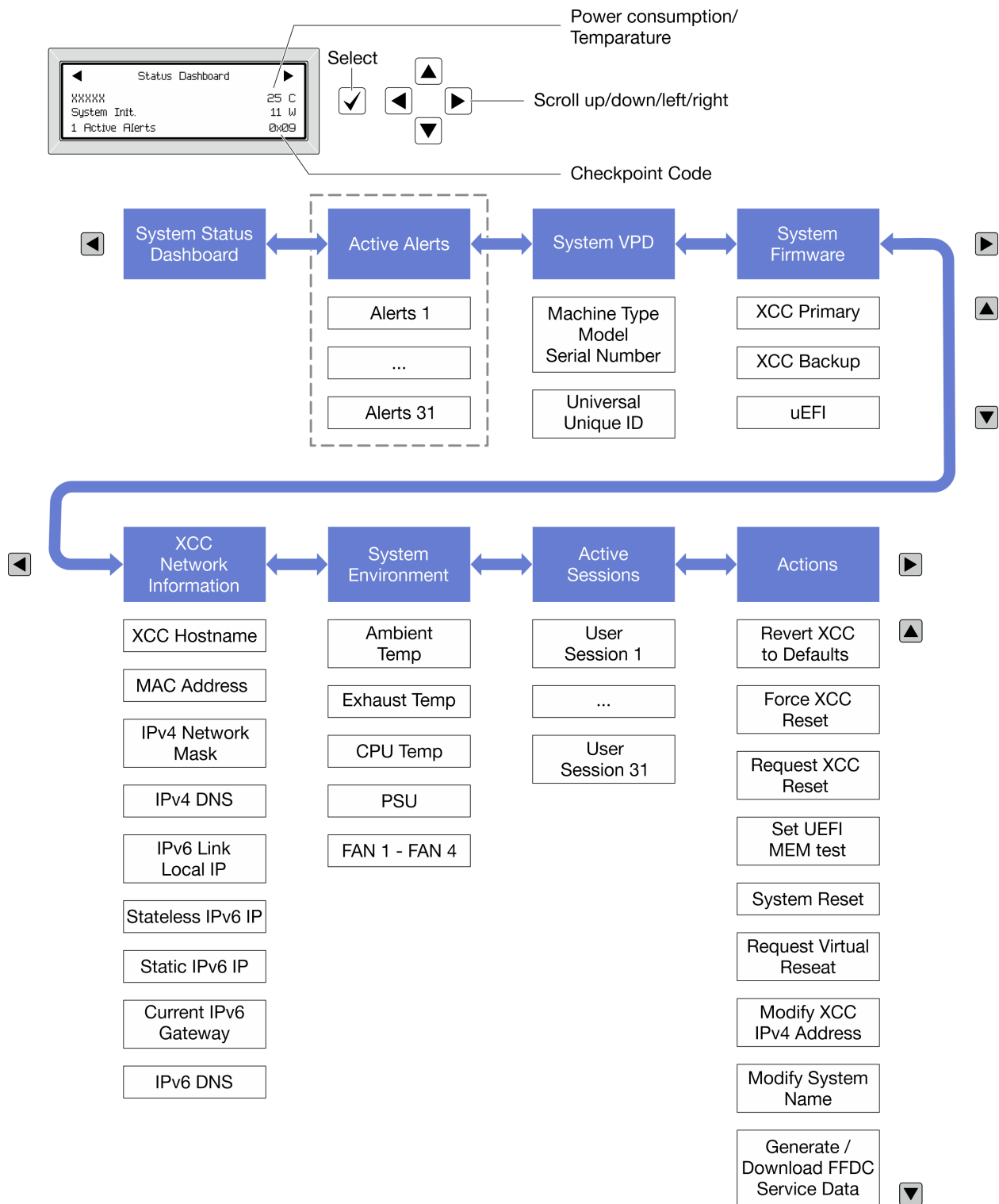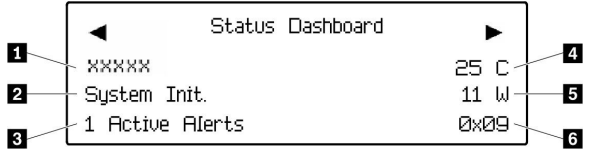
Full menu list

Following is the list of available options. Switch between an option and the subordinate information entries with the select button, and switch among options or information entries with the scroll buttons.

Depending on the model, the options and entries on the LCD display might be different.

Home Menu (System Status Dashboard)

Home Menu	Example
1 System name **2** System status **3** Active alert quantity **4** Temperature **5** Power consumption **6** Checkpoint code	◄ Status Dashboard ► **1** XXXXX 25 C **4** **2** System Init. 11 W **5** **3** 1 Active Alerts 0x09 **6**

Active Alerts

Sub Menu	Example
Home screen: Active error quantity **Note:** The "Active Alerts" menu displays only the quantity of active errors. If no errors occur, the "Active Alerts" menu will not be available during navigation.	1 Active Alerts
Details screen: • Error message ID (Type: Error/Warning/Information) • Occurrence time • Possible sources of the error	Active Alerts: 1 Press ▼ to view alert details FQXSPPU009N(Error) 04/07/2020 02:37:39 PM CPU 1 Status: Configuration Error

System VPD Information

Sub Menu	Example
• Machine type and serial number • Universal Unique ID (UUID)	Machine Type: xxxx Serial Num: xxxxxx Universal Unique ID: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

System Firmware

Sub Menu	Example

XCC Primary
• Firmware level (status)
• Build ID
• Version number
• Release date
	`XCC Primary (Active)`
	`Build: DVI399T`
	`Version: 4.07`
	`Date: 2020-04-07`

XCC Backup
• Firmware level (status)
• Build ID
• Version number
• Release date
	`XCC Backup (Active)`
	`Build: D8BT05I`
	`Version: 1.00`
	`Date: 2019-12-30`

UEFI
• Firmware level (status)
• Build ID
• Version number
• Release date
	`UEFI (Inactive)`
	`Build: DOE101P`
	`Version: 1.00`
	`Date: 2019-12-26`

