



# ThinkSystem SD520 V4 User Guide



**Machine Types:** 7DFY, 7DFZ, 7DG0, and 7DG1

**Note**

Before using this information and the product it supports, be sure to read and understand the safety information and the safety instructions, which are available at:

[https://pubs.lenovo.com/safety\\_documentation/](https://pubs.lenovo.com/safety_documentation/)

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

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

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## Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

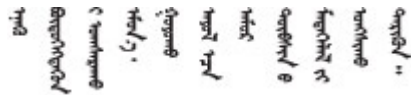
A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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



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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

ཐོན་ཇུས་འདི་བདེ་སྤྱོད་མ་བྱས་གོང་། སྐྱོར་གྱི་ཡིད་གཟབ་  
བྱ་འདྲ་མིན་ཡོད་པའི་འོད་ཟེར་བལྟ་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

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canjbinj soengq cungj vahgangj ancien siusik.

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## Safety inspection checklist

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

**Note:** The product is not suitable for use at visual display workplaces according to §2 of the Workplace Regulations.

**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.

**Note:** The set-up of the server is made in the server room only.

### CAUTION:

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

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

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

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

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

a. Go to:

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

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

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

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

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

3. Check for any obvious non-Lenovo alterations. Use good judgment as to the safety of any non-Lenovo alterations.
4. Check inside the server for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.
5. Check for worn, frayed, or pinched cables.
6. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.





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## Chapter 1. Introduction

Lenovo ThinkSystem SD520 V4 (Types 7DFY, 7DFZ, 7DG0, and 7DG1) is a dense and economical node in a 1U rack form factor. Combining the efficiency and density of blades with the value and simplicity of rack-based servers, SD520 V4 delivers a cost-efficient scaleout platform that is thermally designed to deliver maximum performance in the smallest footprint. The system consists of a 2U D3 V2 Chassis (Types 7DGW and 7DGX) containing up to four SD520 V4 nodes, all with front access. SD520 V4 is well suited for workloads ranging from cloud, analytics to AI and high-performance computing application like Computer Aided Engineering (CAE) or Electronic Design Automation (EDA).



Figure 1. ThinkSystem SD520 V4

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## Features

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

### Chassis features

- **Redundant optional power capabilities**

The chassis supports up to three hot-swap CRPS power supplies, which provide redundancy.

**Important:**

- CRPS power supply units in the chassis must have the same vendor, wattage, and part number (or alternate part number).
- CRPS Premium (CFFv5) power supply units in the chassis must have the same wattage, and part number (or alternate part number).

- **Chassis management**

The chassis midplane with PSoC (Programmable System on Chip) allows monitor and management of nodes and power supply units in the chassis. A **chassis caretaker node** is selected by the PSoC firmware for chassis management.

For the management interface, see <https://pubs.lenovo.com/lxcc-overview/>. In XCC, certain management functions can only be performed by the caretaker node, whereas other functions can be performed by all nodes.

Function	Caretaker node <sup>1</sup>	Other nodes
– Supported: ✓ – Unsupported: X		
PSoC firmware update	✓	X
PSU firmware update <sup>2</sup>	✓	X
Virtual reseal/reset for all nodes in the chassis	✓	X
View PSU inventory and events	✓	X
View chassis VPD and PSoC firmware versions	✓	✓
View PSU present status	✓	✓
View information of chassis and all nodes	✓	✓
Virtual reseal/reset for the current node itself	✓	✓
View the change history of the caretaker node	✓	✓
View the history of node installation/removal	✓	✓
View or participate in the caretaker node selection	✓	✓

## Node features

Your node implements the following features and technologies:

- **Features on Demand**

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

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

- **Lenovo XClarity Controller (XCC)**

The Lenovo XClarity Controller is the common management controller for Lenovo ThinkSystem server hardware. The Lenovo XClarity Controller consolidates multiple management functions in a single chip on the server system board. Some of the features that are unique to the Lenovo XClarity Controller are enhanced performance, higher-resolution remote video, and expanded security options.

The system supports Lenovo XClarity Controller 3 (XCC3). For additional information about Lenovo XClarity Controller 3 (XCC3), refer to <https://pubs.lenovo.com/lxcc-overview/>.

- **UEFI-compliant server firmware**

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

1. By default, the **caretaker node** is automatically selected by the PSoC firmware on the chassis midplane. To change the chassis caretaker preference, see [https://pubs.lenovo.com/xcc3/NN1ia\\_c\\_d3\\_chassis](https://pubs.lenovo.com/xcc3/NN1ia_c_d3_chassis).
2. Only the caretaker node can perform PSU firmware update.

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

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

- **Active Memory**

The Active Memory feature improves the reliability of memory through memory mirroring. Memory mirroring mode replicates and stores data on two pairs of DIMMs within two channels simultaneously. If a failure occurs, the memory controller switches from the primary pair of memory DIMMs to the backup pair of DIMMs.

- **Large system-memory capacity**

The system supports TruDDR5 DIMMs operating at up to 6400 MHz. For more information about the specific types and maximum amount of memory, see “[Node technical specifications](#)” on page 5.

- **Large data-storage capacity**

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

Storage capacity is different depending on server model. See “[Node technical specifications](#)” on page 5 for more information.

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

The node provides a QR code on the system service label, which is on the node top cover, that you can scan using a QR code reader and scanner with a mobile device to get quick access to the Lenovo Service Information website. The Lenovo Service Information website provides additional information for parts installation, replacement videos, and error codes for system support.

- **Active Energy Manager**

Lenovo XClarity Energy Manager is a power and temperature management solution for data centers. You can monitor and manage the power consumption and temperature of Converged, NeXtScale, System x, and ThinkServer solutions, and improve energy efficiency using Lenovo XClarity Energy Manager.

- **ThinkSystem RAID support**

The ThinkSystem RAID provides software RAID (0, 1, 5, and 10) and hardware RAID (0, 1, 10, 5, 50, 6, and 60 standard).

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## Tech Tips

Lenovo continually updates the support website with the latest tips and techniques that you can use to solve issues that your server might encounter. These Tech Tips (also called retain tips or service bulletins) provide procedures to work around issues or solve problems related to the operation of your server.

To find the Tech Tips available for your server:

1. Go to <http://datacentersupport.lenovo.com> and navigate to the support page for your server.
2. Click on **How To's** from the navigation pane.
3. Click **Article Type** → **Solution** from the drop-down menu.

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

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## Security advisories

Lenovo is committed to developing products and services that adhere to the highest security standards in order to protect our customers and their data. When potential vulnerabilities are reported, it is the responsibility of the Lenovo Product Security Incident Response Team (PSIRT) to investigate and provide

information to our customers so they may put mitigation plans in place as we work toward providing solutions.

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

[https://datacentersupport.lenovo.com/product\\_security/home](https://datacentersupport.lenovo.com/product_security/home)

## Specifications

Summary of the features and specifications of the chassis and node. 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	“Chassis specifications” on page 4	“Node technical specifications” on page 5	“Node mechanical specifications” on page 9	“Environmental specifications” on page 9
Content	<ul style="list-style-type: none"> <li>• Technical specifications</li> <li>• Mechanical specifications</li> </ul>	<ul style="list-style-type: none"> <li>• “Processor” on page 6</li> <li>• “Memory” on page 6</li> <li>• “M.2 Drive” on page 6</li> <li>• “Storage expansion” on page 7</li> <li>• “Expansion slots” on page 7</li> <li>• “Integrated functions” on page 7</li> <li>• “Network” on page 7</li> <li>• “RAID adapter” on page 8</li> <li>• “Host bus adapter” on page 8</li> <li>• “System fan” on page 8</li> <li>• “Minimal configuration for debugging” on page 8</li> <li>• “Operating systems” on page 9</li> </ul>	<ul style="list-style-type: none"> <li>• Dimension</li> <li>• Weight</li> </ul>	<ul style="list-style-type: none"> <li>• “Acoustical noise emissions” on page 9</li> <li>• “Ambient temperature management” on page 10</li> <li>• “Environment” on page 12</li> </ul>

## Chassis specifications

Summary of the specifications of the chassis.

## Technical specifications

Table 1. Chassis technical specifications

Specification	Description
Electrical input	<p>The system supports up to three hot-swap power supplies:</p> <ul style="list-style-type: none"><li>• CRPS 1300-watt Titanium v1.1, input power 200-240V</li><li>• CRPS 2700-watt Platinum v1.3, input power 200-240V</li><li>• CRPS 2700-watt Platinum v1.4, input power 200-240V</li><li>• CRPS Premium (CFFv5) 2000-watt Titanium, input power 200-240V</li><li>• CRPS Premium (CFFv5) 2700-watt Titanium, input power 200-240V</li></ul> <p>Supported power supply configurations:</p> <ul style="list-style-type: none"><li>• 3 PSUs: 2+1 (optional redundancy)</li><li>• 2 PSUs: 1+1 (optional redundancy)</li><li>• 1 PSU: 1+0 (only supported on CRPS Premium (CFFv5) 2700-watt Titanium)</li></ul> <p><b>Notes:</b></p> <ul style="list-style-type: none"><li>• CRPS Premium (CFFv5) PSUs support over-subscription.</li><li>• The actual power efficiency depends on system configuration.</li></ul> <p><b>Important:</b></p> <ul style="list-style-type: none"><li>• CRPS power supply units in the chassis must have the same vendor, wattage, and part number (or alternate part number).</li><li>• CRPS Premium (CFFv5) power supply units in the chassis must have the same wattage, and part number (or alternate part number).</li></ul>

## Mechanical specifications

**Important:** For safety, make sure that there is no node or power supply unit installed in the chassis when removing or installing the chassis from or to the rack.

Table 2. Chassis mechanical specifications

Specification	Description
Dimension	<p>2U rack-mounted chassis (2U4N)</p> <ul style="list-style-type: none"><li>• Height: 87 mm (3.43 inches)</li><li>• Depth: 898 mm (35.36 inches)</li><li>• Width: 448 mm (17.64 inches)</li><li>• Weight:<ul style="list-style-type: none"><li>– Empty chassis (with chassis midplane and PSU cage): 11.83 kg (26.08 lbs)</li><li>– Maximum (with four 1U nodes and three CRPS power supplies installed): approximately 42.37 kg (93.41 lbs)</li></ul></li></ul>

**Note:** For the supported nodes for the chassis, see [“Chassis front view” on page 17](#).

## Node technical specifications

Summary of the technical specifications of the node. Depending on the model, some features might not be available, or some specifications might not apply.

## Processor

Processor
<p>Supports multi-core Intel Xeon processors, with integrated memory controller and Intel Mesh UPI (Ultra Path Interconnect) topology.</p> <ul style="list-style-type: none"><li>• One Intel Xeon 6 series scalable processor with the new LGA 4710 socket</li><li>• Scalable up to 144 cores</li><li>• Up to four UPI links at up to 24 GT/s</li><li>• Thermal Design Power (TDP) up to 350 watts</li></ul> <p>For a list of supported processors, see: <a href="https://serverproven.lenovo.com">https://serverproven.lenovo.com</a>.</p>

## Memory

Memory
<p>See “<a href="#">Memory module installation rules and order</a>” on page 40 for detailed information about memory configuration and setup.</p> <ul style="list-style-type: none"><li>• Slots: 8 dual inline memory module (DIMM) connectors that support up to eight TruDDR5 6400 MHz RDIMMs</li><li>• The processor has 8 memory channels, with 1 DIMM per channel</li><li>• Memory module types:<ul style="list-style-type: none"><li>– TruDDR5 6400MHz (2Rx4) RDIMM: 64 GB (2Rx4)</li></ul></li><li>• Speed:<ul style="list-style-type: none"><li>– 6400 MT/s for 1 DIMM per channel</li><li>– Operating speed depends on processor model and UEFI settings</li></ul></li><li>• Maximum memory: 512 GB</li></ul> <p>For a list of supported memory modules, see: <a href="https://serverproven.lenovo.com">https://serverproven.lenovo.com</a>.</p>

## M.2 Drive

M.2 Drive
<p>Up to two NVMe M.2 drives on the system board.</p> <ul style="list-style-type: none"><li>• The following form factors are supported:<ul style="list-style-type: none"><li>– 80 mm (2280)</li><li>– 110 mm (22110)</li></ul></li></ul> <p>Up to two M.2 drives on M.2 boot adapter.</p> <ul style="list-style-type: none"><li>• The following form factors are supported:<ul style="list-style-type: none"><li>– SATA M.2 drive:<ul style="list-style-type: none"><li>– 42 mm (2242)</li><li>– 60 mm (2260)</li><li>– 80 mm (2280)</li></ul></li><li>– NVMe M.2 drive:<ul style="list-style-type: none"><li>– 80 mm (2280)</li></ul></li></ul></li></ul> <p>For a list of supported M.2 drives, see: <a href="https://serverproven.lenovo.com">https://serverproven.lenovo.com</a>.</p>

## Storage expansion

### Storage expansion

- **2.5-inch drive configuration:**
  - Up to six hot-swap 2.5-inch SAS/SATA/NVMe drives

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

## Expansion slots

### Expansion slots

- **PCIe riser**
  - One PCIe riser on the rear of the node: PCI Express 5.0 x16, HH/HL (single width)
  - The PCIe slot can support one PCIe adapter up to 75 watts
- **OCP module**
  - One OCP module slot

## Integrated functions and I/O connectors

### Integrated functions

- Lenovo XClarity Controller (XCC), which provides service processor control and monitoring functions, video controller, and remote keyboard, video, mouse, and remote drive capabilities.
- One XCC system management port (10/100/1000 Mbps RJ-45) to connect to a systems-management network. This RJ-45 connector is dedicated to the Lenovo XClarity Controller functions.
- Rear connectors:
  - A group of two or four Ethernet connectors on OCP Ethernet adapter
  - One Mini DisplayPort connector
  - One XCC system management port (10/100/1000 Mbps RJ-45)
  - One USB 3.2 Gen 1 connector
  - One USB 2.0 connector with Lenovo XClarity Controller (XCC) system management

**Note:** The maximum video resolution is 1920 x 1200 at 60 Hz.

## Network

### Network

Two or four connectors on the OCP 3.0 module

## RAID adapter

RAID adapter
<p><b>Software RAID</b></p> <ul style="list-style-type: none"><li>• Intel VROC RAID1 Only: supports RAID 1 (requires activation key)</li><li>• Intel VROC Standard: supports RAID 0, 1, and 10 (requires activation key)</li><li>• Intel VROC Premium: supports RAID 0, 1, 5, and 10 (requires activation key)</li></ul> <p><b>Hardware RAID</b></p> <ul style="list-style-type: none"><li>• ThinkSystem M.2 RAID B545i-2i SATA/NVMe Enablement Kit (RAID 0 and 1)</li><li>• ThinkSystem RAID 545-8i PCIe Gen4 12Gb Adapter (RAID 0, 1, 10)</li><li>• ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter (RAID 0, 1, 10, 5, 50, 6, and 60 standard)</li></ul> <p>For more information about the RAID/HBA adapters, see <a href="#">Lenovo ThinkSystem RAID Adapter and HBA Reference</a>.</p>

## Host bus adapter

Host bus adapter
<ul style="list-style-type: none"><li>• ThinkSystem 440-16e SAS/SATA PCIe Gen4 12Gb HBA</li><li>• ThinkSystem 440-16i SAS/SATA PCIe Gen4 12Gb HBA</li></ul> <p>For more information about the RAID/HBA adapters, see <a href="#">Lenovo ThinkSystem RAID Adapter and HBA Reference</a>.</p>

## System fan

System fan
Air-cooled configuration: Four high performance or ultra 4056 fans (40 x 40 x 56 mm)

## Minimal configuration for debugging

Minimal configuration for debugging
<ul style="list-style-type: none"><li>• The following minimal configuration is required for the node to start:<ul style="list-style-type: none"><li>– One processor</li><li>– One memory module in DIMM slot 5</li><li>– One power supply in PSU slot 1</li><li>– One boot drive, M.2 or 2.5-inch drive, and RAID adapter if configured (If OS is needed by debugging)</li><li>– Four system fans</li></ul></li></ul>



## Operating systems

Operating systems
Supported and certified operating systems: <ul style="list-style-type: none"><li>• Microsoft Windows Server</li><li>• VMware ESXi</li><li>• Red Hat Enterprise Linux</li><li>• SUSE Linux Enterprise Server</li></ul>
References: <ul style="list-style-type: none"><li>• Complete list of available operating systems: <a href="https://lenovopress.lenovo.com/osig">https://lenovopress.lenovo.com/osig</a>.</li><li>• OS deployment instructions, see “Deploy the operating system” on page 174.</li></ul>

## Node mechanical specifications

Summary of the mechanical specifications of the node. Depending on the model, some features might not be available, or some specifications might not apply.

Dimension
<ul style="list-style-type: none"><li>• Height: 40.55 mm ( 1.60 inches)</li><li>• Width: 221.4 mm (8.72 inches)</li><li>• Depth: 898 mm (35.36 inches)</li></ul>

Weight
Maximum: <ul style="list-style-type: none"><li>• 8.32 kg (18.34 lbs)</li></ul>

## Environmental specifications

Summary of the environmental specifications of server. Depending on the model, some features might not be available, or some specifications might not apply.

### Acoustical noise emissions

Acoustical noise emissions			
Acoustic Performance @ 25°C Ambient		Typical	Max
Declared mean A-weighted sound power level, LWA,m(B)  Statistical adder for verification, Kv (B) = 0.4	Idle	6.9	7.3
	Operating 1	6.9	7.4
	Operating 2	7.0	8.6

Acoustical noise emissions			
Declared mean A-weighted emission sound pressure level, LpA,m(dB)	Idle	55.9	60.2
	Operating 1	55.9	61.6
	Operating 2	56.6	73.4
<b>Notes:</b> <ul style="list-style-type: none"> <li>• These sound levels were measured in controlled acoustical environments according to procedures specified by ISO7779 and are reported in accordance with ISO 9296.</li> <li>• Idle mode is the steady state in which the server is powered on but not operating any intended function. Operating mode 1 is 50% of CPU TDP. Operating Mode 2 is 100% of CPU TDP.</li> <li>• The declared acoustic sound levels are based on the below-specified configurations with four nodes installed in the chassis, which may change depending on configuration/conditions. <ul style="list-style-type: none"> <li>– <b>Typical:</b> four 205-watt processors, thirty-two 64GB 6400 RDIMMs, four U.2 NVMe SSDs, four 10GB PCIe adapters, and two 2000-watt PSUs</li> <li>– <b>Maximum:</b> four 350-watt processors, thirty-two 64GB 6400 RDIMMs, twenty-four U.2 NVMe SSDs, four 1GB OCP modules, four GPU adapters, and three 2700-watt PSUs</li> </ul> </li> <li>• Government regulations (such as those prescribed by OSHA or European Community Directives) may govern noise level exposure in the workplace and may apply to you and your server installation. The actual sound pressure levels in your installation depend upon a variety of factors, including the number of racks in the installation; the size, materials, and configuration of the room; the noise levels from other equipment; the room ambient temperature, and employee's location in relation to the equipment. Further, compliance with such government regulations depends on a variety of additional factors, including the duration of employees' exposure and whether employees wear hearing protection. Lenovo recommends that you consult with qualified experts in this field to determine whether you are in compliance with the applicable regulations.</li> </ul>			

## Ambient temperature management

Ambient temperature management				
Adjust ambient temperature when specific components are installed.				
<b>Notes:</b>				
<ul style="list-style-type: none"> <li>• To avoid throttling, make sure to adopt passive Direct Attach cables when network adapters with 100GbE or higher speed are installed.</li> <li>• If PCIe adapter with up to 2 ports is installed, the configuration only supports OCP module with up to 4 ports.</li> <li>• If PCIe adapter with up to 4 ports is installed, the configuration only supports OCP module with up to 2 ports.</li> </ul>				
Keep the ambient temperature to <b>35°C</b> or lower with the following system configuration:				
Processor	Heat sink and Fan	Storage configuration	Slot capability	Memory capability
205W to 250W	<ul style="list-style-type: none"> <li>• Performance heat sink</li> <li>• Ultra fans</li> </ul>	<ul style="list-style-type: none"> <li>• One front IO board (no 2.5-inch drives)</li> <li>• Two M.2 boot drives</li> </ul>	<ul style="list-style-type: none"> <li>• One PCIe or GPU adapter</li> <li>• One OCP module</li> </ul>	64GB (6400MHz)
200W	<ul style="list-style-type: none"> <li>• Standard heat sink</li> <li>• High performance or ultra fans</li> </ul>			
Keep the ambient temperature to <b>30°C</b> or lower with the following system configuration:				
Processor	Heat sink and Fan	Storage configuration	Slot capability	Memory capability

<b>Ambient temperature management</b>				
205W to 250W	<ul style="list-style-type: none"> <li>• Performance heat sink</li> <li>• Ultra fans</li> </ul>	<ul style="list-style-type: none"> <li>• Six 2.5-inch drives</li> <li>• Two M.2 boot drives</li> </ul>	<ul style="list-style-type: none"> <li>• One PCIe or GPU adapter</li> <li>• One OCP module</li> </ul>	64GB (6400MHz)
205W to 250W	<ul style="list-style-type: none"> <li>• Performance heat sink</li> <li>• High performance or ultra fans</li> </ul>	<ul style="list-style-type: none"> <li>• Two 2.5-inch drives</li> <li>• Two M.2 boot drives</li> </ul>	<ul style="list-style-type: none"> <li>• One PCIe or GPU adapter</li> <li>• One OCP module</li> </ul>	64GB (6400MHz)
200W	<ul style="list-style-type: none"> <li>• Standard heat sink</li> <li>• High performance or ultra fans</li> </ul>			
205W to 250W	<ul style="list-style-type: none"> <li>• Performance heat sink</li> <li>• High performance fans</li> </ul>	<ul style="list-style-type: none"> <li>• One front IO board (no 2.5-inch drives)</li> <li>• Two M.2 boot drives</li> </ul>	<ul style="list-style-type: none"> <li>• One PCIe or GPU adapter</li> <li>• One OCP module</li> </ul>	64GB (6400MHz)
270W to 350W	<ul style="list-style-type: none"> <li>• Performance heat sink</li> <li>• Ultra fans</li> </ul>			
Keep the ambient temperature to <b>25°C</b> or lower with the following system configuration:				
<b>Processor</b>	<b>Heat sink and Fan</b>	<b>Storage configuration</b>	<b>Slot capability</b>	<b>Memory capability</b>
270W to 350W	<ul style="list-style-type: none"> <li>• Performance heat sink</li> <li>• Ultra fans</li> </ul>	<ul style="list-style-type: none"> <li>• Six 2.5-inch drives</li> <li>• Two M.2 boot drives</li> </ul>	<ul style="list-style-type: none"> <li>• One PCIe or GPU adapter</li> <li>• One OCP module</li> </ul>	64GB (6400MHz)
205W to 250W	<ul style="list-style-type: none"> <li>• Performance heat sink</li> <li>• High performance or ultra fans</li> </ul>			
200W	<ul style="list-style-type: none"> <li>• Standard heat sink</li> <li>• High performance or ultra fans</li> </ul>			
270W to 350W	<ul style="list-style-type: none"> <li>• Performance heat sink</li> <li>• High performance or ultra fans</li> </ul>	<ul style="list-style-type: none"> <li>• Two 2.5-inch drives</li> <li>• Two M.2 boot drives</li> </ul>	<ul style="list-style-type: none"> <li>• One PCIe or GPU adapter</li> <li>• One OCP module</li> </ul>	64GB (6400MHz)
270W to 350W	<ul style="list-style-type: none"> <li>• Performance heat sink</li> <li>• High performance fans</li> </ul>	<ul style="list-style-type: none"> <li>• One front IO board (no 2.5-inch drives)</li> <li>• Two M.2 boot drives</li> </ul>	<ul style="list-style-type: none"> <li>• One PCIe or GPU adapter</li> <li>• One OCP module</li> </ul>	64GB (6400MHz)

## Environment

Environment
<p>ThinkSystem SD520 V4 complies with ASHRAE Class A2 specifications. System performance may be impacted when operating temperature is outside AHSRAE A2 specification.</p> <p>Depending on the hardware configuration, SD520 V4 also complies with ASHRAE Class H1 specification. System performance may be impacted when operating temperature is outside ASHRAE H1 specification.</p> <ul style="list-style-type: none"><li>• Air temperature:<ul style="list-style-type: none"><li>– Operating<ul style="list-style-type: none"><li>– ASHRAE Class A2: 10°C to 35°C (50°F to 95°F); the maximum ambient temperature decreases by 1°C for every 300 m (984 ft) increase in altitude above 900 m (2,953 ft).</li><li>– ASHRAE Class H1: 5°C to 25°C (41°F to 77°F); the maximum ambient temperature decreases by 1°C for every 300 m (984 ft) increase in altitude above 900 m (2,953 ft).</li></ul></li><li>– Server off: 5°C to 45°C (41°F to 113°F)</li><li>– Shipment/storage: -40°C to 60°C (-40°F to 140°F)</li></ul></li><li>• Maximum altitude: 3,050 m (10,000 ft)</li><li>• Relative Humidity (non-condensing):<ul style="list-style-type: none"><li>– Operating<ul style="list-style-type: none"><li>– ASHRAE Class A2: 8% to 80%; maximum dew point: 21°C (70°F)</li><li>– ASHRAE Class H1: 8% to 80%; maximum dew point: 17°C (62.6°F)</li></ul></li><li>– Shipment/storage: 8% to 90%</li></ul></li><li>• Particulate contamination</li></ul> <p><b>Attention:</b> 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 <a href="#">“Particulate contamination” on page 12</a>.</p> <p><b>Note:</b> The server is designed for standard data center environment and recommended to be placed in industrial data center.</p>

## Particulate contamination

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

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

Table 3. Limits for particulates and gases

Contaminant	Limits
Reactive gases	<p>Severity level G1 as per ANSI/ISA 71.04-1985<sup>1</sup>:</p> <ul style="list-style-type: none"> <li>• The copper reactivity level shall be less than 200 Angstroms per month (<math>\text{\AA}/\text{month} \approx 0.0035 \mu\text{g}/\text{cm}^2\text{-hour}</math> weight gain).<sup>2</sup></li> <li>• The silver reactivity level shall be less than 200 Angstroms per month (<math>\text{\AA}/\text{month} \approx 0.0035 \mu\text{g}/\text{cm}^2\text{-hour}</math> weight gain).<sup>3</sup></li> <li>• The reactive monitoring of gaseous corrosivity must be conducted approximately 5 cm (2 in.) in front of the rack on the air inlet side at one-quarter and three-quarter frame height off the floor or where the air velocity is much higher.</li> </ul>
Airborne particulates	<p>Data centers must meet the cleanliness level of ISO 14644-1 class 8.</p> <p>For data centers without airside economizer, the ISO 14644-1 class 8 cleanliness might be met by choosing one of the following filtration methods:</p> <ul style="list-style-type: none"> <li>• The room air might be continuously filtered with MERV 8 filters.</li> <li>• Air entering a data center might be filtered with MERV 11 or preferably MERV 13 filters.</li> </ul> <p>For data centers with airside economizers, the choice of filters to achieve ISO class 8 cleanliness depends on the specific conditions present at that data center.</p> <ul style="list-style-type: none"> <li>• The deliquescent relative humidity of the particulate contamination should be more than 60% RH.<sup>4</sup></li> <li>• Data centers must be free of zinc whiskers.<sup>5</sup></li> </ul>
<p>cu</p> <p><sup>1</sup> ANSI/ISA-71.04-1985. <i>Environmental conditions for process measurement and control systems: Airborne contaminants</i>. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.</p> <p><sup>2</sup> The derivation of the equivalence between the rate of copper corrosion growth in the thickness of the corrosion product in <math>\text{\AA}/\text{month}</math> and the rate of weight gain assumes that <math>\text{Cu}_2\text{S}</math> and <math>\text{Cu}_2\text{O}</math> grow in equal proportions.</p> <p><sup>3</sup> The derivation of the equivalence between the rate of silver corrosion growth in the thickness of the corrosion product in <math>\text{\AA}/\text{month}</math> and the rate of weight gain assumes that <math>\text{Ag}_2\text{S}</math> is the only corrosion product.</p> <p><sup>4</sup> The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.</p> <p><sup>5</sup> Surface debris is randomly collected from 10 areas of the data center on a 1.5 cm diameter disk of sticky electrically conductive tape on a metal stub. If examination of the sticky tape in a scanning electron microscope reveals no zinc whiskers, the data center is considered free of zinc whiskers.</p>	

## Management options

The XClarity portfolio and other system management options described in this section are available to help you manage the servers more conveniently and efficiently.

## Overview

Options	Description
Lenovo XClarity Controller	<p>Baseboard management controller (BMC)</p> <p>Consolidates the service processor functionality, Super I/O, video controller, and remote presence capabilities into a single chip on the server system board (system board assembly).</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• CLI application</li> <li>• Web GUI interface</li> <li>• Mobile application</li> <li>• Redfish API</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://pubs.lenovo.com/lxcc-overview/">https://pubs.lenovo.com/lxcc-overview/</a></p>
Lenovo XCC Logger Utility	<p>Application that reports the XCC events to local OS system log.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• CLI application</li> </ul> <p><b>Usage and downloads</b></p> <ul style="list-style-type: none"> <li>• <a href="https://pubs.lenovo.com/lxcc-logger-linux/">https://pubs.lenovo.com/lxcc-logger-linux/</a></li> <li>• <a href="https://pubs.lenovo.com/lxcc-logger-windows/">https://pubs.lenovo.com/lxcc-logger-windows/</a></li> </ul>
Lenovo XClarity Administrator	<p>Centralized interface for multi-server management.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• Web GUI interface</li> <li>• Mobile application</li> <li>• REST API</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://pubs.lenovo.com/lxca/">https://pubs.lenovo.com/lxca/</a></p>
Lenovo XClarity Essentials toolset	<p>Portable and light toolset for server configuration, data collection, and firmware updates. Suitable both for single-server or multi-server management contexts.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• <b>OneCLI:</b> CLI application</li> <li>• <b>Bootable Media Creator:</b> CLI application, GUI application</li> <li>• <b>UpdateXpress:</b> GUI application</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://pubs.lenovo.com/lxce-overview/">https://pubs.lenovo.com/lxce-overview/</a></p>

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

## Functions

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

### Notes:

1. Most options can be updated through the Lenovo tools. Some options, such as GPU firmware or Omni-Path firmware require the use of supplier tools.
2. The server UEFI settings for option ROM must be set to **Auto** or **UEFI** to update firmware using Lenovo XClarity Administrator, Lenovo XClarity Essentials, or Lenovo XClarity Controller.
3. Firmware updates are limited to Lenovo XClarity Provisioning Manager, Lenovo XClarity Controller, and UEFI updates only. Firmware updates for optional devices, such as adapters, are not supported.
4. The server UEFI settings for option ROM must be set to **Auto** or **UEFI** for detailed adapter card information, such as model name and firmware levels, to be displayed in Lenovo XClarity Administrator, Lenovo XClarity Controller, or Lenovo XClarity Essentials.
5. Limited inventory.
6. Power management function is supported only by Lenovo XClarity Integrator for VMware vCenter.
7. It is highly recommended that you check the power summary data for your server using Lenovo Capacity Planner before purchasing any new parts.



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## Chapter 2. Hardware components

This section contains information about each of the components in the chassis and node.

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### Front view

The following sections show the controls, LEDs, and connectors on the front of the chassis and node.

### Chassis front view

This section contains information on the front of the chassis installed with nodes.

The chassis can contain up to four 1U nodes.

#### Important:

- For proper cooling, each node tray must be installed with either a node or node tray fillers before the nodes in the chassis are powered on.
- The installation of nodes must follow the sequence of the tray numbering.

### Four 1U nodes

For four 1U nodes: the two nodes in the right trays ( **2** and **4** ) must be installed upside down.

The following illustration shows the front view of the chassis and respective node trays in the chassis.

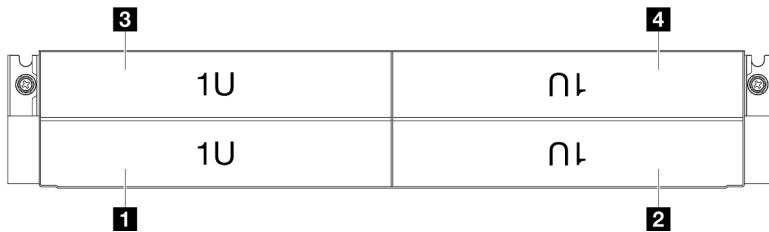


Figure 2. Chassis front view with four 1U nodes

<b>3</b> Node tray 3	<b>4</b> Node tray 4
<b>1</b> Node tray 1	<b>2</b> Node tray 2

### Node front view

This section contains information on the controls and connectors on the front of the ThinkSystem SD520 V4 node.

## Configuration with six 2.5-inch drives

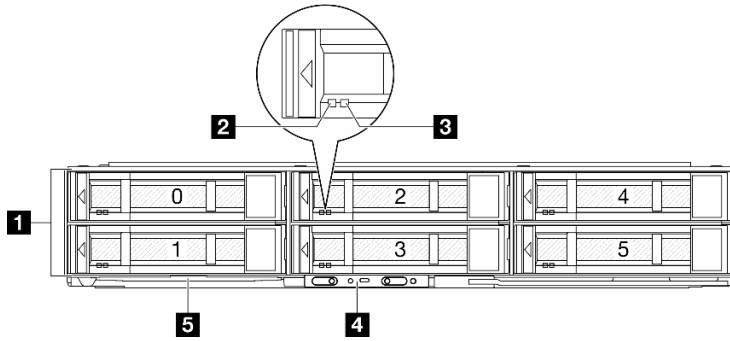


Table 4. Configuration with six 2.5-inch drives

<b>1</b> “2.5-inch drive bays” on page 18	<b>2</b> “Drive activity LED” on page 18
<b>3</b> “Drive status LED” on page 18	<b>4</b> “Front operator panel buttons and LEDs” on page 18
<b>5</b> “Pull-out information tab” on page 18	

### **1** 2.5-inch drive bays

Install 2.5-inch drives or drive fillers to these bays, see [“Hot-swap drive replacement” on page 91](#).

### **2** Drive activity LED

For more information about the drive activity LED, see [“Drive LEDs” on page 179](#).

### **3** Drive status LED

For more information about the drive status LED, see [“Drive LEDs” on page 179](#).

### **4** Front operator panel buttons and LEDs

For more information about the Front operator panel buttons and LEDs, see [“Front operator panel LEDs” on page 179](#).

### **5** Pull-out information tab

This tab contains below information:

- Network information such as MAC address and XCC network access label.
- Drive bay numbers.

For more information about this tab, see [“Identify the system and access the Lenovo XClarity Controller” on page 31](#).

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## Rear view

The following sections show the rear of the chassis and node.

### Chassis rear view

This section contains information on the rear of the chassis.

#### Notes:

- Depending on the specific configuration, the hardware might look slightly different from the illustrations in this section.

### Important:

- For proper cooling, each node tray must be installed with either a node or node tray fillers before the nodes in the chassis are powered on.

### Chassis rear view

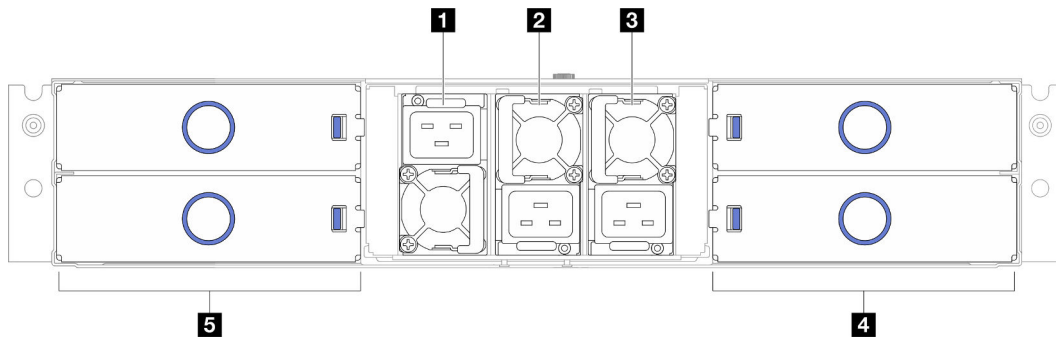


Figure 3. Chassis rear view

Table 5. Components on the rear of the chassis

<b>1</b> PSU slot 1 (the PSU must be installed with the fan downward)	<b>2</b> PSU slot 2 (the PSU must be installed with the fan upward)
<b>3</b> PSU slot 3 (the PSU must be installed with the fan upward)	<b>4</b> Node trays (the nodes must be installed right-side up)
<b>5</b> Node trays (the nodes must be installed upside down)	

### 1 / 2 / 3 PSU slots

Install power supply units to these slots, connect them to power cords. Make sure the power cords are connected properly.

**Important:** When installing the power supply units, make sure to follow the instruction on the label in each slot.

- For slot 1 (**1**), the PSU must be installed with the fan downward.
- For slots 2 and 3 (**2** and **3**), the PSU must be installed with the fan upward.

Following are the power supplies supported by the system:

- CRPS 1300-watt Titanium v1.1, input power 200-240V
- CRPS 2700-watt Platinum v1.3, input power 200-240V
- CRPS 2700-watt Platinum v1.4, input power 200-240V
- CRPS Premium (CFFv5) 2000-watt Titanium, input power 200-240V
- CRPS Premium (CFFv5) 2700-watt Titanium, input power 200-240V

For more information on the power supply LED, see [“Power supply LED” on page 180](#).

### Node rear view

This section contains information on the controls and connectors on the rear of the ThinkSystem SD520 V4 node.

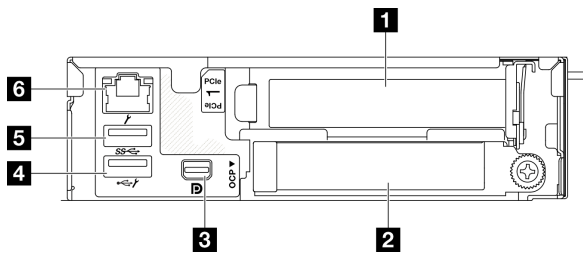


Table 6. Node rear view

<b>1</b> “PCIe slot 1” on page 20	<b>2</b> “OCP slot” on page 20
<b>3</b> “Mini DisplayPort connector” on page 20	<b>4</b> “USB 2.0 connector with Lenovo XClarity Controller (XCC) management” on page 21
<b>5</b> “USB 3.2 Gen 1 (5 Gbps) connector” on page 21	<b>6</b> “XCC system management port (10/100/1000 Mbps RJ-45)” on page 21

### 1 PCIe slot

Install PCIe adapters into these PCIe slots. See “Install a PCIe adapter” on page 122.

### 2 OCP slot

The system may support a 2-port or a 4-port OCP module for network connections. Port numbering are shown in the illustrations below.

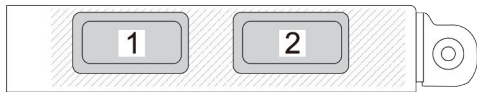


Figure 4. Port numbering — 2-port OCP module

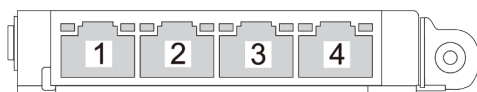


Figure 5. Port numbering — 4-port OCP 3.0 module

### 3 Mini DisplayPort connector

Connect a Mini DisplayPort-compatible video device, such as a monitor, to this connector.

**Note:** The maximum video resolution is 1920 x 1200 at 60 Hz.

#### 4 USB 2.0 connector with Lenovo XClarity Controller (XCC) management

**Note:** This is the only USB port that supports USB automation update of the firmware and RoT security module.

Connection to Lenovo XClarity Controller is primarily intended for users with a mobile device running the Lenovo XClarity Controller mobile application. When a mobile device is connected to this USB port, an Ethernet over USB connection is established between the mobile application running on the device and the Lenovo XClarity Controller.

Select **Network** in **BMC Configuration** to view or modify settings.

Four types of settings are available:

- **Host only mode**

In this mode, the USB port is always solely connected to the server.

- **BMC only mode**

In this mode, the USB port is always solely connected to Lenovo XClarity Controller.

- **Shared mode: owned by BMC**

In this mode, connection to the USB port is shared by the server and Lenovo XClarity Controller, while the port is switched to Lenovo XClarity Controller.

- **Shared mode: owned by host**

In this mode, connection to the USB port is shared by the server and Lenovo XClarity Controller, while the port is switched to the server.

#### 5 XCC system management port (10/100/1000 Mbps RJ-45)

The node has a 10/100/1000 Mbps RJ-45 connector dedicated to Lenovo XClarity Controller, which cannot be accessed directly from the production network. A dedicated management network provides additional security by physically separating the management network traffic from the production network. You can use the Setup Utility to configure the node to use a dedicated systems-management network or a shared network.

See the following for more information:

- [“Set the network connection for the Lenovo XClarity Controller” on page 167](#)
- [“XCC system management port LEDs” on page 183](#)

#### 6 USB 3.2 Gen 1 (5 Gbps) connector

Connect a USB device, such as a mouse, keyboard, or other devices, to this connector.

---

## Top view

This section contains information on the top view of the node.

**Note:** Depending on the specific configuration, the hardware might look slightly different from the illustrations in this section.

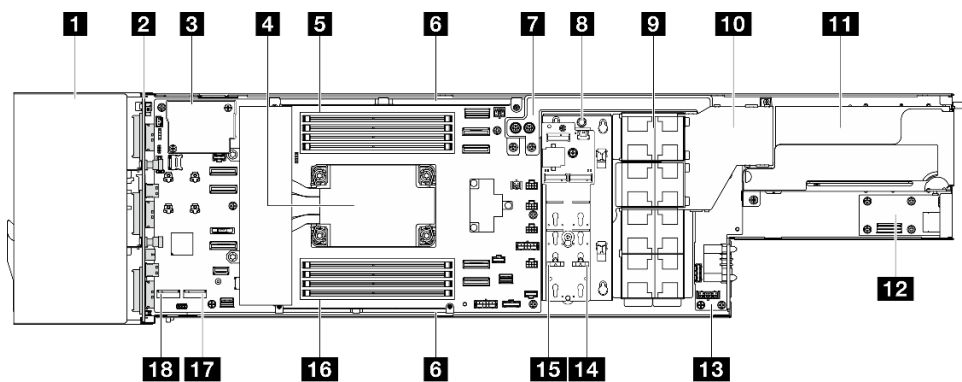


Figure 6. Top view of node

<b>1</b> Drive cage	<b>2</b> Drive backplane or front I/O board
<b>3</b> Firmware and RoT security module	<b>4</b> Processor and heat sink
<b>5</b> Memory modules 5-8	<b>6</b> Cable wall
<b>7</b> Power bus bar	<b>8</b> M.2 boot adapter or flash power module
<b>9</b> Fans and fan cage	<b>10</b> Air duct
<b>11</b> PCIe riser assembly	<b>12</b> Rear I/O module
<b>13</b> Power distribution board	<b>14</b> M.2 bay 1
<b>15</b> M.2 bay 0	<b>16</b> Memory modules 1-4
<b>17</b> M.2 bay 2	<b>18</b> M.2 bay 3

## Chassis midplane

The following illustration shows the location and connectors of the chassis midplane.

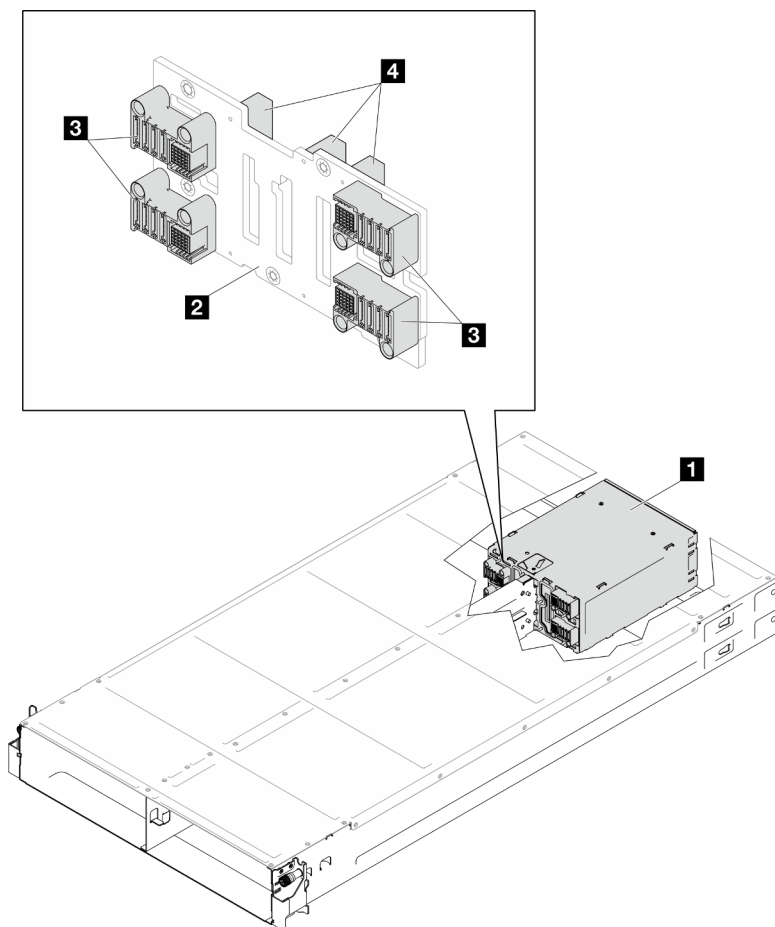


Figure 7. Chassis midplane location and connectors

<b>1</b> PSU cage	<b>3</b> PDB connectors
<b>2</b> Chassis midplane	<b>4</b> PSU connectors

**1** PSU cage: For the PSU slots, see “Chassis rear view” on page 18.

**2** Chassis midplane: For the replacement of the PSU cage and Chassis midplane, see “PSU cage and chassis midplane replacement” on page 58.

**3** PDB connectors: When a node is installed in the chassis, the power distribution board (PDB) in the node is connected to the corresponding connector on the chassis midplane.

**4** PSU connectors: When a hot-swap power supply unit (PSU) is installed in the PSU cage, the PSU is connected to the corresponding connector on the chassis midplane.

#### Notes:

- The firmware of the chassis midplane can be updated via Lenovo XClarity Controller (XCC) and Lenovo XClarity Essentials OneCLI (LXCE OneCLI). **Only the caretaker node can perform this update.**
- By default, the **caretaker node** is automatically selected by the PSoC firmware on the chassis midplane. To change the chassis caretaker preference, see [https://pubs.lenovo.com/xcc3/NN1ia\\_c\\_d3\\_chassis](https://pubs.lenovo.com/xcc3/NN1ia_c_d3_chassis).
- Go to “Update the firmware” on page 168 for more information on firmware updating tools.

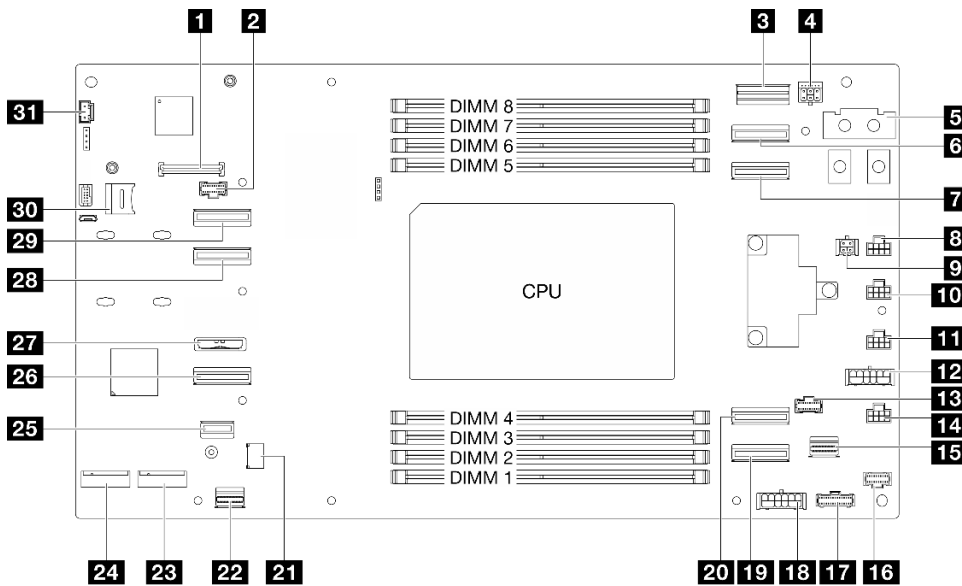
## System-board layout

The following sections provide information about the connectors and switches that are available on the system board.

For more information about the LEDs that are available on the system board, see [“System-board LEDs” on page 182](#).

## System-board connectors

This section contains information on the internal connectors on the system board.



<b>1</b> Firmware and RoT security module connector	<b>2</b> Drive backplane sideband connector
<b>3</b> OCP sideband connector	<b>4</b> Drive backplane power connector
<b>5</b> Power bus bar connector	<b>6</b> OCP signal connector 1
<b>7</b> OCP signal connector 2	<b>8</b> Fan 1 connector
<b>9</b> Leakage sensor connector	<b>10</b> Fan 2 connector
<b>11</b> Fan 3 connector	<b>12</b> PCIe riser power connector
<b>13</b> PCIe riser sideband connector	<b>14</b> Fan 4 connector
<b>15</b> Rear I/O Ethernet connector	<b>16</b> M.2 boot adapter power and sideband connector
<b>17</b> PDB management connector	<b>18</b> PDB auxiliary power connector
<b>19</b> PCIe riser connector 1	<b>20</b> PCIe riser connector 2
<b>21</b> TPM connector	<b>22</b> Rear I/O USB DP connector
<b>23</b> M.2 bay 2	<b>24</b> M.2 bay 3
<b>25</b> M.2 boot adapter signal connector	<b>26</b> NVMe 4-5 connector
<b>27</b> CMOS battery socket	<b>28</b> NVMe 2-3 connector



<b>29</b> NVMe 0-1 connector	<b>30</b> MicroSD card socket
<b>31</b> Thermal sensor connector	

## System-board switches

This section contains information on the location of the switches on the server.

### Important:

- Before you change any switch settings or move any jumpers, turn off the server; then, disconnect all power cords and external cables. Review the following information:
  - [https://pubs.lenovo.com/safety\\_documentation/](https://pubs.lenovo.com/safety_documentation/)
  - “Installation Guidelines” on page 37
  - “Handling static-sensitive devices” on page 39
  - “Power off the node” on page 43
- Any system-board switch or jumper block that is not shown in the illustrations in this document are reserved.

**Note:** If there is a clear protective sticker on the top of the switch blocks, you must remove and discard it to access the switches.

