Lenovo

ThinkSystem HS350X V3
User Guide

Machine Type: 7DE3

Note

Before using this information and the product it supports, be sure to read and understand the safety information and the safety instructions, which are available at:
http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html

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

Second Edition (April 2024)

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

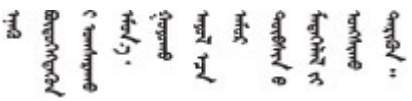
A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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



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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

ཐོན་རྫས་འདི་བདེ་སྤྱོད་མ་བྱས་གོང་། ·སྐྱོ་ཤི་ཡིད་གཟབ· བྱ་འདྲ་མེན་ཡོད་པའི་འོད་སྣེར་བལྟ་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

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

Safety inspection checklist

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

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

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

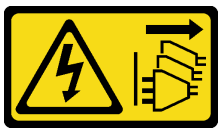
CAUTION:
This equipment must be installed or serviced by trained personnel, as defined by the NEC, IEC 62368-1 & IEC 60950-1, the standard for Safety of Electronic Equipment within the Field of Audio/Video, Information Technology and Communication Technology. Lenovo assumes that you are qualified in 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. If your working condition necessitates the server being powered off or you intend to power off, make sure that the power cord is disconnected.

   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.

Note: Under certain circumstances, powering off the server is not a prerequisite. Refer to the precautions before conducting any tasks.

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

Chapter 1. Introduction

The HS350X V3 server (7DE3) is a high-performance, multi-core 2U rack server designed to support many kinds of Information Technology (IT) workloads with high agility. It carries the most advanced processing and memory units. This server is ideally suited for IT environments that require superior processor performance, flexible manageability, and thermal efficiency.

Figure 1. ThinkSystem HS350X V3

Security advisories

In order to protect our customers and their data, Lenovo is committed to developing products and services that adhere to the highest security standards. 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 that they may put mitigation plans in place as we work toward providing solutions.

Specifications

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

Refer to the below table for specifications categories and the content of each category.

Specification category	Technical specifications	Mechanical specifications	Environmental specifications
Content	• Processor • Memory • Internal drives • Expansion slots • Integrated functions and I/O connectors • Network • Rear button • RAID adapter • Host bus adapter • System fan • Electrical input • Operating systems	• Dimension • Weight	• Acoustical noise emissions • Environmental

Technical specifications

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

Processor

Processor
Supports multi-core Intel Xeon processors, with integrated memory controller. • One 4th (Sapphire Rapids, SPR) or 5th Gen (Emerald Rapids, EMR) Intel Xeon scalable processor with the new LGA 4677-X socket • Up to 60 cores per socket for SPR processors and 64 cores per socket for EMR processors **Note:** The actual core count of the processor depends on the models delivered. • Thermal Design Power (TDP): up to 350 watts for SPR and EMR processors

Memory

Memory
See “Memory module installation rules and order” on page 37 for detailed information about memory configuration and setup. • Slots: 16 dual inline memory module (DIMM) connectors that support up to: – 16 DDR5 DIMMs • Memory module type: – TruDDR5 4800MHz RDIMM: 32 GB (2Rx8), 64 GB (2Rx4) • Speed: Operating speed depends on processor model and BIOS settings. – 4800 MT/s for 1 DIMM per channel – 4400 MT/s for 2 DIMMs per channel • Minimum memory: 32 GB • Maximum memory: 1 TB: 16 x 64 GB RDIMMs

Internal drives

Internal drives
Front: • 24 3.5-inch hot-swap SAS/SATA drives Rear: • Up to two 2.5-inch hot-swap NVMe drives

Expansion slots

Expansion slots
Depending on the model, your server supports up to three PCIe slots in the rear. • Riser 1: – PCIe x8, Gen 4, full-height, half-length – PCIe x16, Gen 4, full-height, half-length • Riser 2: – PCIe x16, Gen 4, half-height, half-length

Integrated functions and I/O connectors

Integrated functions and I/O connectors
• A group of two Ethernet connectors on the OCP module • Up to three USB 3.2 Gen1 (5 Gbps) ports: – Two on the rear of the server – One on the front of the server • One VGA connector on the rear • One internal COM header • One RJ-45 connector on the rear

Network

Network
• OCP module

Rear buttons (on the DC-SCM)

Rear buttons (on the DC-SCM)
• One power control button with a power-on LED • One system locator button with a system locator LED

RAID adapter

RAID adapter
Support the following RAID adapter: • ThinkSystem Broadcom 9670-24i 05-50123-00 Tri RAID

Host bus adapter

Host bus adapter
Support the following HBA: • ThinkSystem Broadcom 9600-24i 05-50111-01 SFF8654 SAS HBA

System fan

System fan
• Supported fan type: – Performance fan 6038 (23500 RPM) • Fan redundancy: N+1 redundancy, one redundant fan – Six hot-swap single-rotor system fans (one redundant fan) **Note:** The redundant cooling by the fans in the server enables continued operation if one fan fails. If there is an OCP module installed, when the system is powered off but still plugged in to AC power, system fan 1 and fan 2 will continue to spin at a much lower speed. This is the system design to provide proper cooling for the OCP module.

Electrical input

Electrical input
Two hot-swap power supply units for redundancy support: *Table 1. Electrical input for power supply units*

Power supply	200–240 V ac
1300-watt 80 PLUS Platinum	√
1300-watt 80 PLUS Titanium	√
1600-watt 80 PLUS Platinum	√

Attention: Power supply units are supported only within the input voltage ranges listed above.

Operating systems

Operating systems
Supported operating systems: • Support: – Ubuntu 22.04.3 GA (kernel 5.15) – RHEL9.2 • Support with limitations: – Rocky Linux 8.8 – Rocky Linux 9.2

Mechanical specifications

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

Dimension
2U server • Height: 86.80 mm (3.42 inches) • Width: – With rack latches: 481.00 mm (18.94 inches) – Without rack latches: 447.00 mm (17.60 inches) • Depth: – With rack latches: 855.60 mm (33.69 inches) – Without rack latches: 812.00 mm (31.97 inches)

Weight
• With packaging: up to 47.83 kg (105.44 lb) • Without packaging: up to 40.00 kg (88.18 lb)

Environmental specifications

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

- “Acoustical noise emissions” on page 6
- “Ambient temperature management” on page 7
- “Environment” on page 8

Acoustical noise emissions

Acoustical noise emissions

The server has the following acoustic noise emissions declaration:

Table 2. Acoustic noise emissions declaration

Used configuration	Sound power level (L_{WAd})	Sound pressure level (L_{pAm}):
Six 6038 performance fans (100% duty) One 350 W processor Sixteen 64 GB RDIMMs 24 SATA hard disk drives Two 1600-watt power supply units One Broadcom 9600-24i 05-50111-01 SFF8654 SAS HBA Two Mellanox ConnectX-6 100Gb PCIe adapters One Intel E810-CQDA2 OCP module	8.60 Bel	73.38 dBA

Notes:

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

Ambient temperature management

Ambient temperature management
The server is supported in the following environment: • Air temperature: – Operating: – ASHRAE class H1: 5–25°C (41–77°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 500 m (1640 ft) of altitude increase. – ASHRAE class A2: 10–35°C (50–95°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 300 m (984 ft) of altitude increase. – ASHRAE class A3: 5–40°C (41–104°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 175 m (574 ft) of altitude increase. – ASHRAE class A4: 5–45°C (41–113°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 125 m (410 ft) of altitude increase. – Server off: 5–45°C (41–113°F) – Shipping or storage: -40–60°C (-40–140°F) • Maximum altitude: 3050 m (10 000 ft) • Relative humidity (non-condensing): – Operating: – ASHRAE Class H1: 8%–80%, maximum dew point: 17°C (62.6°F) – ASHRAE Class A2: 8%–80%, maximum dew point: 21°C (70°F) – ASHRAE Class A3: 8%–85%, maximum dew point: 24°C (75°F) – ASHRAE Class A4: 8%–90%, maximum dew point: 24°C (75°F) – Shipment or storage: 8%–90% • Particulate contamination **Attention:** Airborne particulates and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server. For information about the limits for particulates and gases, see “Particulate contamination” on page 8.

Environment

Environment
HS350X V3 complies with ASHRAE Class A2 specifications. System performance may be affected when operating temperature is outside of AHSARE A2 specification. • Air temperature: – Operating – ASHARE Class A2: 10°C to 35°C (50°F to 95°F); the maximum ambient temperature decreases by 1°C for every 300 m (984 ft) increase in altitude above 900 m (2,953 ft). – Server off: 5°C to 45°C (41°F to 113°F) – Shipment/storage: -40°C to 60°C (-40°F to 140°F) • Maximum altitude: 3,050 m (10,000 ft) • Relative Humidity (non-condensing): – Operating – ASHRAE Class A2: 8% to 80%; maximum dew point: 21°C (70°F) – Shipment/storage: 8% to 90% • Particulate contamination **Attention:** Airborne particulates and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server. For information about the limits for particulates and gases, see “Particulate contamination” on page 8. **Note:** The server is designed for standard data center environment and recommended to be placed in industrial data centers. When the ambient temperature is greater than the supported max temperature (ASHARE A4 45°C), the server will shut down. The server will not power on again until the ambient temperature falls within the supported temperature range. Depending on hardware configurations, the server complies with ASHRAE Class H1, A2, A3, or A4 specifications with certain thermal restrictions. System performance may be impacted when operating temperature is out of permitted conditions.

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 factors, such as temperature or moisture in the air, can influence the effect 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	Severity level G1 as per ANSI/ISA 71.04-1985[1]: • The copper reactivity level shall be less than 200 Angstroms per month (Å/month ≈ 0.0035 µg/cm^2-hour weight gain).[2] • The silver reactivity level shall be less than 200 Angstroms per month (Å/month ≈ 0.0035 µg/cm^2-hour weight gain).[3] • The reactive monitoring of gaseous corrosivity must be conducted approximately 5 cm (2 in.) in front of the rack on the air inlet side at one-quarter and three-quarter frame height off the floor or where the air velocity is much higher.
Airborne particulates	Data centers must meet the cleanliness level of ISO 14644-1 class 8. For data centers without airside economizer, the ISO 14644-1 class 8 cleanliness might be met by choosing one of the following filtration methods: • The room air might be continuously filtered with MERV 8 filters. • Air entering a data center might be filtered with MERV 11 or preferably MERV 13 filters. For data centers with airside economizers, the choice of filters to achieve ISO class 8 cleanliness depends on the specific conditions present at that data center. • The deliquescent relative humidity of the particulate contamination should be more than 60% RH.[4] • Data centers must be free of zinc whiskers.[5]

[1] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.

[2] The derivation of the equivalence between the rate of copper corrosion growth in the thickness of the corrosion product in Å/month and the rate of weight gain assumes that Cu_2S and Cu_2O grow in equal proportions.

[3] The derivation of the equivalence between the rate of silver corrosion growth in the thickness of the corrosion product in Å/month and the rate of weight gain assumes that Ag_2S is the only corrosion product.

[4] The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.

[5] Surface debris is randomly collected from 10 areas of the data center on a 1.5 cm diameter disk of sticky electrically conductive tape on a metal stub. If examination of the sticky tape in a scanning electron microscope reveals no zinc whiskers, the data center is considered free of zinc whiskers.

Chapter 2. Server components

This section includes information about the front view, rear view, and top view of the server. Front I/O module, the system board and LEDs are also illustrated in details.

Front view

Depending on the model, your server might look slightly different from the illustrations in this topic.

Server model with 24 3.5-inch drive bays

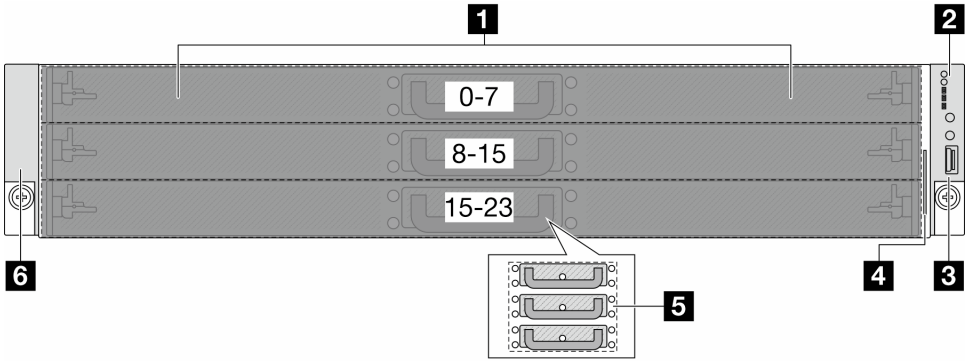


Table 4. Components on the front of the server

Callout	Callout
1 Front drives and drive trays	2 Front I/O module
3 Rack latch (right)	4 Pull-out information tab
5 Drive tray handles	6 Rack latch (left)

Note: For more information about each component, see “Front components overview” on page 11.

Front components overview

Hot-swap drives and drive bays

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

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

Front I/O module

The front I/O module of the server provides control buttons, connectors, and LEDs. See “LEDs and buttons on the front I/O module” on page 17 for more details.

Rack latches

If your server is installed in a rack, you can use the rack latches to help you slide the server out of the rack. You also can use the rack latches and screws to secure the server in the rack so that the server cannot slide out, especially in vibration-prone areas. For more information, refer to “Server replacement” on page 41.

Rear view

Depending on the model, your server might look slightly different from the illustration in this topic.

Server model with three PCIe slots

The following illustration shows the rear view of server model with three PCIe slots.

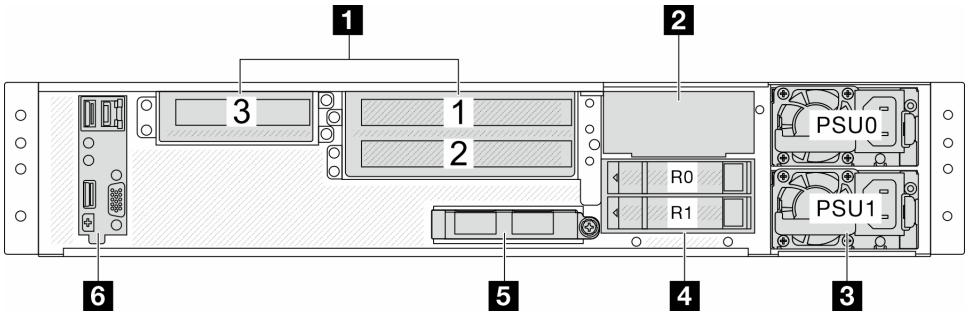


Figure 2. Rear view with three PCIe slots

Table 5. Components on the rear of the server

Callout	Callout
1 PCIe slots	2 Rear wall bracket
3 Power supply units	4 Rear drive assemblies
5 OCP module	6 DC-SCM

Note: For more information about each component, see "Rear components overview" on page 12.

Rear components overview

DC-SCM

DC-SCM, short for Datacenter Secure Control Module, it moves common server management, security, and control features from a typical system board architecture onto a smaller common form factor module. This module contains all the firmware states previously housed on a typical system board. This provides benefits to both the user and developer.

Ethernet connectors

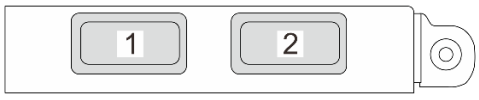


Figure 3. OCP module (two connectors)

The OCP module provides two Ethernet connectors for network connections.

By default, any Ethernet connector on the OCP module can also function as a management connector using the shared management capacity.

Hot-swap drives and drive bays

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

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

PCIe slots

The PCIe slots are on the rear of the server and your server supports up to three PCIe slots on riser 1 and 2 assemblies.

Power supply units

The hot-swap redundant power supply helps you avoid significant interruption to the operation of the system when a power supply fails.

Top view

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

Top view of 3.5-inch front drive configuration

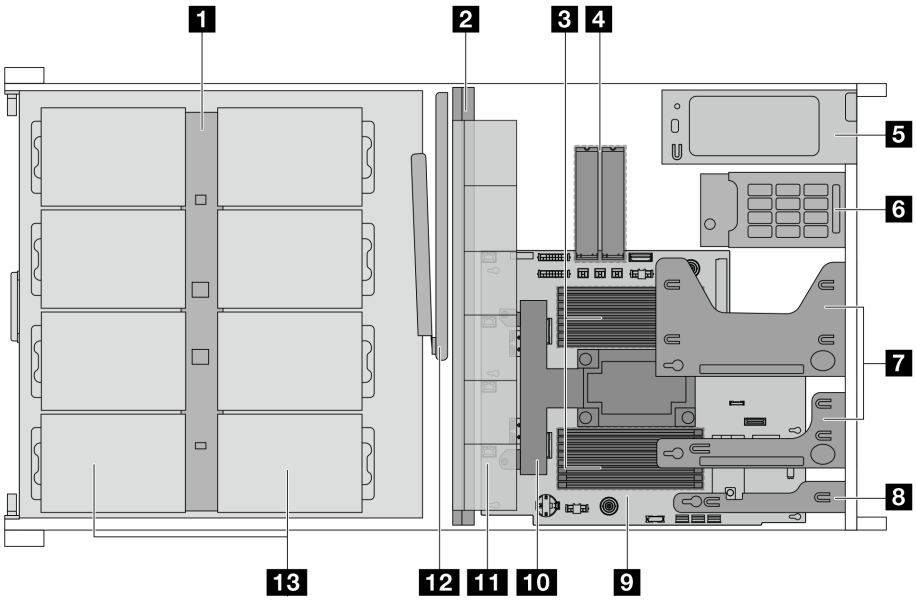


Figure 4. Top view of 3.5-inch front drive configuration

Table 6. Components on the top view of 3.5-inch front drive configuration

1 Front backplane	8 DC-SCM
2 Middle wall	9 System board
3 Memory modules	10 Processor and heat sink assembly
4 M.2 drive assembly	11 System fan assembly
5 Power supply units	12 Cable management arm (CMA)
6 Rear drive assemblies	13 Front drives
7 Riser assemblies	

Notes:

1. The illustration shows the server rear configuration with two riser assemblies. For details, see "Rear view" on page 12.
2. The illustration shows the location of certain parts. Some parts may not be supported at the same time within certain configuration(s).

System-board connectors

The following illustrations show the internal connectors on the system board.