XCC Network Information

Sub Menu	Example

• XCC hostname
• MAC address
• IPv4 Network Mask
• IPv4 DNS
• IPv6 Link Local IP
• Stateless IPv6 IP
• Static IPv6 IP
• Current IPv6 Gateway
• IPv6 DNS
Note: Only the MAC address that is currently in use is displayed (extension or shared).
	`XCC Network Information`
	`XCC Hostname: XCC-xxxx-SN`
	`MAC Address:`
	`xx:xx:xx:xx:xx:xx`
	`IPv4 IP:`
	`xx.xx.xx.xx`
	`IPv4 Network Mask:`
	`x.x.x.x`
	`IPv4 Default Gateway:`
	`x.x.x.x`

System Environmental Information

Sub Menu	Example
• Ambient temperature • Exhaust temperature • CPU temperature • PSU status • Spinning speed of fans by RPM	Ambient Temp: 24 C Exhaust Temp: 30 C CPU1 Temp: 50 C PSU1: Vin= 213 w Inlet= 26 C FAN1 Front: 21000 RPM FAN2 Front: 21000 RPM FAN3 Front: 21000 RPM FAN4 Front: 21000 RPM

Active Sessions

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

Actions

Sub Menu	Example
Several quick actions are available: • Restore XCC to Defaults • Force XCC Reset • Request XCC Reset • Set UEFI Memory Test • Request Virtual Reseat • Modify XCC Static IPv4 Address/Net mask/Gateway • Modify System Name • Generate/Download FFDC Service Data	Request XCC Reset? This will request the BMC to reboot itself. Hold √ for 3 seconds

General problem determination procedures

Use the information in this section to resolve problems if the event log does not contain specific errors or the server is inoperative.

If you are not sure about the cause of a problem and the power supplies are working correctly, complete the following steps to attempt to resolve the problem:

1. Power off the server.

2. Make sure that the server is cabled correctly.

3. Remove or disconnect the following devices if applicable, one at a time, until you find the failure. Power on and configure the server each time you remove or disconnect a device.
   - Any external devices.
   - Surge-suppressor device (on the server).
   - Printer, mouse, and non-Lenovo devices.
   - Each adapter.

- Hard disk drives.
- Memory modules until you reach the minimal configuration for debugging that is supported for the server.

  To determine the minimal configuration for your server, see "Minimal configuration for debugging" in "Technical specifications" on page 229.

4. Power on the server.

If the problem is solved when you remove an adapter from the server, but the problem recurs when you install the same adapter again, suspect the adapter. If the problem recurs when you replace the adapter with a different one, try a different PCIe slot.

If the problem appears to be a networking problem and the server passes all system tests, suspect a network cabling problem that is external to the server.

Resolving suspected power problems

Power problems can be difficult to solve. For example, a short circuit can exist anywhere on any of the power distribution buses. Usually, a short circuit will cause the power subsystem to shut down because of an overcurrent condition.

Complete the following steps to diagnose and resolve a suspected power problem.

Step 1. Check the event log and resolve any errors related to the power.

> **Note:** Start with the event log of the application that is managing the server. For more information about event logs, see "Event logs" on page 227.

Step 2. Check for short circuits, for example, if a loose screw is causing a short circuit on a circuit board.

Step 3. Remove the adapters and disconnect the cables and power cords to all internal and external devices until the server is at the minimal configuration for debugging that is required for the server to start. To determine the minimal configuration for your server, see "Minimal configuration for debugging" in "Technical specifications" on page 229.

Step 4. Reconnect all AC power cords and turn on the server. If the server starts successfully, reseat the adapters and devices one at a time until the problem is isolated.

If the server does not start from the minimal configuration, replace the components in the minimal configuration one at a time until the problem is isolated.

Resolving suspected Ethernet controller problems

The method that you use to test the Ethernet controller depends on which operating system you are using. See the operating-system documentation for information about Ethernet controllers, and see the Ethernet controller device-driver readme file.

Complete the following steps to attempt to resolve suspected problems with the Ethernet controller.

Step 1. Make sure that the correct device drivers, which come with the server are installed and that they are at the latest level.

Step 2. Make sure that the Ethernet cable is installed correctly.

- The cable must be securely attached at all connections. If the cable is attached but the problem remains, try a different cable.
- If you set the Ethernet controller to operate at 100 Mbps or 1000 Mbps, you must use Category 5 cabling.

Step 3. Determine whether the hub supports auto-negotiation. If it does not, try configuring the integrated Ethernet controller manually to match the speed and duplex mode of the hub.

Step 4. Check the Ethernet controller LEDs on the server. These LEDs indicate whether there is a problem with the connector, cable, or hub.

Ethernet controller LED locations are specified in "Troubleshooting by system LEDs and diagnostics display" on page 244.

- The Ethernet link status LED is lit when the Ethernet controller receives a link pulse from the hub. If the LED is off, there might be a defective connector or cable or a problem with the hub.
- The Ethernet transmit/receive activity LED is lit when the Ethernet controller sends or receives data over the Ethernet network. If the Ethernet transmit/receive activity is off, make sure that the hub and network are operating and that the correct device drivers are installed.

Step 5. Check the Network activity LED on the server. The Network activity LED is lit when data is active on the Ethernet network. If the Network activity LED is off, make sure that the hub and network are operating and that the correct device drivers are installed.

Network activity LED location is specified in "Troubleshooting by system LEDs and diagnostics display" on page 244.

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 227).

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 279).

Fan problems

See this section to resolve issues related the to fans.

- "Abnormally high RPM (revolutions per minute)" on page 260

Abnormally high RPM (revolutions per minute)

Complete the following steps until the problem is solved.

1. Check the Lenovo XClarity Controller event log and the system error log for information to make sure if any of the fans or rotors of the fans fail. Replace the failed fan.