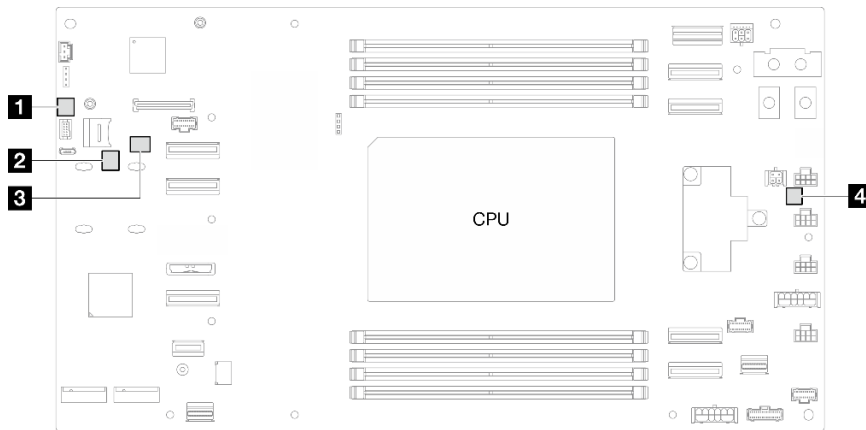


Figure 8. System-board switches

<b>1</b> SW2	<b>2</b> SW31C
<b>3</b> SWX2	<b>4</b> SW1

### SW2 switch block

Table 7. SW2 switch block definition

Switch number	Switch name	Usage description	
		On	Off
1	Password clear	Forces reset UEFI password	Normal (default)
2	(Reserved)	(Reserved)	Normal (default)
3	(Reserved)	(Reserved)	Normal (default)
4	(Reserved)	(Reserved)	Normal (default)

## SW31C switch block

Table 8. SW31C switch block definition

Switch number	Switch name	Usage description	
		On	Off
1	(Reserved)	(Reserved)	Normal (default)
2	(Reserved)	(Reserved)	Normal (default)
3	(Reserved)	Normal (default)	(Reserved)
4	(Reserved)	(Reserved)	Normal (default)

## SWX2 switch block

Table 9. SWX2 switch block definition

Switch number	Switch name	Usage description	
		On	Off
1	(Reserved)	(Reserved)	Normal (default)
2	Low security	Enables XCC low security mode	(Reserved)
3	Force BMC reset	Force hot reset BMC chip	Normal (default)
4	XCC boot primary	Request XCC to boot from backup bank	Normal (default)

## SW1 switch block

Table 10. SW1 switch block definition

Switch number	Switch name	Usage description	
		On	Off
1	Clear CMOS	Clears CMOS data	Normal (default)
2	(Reserved)	(Reserved)	Normal (default)
3	(Reserved)	(Reserved)	Normal (default)
4	(Reserved)	(Reserved)	Normal (default)

---

## System LEDs and diagnostics display

The following section provides information on available system LEDs and diagnostics display.

For more information, refer to [“Troubleshooting by system LEDs and diagnostics display”](#) on page 179.

## Chapter 3. Parts list

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

For more information about ordering parts:

1. Go to <http://datacentersupport.lenovo.com> and navigate to the support page for your node or chassis.
2. Click **Parts**.
3. Enter the serial number to view a listing of parts for your system.

It is highly recommended that you check the power summary data for your server using Lenovo Capacity Planner before purchasing any new parts.

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

The parts listed in the following tables are identified as one of the following:

- **T1:** Tier 1 customer replaceable unit (CRU). Replacement of Tier 1 CRUs is your responsibility. If Lenovo installs a Tier 1 CRU at your request with no service agreement, you will be charged for the installation.
- **T2:** Tier 2 customer replaceable unit (CRU). You may install a Tier 2 CRU yourself or request Lenovo to install it, at no additional charge, under the type of warranty service that is designated for your server.
- **F:** Field replaceable unit (FRU). FRUs must be installed only by trained service technicians.
- **C:** Consumable and Structural parts. Purchase and replacement of consumable and structural parts is your responsibility. If Lenovo acquires or installs a structural component at your request, you will be charged for the service.

### Chassis components

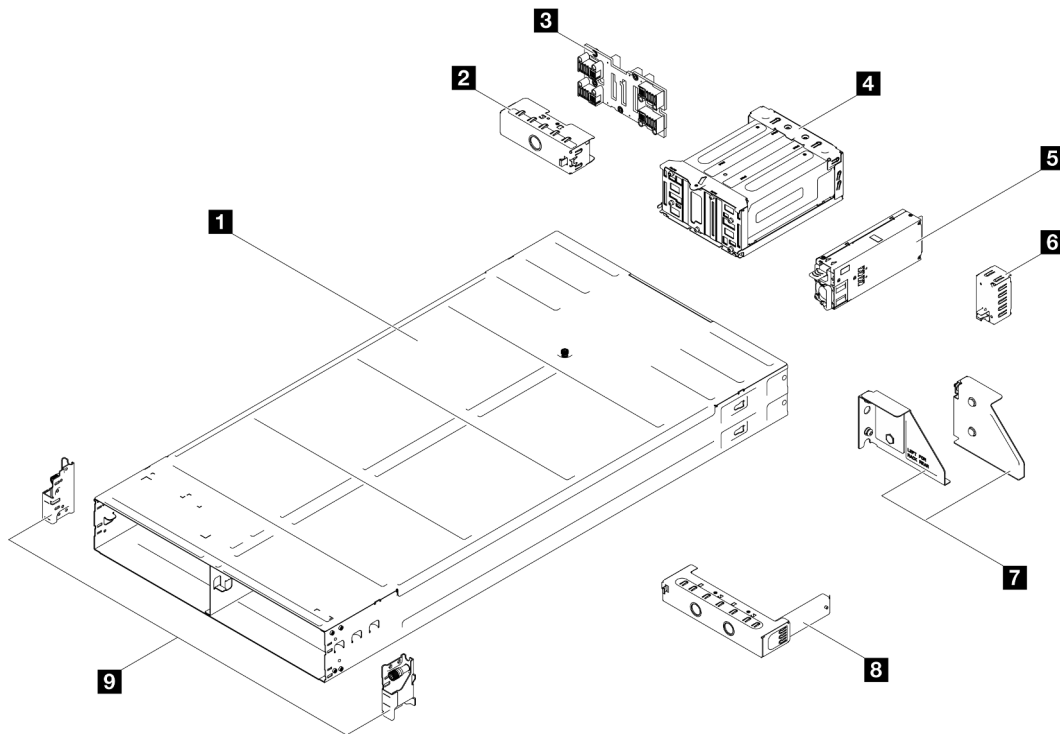


Figure 9. Chassis components

Description	Type
<b>1</b> Chassis	T2
<b>2</b> Node tray rear filler	T1
<b>3</b> Chassis midplane	T2
<b>4</b> PSU cage	T1
<b>5</b> CRPS power supply unit	T2
<b>6</b> PSU filler	T1
<b>7</b> Chassis rear shipping brackets (left and right)	T1
<b>8</b> Node tray front filler	T1
<b>9</b> Chassis front EIA brackets (left and right)	T1

### Node components

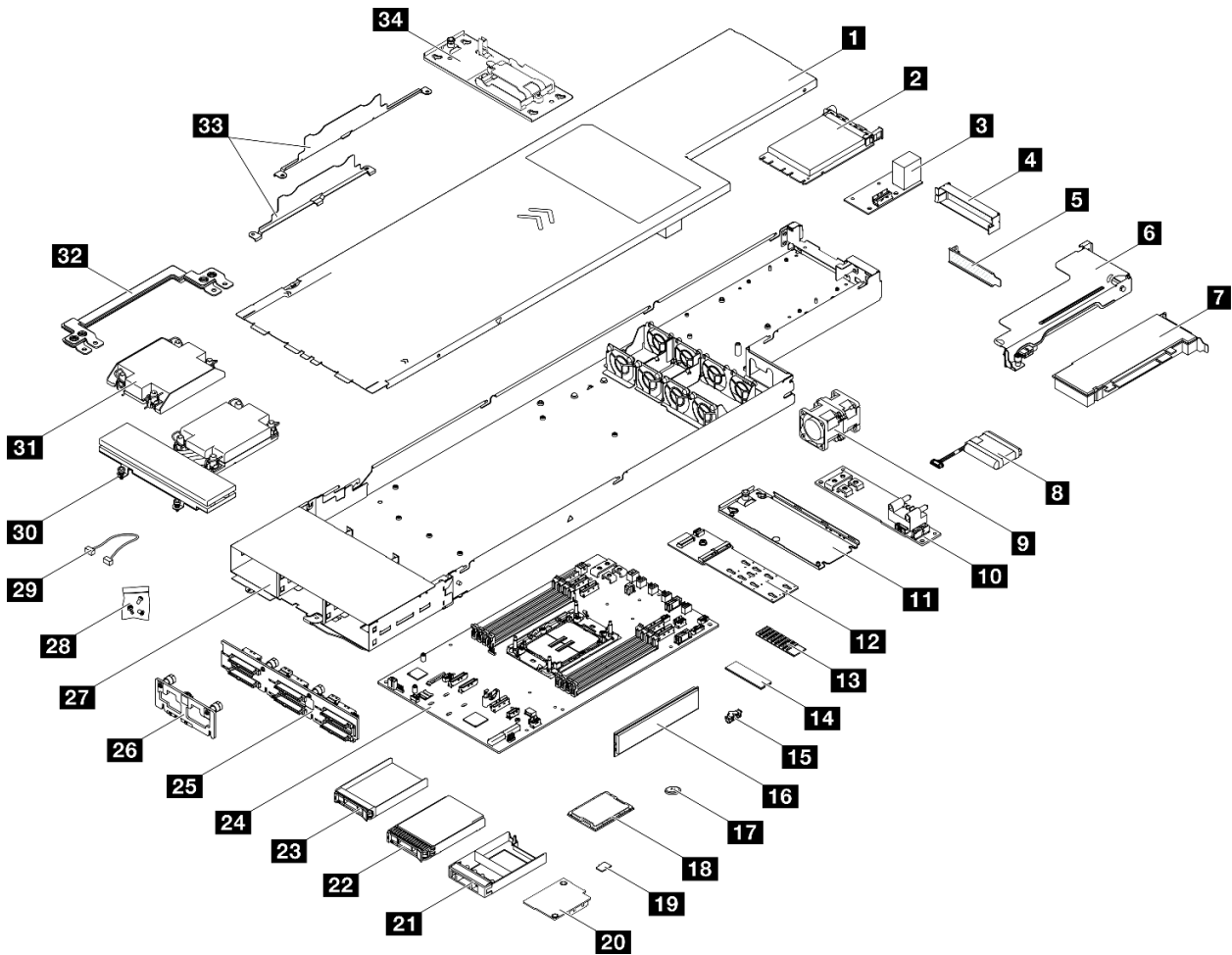


Figure 10. Node components

Description	Type	Description	Type
<b>1</b> Top cover	T1	<b>2</b> OCP 3.0 module	T1
<b>3</b> Rear I/O module	T1	<b>4</b> PCIe riser filler	T1
<b>5</b> PCIe filler	T1	<b>6</b> PCIe riser	T2
<b>7</b> PCIe adapter	T1	<b>8</b> Flash power module	T1
<b>9</b> Fan	T1	<b>10</b> Power distribution board	T2
<b>11</b> M.2 boot adapter tray	T1	<b>12</b> M.2 boot adapter	T1
<b>13</b> M.2 heat sink	T2	<b>14</b> M.2 drive	T1
<b>15</b> M.2 drive retainer	T1	<b>16</b> Memory module	T1
<b>17</b> CMOS battery (CR2032)	C	<b>18</b> Processor	F
<b>19</b> MicroSD card	T1	<b>20</b> Firmware and RoT security module	F
<b>21</b> 2.5-inch drive filler	T1	<b>22</b> 2.5-inch drive (15 mm)	T1
<b>23</b> 2.5-inch drive (7 mm)	T1	<b>24</b> System board	F
<b>25</b> 2.5-inch drive backplane	T1	<b>26</b> Front I/O board	T1
<b>27</b> Node tray	F	<b>28</b> Screws	T1
<b>29</b> Cables	T1	<b>30</b> Performance heat sink	F
<b>31</b> Standard heat sink	F	<b>32</b> Power bus bar	T1
<b>33</b> Cable walls	T1	<b>34</b> Flash power module holder	T1

## Power cords

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

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

1. Go to:  
<http://dcsc.lenovo.com/#/>
2. Click **Preconfigured Model** or **Configure to order**.
3. Enter the machine type and model for your server to display the configurator page.
4. Click **Power** → **Power Cables** to see all line cords.

### Notes:

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

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

---

## Chapter 4. Unboxing and setup

Information in this section assists you on unboxing and setting up the system. When unboxing the chassis and node, check if the items in the package are correct, and learn where to find information of system serial number and Lenovo XClarity Controller access.

---

### System package contents

When you receive your system, verify that the shipment contains everything that you expected to receive.

The system package includes the following items:

- Node
- Chassis
- Rail installation kit\*. Installation guide is provided in the package.
- Material box, including items such as power cords\*, accessory kit, and printed documents.

#### Notes:

- Some of the items listed are available on select models only.
- Items marked with asterisk(\*) are optional.

If any item is missing or damaged, contact your place of purchase. Make sure that you retain your proof of purchase and packing material. They might be required to receive warranty service.

---

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

This section contains instruction on how to identify the system and where to find the Lenovo XClarity Controller access information.

## Identifying your system

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

The illustration below shows the location of the ID label which contains the chassis model number, machine type, and serial number of the chassis. You can also add other system information labels to the front of the node in the customer label spaces.

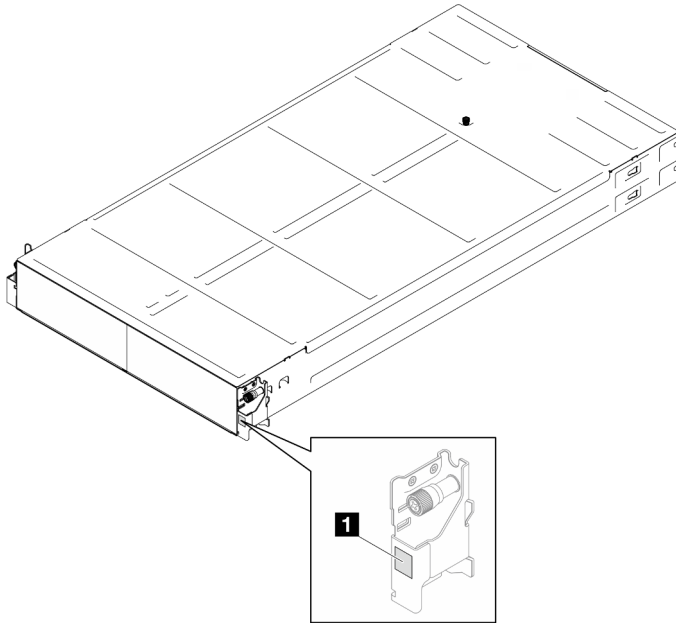


Figure 11. Location of the ID label on the chassis

Table 11. ID label on the front of the chassis

<b>1</b> ID label
-------------------

## Lenovo XClarity Controller network access label

In addition, the Lenovo XClarity Controller network access label for the node can be found on the pull-out information tag located at the front of the node. This pull-out information tag also shows the bay numbers of the hot-swap drives. You can use the information on the pull-out tag to access the XCC MAC address and LLA for the node. The left node information is at the left bottom side, while the right node information is on the right upper side. You can also use the information tag for your own node labeling information, such as the hostname, the system name, and the inventory bar code.



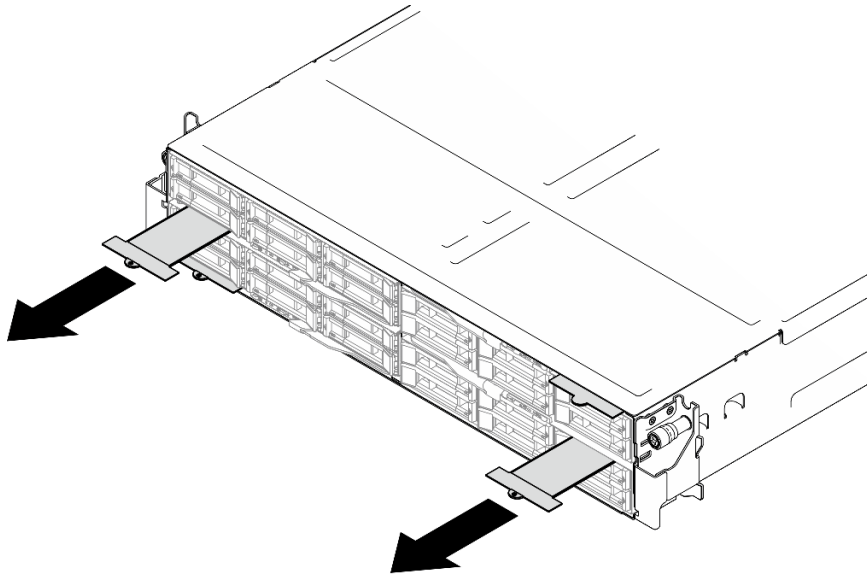


Figure 12. Lenovo XClarity Controller network access label on the pull-out information tab

### Service Label and QR code

In addition, the System Service Label is located on the inside surface of the node cover, providing a quick response (QR) code for mobile access to service information. You can scan the QR code with a mobile device using a QR code reader application and get quick access to the Service Information web page. The Service Information web page provides additional information for parts installation and replacement videos, and error codes for system support.

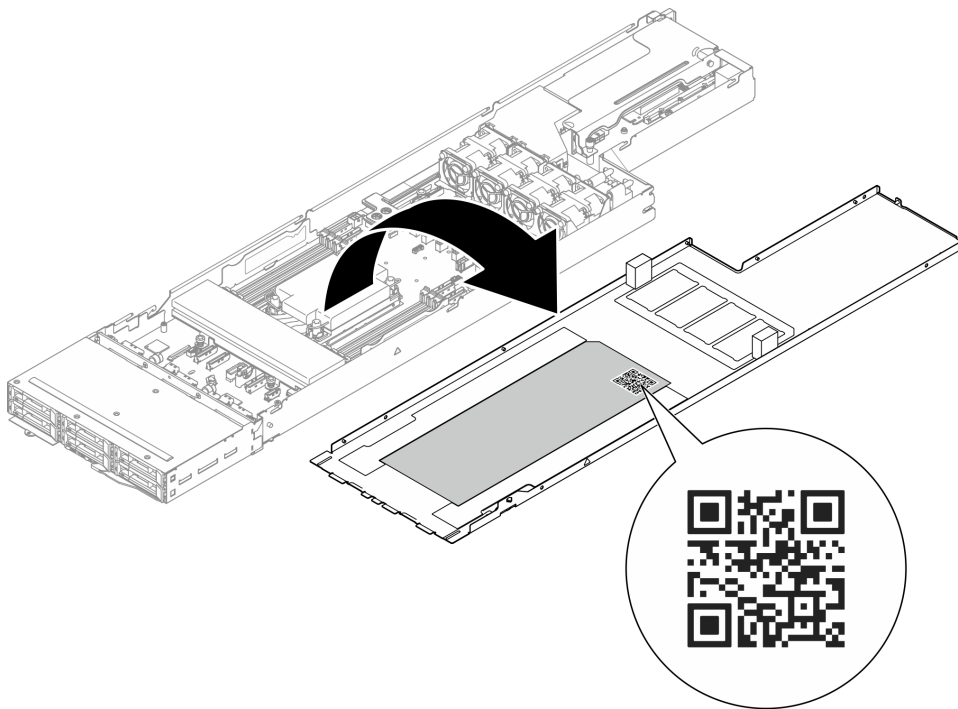


Figure 13. Service Label and QR code

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## System setup checklist

Use the system setup checklist to make sure that you have performed all tasks that are required to set up your system.

The system setup procedure varies depending on the configuration of the system when it was delivered. In some cases, the system is fully configured and you just need to connect the system to the network and an AC power source, and then you can power on the system. In other cases, the system needs to have hardware options installed, requires hardware and firmware configuration, and requires an operating system to be installed.

The following steps describe the general procedure for setting up a system.

### Setup the system hardware

Complete the following procedures to setup the system hardware.

1. Unpack the system package. See [“System package contents” on page 31](#).
2. Install any required hardware or system options. See the related topics in [Chapter 5 “Hardware replacement procedures” on page 37](#).
3. If necessary, install the rail to a standard rack cabinet. Follow the instruction in *Rail Installation Guide* that comes with the rail installation kit.
4. To install the chassis to the rack, see [“Install the chassis to the rack” on page 46](#).  
To install the node into the chassis, see [“Install a node to the chassis” on page 70](#).
5. Connect all external cables to the system. See [Chapter 2 “Hardware components” on page 17](#) for connectors locations.

Typically, you will need to connect the following cables:

- Connect the system to the power source.
  - Connect the system to the data network.
  - Connect the system to the storage device.
  - Connect the system to the management network.
6. Power on the system.

The power button location and power LED are specified in [“Troubleshooting by system LEDs and diagnostics display” on page 179](#).

A node can be turned on (power LED on) in any of the following ways:

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

**Note:** You can access the management processor interface to configure the system without powering on the system. Whenever the system is connected to power, the management processor interface is available. For details about accessing the management system processor, see [“Opening and Using the XClarity Controller Web Interface”](#) section in the XCC documentation compatible with your system at <https://pubs.lenovo.com/lxcc-overview/>.

7. Validate the system. Make sure that the power LED, Ethernet connector LED, and network LED are lit with green light, which means the system hardware was set up successfully.

See [“Troubleshooting by system LEDs and diagnostics display” on page 179](#) for more information on the LED indications.

## Configure the system

Complete the following procedures to configure the system. For detailed instructions, refer to [Chapter 6 “System configuration” on page 167](#).

1. Set the network connection for the Lenovo XClarity Controller to the management network.
2. Update the firmware for the system, if necessary.
3. Configure the firmware for the system.

The following information is available for RAID configuration:

- <https://lenovopress.lenovo.com/lp0578-lenovo-raid-introduction>
  - <https://lenovopress.lenovo.com/lp0579-lenovo-raid-management-tools-and-resources>
4. Install the operating system.
  5. Back up the system configuration.
  6. Install the applications and programs for which the system is intended to be used.



---

## Chapter 5. Hardware replacement procedures

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

---

### Installation Guidelines

Before installing components in your node or chassis, read the installation guidelines.

Before installing optional devices, read the following notices carefully:

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

- Read the safety information and guidelines to ensure your safety at work:
  - A complete list of safety information for all products is available at:  
[https://pubs.lenovo.com/safety\\_documentation/](https://pubs.lenovo.com/safety_documentation/)
  - The following guideline is also available at: “[Handling static-sensitive devices](#)” on page 39.
- Make sure the components you are installing are supported by your system.
  - For a list of supported optional components for the system, 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 node or chassis.
  2. Click **Parts**.
  3. Enter the serial number to view a listing of parts for your system.
- When you install a new node, download and apply the latest firmware. This will help ensure that any known issues are addressed, and that your node is ready to work with optimal performance. Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sd520v4/7dfy/downloads/driver-list> to download the latest firmware and driver updates for your server.

**Important:** Some cluster solutions require specific code levels or coordinated code updates. If the component is part of a cluster solution, verify the latest Best Recipe code level menu for cluster supported firmware and driver before you update the code.

- If you replace a part, such as an adapter, that contains firmware, you might also need to update the firmware for that part. For more information about updating firmware, see “[Update the firmware](#)” on page 168.
- It is good practice to make sure that the system is working correctly before installing an optional component.
- Keep the working area clean, and place the 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 T30 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 node to remove or install hot-swap power supplies, hot-swap drives, or hot-plug USB devices. However, you must turn off the node and remove it from the chassis before performing any steps that involve removing or installing components or cables inside the node.
- When replacing power supply units, make sure to refer to redundancy rules.
- 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.
- Except PSU, orange on a component or an orange label on or near a component indicates that the component can be hot-swapped if the server and operating system support hot-swap capability, which means that you can remove or install the component while the server is still running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- PSU with a release tab is a hot-swap PSU. The color of the release tab does not affect the serviceability of the PSU.
- 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 node or chassis, make sure to reinstall all safety shields, guards, labels, and ground wires.

## Safety inspection checklist

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

**Note:** The product is not suitable for use at visual display workplaces according to §2 of the Workplace Regulations.

**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.

**Note:** The set-up of the server is made in the server room only.

### CAUTION:

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

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

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

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

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

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

## System reliability guidelines

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

Make sure the following requirements are met:

- When the system comes with redundant power, a power supply must be installed in each power-supply bay.
- Adequate space around the node and chassis must be spared to allow the cooling system to work properly. Leave approximately 50 mm (2.0 in.) of open space around the front and rear of the chassis. Do not place any object in front of the fans.
- For proper cooling and airflow, refit the node cover before you turn the power on. Do not operate the node with the node cover removed, for it might damage node components.
- Cabling instructions that come with optional components must be followed.
- A removed hot-swap drive must be replaced within two minutes after removal.
- A removed hot-swap power supply must be replaced by another power supply unit or a PSU filler within two minutes after removal.
- All processor sockets must contain either a socket cover or a processor with heat sink.

## Handling static-sensitive devices

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

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

- Limit your movement to prevent building up static electricity around you.
- Take additional care when handling devices during cold weather, for heating would reduce indoor humidity and increase static electricity.
- Always use an electrostatic-discharge wrist strap or other grounding system.
- While the device is still in its static-protective package, touch it to an unpainted metal surface on the outside of the node or chassis 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 node or chassis 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 node or chassis 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 “[Node technical specifications](#)” on page 5.

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](https://dcsc.lenovo.com/#/memory_configuration)

For the specific information about the required installation order of memory modules in SD520 V4 based on the system configuration and memory mode that you are implementing, see below.



## Memory modules and processors layout

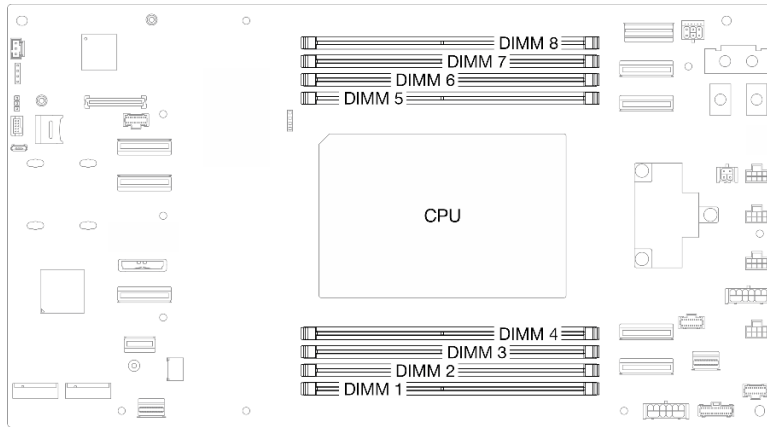


Figure 14. Memory modules and processors layout

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

Table 12. Memory slot and channel identification

Channel	CH 7/H	CH 6/G	CH 5/F	CH 4/E	Processor	CH 0/A	CH 1/B	CH 2/C	CH 3/D
DIMM slot No.	1	2	3	4			5	6	7

### Memory module installation guideline

- Install eight DIMMs for good performance.
- When a DIMM is replaced, the node provides automatic DIMM enablement capability without requiring you to use the Setup Utility to enable the new DIMM manually.

#### Attention:

- Install DIMMs of the same speed for optimal performance. Otherwise, the BIOS will find and run the lowest speed among all channels.
- Within a channel, always populate DIMMs with the maximum number of ranks in the farthest DIMM slot, followed by the nearest DIMM slot.

## 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 the processor in any order with no matching requirements. Independent memory mode provides the highest level of memory performance, but lacks failover protection.

### Memory module installation order in independent mode

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

- All memory modules must be DDR5 memory modules.
- All DDR5 DIMM must operate at the same speed in the same node.
- Memory modules from different vendors are supported.
- Mixing x8 and x4 DIMM is not supported in a node.
- All the installed memory modules must be of the same type.
- For proper cooling, each DIMM slot must be installed with a DIMM or DIMM filler.

Table 13. Independent memory mode population sequence

Total DIMMs	1	2	3	4	5	6	7	8
8†	1	2	3	4	5	6	7	8
<b>Note:</b> † DIMM configurations that support Software Guard Extensions (SGX), see <a href="#">“Enable Software Guard Extensions (SGX)” on page 173</a> to enable this feature.								

## Memory mirroring mode installation order

Memory-mirroring mode provides full memory redundancy while reducing the total node memory capacity in half. Memory channels are grouped in pairs with each channel receiving the same data. If a failure occurs, the memory controller switches from the DIMMs on the primary channel to the DIMMs on the backup channel.

Memory mirroring guidelines:

- Memory mirroring reduces the maximum available memory by half of the installed memory. For example, if the node has 64 GB of installed memory, only 32 GB of addressable memory is available when memory mirroring is enabled.
- Each DIMM must be identical in size and architecture.
- Partial Memory Mirroring is a sub-function of memory mirroring. It requires following the memory installation order of memory mirroring mode.

Table 14. Memory mirroring mode population sequence

Total DIMMs	1	2	3	4	5	6	7	8
8†	1	2	3	4	5	6	7	8
<b>Note:</b> † DIMM configurations that support Software Guard Extensions (SGX), see <a href="#">“Enable Software Guard Extensions (SGX)” on page 173</a> to enable this feature.								

## Power on and power off the node

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

### Power on the node

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

Power button location and power LED are specified in:

- [Chapter 2 “Hardware components” on page 17](#)
- [“Troubleshooting by system LEDs and diagnostics display” on page 179](#)

A node can be turned on (power LED on) in any of the following ways:

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

For information about powering off the compute node, see [“Power off the node” on page 43](#).

## Power off the node

The node 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 completely power off the node (power status LED off), you must disconnect all power cables.

Power button location and power LED are specified in:

- [Chapter 2 “Hardware components” on page 17](#)
- [“Troubleshooting by system LEDs and diagnostics display” on page 179](#)

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

**Note:** The Lenovo XClarity Controller can place the node 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 node can respond to remote power-on requests sent to the Lenovo XClarity Controller. For information about powering on the compute node, see [“Power on the node” on page 42](#).

---

## Chassis replacement

Follow instructions in this section to remove or install the chassis from or to the rack.

**Important:** For safety, make sure that there is no node or power supply unit installed in the chassis when removing or installing the chassis from or to the rack.

### Remove the chassis from the rack

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

#### About this task

To avoid potential danger, make sure to read and follow the safety information.

#### 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 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.
- Use safe practices when lifting the chassis. It is advised that the task of removing or installing the chassis be executed by two persons.

**CAUTION:**  
Use safe practices when lifting the chassis.

## Procedure

Step 1. Make preparations for this task.

- a. If shipping brackets are installed on the rear of the rack, remove them.
  1. ① Remove the screws that secure the rear brackets.
  2. ② Slide the brackets toward the rear of the rack; then, remove the brackets from the rack and the chassis.

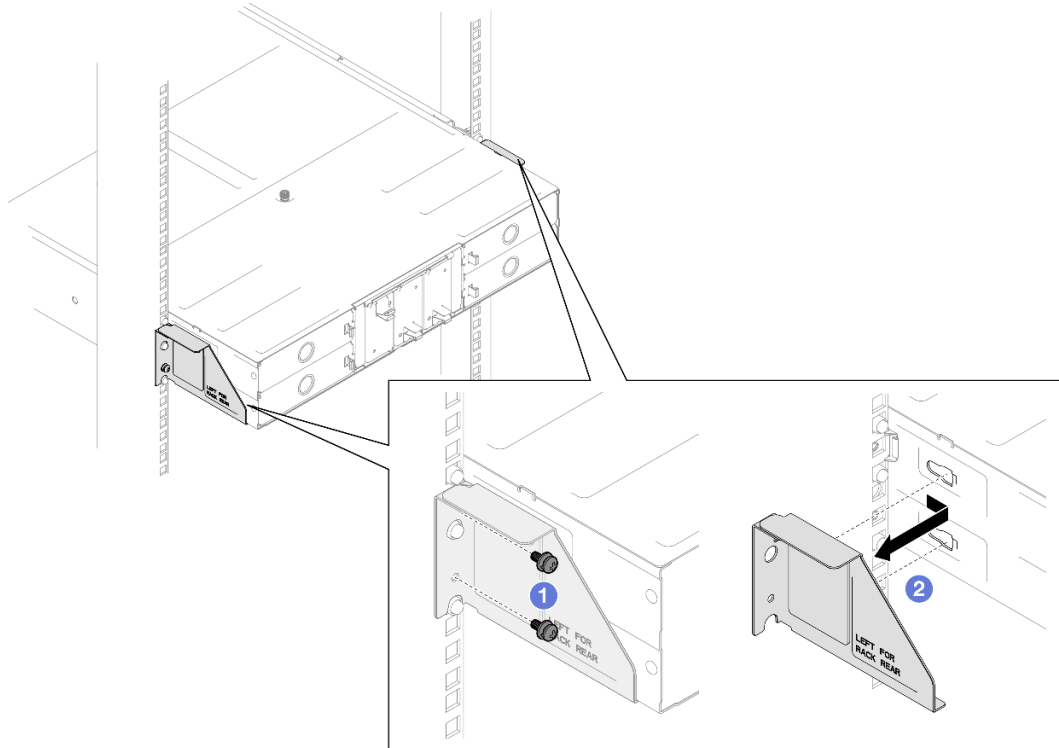


Figure 15. Removal of shipping brackets for 29-inch or 28.31-inch deep racks

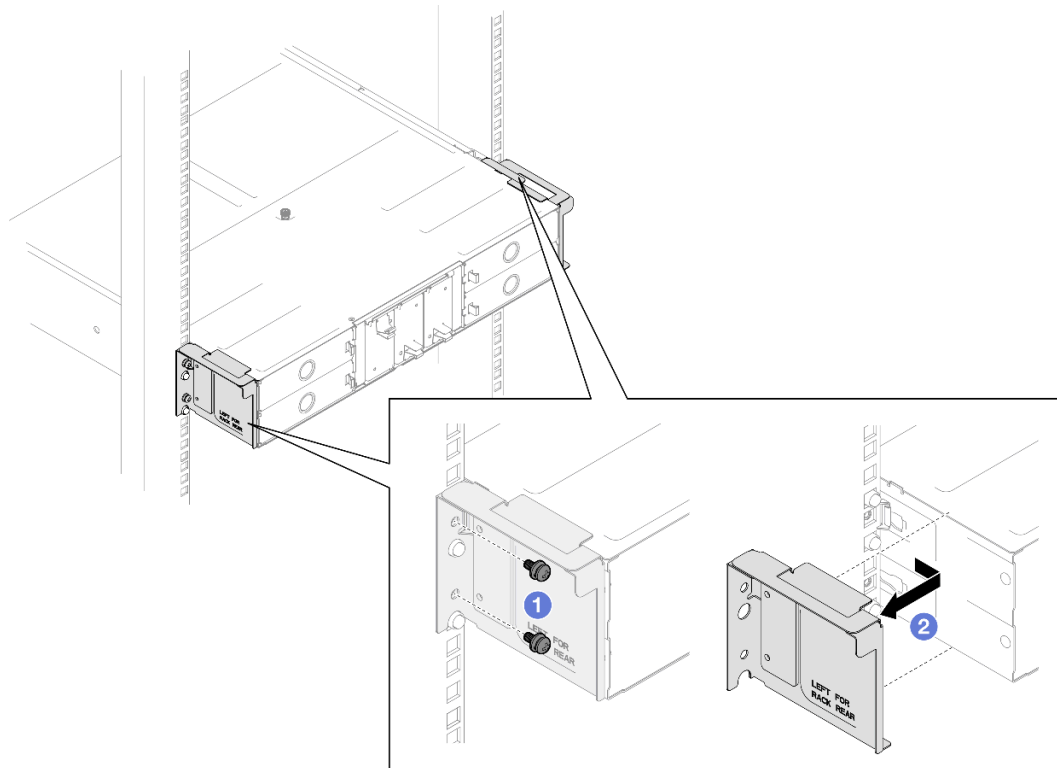


Figure 16. Removal of shipping brackets for 29.5-inch deep racks

- b. If any nodes are installed in the chassis, power off all the nodes and disconnect all external cables from the nodes; then, remove the nodes from the chassis (see [“Power off the node” on page 43](#) and [“Remove a node from the chassis” on page 66](#)).
- c. If any power supply units are installed in the chassis, remove them (see [“Remove a hot-swap power supply” on page 52](#)).

Step 2. Loosen the captive screws on the front of the chassis.

Step 3. Carefully pull the chassis out of the rack; then, remove the chassis from the rails.

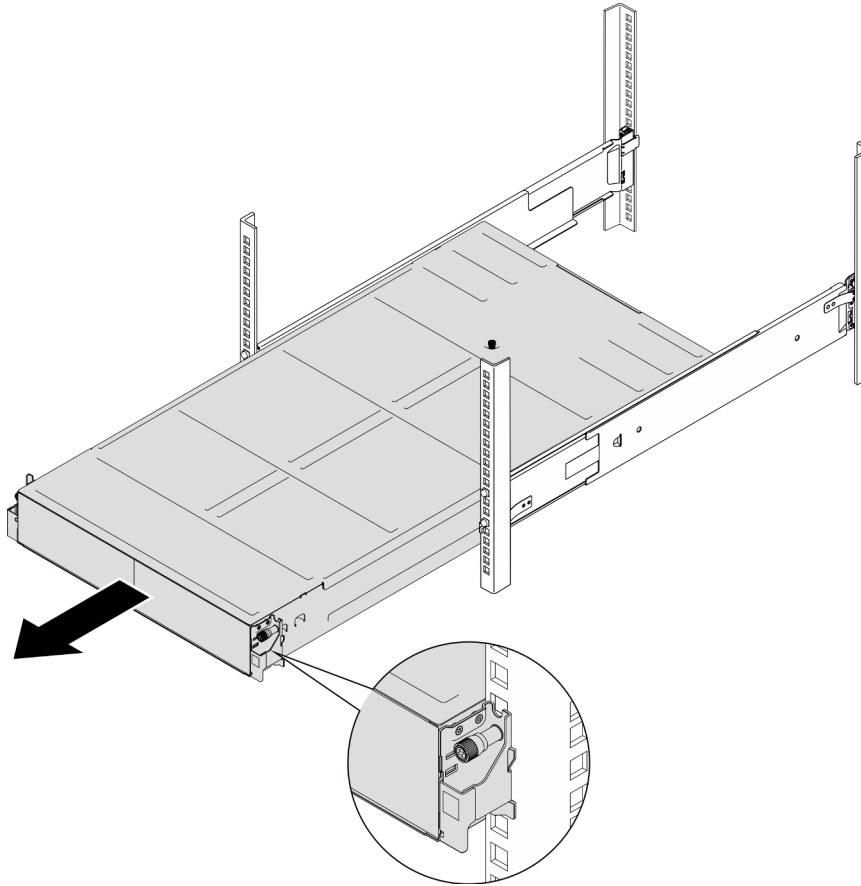


Figure 17. Chassis removal

Step 4. Carefully lay the chassis on a flat, static-protective surface.

### After you finish

1. To remove the rails from the rack, follow the instructions below:

[https://pubs.lenovo.com/st650-v2/thinksystem\\_l\\_shaped\\_rail\\_kit.pdf](https://pubs.lenovo.com/st650-v2/thinksystem_l_shaped_rail_kit.pdf)

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

<https://www.youtube.com/watch?v=3yK2cjTXQeA>

### Install the chassis to the rack

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

### About this task

To avoid potential danger, make sure to read and follow the safety information.

### 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 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.
- To install the rails into a rack, follow the instructions below:

[https://pubs.lenovo.com/st650-v2/thinksystem\\_l\\_shaped\\_rail\\_kit.pdf](https://pubs.lenovo.com/st650-v2/thinksystem_l_shaped_rail_kit.pdf)

After the rails are installed successfully, complete the following steps to install the chassis to the rack.

**CAUTION:**

**Use safe practices when lifting the chassis.**

**Procedure**

Step 1. Make preparations for this task.

- a. If the EIA brackets are not installed to the front of the chassis yet, install them (see “[Install the EIA brackets to the chassis](#)” on page 51).

Step 2. Align the chassis with the rails; then, slide the chassis into the rack.

Step 3. Tighten the captive screws on the front to secure the chassis to the rack.

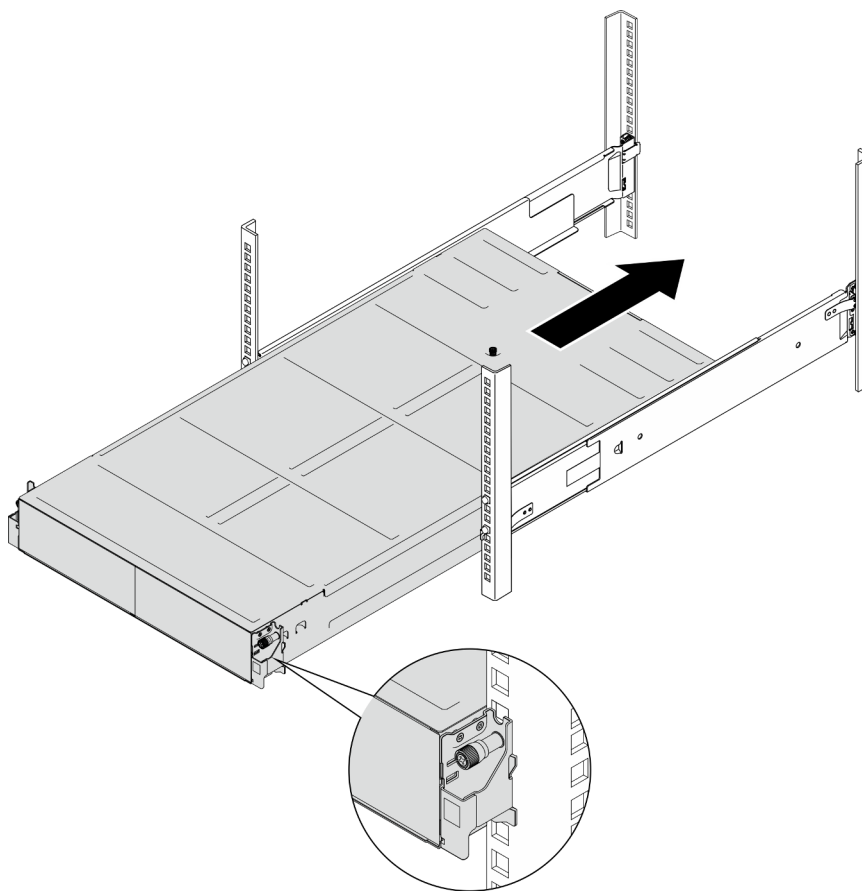


Figure 18. Chassis installation

### After you finish

- Reinstall each PSU slot with a PSU or PSU filler (see [“Install a hot-swap power supply” on page 54](#) and [Installation of a PSU filler](#)).
- Reinstall the nodes into the chassis (see [“Install a node to the chassis” on page 70](#)).
- Proceed to complete the parts replacement (see [“Complete the parts replacement” on page 164](#)).
- If the chassis is to be shipped in the cabinet, install shipping brackets on the rear to secure the chassis to the rack.

**Note:** For reference, the torque required for the screws to be fully tightened/removed is 10.0+/- 0.5 lbf-in, 1.13+/- 0.05 N-M.

### Shipping brackets for 29-inch deep racks

1. **1** Align the shipping brackets with the guide holes on the rack and the chassis; then, insert the brackets and push it toward the front to engage the brackets in place.
2. **2** Tighten the screws to secure the shipping brackets to the chassis and the rack.



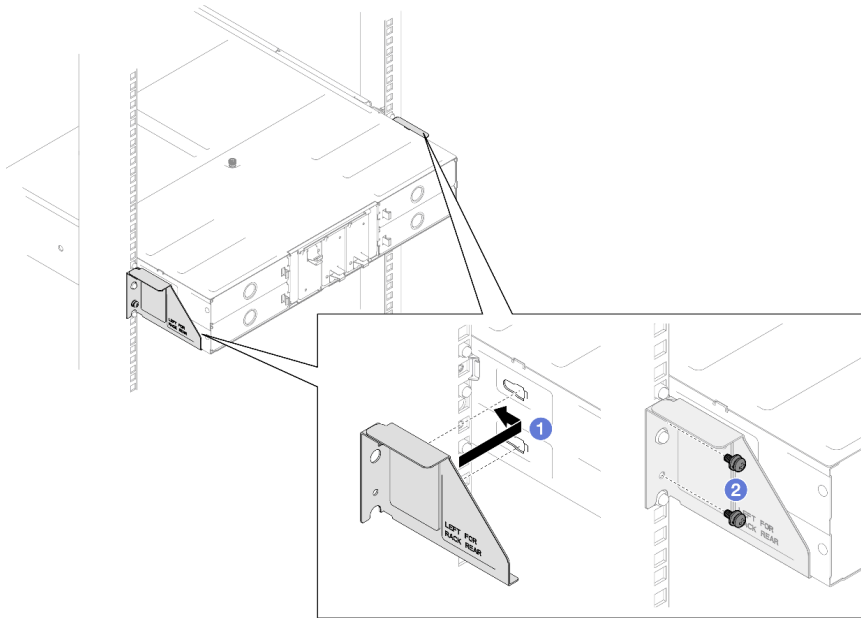


Figure 19. Installation of shipping brackets for 29-inch or 28.31-inch deep racks

### Shipping brackets for 29.5-inch deep racks

1. ① Align the shipping brackets with the chassis; then, slide the brackets towards the rack post.
2. ② Tighten the screws to secure the shipping brackets to the rack post.

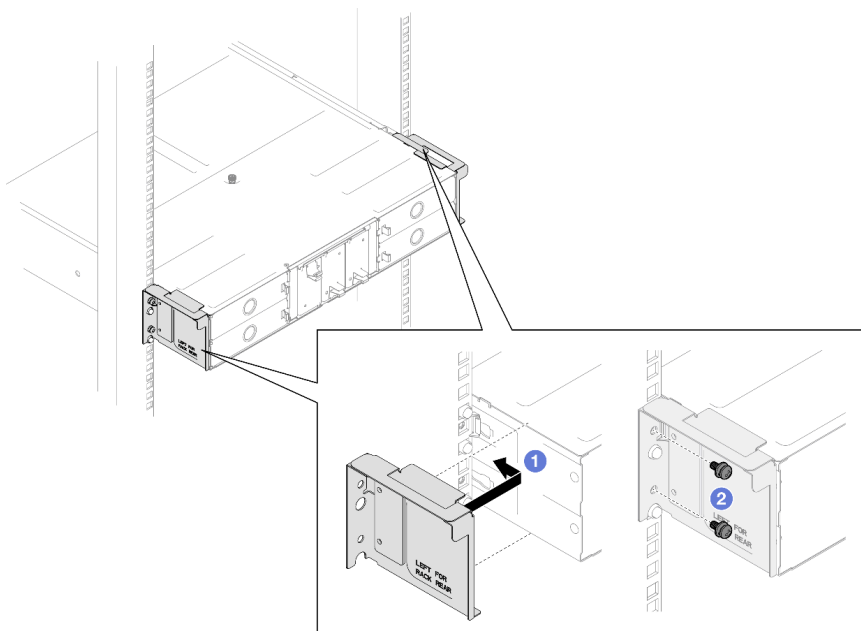


Figure 20. Installation of shipping brackets for 29.5-inch deep racks

### Demo video

<https://www.youtube.com/watch?v=aTAsdWTPUF0>

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## Replace components in the chassis

Follow instructions in this section to remove or install components from or to the chassis.

### EIA bracket replacement

Follow instructions in this section to remove or install the EIA brackets from or to the chassis.

#### Remove the EIA brackets from the chassis

Follow instructions in this section to remove the EIA brackets from the chassis.

#### About this task

To avoid potential danger, make sure to read and follow the safety information.

#### Attention:

- Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.

#### Procedure

Step 1. Make preparations for this task.

- a. Power off all the nodes (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the nodes.
- b. Remove all the nodes from the chassis (see [“Remove a node from the chassis” on page 66](#)).
- c. Remove all power supply units and PSU fillers from the PSU cage (see [“Remove a hot-swap power supply” on page 52](#) and [Removal of a PSU filler](#)).
- d. Remove the chassis from the rack (see [“Remove the chassis from the rack” on page 43](#)); then, lay the chassis on a flat, static-protective surface.

Step 2. Remove the left and right EIA brackets from the chassis.

- a. Remove the screws that secure the EIA brackets to the chassis.
- b. Remove the EIA brackets from the chassis.

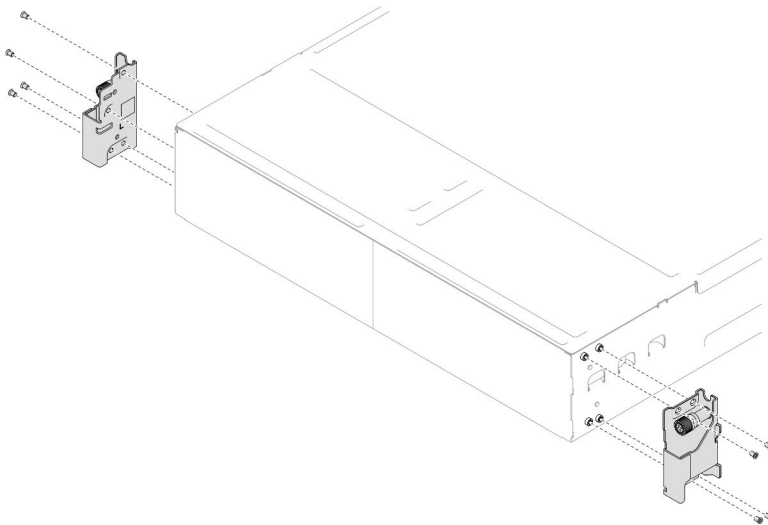


Figure 21. Removal of the EIA brackets

## After you finish

1. Install a replacement unit (see [“Install the EIA brackets to the chassis”](#) on page 51).
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

<https://www.youtube.com/watch?v=3yK2cJTQeA>

## Install the EIA brackets to the chassis

Follow instructions in this section to install the EIA brackets to the chassis.

## About this task

To avoid potential danger, make sure to read and follow the safety information.

### Attention:

- Read [“Installation Guidelines”](#) on page 37 and [“Safety inspection checklist”](#) on page 38 to make sure that you work safely.

## Procedure

- Step 1. Align the left EIA bracket with the screw holes on the left of the chassis; then, secure it to the chassis with the screws.
- Step 2. Repeat the same step to secure the right EIA bracket to the right of the chassis.

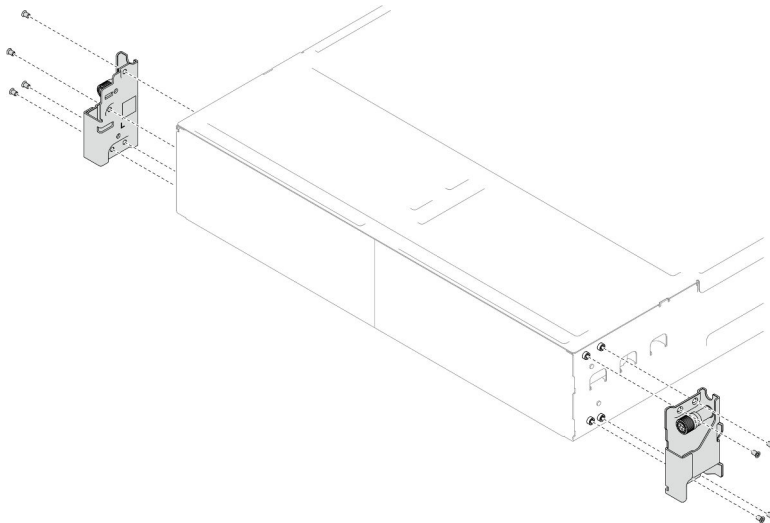


Figure 22. Installation of the EIA brackets

## After you finish

- Install the chassis to the rack (see [“Install the chassis to the rack”](#) on page 46).
- Reinstall each PSU slot with a PSU or PSU filler (see [“Install a hot-swap power supply”](#) on page 54 and [Installation of a PSU filler](#)).
- Reinstall the nodes into the chassis (see [“Install a node to the chassis”](#) on page 70).
- Proceed to complete the parts replacement (see [“Complete the parts replacement”](#) on page 164).

## Demo video

<https://www.youtube.com/watch?v=aTAsdWTPUF0>

## Hot-swap power supply replacement

Follow instructions in this section to remove or install a hot-swap power supply unit (PSU).

### Remove a hot-swap power supply

Follow instructions in this section to remove a power supply unit (PSU).

### About this task

To avoid potential danger, make sure to read and follow the safety information.

#### 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.

#### 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.

**Attention:**

- Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.
- If only one hot-swap power supply is installed in the chassis, the installed nodes must be turned off before the power supply is to be removed.

**Procedure**

Step 1. Untie the Velcro strap and disconnect the power cord from the power supply unit.

Step 2. Remove the power supply unit.