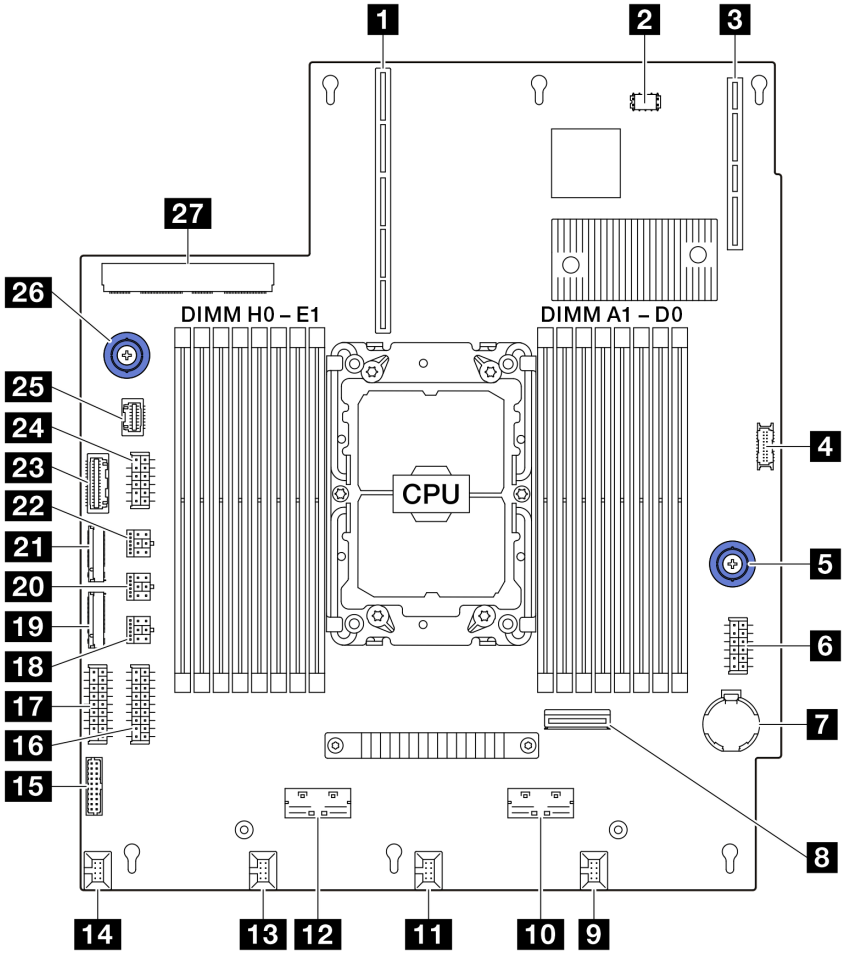


Figure 5. System-board connectors

Table 7. System-board connectors

1 Riser 1 slot (PCIe × 24)	15 Fan 4 & 5 connector
2 VROC key connector	16 PIB power connector 1
3 DC-SCM slot	17 PIB power connector 0
4 Front panel connector	18 Front BP power connector 3
5 System board handle	19 NVMe M.2 connector 0
6 Riser 2 power connector	20 Front BP power connector 2

Table 7. System-board connectors (continued)

7 Battery	21 NVMe M.2 connector 1
8 MCIO 2 for riser 2	22 Front BP power connector 1
9 Fan 0 connector	23 PIB signal connector
10 MCIO 3 for riser 2	24 Rear BP power connector
11 Fan 1 connector	25 NCSI for PCIe NIC card
12 MCIO 1 for NVMe SSD	26 System board handle
13 Fan 2 connector	27 OCP connector
14 Fan 3 connector	

System-board switches

The following illustrations show the location of the switches on the server.

Notes:

- If there is a clear protective sticker on the top of the switch blocks, you must remove and discard it to access the switches.
- To gain access to the switches, remove DC-SCM first, see “Remove the Datacenter Secure Control Module (DC-SCM)” on page 84.

Important:

1. 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:
   - “Installation Guidelines” on page 33
   - “Handling static-sensitive devices” on page 35
   - “Power off the server” on page 40
2. Any system-board switch or jumper block that is not shown in the illustrations in this document are reserved.

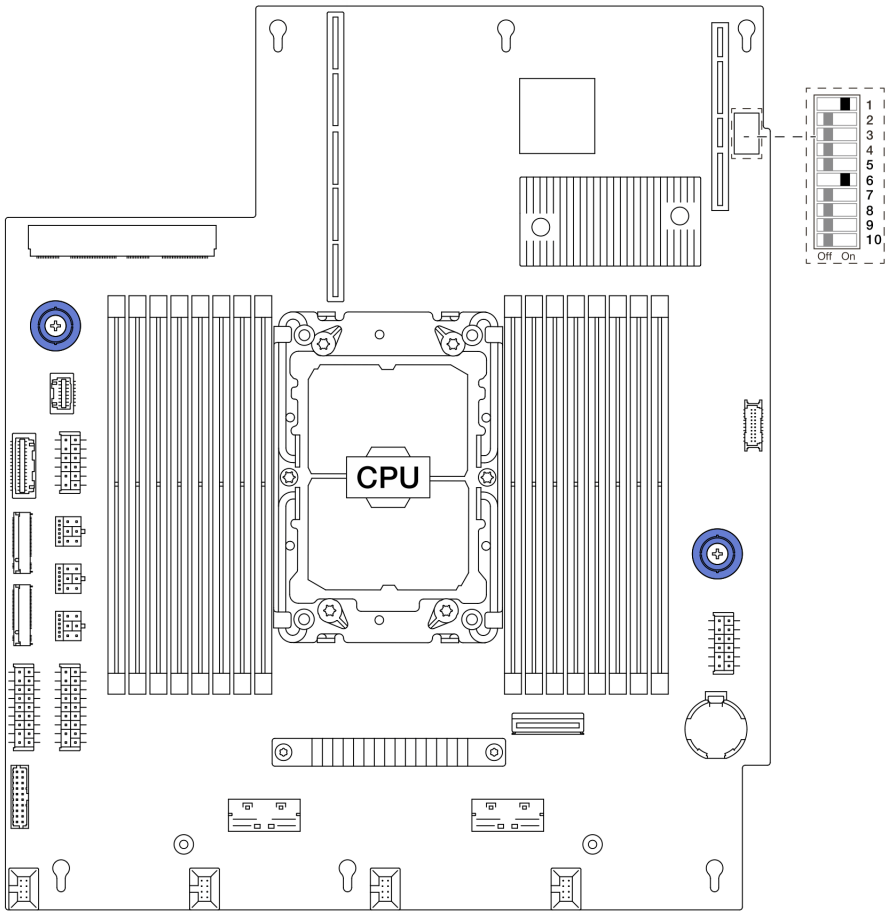


Figure 6. System-board switches

SW4 switch block

The following table describes the functions of the SW4 switch block on the system board.

Table 8. SW4 switch block description

Switch-bit number	Switch name	Default position	Description
1 SW4–1	PVNN_PCH_AUX_ VSET	On	Sets the voltage of PVNN_PCH_AUX when switched to On.
2 SW4–2	RST_RTCRST_N	Off	Clears CMOS.
3 SW4–3	FM_NO_REBOOT_ SPKR	Off	Controls the TCO timer when running the ITP.
4 SW4–4	PD_MFG_MODE	Off	Sets manufactory mode for BIOS.
5 SW4–5	FM_ME_RCVR_N	Off	Recovers Intel ME.
6 SW4–6	FM_CPU0_SKTOCC_ N	On	Bypasses the processor when running the ITP.
7 SW4–7	BMC_XDP_JTAG_ SEL	Off	Selects BMC JTAG to the processor or CPLD.
8 SW4–8	FM_FORCE_ PWRON_LVC3_R	Off	Forces power on for power measurement.

Table 8. SW4 switch block description (continued)

Switch-bit number	Switch name	Default position	Description
9 SW4–9	PD_ADR_ COMPLETE	Off	Controls Asynchronous DRAM Refresh completion.
8 SW4–10	HW_ASD_EN	Off	Enables At-Scale Debug.

Troubleshooting by system LEDs and diagnostics display

See the following section for information on available system LEDs and diagnostics display.

LEDs and buttons on the front I/O module

The front I/O module of the server provides control buttons, connectors, and LEDs.

Your server supports the following front I/O module.

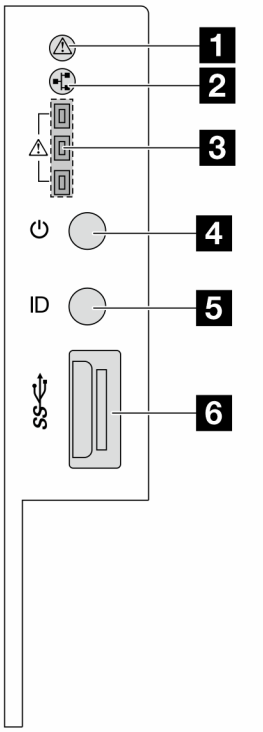


Figure 7. Front I/O module

Table 9. LEDs and buttons on the front I/O module

1 System health LED	2 Network activity LED
3 Tray 1/2/3 error LEDs	4 Power button with power status LED
5 UID button with UID LED	6 USB 3.2 Gen1 (5 Gbps) connector

1 System health LED

The system health LED helps determine if there are any system errors. There is another system health LED on DC-SCM on the rear, see “LEDs and buttons on Datacenter Secure Control Module (DC-SCM)” on page 19.

Status	Color	Description
Solid on	Yellow	A warning error has been detected on the server. Check the BMC event log to determine the exact cause of the error.
Blinking		A critical error has been detected on the server.
Off	/	The server is off or the server is on and is working normally.

2 Network activity LED

When an OCP module is installed, the network activity LED on the front I/O module helps you identify the network connectivity and activity. If no OCP module is installed, this LED is off.

Status	Color	Description
Solid on	Green	The server is connected to a network.
Blinking (4Hz)		The network is connected and active.
Off	/	The server is disconnected from the network. **Note:** If the network activity LED is off when an OCP module is installed, check the network ports in the rear of your server to determine which port is disconnected.

3 Tray 1/2/3 error LEDs

The server comes with three tray error LEDs to help identify the status of front drives connected to front backplanes from the top down.

Status	Color	Description
Solid on	Red	At least one front drive is not connected to the backplane correctly, or the backplane is not working normally.
Off	/	All drives and backplanes work normally.

4 Power button with power status LED

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 eight seconds to power off the server if you cannot shut down the server from the operating system. The power status LED helps you determine the current power status. There is another power button on DC-SCM on the rear, see “LEDs and buttons on Datacenter Secure Control Module (DC-SCM)” on page 19.

Status	Color	Description
Solid on	Green	Power on.
Slow blinking (about one flash per second)		Power off, and the server is ready to be powered on (standby state).
Fast blinking (about four flashes per second)		Power fault, or the server is waiting for BMC power permission to be ready.
Off	None	There is no ac power applied to the server.

5 UID button with UID LED

Use this UID button and the blue UID LED to visually locate the server. There is another UID LED on DC-SCM on the rear, see “LEDs and buttons on Datacenter Secure Control Module (DC-SCM)” on page 19.

Each time you press the UID button, the state of both the UID LEDs changes. The LEDs can be changed to on, blinking, or off. Press the UID button down and hold for five seconds, you can reset BMC.

You can also use BMC or a remote management program to change the state of the UID LEDs to assist in visually locating the server among other servers.

6 USB 3.2 Gen 1 (5Gbps) ports

The USB 3.2 Gen 1 (5Gbps) connectors are direct connect interfaces (DCIs) for debugging, which can be used to attach a USB-compatible device, such as a USB keyboard, USB mouse, or USB storage device.

LEDs and buttons on Datacenter Secure Control Module (DC-SCM)

The Datacenter Secure Control Module (DC-SCM) provides controls, connectors, and LEDs.

- “Connectors, LEDs and buttons on the front of DC-SCM” on page 20
- “LEDs and a connector on the side of DC-SCM” on page 22

Connectors, LEDs and buttons on the front of DC-SCM

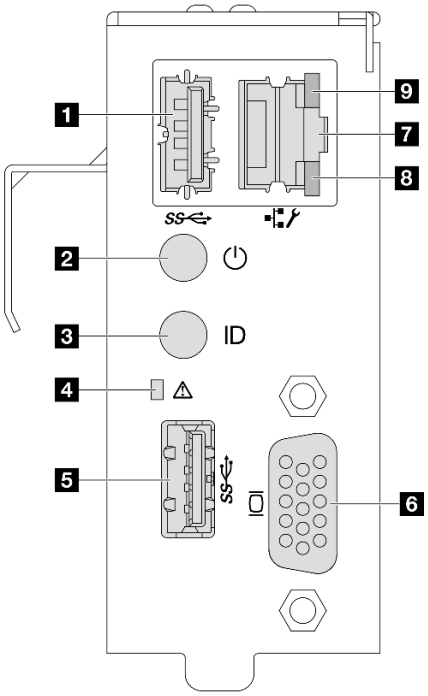


Figure 8. The front view of DC-SCM

1 USB 3.2 Gen 1 (5Gbps) port 1	2 Power button and power status LED
3 UID button and UID LED	4 System health LED
5 USB 3.2 Gen 1 (5Gbps) port 2	6 VGA port
7 BMC system management port (RJ-45)	8 Ethernet port activity LED
9 Ethernet port link LED	

1 5 USB 3.2 Gen 1 (5Gbps) ports

The USB 3.2 Gen 1 (5Gbps) connectors are direct connect interfaces (DCIs) for debugging, which can be used to attach a USB-compatible device, such as a USB keyboard, USB mouse, or USB storage device.

2 Power button with power status LED

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 eight seconds to power off the server if you cannot shut down the server from the operating system. The power status LED helps you determine the current power status. There is another power button on front I/O module on the front, see "LEDs and buttons on the front I/O module" on page 17.

Status	Color	Description
Solid on	Green	Power on.
Slow blinking (about one flash per second)	Green	Power off, and the server is ready to be powered on (standby state).

Status	Color	Description
Fast blinking (about four flashes per second)	Green	Power fault, or the server is waiting for BMC power permission to be ready.
Off	None	There is no ac power applied to the server.

3 UID button with UID LED

Use this UID button and the blue UID LED to visually locate the server. There is another UID button with UID LED on front I/O module on the front, see "LEDs and buttons on the front I/O module" on page 17.

Each time you press the UID button, the state of both the UID LEDs changes. The LEDs can be changed to on, blinking, or off. Press the UID button down and hold for five seconds, you can reset BMC.

You can also use BMC or a remote management program to change the state of the UID LEDs to assist in visually locating the server among other servers.

4 System health LED

The system health LED helps determine if there are any system errors. There is another system health LED on front I/O module on the front, see "LEDs and buttons on the front I/O module" on page 17.

Status	Color	Description
Solid on	Yellow	A warning error has been detected on the server. Check the BMC event log to determine the exact cause of the error.
Blinking		A critical error has been detected on the server.
Off	/	The server is off or the server is on and is working normally.

6 VGA port

The VGA port on the rear of the server can be used to attach a high-performance monitor, a direct-drive monitor, or other devices that use a VGA connector.

7 BMC system management port (RJ-45)

The BMC system management port can be used to attach an Ethernet cable to manage the baseboard management controller (BMC).

8 9 LEDs on BMC system management port

LED	Description
8 Ethernet port activity LED	Use this green LED to distinguish the network activity status: • Off: The server is disconnected from a LAN. • Green: The network is connected and active.
9 Ethernet port link LED	Use this LED to distinguish the network connectivity status: • Off: The network link is connected to 10 MB. • Yellow: The network link is connected to 100 MB. • Green: The network link is connected to 1000 MB.

LEDs and a connector on the side of DC-SCM

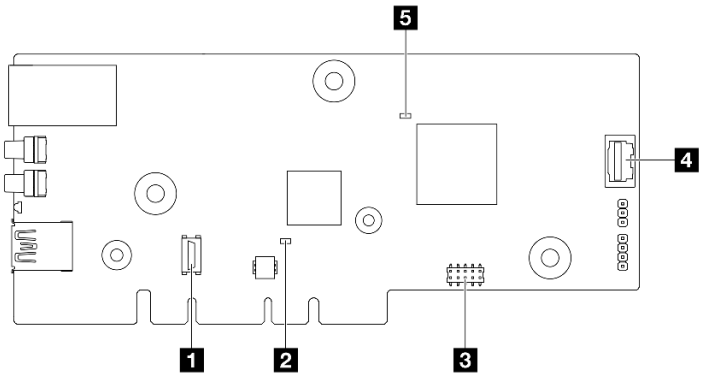


Figure 9. The side view of DC-SCM

1 TPM connector

The connector is provided for TPM utilisation.

2 CPLD heartbeat LED (Green) 5 BMC heartbeat LED (Green)

Item	Description
2 CPLD heartbeat LED (Green)	The CPLD heartbeat LED helps you identify the power and health status of the system board. There is another CPLD heartbeat LED on the front backplane, see "Front backplane LEDs and rear drive LEDs" on page 24. • Blinking (about one flash per second) : CPLD is working normally. • Blinking at other speeds or always on: CPLD is at the initial phase or is working abnormally. • Off: CPLD is not working.
5 BMC heartbeat LED (Green)	The BMC heartbeat LED helps you identify the BMC status. • Blinking (about one flash per second) : BMC is working normally. • Blinking at other speeds or always on: BMC is at the initial phase or is working abnormally. • Off: BMC is not working.

3 Serial port connector

The connector is provided for serial port utilisation.

4 VGA port

Connected to the VGA port on the front of DC-SCM, the VGA port on the side can be used with a cable plugged in.

LEDs on the system board

The following illustrations show the light-emitting diodes (LEDs) on the system board.

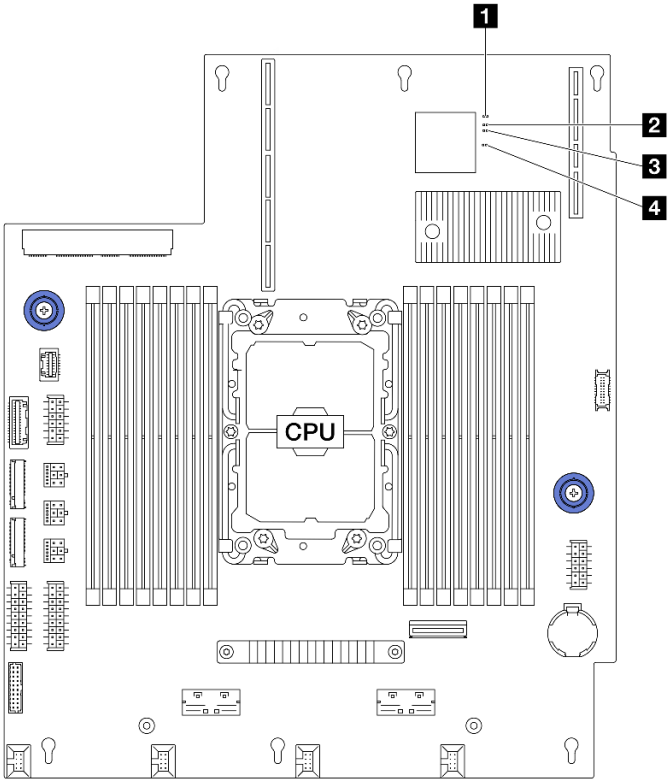


Figure 10. LEDs on the system board

1 FPGA error LED (red)

2 System power LED (green)

3 Catterr LED (red)

4 FPGA heartbeat LED (green)

Descriptions of LEDs on the system board

1 FPGA error LED (red)	
Description	The FPGA error LED indicates the working status of FPGA. • Blinking (1Hz): A power fault error happens. • Off: No FPGA errors happen.
Action	If the FPGA error LED is lit, contact Lenovo Support.

2 System power LED (green)	
Description	The system power LED indicates the working status of the system. • Fast blinking (about four flashes per second): Power fault or is waiting for BMC power permission ready. • Slow blinking (about one flash per second): Power off and is ready to be powered on (standby state). • On: Power on.
Action	• If the system power LED is blinking fast over 5 minutes and cannot power on, check the BMC heartbeat LED. For more information, see “LEDs and buttons on Datacenter Secure Control Module (DC-SCM)” on page 19. • If the system power LED remains off or is blinking fast (about four flashes per second) and the system error LED on the front panel is on (yellow), the system is in a power fault status. Do the following: 1. Re-plug the power cord. 2. Remove installed adapters/devices, one at a time, until you reach the minimal configuration for debugging. 3. (Trained technicians only) If the problem remains, capture FFDC log, and replace the system board. 4. If the problem still remains, contact Lenovo Support.

3 Catterr LED (red)	
Description	The Catterr LED helps you identify if there are major errors happening within the system. • On (red): One or more major errors happen. • Off: No major errors happen.
Action	If the Catterr LED is always on, do the following: 1. Replace the system board. 2. If the problem remains, contact Lenovo Support.

4 FPGA heartbeat LED (green)	
Description	The FPGA heartbeat LED helps you identify the FPGA status. • Blinking (about one flash per second): FPGA is working normally. • On or off: FPGA is not working.
Action	If FPGA heartbeat LED is always off or always on, do the following: 1. Replace the system board. 2. If the problem remains, contact Lenovo Support.

Front backplane LEDs and rear drive LEDs

This topic offers the status of LEDs on the front backplane, and rear drives LEDs showing via light pipes.