2. With air flow sensor board installed, SE455 V3 BMC supports dust filter measurement to check the status of the dust filter. Log in to Lenovo XClarity Controller web interface, and go to **Utilization ➙ Fan Speed (RPM) ➙ Dust Filter Measurement** to take the measurement by selecting **Run immediately (once)**, or by setting a regular schedule. When taking the measurement, the fans will operate at full fan speed for about 30 seconds. Make sure the high RPM is not caused by dust filter measurement.

3. Check to see if the system inlet perforation or heatsinks are clogged.

4. Make sure that all air baffles are correctly installed in the server.

5. Check the thermal grease on the processor, and make sure it's not contaminated.

Intermittent problems

Use this information to solve intermittent problems.

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-
-

Intermittent external device problems

Complete the following steps until the problem is solved.

1. Update the UEFI and XCC firmware to the latest versions.

2. Make sure that the correct device drivers are installed. See the manufacturer's website for documentation.

3. For a USB device:

   a. Make sure that the device is configured correctly.

      Restart the server and press the key according to the on-screen instructions to display the LXPM system setup interface. (For more information, see the "Startup" section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.) Then, click **System Settings ➙ Devices and I/O Ports ➙ USB Configuration**.

   b. Connect the device to another port. If using a USB hub, remove the hub and connect the device directly to the server. Make sure that the device is configured correctly for the port.

Intermittent KVM problems

Complete the following steps until the problem is solved.

Video problems:

1. Make sure that all cables and the console breakout cable are properly connected and secure.

2. Make sure that the monitor is working properly by testing it on another server.

3. Test the console breakout cable on a working server to ensure that it is operating properly. Replace the console breakout cable if it is defective.

Keyboard problems:

Make sure that all cables and the console breakout cable are properly connected and secure.

Mouse problems:

Make sure that all cables and the console breakout cable are properly connected and secure.

Intermittent unexpected reboots

Note: Some uncorrectable errors require that the server reboot so that it can disable a device, such as a memory DIMM or a processor to allow the machine to boot up properly.

1. If the reset occurs during POST and the POST watchdog timer is enabled, make sure that sufficient time is allowed in the watchdog timeout value (POST Watchdog Timer).

   To check the POST watchdog time, restart the server and press the key according to the on-screen instructions to display the LXPM system setup interface. (For more information, see the "Startup" section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.) Then, click **BMC Settings ➔ POST Watchdog Timer**.

2. If the reset occurs after the operating system starts, do one of the followings:

   - Enter the operating system when the system operates normally and set up operating system kernel dump process (Windows and Linux base operating systems will be using different method). Enter the UEFI setup menus and disable the feature, or disable it with the following OneCli command.
     `OneCli.exe config set SystemRecovery.RebootSystemOnNMI Disable --bmc XCC_USER:XCC_PASSWORD@XCC_IPAddress`

   - Disable any automatic server restart (ASR) utilities, such as the Automatic Server Restart IPMI Application for Windows, or any ASR devices that are installed.

3. See the management controller event log to check for an event code that indicates a reboot. See "Event logs" on page 227 for information about viewing the event log. If you are using Linux base operating system, then capture all logs back to Lenovo support for further investigation.

Keyboard, mouse, KVM switch or USB-device problems

Use this information to solve problems related to a keyboard, mouse, KVM switch or USB-device problems.

- "All or some keys on the keyboard do not work" on page 262
- "Mouse does not work" on page 262
- "KVM switch problems" on page 263
- "USB-device does not work" on page 263

All or some keys on the keyboard do not work

1. Make sure that:
   - The keyboard cable is securely connected.
   - The server and the monitor are turned on.
2. If you are using a USB keyboard, run the Setup utility and enable keyboardless operation.
3. If you are using a USB keyboard and it is connected to a USB hub, disconnect the keyboard from the hub and connect it directly to the server.
4. Replace the keyboard.

Mouse does not work

1. Make sure that:

   - The mouse cable is securely connected to the server.

   - The mouse device drivers are installed correctly.

   - The server and the monitor are turned on.

   - The mouse option is enabled in the Setup utility.

2. If you are using a USB mouse and it is connected to a USB hub, disconnect the mouse from the hub and connect it directly to the server.

3. Replace the mouse.

KVM switch problems

1. Make sure that the KVM switch is supported by your server.

2. Make sure that the KVM switch is powered on correctly.

3. If the keyboard, mouse or monitor can be operated normally with direct connection to the server, then replace the KVM switch.

USB-device does not work

1. Make sure that:
   - The 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 the key according to the on-screen instructions to display the LXPM system setup interface. (For more information, see the "Startup" section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.) Then, click **System Settings ➙ Devices and I/O Ports ➙ USB Configuration**.

3. If you are using a USB hub, disconnect the USB device from the hub and connect it directly to the server.

Memory problems

See this section to resolve issues related to memory.

Common memory problems

- "Multiple memory modules in a channel identified as failing" on page 263
- "Displayed system memory is less than installed physical memory" on page 263
- "Invalid memory population detected" on page 264

Multiple memory modules in a channel identified as failing

Note: Each time you install or remove a memory module, you must disconnect the server from the power source; then, wait 10 seconds before restarting the server.

Complete the following procedure to solve the problem.

1. Reseat the memory modules; then, restart the server.

2. Remove the highest-numbered memory module of those that are identified and replace it with an identical known good memory module; then, restart the server. Repeat as necessary. If the failures continue after all identified memory modules are replaced, go to step 4.

3. Return the removed memory modules, one at a time, to their original connectors, restarting the server after each memory module, until a memory module fails. Replace each failing memory module with an identical known good memory module, restarting the server after each memory module replacement. Repeat step 3 until you have tested all removed memory modules.

4. Replace the highest-numbered memory module of those identified; then, restart the server. Repeat as necessary.

5. Reverse the memory modules between the channels (of the same processor), and then restart the server. If the problem is related to a memory module, replace the failing memory module.

6. (Trained technician only) Replace the system board (system board assembly).

Displayed system memory is less than installed physical memory

Complete the following procedure to solve the problem.

Note: Each time you install or remove a memory module, you must disconnect the server from the power source; then, wait 10 seconds before restarting the server.