- a. ① Press and hold on the release tab of the power supply unit.
- b. ② Hold the handle and pull the power supply unit out of the slot.

**Note:** PSU with a release tab is a hot-swap PSU. The color of the release tab does not affect the serviceability of the PSU.

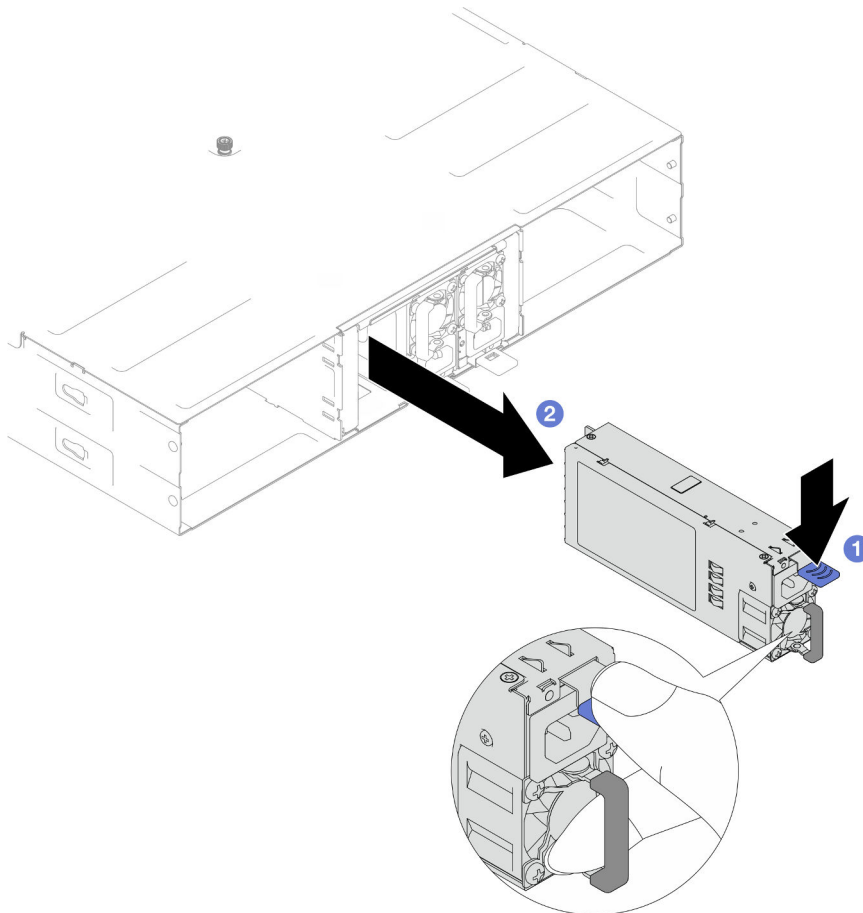


Figure 23. Removal of a hot-swap PSU

## After you finish

1. Install a replacement unit or filler (see “Install a hot-swap power supply” on page 54) .

### Important:

- A removed hot-swap power supply must be replaced by another power supply unit or a PSU filler within two minutes after removal.
- For PSU slots 2 and 3, the PSU filler must be installed with the tab downward. For PSU slot 1, the filler must be installed with the tab upward.

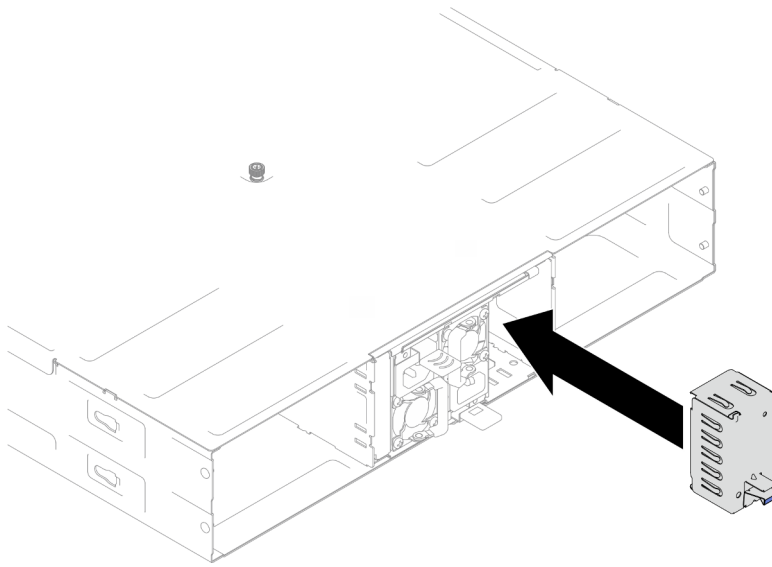


Figure 24. Installation of a PSU filler

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

[https://www.youtube.com/watch?v=VeU\\_2a1x79g](https://www.youtube.com/watch?v=VeU_2a1x79g)

## Install a hot-swap power supply

Follow instructions in this section to install a power supply unit (PSU).

## About this task

To avoid potential danger, make sure to read and follow the safety information.

### 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.

**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.

**CAUTION:**



**High touch current. Connect to earth before connecting to supply.**

**Attention:**

- Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.
- The following notes describe the type of power supply that the chassis supports and other information that you must consider when installing a power supply:
  - For redundancy support, an additional hot-swap power supply must be installed, if one is not installed in the chassis.
  - Make sure that the devices that you are installing are supported. For a list of supported optional devices for the chassis, see <https://serverproven.lenovo.com>.

**Procedure**

Step 1. Make preparations for this task.

- a. Make sure that the power supply unit to be installed is the same as the installed ones. Otherwise, remove all existing power supply units and replace them all with the same power supply units.

**Notes:**

- CRPS power supply units in the chassis must have the same vendor, wattage, and part number (or alternate part number).
  - CRPS Premium (CFFv5) power supply units in the chassis must have the same wattage, and part number (or alternate part number).
  - PSU with a release tab is a hot-swap PSU. The color of the release tab does not affect the serviceability of the PSU.
- b. If a PSU filler is installed in the PSU slot, remove it.
1. ① Press and hold the tab on the PSU filler.
  2. ② Pull the filler out of the PSU slot.

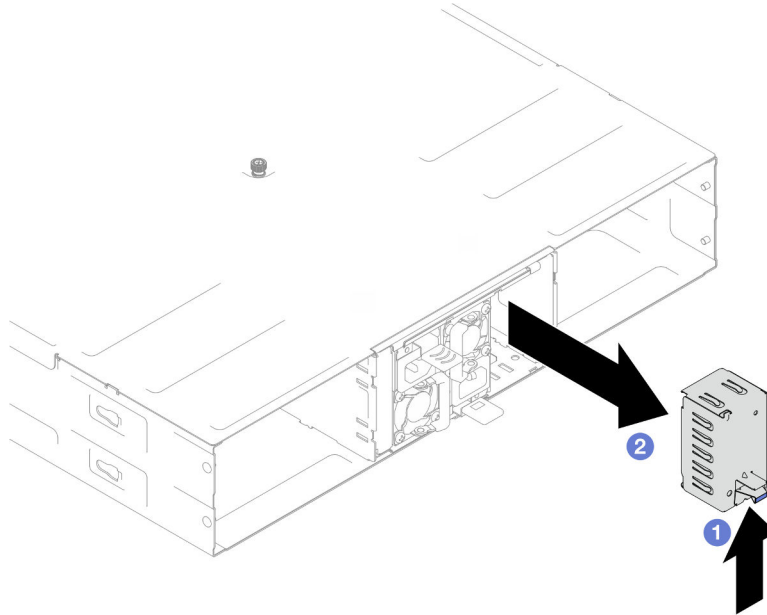


Figure 25. Removal of a PSU filler

- c. If more than one power supply units are to be installed, start with the lowest available PSU slot number.

Step 2. Insert the hot-swap power supply into the slot until the release tab clicks into place.

**Important:**

- During normal operation, each power-supply slot must contain either a power supply or power-supply filler for proper cooling.
- Make sure to follow the instruction on the guiding label in each slot. For slot 1, the power supply unit must be installed with the fan downward; for slots 2 and 3, the power supply units must be installed with the fan upward.
- After docking the power supply, hold the handle and slightly pull the power supply to make sure that it is securely engaged and cannot be pulled out.



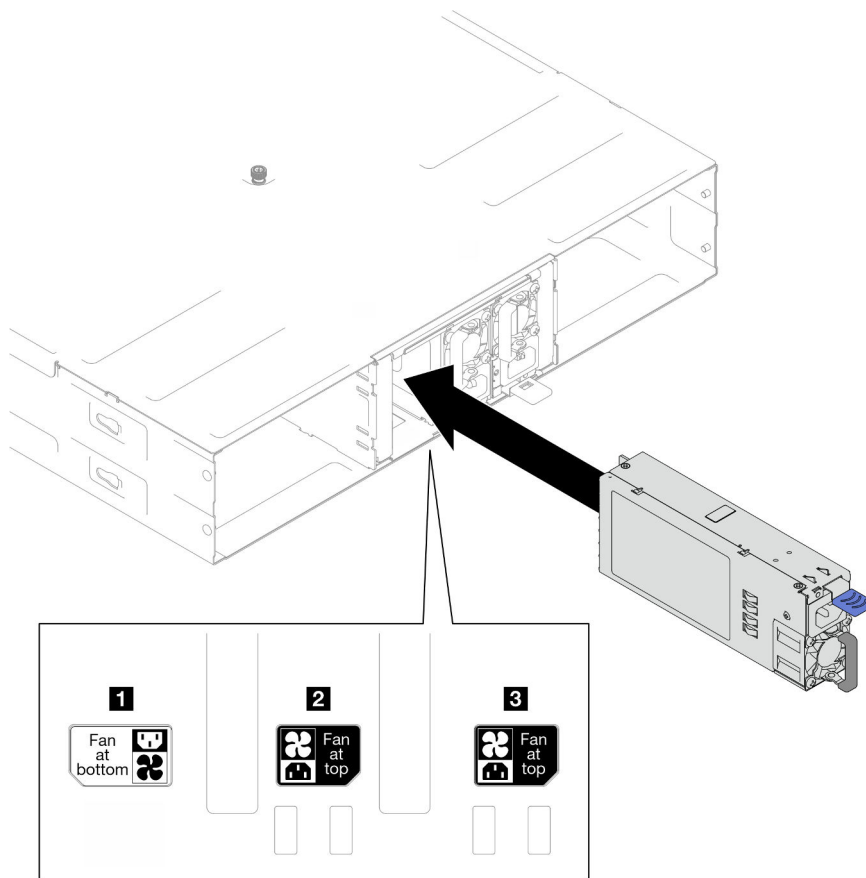


Figure 26. Installation of a hot-swap power supply

- Step 3. Connect one end of the power cord to the AC connector on the back of the new power supply; then, connect the other end of the power cord to a properly grounded electrical outlet.
- Step 4. Make sure the power supply unit handle is perpendicular to the power supply unit; then, tie the power cord to the handle with the pre-attached strap as shown below.

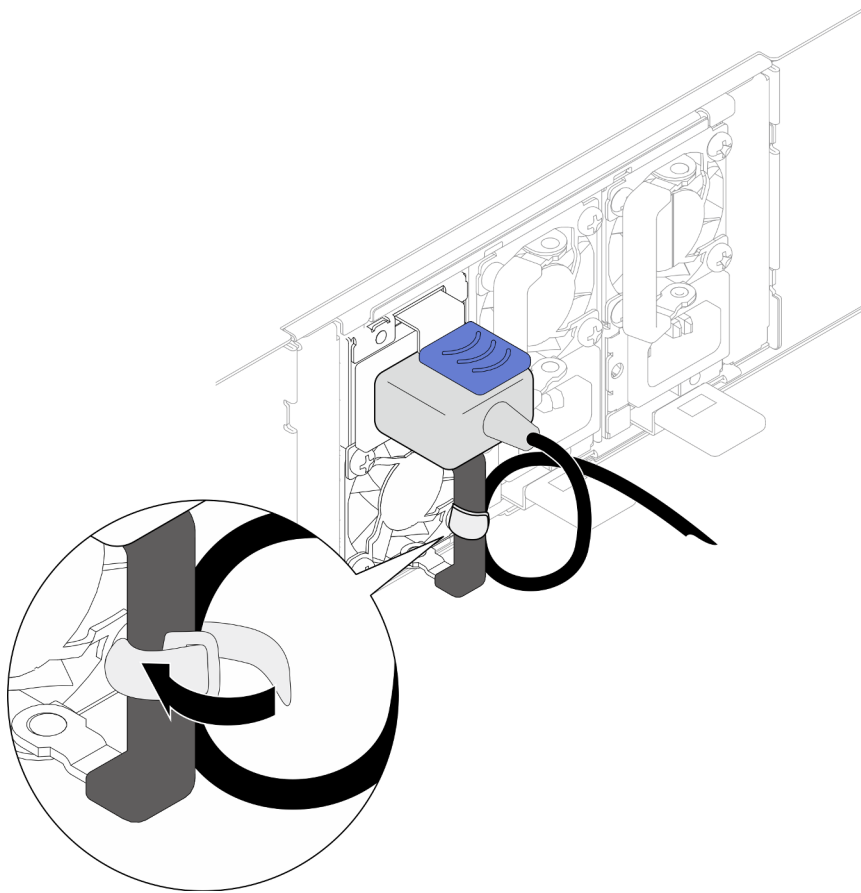


Figure 27. Routing and tying power cord

### **After you finish**

Make sure that the power LED on the power supply is lit, indicating that the power supply is operating correctly.

### **Demo video**

<https://www.youtube.com/watch?v=uPvhuBCt8mw>

## **PSU cage and chassis midplane replacement**

Follow instructions in this section to remove or install the PSU cage and the chassis midplane.

### **Remove the PSU cage**

Follow instructions in this section to remove the PSU cage.

### **About this task**

To avoid potential danger, make sure to read and follow the safety information.

### **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.

#### 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.

#### **CAUTION:**



High touch current. Connect to earth before connecting to supply.

#### **Attention:**

- Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.

## Procedure

Step 1. Make preparations for this task.

- a. Power off all the nodes (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the nodes.
- b. Remove all the nodes from the chassis (see [“Remove a node from the chassis” on page 66](#)).
- c. Remove all power supply units and PSU fillers from the PSU cage (see [“Remove a hot-swap power supply” on page 52](#) and [Removal of a PSU filler](#)).
- d. Remove the chassis from the rack (see [“Remove the chassis from the rack” on page 43](#)); then, lay the chassis on a flat, static-protective surface.

Step 2. Remove the PSU cage from the chassis.

- a. Loosen the thumbscrew located on the top of the chassis.
- b. Hold the vertical partitions between the PSU slots; then, pull the PSU cage out of the chassis.

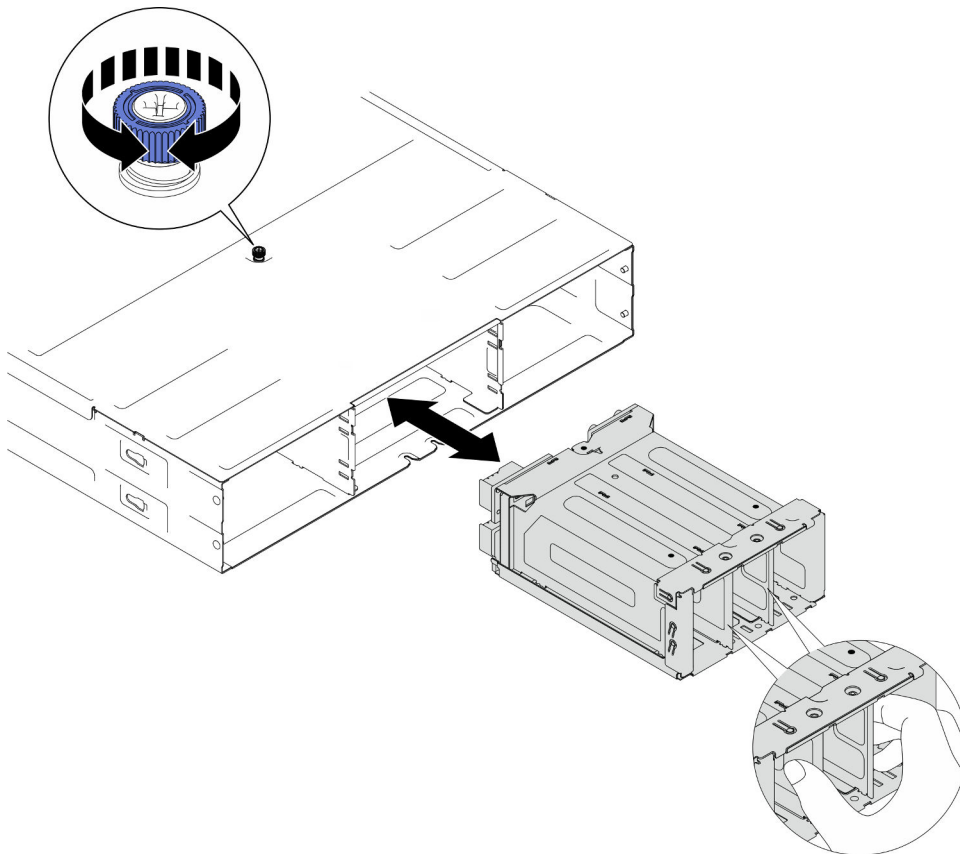


Figure 28. Removal of the PSU cage

Step 3. Carefully lay the PSU cage on a flat, static-protective surface.

## After you finish

1. Install a replacement unit (see [“Install a PSU cage” on page 64](#)).

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

[https://www.youtube.com/watch?v=fpsEcN\\_KA4Q](https://www.youtube.com/watch?v=fpsEcN_KA4Q)

## Remove the chassis midplane

Follow instructions in this section to remove the chassis midplane.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

#### 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 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.
- Power off all the nodes in the chassis; then, disconnect all the power cords from the installed power supply units.

## Procedure

Step 1. Make preparations for this task.

- a. Power off all the nodes (see “[Power off the node](#)” on page 43); then, disconnect all external cables from the nodes.
- b. Remove all the nodes from the chassis (see “[Remove a node from the chassis](#)” on page 66).
- c. Remove all power supply units and PSU fillers from the PSU cage (see “[Remove a hot-swap power supply](#)” on page 52 and [Removal of a PSU filler](#)).
- d. Remove the chassis from the rack (see “[Remove the chassis from the rack](#)” on page 43); then, lay the chassis on a flat, static-protective surface.
- e. Remove the PSU cage from the chassis (see “[Remove the PSU cage](#)” on page 58); then, carefully lay the PSU cage on a flat, static-protective surface, orienting the midplane upward.

Step 2. Loosen the six screws that secure the chassis midplane to the PSU cage.

Step 3. Lift the chassis midplane away from the PSU cage.

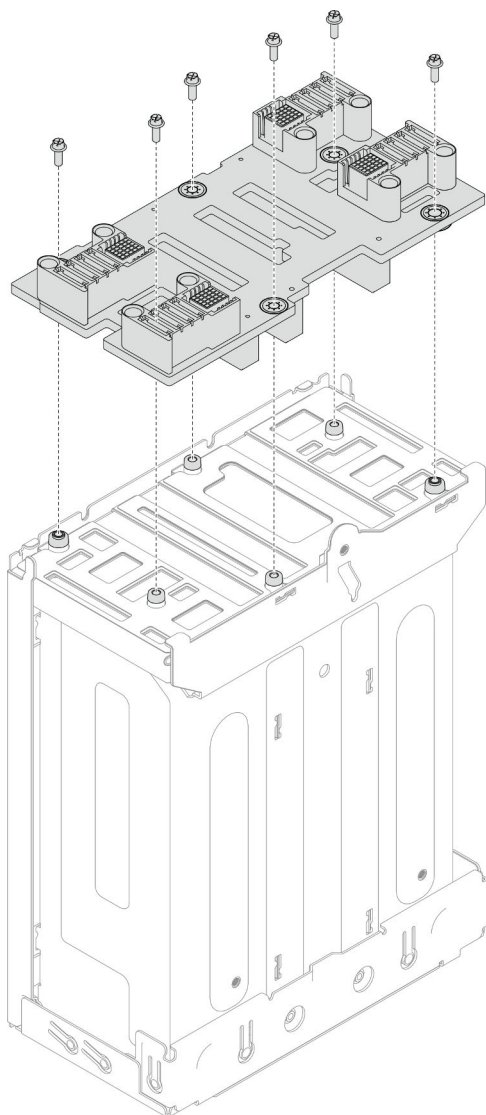


Figure 29. Removal of the chassis midplane

### After you finish

1. Install a replacement unit (see [“Install the chassis midplane” on page 62](#)).
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

<https://www.youtube.com/watch?v=tl88mbxQAqk>

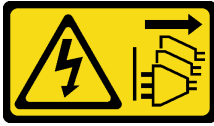
### Install the chassis midplane

Follow instructions in this section to install the chassis midplane.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

## 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 37 and “[Safety inspection checklist](#)” on page 38 to make sure 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.

### Notes:

- The firmware of the chassis midplane can be updated via Lenovo XClarity Controller (XCC) and Lenovo XClarity Essentials OneCLI (LXCE OneCLI). **Only the caretaker node can perform this update.**
- By default, the **caretaker node** is automatically selected by the PSoC firmware on the chassis midplane. To change the chassis caretaker preference, see [https://pubs.lenovo.com/xcc3/NN1ia\\_c\\_d3\\_chassis](https://pubs.lenovo.com/xcc3/NN1ia_c_d3_chassis).
- Go to “[Update the firmware](#)” on page 168 for more information on firmware updating tools.

### Procedure

- Step 1. Align the chassis midplane with the screw holes and edges of the PSU cage; then, place the midplane onto the PSU cage.
- Step 2. Tighten the six screws to secure the chassis midplane to the PSU cage.

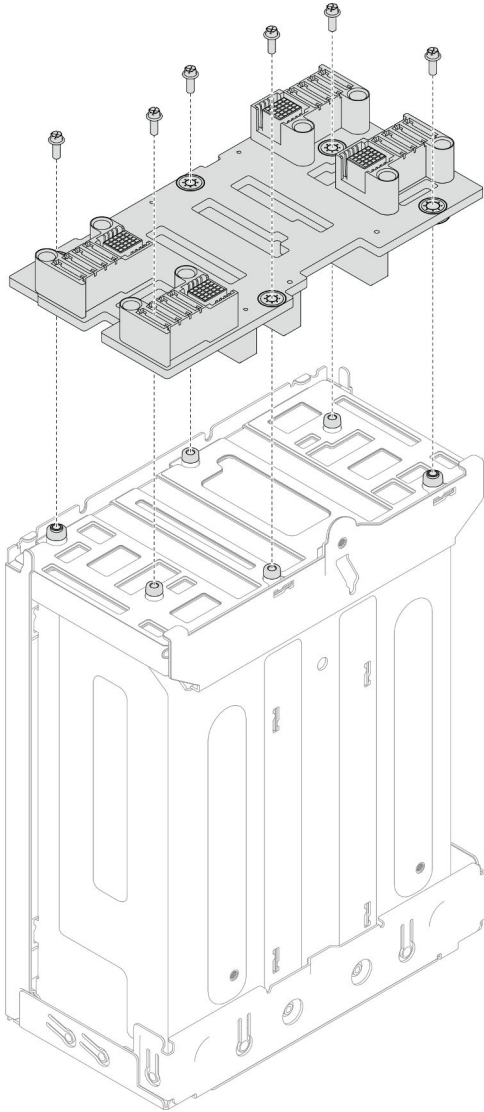


Figure 30. Installation of the chassis midplane

## After you finish

1. Reinstall the PSU cage to the chassis (see “Install a PSU cage” on page 64).
2. Install the chassis to the rack (see “Install the chassis to the rack” on page 46).
3. Reinstall the nodes into the chassis (see “Install a node to the chassis” on page 70).
4. Reinstall each PSU slot with a PSU or PSU filler (see “Install a hot-swap power supply” on page 54 and [Installation of a PSU filler](#)).
5. Proceed to complete the parts replacement (see “Complete the parts replacement” on page 164).

## Demo video

<https://www.youtube.com/watch?v=gElqsboo8os>

## Install a PSU cage

Follow instructions in this section to install a PSU cage.



## About this task

To avoid potential danger, make sure to read and follow the safety information.

### 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.

### 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.

#### **CAUTION:**



**High touch current. Connect to earth before connecting to supply.**

#### **Attention:**

- Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

## Procedure

- Step 1. Insert the PSU cage into the chassis until it stops.
- Step 2. Tighten the thumbscrew located on the top of the chassis.

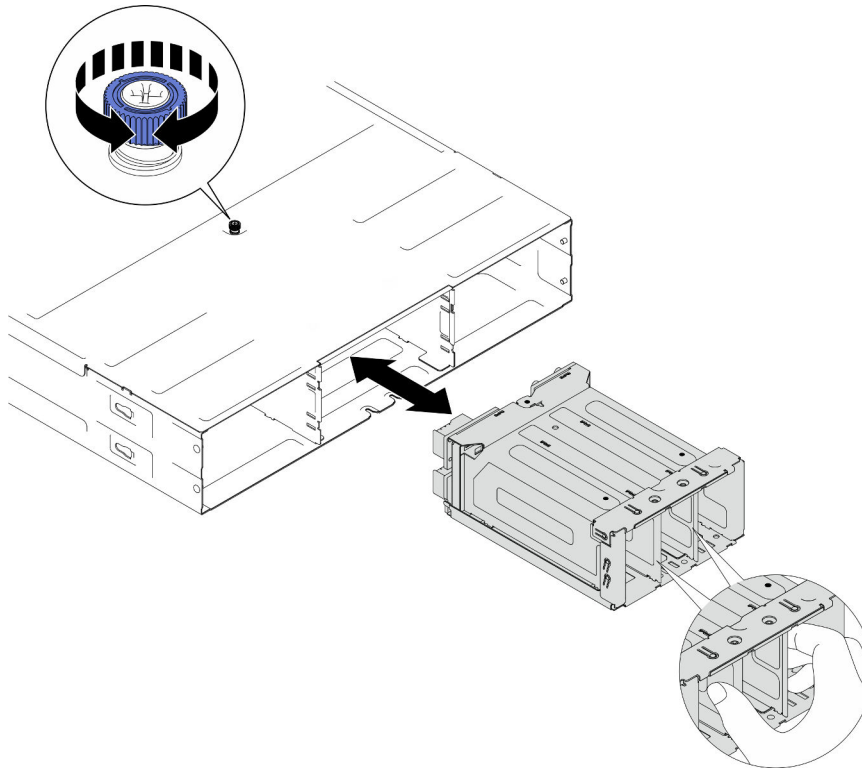


Figure 31. Installation of the PSU cage

### After you finish

1. Install the chassis to the rack (see “[Install the chassis to the rack](#)” on page 46).
2. Reinstall the nodes into the chassis (see “[Install a node to the chassis](#)” on page 70).
3. Reinstall each PSU slot with a PSU or PSU filler (see “[Install a hot-swap power supply](#)” on page 54 and [Installation of a PSU filler](#)).
4. Proceed to complete the parts replacement (see “[Complete the parts replacement](#)” on page 164).

### Demo video

<https://www.youtube.com/watch?v=RXenXuPc-JA>

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## Node component replacement

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

### Node replacement

Follow instructions in this section to remove or install a node from or to the chassis.

#### Remove a node from the chassis

Follow instructions in this section to remove a node from the chassis.

## About this task

To avoid potential danger, make sure to read and follow the safety information.

### 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 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.
- When removing the node, note the node tray number and make sure to install the node in the same tray from which it was removed. Reinstalling the node into a different tray requires the node to be reconfigured.
- Be careful when removing or installing the node to avoid damaging the node connectors.
- For proper cooling, each node tray must be installed with either a node or node tray fillers before the nodes in the chassis are powered on.

**Note:** Depending on the specific configuration, the hardware might look slightly different from the illustrations in this section.

## Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.

Step 2. Remove the node from the chassis.

- a. ① Pivot and release the front handle of the node.
- b. ② Carefully slide the node out of the chassis until you see the warning icon on the side label of the node. Then, hold the node with both hands as illustrated and carefully pull it out of the chassis.

**Attention:** For safety, make sure to hold the node with both hands when lifting the node.

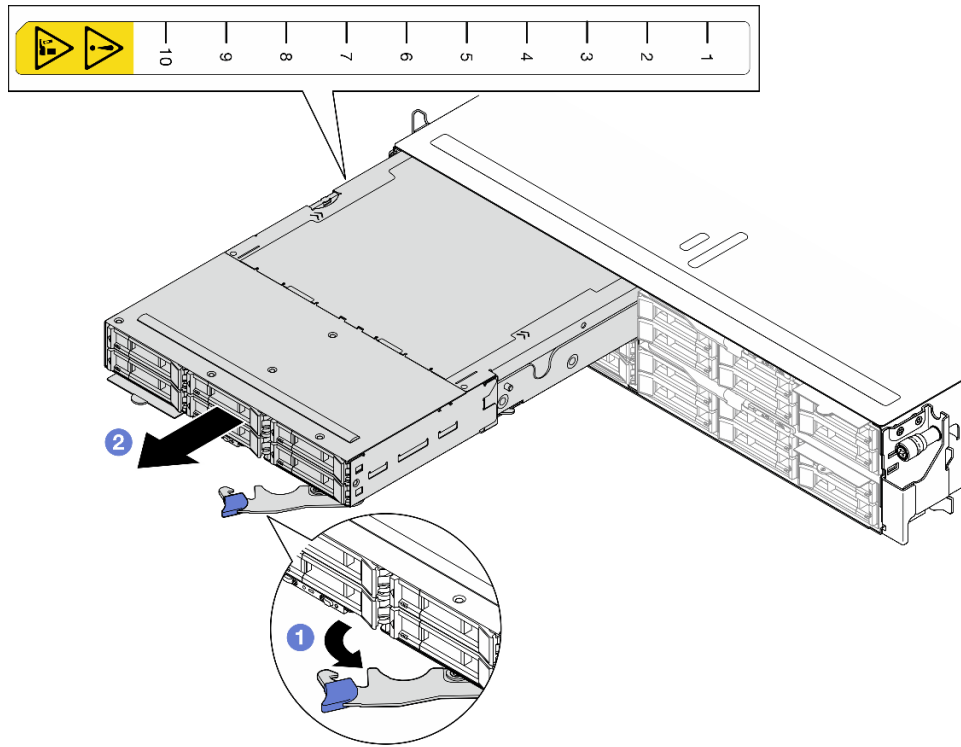


Figure 32. Node removal from a left tray

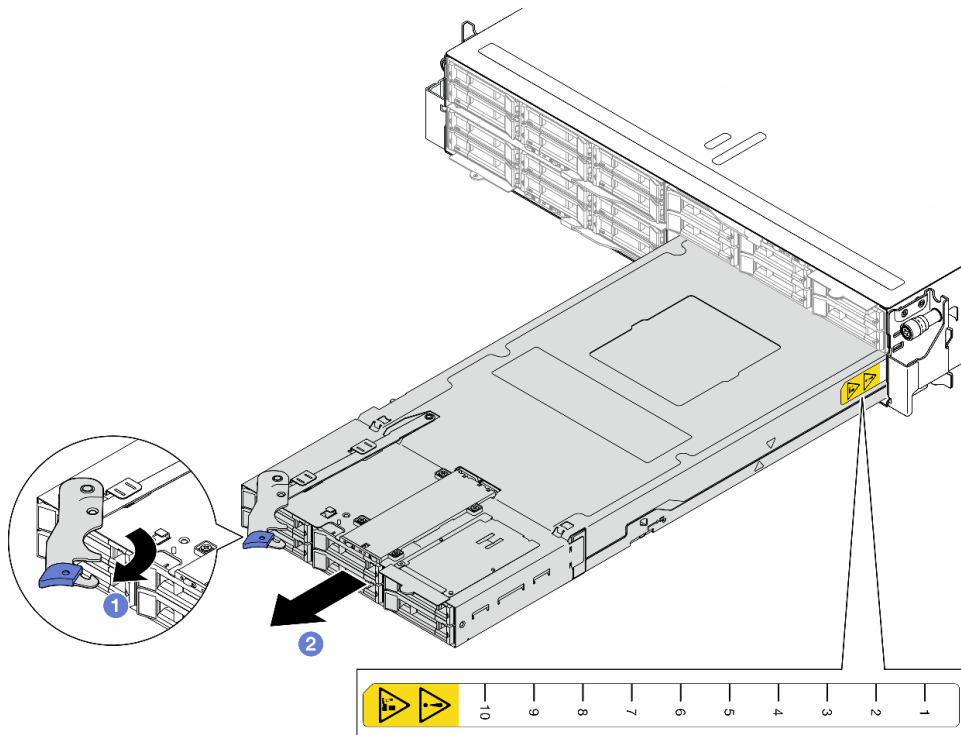


Figure 33. Node removal from a right tray

## After you finish

1. Install either a replacement node (see [“Install a node to the chassis” on page 70](#)) or front and rear node tray fillers into the node tray within one minute.

**Important:** For proper cooling, each node tray must be installed with either a node or node tray fillers before the nodes in the chassis are powered on.

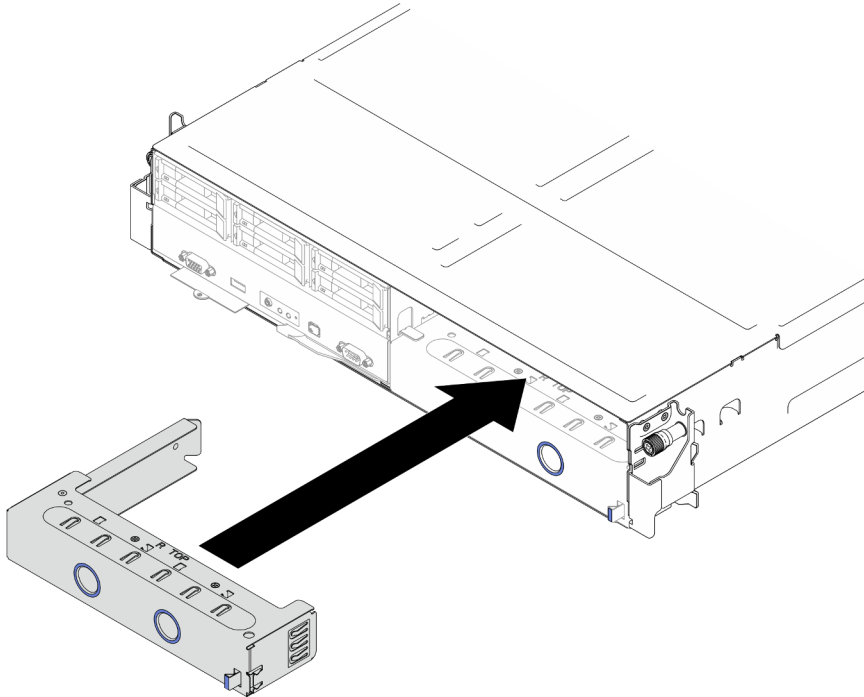


Figure 34. Installation of a front node tray filler

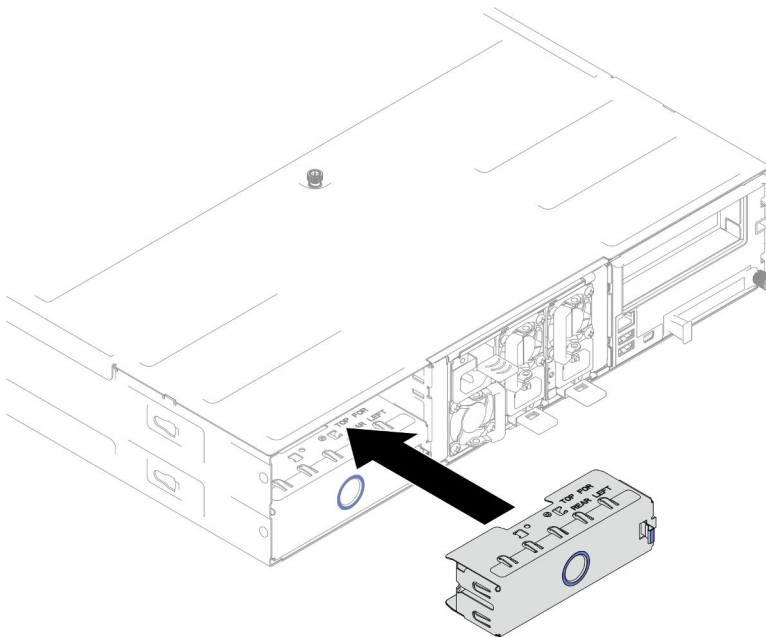


Figure 35. Installation of a rear node tray filler

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

<https://www.youtube.com/watch?v=BRbHhIF1Jo>

## Install a node to the chassis

Follow instructions in this section to install a node into the chassis.

## About this task

To avoid potential danger, make sure to read and follow the safety information.

### 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 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.
- Be careful when removing or installing the node to avoid damaging the node connectors.
- When removing the node, note the node tray number and make sure to install the node in the same tray from which it was removed. Reinstalling the node into a different tray requires the node to be reconfigured.
- The time required for a node to initialize varies by system configurations. The power LED flashes rapidly; the power button on the node will not respond until the power LED flashes slowly, indicating that the initialization process is complete.
- For proper cooling, each node tray must be installed with either a node or node tray fillers before the nodes in the chassis are powered on.

**Note:** Depending on the specific configuration, the hardware might look slightly different from the illustrations in this section.

## Procedure

Step 1. If node tray fillers are installed, remove them from the chassis.

1. ① Press and hold on the latch of the filler.
2. ② Pull the filler out of the node tray.

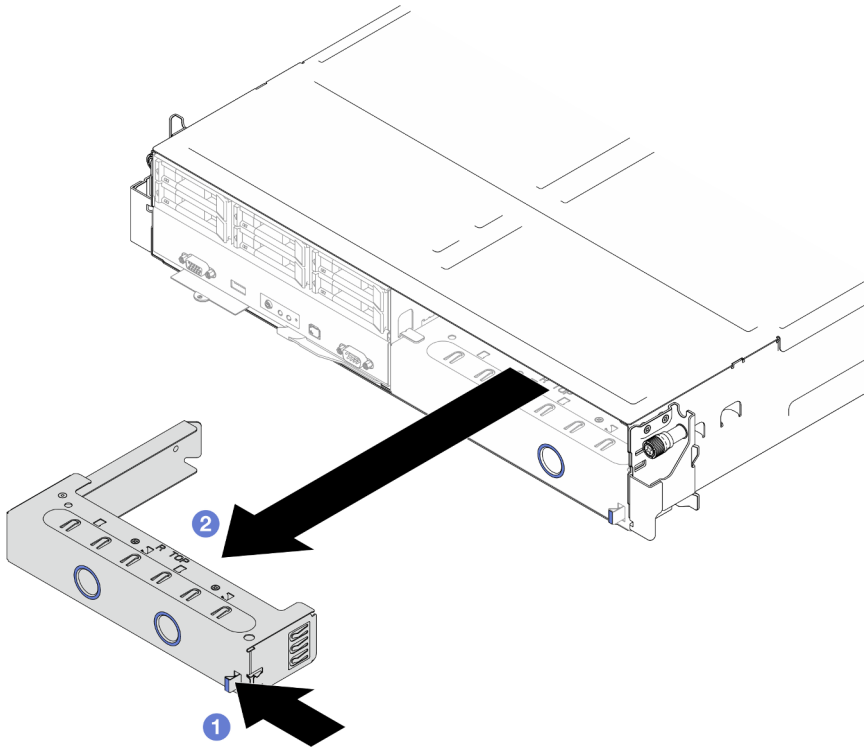


Figure 36. Removal of a front node tray filler

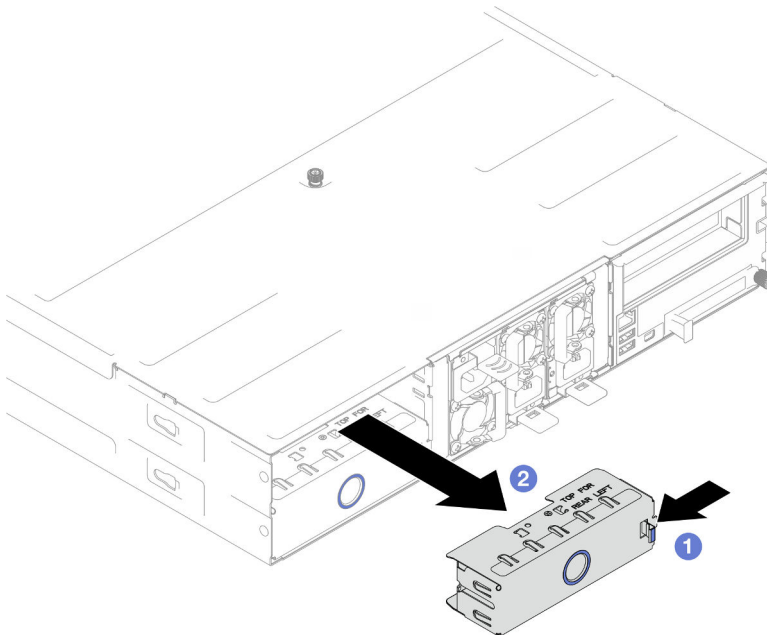


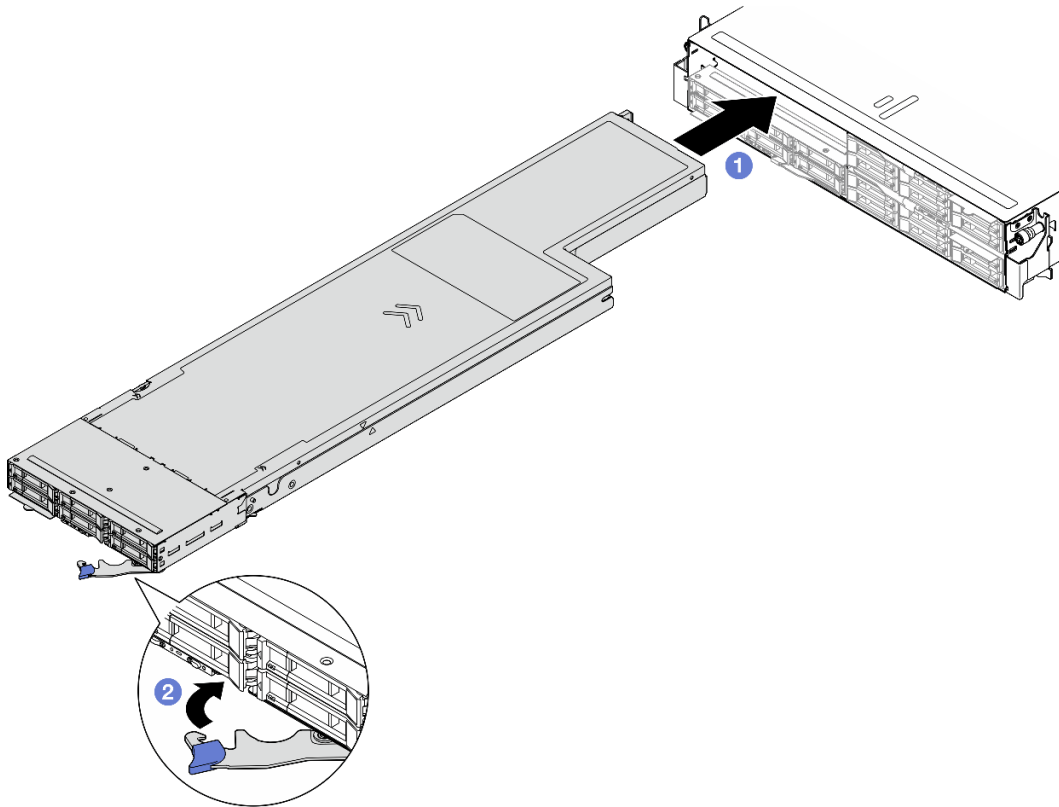
Figure 37. Removal of a rear node tray filler

Step 2. Install the node into the chassis.

- a. 1 Make sure that the front handle on the node is in the fully open position; then, slide the node into the node tray until it stops.
- b. 2 Pivot the front handle to the fully closed position until the handle latch clicks.

**Attention:**

- For safety, make sure to hold the node with both hands when lifting the node.
- To avoid damage to the chassis midplane,
  - In the left tray (seen from the front), the node must be installed right-side up.
  - In the right tray (seen from the front), the node must be installed upside down.



*Figure 38. Node installation to a left tray*



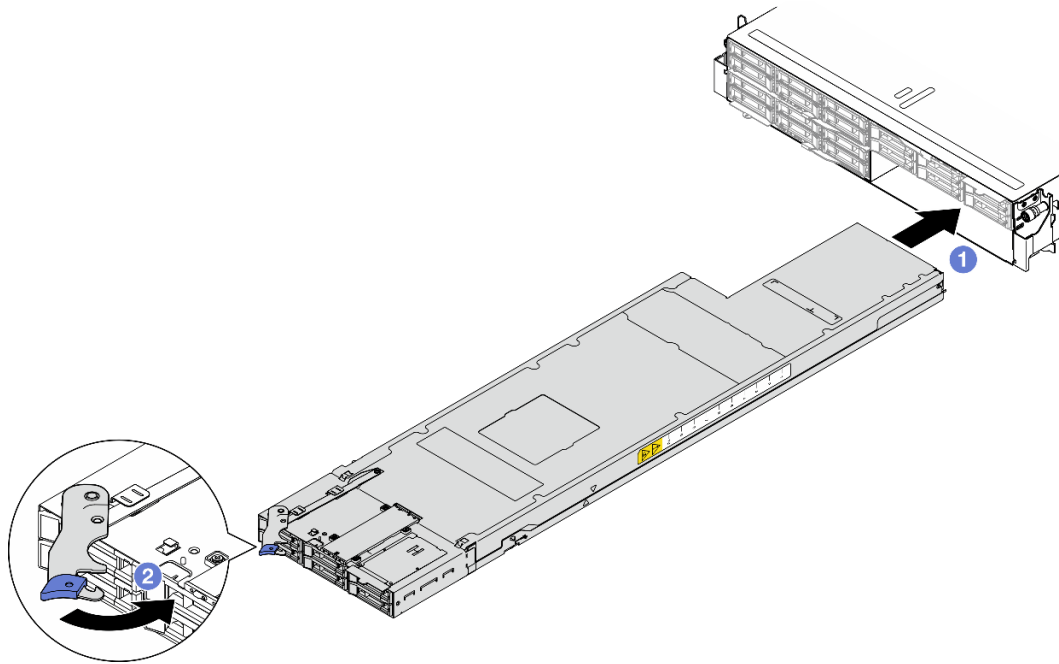


Figure 39. Node installation to a right tray

Step 3. If there is another node or node tray fillers to install, install them now.

**Important:** For proper cooling, each node tray must be installed with either a node or node tray fillers before the nodes in the chassis are powered on.

### After you finish

1. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see [“Install a hot-swap power supply” on page 54](#) and [“Power on the node” on page 42](#)).
2. Check the power LED to make sure it transitions between fast blink and slow blink to indicate the node is ready to be powered on; then, power on the node.
3. Make sure that the power LED is lit continuously, indicating that the node is receiving power and is turned on.
4. If this is the initial installation of the node into the chassis, you must configure the node through the Lenovo XClarity Provisioning Manager and install the node operating system (see <https://pubs.lenovo.com/lxpm-overview/>).
5. If the node access over local console is not available, refer to the following sections in the XCC documentation compatible with your node at <https://pubs.lenovo.com/lxcc-overview/>.
  - a. Access Lenovo XClarity Controller web interface (see “Accessing the XClarity Controller web interface” section).
  - b. Set up Lenovo XClarity Controller network connection through Lenovo XClarity Provisioning Manager (see “Setting up the XClarity Controller network connection through the XClarity Provisioning Manager” section).
  - c. Log in to Lenovo XClarity Controller (see “Logging in to the XClarity Controller” section).
6. If you have changed the configuration of the node, or if you are installing a different node from the one that you removed, make sure to configure the node through the Setup utility, and you might have to install the node operating system. For more details, see [Chapter 6 “System configuration” on page 167](#).

7. You can place the identifying information on the pull-out label tab that are accessible on the front of the node (see [“Identify the system and access the Lenovo XClarity Controller” on page 31](#)).

## Demo video

<https://www.youtube.com/watch?v=BfdiutmetaA>

## CMOS battery (CR2032) replacement

Follow instructions in this section to remove or install the CMOS battery (CR2032).

### Remove the CMOS battery (CR2032)

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

### About this task

To avoid potential danger, make sure to read and follow the safety information.

#### 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.**

#### **Attention:**

- Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.
- Make sure to read the following notes carefully before replacing the CMOS battery in the node.

- Do not make CMOS battery in contact with any metal surface during the replacement. Any contact with a metal surface, such as the node and chassis side, can cause damages to the battery.
- When replacing the battery, you must replace it with another CMOS battery of the exact same type (CR2032) made by the same manufacturer.
- After replacing the battery, make sure to reconfigure the node and reset the system date and time.
- Dispose of the battery as required by local ordinances or regulations.

## Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.
- b. Remove the node from the chassis (see [“Remove a node from the chassis” on page 66](#)); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- c. Remove the top cover (see [“Remove the top cover” on page 162](#)).
- d. Locate the CMOS battery socket on the system board.

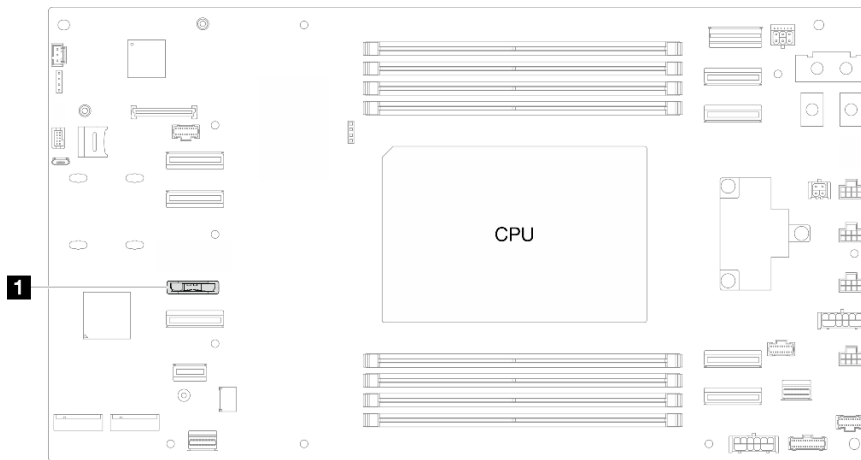


Figure 40. Location of the CMOS battery socket

Step 2. Remove the CMOS battery from the node.

- a. ① Gently push the battery socket clip backward to release the CMOS battery.
- b. ② Carefully take the battery out of the socket.

**Attention:** Avoid using excessive force on the CMOS battery, as it might damage the socket on the system board and result in system board replacement.

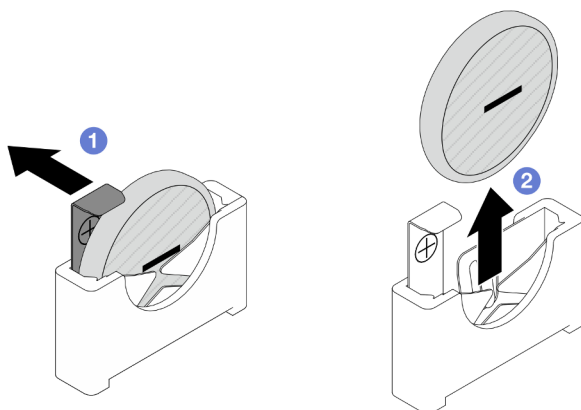


Figure 41. Removal of the CMOS battery

### After you finish

1. Install a replacement unit (see “Install a CMOS battery (CR2032)” on page 76).
2. Dispose of the CMOS battery as required by local ordinances or regulations.

### Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

### Install a CMOS battery (CR2032)

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

### About this task

To avoid potential danger, make sure to read and follow the safety information.