LEDs on the front backplane

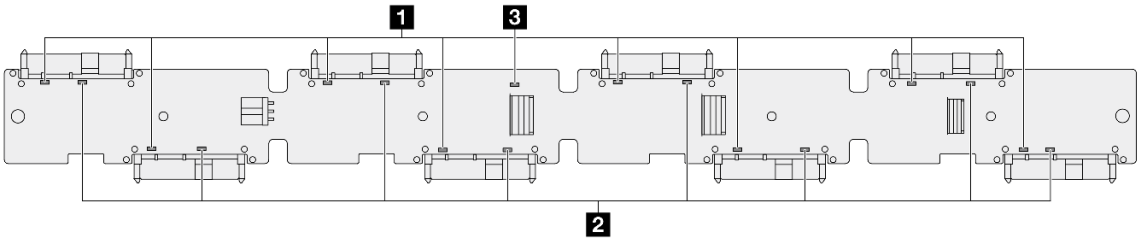


Figure 11. LEDs on the front backplane

1 Drive status LED	2 Drive activity LED
3 CPLD heartbeat LED	

1 Drive status LED 2 Drive activity LED

Table 10. Front drive LED description

Drive Status	1 Drive status LED (Orange)	2 Drive activity LED (Green)
The drive is not present.	Off	Off
The drive is present but not active.	Off	On
The drive is present and active.	Off	Blinking (4 Hz)
Locating the drive.	Blinking (4 Hz)	On
A drive fault happens.	On	On
The drive is being rebuilt.	Blinking (1 Hz)	Blinking (1 Hz)

3 CPLD heartbeat LED

The CPLD heartbeat LED helps you identify the power and health status of the system board. There is another CPLD heartbeat LED on DC-SCM, see “LEDs and buttons on Datacenter Secure Control Module (DC-SCM)” on page 19.

Table 11. CPLD heartbeat LED

3 CPLD heartbeat LED (Green)	
Status	Description
Blinking (about one flash per second)	CPLD is working normally.
Blinking at other speeds or always on	CPLD is at the initial phase or is working abnormally
Off	CPLD is not working

Rear drive LEDs

Communicating through the light pipes, each drive comes with a window for an activity LED and a status LED. Different colors and speeds indicate different activities or status of the drive. The following illustrations and tables describe the problems that are indicated by the activity LED and the status LED.

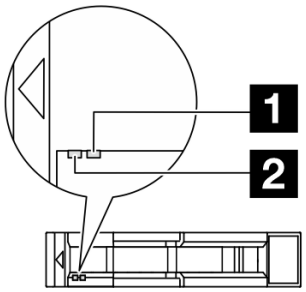


Figure 12. Rear drive LEDs

Table 12. Rear drive LED description

Drive Status	1 Drive status LED (Orange)	2 Drive activity LED (Green)
The drive is not present.	Off	Off
The drive is present but not active.	Off	On
The drive is present and active.	Off	Blinking (4 Hz)
Locating the drive.	Blinking (4 Hz)	On
A drive fault happens.	On	On
The drive is being rebuilt.	Blinking (1 Hz)	Blinking (1 Hz)

The LED on the power supply unit

This topic provides information about the LED status of a power supply unit.

The following table describes the problems that are indicated by various status of the power-supply unit LED.

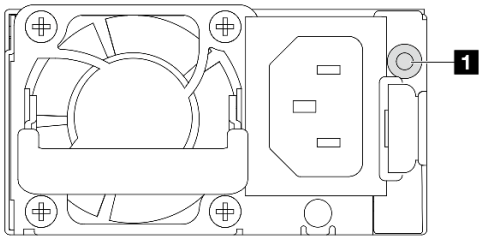


Figure 13. The LED on the power supply unit

Status	Description
On (green)	The server is on and the power supply unit is working normally.
Blinking (green, one flash per second)	The power supply unit is in zero-output mode (standby). When the server power load is low, one of the installed power supplies enters into the standby state while the other one delivers entire load. When the power load increases, the standby power supply will switch to active state to provide sufficient power to the server.
Blinking (green, two flashes per second)	The power supply unit is updating online.

Status	Description
On (yellow)	When the power supply unit is lit yellow: • Scenario 1: one of the two power supply units has powered off or is unplugged from the power cord, and at the same time, the other one has power on. • Scenario 2: the power supply unit has failed due to OTP, OCP, UVP or OVP.
Blinking (yellow, one flash per second)	The power supply unit is showing warnings, indicating OTW, OCW, or a slow fan speed.
Off	The power supply unit has no power input.

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 **Lenovo Data Center Support**, and enter the model name or machine type of your server in the search bar to navigate to the support page.
2. Click **Parts**.
3. Enter the serial number to view a listing of parts for your server.

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

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

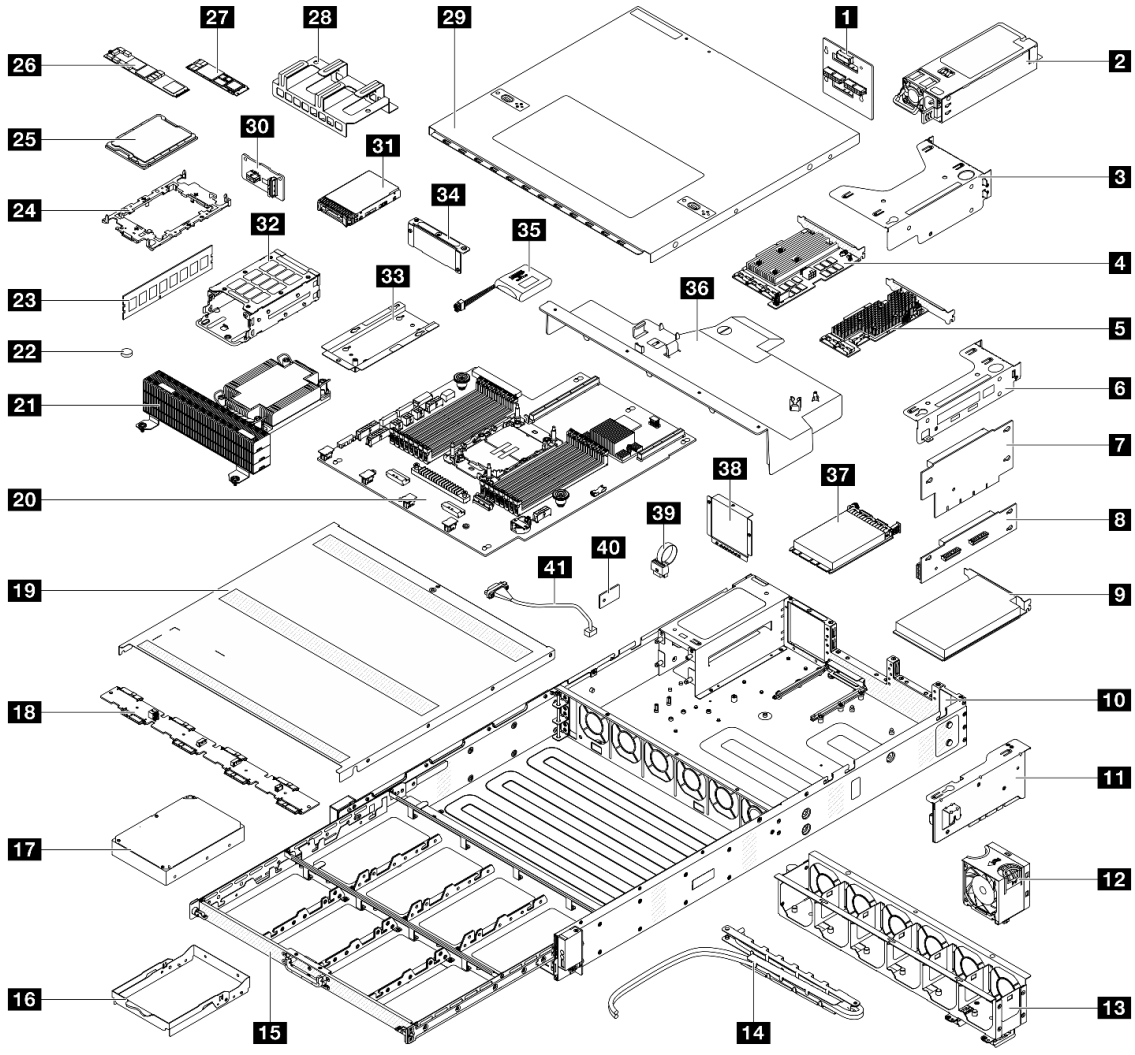


Figure 14. Server components

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

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

Table 13. Parts list

Description	Type	Description	Type
1 Power input board (PIB)	T2	2 Power supply unit	T1
3 Riser 1 bracket	T1	4 Broadcom 9670-24i 05-50123-00 Tri RAID	T2
5 Broadcom 9600-24i SATA/SAS HBA	T2	6 Riser 2 bracket	T1
7 Riser 1 card	T1	8 Riser 2 card	T1
9 PCIe adapter	T1	10 Chassis	FRU
11 DC-SCM	FRU	12 System fan	T1
13 Fan cage	FRU	14 CMA with cables	FRU
15 Hard drive tray	T1	16 3.5-inch hard drive bracket	T1
17 Hard drive (3.5-inch)	T1	18 Front backplane	FRU
19 Front top cover	FRU	20 System board	FRU
21 Performance heat sink	FRU	22 CMOS battery	C
23 Memory module	T1	24 Processor socket cover	T1
25 Processor	FRU	26 M.2 drive (type 22110)	T2
27 M.2 drive (type 2280)	T2	28 M.2 drive cover	T1
29 Rear top cover	FRU	30 Rear backplane	T2
31 Hard drive (2.5-inch)	T1	32 Rear hard drive cage	T1
33 Hard drive cage holder	T1	34 Rear wall cover	T1
35 RAID flash power module	T2	36 Air baffle	FRU
37 OCP module	T1	38 4-bay filler	C
39 VRoC key	FRU	40 TPM	T1
41 VGA cable	T1		

Power cords

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

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 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. Hardware replacement procedures

This section provides installation and removal procedures for all serviceable system components.

Installation Guidelines

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

Before installing optional devices, read the following notices carefully:

Attention: 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 to prevent exposure to static electricity which might lead to system halt and loss of data.

- When you install a new server, download and apply the latest firmware. This will help ensure that any known issues are addressed, and that your server is ready to work with optimal performance.

  Important: Some cluster solutions require specific code levels or coordinated code updates. If the component is part of a cluster solution, verify that the latest 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.
- It is good practice to make sure that the server is working normally before you install an optional component.
- Keep the working area clean, and place removed components on a flat and sturdy 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 Phillips #1 and #2 screwdriver, and a T30 Torx bit screwdriver available.
- To view the error LEDs on the system board and internal components, leave the power on.
- You do not have to turn off the server to remove or install hot-swap power supply units, hot swap fans, or hot-plug USB devices. However, you must turn off the server before you perform any steps that involve removing or installing adapter cables, and you must disconnect the power source from the server before you perform any steps that involve removing or installing a riser card.
- When replacing power supply units or fans, make sure to refer to redundancy rules for these components.
- Blue on a component indicates touch points, where you can grip to remove a component from or install it in the server, open or close a latch, and so on.
- Terra-cotta on a component or a terra-cotta 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. (Terra-cotta can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap

component for any additional procedures that you might have to perform before you remove or install the component.

- The Red strip on the drives, adjacent to the release latch, indicates that the drive can be hot-swapped if the server and operating system support hot-swap capability. This means that you can remove or install the drive while the server is still running.

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

Safety inspection checklist

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

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

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

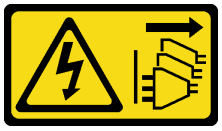
CAUTION:
This equipment must be installed or serviced by trained personnel, as defined by the NEC, IEC 62368-1 & IEC 60950-1, the standard for Safety of Electronic Equipment within the Field of Audio/Video, Information Technology and Communication Technology. Lenovo assumes that you are qualified in 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. If your working condition necessitates the server being powered off or you intend to power off, make sure that the power cord is disconnected.

   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.

   Note: Under certain circumstances, powering off the server is not a prerequisite. Refer to the precautions before conducting any tasks.
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 insulation is not frayed or worn.

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

System reliability guidelines

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

Make sure the following requirements are met:

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

Working inside the server with the power on

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

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

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

Handling static-sensitive devices

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

Attention: 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 to prevent exposure to static electricity which might lead to system halt and loss of data.

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

Memory module installation rules and order

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

Memory modules and processors layout

The following illustration helps you to locate the memory module slots on the system board. The memory-channel identification table below shows the relationship between the processors, memory controllers, memory channels, and memory module slot numbers.

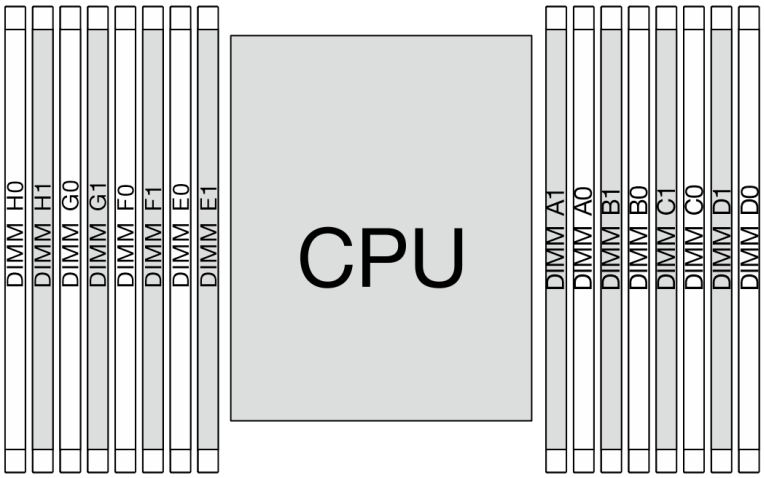


Figure 15. Memory module slots on the system board

Table 14. Memory slot and channel identification

Processor	**CPU**															
Controller	iMC3				iMC2				iMC0				iMC1			
Channel	CH1		CH0		CH1		CH0		CH0		CH1		CH0		CH1	
Slot No.	0	1	0	1	0	1	0	1	1	0	1	0	1	0	1	0
DIMM No.	H0	H1	G0	G1	F0	F1	E0	E1	A1	A0	B1	B0	C1	C0	D1	D0

- Slot No.: DIMM slot number in each memory channel. Each memory channel has two DIMM slots: slot 0 (further from the processor) and slot 1 (closer to the processor).
- DIMM No.: DIMM slot number helps identify the order of DIMM installation.

Memory module installation guideline

- For the installation rules and population sequence, see "DDR5 DIMMs installation order" on page 38.
- At least one DIMM is required for the processor. Install at least eight DIMMs for good performance.

DDR5 DIMMs installation order

This section contains information of how to install DDR5 DIMMs properly.

Independent mode installation order

In independent 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 mode provides the highest level of memory performance, but lacks failover protection. The DIMM installation order for independent mode varies based on the number of memory modules installed in the server.

Independent mode installation rules

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

- There should be at least one DDR5 DIMM installed.
- All DDR5 memory modules must operate at the same speed in the same system.
- In each memory channel, populate the slot farthest from the processor (slot 0) first.
- All DIMMs must be all DDR5 DIMMs.
- All memory modules to be installed must be of the same type.

The following table shows the sequence of populating memory modules for independent mode.

Table 15. Independent mode with one processor

Total DIMMs	Processor															
	H0	H1	G0	G1	F0	F1	E0	E1	A1	A0	B1	B0	C1	C0	D1	D0
1 DIMM										A0						
2 DIMMs			G0							A0						
4 DIMMs			G0				E0			A0				C0		
6 DIMMs			G0		F0		E0			A0				C0		D0
8 DIMMs	H0		G0		F0		E0			A0		B0		C0		D0
12 DIMMs	H0		G0	G1	F0		E0	E1	A1	A0		B0	C1	C0		D0
16 DIMMs	H0	H1	G0	G1	F0	F1	E0	E1	A1	A0	B1	B0	C1	C0	D1	D0

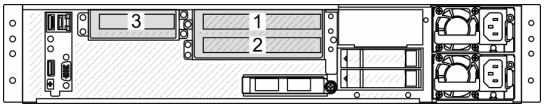
Technical rules

Refer to the below technical rules and limitations when you install the related server components.

PCIe slots and adapters

Understanding the technical rules for PCIe adapters helps you correctly install and configure PCIe adapters in the system.

Table 16. PCIe adapters supported and locations

Server rear view	Supported types and slot location
	**Riser 1 assembly** • Slot 1: PCIe x8, Gen 4, full-height, half-length • Slot 2: PCIe x16, Gen 4, full-height, half-length **Riser 2 assembly** • Slot 3: PCIe x16, Gen 4, half-height, half-length

PCIe adapter	Installation priority	Maximum supported	Slot supported
OCP module			
ThinkSystem Broadcom 2X25G BCM957414N4140C-N225p SFP28 OCP3.0 v18 NIC	OCP slot	1	OCP slot
ThinkSystem Intel E810-XXVDA2 25GbE SFP28 2-port OCP 3.0 Ethernet Adapter			
ThinkSystem Intel E810-CQDA2 OCP3.0 Ethernet Network Adapter			
ThinkSystem Mellanox MCX623436AN-CDAB OCP3.0 2x100G QSFP56 NIC			
ThinkSystem Broadcom 2X100G BCM957508-N2100G QSFP28 OCP3.0 NIC			
NIC adapters			
ThinkSystem Broadcom 2P 25Gbe PCIe RDMA BCM957414A4142CC NIC	2	1	2
ThinkSystem Emulex LPe35002 32Gb 2-port PCIe Fibre Channel Adapter			
RAID adapter and HBA			
ThinkSystem Broadcom 9600-24i 05-50111-01 SFF8654 SAS HBA RAID	1	1	1
ThinkSystem Broadcom 9670-24i 05-50123-00 Tri RAID			

To locate the PCIe slots, see “Rear view” on page 12.

Thermal rules

This topic provides thermal rules for the server.

Server models with front and rear drive bays

This section provides thermal information for server models with front and rear drive bays.

Drive bays	Front drives	24 x 3.5-inch SATA
	Rear drives	2 x 2.5-inch NVMe
Maximum ambient temperature support (fan normal)		40°C (at sea level)

Maximum ambient temperature support (fan fail)		30°C (at sea level)
Processor TDP		350 W
Air baffle type		Standard
Heat sink type		2U performance T-shape heat sink
System fan type		6038
DIMM	Type	Hynix DDR5 RDIMM 64 GB (2Rx4)
	Maximum quantity supported	16
OCP module		Install either one below: • Broadcom 2X25G BCM957414N4140C-N225p SFP28 OCP3.0 v18 NIC -CSP • Intel E810-XXVDA2 25GbE SFP28 2-port OCP 3.0 Ethernet Adapter CSP • Intel E810-CQDA2 OCP3.0 Ethernet Network Adapter CSP • Mellanox MCX623436AN-CDAB OCP3.0 2x100G QSFP56 NIC -IPDC • Broadcom 2X100G BCM957508-N2100G QSFP28 OCP3.0 NIC -CSP

Power on and power off the server

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

Power on the server

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

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

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

For information about powering off the server, see “Power off the server” on page 40.

Power off the server

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

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

- 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 eight seconds to force a shutdown.

When in a standby state, the server can respond to remote power-on requests sent to the BMC. For information about powering on the server, see “Power on the server” on page 40.

Server replacement

Follow instructions in this section to remove and install the server.

- “Remove the server from the rack” on page 41
- “Install the server to the rack” on page 44

Remove the server from the rack

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

S036

18 - 32 kg (39 - 70 lb)

32 - 55 kg (70 - 121 lb)

CAUTION:
Use safe practices when lifting.

CAUTION:

- **Potential stability hazards exist. The rack might tip over and cause serious personal injury.**
- **Before extending the rack to the installation position, read the “Installation Guidelines” on page 33. Do not put any load on the slide-rail mounted equipment in the installation position. Do not leave the slide-rail mounted equipment in the installation position.**

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

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

Procedure

Step 1. If the server comes with two shipping brackets on both rear ends of the chassis, remove them first.