1. Make sure that:

   - No error LEDs are lit. See "Troubleshooting by system LEDs and diagnostics display" on page 244.

   - No memory module error LEDs are lit on the system board (system board assembly).

   - Memory mirrored channel does not account for the discrepancy.

   - The memory modules are seated correctly.

   - You have installed the correct type of memory module (see "Memory module installation rules and order" on page 5 for requirements).

   - After changing or replacing a memory module, memory configuration is updated accordingly in the Setup Utility.

   - All banks of memory are enabled. The server might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled.

   - There is no memory mismatch when the server is at the minimum memory configuration.

2. Reseat the memory modules, and then restart the server.

3. Check the POST error log:

   - If a memory module was disabled by a systems-management interrupt (SMI), replace the memory module.

   - If a memory module was disabled by the user or by POST, reseat the memory module; then, run the Setup Utility and enable the memory module.

4. Re-enable all memory modules using the Setup Utility, and then restart the server.

5. (Trained technician only) Replace the system board (system board assembly).

Invalid memory population detected

If this warning message appears, complete the following steps:

> Invalid memory population (unsupported DIMM population) detected. Please verify memory configuration is valid.

1. See "Memory module installation rules and order" on page 5 to make sure the present memory module population sequence is supported.

2. If the present sequence is indeed supported, see if any of the modules is displayed as "disabled" in Setup Utility.

3. Reseat the module that is displayed as "disabled," and reboot the system.

4. If the problem persists, replace the memory module.

Monitor and video problems

Use this information to solve problems related to a monitor or video.

- "Incorrect characters are displayed" on page 264
- "Screen is blank" on page 265
- "Screen goes blank when you start some application programs" on page 265
- "The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted" on page 265
- "The wrong characters appear on the screen" on page 266

Incorrect characters are displayed

Complete the following steps:

1. Verify that the language and locality settings are correct for the keyboard and operating system.
2. If the wrong language is displayed, update the server firmware to the latest level. See "Update the firmware" in *User Guide* or *System Configuration Guide*.

Screen is blank

Note: Make sure that the expected boot mode has not been changed from the UEFI to Legacy or vice versa.

1. If the server is attached to a KVM switch, bypass the KVM switch to eliminate it as a possible cause of the problem: connect the monitor cable directly to the correct connector on the rear of the server.
2. The management controller remote presence function is disabled if you install an optional video adapter. To use the management controller remote presence function, remove the optional video adapter.
3. If the server is installed with the graphical adapters while turning on the server, the Lenovo logo is displayed on the screen after approximately 3 minutes. This is normal operation while the system loads.
4. Make sure that:
   - The server is turned on and there is power supplied to the server.
   - The monitor cables are connected correctly.
   - The monitor is turned on and the brightness and contrast controls are adjusted correctly.
5. Make sure that the correct server is controlling the monitor, if applicable.
6. Make sure that the video output is not affected by corrupted server firmware; See "Update the firmware" in *User Guide* or *System Configuration Guide*.
7. If the problem remains, contact Lenovo Support.

Screen goes blank when you start some application programs

1. Make sure that:

   - The application program is not setting a display mode that is higher than the capability of the monitor.

   - You installed the necessary device drivers for the application.

The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted

1. If the monitor self-tests show that the monitor is working correctly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescents, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor.

   Attention: Moving a color monitor while it is turned on might cause screen discoloration.

   Move the device and the monitor at least 305 mm (12 in.) apart, and turn on the monitor.

   Notes:

   a. To prevent diskette drive read/write errors, make sure that the distance between the monitor and any external diskette drive is at least 76 mm (3 in.).

   b. Non-Lenovo monitor cables might cause unpredictable problems.

2. Reseat the monitor cable.
3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time:
   a. Monitor cable
   b. Video adapter (if one is installed)
   c. Monitor
   d. (Trained technician only) System board (system board assembly)

The wrong characters appear on the screen

Complete the following steps until the problem is solved:

1. Verify that the language and locality settings are correct for the keyboard and operating system.

2. If the wrong language is displayed, update the server firmware to the latest level. See "Update the firmware" in *User Guide* or *System Configuration Guide*.

Network problems

Use this information to resolve issues related to networking.

- "Cannot wake server using Wake on LAN" on page 266
- "Could not log in using LDAP account with SSL enabled" on page 266

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 227), make sure:

   a. Fan 3 is running in standby mode, if Emulex dual port 10GBase-T embedded adapter is installed.

   b. The room temperature is not too high (see "Specifications" on page 229).

   c. The air vents are not blocked.

   d. The air baffle is installed securely.

2. Reseat the dual-port network adapter.

3. Turn off the server and disconnect it from the power source; then, wait 10 seconds before restarting the server.

4. If the problem still remains, replace the dual-port network adapter.

Could not log in using LDAP account with SSL enabled

Complete the following steps until the problem is resolved:

1. Make sure that the license key is valid.

2. Generate a new license key and log in again.

Observable problems

Use this information to solve observable problems.

- "Server hangs during the UEFI boot process" on page 267
- "The server immediately displays the POST Event Viewer when it is turned on" on page 267
- "Server is unresponsive (POST is complete and operating system is running)" on page 267
- "Server is unresponsive (POST failed and cannot start System Setup)" on page 268
- "Voltage planar fault is displayed in the event log" on page 268
- "Unusual smell" on page 268
- "Server seems to be running hot" on page 268
- "Cannot enter legacy mode after installing a new adapter" on page 269
- "Cracked parts or cracked chassis" on page 269

Server hangs during the UEFI boot process

If the system hangs during the UEFI boot process with the message `UEFI: DXE INIT` on the display, make sure that Option ROMs were not configured with a setting of **Legacy**. You can remotely view the current settings for Option ROMs by running the following command using the Lenovo XClarity Essentials OneCLI:

`onecli config show EnableDisableAdapterOptionROMSupport --bmc` *xcc_userid*`:`*xcc_password*`@`*xcc_ipaddress*

To recover a system that hangs during the boot process with Legacy Option ROM settings, see the following Tech Tip:

https://datacentersupport.lenovo.com/solutions/ht506118

If legacy Option ROMs must be used, do not set slot Option ROMs to **Legacy** on the Devices and I/O Ports menu. Instead, set slot Option ROMs to **Auto** (the default setting), and set the System Boot Mode to **Legacy Mode**. Legacy option ROMs will be invoked shortly before the system boots.