#### 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.

**Attention:**

- Read “Installation Guidelines” on page 37 and “Safety inspection checklist” on page 38 to make sure that you work safely.
- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of the package and place it on a static-protective surface.
- Make sure to read the following notes carefully before replacing the CMOS battery in the node.
  - Do not make CMOS battery in contact with any metal surface during the replacement. Any contact with a metal surface, such as the node and chassis side, can cause damages to the battery.
  - When replacing the battery, you must replace it with another CMOS battery of the exact same type (CR2032) made by the same manufacturer.
  - After replacing the battery, make sure to reconfigure the node and reset the system date and time.
  - Dispose of the battery as required by local ordinances or regulations.

**Procedure**

Step 1. Locate the CMOS battery socket on the system board.

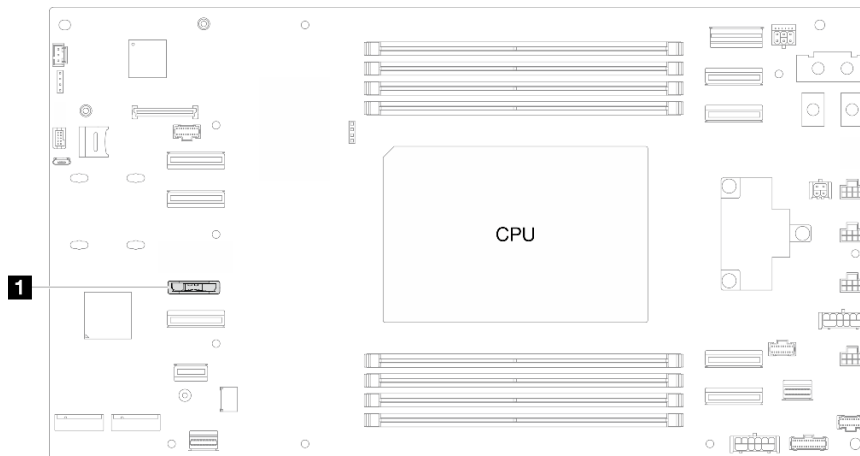


Figure 42. Location of the CMOS battery socket

Step 2. Follow any special handling and installation instructions that come with the CMOS battery.

Step 3. Install the new CMOS battery into the node.

- a. ① Slightly pivot open the socket clip of the CMOS battery socket.
- b. ② Insert the battery into the socket, orienting the battery so that the positive (+) side faces toward the positive side of the socket.
- c. ③ Make sure that the battery clip holds the battery securely.

**Attention:** Avoid using excessive force on the CMOS battery, as it might damage the socket on the system board and result in system board replacement.

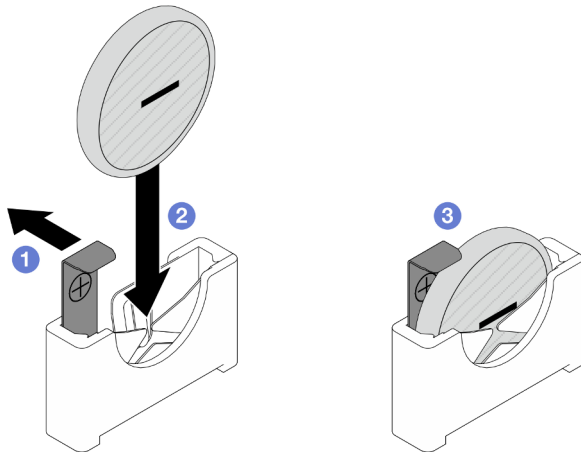


Figure 43. Installation of a CMOS battery

## After you finish

1. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see “Install the top cover” on page 163).
2. Reinstall the node into the chassis (see “Install a node to the chassis” on page 70).
3. Reinstall all drives and drive fillers (if any) to the node (see “Install a hot-swap drive” on page 93).
4. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see “Install a hot-swap power supply” on page 54 and “Power on the node” on page 42).
5. Proceed to complete the parts replacement (see “Complete the parts replacement” on page 164).

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Drive backplane replacement

Follow instructions in this section to remove or install the drive backplane.

**Note:** Depending on the specific configuration, the node might not come with this component.

### Remove the drive backplane

Follow instructions in this section to remove the drive backplane.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read “Installation Guidelines” on page 37 and “Safety inspection checklist” on page 38 to make sure that you work safely.

### Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see “Power off the node” on page 43); then, disconnect all external cables from the node.
- b. Remove the node from the chassis (see “Remove a node from the chassis” on page 66); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- c. Remove all the installed drives and drive fillers (if any) from the node; then, place the drives and fillers on a flat, static-protective surface (see “Remove a hot-swap drive” on page 91).
- d. Remove the top cover (see “Remove the top cover” on page 162).
- e. Disconnect all the cables from the drive backplane.

Step 2. Remove the drive backplane from the drive cage.

- a. ① Rotate both plungers counterclockwise to the unlocked position.
- b. ② Hold on both plungers and pull the drive backplane upward then slightly away from the drive cage to disengage the backplane; then, continue to pull up and remove the backplane.

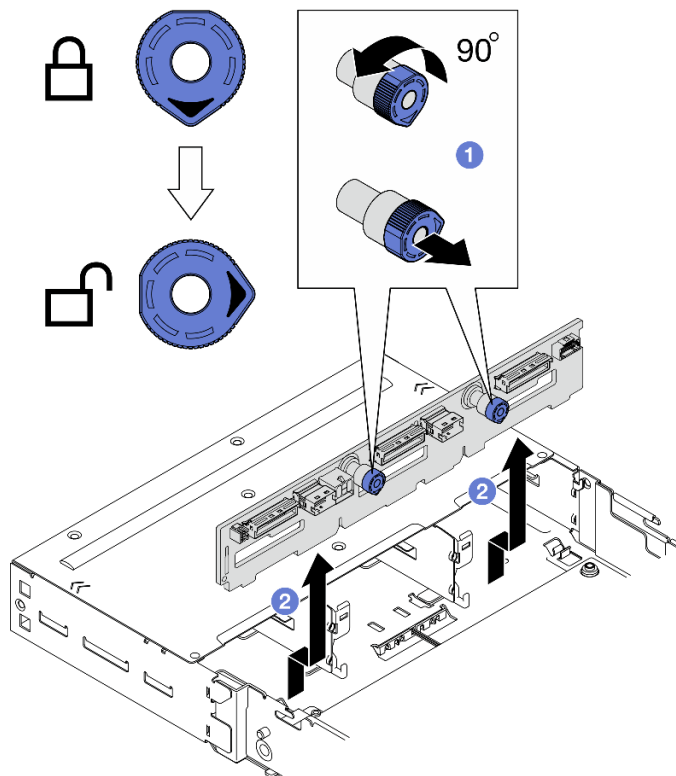


Figure 44. Removal of the drive backplane

### After you finish

1. Install a replacement unit (see “Install the drive backplane” on page 80).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Install the drive backplane

Follow instructions in this section to install the drive backplane.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

#### Attention:

- Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.
- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of the package and place it on a static-protective surface.

### Procedure

Step 1. Install the drive backplane.

- 1 Align the drive backplane with the corresponding guide pins on the drive cage; then, lower and insert the drive backplane into place.
- 2 Push and hold both plungers to secure the drive backplane.
- 3 Rotate the plungers clockwise to the locked position.

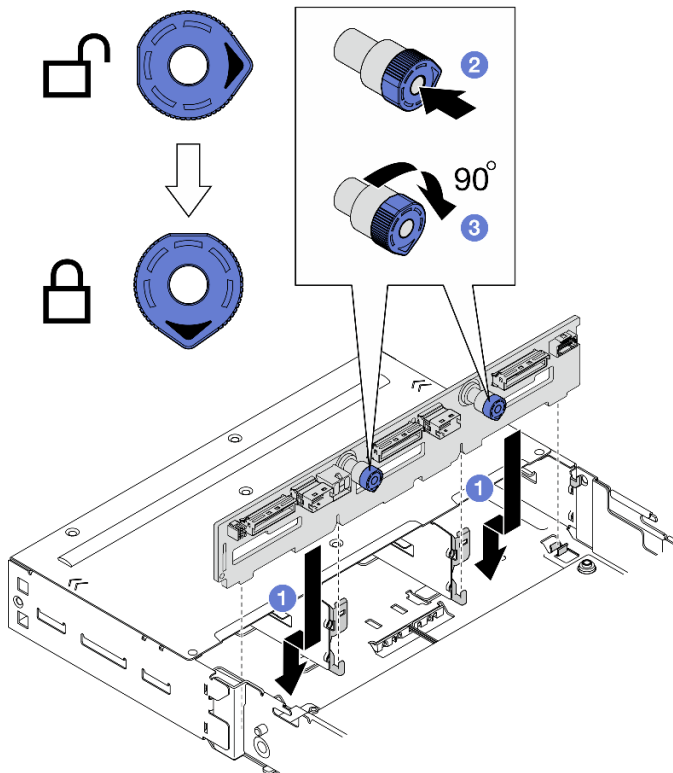


Figure 45. Installation of the drive backplane

### After you finish

1. Reconnect all the cables to the drive backplane (see [Internal Cable Routing Guide](#)).



2. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see [“Install the top cover” on page 163](#)).
3. Reinstall the node into the chassis (see [“Install a node to the chassis” on page 70](#)).
4. Reinstall all drives and drive fillers (if any) to the node (see [“Install a hot-swap drive” on page 93](#)).
5. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see [“Install a hot-swap power supply” on page 54](#) and [“Power on the node” on page 42](#)).
6. Proceed to complete the parts replacement (see [“Complete the parts replacement” on page 164](#)).

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Fan replacement

Follow instructions in this section to remove or install the fans.

### Remove a fan

Follow instructions in this section to remove a fan.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.

### Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.
- b. Remove the node from the chassis (see [“Remove a node from the chassis” on page 66](#)); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- c. Remove the top cover (see [“Remove the top cover” on page 162](#)).

Step 2. Identify the fan to be removed; then, remove the fan from the fan cage.

- a. ① Press and hold the fan cable latch.
- b. ② Disconnect the fan cable from the system board.
- c. ③ Pull out the four rivets that secure the fan to the fan cage on the top side.
- d. ④ Lift the fan out of the fan cage.

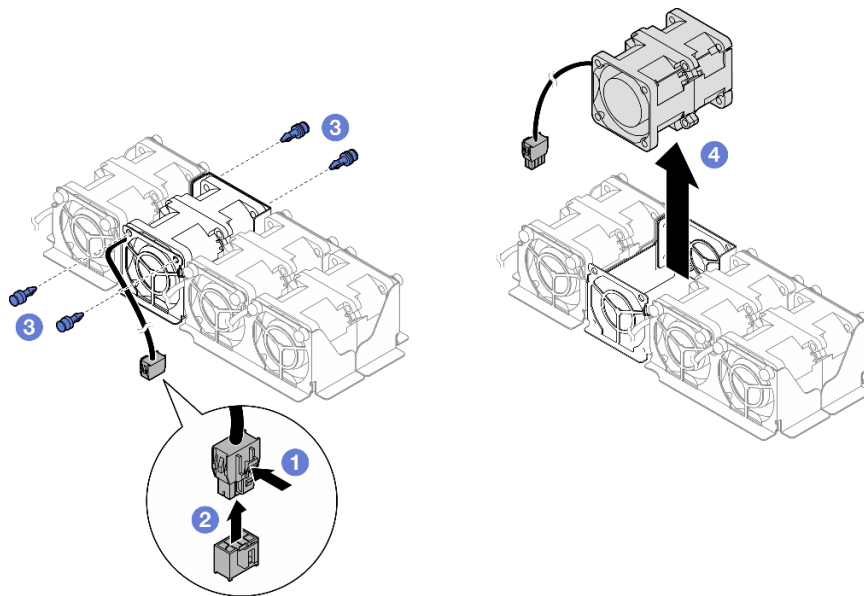


Figure 46. Fan removal

## After you finish

1. Install a replacement unit (see “[Install a fan](#)” on page 82).

**Important:** To maintain proper cooling, all the fans must be installed during operation.

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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Install a fan

Follow instructions in this section to install a fan.

## About this task

To avoid potential danger, make sure to read and follow the safety information.

### Attention:

- Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.
- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of the package and place it on a static-protective surface.

## Procedure

Step 1. Install the fan.

- a. 1 Align the fan with the fan slot in the fan cage, orienting the fan with the label side on top and following the airflow arrows on the fan bottom as illustrated; then, lower and press the fan into the fan slot until it is securely seated.

- b. **2** Insert the four rivets on the top side from the exterior of the fan cage to secure the fan to the fan cage.
- c. **3** Connect the fan cable to the system board.

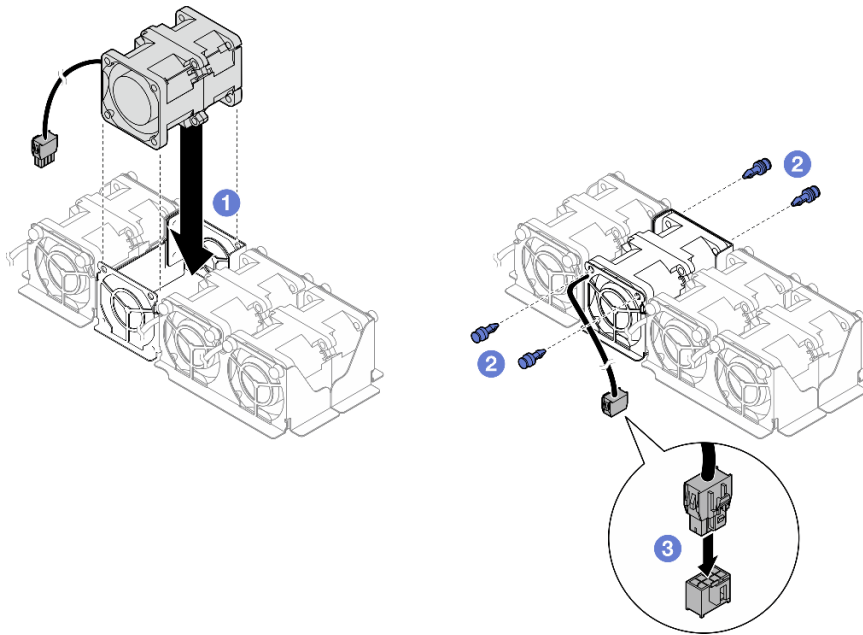


Figure 47. Fan installation

Step 2. Route the fan cables as shown.

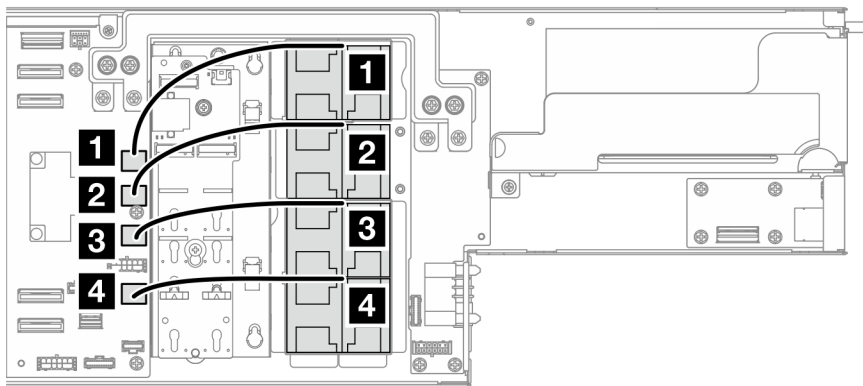


Figure 48. Fan cable routing

From (fan)	To (System board)
<b>1</b> Fan 1 cable	Fan 1 connector
<b>2</b> Fan 2 cable	Fan 2 connector
<b>3</b> Fan 3 cable	Fan 3 connector
<b>4</b> Fan 4 cable	Fan 4 connector

**After you finish**

1. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see [“Install the top cover” on page 163](#)).
2. Reinstall the node into the chassis (see [“Install a node to the chassis” on page 70](#)).
3. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see [“Install a hot-swap power supply” on page 54](#) and [“Power on the node” on page 42](#)).
4. Proceed to complete the parts replacement (see [“Complete the parts replacement” on page 164](#)).

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Flash power module replacement

Follow instructions in this section to remove or install a flash power module.

The flash power module protects the cache memory on the installed RAID adapters. Flash power modules can be purchased from Lenovo.

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

**Note:** Depending on the specific configuration, the node might not come with this component.

### Remove the flash power module

Follow instructions in this section to remove the flash power module.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.

### Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.
- b. Remove the node from the chassis (see [“Remove a node from the chassis” on page 66](#)); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- c. Remove the top cover (see [“Remove the top cover” on page 162](#)).

Step 2. Disconnect the flash power module cable from the RAID adapter.

Step 3. Remove the flash power module from the holder.

- a. ❶ Gently press open the retaining clip.
- b. ❷ Pivot the flash power module to disengage and remove it from the holder.

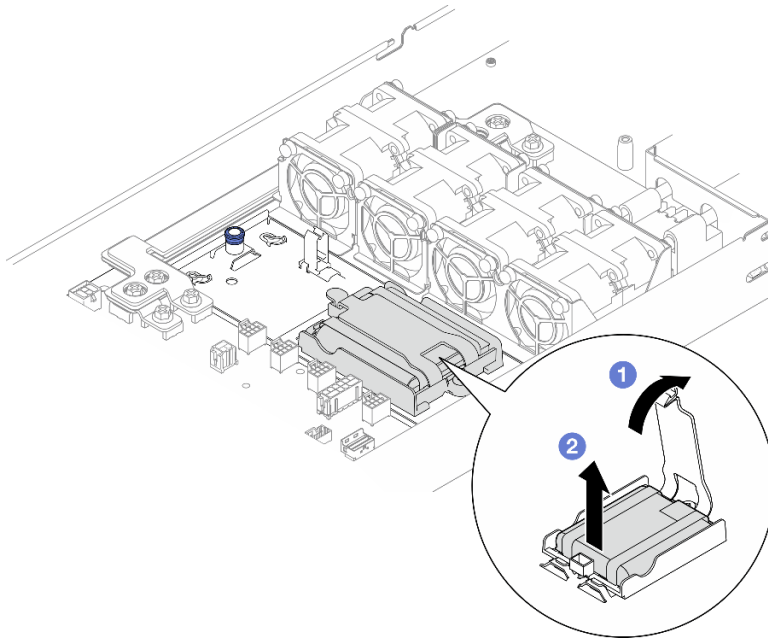


Figure 49. Removal of the flash power module

Step 4. If necessary, remove the flash power module holder.

- a. ① Lift and hold the release pin to disengage the flash power module holder from the node.
- b. ② Slightly slide the flash power module holder toward the pin; then, carefully pull it out of the node.

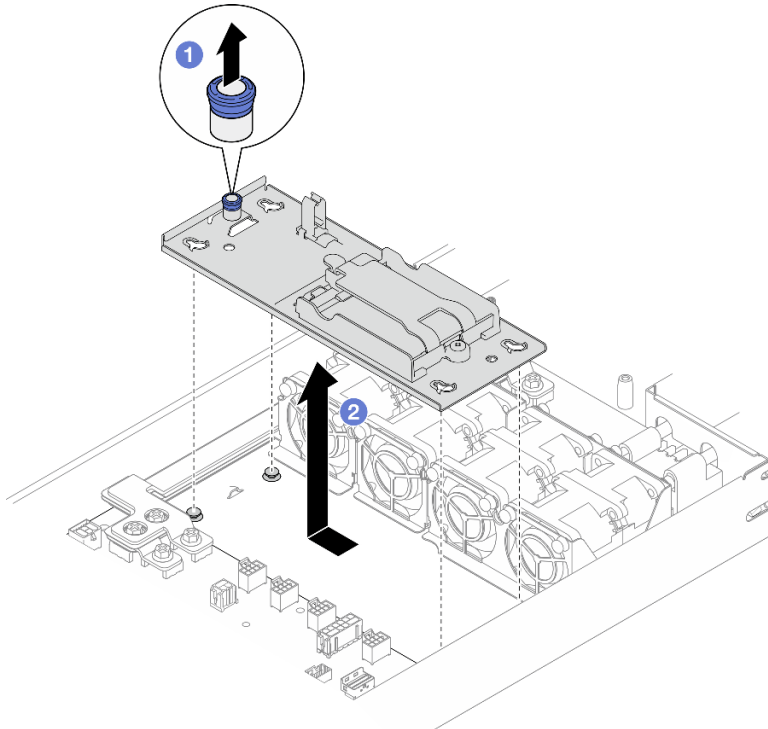


Figure 50. Removal of the flash power module holder

## After you finish

1. Install a replacement unit (see “[Install a flash power module](#)” on page 86).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Install a flash power module

Follow instructions in this section to install a flash power module.

## About this task

To avoid potential danger, make sure to read and follow the safety information.

### Attention:

- Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.
- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of the package and place it on a static-protective surface.

## Procedure

- Step 1. Install the flash power module holder.
- a. Align the notches of the flash power module holder with the guide pins on the node.
  - b. Lower the flash power module holder and slide it as illustrated until the holder is securely seated in the node.

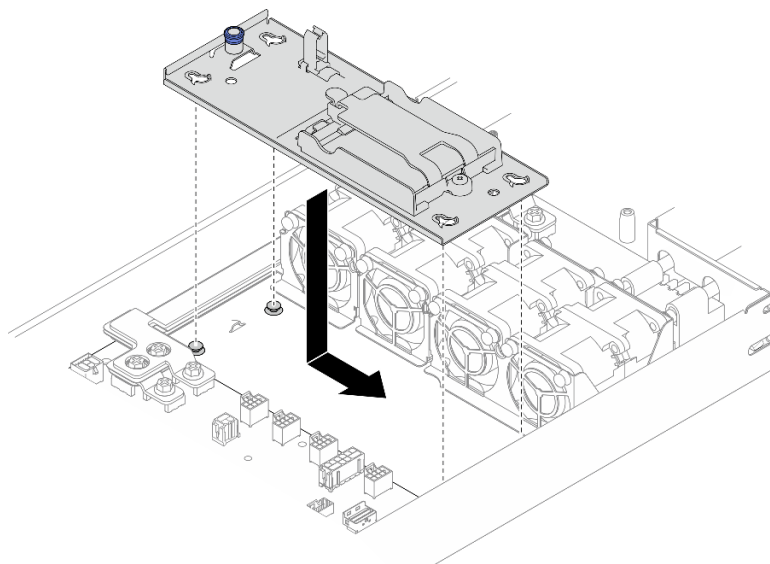


Figure 51. Installation of the flash power module holder

- Step 2. Install the flash power module to the holder.

- a. ① Note the orientation of the flash power module; then, gently insert one side of the flash power module into the retaining clip. Press down the flash power module on the other side until it snaps into place.
- b. ② Close the retaining latch.

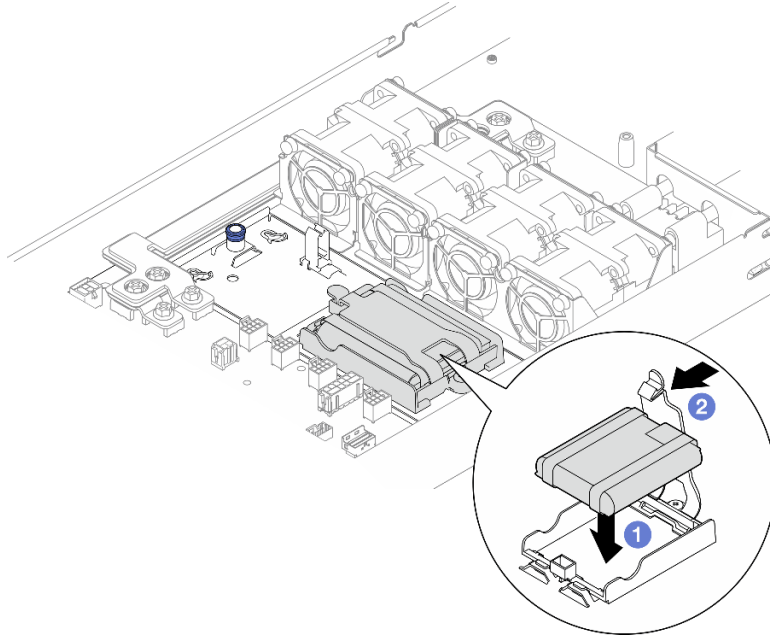


Figure 52. Installation of the flash power module

- Step 3. Route and connect the flash power module cable and its extension cable that comes with the flash power module kit to the RAID adapter.

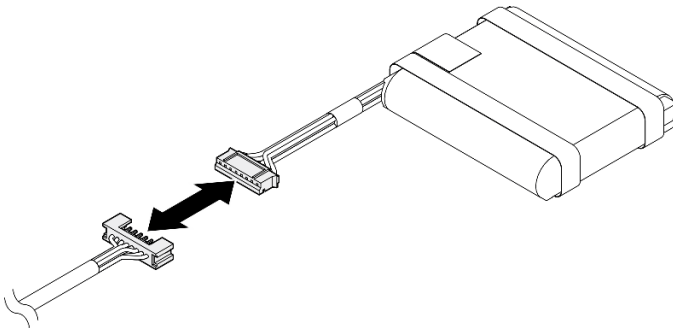


Figure 53. Flash power module extension cable

### After you finish

1. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see [“Install the top cover” on page 163](#)).
2. Reinstall the node into the chassis (see [“Install a node to the chassis” on page 70](#)).
3. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see [“Install a hot-swap power supply” on page 54](#) and [“Power on the node” on page 42](#)).
4. Proceed to complete the parts replacement (see [“Complete the parts replacement” on page 164](#)).

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Front I/O board replacement

Follow instructions in this section to remove or install the front I/O board.

### Remove the front I/O board

Follow instructions in this section to remove the front I/O board.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.

### Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.
- b. Remove the node from the chassis (see [“Remove a node from the chassis” on page 66](#)); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- c. Remove the top cover (see [“Remove the top cover” on page 162](#)).
- d. Disconnect all the cables from the front I/O board.

Step 2. Remove the front I/O board from the drive cage.

- a. ❶ Rotate both plungers counterclockwise to the unlocked position to disengage the front I/O board from the drive cage.
- b. ❷ Pull up the front I/O board and push it lightly toward the rear of the node; then, continue to pull the board out of the drive cage.



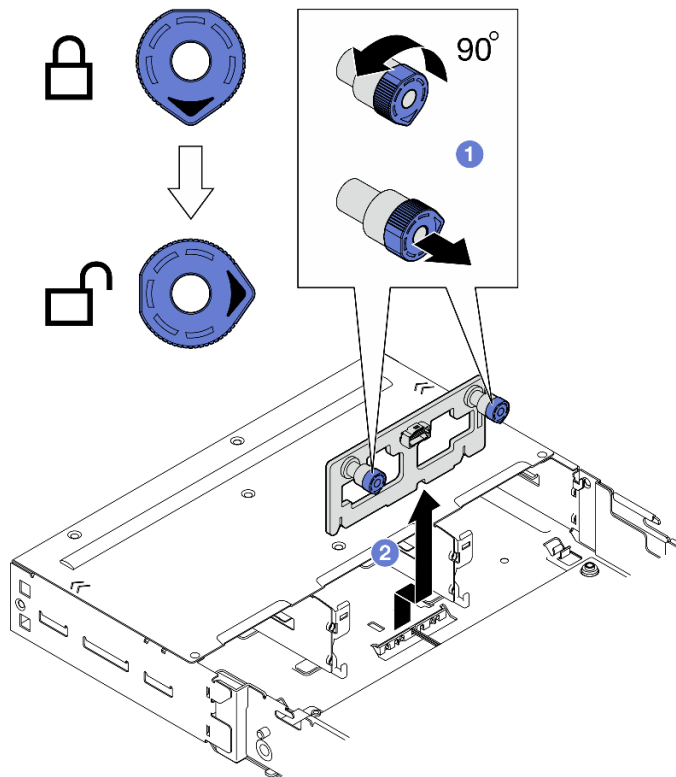


Figure 54. Removal of the front I/O board

### After you finish

1. Install a replacement unit (see “Install the front I/O board” on page 89).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

### Install the front I/O board

Follow instructions in this section to install the front I/O board.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

#### Attention:

- Read “Installation Guidelines” on page 37 and “Safety inspection checklist” on page 38 to make sure that you work safely.
- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of 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/thinksystem/sd520v4/7dfy/downloads/driver-list> to see the latest firmware and driver updates for your server.
- Go to “Update the firmware” on page 168 for more information on firmware updating tools.

## Procedure

- Step 1. ① Align the front I/O board with the corresponding guide pins on the drive cage; then, lower and insert the board into place.
- Step 2. ② Push and hold both plungers to secure the front I/O board.
- Step 3. ③ Rotate the plungers clockwise to the locked position.

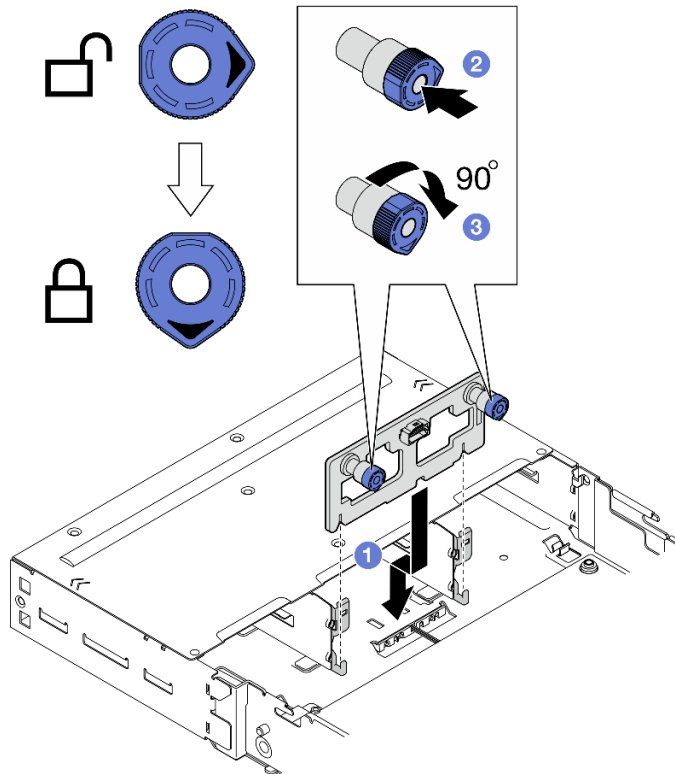


Figure 55. Installation of the front I/O board

## After you finish

1. Reconnect all the required cables to the front I/O board (see [Internal Cable Routing Guide](#)).
2. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see “Install the top cover” on page 163).
3. Reinstall the node into the chassis (see “Install a node to the chassis” on page 70).
4. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see “Install a hot-swap power supply” on page 54 and “Power on the node” on page 42).
5. Proceed to complete the parts replacement (see “Complete the parts replacement” on page 164).

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Hot-swap drive replacement

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

### Remove a hot-swap drive

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

### About this task

#### Attention:

- Make sure to save the data on the drive, especially if it is part of a RAID array, before removing it from the node.
- To avoid damage to the drive connectors, make sure that the node top cover is installed and fully closed whenever installing or removing a drive.
- To make sure that there is adequate system cooling, do not operate the node for more than two minutes without either a drive or a filler installed in each drive 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 removing or making changes to the drives, drive controllers (including controllers that are integrated on the system board), drive backplanes, or drive cables, make sure to back up all important data that is stored on the drives.
- Before removing any component of a RAID array (drive, RAID card, etc.), back up all RAID configuration information.
- Make sure to have the drive bay fillers readily available if some drive bays will be left empty after the removal.

### Remove a 2.5-inch hot-swap drive

#### Procedure

Step 1. Make preparations for this task.

- a. Identify the hot-swap drive to be removed.
- b. Make sure to save the data on the drive before removing it from the node.

Step 2. Remove the hot-swap drive.

- a. ① Slide the latch to unlock the drive handle.
- b. ② Open and hold the handle.
- c. ③ Pull the drive out of the drive bay.

#### Notes:

- Depending on the specific configuration, the hot-swap drive to be removed may be a 7 mm or 15 mm 2.5-inch solid-state drive. The removal procedures are the same.
- In the right bay (seen from the front), the node must be installed upside down. From this node, the drive to be removed is also upside down, but the removal procedures are the same.

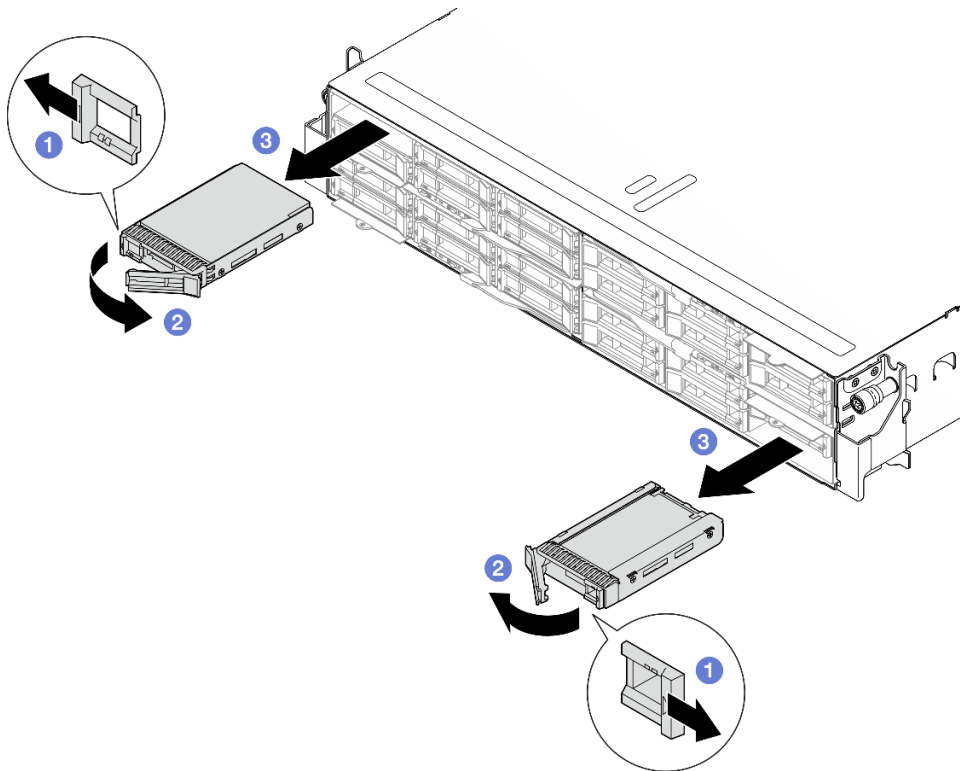


Figure 56. Removal of a solid-state drive

## After you finish

1. Install a replacement unit or filler (See [“Install a hot-swap drive” on page 93.](#))

**Important:** During normal operation, the drive bay must contain either a drive or a drive filler for proper cooling.

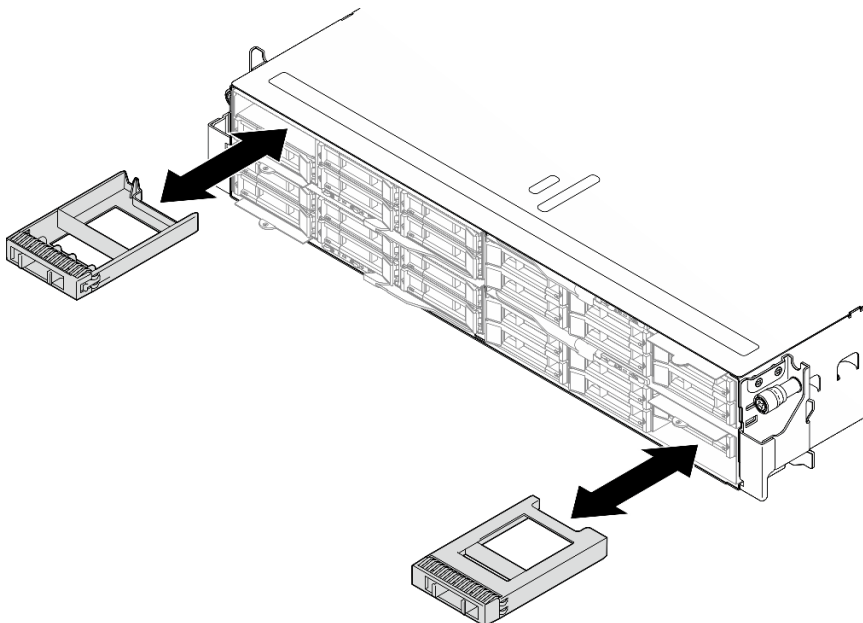


Figure 57. Replacement of a drive filler

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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Install a hot-swap drive

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

## About this task

### Attention:

- To avoid damage to the drive connectors, make sure that the node top cover is installed and fully closed whenever installing or removing a drive.
- To make sure that there is adequate system cooling, do not operate the node for more than two minutes without either a drive or a filler installed in each drive bay.
- The drive bays are numbered in installation ordering (starting from number “0”). Follow this sequential order of the drive bays when installing a drive. To locate the drive bays of the node, see the pull-out information tab on the front of the node or [“Node front view” on page 17](#).
- The following notes describe the type of drives that the node supports and other information that must be considered for drive installation.
  - Locate the documentation that comes with the drive and follow those instructions in addition to the instructions in this topic.
  - The drive cage supports up to six 7mm or 15mm 2.5-inch SAS/SATA/NVMe solid-state drives.
  - The electromagnetic interference (EMI) integrity and cooling of the node are protected by having all bays and PCI and PCIe slots covered or occupied. When installing a drive, PCI, or PCIe adapter, save the EMC shield and filler panel from the bay or PCI or PCIe adapter slot cover in the event that you later remove the device.
  - For a complete list of supported optional devices for the node, see <https://serverproven.lenovo.com>.

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sd520v4/7dfy/downloads/driver-list> to see the latest firmware and driver updates for your server.
- Go to [“Update the firmware” on page 168](#) for more information on firmware updating tools.

## Install a 2.5-inch hot-swap drive

### Procedure

Step 1. If the drive bay contains a filler, pull the release lever on the filler and slide it out of the bay.

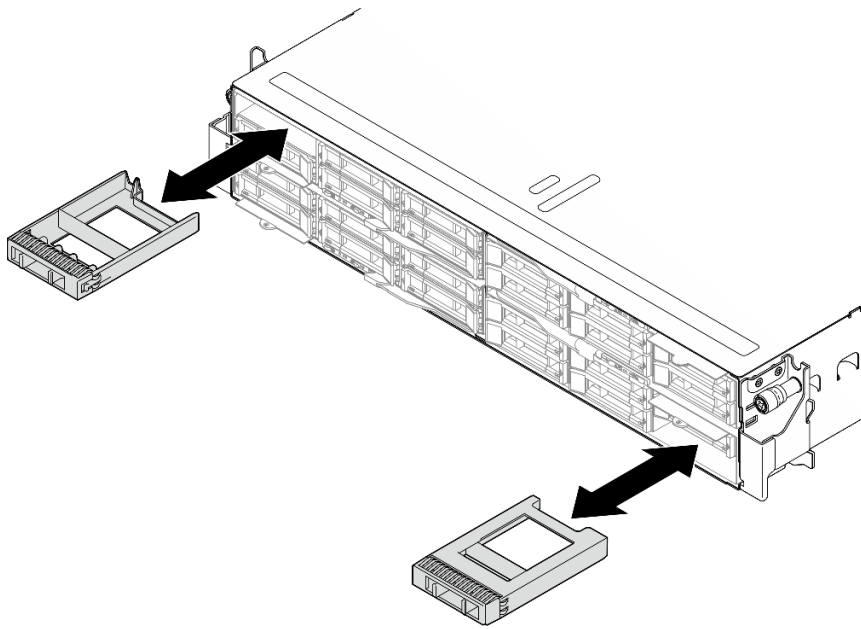


Figure 58. Replacement of a drive filler

Step 2. Install the hot-swap drive.

- a. ① Make sure that the drive handle is in the open position; then, align the drive with the guide rails in the bay and gently push the drive into the bay until the drive stops.
- b. ② Pivot the drive handle to the fully closed position until the handle latch clicks into place.

**Notes:**

- Depending on the specific configuration, the hot-swap drive to be installed may be a 7 mm or 15 mm 2.5-inch solid-state drive. The installation procedures are the same.
- In the right bay (seen from the front), the node must be installed upside down. From this node, the drive to be installed is also upside down, but the installation procedures are the same.

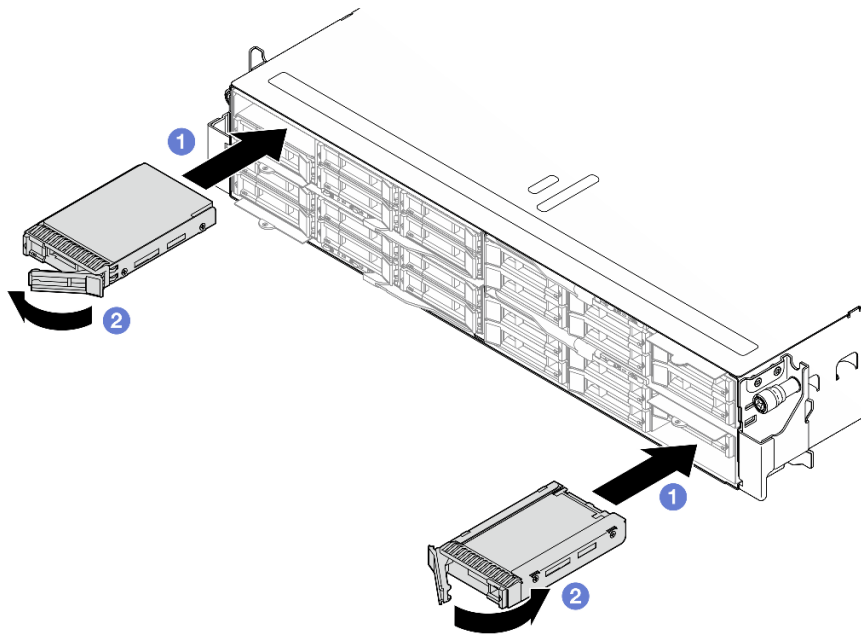


Figure 59. Installation of a solid-state drive

## After you finish

1. Check the drive status LED to verify that the drive is operating correctly (see “Drive LEDs” on page 179). 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.

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## M.2 drive and M.2 boot adapter replacement

Follow the instructions in this section to remove or install an M.2 drive and the M.2 boot adapter.

### Remove an M.2 drive

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

### About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read “Installation Guidelines” on page 37 and “Safety inspection checklist” on page 38 to make sure that you work safely.

Depending on the configuration, follow the corresponding procedures below for proper removal procedure.

- “Remove an M.2 drive from the system board” on page 95
- “Remove an M.2 drive from the M.2 boot adapter” on page 97

### Remove an M.2 drive from the system board

#### Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see “Power off the node” on page 43); then, disconnect all external cables from the node.
- b. Remove the node from the chassis (see “Remove a node from the chassis” on page 66); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- c. Remove the top cover (see “Remove the top cover” on page 162).
- d. Locate the M.2 connectors on the system board.

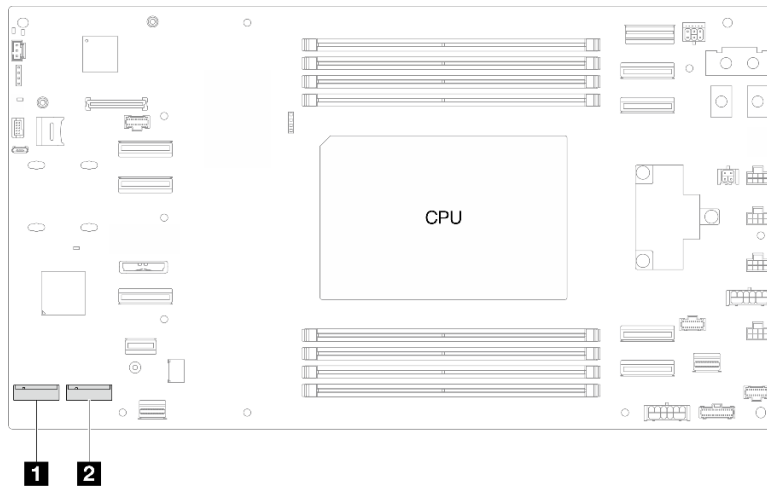


Figure 60. Location of M.2 bays on system board

<b>1</b> M.2 bay 3	<b>2</b> M.2 bay 2
--------------------	--------------------

Step 2. Remove the M.2 drive from the system board.

- a. **1** Slightly press the retainer away from the M.2 drive to disengage the M.2 drive.
- b. **2** Pivot the rear side of the M.2 drive slightly away from the system board.
- c. **3** Pull the M.2 drive out of the connector at an angle of approximately 15 degrees.

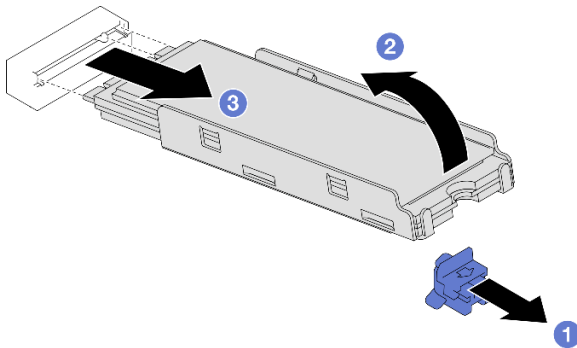


Figure 61. Removal of an M.2 drive

Step 3. (Optional) If necessary, remove the M.2 heat sink and the M.2 drive from the tray.

- a. **1** Press the tabs on the M.2 and heat sink tray to disengage the heat sink.

**Note:** If necessary, press the tabs with a flat-head screwdriver.



- b. ② Lift the M.2 heat sink out of the tray.
- c. ③ Slide the M.2 drive outward and remove it from the tray.

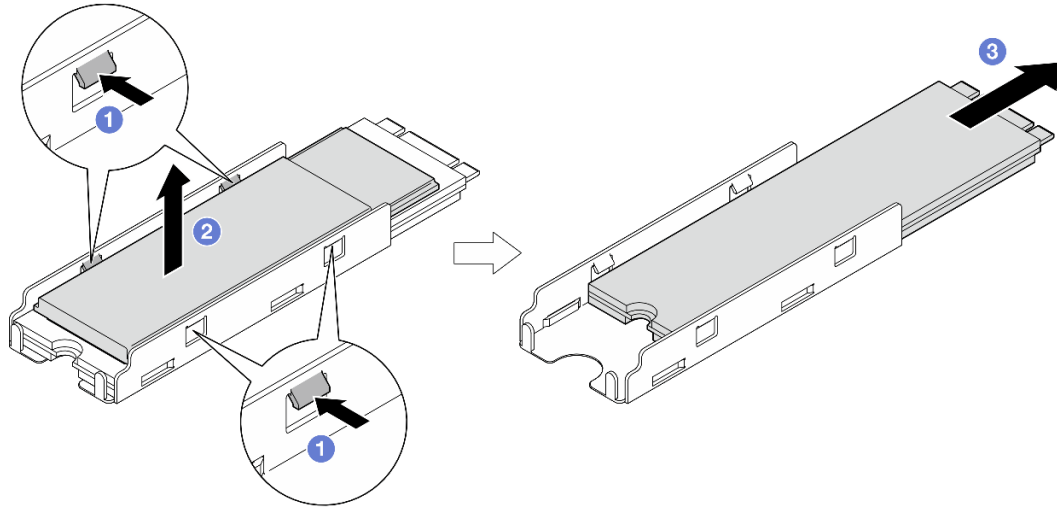


Figure 62. Removal of the M.2 heat sink

### After you finish

1. If necessary, adjust location of the M.2 drive retainer to accommodate another M.2 drive of a different size (see “Adjust an M.2 drive retainer” on page 103).
2. Install a replacement unit (see “Install an M.2 drive” on page 105).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

### Remove an M.2 drive from the M.2 boot adapter

#### Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see “Power off the node” on page 43); then, disconnect all external cables from the node.
- b. Remove the node from the chassis (see “Remove a node from the chassis” on page 66); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- c. Remove the top cover (see “Remove the top cover” on page 162).

Step 2. Remove the M.2 drive from M.2 boot adapter.

- a. ① Pinch and hold on the retainer clip.
- b. ② Slide the retainer backward to loosen the M.2 drive from the M.2 boot adapter.
- c. ③ Pivot the rear side of the M.2 drive away from the M.2 boot adapter.
- d. ④ Pull the M.2 drive away from the slot at an angle of approximately 30 degrees.

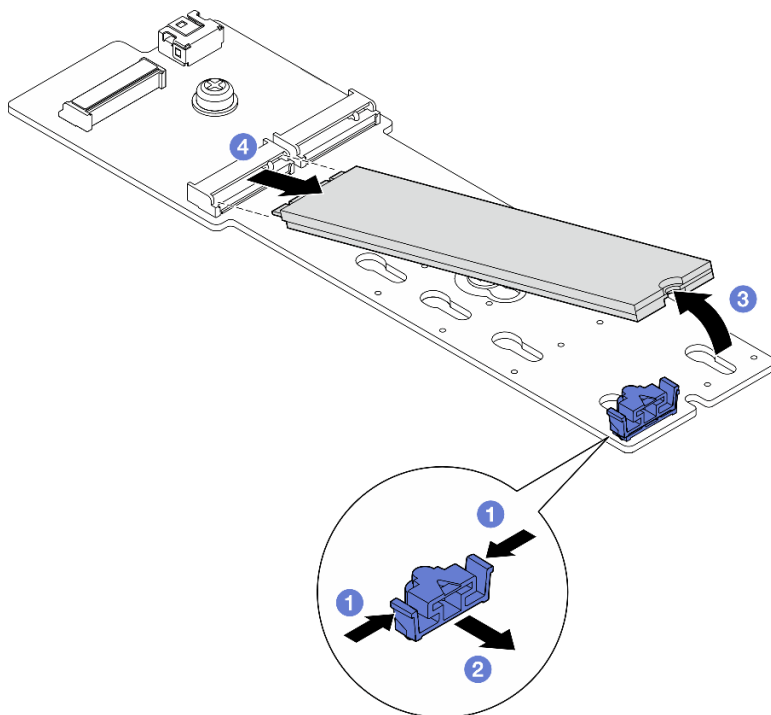


Figure 63. Removal of an M.2 drive

## After you finish

1. If necessary, adjust location of the M.2 drive retainer to accommodate another M.2 drive of a different size (see [“Adjust an M.2 drive retainer” on page 103](#)).
2. Install a replacement unit (see [“Install an M.2 drive” on page 105](#)).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Remove an M.2 boot adapter

Follow instructions in this section to remove an M.2 boot adapter.

## About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.

## Procedure

- Step 1. Make preparations for this task.
  - a. Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.

- b. Remove the node from the chassis (see [“Remove a node from the chassis” on page 66](#)); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- c. Remove the top cover (see [“Remove the top cover” on page 162](#)).
- d. Remove all M.2 drives from the M.2 boot adapter (see [“Remove an M.2 drive” on page 95](#)).

Step 2. Disconnect the cables from the M.2 boot adapter.

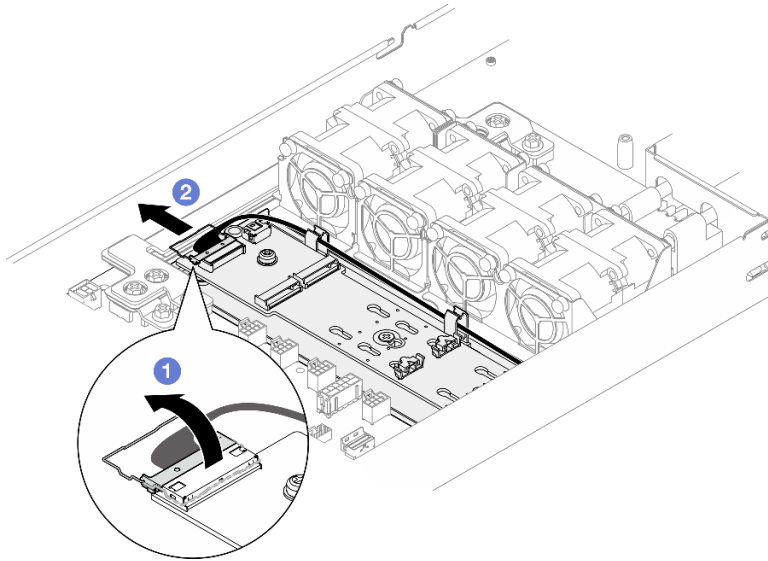


Figure 64. Disconnecting cable from M.2 boot adapter

- a. ① Unhook the wire bail on the cable from the connector.
- b. ② Disconnect the cables from the M.2 boot adapter.