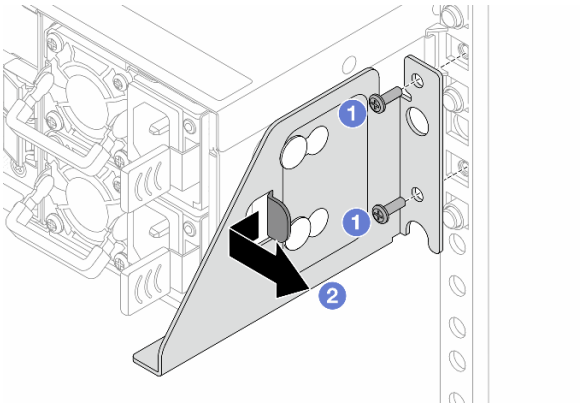


Figure 16. Removing the shipping bracket

- 1 Loosen the two screws on the shipping bracket.
- 2 Pull the bracket backwards to latch the standoff screws on the right holes, and pull the bracket to the right to disengage it from the chassis.

Step 2. Use a screwdriver to loosen the captive screws and disengage the server from the rack.

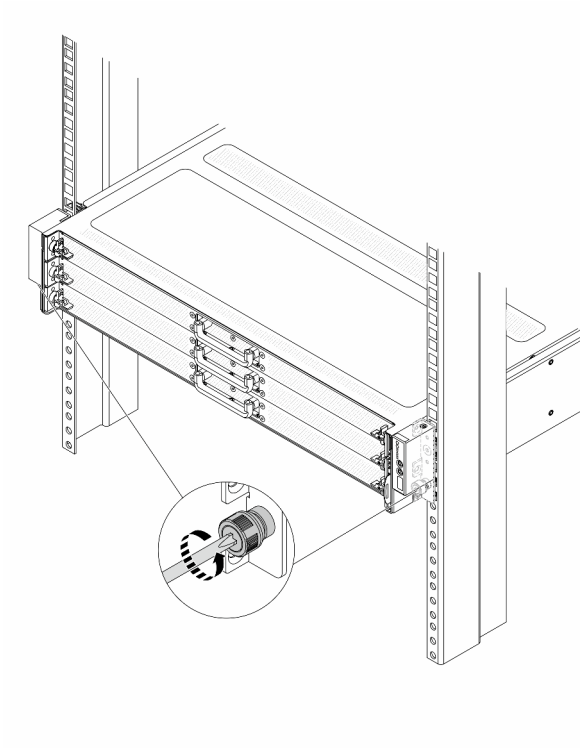


Figure 17. Disengaging the server from the rack

Step 3. Slide the server out along the rails.

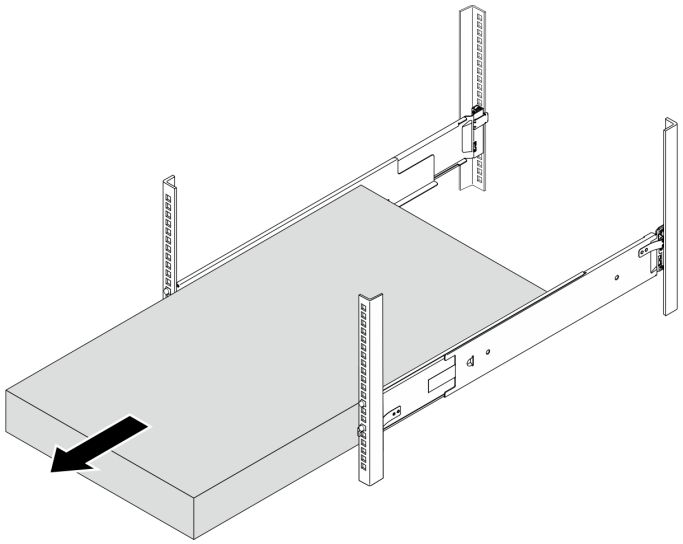


Figure 18. Pulling out the server

Step 4. Remove the rails from the rack.

a. Press and hold the blue button on the front end of the rail to release the front latch gripping the rack flange; then, slightly push the rail towards the rear until the pins disengage from the holes in the EIA flange.

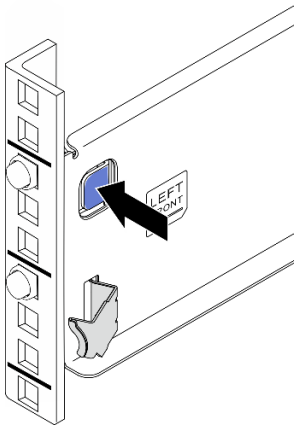


Figure 19. Releasing the front latch

b. Hold the rail with one hand and pull the rear latch with your other hand to release the rail from the rear mounting flange; then, remove the rail from the rack.

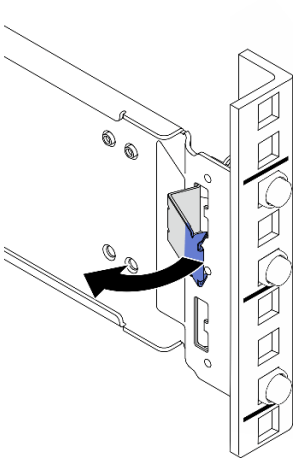


Figure 20. Releasing the rear latch

c. Repeat the previous two steps on the other rail to remove it.

After you finish

Carefully lay the server on a flat, static-protective surface.

Install the server to the rack

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

S036

18 - 32 kg (39 - 70 lb)

32 - 55 kg (70 - 121 lb)

CAUTION:
Use safe practices when lifting.

CAUTION:

- **Potential stability hazards exist. The rack might tip over and cause serious personal injury.**
- **Before extending the rack to the installation position, read the “Installation Guidelines” on page 33. Do not put any load on the slide-rail mounted equipment in the installation position. Do not leave the slide-rail mounted equipment in the installation position.**

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.

- 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 systems.

CAUTION:
Make sure to have three people operate the server installation procedures to prevent injury.

This task has two main steps:

- Step 1 Install the rails to the rack on page 45
- Step 2 Install the server to the rails on page 47

Procedure

Step 1. Install the rails to the rack.

Identify the left rail 1 and the right rail 2. See the text on the front end of the rail to identify if it is the left or right rail.

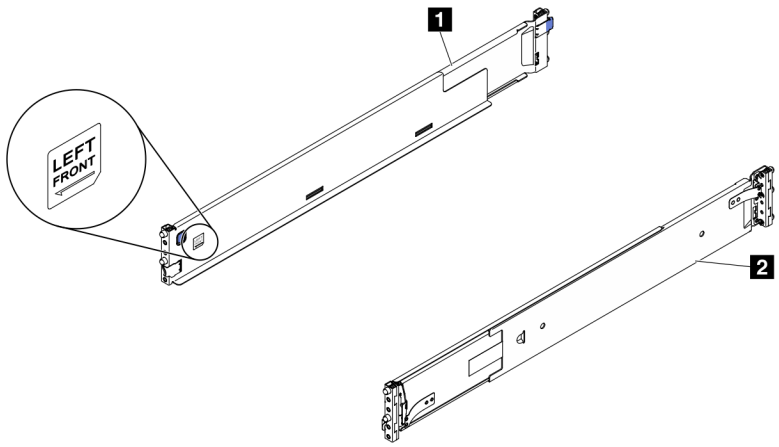


Figure 21. The left and right rails

a. Grab the rear end of one rail and expand it to a proper length.

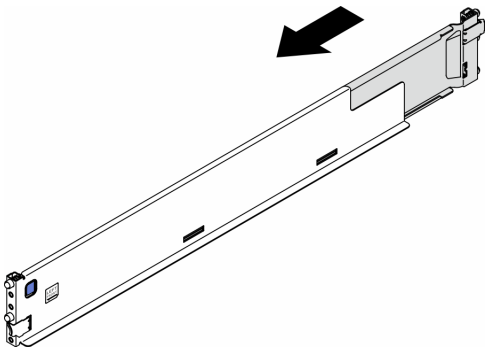


Figure 22. Extending the rail

b. Align the posts, that are extending from the rear end of the rail, to the holes on the rear EIA flanges; then, push the rail until the latch clicks into place around the edge of the EIA flange.

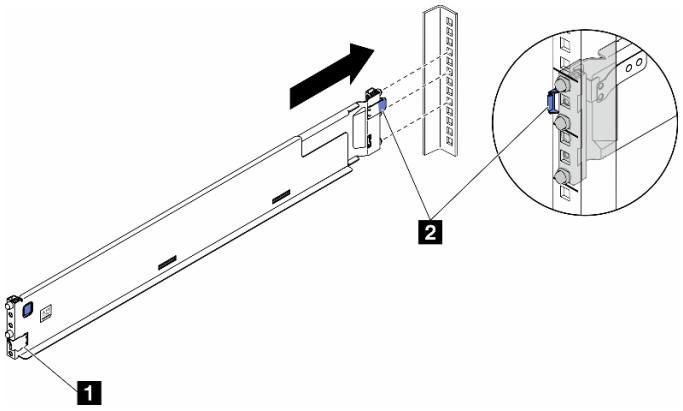


Figure 23. Installing the rear end of the rail

1 Front latch	2 Rear latch

c. Install the front end of the rail.

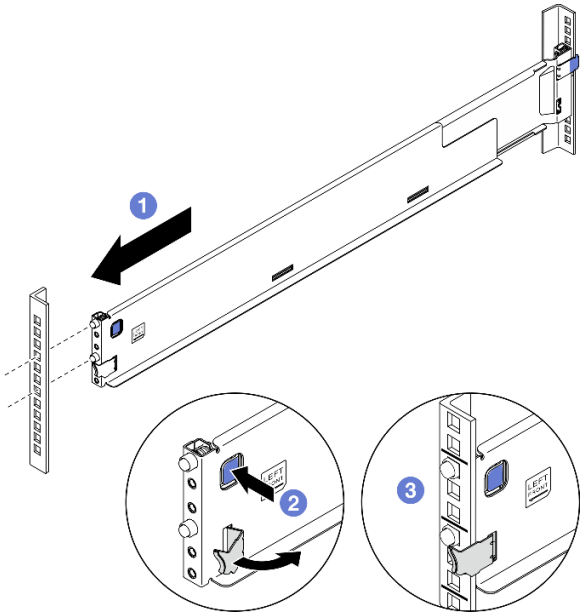


Figure 24. Install the front end of the rail

- 1 Pull the rail towards the front.
- 2 Press and hold the blue button to open the front latch.
- 3 Align the pins on the front end of the rail to the holes in the front EIA flange and pull the rail forward; then, release the blue button so that the latch catches over the EIA flange.

Note: To make sure the rails are secured to square hole racks, examine the pins to see if the collars are fully in the mounting flange holes. If not, gently shake the rails until all the collars are visible in the mounting flange holes. Examine both ends to make sure the rails are secured.

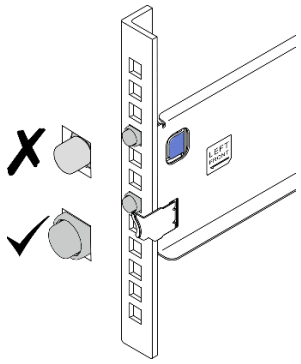


Figure 25. Pins in square mounting flange holes

d. Repeat the previous three steps on the other rail.

Step 2. Install the server to the rails.

a. Align and place the server onto the rails; then, slide it into the rack along the rails.

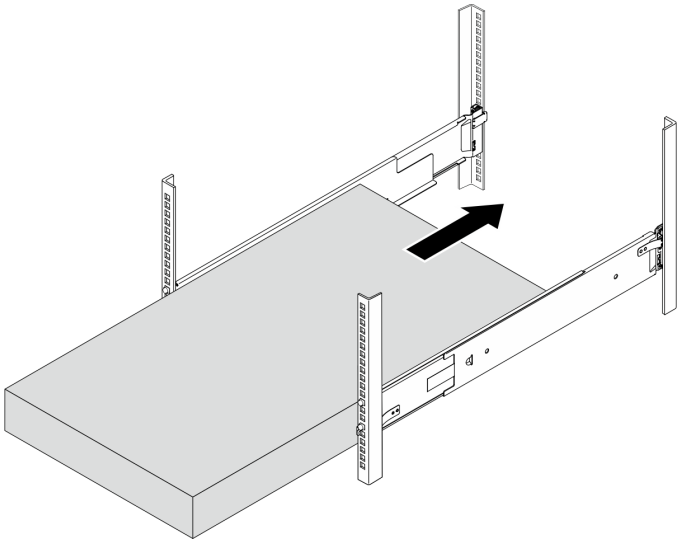


Figure 26. Installing the server on rails

b. Use a screwdriver to secure the captive screws to racks.

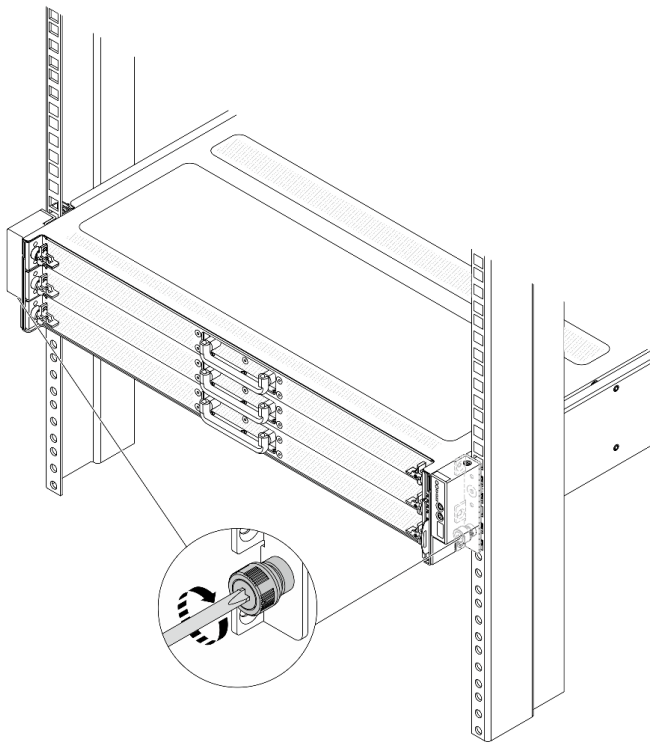


Figure 27. Secure the captive screws

After you finish

1. Reconnect the power cords and any cables that you removed.
2. Power on the server and any peripheral devices. See “Power on the server” on page 40.
3. Update the server configuration. See “Complete the parts replacement” on page 174.

Air baffle replacement

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

- “Remove the air baffle” on page 48
- “Install the air baffle” on page 50

Remove the air baffle

Follow instructions in this section to remove the air baffle.

About this task

The air baffle you want to remove might be different from following illustrations, but the removal method is the same.

S033

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

S017

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

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.
- If you intend to install memory modules in the server, you must first remove the air baffle from the server.

Procedure

Step 1. Remove the top cover. See “Remove the rear top cover” on page 162.

Step 2. If there is a RAID flash power module installed on the air baffle, disconnect the RAID flash power module cable first.

Step 3. Grasp the air baffle and carefully lift it out of the server.

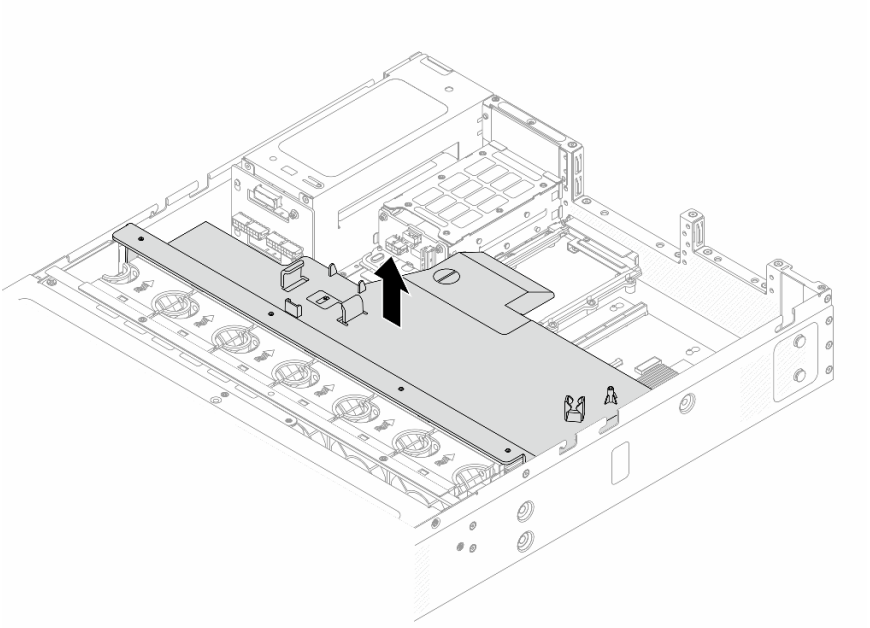


Figure 28. Air baffle removal

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

After you finish

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

Demo video

Watch the procedure on YouTube

Install the air baffle

Follow instructions in this section to install the air baffle.

About this task

The air baffle you want to install might be different from following illustrations, but the installation method is the same.

S033

CAUTION:

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

S017

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

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Procedure

Step 1. If you need to install a RAID flash power module on the back side of the air baffle, install it first. See "Install the RAID flash power module" on page 136.

Step 2. Align the clips on the air baffle to the sockets on the fan cage.

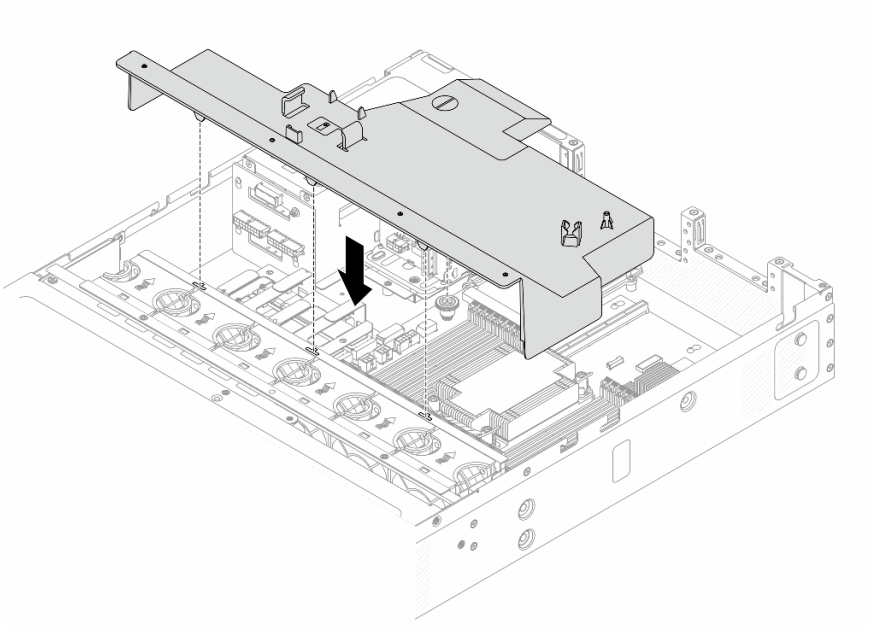


Figure 29. Air baffle installation

Step 3. Lower the air baffle into the chassis and press the air baffle down until it is securely seated.

After you finish

Complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

Backplane replacement

Use this information to remove and install a backplane.

Remove the front 3.5-inch drive backplane

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

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Prepare your server.

a. Remove the top cover. See “Remove the rear top cover” on page 162.

b. Remove all installed drives from the drive bays.

Step 2. Record the cable connections on the backplane and then disconnect all cables from the backplane. For more details, see “Cable routing for front backplane power” on page 176 and “Cable routing for front backplane signals” on page 177 If the cable connectors come with protective dust caps, make sure to put them back on.

Step 3. Remove the backplane from the chassis.