The server immediately displays the POST Event Viewer when it is turned on

Complete the following steps until the problem is solved.

1. Correct any errors that are indicated by the system LEDs and diagnostics display.
2. Make sure that the server supports all the processors and that the processors match in speed and cache size.

   You can view processor details from system setup.

   To determine if the processor is supported for the server, see https://serverproven.lenovo.com.
3. (Trained technician only) Make sure that processor is seated correctly.
4. Replace the following components one at a time, in the order shown, restarting the server each time:
   a. (Trained technician only) Processor
   b. (Trained technician only) System board (system board assembly)

Server is unresponsive (POST is complete and operating system is running)

Complete the following steps until the problem is solved.

- If you are in the same location as the server, complete the following steps:
  1. If you are using a KVM connection, make sure that the connection is operating correctly. Otherwise, make sure that the keyboard and mouse are operating correctly.
  2. If possible, log in to the server and verify that all applications are running (no applications are hung).
  3. Restart the server.
  4. If the problem remains, make sure that any new software has been installed and configured correctly.
  5. Contact your place of purchase of the software or your software provider.
- If you are accessing the server from a remote location, complete the following steps:
  1. Make sure that all applications are running (no applications are hung).
  2. Attempt to log out of the system and log back in.
  3. Validate the network access by pinging or running a trace route to the server from a command line.
     a. If you are unable to get a response during a ping test, attempt to ping another server at the same location with the unresponsive one to determine whether it is a connection problem or server problem.

b. Run a trace route to determine where the connection breaks down. Attempt to resolve a connection issue with either the VPN or the point at which the connection breaks down.

4. Restart the server remotely through the management interface.

5. If the problem remains, verify that any new software has been installed and configured correctly.

6. Contact your place of purchase of the software or your software provider.

Server is unresponsive (POST failed and cannot start System Setup)

Configuration changes, such as added devices or adapter firmware updates, and firmware or application code problems can cause the server to fail POST (the power-on self-test).

If this occurs, the server responds in either of the following ways:

- The server restarts automatically and attempts POST again.
- The server hangs, and you must manually restart the server for the server to attempt POST again.

After a specified number of consecutive attempts (automatic or manual), the server reverts to the default UEFI configuration and starts System Setup so that you can make the necessary corrections to the configuration and restart the server. If the server is unable to successfully complete POST with the default configuration, there might be a problem with the system board (system board assembly).

You can specify the number of consecutive restart attempts in System Setup. Restart the server and press the key according to the on-screen instructions to display the LXPM system setup interface. (For more information, see the "Startup" section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.) Then, click **System Settings ➔ 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 229 for the minimally required number of processors and DIMMs.

2. Restart the system.

   - If the system restarts, add each of the removed items one at a time and restart the system each time until the error occurs. Replace the item for which the error occurs.

   - If the system does not restart, suspect the system board (system board assembly).

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.

1. Make sure that the room temperature is within the specified range (see "Specifications" on page 229).

2. Make sure that the fans are installed correctly.

3. Update the UEFI and XCC to the latest versions.

4. Make sure that the fillers in the server are installed correctly (see Chapter 1 "Hardware replacement procedures" on page 1 for detailed installation procedures).

5. Use the IPMI command to ramp up the fan speed to the full fan speed to see whether the issue can be resolved.

Note: The IPMI raw command should only be used by trained technician and the each system has its own specific PMI raw command.

6. Check the management processor event log for rising temperature events. If there are no events, the server is running within normal operating temperatures. Note that you can expect some variation in temperature.

Cannot enter legacy mode after installing a new adapter

Complete the following procedure to solve the problem.

1. Go to **UEFI Setup ➙ Devices and I/O Ports ➙ Set Option ROM Execution Order**.

2. Move the RAID adapter with operation system installed to the top of the list.

3. Select **Save**.

4. Reboot the system and auto boot to operation system.

Cracked parts or cracked chassis

Contact Lenovo Support.

Optional-device problems

Use this information to solve problems related to optional devices.

- "External USB device is not recognized" on page 269
- "PCIe adapter is not recognized or is not functioning" on page 269
- "Insufficient PCIe resources are detected." on page 270
- "A Lenovo optional device that was just installed does not work." on page 270
- "A Lenovo optional device that worked previously does not work now" on page 270

External USB device is not recognized

Complete the following steps until the problem is resolved:

1. Update the UEFI firmware to the latest version.

2. Make sure that the proper drivers are installed on the compute node. See the product documentation for the USB device for information about device drivers.

3. Use the Setup utility to make sure that the device is configured correctly.

4. If the USB device is plugged into a hub or the console breakout cable, unplug the device and plug it directly into the USB port on the front of the compute node.

PCIe adapter is not recognized or is not functioning

Complete the following steps until the problem is resolved:

1. Update the UEFI firmware to the latest version.

2. Check the event log and resolve any issues related to the device.

3. Validate that the device is supported for the server (see https://serverproven.lenovo.com). Make sure that the firmware level on the device is at the latest supported level and update the firmware if applicable.

4. Make sure that the adapter is installed in a correct slot.

5. Make sure that the proper device drivers are installed for the device.

6. Resolve any resource conflicts if running legacy mode (UEFI). Check legacy ROM boot orders and modify the UEFI setting for MM config base.

Note: Ensure that you modify the ROM boot order associated with the PCIe adapter to the first execution order.

7. Check http://datacentersupport.lenovo.com for any tech tips (also known as retain tips or service bulletins) that might be related to the adapter.

8. Ensure any adapter external connections are correct and that the connectors are not physically damaged.

9. Make sure that the PCIe adapter is installed with the supported operating system.

Insufficient PCIe resources are detected.