Step 3. Remove the M.2 boot adapter tray from the node.

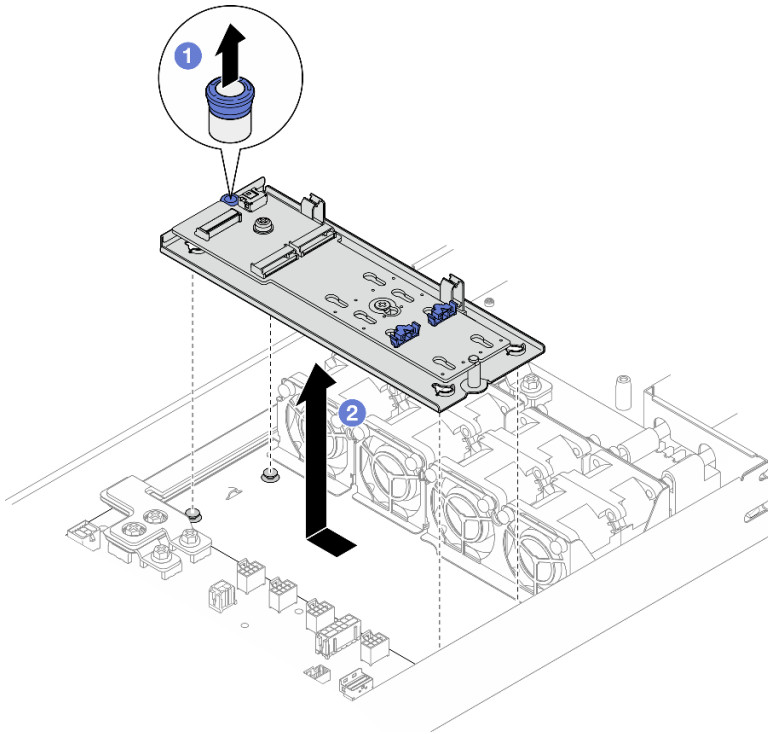


Figure 65. Removing M.2 boot adapter tray

- a. 1 Lift and hold the release pin to disengage the M.2 boot adapter tray from the node.
- b. 2 Slightly slide the M.2 boot adapter tray toward the pin; then, carefully pull it out of the node.

Step 4. Remove the M.2 boot adapter.

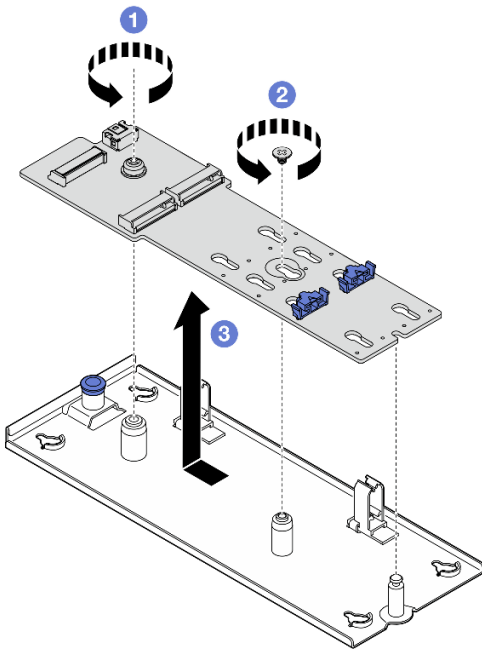


Figure 66. Removing M.2 boot adapter

- a. 1 Unfasten the screw that secures the end of the M.2 boot adapter to the tray.

- b. 2 Unfasten the screw that secures the middle of the M.2 boot adapter to the tray.
- c. 3 Slide the M.2 boot adapter toward the plunger and lift it out of the tray.

## After you finish

1. If necessary, adjust location of the M.2 drive retainer to accommodate another M.2 drive of a different size (see “Adjust an M.2 drive retainer” on page 103).
2. Install a replacement unit (see “Install an M.2 boot adapter” on page 101).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Install an M.2 boot adapter

Follow instructions in this section to remove an M.2 boot adapter.

## About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read “Installation Guidelines” on page 37 and “Safety inspection checklist” on page 38 to make sure that you work safely.

## Procedure

Step 1. Install the M.2 boot adapter.

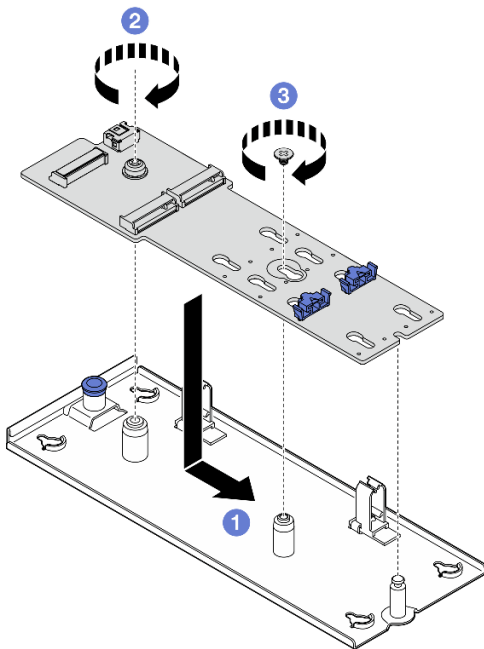


Figure 67. Installing M.2 boot adapter

- a. 1 Lower the M.2 boot adapter into the tray; then, slide the M.2 boot adapter forward until it is seated.

- b. ② Fasten the screw that secures the end of the M.2 boot adapter to the tray.
- c. ③ Fasten the screw that secures the middle of the M.2 boot adapter to the tray.

Step 2. Align the notches of the tray with the guide pins on the node; then, lower the M.2 boot adapter and slide it to one side until the M.2 boot adapter is securely seated in the node.

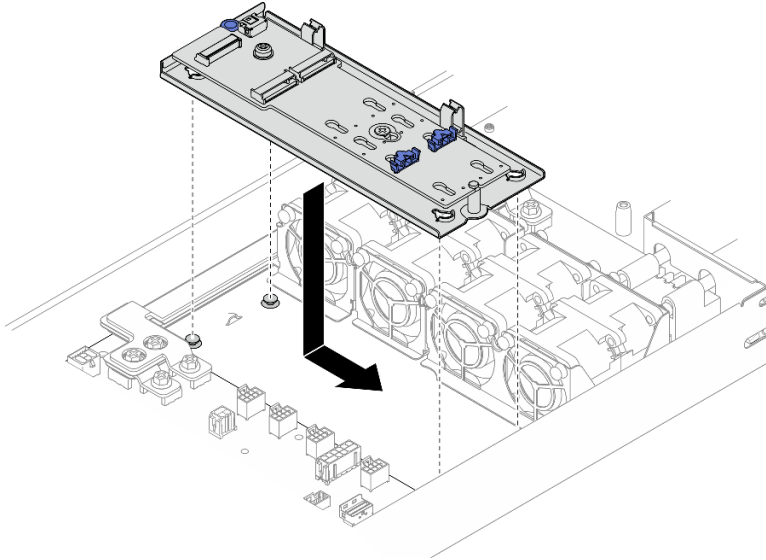


Figure 68. Installing M.2 boot adapter tray

Step 3. Connect the cables to the M.2 boot adapter.

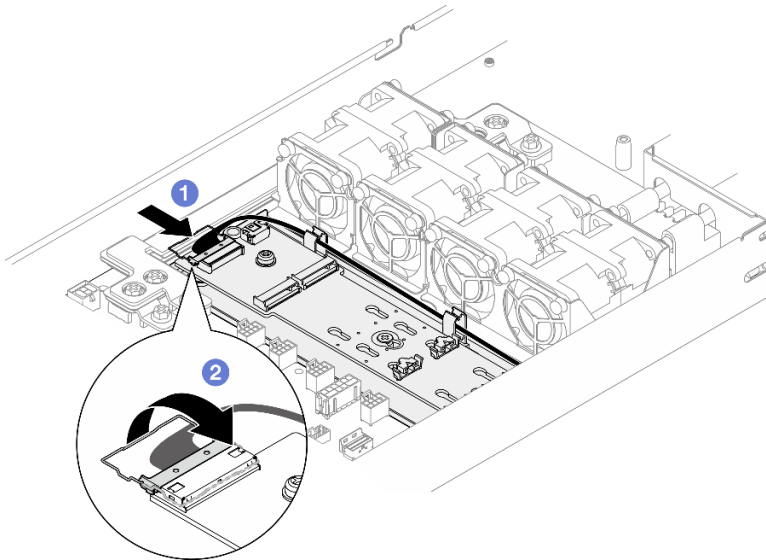


Figure 69. Connecting cable to SATA/NVMe M.2 boot adapter

- a. ① Connect the cables to the M.2 boot adapter.
- b. ② Hook the wire bail on the cable onto the connector.

## After you finish

1. If necessary, adjust location of the M.2 drive retainer on the M.2 boot adapter to accommodate another M.2 drive of a different size (see [“Adjust an M.2 drive retainer” on page 103](#)).
2. Install all M.2 drives to the M.2 boot adapter (see [“Install an M.2 drive” on page 105](#)).
3. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see [“Install the top cover” on page 163](#)).
4. Reinstall the node into the chassis (see [“Install a node to the chassis” on page 70](#)).
5. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see [“Install a hot-swap power supply” on page 54](#) and [“Power on the node” on page 42](#)).
6. Proceed to complete the parts replacement (see [“Complete the parts replacement” on page 164](#)).

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Adjust an M.2 drive retainer

Follow instructions in this section to adjust the position of an M.2 drive retainer on the system board or on the M.2 boot adapter.

### About this task

Sometimes you need to adjust the M.2 drive retainer to a correct keyhole that can accommodate the particular size of the M.2 drive you wish to install.

#### Attention:

- Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.
- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of the package and place it on a static-protective surface.

Depending on your configuration, follow the corresponding procedures below for proper procedure.

- [“Adjust an M.2 drive retainer on the system board” on page 103](#)
- [“Adjust an M.2 drive retainer on the M.2 boot adapter” on page 104](#)

### Adjust an M.2 drive retainer on the system board

#### Procedure

- Step 1. Adjust the position of the M.2 retainer on the system board.
- a. ① Rotate the retainer by 90 degrees to the unlocked position; then, lift the retainer from the system board.
  - b. ② Locate the correct keyhole into which the retainer should be installed; then, insert the retainer into the keyhole, orienting at the unlocked position.
  - c. ③ Rotate the retainer by 90 degrees to the locked position.

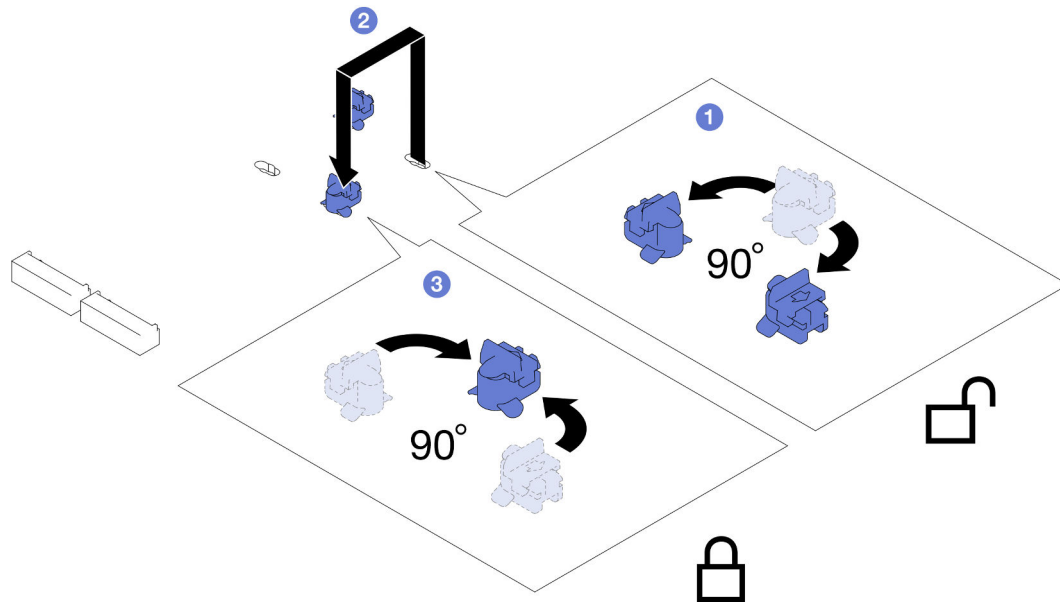


Figure 70. Adjustment of an M.2 drive retainer

### After you finish

1. Install the required M.2 drives (see “Install an M.2 drive” on page 105).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

### Adjust an M.2 drive retainer on the M.2 boot adapter

#### Procedure



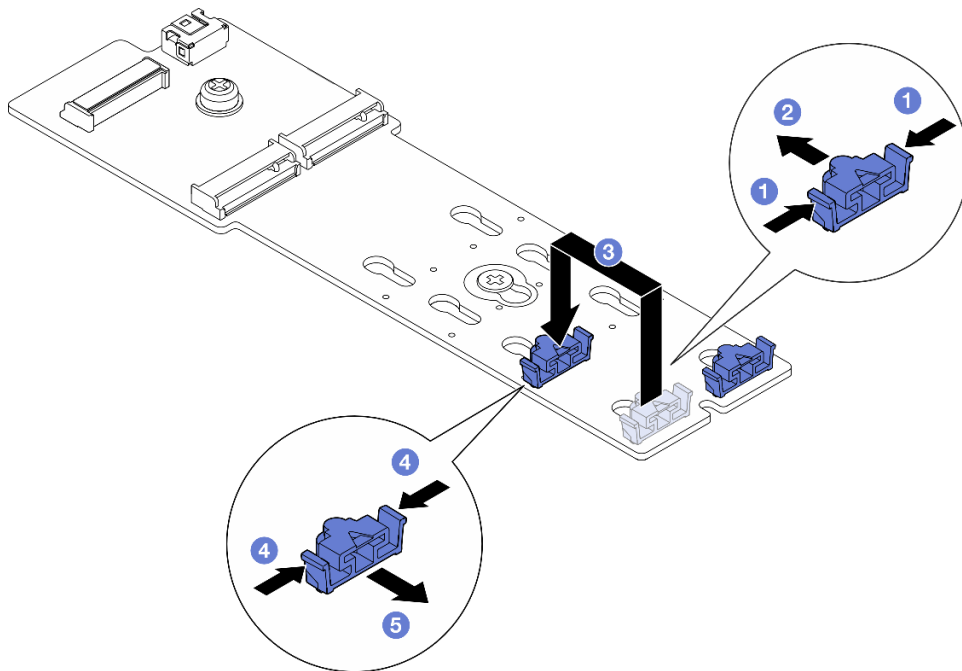


Figure 71. M.2 retainer adjustment

Step 1. Adjust the M.2 retainer.

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

### After you finish

1. Install all M.2 drives to the M.2 boot adapter (see “Install an M.2 drive” on page 105).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

### Install an M.2 drive

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

### About this task

To avoid potential danger, make sure to read and follow the safety information.

#### Attention:

- Read “Installation Guidelines” on page 37 and “Safety inspection checklist” on page 38 to make sure that you work safely.

- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of the package and place it on a static-protective surface.

Depending on your configuration, follow the corresponding procedures below for proper installation procedure.

- [“Install M.2 drive to system board” on page 106](#)
- [“Install M.2 drive to M.2 boot adapter” on page 108](#)

### Install M.2 drive to system board

#### Procedure

Step 1. Locate the M.2 connectors on the system board. Then, determine to which connector the M.2 drive is to be installed.

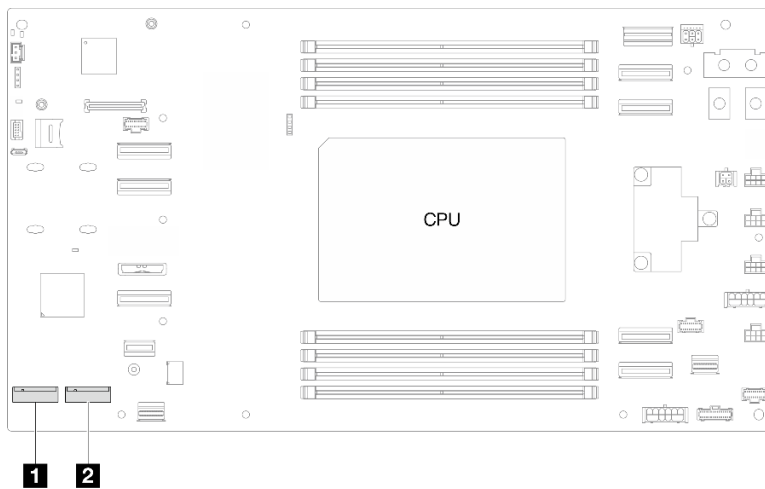


Figure 72. Location of the M.2 bays on the system board

<b>1</b> M.2 bay 3	<b>2</b> M.2 bay 2
--------------------	--------------------

- Step 2. (Optional) If necessary, install the M.2 drive into the M.2 tray.
- 1 Peel off the plastic liner from the thermal pad in the tray.
  - 2 Slide the M.2 drive all the way into the tray, the side with the most chips facing up. Make sure that the **screw cutout** of the drive is aligned with the cutout of the tray.

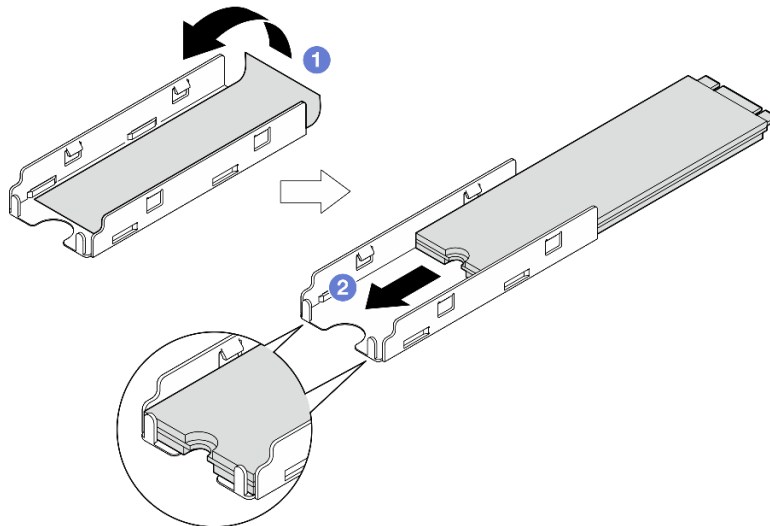


Figure 73. Installation of thermal pad and M.2 drive to tray

- Step 3. (Optional) If applicable, install the M.2 heat sink into tray.
- a. ① Peel off the plastic liner from the thermal pad at the bottom side of the heat sink.
  - b. ② Align the heat sink with the four clips of the tray; then, insert and press down the heat sink until it clicks into place.

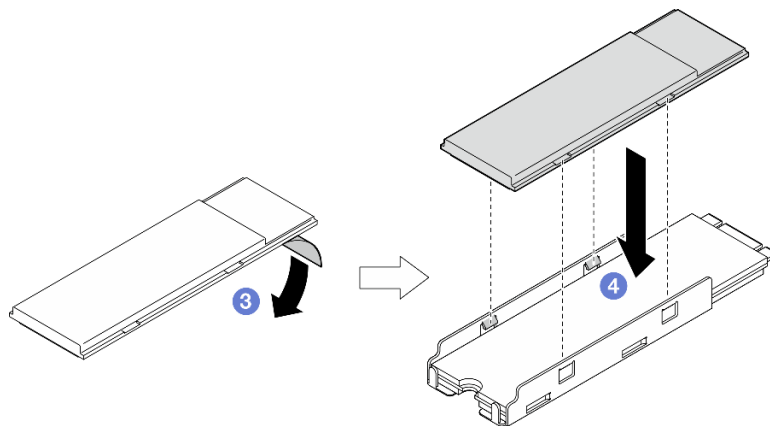


Figure 74. Installation of an M.2 heat sink to the M.2 tray

- Step 4. Install the M.2 drive to the system board.
- a. ① Insert the M.2 drive into the M.2 connector at an angle of approximately 15 degrees.
  - b. ② Slightly press the retainer to accommodate the M.2 drive.
  - c. ③ Pivot and press down the M.2 drive; then, make sure the M.2 drive is engaged securely by the retainer.

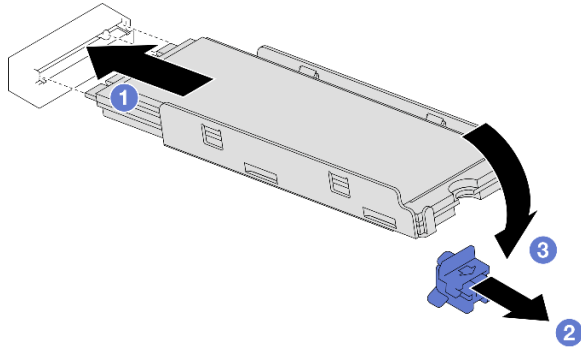


Figure 75. Installation of an M.2 drive

## After you finish

1. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see “Install the top cover” on page 163).
2. Reinstall the node into the chassis (see “Install a node to the chassis” on page 70).
3. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see “Install a hot-swap power supply” on page 54 and “Power on the node” on page 42).
4. Proceed to complete the parts replacement (see “Complete the parts replacement” on page 164).

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Install M.2 drive to M.2 boot adapter

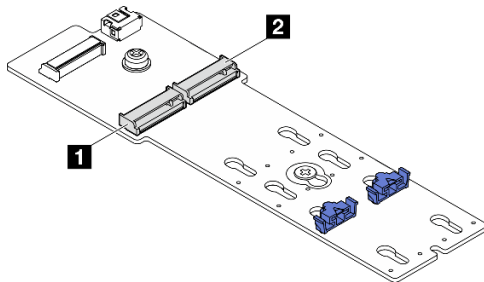
### Procedure

Step 1. Locate the connector on the M.2 boot adapter.

#### Notes:

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

Figure 76. M.2 drive slots



<b>1</b> M.2 bay 0	<b>2</b> M.2 bay 1
--------------------	--------------------

Step 2. Install M.2 drive into M.2 boot adapter.

- a. **1** Insert the M.2 drive into the slot at an angle of approximately 30 degrees.

- b. 2 Pivot down the M.2 drive until the notch at the end of the M.2 drive catches on the lip of the retainer.
- c. 3 Slide the retaining clip forward to secure the M.2 drive to the M.2 boot adapter.

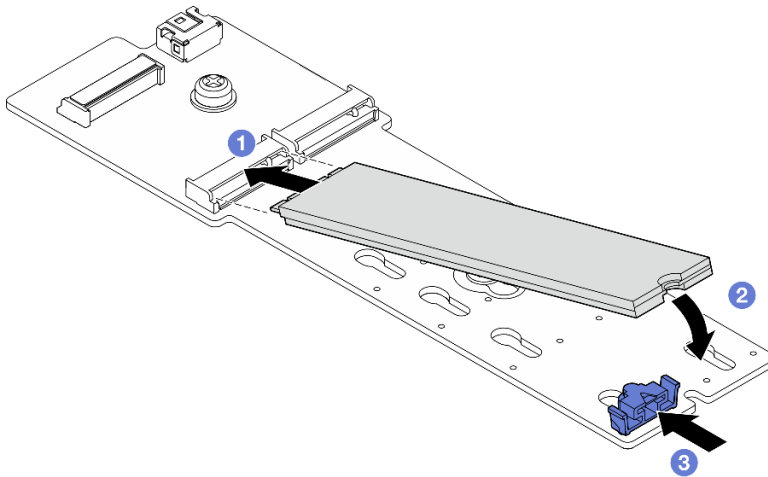


Figure 77. Installation of an M.2 drive

### After you finish

1. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see “Install the top cover” on page 163).
2. Reinstall the node into the chassis (see “Install a node to the chassis” on page 70).
3. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see “Install a hot-swap power supply” on page 54 and “Power on the node” on page 42).
4. Proceed to complete the parts replacement (see “Complete the parts replacement” on page 164).

### Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Memory module replacement

Follow instructions in this section to remove or install a memory module.

### Remove a memory module

Follow instructions in this section to remove a memory module.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

#### Attention:

- Read “Installation Guidelines” on page 37 and “Safety inspection checklist” on page 38 to make sure that you work safely.
- Make sure to remove or install memory module 20 seconds after disconnecting power cords from the system. It allows the system to be completely discharged of electricity and safe for handling memory module.

- Memory modules are sensitive to static discharge and require special handling. Refer to the standard guidelines for [“Handling static-sensitive devices” on page 39](#):
  - 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.
- When a processor is installed, each of the DIMM slots connected to the processor must be installed with a DIMM or DIMM filler.

## Procedure

Step 1. Make preparations for this task.

- Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.
- Remove the node from the chassis (see [“Remove a node from the chassis” on page 66](#)); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- Remove the top cover (see [“Remove the top cover” on page 162](#)).

Step 2. Locate the memory module slots and determine which memory module is to be removed from the node.

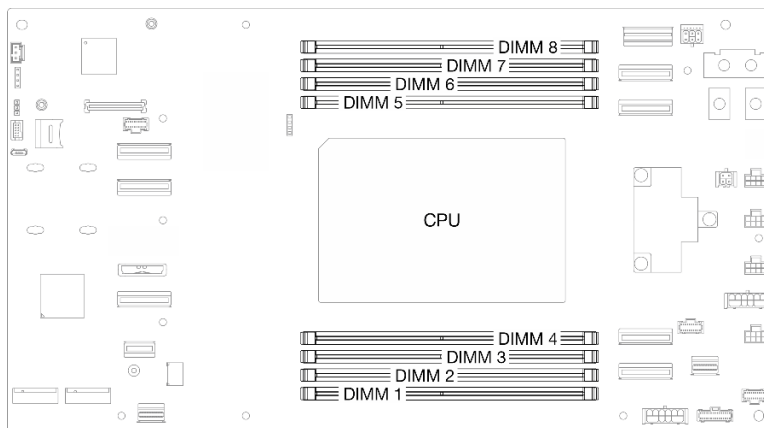


Figure 78. Memory modules and processors layout

Step 3. Remove the memory module from the slot.

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

- ① Open the retaining clip at each end of the memory module slot.
- ② Carefully hold both ends of the memory module and lift it out of the slot.

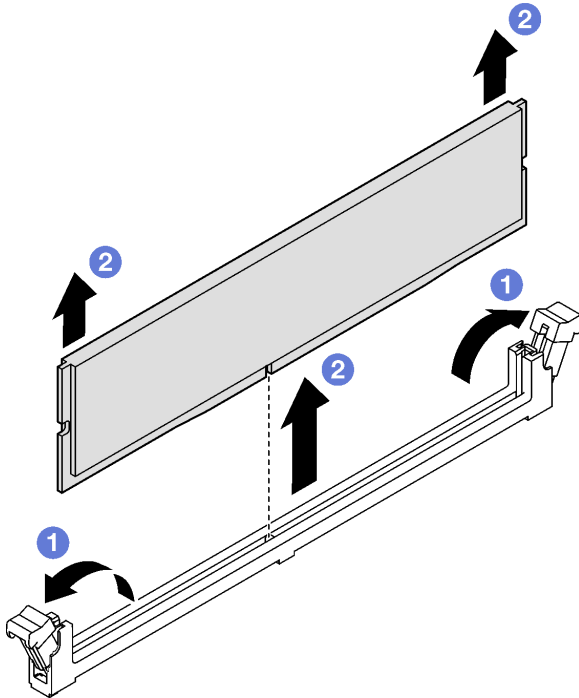


Figure 79. Removal of a memory module

### After you finish

1. Install a replacement unit or filler (see “Install a memory module” on page 111) .
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

### Install a memory module

Follow instructions in this section to install a memory module.

### About this task

See “Memory module installation rules and order” on page 40 for detailed information about memory configuration and setup.

To avoid potential danger, make sure to read and follow the safety information.

#### Attention:

- Read “Installation Guidelines” on page 37 and “Safety inspection checklist” on page 38 to make sure that you work safely.
- Make sure to remove or install memory module 20 seconds after disconnecting power cords from the system. It allows the system to be completely discharged of electricity and safe for handling memory module.
- Memory modules are sensitive to static discharge and require special handling. Refer to the standard guidelines for “Handling static-sensitive devices” on page 39:

- 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.
- When a processor is installed, each of the DIMM slots connected to the processor must be installed with a DIMM or DIMM filler.

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sd520v4/7dfy/downloads/driver-list> to see the latest firmware and driver updates for your server.
- Go to “Update the firmware” on page 168 for more information on firmware updating tools.

## Procedure

Step 1. Locate the required memory module slot on the system board.

**Note:** Make sure to observe the installation rules and sequence order in “Memory module installation rules and order” on page 40.

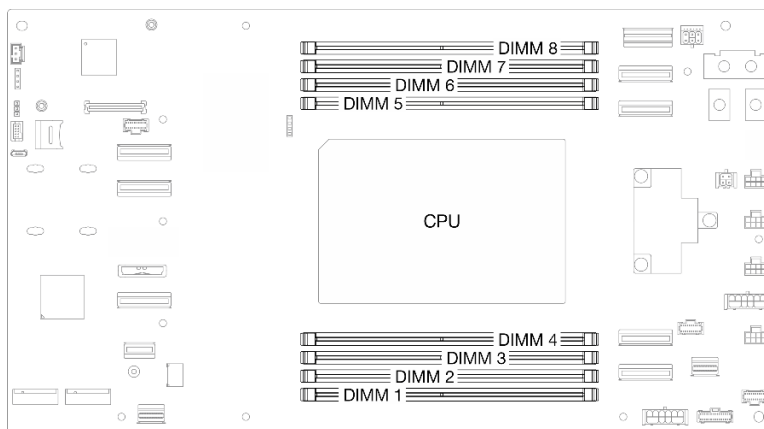


Figure 80. Memory modules and processors layout

- Step 2. Touch the static-protective package that contains the memory module to any unpainted surface on the outside of the node. Then, take the memory module out of the package and place it on a static-protective surface.
- Step 3. Install the memory module into the slot.
- 1 Open the retaining clip at each end of the memory module slot.
  - 2 Align the memory module with the slot and gently place the memory module into the slot with both hands.



- c. 3 Firmly press both ends of the memory module straight down into the slot until the retaining clips snap into the locked position.

**Attention:**

- To avoid breaking the retaining clips or damaging the DIMM connectors, handle the retaining 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.

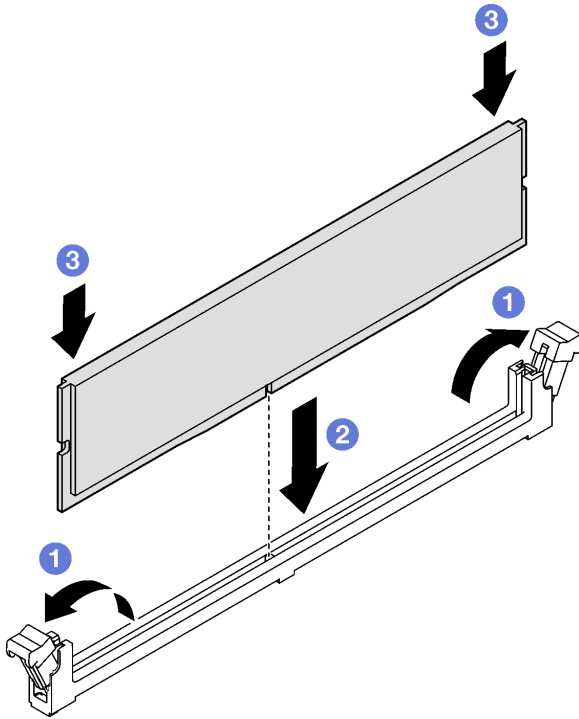


Figure 81. Installation of a memory module

### After you finish

1. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see “[Install the top cover](#)” on page 163).
2. Reinstall the node into the chassis (see “[Install a node to the chassis](#)” on page 70).
3. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see “[Install a hot-swap power supply](#)” on page 54 and “[Power on the node](#)” on page 42).
4. Proceed to complete the parts replacement (see “[Complete the parts replacement](#)” on page 164).

### Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

### MicroSD card replacement

Follow instructions in this section to remove or install a MicroSD card from or to the system board.

## Remove the MicroSD card

Follow instructions in this section to remove the MicroSD card.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.

### Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.
- b. Remove the node from the chassis (see [“Remove a node from the chassis” on page 66](#)); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- c. Remove the top cover (see [“Remove the top cover” on page 162](#)).

Step 2. Locate the MicroSD socket on the system board.

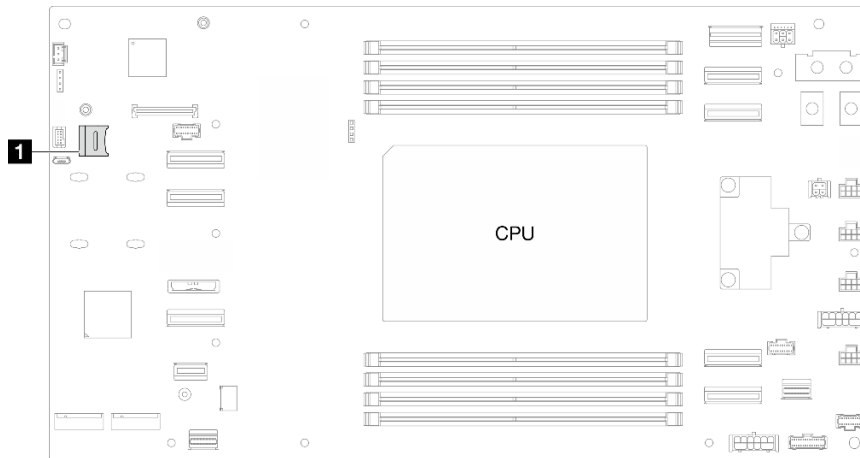


Figure 82. Location of the MicroSD socket

Step 3. Remove the MicroSD card.

- a. ① Slide the socket lid to the open position.
- b. ② Lift open the socket lid.
- c. ③ Remove the MicroSD card from the socket.

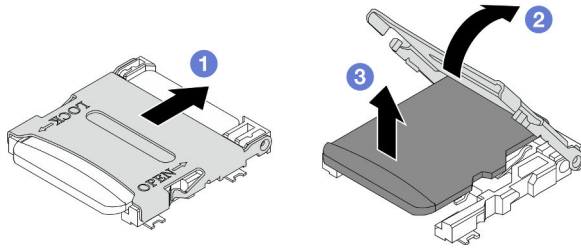


Figure 83. Removal of the MicroSD card

## After you finish

1. Install a replacement unit (see “Install a MicroSD card” on page 115).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Install a MicroSD card

Follow instructions in this section to install a MicroSD card.

## About this task

To avoid potential danger, make sure to read and follow the safety information.

### Attention:

- Read “Installation Guidelines” on page 37 and “Safety inspection checklist” on page 38 to make sure that you work safely.
- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of the package and place it on a static-protective surface.

## Procedure

Step 1. Locate the MicroSD socket on the system board.

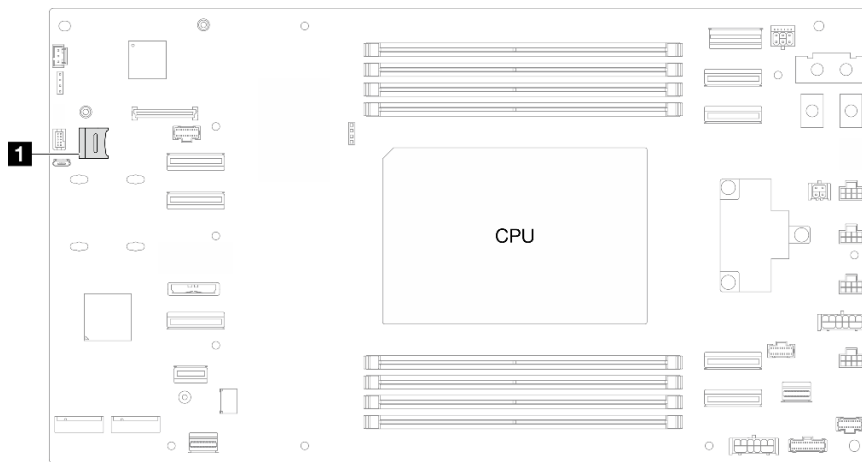


Figure 84. Location of the MicroSD socket

- Step 2. Install the MicroSD card to the system board.
- a. 1 Place the MicroSD card into the socket.
  - b. 2 Close the socket lid.
  - c. 3 Slide the socket lid to the lock position.

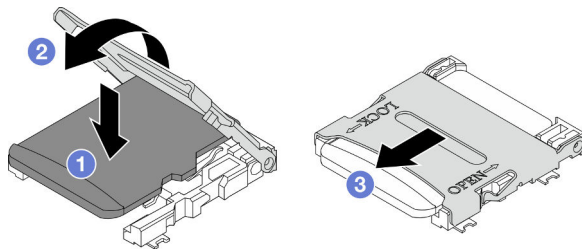


Figure 85. Installation of a MicroSD card

### After you finish

1. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see “[Install the top cover](#)” on page 163).
2. Reinstall the node into the chassis (see “[Install a node to the chassis](#)” on page 70).
3. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see “[Install a hot-swap power supply](#)” on page 54 and “[Power on the node](#)” on page 42).
4. Proceed to complete the parts replacement (see “[Complete the parts replacement](#)” on page 164).

### Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

### OCP module replacement

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

#### Notes:

- Depending on the specific configuration, the node might not come with this component.

- When no OCP module is installed, make sure to install an OCP filler in the OCP slot.

## Remove the OCP module

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

### About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.

### Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see [“Power off the node” on page 43](#)).

Step 2. Remove the OCP module.

- a. ① Loosen the thumbscrew that secures the OCP module. Use a screwdriver if necessary.
- b. ② Grasp the handle and pull out the OCP module.

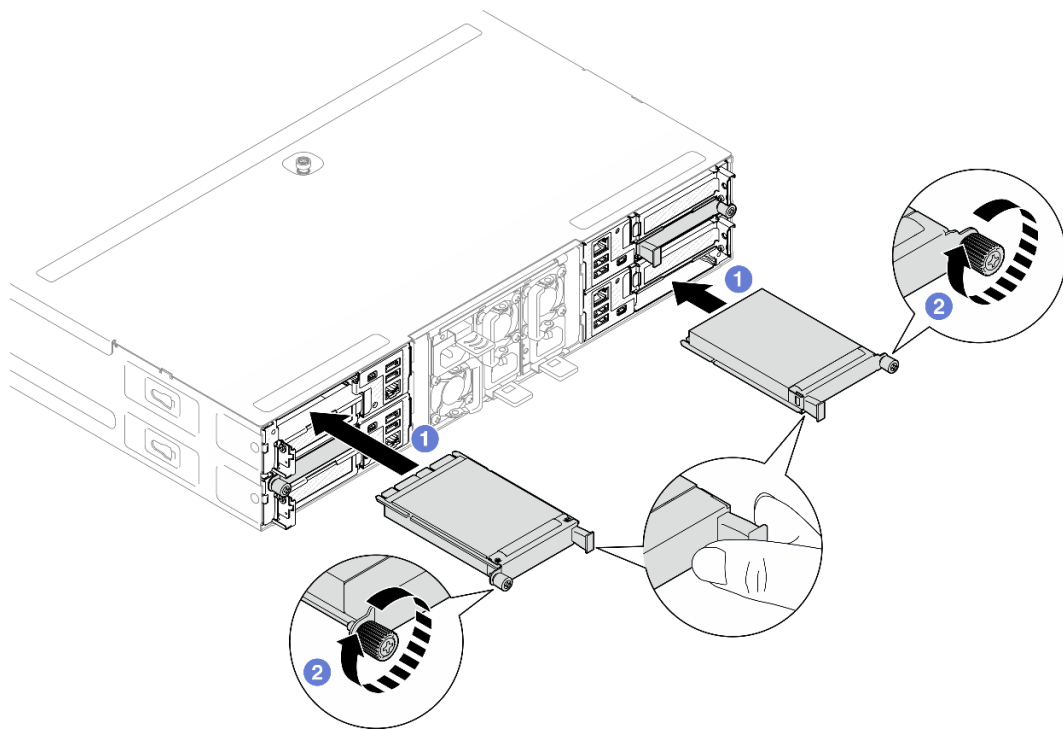


Figure 86. Removal of the rear OCP module

### After you finish

1. Install a replacement unit or filler (see [“Install an OCP module” on page 118](#)).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Install an OCP module

Follow instructions in this section to install an OCP module.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

#### Attention:

- Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.
- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of 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/thinksystem/sd520v4/7dfy/downloads/driver-list> to see the latest firmware and driver updates for your server.
  - Go to “[Update the firmware](#)” on page 168 for more information on firmware updating tools.

### Procedure

Step 1. If an OCP filler has been installed, remove it from the OCP slot.

Step 2. Install the OCP module.

- a. ① Insert and push the OCP module into the slot until it is fully seated.
- b. ② Tighten the thumbscrew to secure the OCP module. Use a screwdriver if necessary.

**Note:** Make sure to fully install the OCP module and securely tighten the thumbscrew. Otherwise, the OCP module may not get full connection and may not function.

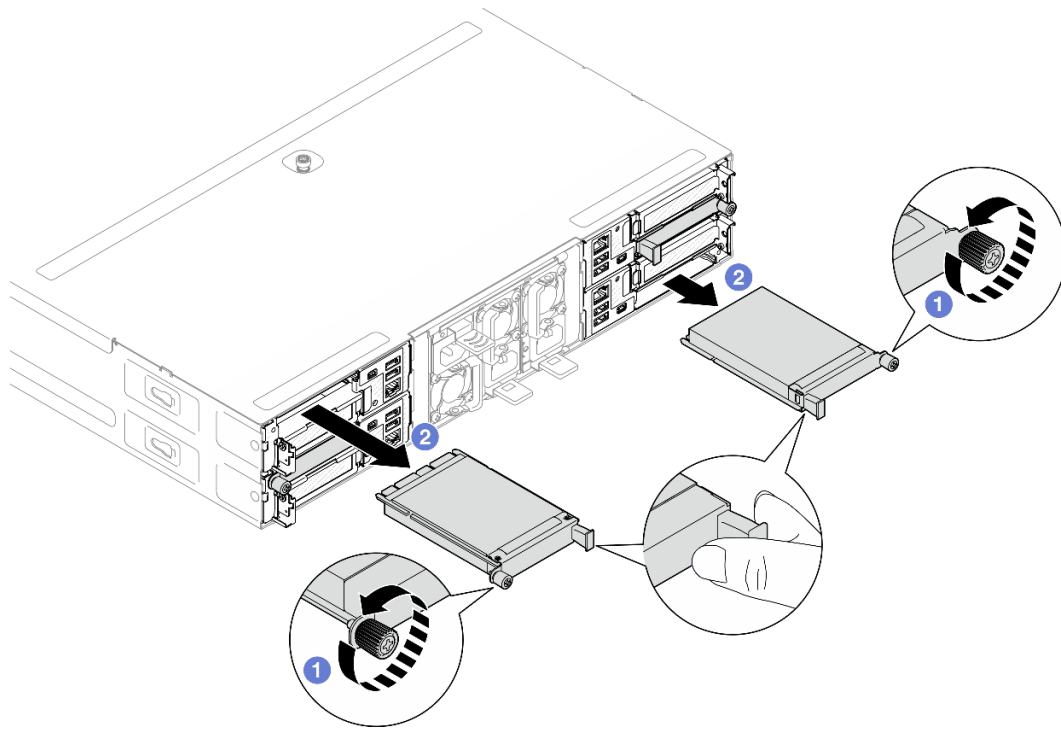


Figure 87. Installation of rear OCP module

### After you finish

1. Power on the node (see “Power on the node” on page 42).
2. Proceed to complete the parts replacement (see “Complete the parts replacement” on page 164).

### Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## PCIe riser assembly and adapter replacement

Follow instructions in this section to remove or install the PCIe riser assembly and PCIe adapter.

### Notes:

- Depending on the specific configuration, the node might not come with this component.
- When there is no PCIe riser assembly installed in the node, make sure to install a PCIe riser filler on the rear of the node.

### Remove the PCIe riser assembly

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

### About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read “Installation Guidelines” on page 37 and “Safety inspection checklist” on page 38 to make sure that you work safely.

## Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.
- b. Remove the node from the chassis (see [“Remove a node from the chassis” on page 66](#)); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- c. Remove the top cover (see [“Remove the top cover” on page 162](#)).

Step 2. Remove the PCIe riser assembly from the node.

- a. ① Loosen the captive screw that secures the PCIe riser assembly to the node.
- b. ② Carefully hold the PCIe riser assembly by its edges and lift it out of the node.
- c. ③ Disconnect the PCIe riser power cable from the riser.

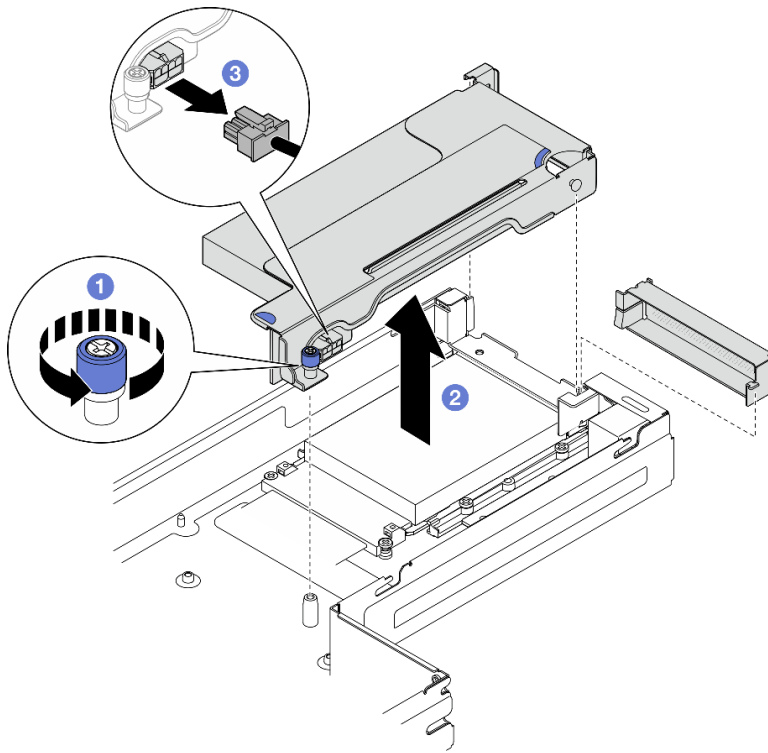


Figure 88. Removal of the PCIe riser assembly

Step 3. If necessary, disconnect all the PCIe riser cables from the system board (see [Internal Cable Routing Guide](#)); then, lay the PCIe riser assembly on a flat, static-protective surface.

## After you finish

1. To replace a PCIe adapter, see [“Remove a PCIe adapter” on page 121](#) and [“Install a PCIe adapter” on page 122](#).
2. If necessary, replace or remove the PCIe riser card from the riser cage.



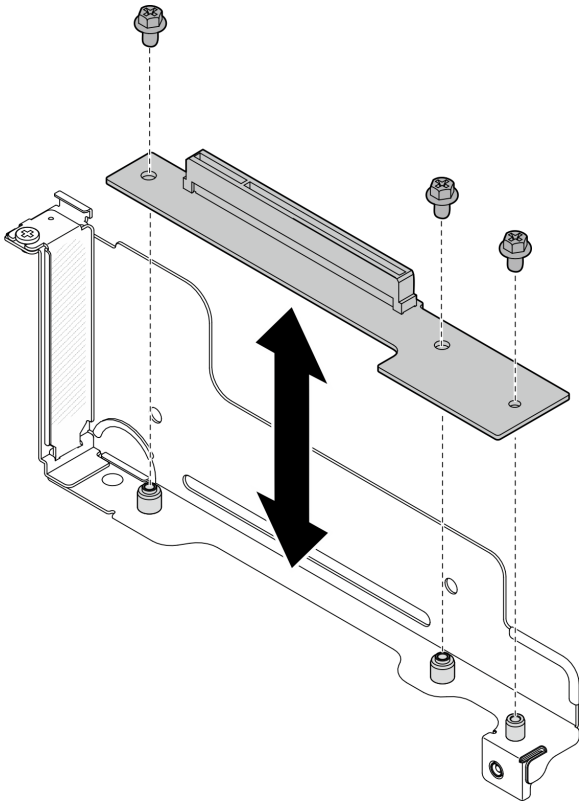


Figure 89. Replacement of the PCIe riser card

3. Install a replacement unit or filler (see [“Install a PCIe riser assembly” on page 124](#)).
4. 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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Remove a PCIe adapter

Follow instructions in this section to remove a PCIe adapter.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.

### Procedure

- Step 1. Make preparations for this task.
  - a. Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.
  - b. Remove the node from the chassis (see [“Remove a node from the chassis” on page 66](#)); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.

- c. Remove the top cover (see “Remove the top cover” on page 162).
- d. If the PCIe riser assembly is installed, remove it from the node and disconnect the PCIe cables from the system board (see “Remove the PCIe riser assembly” on page 119 and *Internal Cable Routing Guide*).

Step 2. Remove the PCIe adapter from the PCIe riser cage.

- a. ① Remove the screw that secures the PCIe adapter to the PCIe riser.
- b. ② Grasp the PCIe adapter by its edges and carefully pull it out of the PCIe slot.

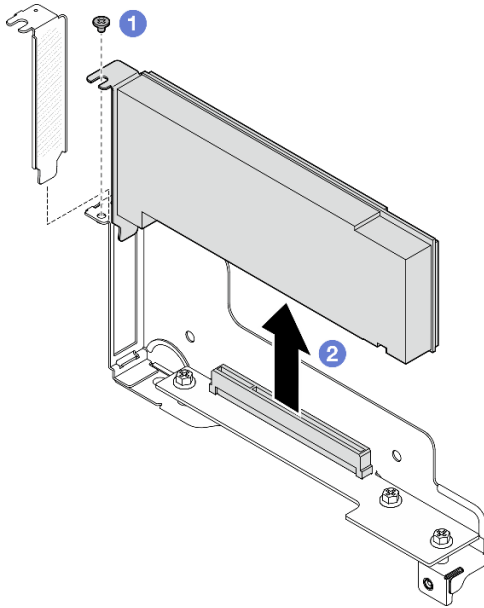


Figure 90. Removal of a PCIe adapter

## After you finish

1. Install a replacement unit or filler (see “Install a PCIe adapter” on page 122).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Install a PCIe adapter

Follow instructions in this section to install a PCIe adapter.

## About this task

To avoid potential danger, make sure to read and follow the safety information.

### Attention:

- Read “Installation Guidelines” on page 37 and “Safety inspection checklist” on page 38 to make sure that you work safely.

- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of the package and place it on a static-protective surface.

## Procedure

- Step 1. If the PCIe riser card is not installed in the riser cage, install it now.
- a. Align the screw holes of the PCIe riser card with the corresponding holes on the riser cage; then, insert the PCIe riser card into place.
  - b. Tighten the screws to secure the PCIe riser card to the PCIe riser cage.