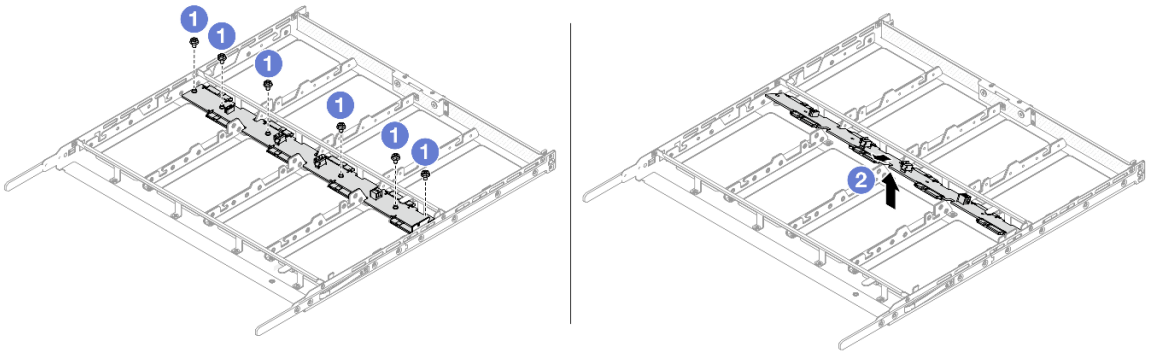


Figure 30. 3.5-inch drive backplane removal

a. 1 Loosen the screws that secure the backplane.

b. 2 Tilt the backplane and lift it out of the drive tray.

After you finish

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

Demo video

Watch the procedure on YouTube

Install the front 3.5-inch drive backplane

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

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

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

Step 2. Install the backplane down into place.

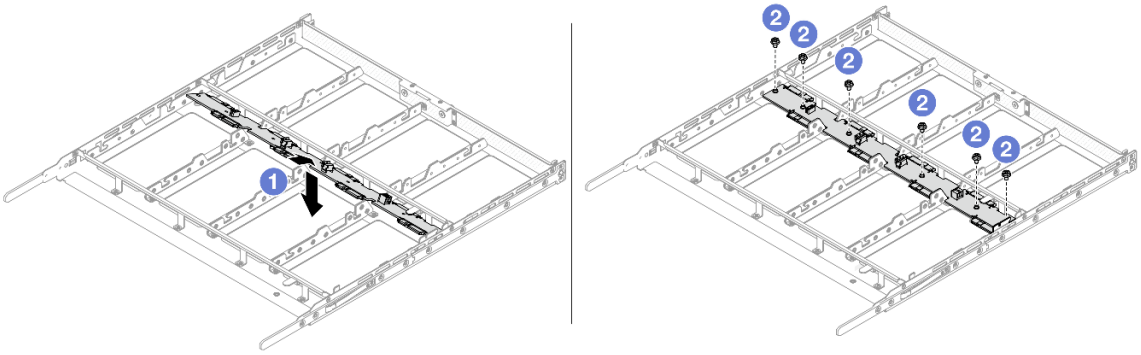


Figure 31. Installing a 3.5-inch drive backplane

a. 1 Tilt the backplane and place it evenly into the chassis.

b. 2 Tighten the screws and make sure the backplane is secured in place.

Step 3. Connect the cables to the system board assembly and the backplane. For more details, see "Cable routing for front backplane power" on page 176 and "Cable routing for front backplane signals" on page 177. If the cable connectors come with protective dust caps, make sure to remove them before plugging in.

After you finish

1. Reinstall all the drives into the drive bays. See "Install a 3.5-inch hot-swap front drive" on page 98.
2. Complete the parts replacement. See "Complete the parts replacement" on page 174.

Demo video

Watch the procedure on YouTube

Remove the 2.5-inch rear drive backplane

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

About this task

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Procedure

Step 1. Prepare your server.

a. Remove the top cover. See "Remove the rear top cover" on page 162.

b. Remove the air baffle. See “Remove the air baffle” on page 48.

c. Remove all installed drives from the drive bays. See “Remove a 2.5-inch hot-swap rear drive” on page 101.

Step 2. Record the cable connections for 2.5-inch rear drive and then disconnect all cables from the backplanes. For information about the backplane cable routing, see “Cable routing for rear drive backplane” on page 181.

Step 3. Carefully lift the 2.5-inch rear drive backplane out of the rear hot-swap drive cage.

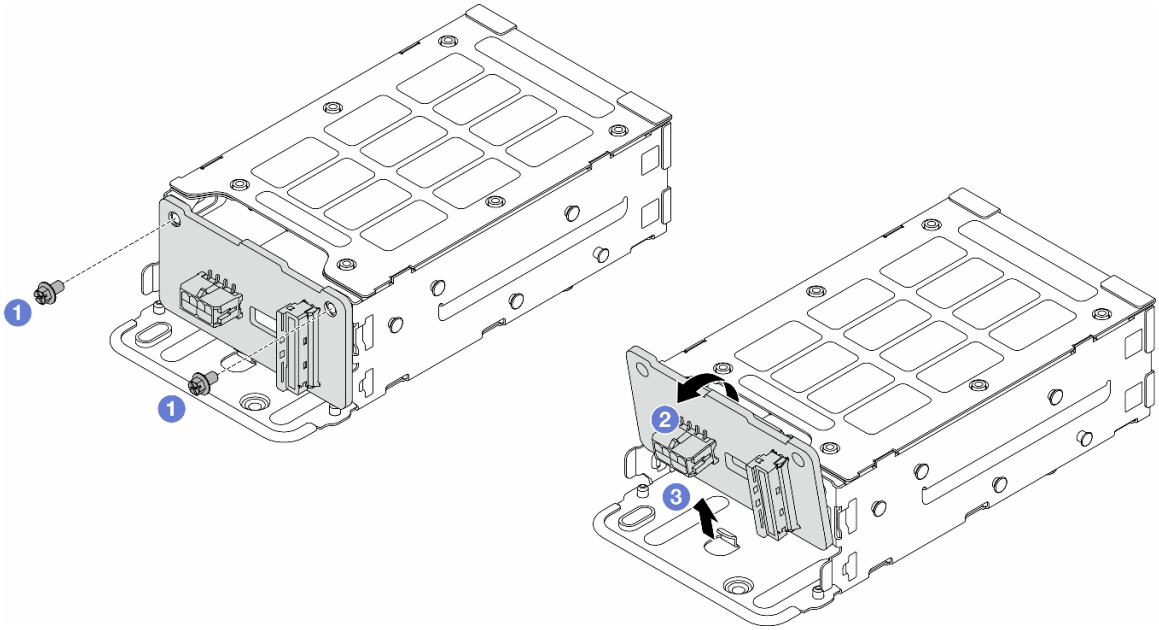


Figure 32. 2.5-inch rear drive backplane removal

a. 1 Loosen the screws that secure the rear backplane.

b. 2 Tilt the backplane as the illustration shows.

c. 3 Slide the backplane out of the rear drive cage.

After you finish

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

Demo video

Watch the procedure on YouTube

Install the 2.5-inch rear drive backplane

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

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

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

Step 2. Install the rear backplane to rear drive cage.

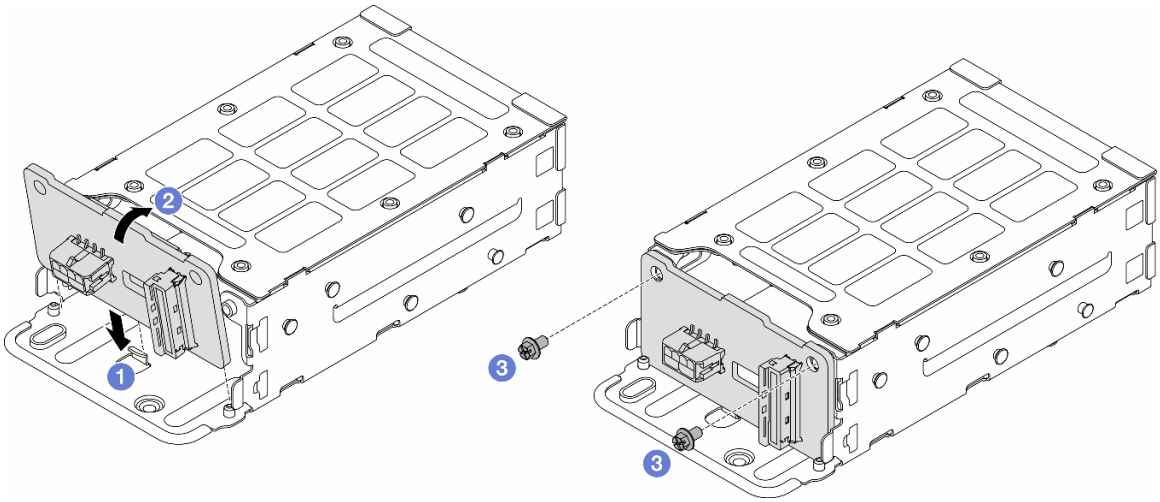


Figure 33. Rear backplane installation

a. 1 Tilt the backplane and insert the bottom into drive cage clips.

b. 2 Align the screw holes on the backplane and drive cage.

c. 3 Tighten the screws and make sure that the rear backplane is secured.

Step 3. Connect the cables to the system board assembly and the backplane. See Chapter 5 “Internal cable routing” on page 175. If the cable connectors come with protective dust caps, make sure to remove them before plugging in.

After you finish

1. Reinstall drives into the rear hot-swap drive cage. See “Install a 2.5-inch hot-swap rear drive” on page 102.
2. Reinstall the drive assembly to the server. See “Install the 2.5-inch rear drive assembly” on page 141.
3. Complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

Cable management arm (CMA) replacement (trained technicians only)

Follow the instructions in this section to remove and install the cable management arm (CMA).

- “Remove top cable management arm (CMA)” on page 57
- “Install top cable management arm (CMA)” on page 59
- “Remove middle cable management arm (CMA)” on page 62
- “Install middle cable management arm (CMA)” on page 66
- “Remove bottom cable management arm (CMA)” on page 69
- “Install bottom cable management arm (CMA)” on page 75

Remove top cable management arm (CMA)

Use this information to remove the top cable management arm (CMA).

About this task

S033

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

S014

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

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. If the server is installed in a rack, remove the server from the rack. See “Remove the server from the rack” on page 41.

Step 2. Remove the rear top cover. See “Remove the rear top cover” on page 162.

Step 3. Remove the front top cover.

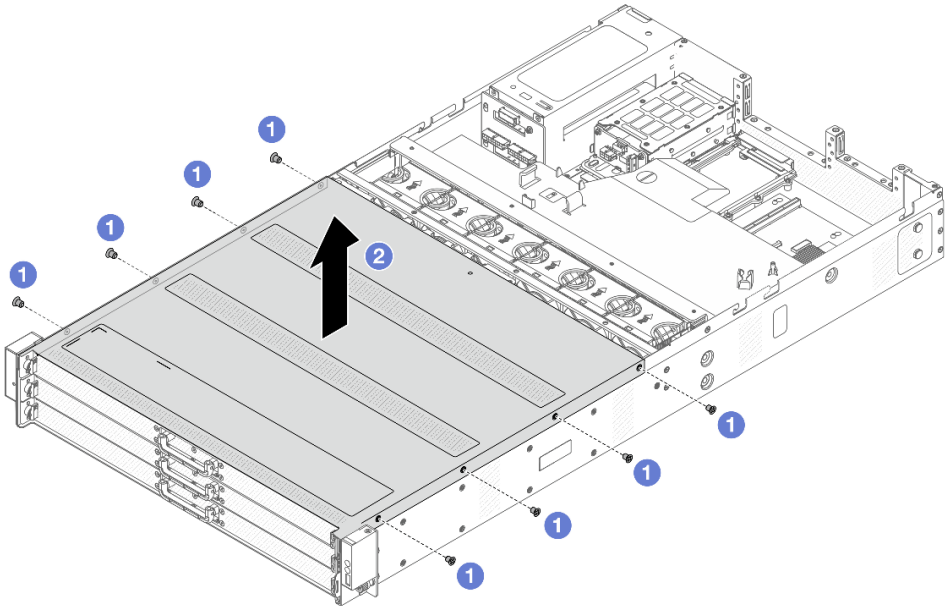


Figure 34. Top cover removal

a. 1 Use a screwdriver to remove the screws that lock the front top cover.

b. 2 Lift the front cover up and remove it.

Step 4. Remove riser 1 and 2 assemblies. See “Riser card and PCIe adapter replacement” on page 145.

Step 5. Remove the air baffle. See “Remove the air baffle” on page 48.

Step 6. Pull out the front drive tray steadily to get access to the top CMA.

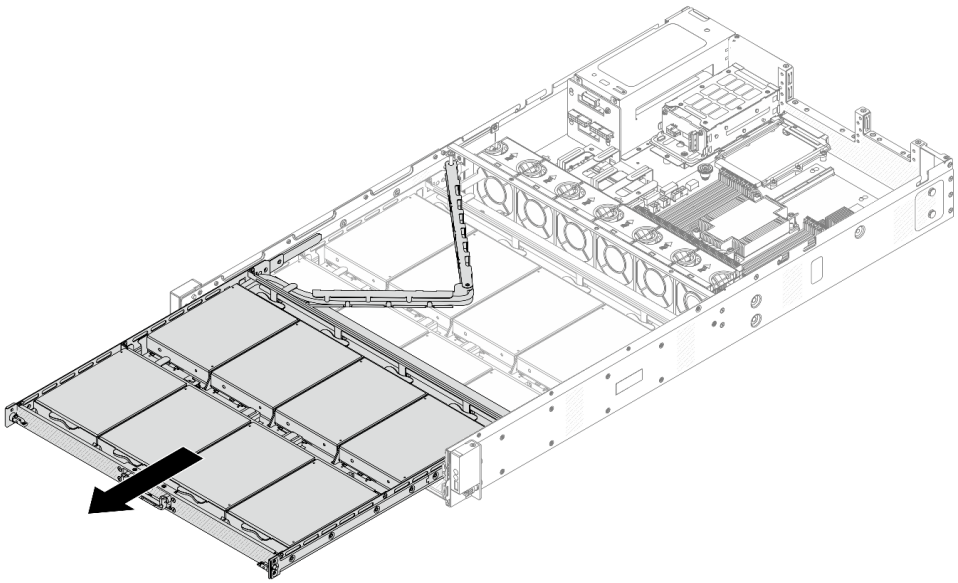


Figure 35. Extending the top CMA

Step 7. Disconnect all cables that go through the CMA to be removed. For more details about the cable routing, see “Cable routing for front backplane power” on page 176 and “Cable routing for front backplane signals” on page 177.

Step 8. Remove the CMA with cables attached.

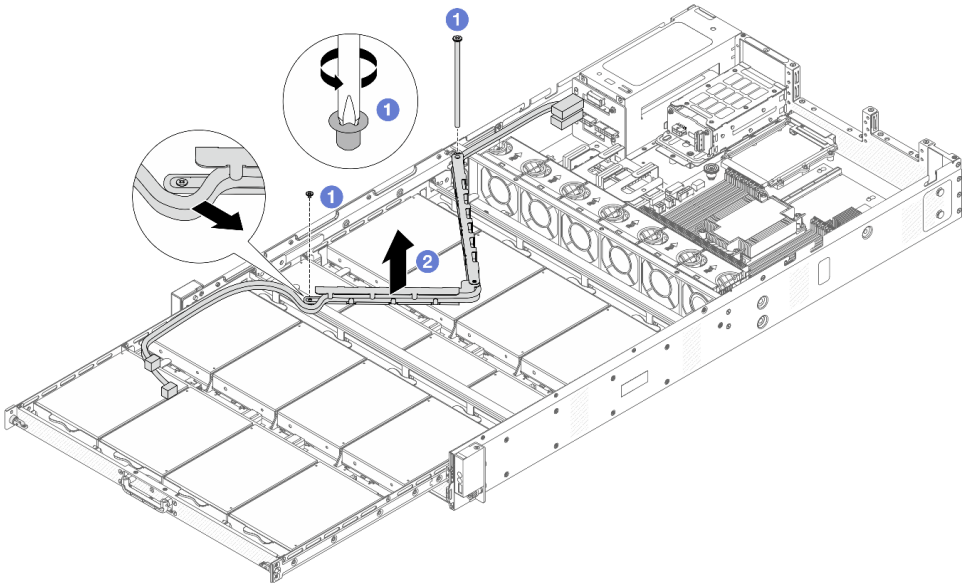


Figure 36. Removing the top CMA

a. 1 Use a screwdriver to remove the screws that lock top CMA.

b. 2 Lift the CMA up and remove it.

After you finish

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

Demo video

Watch the procedure on YouTube

Install top cable management arm (CMA)

Follow instructions in this section to install the top cable management arm (CMA).

About this task

S033

CAUTION:

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

S014

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

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Procedure

Step 1. Check your server and ensure that:

- All cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server.
- All internal cables are connected and routed correctly. See Chapter 5 "Internal cable routing" on page 175.

Step 2. Install the top CMA.

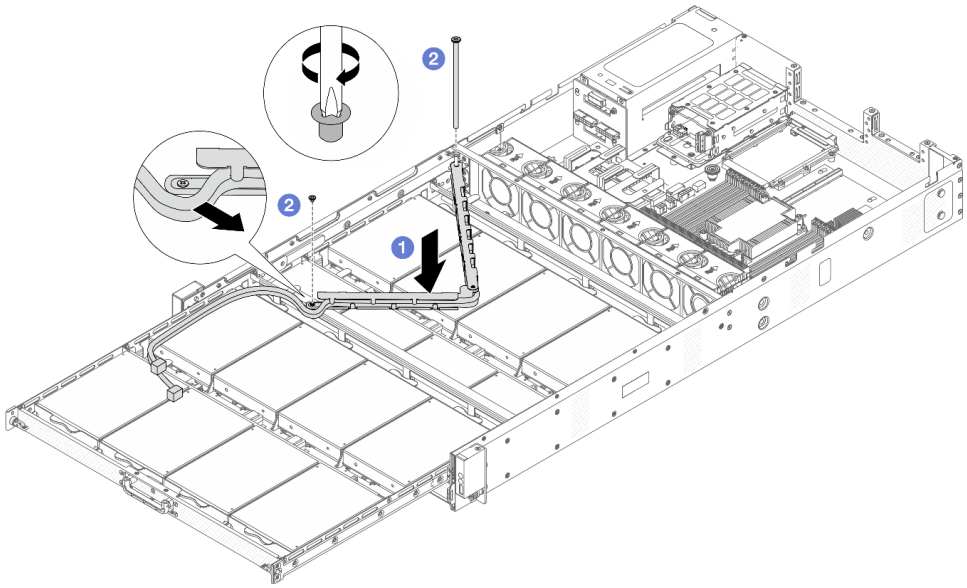


Figure 37. Installing the top CMA

a. (1) Lower the CMA into the chassis until both sides align the screw holes on the chassis.

b. (2) Use a screwdriver to install the screws to secure the CMA.

Step 3. Connect all cables that go through the CMA. For more details about the cable routing, see “Cable routing for front backplane power” on page 176 and “Cable routing for front backplane signals” on page 177.

Step 4. Push the front drive tray back into position.