If you see an error message stating "Insufficient PCI Resources Detected," complete the following steps until the problem is resolved:

1. Press Enter to access System Setup Utility.

2. Select **System Settings ➙ Devices and I/O Ports ➙ MM Config Base**; then, modify the setting to increase the device resources. For example, modify 3 GB to 2 GB or modify 2 GB to 1 GB.

3. Save the settings and restart the system.

4. If the error recurs with the highest device resource setting (1GB), shutdown the system and remove some PCIe devices; then, power on the system.

5. If the reboot failed, repeat step 1 to step 4.

6. If the error recurs, press Enter to access System Setup Utility.

7. Select **System Settings ➙ Devices and I/O Ports ➙ PCI 64–Bit Resource Allocation**, then; modify the setting from **Auto** to **Enable**.

8. If the Boot Device does not support MMIO above 4GB for Legacy Boot, use UEFI Boot Mode or remove/disable some PCIe devices.

9. DC cycle the system and ensure the system is enter UEFI boot menu or the operating system; then, capture the FFDC log.

10. Contact Lenovo technical support.

A Lenovo optional device that was just installed does not work.

1. Make sure that:
   - The device is supported for the server (see https://serverproven.lenovo.com).
   - You followed the installation instructions that came with the device and the device is installed correctly.
   - You have not loosened any other installed devices or cables.
   - You updated the configuration information in system setup. When you start a server and press the key according to the on-screen instructions to display the Setup Utility. (For more information, see the "Startup" section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.) Whenever memory or any other device is changed, you must update the configuration.

2. Reseat the device that you have just installed.

3. Replace the device that you have just installed.

4. Reseat the cable connection and check there is no physical damage to the cable.

5. If there is any cable damages, then replace the cable.

A Lenovo optional device that worked previously does not work now

1. Make sure that all of the cable connections for the device are secure.

2. If the device comes with test instructions, use those instructions to test the device.

3. Reseat the cable connection and check if any physical parts have been damaged.

4. Replace the cable.

5. Reseat the failing device.

6. Replace the failing device.

Performance problems

Use this information to solve performance problems.

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Network performance

Complete the following steps until the problem is solved:

1. Isolate which network is operating slowly (such as storage, data, and management). You might find it helpful to use ping tools or operating-system tools such as task manager or resource manager.

2. Check for traffic congestion on the network.

3. Update the NIC device driver, or the storage device controller device driver.

4. Use the traffic-diagnostic tools that are provided by the IO-module manufacturer.

Operating system performance

Complete the following steps until the problem is solved:

1. If you have recently made changes to the compute node (for example updated device drivers or installed software applications) remove the changes.

2. Check for any networking issues.

3. Check the operating system logs for performance related errors.

4. Check for events related to high temperatures and power issues as the compute node might be throttled to help with cooling. If it is throttled, reduce the workload on the compute node to help improve performance.

5. Check for events related to disabled DIMMs. If you do not have enough memory for the application workload, your operating system will have poor performance.

6. Ensure that the workload is not too high for the configuration.

Power on and power off problems

Use this information to resolve issues when powering on or powering off the server.

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The power button does not work (server does not start)

Note: The power button will not function until approximately 1 to 3 minutes after the server has been connected to ac power to allow time for BMC to initialize.

Complete the following steps until the problem is resolved:

1. Make sure that the power button on the server is working correctly:

   a. Disconnect the server power cords.

   b. Reconnect the server power cords.

   c. Reseat the front operator panel cable, and then repeat steps 1a and 2b.

- If the server starts, reseat the front operator panel.
- If the problem remains, replace the front operator panel.

2. Make sure that:

- The power cords are correctly connected to the server and to a working electrical outlet.
- The LEDs on the power supply do not indicate a problem.
- The Power button LED is lit on and is flashing slowly.
- The push force is enough and with button force response.

3. If the power button LED is not lit on or is not flashing correctly, reseat all the power supplies and make sure AC LED on PSU rear side are lit on.

4. If you have just installed an optional device, remove it, and restart the server.

5. If the issue is still observed or without power button LED lit on, implement the minimum configuration to check whether any specific components lock the power permission. Replace the each power supply and check the power button function after installing the each one.

6. If everything is still done and the issue cannot be resolved, collect the failure information with system logs captured to Lenovo support.

Server does not power on

Complete the following steps until the problem is resolved:

1. Check the event log for any events related to the server not powering on.

2. Check for any LEDs that are flashing amber.

3. Check the power LED on the system board (system board assembly).

4. Check if AC power LED is lit on or the amber LED is lit on at the PSU rear side.

5. AC cycle the system.

6. Remove the CMOS battery for at least ten seconds, then, reinstall the CMOS battery.

7. Try to power on the system by IPMI command through XCC or by the power button.

8. Implement the minimum configuration (see "Technical specifications" on page 229).

9. Reseat all power supplies and make sure that AC LEDs on the PSU rear side are lit.

10. Replace the each power supply and check the power button function after installing the each one.

11. If the issue cannot be resolved by above actions, call service to review the issue symptom and see whether the system board (system board assembly) replacement is necessary.

Power problems

Use this information to resolve issues related to power.

System error LED is on and event log "Power supply has lost input" is displayed

To resolve the problem, ensure that:

1. The power supply is properly connected to a power cord.

2. The power cord is connected to a properly grounded electrical outlet for the server.

3. Make sure that the power supply AC source is stable within the supported range.

4. Swap the power supply to see if the issue follows the power supply, if it follows the power supply, then replace the failing one.

5. Review the event log and see how the problem it is to follow the event log actions to resolved the problems.

Serial-device problems

Use this information to solve problems with serial ports or devices.

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Number of displayed serial ports is less than the number of installed serial ports

Complete the following steps until the problem is solved.

1. Make sure that:

   - Each port is assigned a unique address in the Setup utility and none of the serial ports is disabled.
   - The serial-port adapter (if one is present) is seated correctly.