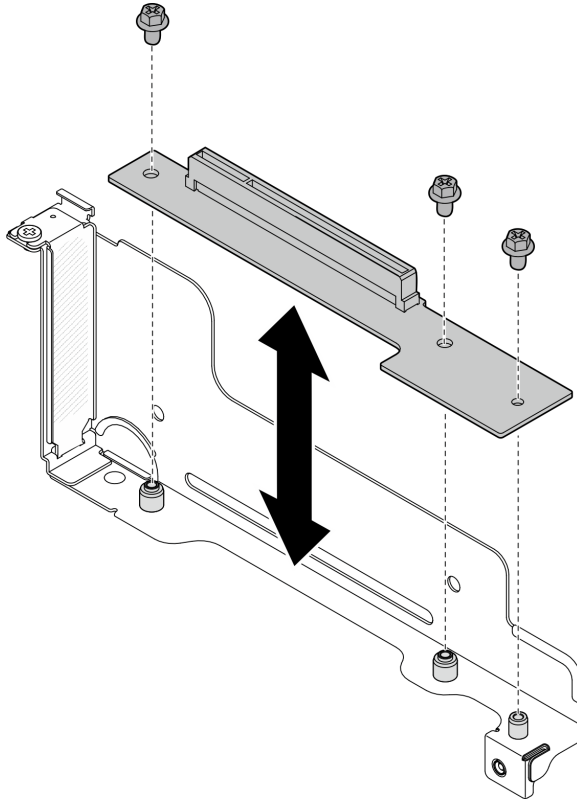


Figure 91. Replacement of the PCIe riser card

- Step 2. If a PCIe filler is installed in the slot, remove it.
- Step 3. Install the PCIe adapter to the PCIe slot.
- a. ① Align the adapter with the PCIe connector; then, carefully press the adapter straight into the connector until it is securely seated.
  - b. ② Tighten the screw to secure the adapter.

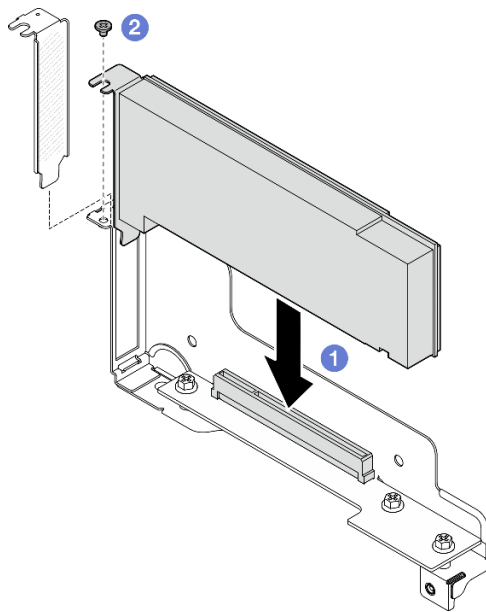


Figure 92. Installation of a PCIe adapter

## After you finish

1. Reinstall the PCIe riser assembly and reconnect the cables (see “[Install a PCIe riser assembly](#)” on page 124 and [Internal Cable Routing Guide](#)).
2. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see “[Install the top cover](#)” on page 163).
3. Reinstall the node into the chassis (see “[Install a node to the chassis](#)” on page 70).
4. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see “[Install a hot-swap power supply](#)” on page 54 and “[Power on the node](#)” on page 42).
5. Proceed to complete the parts replacement (see “[Complete the parts replacement](#)” on page 164).

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Install a PCIe riser assembly

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

## About this task

To avoid potential danger, make sure to read and follow the safety information.

### Attention:

- Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.
- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of the package and place it on a static-protective surface.

## Procedure

- Step 1. If a PCIe riser filler has been installed, remove the screw and then remove the filler.
- Step 2. If the PCIe riser card is not installed in the riser cage, install it now.
  - a. Align the screw holes of the PCIe riser card with the corresponding holes on the riser cage; then, insert the PCIe riser card into place.
  - b. Tighten the screws to secure the PCIe riser card to the PCIe riser cage.

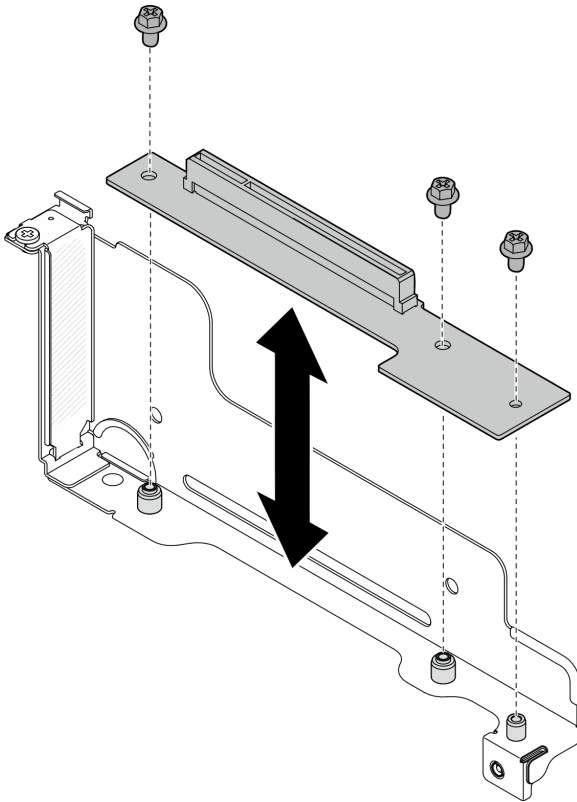


Figure 93. Replacement of the PCIe riser card

- Step 3. Install the required PCIe adapter (see [“Install a PCIe adapter” on page 122](#)).
- Step 4. If the PCIe cables have been disconnected from the system board, reconnect these cables to the system board (see [Internal Cable Routing Guide](#)).
- Step 5. Install the PCIe riser assembly to the node.
  - a. ① Connect the PCIe riser power cable to the riser.
  - b. ② Align the edges of the PCIe riser assembly with the edges of the node; then, place the PCIe riser assembly into place until it is securely seated.
  - c. ③ Tighten the captive screw to secure the PCIe riser assembly to the node.

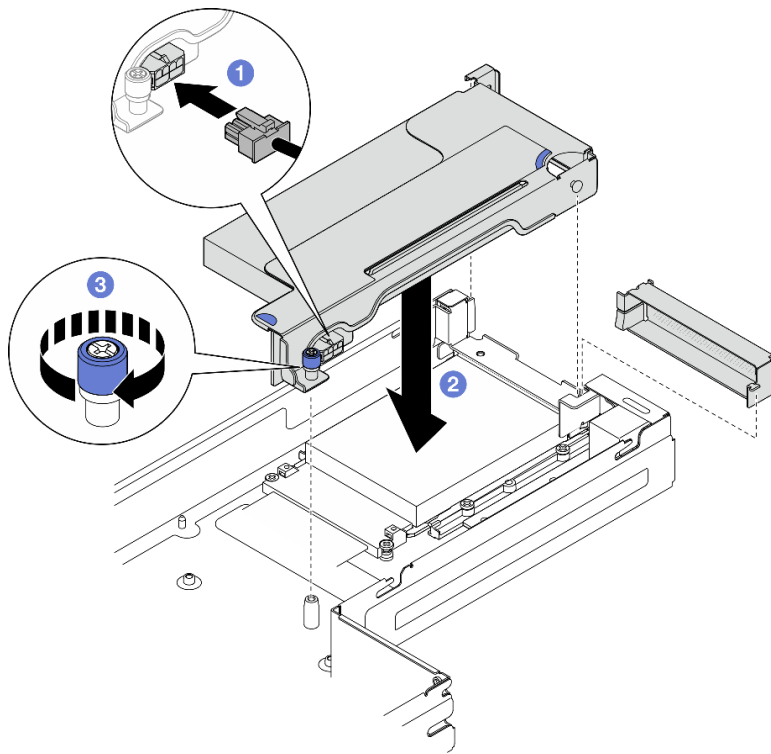


Figure 94. Installation of the PCIe riser assembly

## After you finish

1. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see “[Install the top cover](#)” on page 163).
2. Reinstall the node into the chassis (see “[Install a node to the chassis](#)” on page 70).
3. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see “[Install a hot-swap power supply](#)” on page 54 and “[Power on the node](#)” on page 42).
4. Proceed to complete the parts replacement (see “[Complete the parts replacement](#)” on page 164).

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Power bus bar replacement

Follow instructions in this section to remove or install the power bus bar.

### Remove the power bus bar

Follow instructions in this section to remove the power bus bar.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.

## Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.
- b. Remove the node from the chassis (see [“Remove a node from the chassis” on page 66](#)); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- c. Remove the top cover (see [“Remove the top cover” on page 162](#)).
- d. If the PCIe riser assembly is installed, remove it from the node and disconnect the PCIe cables from the system board (see [“Remove the PCIe riser assembly” on page 119](#) and [Internal Cable Routing Guide](#)).

Step 2. Remove the six outer screws from the power bus bar.

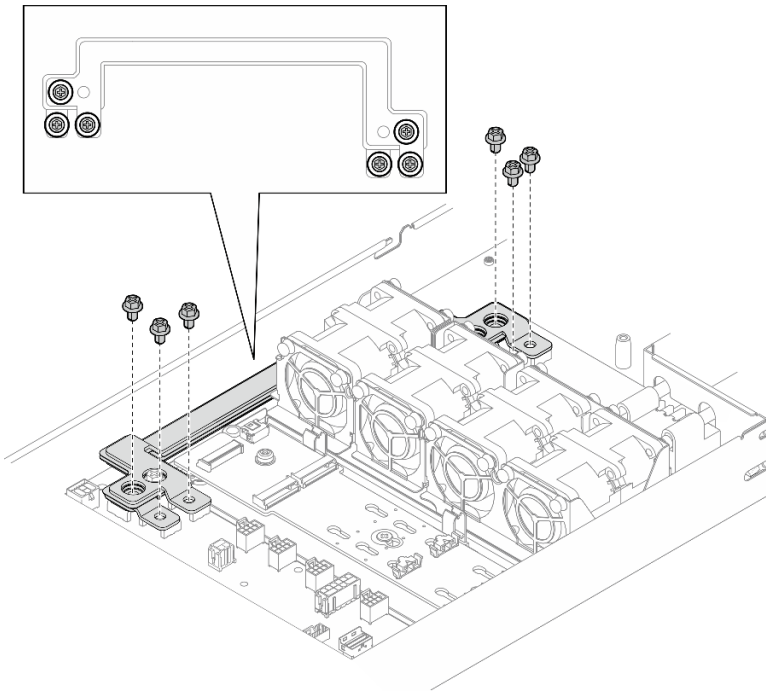


Figure 95. Removal of outer screws of the power bus bar

Step 3. Remove the power bus bar.

- a. ① Remove the main PDB screw from the power bus bar.
- b. ② Remove the main system board screw from the power bus bar.
- c. ③ Lift the power bus bar out of the node.

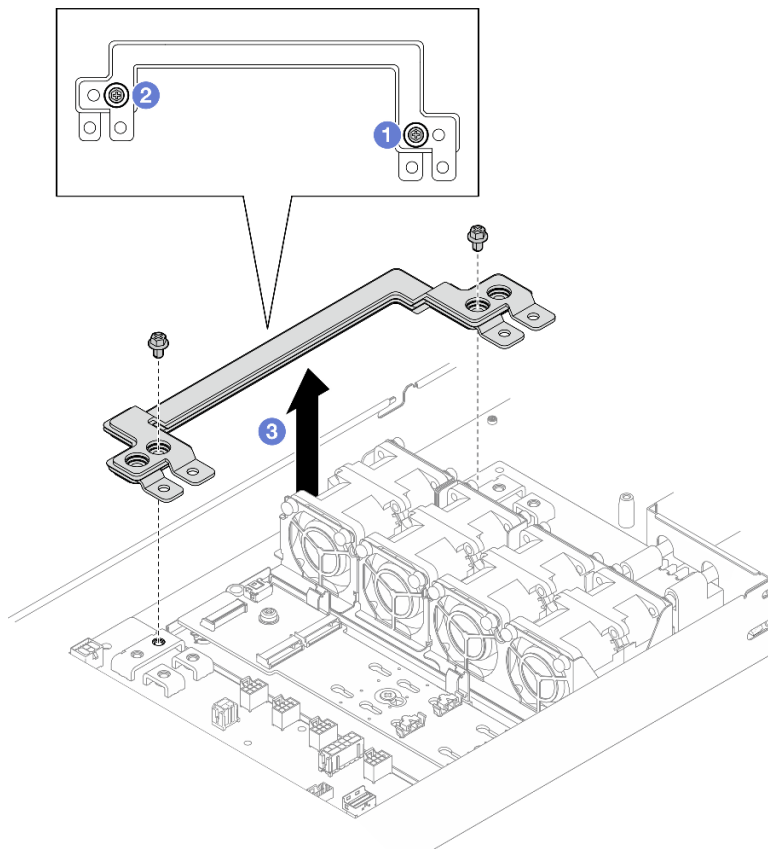


Figure 96. Removal of the power bus bar

## After you finish

1. Install a replacement unit (see “[Install a power bus bar](#)” on page 128).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Install a power bus bar

Follow instructions in this section to install a power bus bar.

## About this task

To avoid potential danger, make sure to read and follow the safety information.

### Attention:

- Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.
- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of the package and place it on a static-protective surface.



**Note:** For reference, the torque required for the screws to be fully tightened to the power bus bar is 12 +/- 0.5 lbf-in.

## Procedure

Step 1. Install the power bus bar to the node.

- a. ① Align the screw holes on the power bus bar with the corresponding screw holes on the system board and power distribution board; then, lower the power bus bar into place.
- b. ② Tighten the main system board screw to secure the power bus bar to the system board.
- c. ③ Tighten the main PDB screw to secure the power bus bar to the power distribution board.

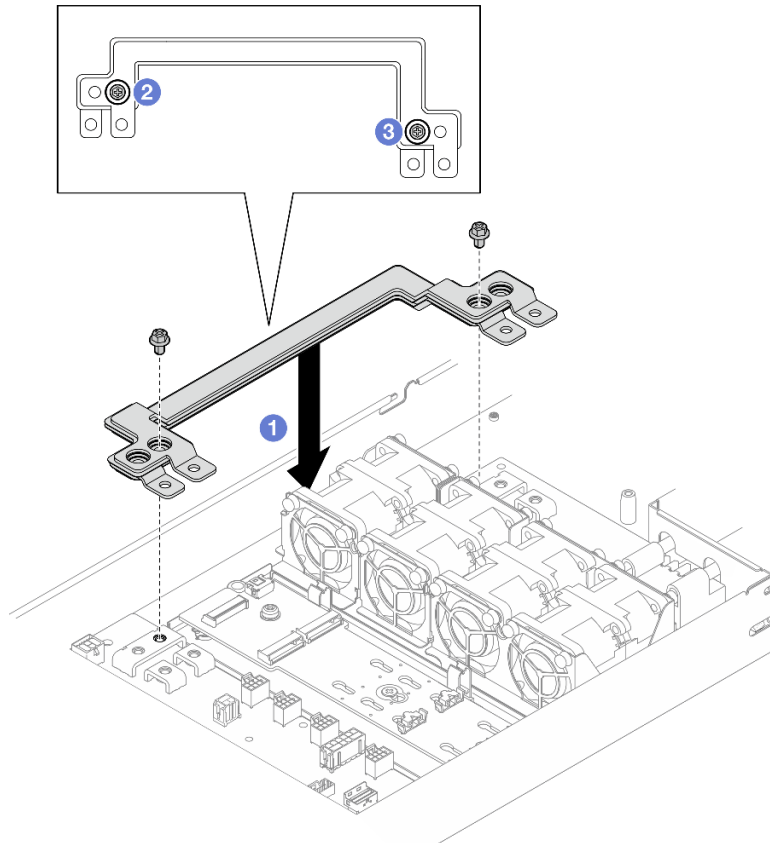


Figure 97. Installation of the power bus bar

Step 2. Tighten the six outer screws to secure the power bus bar.

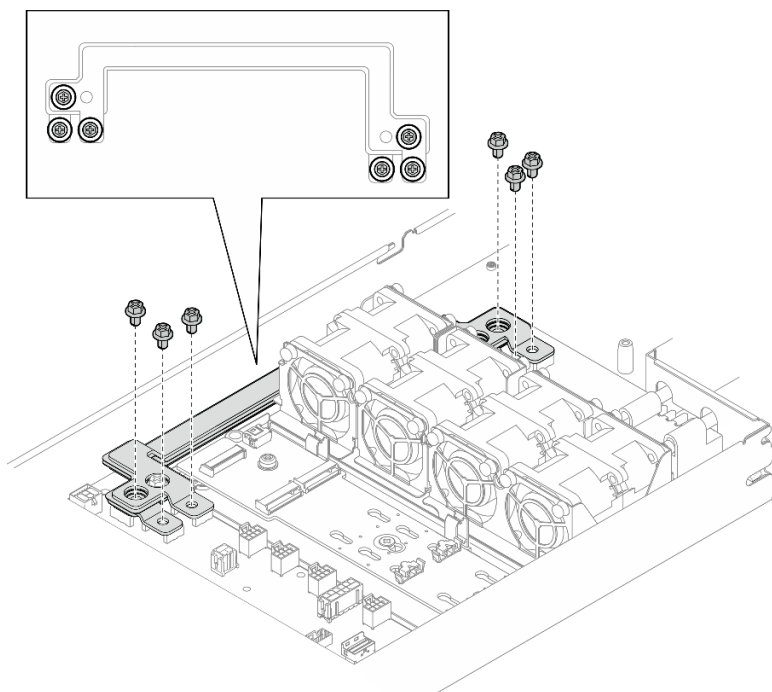


Figure 98. Installation of the power bus bar outer screws

## After you finish

1. Reinstall the PCIe riser assembly and reconnect the cables (see “Install a PCIe riser assembly” on page 124 and [Internal Cable Routing Guide](#)).
2. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see “Install the top cover” on page 163).
3. Reinstall the node into the chassis (see “Install a node to the chassis” on page 70).
4. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see “Install a hot-swap power supply” on page 54 and “Power on the node” on page 42).
5. Proceed to complete the parts replacement (see “Complete the parts replacement” on page 164).

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Power distribution board replacement

Follow instructions in this section to remove or install the power distribution board.

### Remove the power distribution board

Follow instructions in this section to remove the power distribution board.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read “Installation Guidelines” on page 37 and “Safety inspection checklist” on page 38 to make sure that you work safely.

## Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.
- b. Remove the node from the chassis (see [“Remove a node from the chassis” on page 66](#)); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- c. Remove the top cover (see [“Remove the top cover” on page 162](#)).
- d. If the PCIe riser assembly is installed, remove it from the node and disconnect the PCIe cables from the system board (see [“Remove the PCIe riser assembly” on page 119](#) and [Internal Cable Routing Guide](#)).
- e. Remove the power bus bar (see [“Remove the power bus bar” on page 126](#)).

Step 2. Disconnect the power cable from the power distribution board.

Step 3. Remove the power distribution board from the node.

- a. ① Remove the five screws that secure the power distribution board to the node.
- b. ② Slightly pull the power distribution board toward the front of the node; then, lift it out of the node.

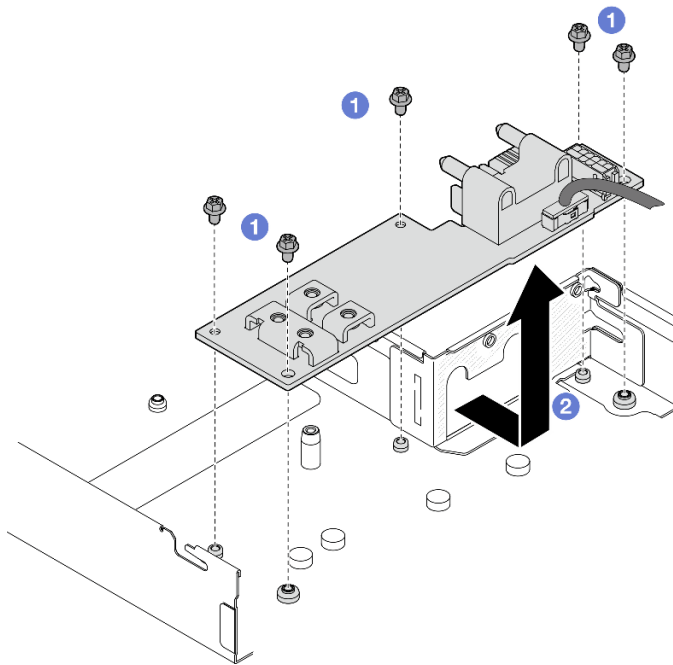


Figure 99. Removal of the power distribution board

Step 4. Disconnect the sideband cable from the power distribution board.

## After you finish

1. Install a replacement unit (see [“Install a power distribution board” on page 132](#)).
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 power distribution board

Follow instructions in this section to install a power distribution board.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

#### Attention:

- Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.
- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of the package and place it on a static-protective surface.

### Procedure

Step 1. Connect the sideband cable to the power distribution board.

Step 2. Install the power distribution board.

- 1 Align the screws holes on the power distribution board with the screw holes on the node; then, lower and insert the power distribution board into place.
- 2 Tighten the five screws to secure the power distribution board to the node.

**Note:** Make sure that the standoffs are securely seated in the holes of the power distribution board.

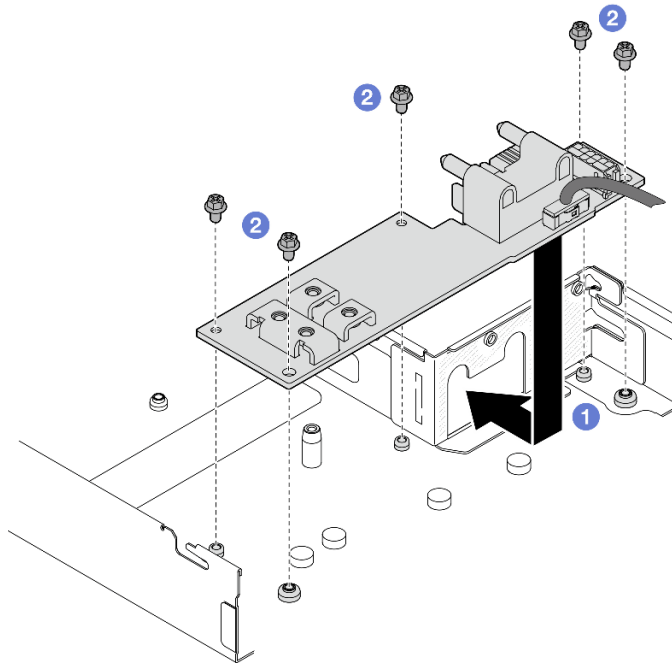


Figure 100. Installation of a power distribution board

Step 3. Connect the power cable to the power distribution board; then, reconnect the power distribution board cables to the system board (see [Internal Cable Routing Guide](#)).

## After you finish

1. Reinstall the power bus bar (see “Install a power bus bar” on page 128).
2. Reinstall the PCIe riser assembly and reconnect the cables (see “Install a PCIe riser assembly” on page 124 and *Internal Cable Routing Guide*).
3. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see “Install the top cover” on page 163).
4. Reinstall the node into the chassis (see “Install a node to the chassis” on page 70).
5. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see “Install a hot-swap power supply” on page 54 and “Power on the node” on page 42).
6. Proceed to complete the parts replacement (see “Complete the parts replacement” on page 164).

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Processor and heat sink replacement (trained technician only)

Follow instructions in this section to remove or install a processor and heat sink module (PHM).

**Important:** This task must be operated by trained technicians.

**Attention:** Before reusing a processor or heat sink, make sure to use Lenovo proven alcohol cleaning pad and thermal grease.

### Remove the processor and heat sink

This task has instructions for removing an assembled processor and heat sink, known as a processor-heat-sink module (PHM). This task requires a Torx T30 screwdriver. This procedure must be executed by a trained technician.

### About this task

#### S002



#### **CAUTION:**

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

#### S011



#### **CAUTION:**

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

**Attention:**

- Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure 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.
- Each processor socket must always contain a cover or a PHM. When removing or installing a PHM, protect empty processor sockets with a cover.
- Do not touch the processor socket or processor contacts. Processor-socket contacts are very fragile and easily damaged. Contaminants on the processor contacts, such as oil from your skin, can cause connection failures.
- Do not allow the thermal grease on the processor or heat sink to come in contact with anything. Contact with any surface can compromise the thermal grease, rendering it ineffective. Thermal grease can damage components, such as the electrical connectors in the processor socket.
- Remove and install only one PHM at a time. If the processor board supports multiple processors, install the PHMs starting with the first processor socket.

**Notes:**

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

The following illustration shows the components of the PHM.

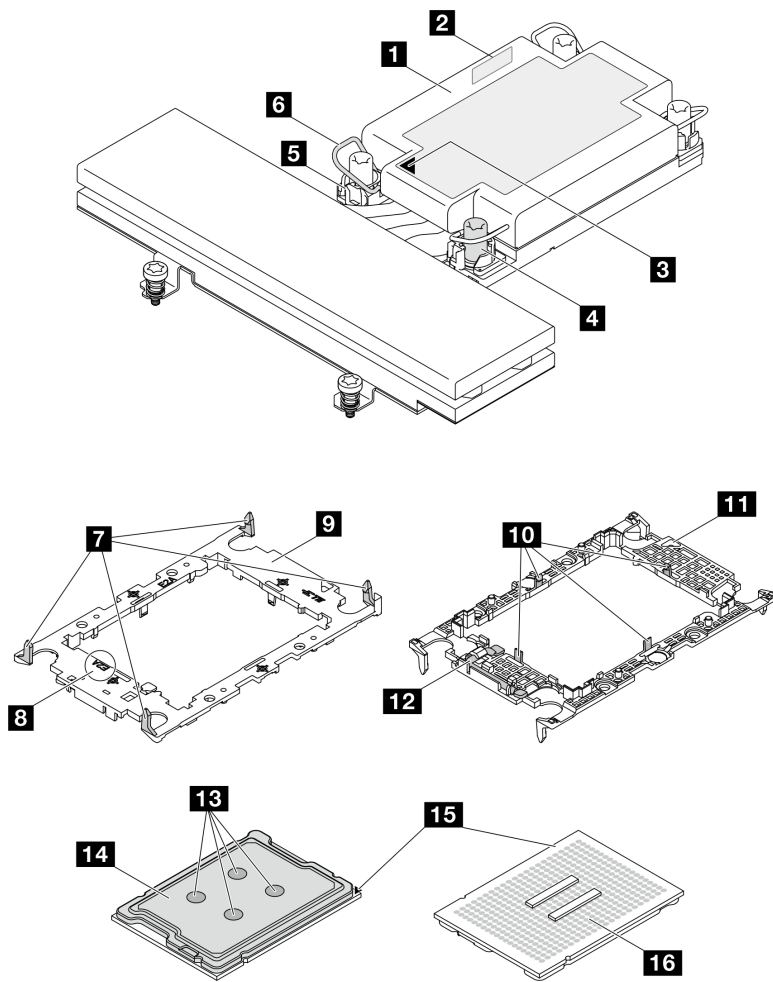


Figure 101. PHM components

<b>1</b> Heat sink	<b>2</b> Processor identification label
<b>3</b> Heat sink triangular mark	<b>4</b> Torx T30 nut
<b>5</b> Nut and wire bail retainer	<b>6</b> Anti-tilt wire bail
<b>7</b> Clips to secure carrier to a heat sink	<b>8</b> Processor carrier code marking
<b>9</b> Processor carrier	<b>10</b> Clips to secure processor in a carrier
<b>11</b> Carrier triangular mark	<b>12</b> Processor ejector handle
<b>13</b> Thermal grease	<b>14</b> Processor heat spreader
<b>15</b> Processor triangular mark	<b>16</b> Processor contacts

Prepare the following screwdrivers to ensure you can install and remove the corresponding screws properly.

Torque screwdriver type list	Screw Type
Torx T30 head screwdriver	Torx T30 screw

## Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see “Power off the node” on page 43); then, disconnect all external cables from the node.
- b. Remove the node from the chassis (see “Remove a node from the chassis” on page 66); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- c. Remove the top cover (see “Remove the top cover” on page 162).

Step 2. Remove the PHM from the system board.

**Important:**

- Do not touch the contacts on the processor contacts. Contaminants on the processor contacts, such as oil from your skin, can cause connection failures.
- Keep the processor socket clean from any object to prevent possible damages.
- 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.

- a. ① Fully loosen the Torx T30 nuts on the PHM *in the removal sequence shown* on the heat-sink label.

**Note:** For reference, the torque required for the screws to be fully tightened/removed is 10+/- 2.0 lbf-in, 1.1+/- 0.2 N-m.

**Attention:** To prevent damage to components, make sure to follow the indicated tightening/loosening sequence.

- b. ② Rotate the anti-tilt wire bails inward.
- c. ③ Carefully lift the PHM from the processor socket. If the PHM cannot be fully lifted out of the socket, further loosen the Torx T30 nuts and try lifting the PHM again.

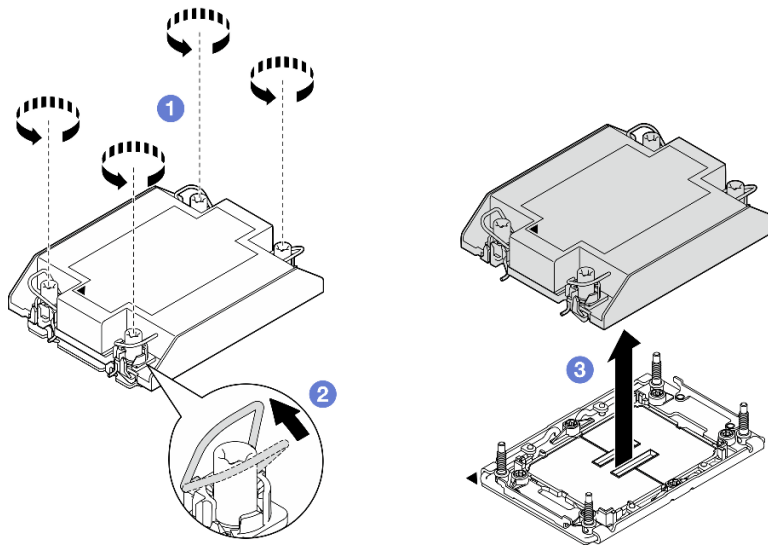


Figure 102. Removal of standard PHM



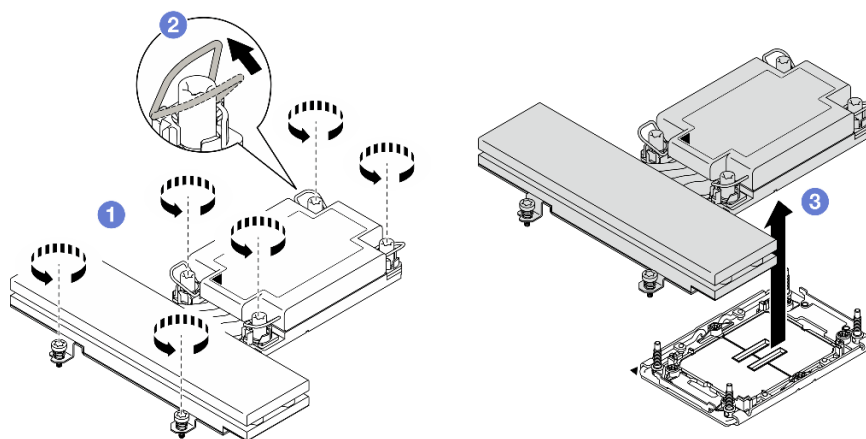


Figure 103. Removal of performance PHM

## After you finish

1. Each processor socket must always contain a cover or a PHM. Protect an empty processor socket with a cover or install a new PHM.
2. If you are removing the PHM as part of a system board replacement, set the PHM aside.
3. If you are reusing the processor or heat sink, separate the processor from its retainer. See “[Separate the processor from carrier and heat sink](#)” on page 137.
4. Install a replacement unit (see “[Install a processor and heat sink](#)” on page 139).
5. 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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Separate the processor from carrier and heat sink

This task has instructions for separating a processor and its carrier from an assembled processor and heat sink, known as a processor-heat-sink module (PHM). This procedure must be executed by a trained technician.

## About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.

### Important:

- Do not touch the contacts on the processor contacts. Contaminants on the processor contacts, such as oil from your skin, can cause connection failures.
- Keep the processor socket clean from any object to prevent possible damages.
- Do not allow the thermal grease on the processor or heat sink to come in contact with anything. Contact with any surface can compromise the thermal grease, rendering it ineffective. Thermal grease can damage components, such as the electrical connectors in the processor socket.

**Note:** The heat sink, processor, and processor carrier for the node might look different from those shown in the illustrations in this section.

## Procedure

Step 1. Separate the processor from the heat sink and carrier.

- a. ① Lift the handle to release the processor from the carrier.
- b. ② Hold the processor by its edges; then, lift the processor from the heat sink and carrier.
- c. ③ Without putting the processor down, wipe the thermal grease from the top of the processor with an alcohol cleaning pad; then, place the processor on a static protective surface with the processor-contact side up.

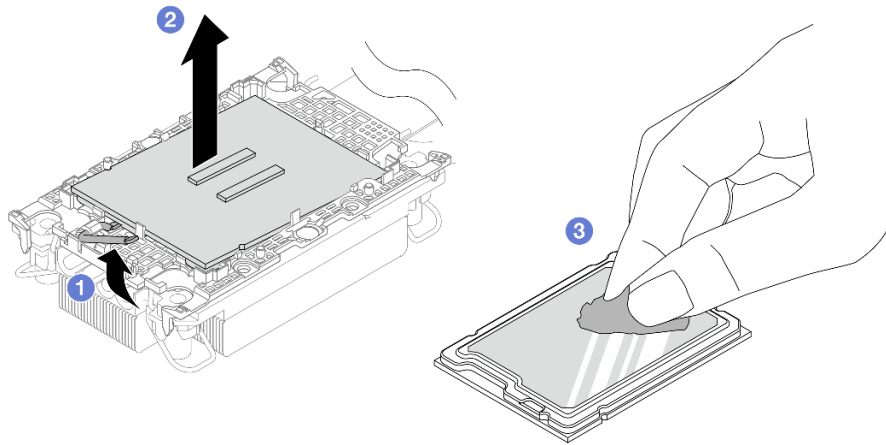


Figure 104. Separating a processor from the heat sink and carrier

**Note:** Do not touch the contacts on the processor.

Step 2. Separate the processor carrier from the heat sink.

- a. ① Release the retaining clips from the heat sink.
- b. ② Lift the carrier from the heat sink.
- c. ③ Wipe the thermal grease from the bottom of the heat sink with an alcohol cleaning pad.

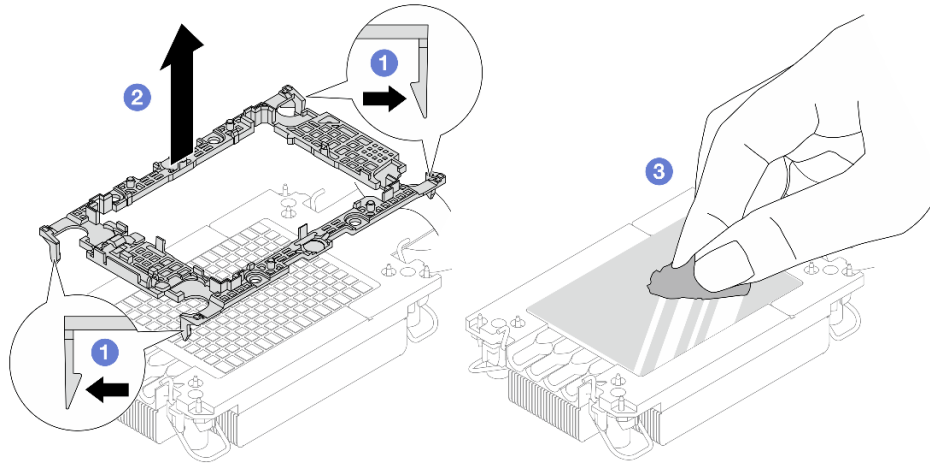


Figure 105. Separating a processor carrier from heat sink

**Note:** The processor carrier will be discarded and replaced with a new one.

### After you finish

1. Install the PHM (see “Install a processor and heat sink” on page 139).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

### Install a processor and heat sink

This task has instructions for installing an assembled processor and heat sink, known as a processor-heat-sink module (PHM). This task requires a Torx T30 screwdriver. This procedure must be executed by a trained technician.

**Important:** This task must be operated by trained technicians.

### 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.

#### S011



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

To avoid potential danger, make sure to read and follow the safety information.

**Attention:**

- Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure 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.
- Each processor socket must always contain a cover or a PHM. When removing or installing a PHM, protect the empty processor sockets with a cover.
- Do not touch the processor socket or processor contacts. Processor-socket contacts are very fragile and easily damaged. Contaminants on the processor contacts, such as oil from your skin, can cause connection failures.
- Do not allow the thermal grease on the processor or heat sink to come in contact with anything. Contact with any surface can compromise the thermal grease, rendering it ineffective. Thermal grease can damage components, such as the electrical connectors in the processor socket.
- Remove and install only one PHM at a time.

**Notes:**

- The heat sink, processor, and processor carrier for the system might be different from those shown in the illustrations.
- PHMs are keyed for the socket where they can be installed and for their orientation in the socket.
- See <https://serverproven.lenovo.com> for a list of processors supported for your server. All processors on the processor board must have the same speed, number of cores, and frequency.
- Before you install a new PHM or replacement processor, update your system firmware to the latest level. See “[Update the firmware](#)” on page 168.

The following illustration shows the components of the PHM.

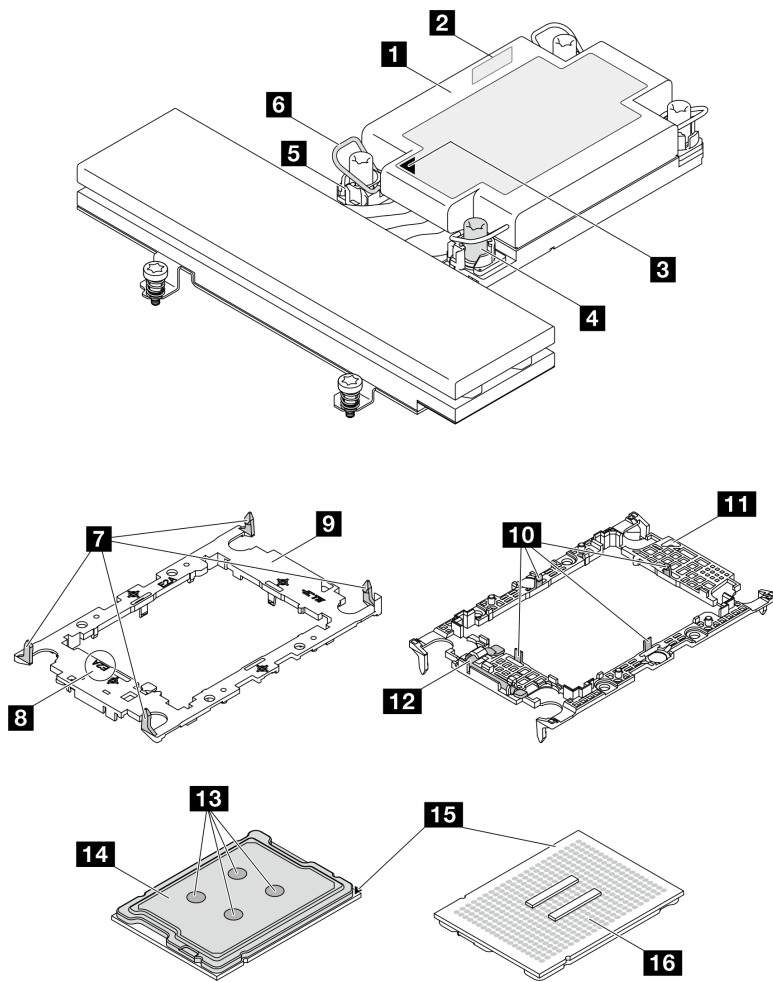


Figure 106. PHM components

<b>1</b> Heat sink	<b>2</b> Processor identification label
<b>3</b> Heat sink triangular mark	<b>4</b> Torx T30 nut
<b>5</b> Nut and wire bail retainer	<b>6</b> Anti-tilt wire bail
<b>7</b> Clips to secure carrier to a heat sink	<b>8</b> Processor carrier code marking
<b>9</b> Processor carrier	<b>10</b> Clips to secure processor in a carrier
<b>11</b> Carrier triangular mark	<b>12</b> Processor ejector handle
<b>13</b> Thermal grease	<b>14</b> Processor heat spreader
<b>15</b> Processor triangular mark	<b>16</b> Processor contacts

Prepare the following screwdrivers to ensure you can install and remove the corresponding screws properly.

Torque screwdriver type list	Screw Type
Torx T30 head screwdriver	Torx T30 screw

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sd520v4/7dfy/downloads/driver-list> to see the latest firmware and driver updates for your server.
- Go to “Update the firmware” on page 168 for more information on firmware updating tools.

## Procedure

Step 1. If you are replacing a processor and reusing the heat sink.

- Remove the processor identification label from the heat sink and replace it with the new label that comes with the replacement processor.
- If there is any old thermal grease on the heat sink, wipe the thermal grease from the bottom of the heat sink with an alcohol cleaning pad.

Step 2. If you are replacing a heat sink and reusing the processor.

- Remove the processor identification label from the old heat sink and place it on the new heat sink in the same location.

**Note:** If you are unable to remove the label and place it on the new heat sink, or if the label is damaged during transfer, write the processor serial number from the processor identification label on the new heat sink in the same location as the label would be placed using a permanent marker.

- Install processor in new carrier.

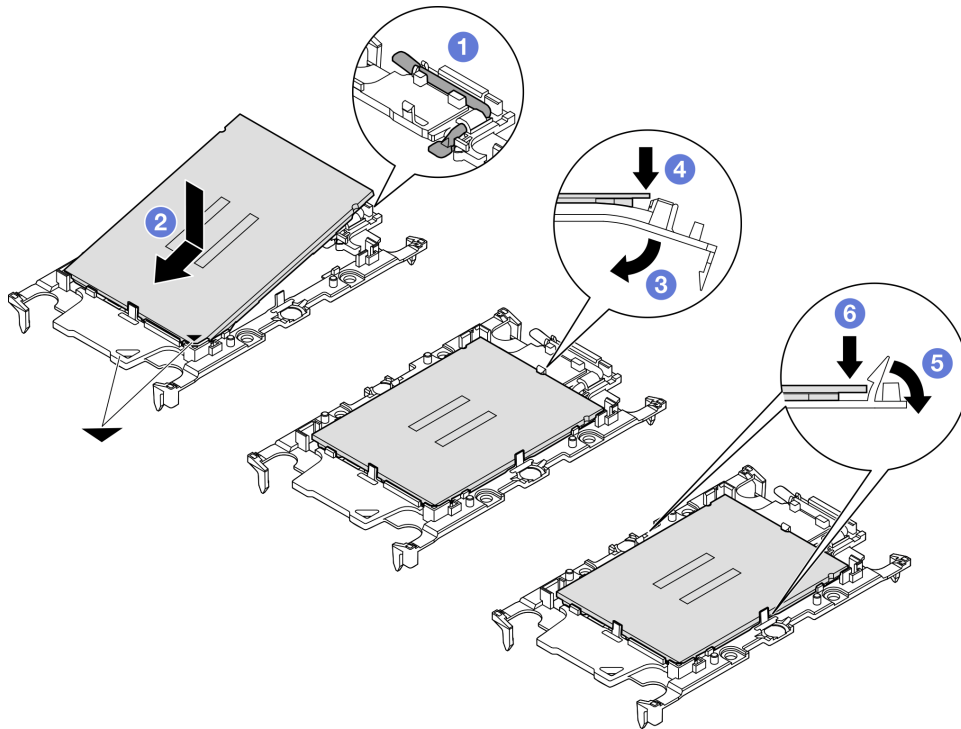


Figure 107. Installation of the processor carrier

**Note:** Replacement heat sinks come with different processor carriers. Make sure to use the carrier with the same carrier code markings as the one discarded.

1. ① Make sure the handle on the carrier is in the closed position.
2. ② Align the processor on the new carrier so that the triangular marks align; then, insert the marked end of the processor into the carrier.

3. ③ Hold the inserted end of the processor in place; then, pivot the unmarked end of the carrier down and away from the processor.
4. ④ Press the processor and secure the unmarked end under the clip on the carrier.
5. ⑤ Carefully pivot the sides of the carrier down and away from the processor.
6. ⑥ Press the processor and secure the sides under the clips on the carrier.

**Note:** To prevent the processor from falling out of the carrier, keep the processor-contact side up and hold the processor-carrier assembly by the sides of the carrier.

Step 3. Apply thermal grease.

- If you are replacing the heat sink and reusing the processor, a new heat sink comes with thermal grease and you do not need to apply new thermal grease.

**Note:** To ensure the best performance, check the manufacturing date on the new heat sink and make sure it does not exceed two years. Otherwise, wipe off the existing thermal grease and apply new thermal grease.

- If you are replacing the processor and reusing the heat sink, do the following steps to apply thermal grease:
  1. If there is any old thermal grease on the heat sink, wipe off the thermal grease with an alcohol cleaning pad.
  2. Carefully place the processor and carrier in the shipping tray with the processor-contact side down. Make sure the triangular mark on the carrier is oriented in the shipping tray as shown below.
  3. Apply the thermal grease on the top of the processor with syringe by forming four uniformly spaced dots, while each dot consists of about 0.1 ml of thermal grease.

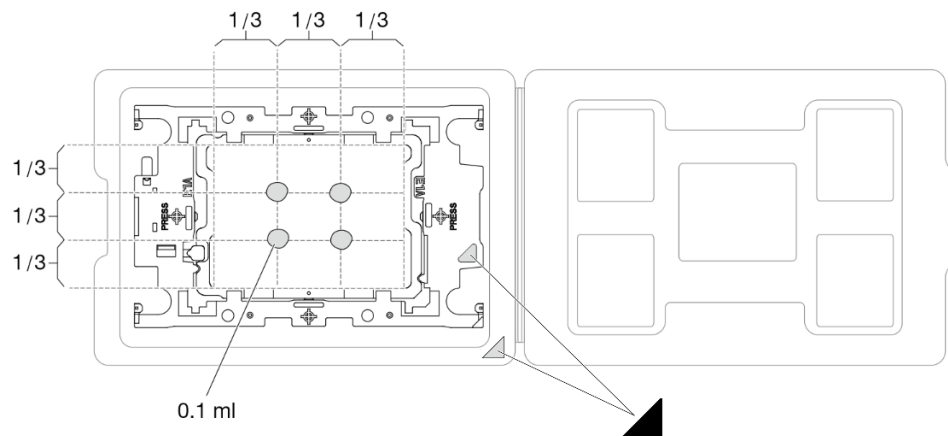


Figure 108. Thermal grease application with processor in shipping tray

Step 4. Assemble the processor and heat sink.

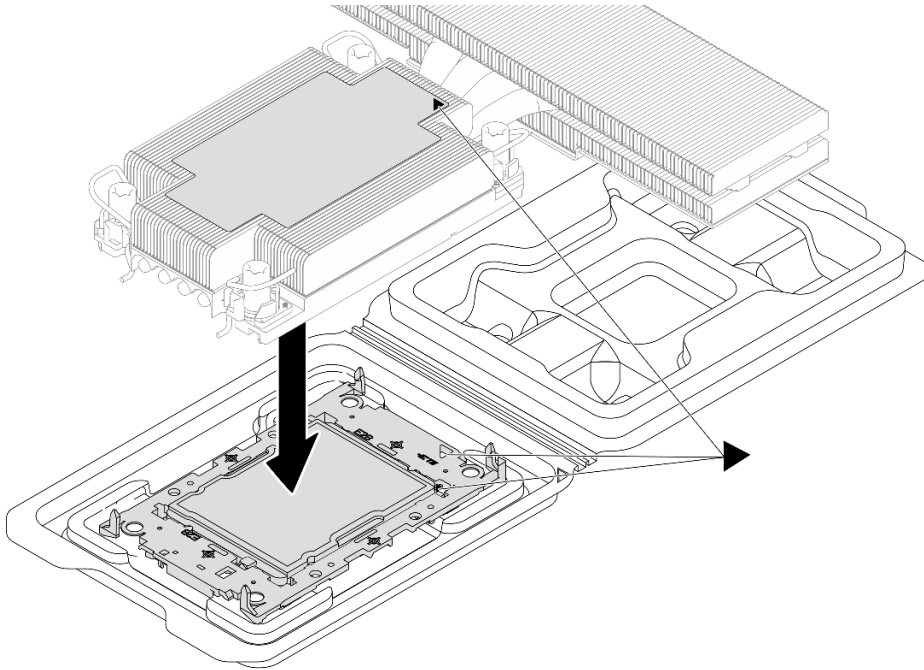


Figure 109. Assembling the PHM with processor in shipping tray

- a. Align the triangular mark on the heat sink label with the triangular mark on the processor carrier and processor.
- b. Install the heat sink onto the processor-carrier.
- c. Press the carrier into place until the clips at all four corners engage.

Step 5. Visually inspect to make sure that there is no gap between the processor carrier and the heat sink.

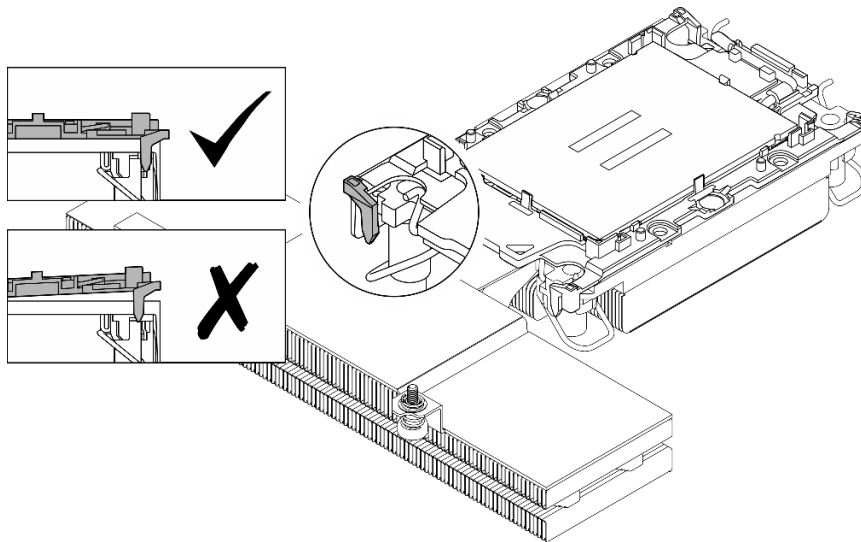


Figure 110. Visually inspect carrier clips

Step 6. Install the processor-heat-sink module to the processor board.