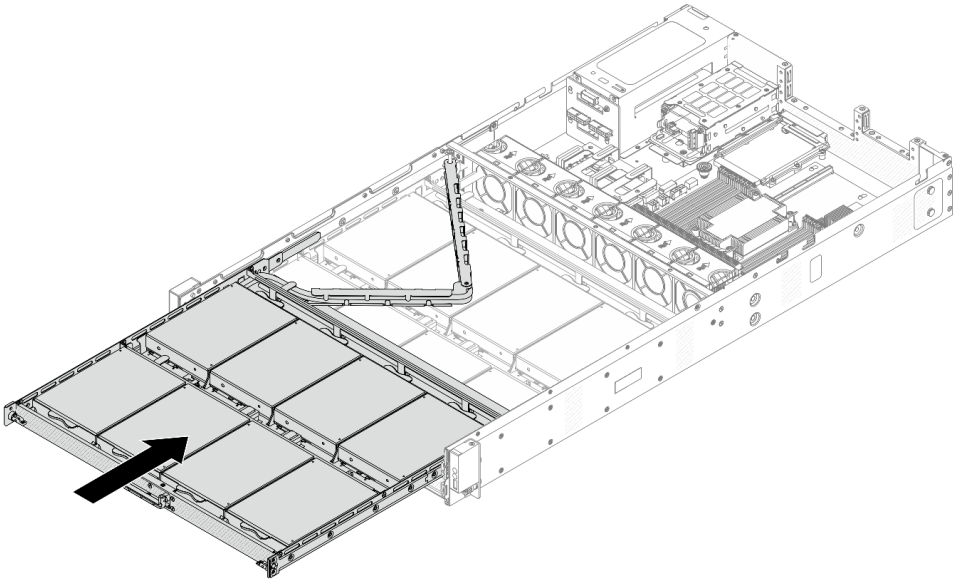


Figure 38. Folding the top CMA

Step 5. Install the air baffle. See “Install the air baffle” on page 50.

Step 6. Install riser 1 and 2 assemblies. See “Riser card and PCIe adapter replacement” on page 145.

Step 7. Install the front top cover to the server.

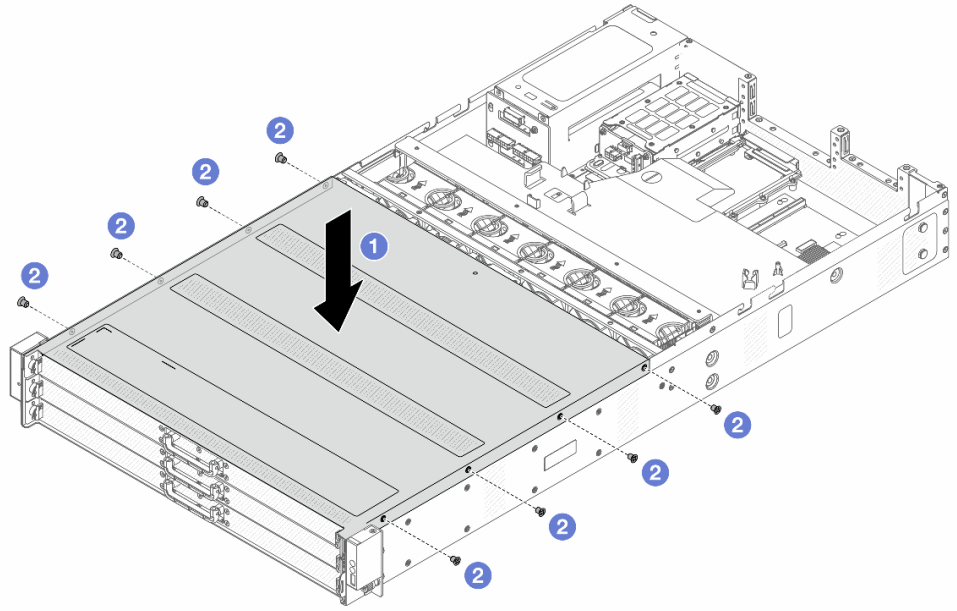


Figure 39. Front top cover installation

a. 1 Lower the front top cover onto the chassis until both sides of the top cover engage the guides on both sides of the chassis.

b. 2 Use a screwdriver to install the screws to secure the front top cover.

Step 8. Install rear top cover. See “Install the rear top cover” on page 164.

Step 9. Install the server into the racks. See “Install the server to the rack” on page 44.

After you finish

After installing the top cover, complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

Remove middle cable management arm (CMA)

Use this information to remove the middle cable management arm (CMA).

About this task

S033

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

S014

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

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Procedure

Step 1. If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 41.

Step 2. Remove the rear top cover. See "Remove the rear top cover" on page 162.

Step 3. Remove the front top cover.

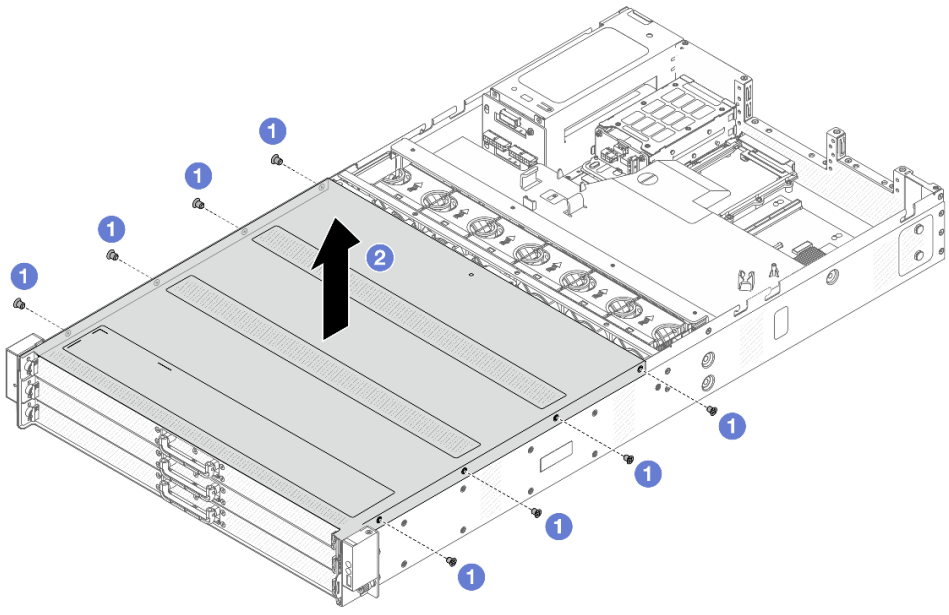


Figure 40. Top cover removal

a. 1 Use a screwdriver to remove the screws that locks the front top cover.

b. 2 Lift the front cover up and remove it.

Step 4. Remove riser 1 and 2 assemblies. See "Riser card and PCIe adapter replacement" on page 145.

Step 5. Remove the air baffle. See “Remove the air baffle” on page 48.

Step 6. Pull out the front drive trays steadily to get access to top and middle CMAs.

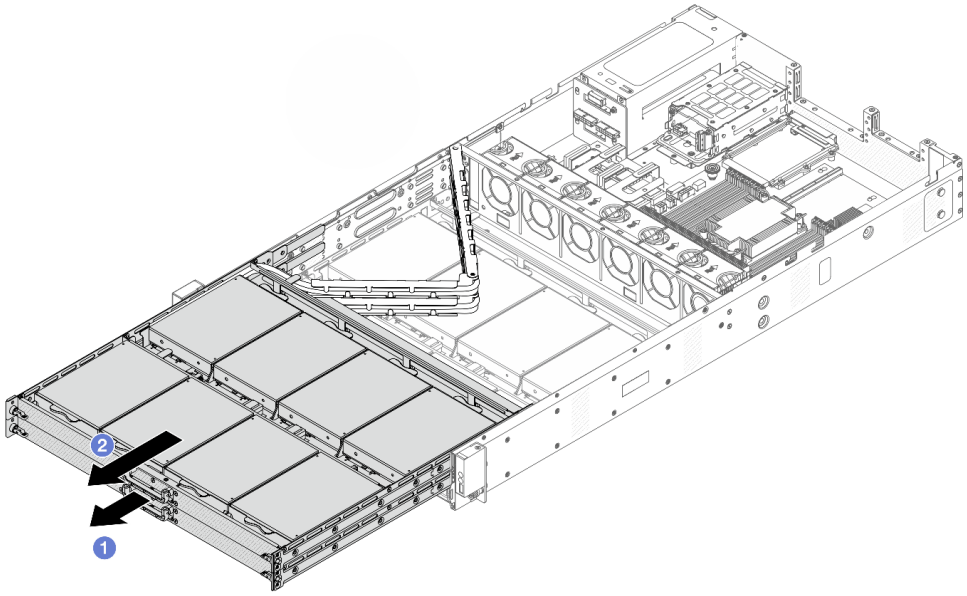


Figure 41. Extending top and middle CMAs

a. Pull out middle CMA first.

b. Pull out top CMA.

Step 7. Disconnect all cables that go through the CMAs to be removed. For more details about the cable routing, see “Cable routing for front backplane power” on page 176 and “Cable routing for front backplane signals” on page 177.

Step 8. Remove top CMA with cables attached.

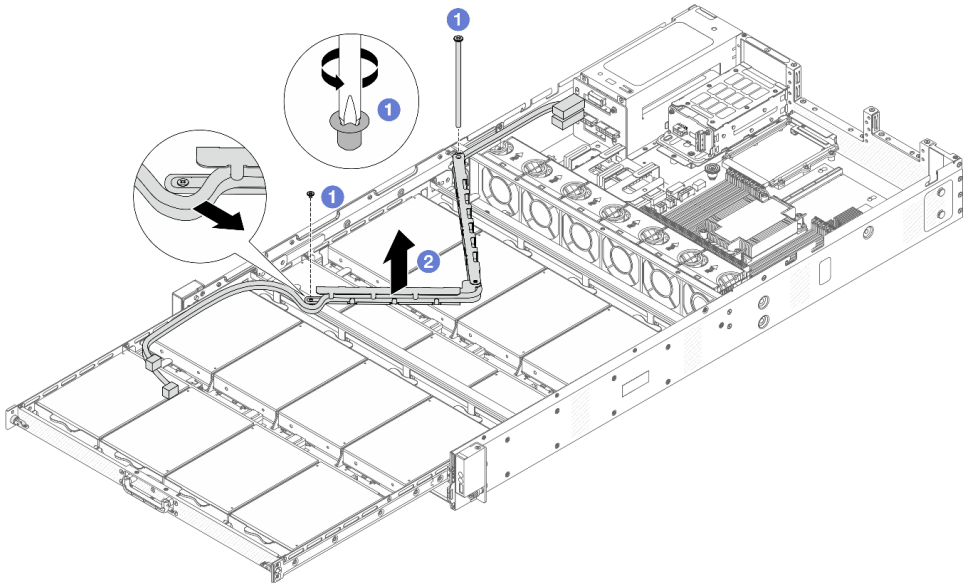


Figure 42. Removing top CMA

a. 1 Use a screwdriver to remove the screws that lock the top CMA.

b. 2 Lift the top CMA and remove it.

Step 9. Remove front drives from the top drive tray. For front drive removal, see “Remove a 3.5-inch hot-swap front drive” on page 96.

Step 10. Remove the top drive tray to gain access to middle CMA.

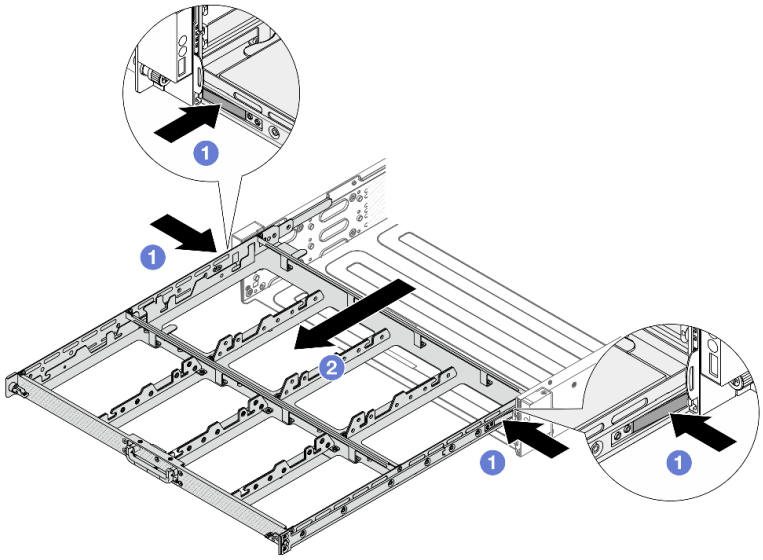


Figure 43. Removing top drive tray

a. 1 Press the latches on both sides to unlock the tray.

b. 2 Pull out the top tray.

Step 11. Remove middle CMA with cables attached.

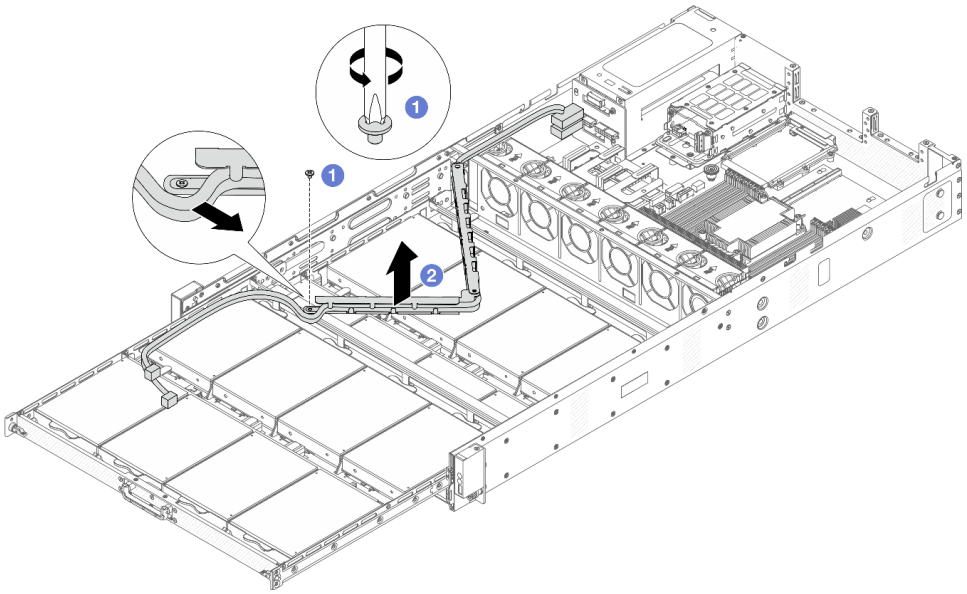


Figure 44. Removing middle CMA

a. Use a screwdriver to remove the screw that locks the middle CMA.
b. Lift the middle CMA and remove it.

After you finish

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

Demo video

Watch the procedure on YouTube

Install middle cable management arm (CMA)

Follow instructions in this section to install the middle cable management arm (CMA).

About this task

S033

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

S014

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

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Check your server and ensure that:

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

- All internal cables are connected and routed correctly. See Chapter 5 “Internal cable routing” on page 175.

Step 2. Install the middle CMA.

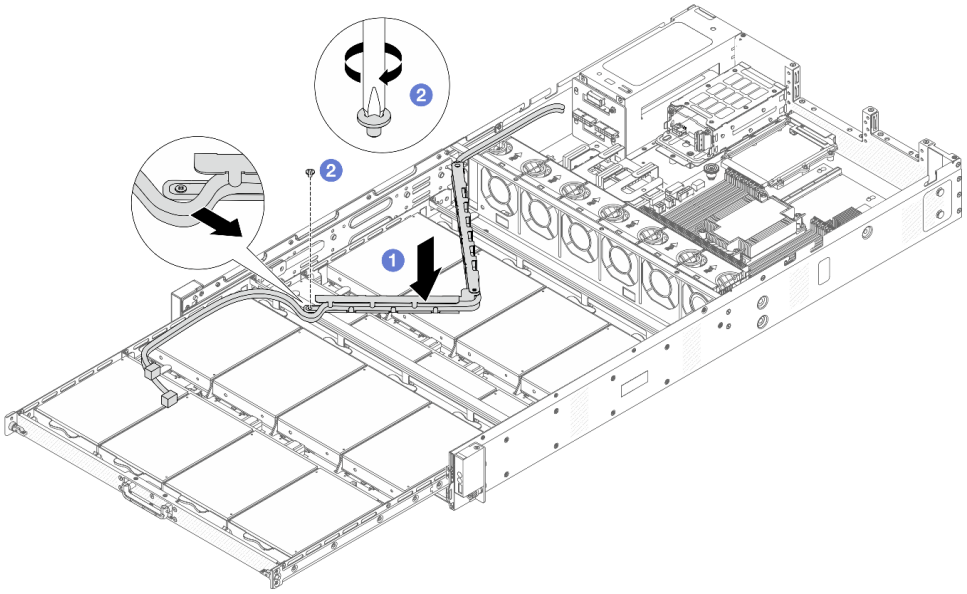


Figure 45. Installing middle CMA

a. 1 Lower the middle CMA into the chassis until both sides align the screw holes on the chassis.

b. 2 Use a screwdriver to install the screw to secure the middle CMA.

Step 3. Install top drive tray. Align the latches on both sides of the tray with chassis, and push it into the rails steadily.

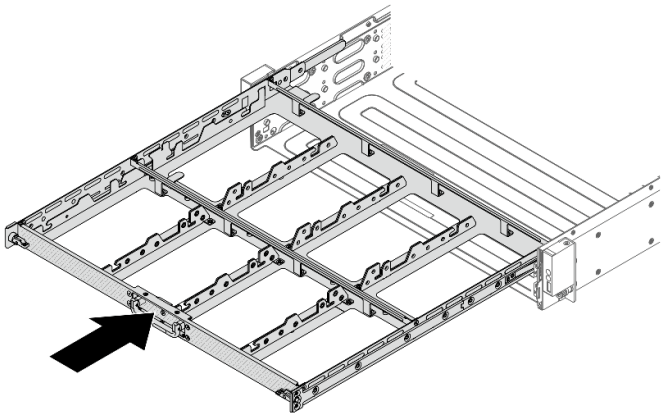


Figure 46. Installing top tray

Step 4. Install front drives to the top drive tray. For front drive installation, see “Install a 3.5-inch hot-swap front drive” on page 98.

Step 5. Install the top CMA.

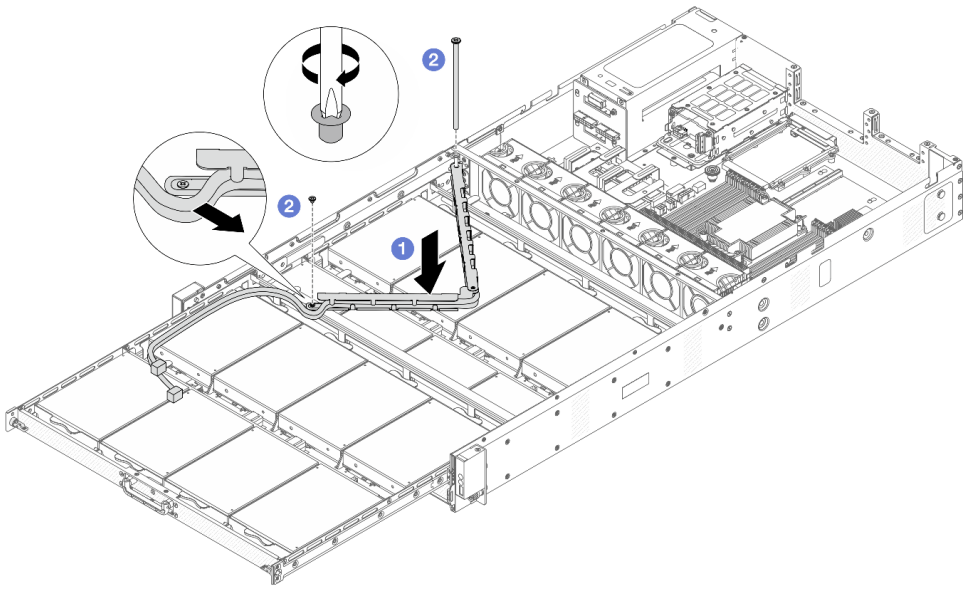


Figure 47. Installing the top CMA

a. 1 Lower the top CMA into the chassis until both sides align the screw holes on the chassis.

b. 2 Use a screwdriver to install the screws to secure the top CMA.

Step 6. Connect all cables that go through the CMAs. For more details about the cable routing, see "Cable routing for front backplane power" on page 176 and "Cable routing for front backplane signals" on page 177.

Step 7. Push the front drive trays back into position.