2. Reseat the serial port adapter.

3. Replace the serial port adapter.

Serial device does not work

1. Make sure that:

   - The device is compatible with the server.
   - The serial port is enabled and is assigned a unique address.
   - The device is connected to the correct connector (see).

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 (system board assembly).

Software problems

Use this information to solve software problems.

1. To determine whether the problem is caused by the software, make sure that:
   - The server has the minimum memory that is needed to use the software. For memory requirements, see the information that comes with the software.

     Note: If you have just installed an adapter or memory, the server might have a memory-address conflict.
   - The software is designed to operate on the server.
   - Other software works on the server.
   - The software works on another server.

2. If you receive any error messages while you use the software, see the information that comes with the software for a description of the messages and suggested solutions to the problem.

3. Contact your place of purchase of the software.

Storage drive problems

Use this information to resolve issues related to the storage drives.

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Server cannot recognize a hard drive

Note: When SED encryption is enabled, it is necessary to power cycle the system after installing an SED; without power cycling, the SED will not be recognized by the host OS.

Complete the following steps until the problem is solved.

1. Observe the associated yellow hard disk drive status LED. If the LED is lit, it indicates a drive fault.

2. If the status LED is lit, remove the drive from the bay, wait 45 seconds, and reinsert the drive, making sure that the drive assembly connects to the hard disk drive backplane.

3. Observe the associated green hard disk drive activity LED and the yellow status LED and perform corresponding operations in different situations:

   - If the green activity LED is flashing and the yellow status LED is not lit, the drive is recognized by the controller and is working correctly. Run the diagnostics tests for the hard disk drives. When you start a server and press the key according to the on-screen instructions, the LXPM is displayed by default. (For more information, see the "Startup" section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.)You can perform hard drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic ➙ Disk Drive Test**.

   - If the green activity LED is flashing and the yellow status LED is flashing slowly, the drive is recognized by the controller and is rebuilding.

   - If neither LED is lit or flashing, check whether the hard disk drive backplane is correctly seated. For details, go to step 4.

   - If the green activity LED is flashing and the yellow status LED is lit, replace the drive.

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 the key according to the on-screen instructions, the LXPM is displayed by default. (For more information, see the "Startup" section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.) You can perform hard drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic ➙ Disk Drive Test**.

   Based on those tests:

   - If the backplane passes the test but the drives are not recognized, replace the backplane signal cable and run the tests again.

   - Replace the backplane.

   - If the adapter fails the test, disconnect the backplane signal cable from the adapter and run the tests again.

- If the adapter fails the test, replace the adapter.

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 the key according to the on-screen instructions, the LXPM is displayed by default. (For more information, see the "Startup" section in the LXPM documentation compatible with your server at https://pubs.lenovo.com/lxpm-overview/.) You can perform hard drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic** ➜ **Disk Drive Test**
2. If the drive passes the test, replace the backplane.
3. If the drive fails the test, replace the drive.

Yellow 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.

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: IBM is Lenovo's preferred service provider for ThinkSystem.

Before you call

Before you call, there are several steps that you can take to try and solve the problem yourself. If you decide that you do need to call for assistance, gather the information that will be needed by the service technician to more quickly resolve your problem.

Attempt to resolve the problem yourself

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The online help also describes the diagnostic tests that you can perform. The documentation for most systems, operating systems, and programs contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

You can find the product documentation for your ThinkSystem products at the following location:

https://pubs.lenovo.com/

You can take these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated software, firmware, and operating-system device drivers for your Lenovo product. (See the following links) The Lenovo Warranty terms and conditions state that you, the owner of the Lenovo product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
  - Drivers and software downloads
    - https://datacentersupport.lenovo.com/products/servers/thinkedge/se455v3/7dby/downloads/driver-list/
  - Operating system support center
    - https://datacentersupport.lenovo.com/solutions/server-os
  - Operating system installing instructions
    - https://pubs.lenovo.com/thinkedge#os-installation
- If you have installed new hardware or software in your environment, check https://serverproven.lenovo.com to make sure that the hardware and software are supported by your product.
- Refer to Chapter 3 "Problem determination" on page 227 for instructions on isolating and solving issues.
- Go to http://datacentersupport.lenovo.com and check for information to help you solve the problem.

To find the Tech Tips available for your server:

1. Go to http://datacentersupport.lenovo.com and navigate to the support page for your server.
2. Click on **How To's** from the navigation pane.
3. Click **Article Type → Solution** from the drop-down menu.

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

- Check Lenovo Data Center Forum at https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg to see if someone else has encountered a similar problem.

Gathering information needed to call Support

If you require warranty service for your Lenovo product, the service technicians will be able to assist you more efficiently if you prepare the appropriate information before you call. You can also go to http://datacentersupport.lenovo.com/warrantylookup for more information about your product warranty.

Gather the following information to provide to the service technician. This data will help the service technician quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.

- Hardware and Software Maintenance agreement contract numbers, if applicable
- Machine type number (Lenovo 4-digit machine identifier). Machine type number can be found on the ID label, see "Identifying the server and access the Lenovo XClarity Controller" in *User Guide* or *System Condiguration Guide*.
- Model number
- Serial number
- Current system UEFI and firmware levels
- Other pertinent information such as error messages and logs

As an alternative to calling Lenovo Support, you can go to https://support.lenovo.com/servicerequest to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to the service technicians. The Lenovo service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

Collecting service data

To clearly identify the root cause of a server issue or at the request of Lenovo Support, you might need collect service data that can be used for further analysis. Service data includes information such as event logs and hardware inventory.

Service data can be collected through the following tools:

- **Lenovo XClarity Provisioning Manager**

  Use the Collect Service Data function of Lenovo XClarity Provisioning Manager to collect system service data. You can collect existing system log data or run a new diagnostic to collect new data.

- **Lenovo XClarity Controller**

  You can use the Lenovo XClarity Controller web interface or the CLI to collect service data for the server. The file can be saved and sent to Lenovo Support.

  – For more information about using the web interface to collect service data, see the "Backing up the BMC configuration" section in the XCC documentation compatible with your server at https://pubs.lenovo.com/lxcc-overview/.