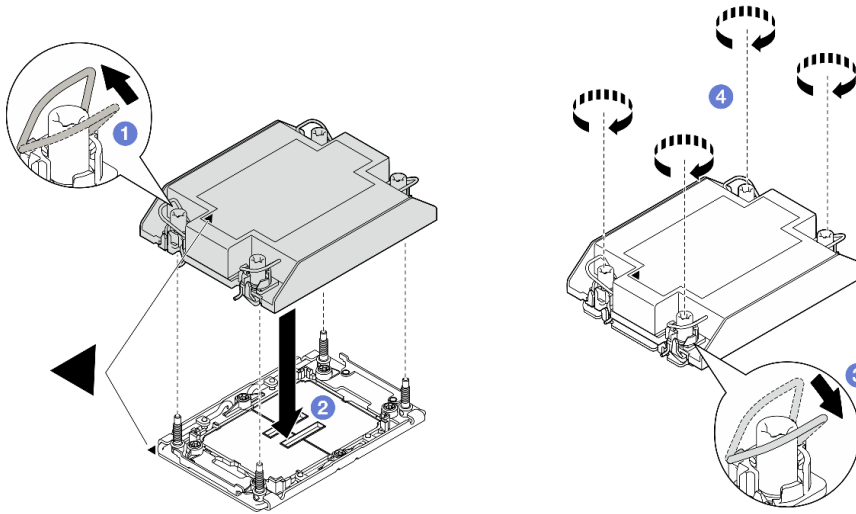


Figure 111. Installation of standard PHM

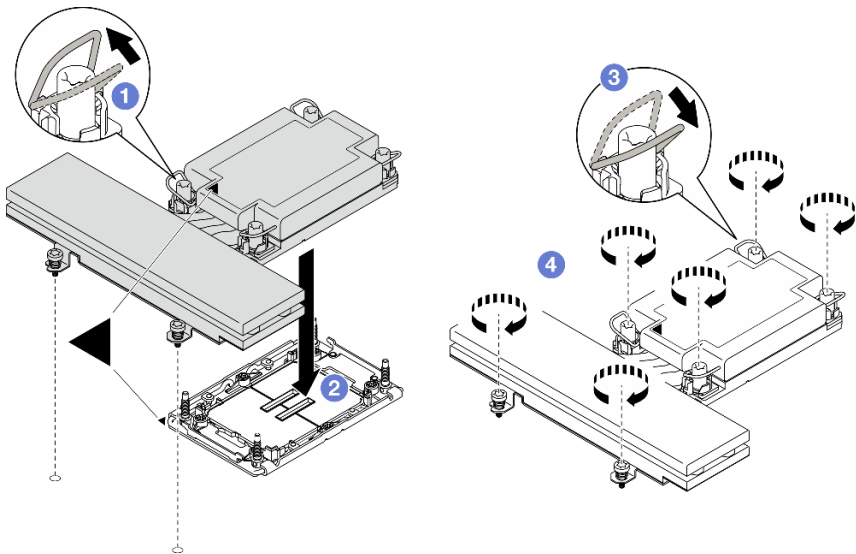


Figure 112. Installation of performance PHM

**Note:** For reference, the torque required for the screws to be fully tightened/removed is 10+/- 2.0 lbf-in, 1.1+/- 0.2 N-m.

- a. ① Rotate the anti-tilt wire bails inward.
- b. ② Align the triangular mark and four Torx T30 nuts on the PHM with the triangular mark and threaded posts of the processor socket; then, insert the PHM into the processor socket.
- c. ③ Rotate the anti-tilt wire bails outward until they engage with the hooks in the socket.
- d. ④ Fully tighten the Torx T30 nuts *in the installation sequence shown* on the heat-sink label. Tighten the screws until they stop; then, visually inspect to make sure that there is no gap between the screw shoulder beneath the heat sink and the processor socket.

## After you finish

1. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see [“Install the top cover”](#) on page 163).

2. Reinstall the node into the chassis (see [“Install a node to the chassis” on page 70](#)).
3. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see [“Install a hot-swap power supply” on page 54](#) and [“Power on the node” on page 42](#)).
4. Proceed to complete the parts replacement (see [“Complete the parts replacement” on page 164](#)).

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Rear I/O module replacement

Follow instructions in this section to remove or install the rear I/O module.

### Remove the rear I/O module

Follow instructions in this section to remove the rear I/O module.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.

### Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.
- b. Remove the node from the chassis (see [“Remove a node from the chassis” on page 66](#)); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- c. Remove the top cover (see [“Remove the top cover” on page 162](#)).
- d. If the PCIe riser assembly is installed, remove it from the node and disconnect the PCIe cables from the system board (see [“Remove the PCIe riser assembly” on page 119](#) and [Internal Cable Routing Guide](#)).

Step 2. Disconnect the cables from the rear I/O module.

Step 3. Remove the rear I/O module.

- a. ❶ Remove the four screws from the rear I/O module as illustrated.
- b. ❷ Slightly pull the rear I/O module toward the front of the node; then, lift it out of the node.

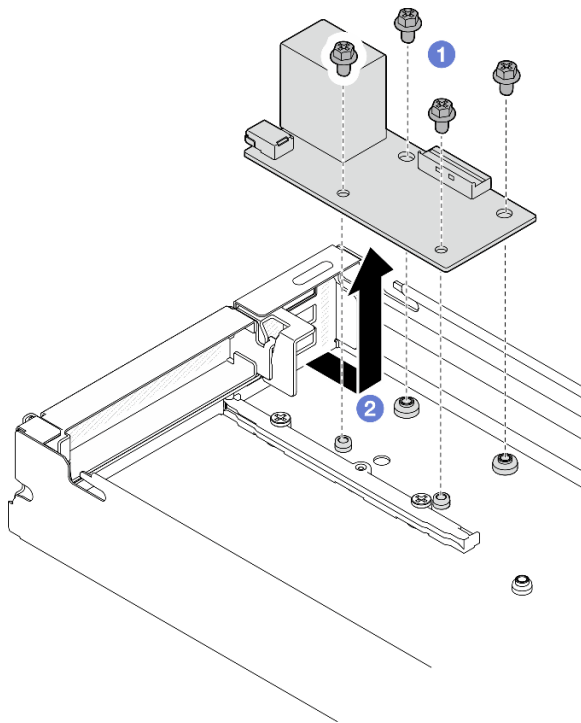


Figure 113. Removal of the rear I/O module

### After you finish

1. Install a replacement unit (see “[Install a rear I/O module](#)” on page 147).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

### Install a rear I/O module

Follow instructions in this section to install a rear I/O module.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

#### Attention:

- Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.
- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of the package and place it on a static-protective surface.

### Procedure

- Step 1. Install the rear I/O module to the node.

- a. ① Align the screw holes on the rear I/O module with the screw holes on the bottom of the node; then, lower the rear I/O module and slightly push it toward the rear into place.
- b. ② Tighten the four screws as illustrated to secure the rear I/O module.

**Note:** Make sure that the standoffs are securely seated in the holes of the rear I/O module as illustrated.

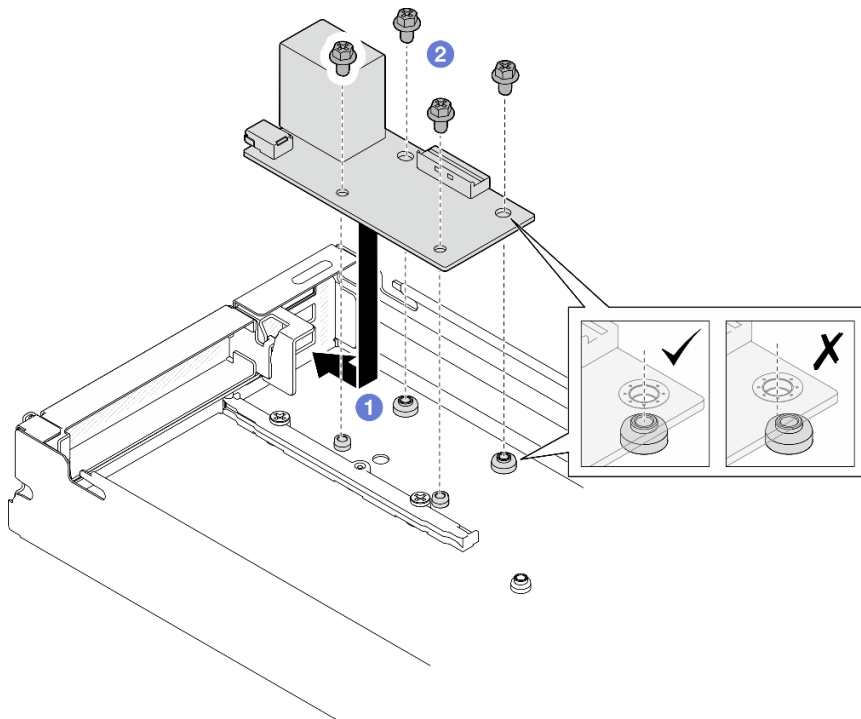


Figure 114. Installation of the rear I/O module

Step 2. Reconnect the cables to the rear I/O module.

### After you finish

1. Reinstall the PCIe riser assembly and reconnect the cables (see “Install a PCIe riser assembly” on page 124 and [Internal Cable Routing Guide](#)).
2. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see “Install the top cover” on page 163).
3. Reinstall the node into the chassis (see “Install a node to the chassis” on page 70).
4. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see “Install a hot-swap power supply” on page 54 and “Power on the node” on page 42).
5. Proceed to complete the parts replacement (see “Complete the parts replacement” on page 164).

### Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

### System board assembly replacement (trained technician only)

Follow instructions in this section to remove or install the system board assembly.

**Important:** This task must be operated by trained technicians.

**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 RoT security module.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.

### Procedure

Step 1. Make preparations for this task.

- a. Perform OneCLI commands to back up the UEFI settings. See [https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_save\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_save_command).
- 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](https://pubs.lenovo.com/lxce-onecli/onecli_r_save_command) and [https://pubs.lenovo.com/xcc3/NN1ia\\_c\\_backupthexcc.html](https://pubs.lenovo.com/xcc3/NN1ia_c_backupthexcc.html).
- c. Power off the node (see “[Power off the node](#)” on page 43); then, disconnect all external cables from the node.
- d. Remove the node from the chassis (see “[Remove a node from the chassis](#)” on page 66); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- e. Remove the top cover (see “[Remove the top cover](#)” on page 162).

Step 2. Locate the Firmware and RoT security module connector on the system board.

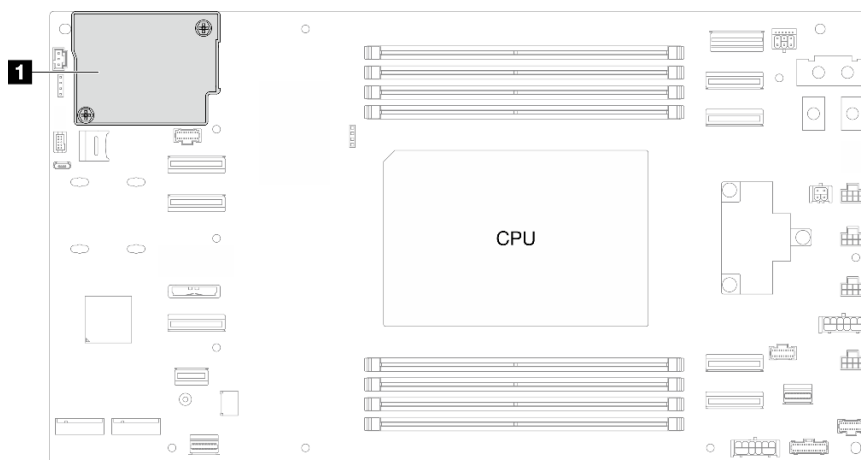


Figure 115. Location of the Firmware and RoT security module

- Step 3. Remove the firmware and RoT security module from the system board.
- 1 Loosen the two screws that secure the firmware and RoT security module on the system board.
  - 2 Lift the firmware and RoT security module away from the system board.

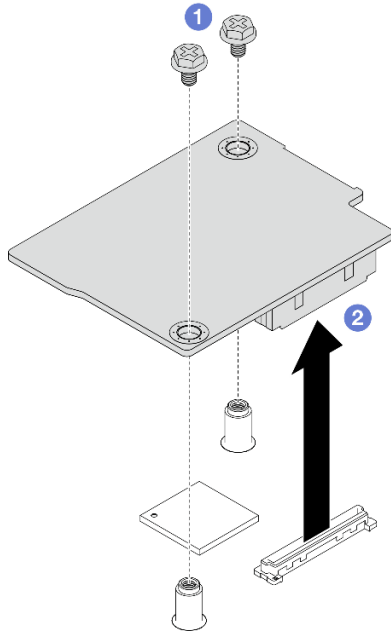


Figure 116. Removal of the Firmware and RoT security module

## After you finish

1. Install a replacement unit (see “[Install a firmware and RoT security module](#)” on page 150).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Install a firmware and RoT security module

Follow instructions in this section to install a firmware and RoT security module.

## About this task

**Important:** This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

(Lenovo trained technician only) After replacing the firmware and RoT security module, update the UEFI firmware to the specific version supported by the server. For detailed information on how to update the firmware, see <https://glosse4lenovo.lenovo.com/wiki/glosse4lenovo/view/How+To/System+related/How+to+do+RoT+Module+FW+update+on+ThinkSystem+V3+machines/> (Lenovo service technicians only).

To avoid potential danger, make sure to read and follow the safety information.

## Attention:

- Read “Installation Guidelines” on page 37 and “Safety inspection checklist” on page 38 to make sure that you work safely.
- Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of 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/thinksystem/sd520v4/7dfy/downloads/driver-list> to see the latest firmware and driver updates for your server.
- Go to “Update the firmware” on page 168 for more information on firmware updating tools.

## Procedure

- Step 1. Touch the static-protective package that contains the component to any unpainted metal surface on the node and chassis; then, take the component out of the package and place it on a static-protective surface.
- Step 2. Locate the Firmware and RoT security module connector on the system board.

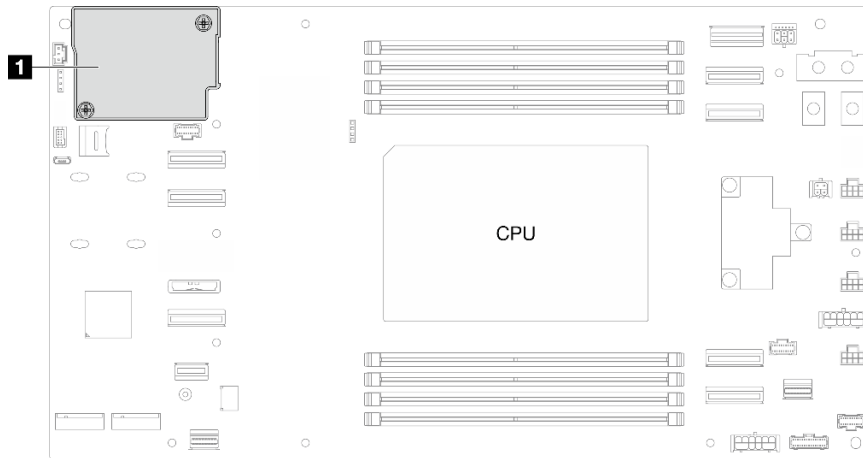


Figure 117. Location of the Firmware and RoT security module

- Step 3. Install the firmware and RoT security module to the node.
  - 1 Lower the firmware and RoT security module onto the system board and make sure that the connector on the module is correctly inserted into the slot on the system board.
  - 2 Tighten the two screws to secure the firmware and RoT security module.

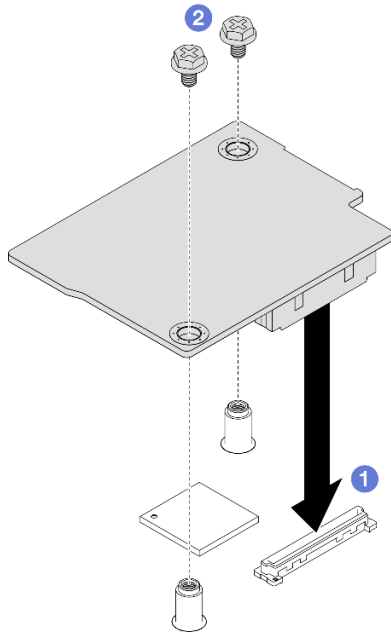


Figure 118. Installation of the firmware and RoT security module

## After you finish

1. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see “Install the top cover” on page 163).
2. Reinstall the node into the chassis (see “Install a node to the chassis” on page 70).
3. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see “Install a hot-swap power supply” on page 54 and “Power on the node” on page 42).
4. Proceed to complete the parts replacement (see “Complete the parts replacement” on page 164).
5. Update the UEFI, XCC and LXPM firmware to the specific version supported by the server. See <https://glosse4lenovo.lenovo.com/wiki/glosse4lenovo/view/How+To/System+related/How+to+do+RoT+Module+FW+update+on+ThinkSystem+V3+machines/> (Lenovo service technicians only).
6. Perform OneCLI commands to back up the UEFI settings. See [https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_save\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_save_command).
7. Perform both OneCLI commands and XCC actions to back up the XCC settings. See [https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_save\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_save_command) and [https://pubs.lenovo.com/xcc3/NN1ia\\_c\\_backupthexcc.html](https://pubs.lenovo.com/xcc3/NN1ia_c_backupthexcc.html).
8. Optionally, do the following if needed:
  - Hide TPM. See “Hide/observe TPM” on page 159.
  - Update the TPM firmware. See “Update the TPM firmware” on page 160.
  - Enable UEFI Secure Boot. See “Enable UEFI Secure Boot” on page 161.

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Remove the system board (Trained technician only)

Follow instructions in this section to remove the system board.



## Important:

- This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.
- When 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 assembly.**

## About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.

## Procedure

Step 1. Make preparations for this task.

- a. Record all system configuration information, such as Lenovo XClarity Controller IP addresses, vital product data, and the machine type, model number, serial number, Universally Unique Identifier, and asset tag of the server.
- b. Save the system configuration to an external device with Lenovo XClarity Essentials.
- c. Save the system event log to external media.
- d. Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.
- e. Remove the node from the chassis (see [“Remove a node from the chassis” on page 66](#)); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
- f. Remove the top cover (see [“Remove the top cover” on page 162](#)).
- g. Remove the processor and heat sink (see [“Remove the processor and heat sink” on page 133](#)).
- h. Remove the firmware and RoT security module (see [“Remove the firmware and RoT security module” on page 149](#)).
- i. Make sure to label the slot number on each memory module; then, remove all the memory modules from the system board and set them aside on a static-protective surface for reinstallation (see [“Remove a memory module” on page 109](#)).

**Important:** It is advised to print out the layout of memory module slots for reference.

- j. If necessary, remove the M.2 drives (see [“Remove an M.2 drive” on page 95](#)).
- k. Remove the microSD card (see [“Remove the MicroSD card” on page 114](#)).
- l. If the PCIe riser assembly is installed, remove it from the node and disconnect the PCIe cables from the system board (see [“Remove the PCIe riser assembly” on page 119](#) and [Internal Cable Routing Guide](#)).
- m. Remove the power bus bar (see [“Remove the power bus bar” on page 126](#)).

- Step 2. Disconnect all the cables from the system board. When disconnecting the cables, make a list of each cable and record the connectors the cables are connected to, and use the record as a cabling checklist after installing the new system board.
- Step 3. Loosen the screws that secure the cable walls and lift them out of the node.

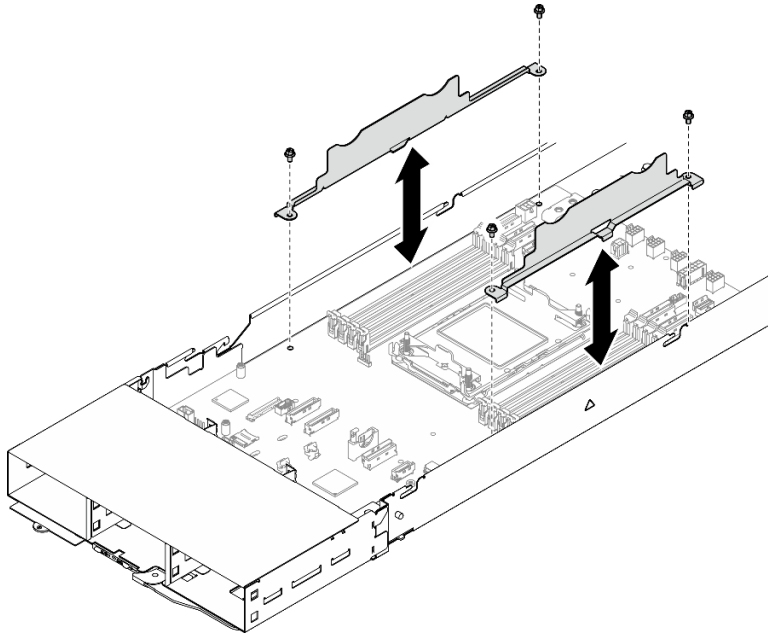


Figure 119. Cable wall removal

- Step 4. Remove all the screws from the system board.

**Important:** When removing the system board from the node, avoid touching the connectors on the system board. Do not damage any surrounding components inside the node.

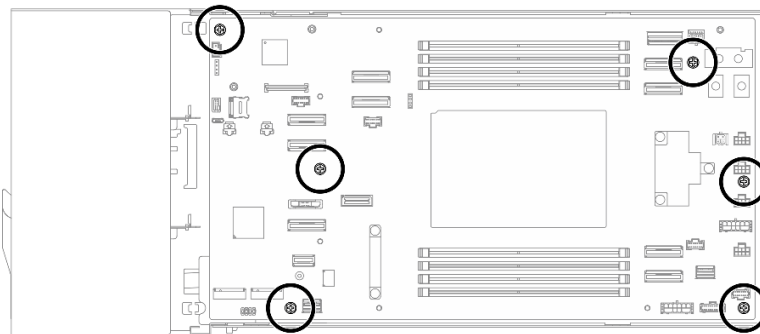


Figure 120. System board screw location

- Step 5. Carefully lift the system board out of the node

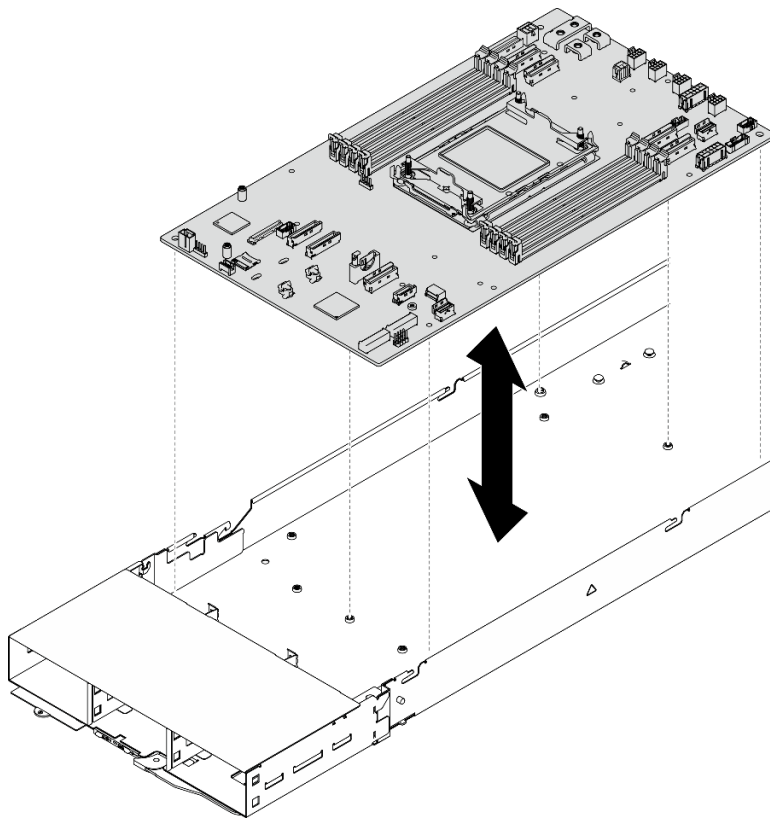


Figure 121. Removal of the system board

## After you finish

1. Install a replacement unit (see “[Install a system board \(Trained technician only\)](#)” on page 155).
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.

**Important:** Before returning the system board, make sure to install the processor socket covers from the new system board. Follow the steps below to replace a processor socket cover:

- a. 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.
- b. 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 when it is securely attached.
- c. Make sure that the socket cover is securely attached to the processor socket assembly.

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Install a system board (Trained technician only)

Follow instructions in this section to install a system board.

## About this task

**Important:** This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.

To avoid potential danger, make sure to read and follow the safety information.

**Attention:**

- Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure 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.
- After replacing the system board, always update the server with the latest firmware or restore the pre-existing firmware.

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

- Go to <https://datacentersupport.lenovo.com/products/servers/thinksystem/sd520v4/7dfy/downloads/driver-list> to see the latest firmware and driver updates for your server.
- Go to “[Update the firmware](#)” on page 168 for more information on firmware updating tools.

**Procedure**

Step 1. Carefully seat the system board onto the corresponding guide pins and screw holes in the node.

**Note:** Make sure that the standoffs are securely seated in the holes of the system board.

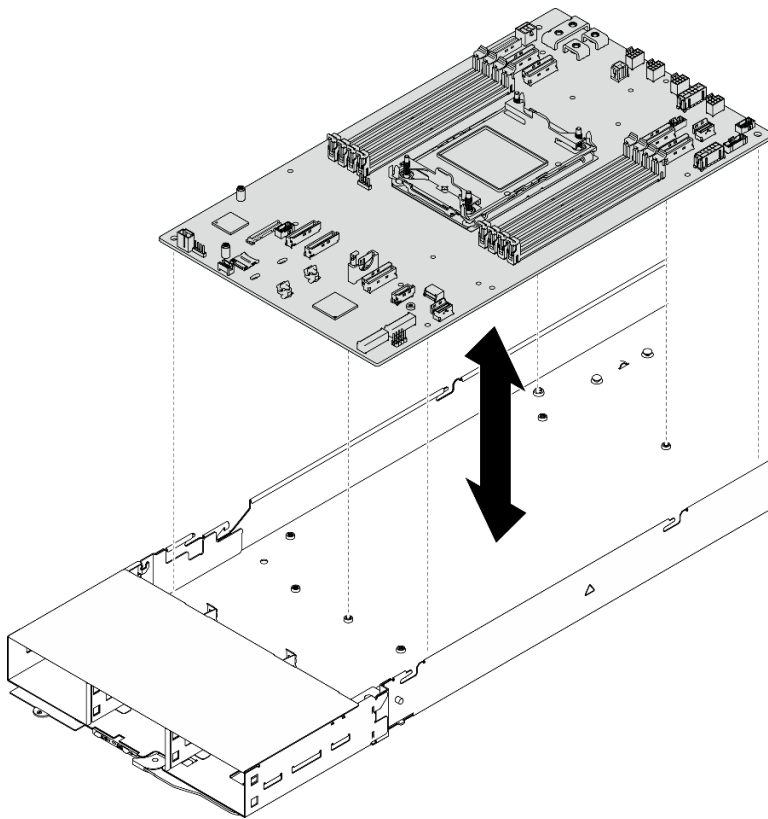


Figure 122. Installation of the system board

Step 2. Tighten all the screws on the system board.

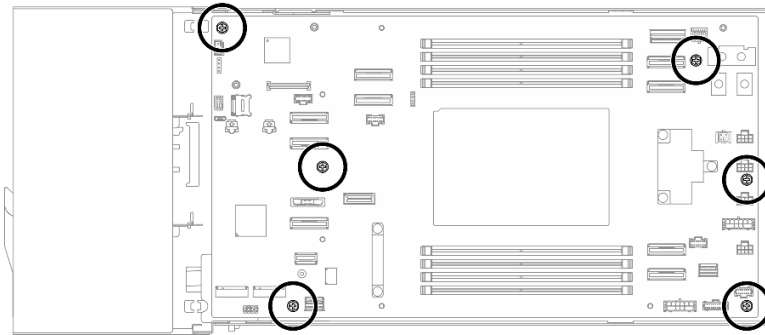


Figure 123. System board screw location

Step 3. Reinstall the cable walls and secure them with screws.

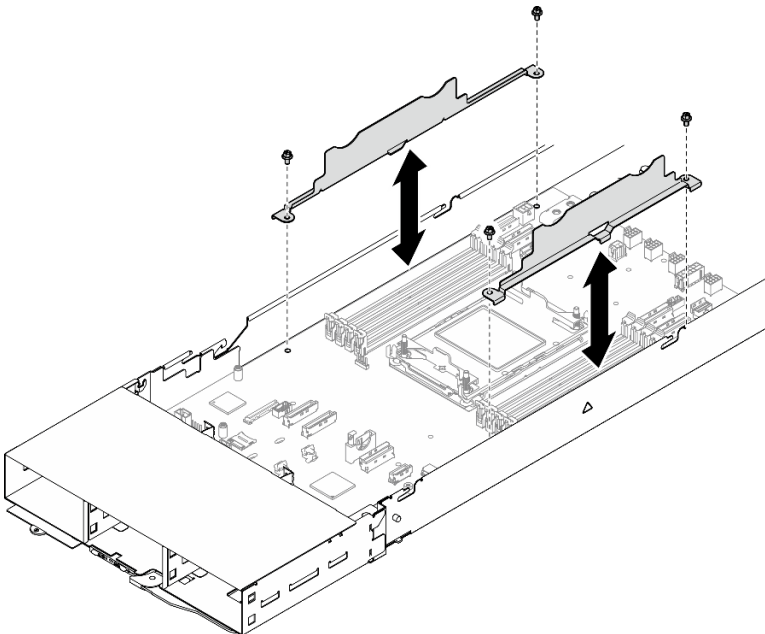


Figure 124. Cable wall installation

## After you finish

1. Reconnect all the required cables to the system board (see [Internal Cable Routing Guide](#)).
2. Reinstall the power bus bar (see [“Install a power bus bar” on page 128](#)).
3. Reinstall the PCIe riser assembly and reconnect the cables (see [“Install a PCIe riser assembly” on page 124](#) and [Internal Cable Routing Guide](#)).
4. Reinstall the MicroSD card to the system board (see [“Install a MicroSD card” on page 115](#)).
5. Reinstall the required M.2 drives to the system board (see [“Install an M.2 drive” on page 105](#)).
6. Reinstall all the required memory modules or memory module fillers (see [“Install a memory module” on page 111](#)).
7. Reinstall the firmware and RoT security module to the system board (see [“Install a firmware and RoT security module” on page 150](#)).

8. Reinstall the processor heat sink (see “[Install a processor and heat sink](#)” on page 139).

**Important:** This task must be operated by trained technicians.

9. Make sure that all the required cables are routed and connected correctly; then, reinstall the top cover (see “[Install the top cover](#)” on page 163).
10. Reinstall the node into the chassis (see “[Install a node to the chassis](#)” on page 70).
11. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see “[Install a hot-swap power supply](#)” on page 54 and “[Power on the node](#)” on page 42).
12. Proceed to complete the parts replacement (see “[Complete the parts replacement](#)” on page 164).
13. Update the vital product data (VPD). See “[Update the Vital Product Data \(VPD\)](#)” on page 158. Machine type number and serial number can be found on the ID label, see “[Identify the system and access the Lenovo XClarity Controller](#)” on page 31.
14. If hiding TPM or updating TPM firmware is needed, see “[Hide/observe TPM](#)” on page 159 or “[Update the TPM firmware](#)” on page 160.
15. Optionally, enable UEFI Secure Boot. See “[Enable UEFI Secure Boot](#)” on page 161.
16. Download and install the latest device drivers: <https://datacentersupport.lenovo.com/products/servers/thinksystem/sd520v4/7dfy/downloads/driver-list>.
17. Update the system and device firmware. See “[Update the firmware](#)” on page 168.

**Note:** If you have replaced the firmware and RoT security module, update the firmware to the specific version supported by the server. See <https://glosse4lenovo.lenovo.com/wiki/glosse4lenovo/view/How+To/System+related/How+to+do+RoT+Module+FW+update+on+ThinkSystem+V3+machines/> (Lenovo service technicians only).

## Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## 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 VPD.SysInfoProdName10 <m/t_model> [access_method]`
- Updating **serial number**  
`onecli config set VPD.SysInfoSerialNum10 <s/n> [access_method]`
- Updating **system model**  
`onecli config set VPD.SysInfoProdIdentifier <system model> [access_method]`
- Updating **asset tag**  
`onecli config set VPD.SysEncloseAssetTag <asset_tag> [access_method]`
- Updating **UUID**  
`onecli config createuuid VPD.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 aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa, where aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa is the asset tag number.
[access_method]	<p>The access method that you select to access the target server.</p> <ul style="list-style-type: none"> <li>• Online KCS (unauthenticated and user restricted): You can directly delete [access_method] from the command.</li> <li>• Online authenticated LAN: In this case, specify below LAN account information at the end of the OneCLI command: --bmc -username &lt;user_id&gt; --bmc -password &lt;password&gt;</li> <li>• Remote WAN/LAN: In this case, specify below XCC account information and IP address at the end of the OneCLI command: --bmc &lt;bmc_user_id&gt;:&lt;bmc_password&gt;@&lt;bmc_external_IP&gt;</li> </ul> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>– &lt;bmc_user_id&gt; The BMC account name (1 of 12 accounts). The default value is USERID.</li> <li>– &lt;bmc_password&gt; The BMC account password (1 of 12 accounts).</li> </ul>

## Hide/observe TPM

TPM is enabled by default to encrypt data transfer for system operation. Optionally, you can disable TPM using Unified Extensible Firmware Interface (UEFI) or Lenovo XClarity Essentials OneCLI.

## Using UEFI

For details, see “Hide TPM from OS” in *UEFI User Guide* at <https://pubs.lenovo.com/uefi-overview/>.

## 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 UEFI.TrustedComputingGroup_TPMDevice "Disabled" --bmc <userid>:<password>@<ip_
address>
```

where:

- <userid>:<password> are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSWORD (zero, not an uppercase o)
- <ip\_address> is the IP address of the BMC.

Example:

```
D:\onecli>OneCli.exe config set UEFI.TrustedComputingGroup_TPMDevice "Disabled" --bmc USERID:PASSWORD@10.245.38.64
[ls]Certificate check finished [100%][=====>]
Start to connect BMC at 10.245.38.64 to apply config set
Invoking SET command ...
UEFI.TrustedComputingGroup_TPMDevice=Disabled
Changes completed successfully, but these changes will not take effect until next reboot.
Succeed.
```

3. Reboot the system.

If you want to enable TPM again, run the following command and reboot the system:

```
OneCli.exe config set UEFI.TrustedComputingGroup_TPMDevice "Enabled" --bmc <userid>:<password>@<ip_address>
```

Example:

```
D:\onecli>OneCli.exe config set UEFI.TrustedComputingGroup_TPMDevice "Enabled" --bmc USERID:PASSWORD@10.245.38.64
[ls]Certificate check finished [100%][=====>]
Start to connect BMC at 10.245.38.64 to apply config set
Invoking SET command ...
UEFI.TrustedComputingGroup_TPMDevice=Enabled
Changes completed successfully, but these changes will not take effect until next reboot.
Succeed.
```

## Update the TPM firmware

Optionally, you can update the TPM firmware using Lenovo XClarity Essentials OneCLI.

**Note:** TPM firmware update is irreversible. After update, the TPM firmware cannot be downgraded to earlier versions.

### TPM firmware version

Follow the procedure below to see the TPM firmware version:

From Lenovo XClarity Provisioning Manager

1. Start the server and press the key specified in the on-screen instructions to display the Lenovo XClarity Provisioning Manager interface. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.)



2. If the power-on Administrator password is required, enter the password.
3. From the UEFI Setup page, click **System Settings → Security → Trusted Platform Module → TPM 2.0 → TPM Firmware Version**.

### Update the TPM firmware

To update the TPM firmware, do the following:

1. Download and install Lenovo XClarity Essentials OneCLI.

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

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

2. Run the following command:

```
OneCli.exe config set TrustedComputingGroup.DeviceOperation "Update to TPM 2.0 firmware version <x.x.x.x>" --bmc <userid>:<password>@<ip_address>
```

where:

- <x.x.x.x> is the target TPM version.

e.g. TPM 2.0 (7.2.1.0) -> TPM 2.0 (7.2.2.0):

```
OneCli.exe config set TrustedComputingGroup.DeviceOperation "Update to TPM 2.0 firmware version 7.2.2.0" --bmc <userid>:<password>@<ip_address>
```

- <userid>:<password> are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSWORD (zero, not an uppercase o).
- <ip\_address> is the IP address of the BMC.

### Enable UEFI Secure Boot

Optionally, you can enable UEFI Secure Boot.

There are two methods available to enable UEFI Secure Boot:

- From Lenovo XClarity Provisioning Manager

To enable UEFI Secure Boot from Lenovo XClarity Provisioning Manager:

1. Start the server and press the key specified in the on-screen instructions to display the Lenovo XClarity Provisioning Manager interface. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.)
2. If the power-on Administrator password is required, enter the password.
3. From the UEFI Setup page, click **System Settings → Security → Secure Boot Configuration → Secure Boot Setting**.
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 UEFI.SecureBootConfiguration_SecureBootSetting Enabled --bmc
<userid>:<password>@<ip_address>
```

where:

- <userid>:<password> are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSWORD (zero, not an uppercase o)
- <ip\_address> is the IP address of the BMC.

For more information about the Lenovo XClarity Essentials OneCLI `set` command, see:

[https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_set\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_set_command)

**Note:** If disabling UEFI secure boot is needed, run the following command:

```
OneCli.exe config set UEFI.SecureBootConfiguration_SecureBootSetting Disabled --bmc <userid>:<password>@<ip_
address>
```

## Top cover replacement

Follow instructions in this section to remove or install the top cover.

### Remove the top cover

Follow instructions in this section to remove the top cover from the node.

### About this task

To avoid potential danger, make sure to read and follow the safety information.

**Attention:** Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.

### Procedure

Step 1. Make preparations for this task.

- a. Power off the node (see “[Power off the node](#)” on page 43); then, disconnect all external cables from the node.
- b. Remove the node from the chassis (see “[Remove a node from the chassis](#)” on page 66); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.

Step 2. Remove the top cover from the node.

- a. ❶ Press the release button on the side of the top cover.
- b. ❷ Slide the top cover toward the rear of the node; then, lift it up from the node and place it on a flat and clean surface.

#### Important:

- Service label is located on the inside of the top cover (see “[Identify the system and access the Lenovo XClarity Controller](#)” on page 31).
- For proper cooling and air flow, install the top cover before powering on the node. Operating the node with the top cover removed might damage the components.

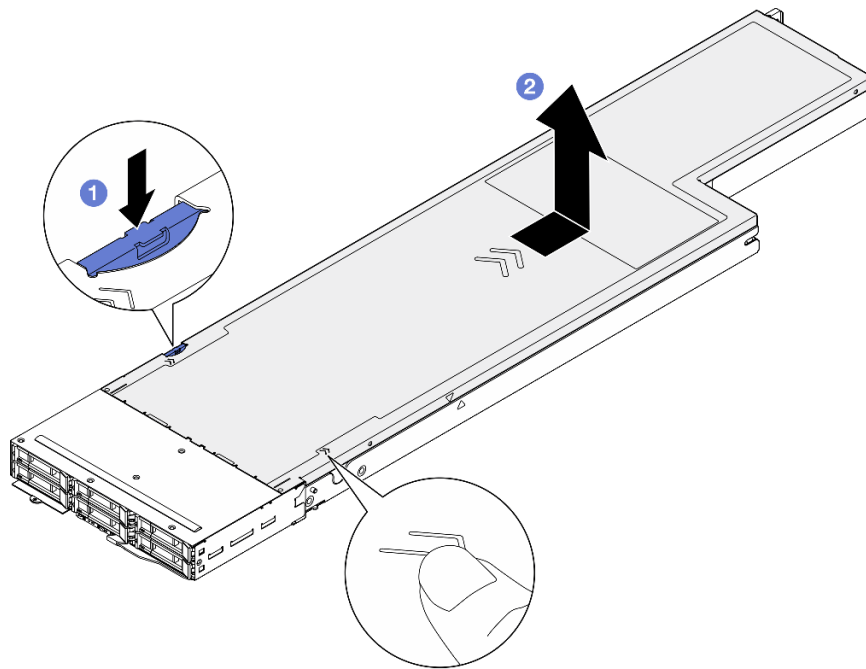


Figure 125. Removal of the top cover

## After you finish

1. Install a replacement unit (see “[Install the top cover](#)” on page 163).
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

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

## Install the top cover

Follow instructions in this section to install the top cover.

## About this task

To avoid potential danger, make sure to read and follow the safety information.

### Attention:

- Read “[Installation Guidelines](#)” on page 37 and “[Safety inspection checklist](#)” on page 38 to make sure that you work safely.
- Make sure that all cables, adapters, and other components are installed and seated correctly and that there are no loose tools or parts left inside the node.
- Make sure that all internal cables are correctly routed (see [Internal Cable Routing Guide](#)).

## Procedure

- Step 1. Align the top cover guide pins with the guide holes on the node; then, place the top cover onto the top of the node and slide it towards the front of the node until it engages with the node.
- Step 2. Check and make sure that the button on the side of the top cover is in locked position.

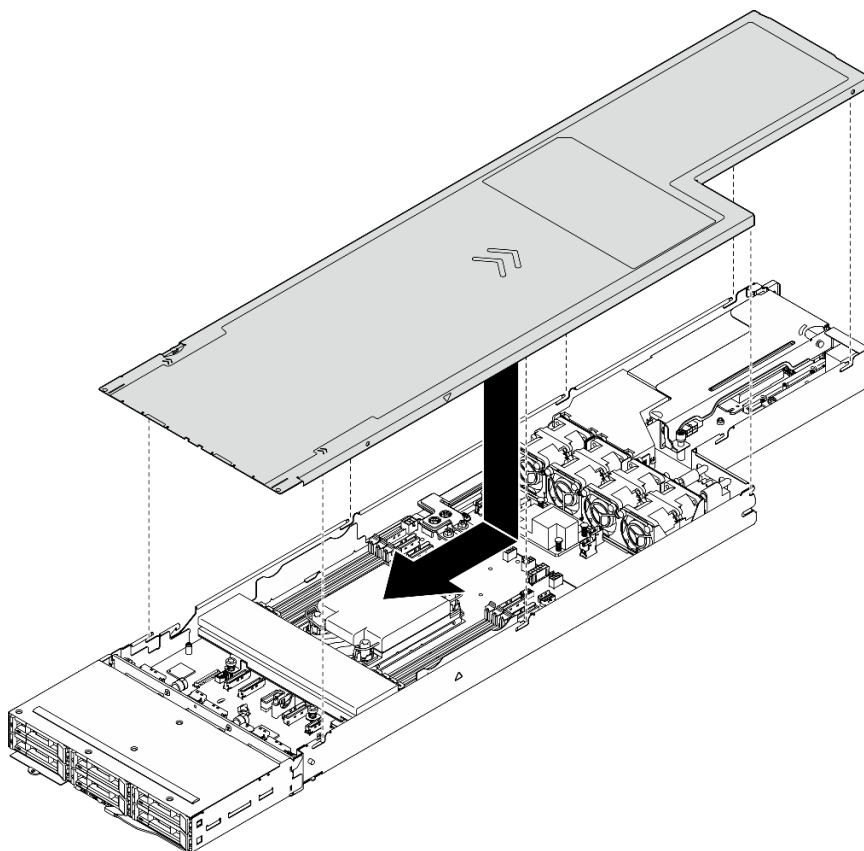


Figure 126. Installation of the top cover

### After you finish

1. Reinstall the node into the chassis (see “Install a node to the chassis” on page 70).
2. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see “Install a hot-swap power supply” on page 54 and “Power on the node” on page 42).
3. Proceed to complete the parts replacement (see “Complete the parts replacement” on page 164).

### Demo video

<https://www.youtube.com/playlist?list=PLYV5R7hVcs-BV61ALBGEq0-rwafjv9SpF>

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## Complete the parts replacement

Go through the checklist to complete parts replacement.

To complete the parts replacement, do the following:

1. Make sure that all components have been reassembled correctly and that no tools or loose screws are left inside the node.
2. Properly route and secure the cables in the node. Refer to the cable connecting and routing information for each component (see [Internal Cable Routing Guide](#)).
3. Reinstall the node into the chassis (see “Install a node to the chassis” on page 70).

4. Make sure that the required power supply units are installed and power cords are connected; then, power on the node (see [“Install a hot-swap power supply” on page 54](#) and [“Power on the node” on page 42](#)).
5. Update the system configuration.
  - Download and install the latest device drivers: <http://datacentersupport.lenovo.com>.
  - Update the system firmware. See [“Update the firmware” on page 168](#).
  - 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 system.



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## Chapter 6. System configuration

Complete these procedures to configure your system.

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### Set the network connection for the Lenovo XClarity Controller

Before you can access the Lenovo XClarity Controller over your network, you need to specify how Lenovo XClarity Controller will connect to the network. Depending on how the network connection is implemented, you might need to specify a static IP address as well.

The following methods are available to set the network connection for the Lenovo XClarity Controller if you are not using DHCP:

- If a monitor is attached to the server, you can use Lenovo XClarity Provisioning Manager to set the network connection.

Complete the following steps to connect the Lenovo XClarity Controller to the network using the Lenovo XClarity Provisioning Manager.

1. Start the server.
2. Press the key specified in the on-screen instructions to display the Lenovo XClarity Provisioning Manager interface. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.)
3. Go to **LXPM → UEFI Setup → BMC Settings** to specify how the Lenovo XClarity Controller will connect to the network.
  - If you choose a static IP connection, make sure that you specify an IPv4 or IPv6 address that is available on the network.
  - If you choose a DHCP connection, make sure that the MAC address for the server has been configured in the DHCP server.
4. Click **OK** to apply the setting and wait for two to three minutes.
5. Use an IPv4 or IPv6 address to connect Lenovo XClarity Controller.

**Important:** The Lenovo XClarity Controller is set initially with a user name of USERID and password of PASSW0RD (with a zero, not the letter O). This default user setting has Supervisor access. It is required to change this user name and password during your initial configuration for enhanced security.

- If no monitor is attached to the server, you can set the network connection through the Lenovo XClarity Controller interface. Connect an Ethernet cable from your laptop to XCC system management port (10/100/1000 Mbps RJ-45) on your server. For the location of the XCC system management port (10/100/1000 Mbps RJ-45), see [Chapter 2 “Hardware components” on page 17](#).

**Note:** Make sure that you modify the IP settings on the laptop so that it is on the same network as the server default settings.

The default IPv4 address and the IPv6 Link Local Address (LLA) is provided on the Lenovo XClarity Controller Network Access label that is affixed to the Pull Out Information Tab. See [“Identify the system and access the Lenovo XClarity Controller” on page 31](#).

- If you are using the Lenovo XClarity Administrator Mobile app from a mobile device, you can connect to the Lenovo XClarity Controller through the Lenovo XClarity Controller USB connector on the server. For the location of the Lenovo XClarity Controller USB connector, see [Chapter 2 “Hardware components” on page 17](#).

**Note:** The Lenovo XClarity Controller USB connector mode must be set to manage the Lenovo XClarity Controller (instead of normal USB mode). To switch from normal mode to Lenovo XClarity Controller management mode, hold the ID button on the server for at least 3 seconds until its LED flashes slowly (once every couple of seconds). See [Chapter 2 “Hardware components” on page 17](#) for the location of the ID button.

To connect using the Lenovo XClarity Administrator Mobile app:

1. Connect the USB cable of your mobile device to the Lenovo XClarity Controller USB connector on the server.
2. On your mobile device, enable USB tethering.
3. On your mobile device, launch the Lenovo XClarity Administrator mobile app.
4. If automatic discovery is disabled, click **Discovery** on the USB Discovery page to connect to the Lenovo XClarity Controller.

For more information about using the Lenovo XClarity Administrator Mobile app, see:

[https://pubs.lenovo.com/lxca/lxca\\_usemobileapp](https://pubs.lenovo.com/lxca/lxca_usemobileapp)

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## Update the firmware

Several options are available to update the firmware for the system.

The tools listed here can be used to update the most current firmware for the chassis, nodes, and the devices that are installed in the system.

- Best practices related to updating firmware is available at the following site:
  - <https://lenovopress.lenovo.com/lp0656-lenovo-thinksystem-firmware-and-driver-update-best-practices>
- The latest firmware can be found at the following site:
  - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sd520v4/7dfy/downloads/driver-list>
- You can subscribe to product notification to stay up to date on firmware updates:
  - <https://datacentersupport.lenovo.com/solutions/ht509500>

### Update Bundles (Service Packs)

Lenovo typically releases firmware in bundles called Update Bundles (Service Packs). To ensure that all of the firmware updates are compatible, you should update all firmware at the same time. If you are updating firmware for both the Lenovo XClarity Controller and UEFI, update the firmware for Lenovo XClarity Controller first.

### Update method terminology

- **In-band update.** The installation or update is performed using a tool or application within an operating system that is executing on the server’s core CPU.
- **Out-of-band update.** The installation or update is performed by the Lenovo XClarity Controller collecting the update and then directing the update to the target subsystem or device. Out-of-band updates have no dependency on an operating system executing on the core CPU. However, most out-of-band operations do require the server to be in the S0 (Working) power state.
- **On-Target update.** The installation or update is initiated from an installed operating system executing on the target server itself.
- **Off-Target update.** The installation or update is initiated from a computing device interacting directly with the server’s Lenovo XClarity Controller.



- **Update Bundles (Service Packs).** Update Bundles (Service Packs) are bundled updates designed and tested to provide the interdependent level of functionality, performance, and compatibility. Update Bundles (Service Packs) are server machine-type specific and are built (with firmware and device driver updates) to support specific Windows Server, Red Hat Enterprise Linux (RHEL) and SUSE Linux Enterprise Server (SLES) operating system distributions. Machine-type-specific firmware-only Update Bundles (Service Packs) are also available.

### Firmware updating tools

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

Tool	Update Methods Supported	Core System Firmware Updates	I/O Devices Firmware Updates	Drive Firmware Updates	Graphical user interface	Command line interface	Supports Static Bundles (Service Packs)	Chassis Mid-plane PSoC Firmware Update
<b>Lenovo XClarity Provisioning Manager (LXPM)</b>	In-band <sup>2</sup> On-Target	√			√			
<b>Lenovo XClarity Controller (XCC)</b>	In-band <sup>4</sup> Out-of-band Off-Target	√	Selected I/O devices	√ <sup>3</sup>	√		√	√
<b>Lenovo XClarity Essentials OneCLI (OneCLI)</b>	In-band Out-of-band On-Target Off-Target	√	All I/O devices	√ <sup>3</sup>		√	√	√
<b>Lenovo XClarity Essentials UpdateXpress (LXCE)</b>	In-band Out-of-band On-Target Off-Target	√	All I/O devices		√		√	
<b>Lenovo XClarity Essentials Bootable Media Creator (BoMC)</b>	In-band Out-of-band Off-Target	√	All I/O devices		√ (BoMC application)	√ (BoMC application)	√	

Tool	Update Methods Supported	Core System Firmware Updates	I/O Devices Firmware Updates	Drive Firmware Updates	Graphical user interface	Command line interface	Supports Static Bundles (Service Packs)	Chassis Mid-plane PSoC Firmware Update
<b>Lenovo XClarity Administrator (LXCA)</b>	In-band <sup>1</sup> Out-of-band <sup>2</sup> Off-Target	✓	All I/O devices	✓	✓		✓	
<b>Lenovo XClarity Integrator (LXCI) for VMware vCenter</b>	Out-of-band Off-Target	✓	Selected I/O devices		✓			
<b>Lenovo XClarity Integrator (LXCI) for Microsoft Windows Admin Center</b>	In-band Out-of-band On-Target Off-Target	✓	All I/O devices		✓		✓	

**Notes:**

1. For I/O firmware updates.
2. For BMC and UEFI firmware updates.
3. Drive firmware update is only supported by the tools and methods below:
  - XCC Bare Metal Update (BMU): In-band, and requires system reboot.
  - Lenovo XClarity Essentials OneCLI: In-band, and does not require system reboot.
4. Bare Metal Update (BMU) only.

• **Lenovo XClarity Provisioning Manager**

From Lenovo XClarity Provisioning Manager, you can update the Lenovo XClarity Controller firmware, the UEFI firmware, and the Lenovo XClarity Provisioning Manager software.

**Note:** By default, the Lenovo XClarity Provisioning Manager Graphical User Interface is displayed when you start the server and press the key specified in the on-screen instructions. If you have changed that default to be the text-based system setup, you can bring up the Graphical User Interface from the text-based system setup interface.

For additional information about using Lenovo XClarity Provisioning Manager to update firmware, see:

“Firmware Update” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>

• **Lenovo XClarity Controller**

If you need to install a specific update, you can use the Lenovo XClarity Controller interface for a specific server.