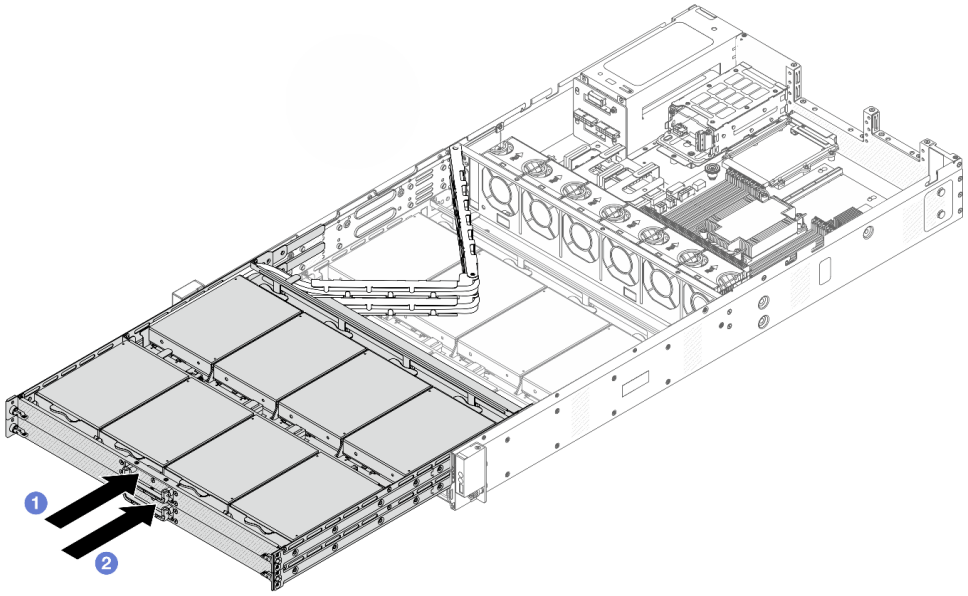


Figure 48. Folding top and middle CMAs

a. 1 Push the top drive tray back first.

b. 2 Push in the middle drive tray.

Step 8. Install the air baffle. See “Install the air baffle” on page 50.

Step 9. Install riser 1 and 2 assemblies. See “Riser card and PCIe adapter replacement” on page 145.

Step 10. Install the front top cover to the server.

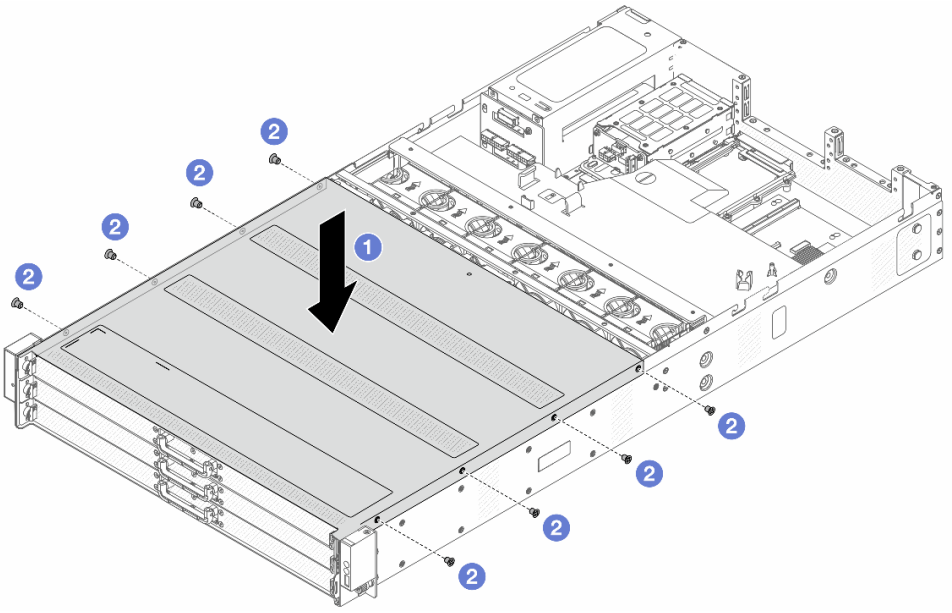


Figure 49. Front top cover installation

a. 1 Lower the front top cover onto the chassis until both sides of the top cover engage the guides on both sides of the chassis.

b. 2 Use a screwdriver to install the screws to secure the front top cover.

Step 11. Install rear top cover. See “Install the rear top cover” on page 164.

Step 12. Install the server into the racks. See “Install the server to the rack” on page 44.

After you finish

After installing the top cover, complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

Remove bottom cable management arm (CMA)

Use this information to remove the bottom cable management arm (CMA).

About this task

S033

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

S014

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

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Procedure

Step 1. If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 41.

Step 2. Remove the rear top cover. See "Remove the rear top cover" on page 162.

Step 3. Remove the front top cover.

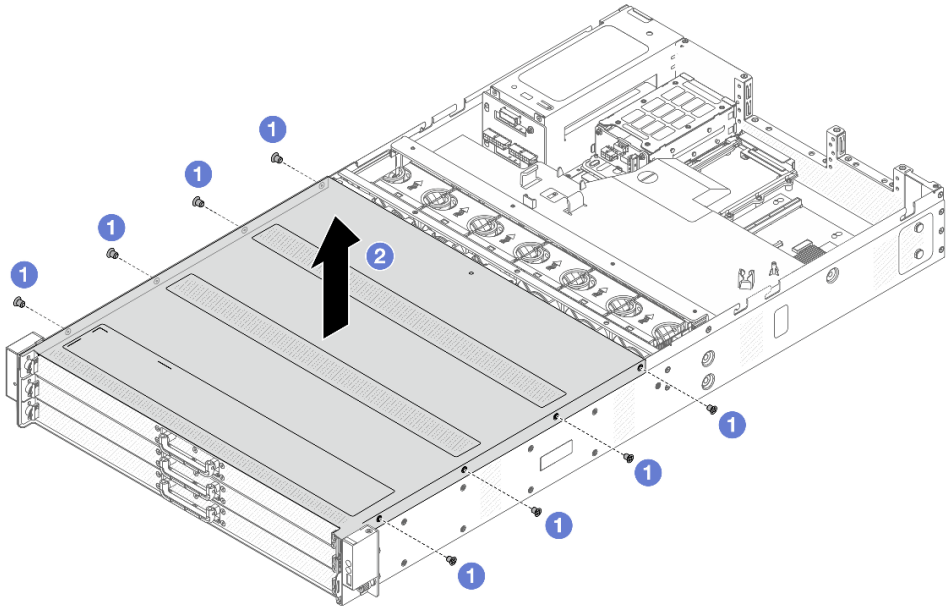


Figure 50. Top cover removal

a. 1 Use a screwdriver to remove the screws that locks the front top cover.

b. 2 Lift the front cover up and remove it.

Step 4. Remove riser 1 and 2 assemblies. See “Riser card and PCIe adapter replacement” on page 145.

Step 5. Remove the air baffle. See “Remove the air baffle” on page 48.

Step 6. Pull out the front drive trays steadily to get access to top and middle CMAs.

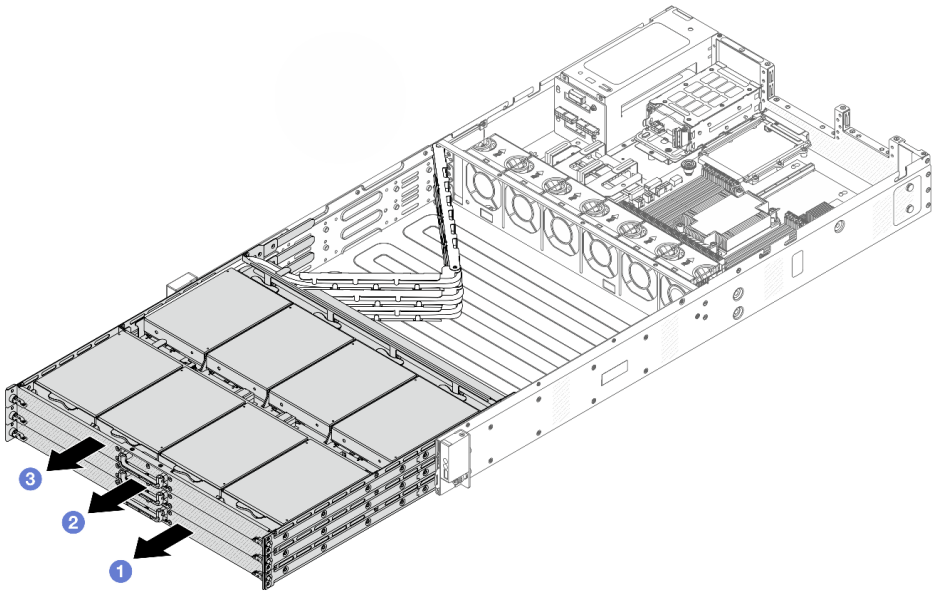


Figure 51. Extending top, middle and bottom CMAs

a. 1 Pull out bottom CMA first.

b. 2 Pull out middle CMA next.

c. (2) Pull out top CMA.

Step 7. Disconnect all cables that go through the CMAs to be removed. For more details about the cable routing, see “Cable routing for front backplane power” on page 176 and “Cable routing for front backplane signals” on page 177.

Step 8. Remove top CMA with cables attached.

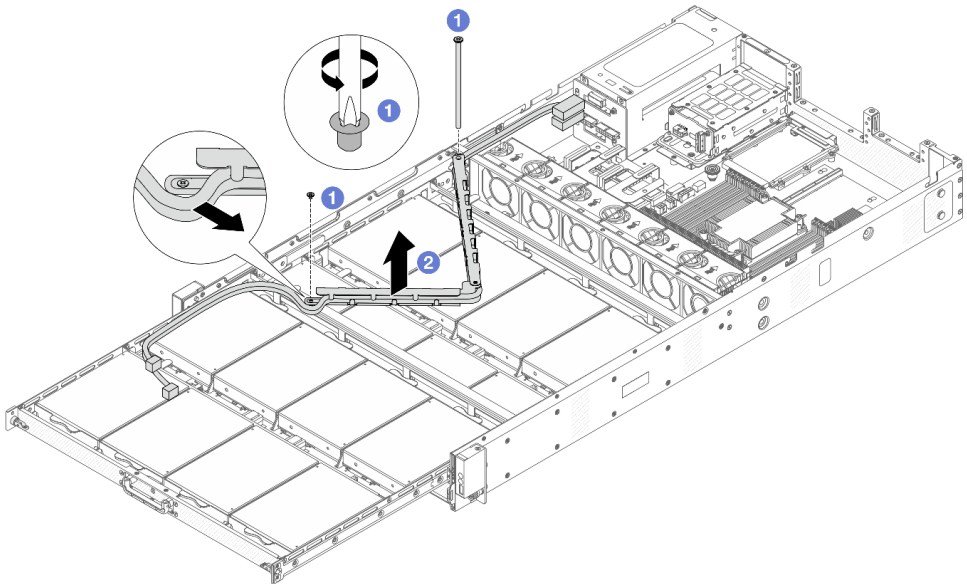


Figure 52. Removing top CMA

a. (1) Use a screwdriver to remove the screws that lock top CMA.

b. (2) Lift the top CMA and remove it.

Step 9. Remove front drives from the top drive tray. For front drive removal, see “Remove a 3.5-inch hot-swap front drive” on page 96.

Step 10. Remove the top drive tray to gain access to middle CMA.

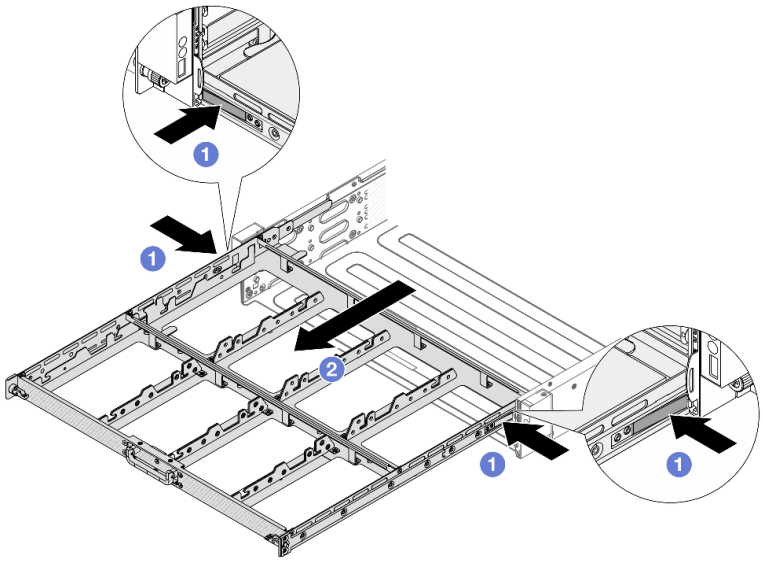


Figure 53. Removing top drive tray

a. 1 Press the latches on both sides to unlock the tray.

b. 2 Pull out the top tray.

Step 11. Remove middle CMA with cables attached.

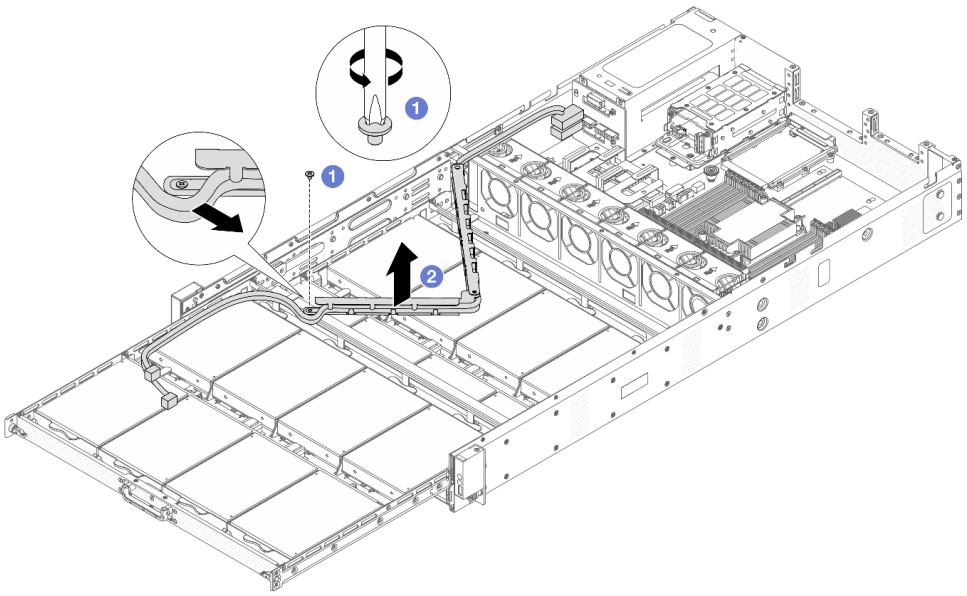


Figure 54. Removing middle CMA

a. 1 Use a screwdriver to remove the screw that locks the middle CMA.

b. 2 Lift the middle CMA and remove it.

Step 12. Remove front drives from the middle drive tray. For front drive removal, see “Remove a 3.5-inch hot-swap front drive” on page 96.

Step 13. Remove the middle drive tray to gain access to bottom CMA.

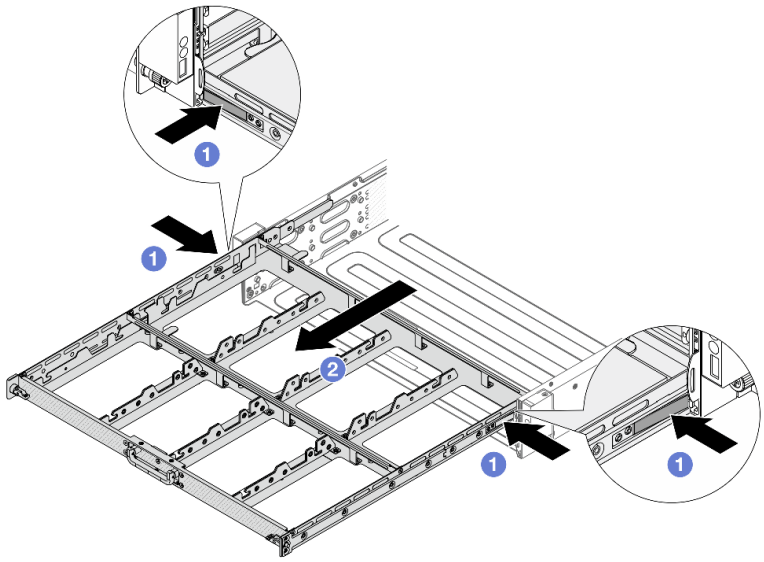


Figure 55. Removing middle drive tray

a. 1 Press the latches on both sides to unlock the tray.

b. 2 Pull out the middle tray.

Step 14. Remove the bottom CMA with cables attached.

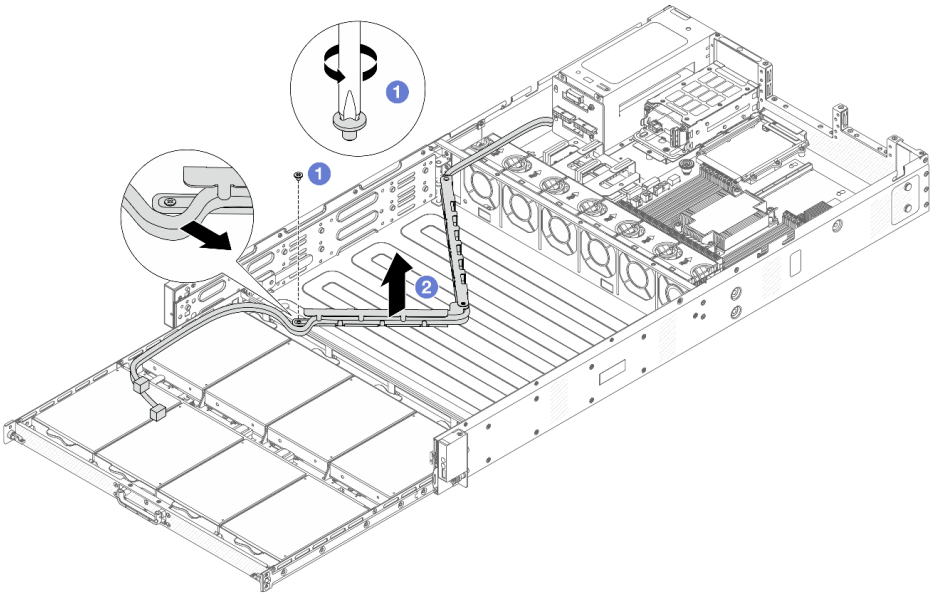


Figure 56. Removing bottom CMA

a. 1 Use a screwdriver to remove the screw that locks the bottom CMA.

b. 2 Lift the bottom CMA and remove it.

After you finish

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

Demo video

Watch the procedure on YouTube

Install bottom cable management arm (CMA)

Follow instructions in this section to install the bottom cable management arm (CMA).

About this task

S033

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

S014

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

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Check your server and ensure that:

- All cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server.
- All internal cables are connected and routed correctly. See Chapter 5 “Internal cable routing” on page 175.

Step 2. Install the bottom CMA.