- For more information about using the CLI to collect service data, see the "XCC `ffdc` command" section in the XCC documentation compatible with your server at https://pubs.lenovo.com/lxcc-overview/.

- **Lenovo XClarity Administrator**

  Lenovo XClarity Administrator can be set up to collect and send diagnostic files automatically to Lenovo Support when certain serviceable events occur in Lenovo XClarity Administrator and the managed endpoints. You can choose to send diagnostic files to Lenovo Support using Call Home or to another service provider using SFTP. You can also manually collect diagnostic files, open a problem record, and send diagnostic files to the Lenovo Support.

  You can find more information about setting up automatic problem notification within the Lenovo XClarity Administrator at https://pubs.lenovo.com/lxca/admin_setupcallhome.

- **Lenovo XClarity Essentials OneCLI**

  Lenovo XClarity Essentials OneCLI has inventory application to collect service data. It can run both in-band and out-of-band. When running in-band within the host operating system on the server, OneCLI can collect information about the operating system, such as the operating system event log, in addition to the hardware service data.

  To obtain service data, you can run the `getinfor` command. For more information about running the `getinfor`, see https://pubs.lenovo.com/lxce-onecli/onecli_r_getinfor_command.

Contacting Support

You can contact Support to obtain help for your issue.

You can receive hardware service through a Lenovo Authorized Service Provider. To locate a service provider authorized by Lenovo to provide warranty service, go to https://datacentersupport.lenovo.com/serviceprovider and use filter searching for different countries. For Lenovo support telephone numbers, see https://datacentersupport.lenovo.com/supportphonelist for your region support details.

Appendix B. Documents and supports

This section provides handy documents, driver and firmware downloads, and support resources.

Documents download

This section provides introduction and download link for handy documents.

Documents

Download the following product documentations at:

https://pubs.lenovo.com/se455-v3/pdf_files.html

- *Rail Installation Guides*

  – Rail installation in a rack

- *Activation Guide*

  – Activation process and activation code

- *User Guide*

  – Complete overview, system configuration, hardware components replacing, and troubleshooting.

    Selected chapters from *User Guide*:

  – *System Configuration Guide* **:** Server overview, components identification, system LEDs and diagnostics display, product unboxing, setting up and configuring the server.

  – *Hardware Maintenance Guide* **:** Installing hardware components, cable routing, and troubleshooting.

- *Messages and Codes Reference*

  – XClarity Controller, LXPM, and uEFI events

- *UEFI Manual*

  – UEFI setting introduction

Support websites

This section provides driver and firmware downloads and support resources.

Support and downloads

- Drivers and Software download website for ThinkEdge SE455 V3

  – https://datacentersupport.lenovo.com/products/servers/thinkedge/se455v3/7dby/downloads/driver-list/

- Lenovo Data Center Forum

  – https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg

- Lenovo Data Center Support for ThinkEdge SE455 V3

  – https://datacentersupport.lenovo.com/products/servers/thinkedge/se455v3/7dby

- Lenovo License Information Documents

  – https://datacentersupport.lenovo.com/documents/lnvo-eula

- Lenovo Press website (Product Guides/Datasheets/White papers)

- – https://lenovopress.lenovo.com/
- Lenovo Privacy Statement
  - – https://www.lenovo.com/privacy
- Lenovo Product Security Advisories
  - – https://datacentersupport.lenovo.com/product_security/home
- Lenovo Product Warranty Plans
  - – http://datacentersupport.lenovo.com/warrantylookup
- Lenovo Server Operating Systems Support Center website
  - – https://datacentersupport.lenovo.com/solutions/server-os
- Lenovo ServerProven website (Options compatibility lookup)
  - – https://serverproven.lenovo.com
- Operating System Installation Instructions
  - – https://pubs.lenovo.com/thinkedge#os-installation
- Submit an eTicket (service request)
  - – https://support.lenovo.com/servicerequest
- Subscribe to Lenovo Data Center Group product notifications (Stay up to date on firmware updates)
  - – https://datacentersupport.lenovo.com/solutions/ht509500

Appendix C. Notices

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Morrisville, NC 27560
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Important notes

Processor speed indicates the internal clock speed of the processor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1 024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard-disk-drive bays with the largest currently supported drives that are available from Lenovo.

Maximum memory might require replacement of the standard memory with an optional memory module.

Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write cycles that it can be subjected to, expressed as `total bytes written` (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. Lenovo is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

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Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

Additional electronic emissions notices are available at:

https://pubs.lenovo.com/important_notices/

Taiwan Region BSMI RoHS declaration

單元 Unit	限用物質及其化學符號 Restricted substances and its chemical symbols					
	鉛Lead (PB)	汞Mercury (Hg)	鎘Cadmium (Cd)	六價鉻 Hexavalent chromium (Cr^{+6})	多溴聯苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
機架	○	○	○	○	○	○
外部蓋板	○	○	○	○	○	○
機械組合件	−	○	○	○	○	○
空氣傳動設備	−	○	○	○	○	○
冷卻組合件	−	○	○	○	○	○
內存模組	−	○	○	○	○	○
處理器模組	−	○	○	○	○	○
電纜組合件	−	○	○	○	○	○
電源供應器	−	○	○	○	○	○
儲備設備	−	○	○	○	○	○
印刷電路板	−	○	○	○	○	○

備考1.〝超出0.1 wt %〞及〝超出0.01 wt %〞係指限用物質之百分比含量超出百分比含量基準值。

Note1 : "exceeding 0.1wt%" and "exceeding 0.01 wt%" indicate that the percentage content of the restricted substance exceeds the reference percentage value of presence condition.

備考2.〝○〞係指該項限用物質之百分比含量未超出百分比含量基準值。

Note2 : " ○ "indicates that the percentage content of the restricted substance does not exceed the percentage of reference value of presence.

備考3.〝−〞係指該項限用物質為排除項目。

Note3 : The "-" indicates that the restricted substance corresponds to the exemption.

Taiwan Region import and export contact information

Contacts are available for Taiwan Region import and export information.

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