**Notes:**

- To perform an in-band update through Windows or Linux, the operating system driver must be installed and the Ethernet-over-USB (sometimes called LAN over USB) interface must be enabled.

For additional information about configuring Ethernet over USB, see:

“Configuring Ethernet over USB” section in the XCC documentation version compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>

- If you update firmware through the Lenovo XClarity Controller, make sure that you have downloaded and installed the latest device drivers for the operating system that is running on the server.

For additional information about using Lenovo XClarity Controller to update firmware, see:

“Updating Server Firmware” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>

- **Lenovo XClarity Essentials OneCLI**

Lenovo XClarity Essentials OneCLI is a collection of command line applications that can be used to manage Lenovo servers. Its update application can be used to update firmware and device drivers for your servers. The update can be performed within the host operating system of the server (in-band) or remotely through the BMC of the server (out-of-band).

For additional information about using Lenovo XClarity Essentials OneCLI to update firmware, see:

[https://pubs.lenovo.com/lxce-onecli/onecli\\_c\\_update](https://pubs.lenovo.com/lxce-onecli/onecli_c_update)

- **Lenovo XClarity Essentials UpdateXpress**

Lenovo XClarity Essentials UpdateXpress provides most of OneCLI update functions through a graphical user interface (GUI). It can be used to acquire and deploy Static Bundle update packages and individual updates. Static Bundle contain firmware and device driver updates for Microsoft Windows and for Linux.

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

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

- **Lenovo XClarity Essentials Bootable Media Creator**

You can use Lenovo XClarity Essentials Bootable Media Creator to create bootable media that is suitable for firmware updates, VPD updates, inventory and FFDC collection, advanced system configuration, FoD Keys management, secure erase, RAID configuration, and diagnostics on supported servers.

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

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

- **Lenovo XClarity Administrator**

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

For additional information about using Lenovo XClarity Administrator to update firmware, see:

[https://pubs.lenovo.com/lxca/update\\_fw](https://pubs.lenovo.com/lxca/update_fw)

- **Lenovo XClarity Integrator offerings**

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

For additional information about using Lenovo XClarity Integrator to update firmware, see:

<https://pubs.lenovo.com/lxci-overview/>

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## Configure the firmware

Several options are available to install and set up the firmware for the server.

**Note:** **UEFI Legacy Mode** is not supported by ThinkSystem V4 products.

- **Lenovo XClarity Provisioning Manager (LXPM)**

From Lenovo XClarity Provisioning Manager, you can configure the UEFI settings for your server.

**Notes:** The Lenovo XClarity Provisioning Manager provides a Graphical User Interface to configure a server. The text-based interface to system configuration (the Setup Utility) is also available. From Lenovo XClarity Provisioning Manager, you can choose to restart the server and access the text-based interface. In addition, you can choose to make the text-based interface the default interface that is displayed when you start LXPM. To do this, go to **Lenovo XClarity Provisioning Manager → UEFI Setup → System Settings → <F1>Start Control → Text Setup**. To start the server with Graphic User Interface, select **Auto** or **Tool Suite**.

See the following documentations for more information:

- Search for the LXPM documentation version compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>
- *UEFI User Guide* at <https://pubs.lenovo.com/uefi-overview/>

- **Lenovo XClarity Essentials OneCLI**

You can use the config application and commands to view the current system configuration settings and make changes to Lenovo XClarity Controller and UEFI. The saved configuration information can be used to replicate or restore other systems.

For information about configuring the server using Lenovo XClarity Essentials OneCLI, see:

[https://pubs.lenovo.com/lxce-onecli/onecli\\_c\\_settings\\_info\\_commands](https://pubs.lenovo.com/lxce-onecli/onecli_c_settings_info_commands)

- **Lenovo XClarity Administrator**

You can quickly provision and pre-provision all of your servers using a consistent configuration. Configuration settings (such as local storage, I/O adapters, boot settings, firmware, ports, and Lenovo XClarity Controller and UEFI settings) are saved as a server pattern that can be applied to one or more managed servers. When the server patterns are updated, the changes are automatically deployed to the applied servers.

Specific details about configuring the server using Lenovo XClarity Administrator are available at:

[https://pubs.lenovo.com/lxca/server\\_configuring](https://pubs.lenovo.com/lxca/server_configuring)

- **Lenovo XClarity Controller**

You can configure the management processor for the server through the Lenovo XClarity Controller Web interface, the command-line interface, or Redfish API.

For information about configuring the server using Lenovo XClarity Controller, see:

“Configuring the Server” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>

---

## Memory module configuration

Memory performance depends on several variables, such as memory mode, memory speed, memory ranks, memory population and processor.

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

<https://lenovopress.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](https://dcsc.lenovo.com/#/memory_configuration)

---

## Enable Software Guard Extensions (SGX)

Intel® Software Guard Extensions (Intel® SGX) operates under the assumption that the security perimeter includes only the internals of the CPU package, and leaves the DRAM untrusted.

Complete the following steps to enable SGX.

- Step 1. **Make sure** to refer to “[Memory module installation rules and order](#)” on page 40, which specifies whether your sever supports SGX and lists the memory module population sequence for SGX configuration. (DIMM configuration must be at least 8 DIMMs per socket to support SGX.)
- Step 2. Restart the system. Before the operating system starts up, press the key specified in the on-screen instructions to enter the Setup Utility. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.)
- Step 3. Go to **System settings** → **Processors** → **UMA-Based Clustering** and disable the option.
- Step 4. Go to **System settings** → **Processors** → **Total Memory Encryption (TME)** and enable the option.
- Step 5. Save the changes, then go to **System settings** → **Processors** → **SW Guard Extension (SGX)** and enable the option.

---

## RAID configuration

Using a Redundant Array of Independent Disks (RAID) to store data remains one of the most common and cost-efficient methods to increase server's storage performance, availability, and capacity.

RAID increases performance by allowing multiple drives to process I/O requests simultaneously. RAID can also prevent data loss in case of a drive failure by reconstructing (or rebuilding) the missing data from the failed drive using the data from the remaining drives.

RAID array (also known as RAID drive group) is a group of multiple physical drives that uses a certain common method to distribute data across the drives. A virtual drive (also known as virtual disk or logical drive) is a partition in the drive group that is made up of contiguous data segments on the drives. Virtual drive is presented up to the host operating system as a physical disk that can be partitioned to create OS logical drives or volumes.

An introduction to RAID is available at the following Lenovo Press website:

<https://lenovopress.lenovo.com/lp0578-lenovo-raid-introduction>

Detailed information about RAID management tools and resources is available at the following Lenovo Press website:

<https://lenovopress.lenovo.com/lp0579-lenovo-raid-management-tools-and-resources>

## Intel VROC

### Enabling Intel VROC

Before setting up RAID for NVMe drives, follow the below steps to enable VROC:

1. Restart the system. Before the operating system starts up, press the key specified in the on-screen instructions to enter the Setup Utility. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.)
2. Go to **System settings → Devices and I/O Ports → Intel® VMD technology → Enable/Disable Intel® VMD** and enable the option.
3. Save the changes and reboot the system.

### Intel VROC configurations

Intel offers various VROC configurations with different RAID level and SSD support. See the following for more details.

#### Notes:

- Supported RAID levels varies by model. For the RAID level supported by , see [Node technical specifications](#).
- For more information about acquiring and installing the activation key, see <https://fod.lenovo.com/lkms>.

Intel VROC configurations for PCIe NVMe SSDs	Requirements
Intel VROC Standard	<ul style="list-style-type: none"><li>• Supports RAID levels 0, 1, and 10</li><li>• Requires an activation key</li></ul>
Intel VROC Premium	<ul style="list-style-type: none"><li>• Supports RAID levels 0, 1, 5, and 10</li><li>• Requires an activation key</li></ul>
Bootable RAID	<ul style="list-style-type: none"><li>• RAID 1 only</li><li>• Supported by 5th Gen Intel® Xeon® Scalable processors (formerly codenamed as Emerald Rapids, EMR)</li><li>• Requires an activation key</li></ul>
Intel VROC configurations for SATA SSDs	Requirements
Intel VROC SATA RAID	<ul style="list-style-type: none"><li>• Supports RAID levels 0, 1, 5, and 10.</li></ul>

---

## Deploy the operating system

Several options are available to deploy an operating system on the server.

### Available operating systems

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

Complete list of available operating systems: <https://lenovopress.lenovo.com/osig>.

## Tool-based deployment

- **Multi-server**

Available tools:

- Lenovo XClarity Administrator  
[https://pubs.lenovo.com/lxca/compute\\_node\\_image\\_deployment](https://pubs.lenovo.com/lxca/compute_node_image_deployment)
- Lenovo XClarity Essentials OneCLI  
[https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_uxspi\\_proxy\\_tool](https://pubs.lenovo.com/lxce-onecli/onecli_r_uxspi_proxy_tool)

- **Single-server**

Available tools:

- Lenovo XClarity Provisioning Manager  
“OS Installation” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>
- Lenovo XClarity Essentials OneCLI  
[https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_uxspi\\_proxy\\_tool](https://pubs.lenovo.com/lxce-onecli/onecli_r_uxspi_proxy_tool)

## Manual deployment

If you cannot access the above tools, follow the instructions below, download the corresponding OS *Installation Guide*, and deploy the operating system manually by referring to the guide.

1. Go to <https://datacentersupport.lenovo.com/solutions/server-os>.
2. Select an operating system from the navigation pane and click **Resources**.
3. Locate the “OS Install Guides” area and click the installation instructions. Then, follow the instructions to complete the operation system deployment task.

---

## Back up the server configuration

After setting up the server or making changes to the configuration, it is a good practice to make a complete backup of the server configuration.

Make sure that you create backups for the following server components:

- **Management processor**

You can back up the management processor configuration through the Lenovo XClarity Controller interface. For details about backing up the management processor configuration, see:

“Backing up the BMC configuration” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>.

Alternatively, you can use the `save` command from Lenovo XClarity Essentials OneCLI to create a backup of all configuration settings. For more information about the `save` command, see:

[https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_save\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_save_command)

- **Operating system**

Use your backup methods to back up the operating system and user data for the server.





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## Chapter 7. Problem determination

Use the information in this section to isolate and resolve issues that you might encounter while using your server.

Lenovo servers can be configured to automatically notify Lenovo Support if certain events are generated. You can configure automatic notification, also known as Call Home, from management applications, such as the Lenovo XClarity Administrator. If you configure automatic problem notification, Lenovo Support is automatically alerted whenever a server encounters a potentially significant event.

To isolate a problem, you should typically begin with the event log of the application that is managing the server:

- If you are managing the server from the Lenovo XClarity Administrator, begin with the Lenovo XClarity Administrator event log.
- If you are using some other management application, begin with the Lenovo XClarity Controller event log.

### Web resources

- **Tech tips**

Lenovo continually updates the support website with the latest tips and techniques that you can use to solve issues that your server might encounter. These Tech Tips (also called retain tips or service bulletins) provide procedures to work around issues or solve problems related to the operation of your server.

To find the Tech Tips available for your server:

1. Go to <http://datacentersupport.lenovo.com> and navigate to the support page for your server.
2. Click on **How To's** from the navigation pane.
3. Click **Article Type** → **Solution** from the drop-down menu.

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

- **Lenovo Data Center Forum**

- Check [https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv\\_eg](https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg) to see if someone else has encountered a similar problem.

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## Event logs

An *alert* is a message or other indication that signals an event or an impending event. Alerts are generated by the Lenovo XClarity Controller or by UEFI in the servers. These alerts are stored in the Lenovo XClarity Controller Event Log. If the server is managed by the Chassis Management Module 2 or by the Lenovo XClarity Administrator, alerts are automatically forwarded to those management applications.

### 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

The Event log provides a history of hardware and management conditions that have been detected.

Severity icons:

Show:

All Event Sources

All Dates

Severity	Serviceability	Date and Time	System	Event	System Type	Source ID
Warning	Support	Jan 30, 2017, 7:48:07 AM	Chassis114:...	Node Node 08 device	Chassis	Jan 30, 20
Warning	Support	Jan 30, 2017, 7:48:07 AM	Chassis114:...	Node Node 02 device	Chassis	Jan 30, 20
Warning	User	Jan 30, 2017, 7:48:07 AM	Chassis114:...	I/O module IO Module	Chassis	Jan 30, 20
Warning	User	Jan 30, 2017, 7:48:07 AM	Chassis114:...	Node Node 08 incom	Chassis	Jan 30, 20

Figure 127. Lenovo XClarity Administrator event log

For more information about working with events from XClarity Administrator, see:

[https://pubs.lenovo.com/lxca/events\\_vieweventlog](https://pubs.lenovo.com/lxca/events_vieweventlog)

### Lenovo XClarity Controller event log

The Lenovo XClarity Controller monitors the physical state of the server and its components using sensors that measure internal physical variables such as temperature, power-supply voltages, fan speeds, and component status. The Lenovo XClarity Controller provides various interfaces to systems management software and to system administrators and users to enable remote management and control of a server.

The Lenovo XClarity Controller monitors all components of the server and posts events in the Lenovo XClarity Controller event log.

ThinkSystem System name: XCC0023579PK

Event Log Audit Log Maintenance History

Customize Table Clear Logs Refresh

Type: All Source All Date

Severity	Source	Event ID	Message	Date
	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM

Figure 128. Lenovo XClarity Controller event log

For more information about accessing the Lenovo XClarity Controller event log, see:

“Viewing Event Logs” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>

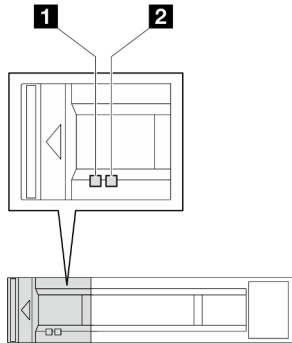
## Troubleshooting by system LEDs and diagnostics display

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

### Drive LEDs

This topic provides information on drive LEDs.

#### Location of 2.5-inch drive LEDs



The following table describes the problems that are indicated by drive activity LED and drive status LED.

LED	Description
<b>1</b> 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.
<b>2</b> Drive status LED (yellow)	The drive status LED indicates the following status: <ul style="list-style-type: none"> <li>The LED is lit: the drive has failed.</li> <li>The LED is flashing slowly (once per second): the drive is being rebuilt.</li> <li>The LED is flashing rapidly (three times per second): the drive is being identified.</li> </ul>

### Front operator panel LEDs

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

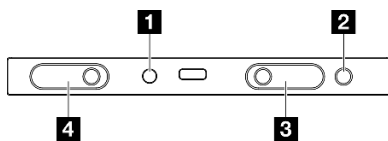


Figure 129. Front operator panel buttons and LEDs

<b>1</b> (Reserved)	<b>2</b> “System Error LED (yellow)” on page 179
<b>3</b> “System ID button with system ID LED (blue)” on page 180	<b>4</b> “Power button with power status LED (green)” on page 180

#### System Error LED (yellow)

The system error LED helps you to determine if there are any system errors.

Status	Color	Description	Action
On	Yellow	<p>An error has been detected on the server. Causes might include one or more of the following errors:</p> <ul style="list-style-type: none"> <li>• The temperature of the server reached the non-critical temperature threshold.</li> <li>• The voltage of the server reached the non-critical voltage threshold.</li> <li>• A fan has been detected to be running at low speed.</li> <li>• The power supply has a critical error.</li> <li>• The power supply is not connected to the power.</li> </ul>	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.

### System ID button with system ID LED (blue)

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

### 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.

## Power supply LED

This topic provides information about various power supply LED status and corresponding action suggestions.

- The following minimal configuration is required for the node to start:
  - One processor
  - One memory module in DIMM slot 5
  - One power supply in PSU slot 1
  - One boot drive, M.2 or 2.5-inch drive, and RAID adapter if configured (If OS is needed by debugging)
  - Four system fans

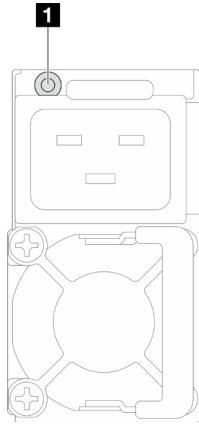


Figure 130. Power supply LED

LED	Description
<b>1</b> Power supply status	<p>The power supply status LED can be in one of the following states:</p> <ul style="list-style-type: none"> <li>• <b>Green:</b> The power supply is connected to the AC power source and working normally.</li> <li>• <b>Off:</b> The power supply is disconnected from the AC power source.</li> <li>• <b>Slow blinking green (about one flash every second):</b> The power supply is in PSU standby state with AC present, cold standby state, or always standby state.</li> <li>• <b>Amber:</b> The AC power cord is unplugged, AC power lost (with a second power supply in parallel still in AC power input power), or power supply has failed. To resolve the issue, replace the power supply.</li> <li>• <b>Slow blinking amber (about one flash every second):</b> Power supply warning events where the power supply continues to operate.</li> </ul>

## Firmware and RoT security module LEDs

The following illustration shows the light-emitting diodes (LEDs) on the Firmware and RoT security module.

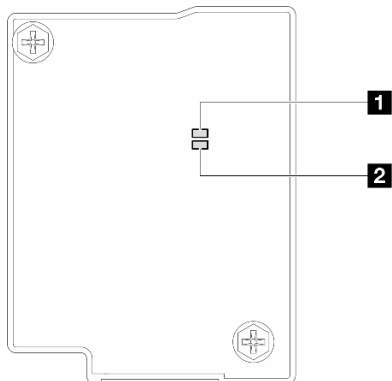


Figure 131. LEDs on the firmware and RoT security module

<b>1</b> BMC LED (Green)	<b>2</b> UEFI LED (Green)
--------------------------	---------------------------

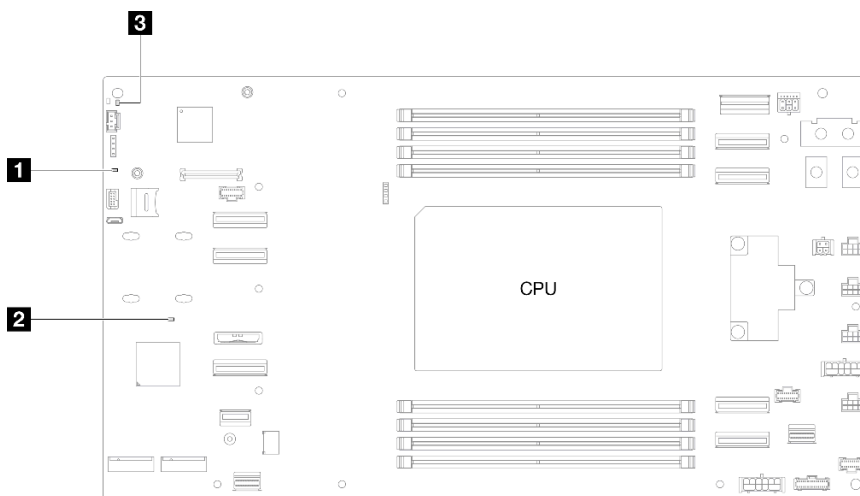
Table 15. LEDs description

Scenario	BMC LED	UEFI LED	Fatal Error LED	XCC heart-beat LED <sup>note</sup>	Actions
RoT security module fatal firmware failure	Off	Off	On	N/A	Replace the firmware and RoT security module.
	Blink	N/A	On	N/A	
	Blink	N/A	On	N/A	
No system power	Off	Off	Off	Off	<p>If the AC power is on, but the system board does not have power, then:</p> <ol style="list-style-type: none"> <li>1. Check the power supply unit (PSU) or chassis midplane. If the PSU or chassis midplane has any error, replace it.</li> <li>2. If there is no problem with the PSU or chassis midplane, replace the system board.</li> </ol>
XCC firmware recoverable error	Blink	N/A	Off	N/A	Information only. No action is required.
XCC firmware is recovered from error	On	N/A	Off	N/A	
UEFI firmware authentication failure	N/A	Blink	Off	N/A	
UEFI firmware is recovered from authentication failure	N/A	On	Off	N/A	
System is OK	On	On	Off	On	

**Note:** For XCC heartbeat LED location, see [“System-board LEDs” on page 182](#).

## System-board LEDs

This section contains information on the light-emitting diodes (LEDs) on the system board.



<b>1</b> System power LED (yellow)	<b>2</b> XCC heartbeat LED (green)
<b>3</b> FPGA heartbeat LED (green)	

- **1 System power LED (yellow)**

**Off:** No power supply is properly installed, or the LED itself has failed.

**Blinking rapidly (four times per second):** The node is turned off and is not ready to be turned on. The power button is disabled. This will last approximately 5 to 10 seconds.

**Blinking slowly (once per second):** The node is turned off and is ready to be turned on. You can press the power button to turn on the node.

**On:** The node is turned on.

- **2 XCC heartbeat LED (green)**

**Blinking slowly:** XCC is functioning.

**Blinking rapidly and constantly:** XCC is initializing or malfunctioning.

**On:** XCC is malfunctioning.

**Off:** XCC is malfunctioning.

- **3 FPGA heartbeat LED (green)**

**On or off:** FPGA is not working.

**Blinking slowly (once per second):** The node is turned off and is not ready to be turned on. The power button is disabled. This will last approximately 5 to 10 seconds.

## XCC system management port LEDs

This topic provides information on LEDs of XCC system management port (10/100/1000 Mbps RJ-45).

The following table describes the problems that are indicated by LEDs on XCC system management port (10/100/1000 Mbps RJ-45).

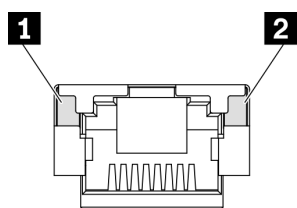


Figure 132. XCC system management port (10/100/1000 Mbps RJ-45) LEDs

LED	Description
<b>1</b> XCC system management port (10/100/1000 Mbps RJ-45) link LED	Use this green LED to distinguish the network connectivity status: <ul style="list-style-type: none"> <li>• Off: The network link is disconnected.</li> <li>• Green: The network link is established.</li> </ul>
<b>2</b> XCC system management port (10/100/1000 Mbps RJ-45) activity LED	Use this green LED to distinguish the network activity status: <ul style="list-style-type: none"> <li>• Off: The server is disconnected from a LAN.</li> <li>• Green (blinking): The network is connected and active.</li> </ul>

---

## General problem determination procedures

Use the information in this section to resolve problems if the event log does not contain specific errors or the system 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 system.
2. Make sure that the system 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 system each time you remove or disconnect a device.
  - Any external devices.
  - Surge-suppressor device (on the system).
  - Printer, mouse, and non-Lenovo devices.
  - Each adapter.
  - Hard disk drives.
  - Memory modules until you reach the minimum configuration that is supported for the system.

**Note:** To determine the minimal configuration for your system, see “Minimal configuration for debugging” in [“Node technical specifications” on page 8](#).

4. Power on the system.

If the problem is solved when you remove an adapter from the node, 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 compute node passes all system tests, suspect a network cabling problem that is external to the node.

## 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 177](#).

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 [“Node technical specifications” on page 5](#).

Step 4. Reconnect all AC power cords and turn on the server. If the server starts successfully, reseal the adapters and devices one at a time until the problem is isolated.

If the server does not start from the minimal configuration, replace the components in the minimal configuration one at a time until the problem is isolated.



## Resolving suspected Ethernet controller problems

The method that you use to test the Ethernet controller depends on which operating system you are using. See the operating-system documentation for information about Ethernet controllers, and see the Ethernet controller device-driver readme file.

Complete the following steps to attempt to resolve suspected problems with the Ethernet controller.

Step 1. Make sure that the correct device drivers, which come with the server are installed and that they are at the latest level.

Step 2. Make sure that the Ethernet cable is installed correctly.

- The cable must be securely attached at all connections. If the cable is attached but the problem remains, try a different cable.
- Make sure that the cable rating is applicable for the network speed selected. For example, an SFP+ cable is only suitable for 10G operation. An SFP25 cable is needed for 25G operation. Likewise for Base-T operation, a CAT5 cable is required for 1G Base-T operation while a CAT6 cable is required for 10G Base-T operation.

Step 3. Set both the adapter port and the switch port to auto-negotiation. If auto-negotiation is not supported on one of the ports, try configuring both ports manually to match each other.

Step 4. Check the Ethernet controller LEDs on the adapter and server. These LEDs indicate whether there is a problem with the connector, cable, or hub.

Although some adapters may vary, when installed vertically the adapter link LED is typically on the left of the port and the activity LED is typically on the right.

The server front panel LED is described in [“System LEDs and diagnostics display” on page 26](#).

- The Ethernet link status LED is lit when the Ethernet controller receives a link indication from the switch. If the LED is off, there might be a defective connector or cable or a problem with the switch.
- 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 179](#).

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 177).

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 203).

## Intermittent problems

Use this information to solve intermittent problems.

- “Intermittent external device problems” on page 186
- “Intermittent unexpected reboots” on page 186

### Intermittent external device problems

Complete the following steps until the problem is solved.

1. Update the UEFI and XCC firmware to the latest versions.
2. Make sure that the correct device drivers are installed. See the manufacturer's website for documentation.
3. For a USB device:
  - a. Make sure that the device is configured correctly.

Restart the server and press the key according to the on-screen instructions to display the LXPM system setup interface. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.) Then, click **System Settings** → **Devices and I/O Ports** → **USB Configuration**.

- b. Connect the device to another port. If using a USB hub, remove the hub and connect the device directly to the compute node. Make sure that the device is configured correctly for the port.

### Intermittent 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 **System Settings** → **Recovery and RAS** → **System Recovery** → **POST Watchdog Timer**.

2. If the reset occurs after the operating system starts, enter the operating system when the system operates normally and set up operating system kernel dump process (Windows and Linux base operating systems will be using different method). Enter the UEFI setup menus and disable the feature, or disable it with the following OneCli command.  

```
OneCli.exe config set SystemRecovery.RebootSystemOnNMI Disable --bmcxcc_userid PASSWORD@xcc_ipaddress
```
3. See the management controller event log to check for an event code that indicates a reboot. See “Event logs” on page 177 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, 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 187
- “Mouse does not work” on page 187
- “USB-device does not work” on page 187

### 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. Try to install the USB keyboard into a different USB port as available.
5. 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. Try to install the USB mouse into a different USB port as available.
4. Replace the mouse.

### USB-device does not work

1. Make sure that:
  - The correct USB device driver is installed.
  - The operating system supports USB devices.
2. Make sure that the USB configuration options are set correctly in system setup.

Restart the server and press 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 188
- “Displayed system memory is less than installed physical memory” on page 188

- [“Invalid memory population detected” on page 189](#)

### Multiple memory modules in a channel identified as failing

**Note:** Each time you install or remove a memory module, you must disconnect the server from the power source; then, wait 10 seconds before restarting the server.

Complete the following procedure to solve the problem.

1. Reseat the memory modules; then, restart the server.
2. Remove the highest-numbered memory module of those that are identified and replace it with an identical known good memory module; then, restart the server. Repeat as necessary. If the failures continue after all identified memory modules are replaced, go to step 4.
3. Return the removed memory modules, one at a time, to their original connectors, restarting the server after each memory module, until a memory module fails. Replace each failing memory module with an identical known good memory module, restarting the server after each memory module replacement. Repeat step 3 until you have tested all removed memory modules.
4. Replace the highest-numbered memory module of those identified; then, restart the server. Repeat as necessary.
5. Reverse the memory modules between the channels (of the same processor), and then restart the server. If the problem is related to a memory module, replace the failing memory module.
6. (Trained technician only) Install the failing memory module into a memory module connector to verify that the problem is not the processor or the memory module connector.
7. (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 179](#).
  - 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 40](#) for requirements).
  - After changing or replacing a memory module, memory configuration is updated accordingly in the Setup Utility.
  - All banks of memory are enabled. The server might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled.
  - There is no memory mismatch when the server is at the minimum memory configuration.
2. Reseat the memory modules, and then restart the server.
3. Check the POST error log:
  - If a memory module was disabled by a systems-management interrupt (SMI), replace the memory module.
  - If a memory module was disabled by the user or by POST, reseat the memory module; then, run the Setup Utility and enable the memory module.
4. Run memory diagnostics. When you start a system and press the key according to the on-screen instructions, the LXPM interface is displayed by default. (For more information, see the “Startup” section

in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.) You can perform memory diagnostics with this interface. From the Diagnostic page, go to **Run Diagnostic → Memory test → Advanced Memory Test**.

5. Reverse the modules between the channels (of the same processor), and then restart the server. If the problem is related to a memory module, replace the failing memory module.
6. Re-enable all memory modules using the Setup Utility, and then restart the server.
7. (Trained technician only) Install the failing memory module into a memory module connector to verify that the problem is not the processor or the memory module connector.
8. (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 40](#) 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.

### Extra namespace appears in an interleaved region

If there are two created namespaces in one interleaved region, VMware ESXi ignores the created namespaces and creates an extra new namespace during system booting. Delete the created namespaces in either the Setup Utility or the operating system before the first booting with ESXi.

## Monitor and video problems

Use this information to solve problems related to a monitor or video.

- [“Screen is blank” on page 189](#)
- [“Screen goes blank when you start some application programs” on page 190](#)
- [“The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted” on page 190](#)

### Screen is blank

1. If the server is attached to a KVM switch, bypass the KVM switch to eliminate it as a possible cause of the problem: connect the monitor cable directly to the correct connector on the rear of the server.
2. The management controller remote presence function is disabled if you install an optional video adapter. To use the management controller remote presence function, remove the optional video adapter.
3. If the server 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 corrupted server firmware is not affecting the video; see [“Update the firmware” on page 168](#).

7. Observe the LEDs on the system board (system board assembly); if the codes are changing, go to step 6.
8. Replace the following components one at a time, in the order shown, restarting the server each time:
  - a. Monitor
  - b. Video adapter (if one is installed)
  - c. (Trained technician only) System board (system board assembly)

### **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)

## **Network problems**

Use this information to resolve issues related to networking.

- [“Cannot wake server using Wake on LAN” on page 190](#)
- [“Could not log in using LDAP account with SSL enabled” on page 191](#)

### **Cannot wake server using Wake on LAN**

Complete the following steps until the problem is resolved:

1. If you are using the multi-port network adapter and the server is connected to the network using RJ-45 connector, check the system-error log (see [“Event logs” on page 177](#)), make sure:
  - a. The room temperature is not too high (see [Ambient temperature management](#)).
  - b. The air vents are not blocked.
  - c. The air baffle is installed securely.

2. Reseat the multi-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 multi-port network adapter.

### **Could not log in using LDAP account with SSL enabled**

Complete the following steps until the problem is resolved:

1. Make sure that the license key is valid.
2. Generate a new license key and log in again.

## **Observable problems**

Use this information to solve observable problems.

- “The server immediately displays the POST Event Viewer when it is turned on” on page 191
- “Server is unresponsive (POST is complete and operating system is running)” on page 191
- “Server is unresponsive (POST failed and cannot start System Setup)” on page 192
- “Voltage planar fault is displayed in the event log” on page 192
- “Unusual smell” on page 192
- “Server seems to be running hot” on page 192
- “Cracked parts or cracked chassis” on page 193

### **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 the 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 compute node, complete the following steps:
  1. If you are using a KVM connection, make sure that the connection is operating correctly. Otherwise, make sure that the keyboard and mouse are operating correctly.
  2. If possible, log in to the compute node and verify that all applications are running (no applications are hung).
  3. Restart the compute node.
  4. If the problem remains, make sure that any new software has been installed and configured correctly.
  5. Contact your place of purchase of the software or your software provider.
- If you are accessing the compute node from a remote location, complete the following steps:

1. Make sure that all applications are running (no applications are hung).
2. Attempt to log out of the system and log back in.
3. Validate the network access by pinging or running a trace route to the compute node from a command line.
  - a. If you are unable to get a response during a ping test, attempt to ping another compute node in the enclosure to determine whether it is a connection problem or compute node problem.
  - b. Run a trace route to determine where the connection breaks down. Attempt to resolve a connection issue with either the VPN or the point at which the connection breaks down.
4. Restart the compute node remotely through the management interface.
5. If the problem remains, verify that any new software has been installed and configured correctly.
6. Contact your place of purchase of the software or your software provider.

### **Server is unresponsive (POST failed and cannot start System Setup)**

Configuration changes, such as added devices or adapter firmware updates, and firmware or application code problems can cause the server to fail POST (the power-on self-test).

If this occurs, the server responds in either of the following ways:

- The server restarts automatically and attempts POST again.
- The server hangs, and you must manually restart the server for the server to attempt POST again.

After a specified number of consecutive attempts (automatic or manual), the server reverts to the default UEFI configuration and starts System Setup so that you can make the necessary corrections to the configuration and restart the server. If the server is unable to successfully complete POST with the default configuration, there might be a problem with the system board (system board assembly). You can specify the number of consecutive restart attempts in System Setup. Click **System Settings** → **Recovery** → **POST Attempts** → **POST Attempts Limit**. Available options are 3, 6, 9, and 255.

### **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 [“Node technical specifications” on page 5](#) 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.

Multiple compute nodes or chassis:

1. Make sure that the room temperature is within the specified range (see [“Ambient temperature management” on page 10](#)).



2. Make sure that the fans are installed correctly.
3. Update the UEFI and XCC firmware to the latest versions.
4. Make sure that the fillers in the server are installed correctly (see [Chapter 5 “Hardware replacement procedures” on page 37](#) for detailed installation procedures).
5. Use the IPMI command to ramp up the fan speed to the full fan speed to see whether the issue can be resolved.

**Note:** The IPMI raw command should only be used by trained technician and each system has its own specific IPMI raw command.

6. Check the management processor event log for rising temperature events. If there are no events, the compute node is running within normal operating temperatures. Note that you can expect some variation in temperature.

### Cracked parts or cracked chassis

Contact Lenovo Support.

## Optional-device problems

Use this information to solve problems related to optional devices.

- [“Insufficient PCIe resources are detected” on page 193](#)
- [“A Lenovo optional device that was just installed does not work” on page 193](#)
- [“A Lenovo optional device that worked previously does not work now” on page 194](#)

### 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. 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 the Setup utility. 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.

## A Lenovo optional device that worked previously does not work now

1. Make sure that all of the cable connections for the device are secure.
2. If the device comes with test instructions, use those instructions to test the device.
3. If the failing device is a SCSI device, make sure that:
  - The cables for all external SCSI devices are connected correctly.
  - Any external SCSI device is turned on. You must turn on an external SCSI device before you turn on the server.
4. Reseat the failing device.
5. Replace the failing device.

## Power on and power off problems

Use this information to resolve issues when powering on or powering off the server.

- [“Embedded hypervisor is not in the boot list” on page 194](#)
- [“Server does not power on” on page 194](#)
- [“Server does not power off” on page 195](#)

### Embedded hypervisor is not in the boot list

Complete the following steps until the problem is resolved:

1. Make sure that the optional embedded hypervisor flash device is selected on the boot manager <F12> *Select Boot Device* at startup.
2. Make sure that the embedded hypervisor flash device is seated in the connector correctly (see [Chapter 5 “Hardware replacement procedures” on page 37](#)).
3. See the documentation that comes with the optional embedded hypervisor flash device to validate that the device is configured correctly.
4. Make sure that other software works on the server.

### Server does not power on

Complete the following steps until the problem is resolved:

**Note:** The power button will not function until approximately five to ten seconds after the server has been connected to power to allow the BMC to complete initialization.

1. Make sure that the power button is working correctly:
  - a. Disconnect the server power cords.
  - b. Reconnect the power cords.
  - c. (Trained technician only) Reseat the front operator panel cable, and then repeat steps 1a and 1b.
    - (Trained technician only) If the server starts, reseat the front operator panel. If the problem remains, replace the front operator panel.
    - If the server does not start, bypass the power button by using the force power-on jumper. If the server starts, reseat the front operator panel. If the problem remains, replace the front operator panel.
2. Make sure that the reset button is working correctly:
  - a. Disconnect the server power cords.
  - b. Reconnect the power cords.
  - c. (Trained technician only) Reseat the front operator panel cable, and then repeat steps 2a and 2b.

- (Trained technician only) If the server starts, replace the front operator panel.
  - If the server does not start, go to step 3.
3. Make sure that both power supplies installed in the server are of the same type. Mixing different power supplies in the server will cause a system error (the system-error LED on the front operator panel turns on).
  4. Make sure that:
    - The power cords are correctly connected to the server and to a working electrical outlet.
    - The type of memory that is installed is correct and the installation rules are met.
    - The DIMMs are fully seated with lock latches fully closed.
    - The LEDs on the power supply do not indicate a problem.
    - The processors are installed in the correct sequence.
  5. Reseat the following components:
    - a. Front operator panel connector
    - b. Power supplies
  6. Replace the following components and restart the server each time:
    - a. Front operator panel connector
    - b. Power supplies
  7. If you just installed an optional device, remove it, and restart the server. If the server now starts, you might have installed more devices than the power supply supports.
  8. Implement the minimum configuration (one processor and one DIMM) to check whether any specific components lock the power permission.
  9. Collect the failure information by capturing the system logs and provide it to Lenovo support.
  10. See [“Power supply LED” on page 180](#).

### **Server does not power off**

Complete the following steps until the problem is resolved:

1. Determine whether you are using an Advanced Configuration and Power Interface (ACPI) or a non-ACPI operating system. If you are using a non-ACPI operating system, complete the following steps:
  - a. Press Ctrl+Alt+Delete.
  - b. Turn off the server by pressing the power button and holding it down for 5 seconds.
  - c. Restart the server.
  - d. If the server fails POST and the power button does not work, disconnect the power cord for 20 seconds; then, reconnect the power cord and restart the server.
2. If the problem remains or if you are using an ACPI-aware operating system, suspect the system board (system board assembly).

## **Power problems**

Use this information to resolve issues related to power.

### **System error LED is on and event log "Power supply has lost input" is displayed**

To resolve the problem, ensure that:

1. The power supply is properly connected to a power cord.
2. The power cord is connected to a properly grounded electrical outlet for the server.
3. Make sure that the power supply AC source is stable within the supported range.

4. Swap the power supply to see if the issue follows the power supply, if it follows the power supply, then replace the failing one.
5. Review the event log and see how the problem it is to follow the event log actions to resolved the problems.

## Processor problems

See this section to solve problems related to a processor.

- [“The system goes directly to the POST event viewer when it is turned on.” on page 196](#)

### The system goes directly to the POST event viewer when it is turned on.

1. Check the light path diagnostics LEDs and the Lenovo XClarity Controller event log, and resolve any errors that have occurred.
2. Make sure that the system supports the processor. You can view processor details from system setup. To determine if the processor is supported for the system, see <https://serverproven.lenovo.com>.
3. (Trained technician only) Make sure that the processor is seated correctly.
4. Replace the following components one at a time, in the order shown, restarting the system each time:
  - a. (Trained technician only) Processor
  - b. (Trained technician only) System board

## Software problems

Use this information to solve software problems.

1. To determine whether the problem is caused by the software, make sure that:
  - The server has the minimum memory that is needed to use the software. For memory requirements, see the information that comes with the software.  
  
**Note:** If you have just installed an adapter or memory, the server might have a memory-address conflict.
  - The software is designed to operate on the server.
  - Other software works on the server.
  - The software works on another server.
2. If you receive any error messages while you use the software, see the information that comes with the software for a description of the messages and suggested solutions to the problem.
3. Contact your place of purchase of the software.

## Storage drive problems

Use this information to resolve issues related to the storage drives.

- [“Server cannot recognize a drive” on page 196](#)

### Server cannot recognize a drive

Complete the following steps until the problem is solved.

1. Verify that the drive is supported for the server. See <https://serverproven.lenovo.com> for a list of supported drives.
2. Make sure that the drive is seated in the drive bay properly and that there is no physical damage to the drive connectors.

3. Run the diagnostics tests for the SAS/SATA adapter and drives. When you start a server and press the key according to the on-screen instructions, the LXPM interface is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.) You can perform drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → Disk Drive Test**.

Based on those tests:

- If the adapter passes the test but the drives are not recognized, replace the backplane signal cable and run the tests again.
- Replace the backplane.
- If the adapter fails the test, disconnect the backplane signal cable from the adapter and run the tests again.
- If the adapter fails the test, replace the adapter.



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## Appendix A. Hardware disassembling for recycle

Follow instructions in this section to recycle components with compliance with local laws or regulations.

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### Disassemble the node for recycle

Follow instructions in this section to disassemble the node before recycling the node tray.

#### About this task

##### Attention:

- Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.
1. Power off the node (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the node.
  2. Remove the node from the chassis (see [“Remove a node from the chassis” on page 66](#)); then, carefully lay the node on a flat, static-protective surface, orienting the node with the front toward you.
  3. Remove the top cover (see [“Remove the top cover” on page 162](#)).
  4. Remove the drive backplane (see [“Remove the drive backplane” on page 78](#)).
  5. Remove the firmware and RoT security module (see [“Remove the firmware and RoT security module” on page 149](#)).
  6. Remove the processor and heat sink (see [“Remove the processor and heat sink” on page 133](#)).
  7. Remove all the memory modules (see [“Remove a memory module” on page 109](#)).
  8. If necessary, remove the M.2 drives (see [“Remove an M.2 drive” on page 95](#)).
  9. Remove the microSD card (see [“Remove the MicroSD card” on page 114](#)).
  10. Disconnect all the fan cables from the system board; then, remove all the fans from the fan cage (see [“Remove a fan” on page 81](#)).
  11. If the PCIe riser assembly is installed, remove it from the node and disconnect the PCIe cables from the system board (see [“Remove the PCIe riser assembly” on page 119](#) and [Internal Cable Routing Guide](#)).
  12. Remove the power bus bar (see [“Remove the power bus bar” on page 126](#)).
  13. Disconnect the power distribution board cables from the system board; then, remove the power distribution board (see [“Remove the power distribution board” on page 130](#)).
  14. Remove the rear I/O module (see [“Remove the rear I/O module” on page 146](#)).
  15. Remove all the installed cable walls
  16. Disconnect all the cables from the system board.
  17. Remove the system board (see [“Remove the system board \(Trained technician only\)” on page 152](#)).

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### Disassemble the chassis for recycle

Follow instructions in this section to disassemble the chassis before recycling.

#### About this task

##### Attention:

- Read [“Installation Guidelines” on page 37](#) and [“Safety inspection checklist” on page 38](#) to make sure that you work safely.
- Step 1. Power off all the nodes (see [“Power off the node” on page 43](#)); then, disconnect all external cables from the nodes.
  - Step 2. Remove all the nodes from the chassis (see [“Remove a node from the chassis” on page 66](#)).
  - Step 3. Remove all power supply units and PSU fillers from the PSU cage (see [“Remove a hot-swap power supply” on page 52](#) and [Removal of a PSU filler](#)).
  - Step 4. Remove the chassis from the rack (see [“Remove the chassis from the rack” on page 43](#)); then, lay the chassis on a flat, static-protective surface.
  - Step 5. Remove the PSU cage from the chassis (see [“Remove the PSU cage” on page 58](#)).
  - Step 6. Remove the chassis midplane from the PSU cage (see [“Remove the chassis midplane” on page 61](#)).
  - Step 7. Remove the left and right EIA brackets from the chassis (see [“Remove the EIA brackets from the chassis ” on page 50](#)).

After disassembling the chassis, recycle the units in compliance with local regulations.



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## Appendix B. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about Lenovo products, you will find a wide variety of sources available from Lenovo to assist you.

On the World Wide Web, up-to-date information about Lenovo systems, optional devices, services, and support are available at:

<http://datacentersupport.lenovo.com>

**Note:** IBM is Lenovo's preferred service provider for ThinkSystem.

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### Before you call

Before you call, there are several steps that you can take to try and solve the problem yourself. If you decide that you do need to call for assistance, gather the information that will be needed by the service technician to more quickly resolve your problem.

#### Attempt to resolve the problem yourself

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The online help also describes the diagnostic tests that you can perform. The documentation for most systems, operating systems, and programs contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

You can find the product documentation for your ThinkSystem products at the following location:

<https://pubs.lenovo.com/>

You can take these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated software, firmware, and operating-system device drivers for your Lenovo product. (See the following links) The Lenovo Warranty terms and conditions state that you, the owner of the Lenovo product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
  - Drivers and software downloads
    - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sd520v4/7dfy/downloads/driver-list>
  - Operating system support center
    - <https://datacentersupport.lenovo.com/solutions/server-os>
  - Operating system installing instructions
    - <https://pubs.lenovo.com/thinksystem#os-installation>
- If you have installed new hardware or software in your environment, check <https://serverproven.lenovo.com> to make sure that the hardware and software are supported by your product.
- Refer to [Chapter 7 “Problem determination” on page 177](#) for instructions on isolating and solving issues.
- Go to <http://datacentersupport.lenovo.com> and check for information to help you solve the problem.

To find the Tech Tips available for your server:

1. Go to <http://datacentersupport.lenovo.com> and navigate to the support page for your server.
2. Click on **How To's** from the navigation pane.
3. Click **Article Type** → **Solution** from the drop-down menu.

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

- Check Lenovo Data Center Forum at [https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv\\_eg](https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg) to see if someone else has encountered a similar problem.

### Gathering information needed to call Support

If you require warranty service for your Lenovo product, the service technicians will be able to assist you more efficiently if you prepare the appropriate information before you call. You can also go to <http://datacentersupport.lenovo.com/warrantylookup> for more information about your product warranty.

Gather the following information to provide to the service technician. This data will help the service technician quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.

- Hardware and Software Maintenance agreement contract numbers, if applicable
- Machine type number (Lenovo 4-digit machine identifier). Machine type number can be found on the ID label, see “[Identify the system and access the Lenovo XClarity Controller](#)” on page 31.
- Model number
- Serial number
- Current system UEFI and firmware levels
- Other pertinent information such as error messages and logs

As an alternative to calling Lenovo Support, you can go to <https://support.lenovo.com/servicerequest> to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to the service technicians. The Lenovo service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

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## Collecting service data

To clearly identify the root cause of a server issue or at the request of Lenovo Support, you might need collect service data that can be used for further analysis. Service data includes information such as event logs and hardware inventory.

Service data can be collected through the following tools:

- **Lenovo XClarity Provisioning Manager**

Use the Collect Service Data function of Lenovo XClarity Provisioning Manager to collect system service data. You can collect existing system log data or run a new diagnostic to collect new data.

- **Lenovo XClarity Controller**

You can use the Lenovo XClarity Controller web interface or the CLI to collect service data for the server. The file can be saved and sent to Lenovo Support.

- For more information about using the web interface to collect service data, see the “Backing up the BMC configuration” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>.

- For more information about using the CLI to collect service data, see the “XCC `servicelog` command” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>.

- **Lenovo XClarity Administrator**

Lenovo XClarity Administrator can be set up to collect and send diagnostic files automatically to Lenovo Support when certain serviceable events occur in Lenovo XClarity Administrator and the managed endpoints. You can choose to send diagnostic files to Lenovo Support using Call Home or to another service provider using SFTP. You can also manually collect diagnostic files, open a problem record, and send diagnostic files to the Lenovo Support.

You can find more information about setting up automatic problem notification within the Lenovo XClarity Administrator at [https://pubs.lenovo.com/lxca/admin\\_setupcallhome](https://pubs.lenovo.com/lxca/admin_setupcallhome).

- **Lenovo XClarity Essentials OneCLI**

Lenovo XClarity Essentials OneCLI has inventory application to collect service data. It can run both in-band and out-of-band. When running in-band within the host operating system on the server, OneCLI can collect information about the operating system, such as the operating system event log, in addition to the hardware service data.

To obtain service data, you can run the `getinfor` command. For more information about running the `getinfor`, see [https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_getinfor\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_getinfor_command).

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## Contacting Support

You can contact Support to obtain help for your issue.

You can receive hardware service through a Lenovo Authorized Service Provider. To locate a service provider authorized by Lenovo to provide warranty service, go to <https://datacentersupport.lenovo.com/serviceprovider> and use filter searching for different countries. For Lenovo support telephone numbers, see <https://datacentersupport.lenovo.com/supportphonenumberlist> for your region support details.



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## Appendix C. Documents and supports

This section provides handy documents, driver and firmware downloads, and support resources.

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### Documents download

This section provides introduction and download link for handy documents.

#### Documents

Download the following product documentations at:

[https://pubs.lenovo.com/sd520-v4/pdf\\_files](https://pubs.lenovo.com/sd520-v4/pdf_files)

- **Rail Installation Guides**

- Rail installation in a rack

[https://pubs.lenovo.com/st650-v2/thinksystem\\_l\\_shaped\\_rail\\_kit.pdf](https://pubs.lenovo.com/st650-v2/thinksystem_l_shaped_rail_kit.pdf)

- **User Guide**

- Complete overview, system configuration, hardware components replacing, and troubleshooting.

Selected chapters from the *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.

- **Cable Routing Guide**

- Cable routing information.

- **UEFI Manual**

- UEFI setting introduction

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### Support websites

This section provides driver and firmware downloads and support resources.

#### Support and downloads

- Lenovo Data Center Forum
  - [https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv\\_eg](https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg)
- Lenovo License Information Documents
  - <https://datacentersupport.lenovo.com/documents/Invo-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](https://datacentersupport.lenovo.com/product_security/home)

- Lenovo Product Warranty Plans
  - <http://datacentersupport.lenovo.com/warrantylookup>
- Lenovo Server Operating Systems Support Center website
  - <https://datacentersupport.lenovo.com/solutions/server-os>
- Lenovo ServerProven website (Options compatibility lookup)
  - <https://serverproven.lenovo.com>
- Operating System Installation Instructions
  - <https://pubs.lenovo.com/thinksystem#os-installation>
- Submit an eTicket (service request)
  - <https://support.lenovo.com/servicerequest>
- Subscribe to Lenovo Data Center Group product notifications (Stay up to date on firmware updates)
  - <https://datacentersupport.lenovo.com/solutions/ht509500>

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## Appendix D. Notices

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1009 Think Place  
Morrisville, NC 27560  
U.S.A.  
Attention: Lenovo VP of Intellectual Property*

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Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

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## 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 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 drive capacities assume the replacement of any standard drives and population of all drive bays with the largest currently supported drives that are available from Lenovo.

Maximum memory might require replacement of the standard memory with an optional memory module.

Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write cycles that it can be subjected to, expressed as total bytes written (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. Lenovo is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

Lenovo makes no representations or warranties with respect to non-Lenovo products. Support (if any) for the non-Lenovo products is provided by the third party, not Lenovo.

Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

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## Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.



## Taiwan Region BSMI RoHS declaration

單元 Unit	限用物質及其化學符號 Restricted substances and its chemical symbols					
	鉛Lead (Pb)	汞Mercury (Hg)	鎘Cadmium (Cd)	六價鉻 Hexavalent chromium (Cr <sup>6+</sup> )	多溴聯苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
機架	○	○	○	○	○	○
外部蓋板	○	○	○	○	○	○
機械組零件	-	○	○	○	○	○
空氣傳動設備	-	○	○	○	○	○
冷卻組零件	-	○	○	○	○	○
內存模組	-	○	○	○	○	○
處理器模組	-	○	○	○	○	○
電纜組零件	-	○	○	○	○	○
儲備設備	-	○	○	○	○	○
印刷電路板	-	○	○	○	○	○

備考1. “超出0.1 wt %” 及 “超出0.01 wt %” 係指限用物質之百分比含量超出百分比含量基準值。  
 Note1: “exceeding 0.1wt%” and “exceeding 0.01 wt%” indicate that the percentage content of the restricted substance exceeds the reference percentage value of presence condition.

備考2. “○” 係指該項限用物質之百分比含量未超出百分比含量基準值。  
 Note2: “○” indicates that the percentage content of the restricted substance does not exceed the percentage of reference value of presence.

備考3. “-” 係指該項限用物質為排除項目。  
 Note3: The “-” indicates that the restricted substance corresponds to the exemption.

## Taiwan import and export contact information

Contacts are available for Taiwan import and export information.

**委製商/進口商名稱: 台灣聯想環球科技股份有限公司**  
**進口商地址: 台北市南港區三重路 66 號 8 樓**  
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