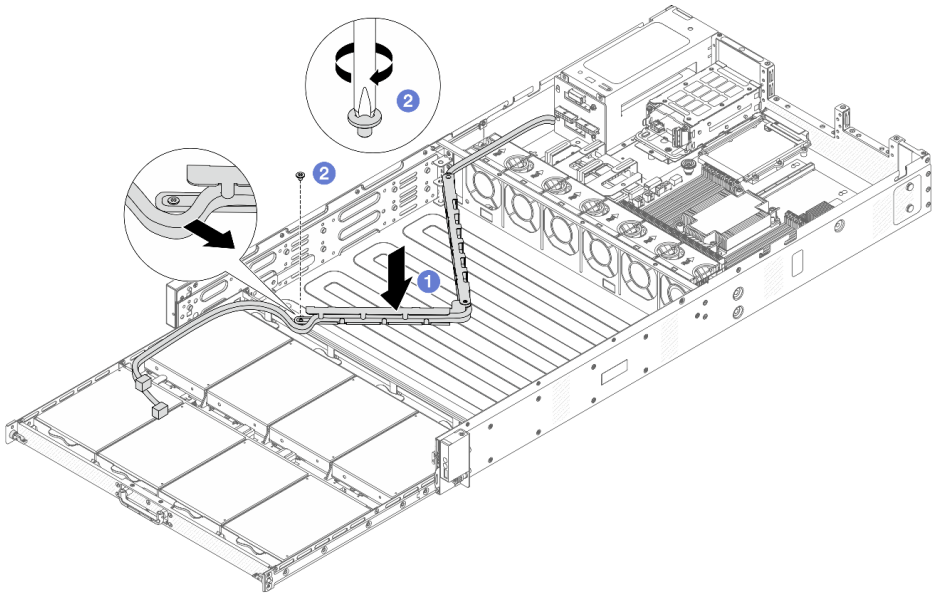


Figure 57. Installing bottom CMA

a. 1 Lower the bottom CMA into the chassis until both sides align the screw holes on the chassis.

b. 2 Use a screwdriver to install the screws to secure the bottom CMA.

Step 3. Install middle drive tray. Align the latches on both sides of the tray with chassis, and push it into the rails steadily.

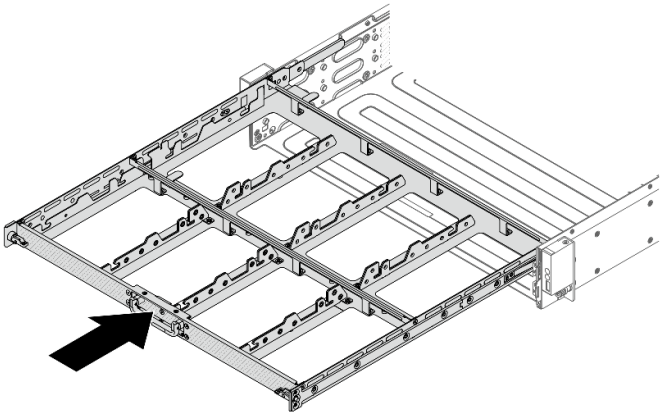


Figure 58. Installing middle tray

Step 4. Install front drives to the middle drive tray. For front drive installation, see “Install a 3.5-inch hot-swap front drive” on page 98.

Step 5. Install the middle CMA.

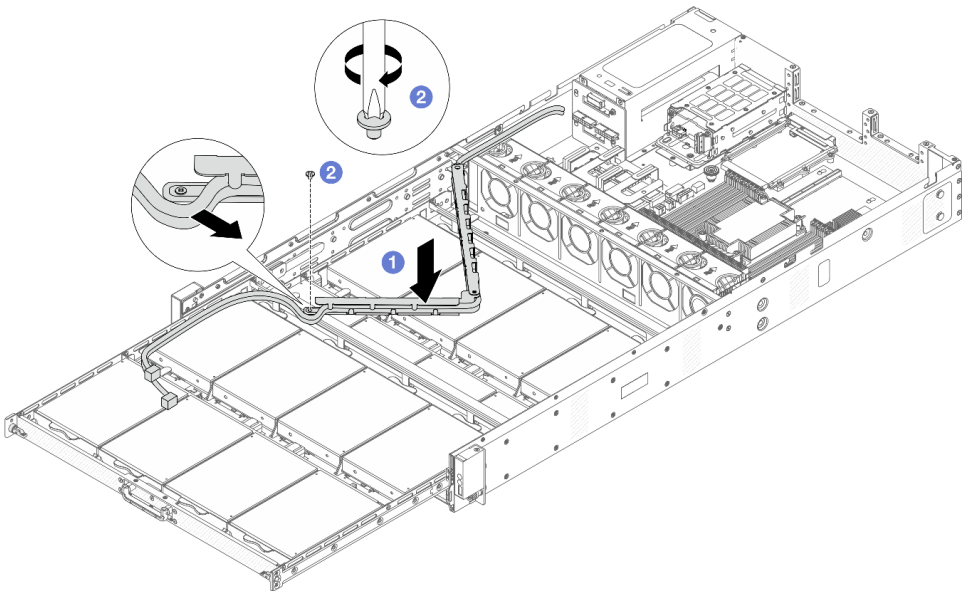


Figure 59. Installing middle CMA

a. 1 Lower the middle CMA into the chassis until both sides align the screw holes on the chassis.

b. 2 Use a screwdriver to install the screws to secure the middle CMA.

Step 6. Install top drive tray. Align the latches on both sides of the tray with chassis, and push it into the rails.

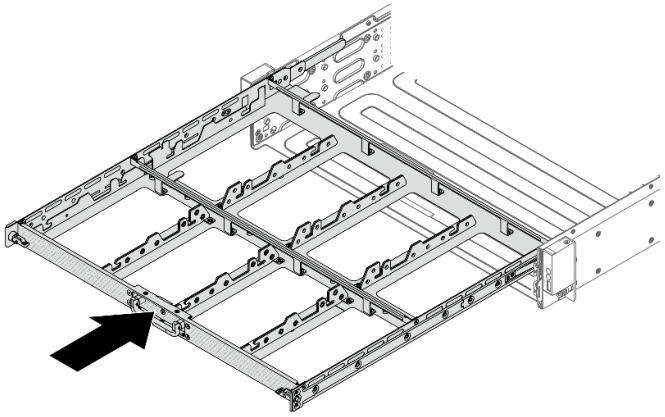


Figure 60. Installing top tray

Step 7. Install front drives to the top drive tray. For front drive installation, see "Install a 3.5-inch hot-swap front drive" on page 98.

Step 8. Install the top CMA.

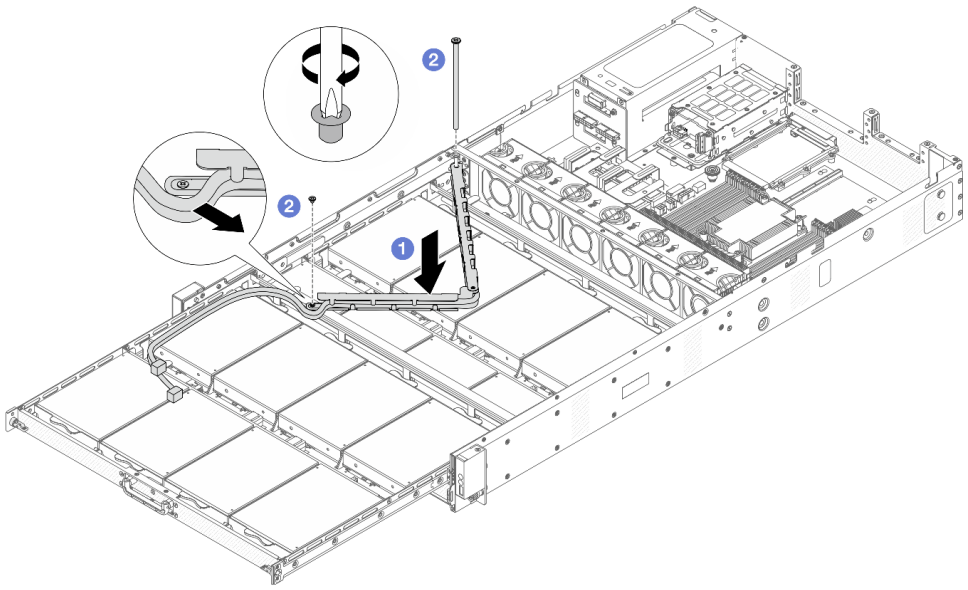


Figure 61. Installing the top CMA

a. 1 Lower the top CMA into the chassis until both sides align the screw holes on the chassis.

b. 2 Use a screwdriver to install the screws to secure the top CMA.

Step 9. Connect all cables that go through the CMAs. For more details about the cable routing, see "Cable routing for front backplane power" on page 176 and "Cable routing for front backplane signals" on page 177.

Step 10. Push the front drive trays back into position.

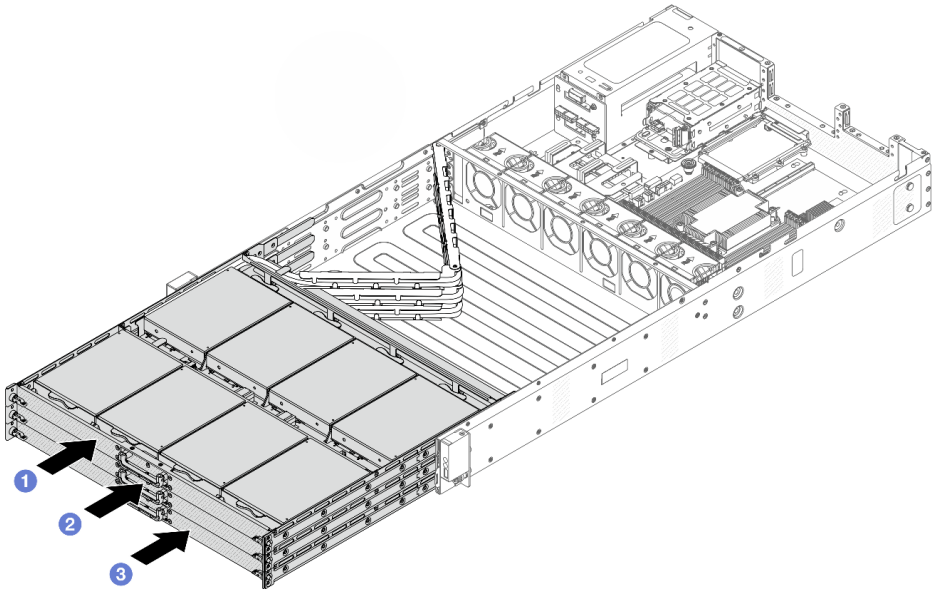


Figure 62. Folding top, middle and bottom CMAs

a. 1 Push the top drive tray back first.

b. 2 Push in the middle drive tray next.

c. (2) Push in the bottom drive tray.

Step 11. Install the air baffle. See “Install the air baffle” on page 50.

Step 12. Install riser 1 and 2 assemblies. See “Riser card and PCIe adapter replacement” on page 145.

Step 13. Install the front top cover to the server.

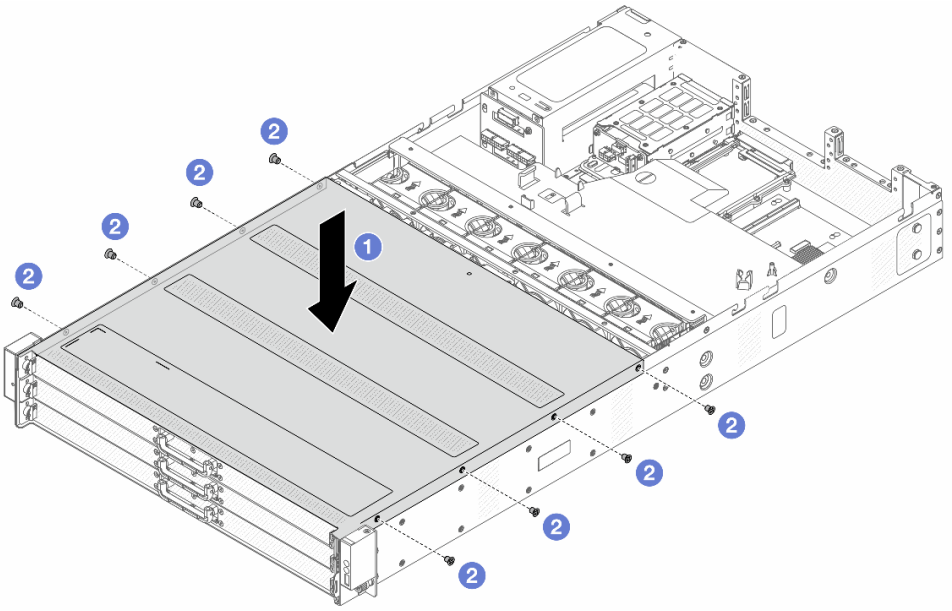


Figure 63. Front top cover installation

a. (1) Lower the front top cover onto the chassis until both sides of the top cover engage the guides on both sides of the chassis.

b. (2) Use a screwdriver to install the screws to secure the front top cover.

Step 14. Install rear top cover. See “Install the rear top cover” on page 164.

Step 15. Install the server into the racks. See “Install the server to the rack” on page 44.

After you finish

After installing the top cover, complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

CMOS battery replacement

Use this information to remove and install the CMOS battery.

The server supports two types of CMOS battery, refer to below sections to remove or install the battery delivered.

- “Remove the CMOS battery” on page 80
- “Install the CMOS battery” on page 82

Remove the CMOS battery

Use this information to remove the CMOS battery.

About this task

The following tips describe information that you must consider when removing the CMOS battery.

- Lenovo has designed this product with your safety in mind. The lithium CMOS battery must be handled correctly to avoid possible danger. If you replace the CMOS battery, you must adhere to local ordinances or regulations for battery disposal.
- If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.

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

S004

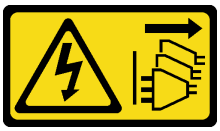
CAUTION:
When replacing the lithium battery, use only Lenovo specified part number or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium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

Do not:

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

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

S002



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

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Remove the top cover. See “Remove the rear top cover” on page 162.

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

Step 3. Locate the CMOS battery. See “System-board connectors” on page 14.

Step 4. Open the battery clip as shown and carefully take the CMOS battery out of the socket.

Attention:

- Failing to remove the CMOS battery properly might damage the socket on the system board. Any damage to the socket might require replacing the system board.
- Do not tilt or push the CMOS battery by using excessive force.

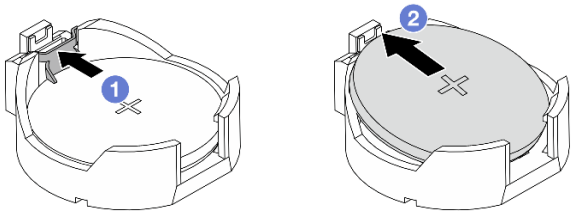


Figure 64. CMOS battery removal (1)

1. (1) Press the clip on the CMOS battery socket.
2. (2) Remove the CMOS battery.

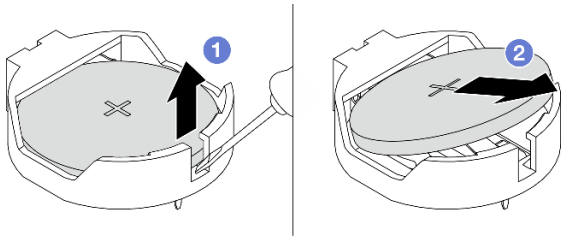


Figure 65. CMOS battery removal (2)

1. (1) Pry the CMOS battery with a flat-blade screwdriver (3mm in tip width) from the socket as illustrated above.
2. (2) Remove the CMOS battery.

After you finish

1. Install a new CMOS battery. See “Install the CMOS battery” on page 82.

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

Demo video

Watch the procedure on YouTube

Install the CMOS battery

Use this information to install the CMOS battery.

About this task

The following tips describe information that you must consider when installing the CMOS battery.

- Lenovo has designed this product with your safety in mind. The lithium CMOS battery must be handled correctly to avoid possible danger. If you replace the CMOS battery, you must adhere to local ordinances or regulations for battery disposal.
- If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.

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

S004

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

Do not:

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

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

S002

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

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Procedure

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

Step 2. Install the CMOS battery. Ensure that the CMOS battery is seated in place.

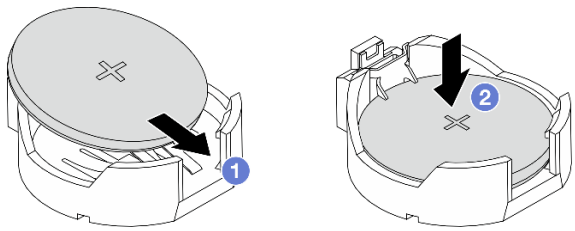


Figure 66. CMOS battery installation (1)

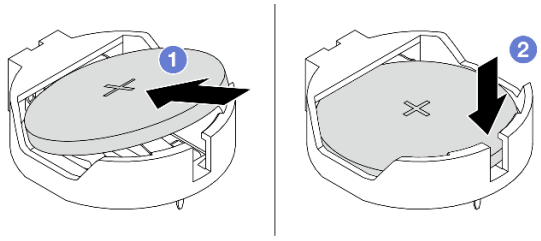


Figure 67. CMOS battery installation (2)

Note: Before you install the battery into the socket, make sure that the positive side faces upward.

a. (1) Tilt the battery and insert it into the socket, and make sure that the battery goes tight to the metal clip.

b. (2) Press the battery down until it clicks into the socket.

After you finish

1. Complete the parts replacement. See “Complete the parts replacement” on page 174.
2. Use BIOS to set the date, time, and any passwords.

Demo video

Watch the procedure on YouTube

Datacenter Secure Control Module (DC-SCM) replacement

Use this information to remove and install the Datacenter Secure Control Module (DC-SCM).

Remove the Datacenter Secure Control Module (DC-SCM)

Follow the instructions in this section to remove the Datacenter Secure Control Module (DC-SCM).

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Remove the rear top cover. See “Remove the rear top cover” on page 162.

Step 2. Remove the DC-SCM. Grab the edges of the bracket with both hands and lift the DC-SCM out of chassis.

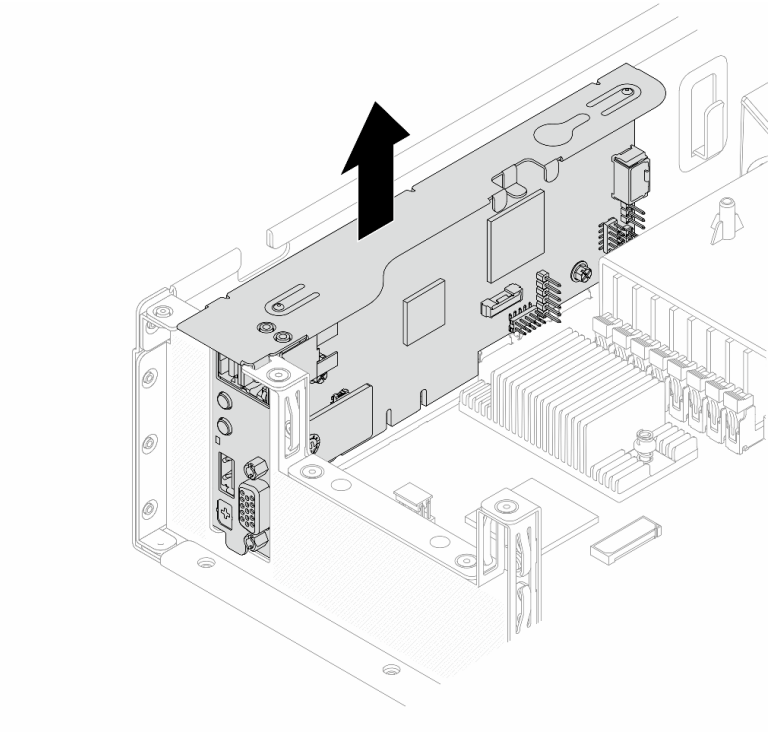


Figure 68. DC-SCM removal

Step 3. Place the replaced DC-SCM on a clean and sturdy surface, and always keep the side with connectors upside.

After you finish

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

Demo video

Watch the procedure on YouTube

Install the Datacenter Secure Control Module (DC-SCM)

Follow the instructions in this section to install the Datacenter Secure Control Module (DC-SCM).

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

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

Step 2. Install the DC-SCM into the chassis. Align the DC-SCM with the slot on system board, guiding pins on the chassis and the socket on the rear wall. Press it down until it's fully seated.

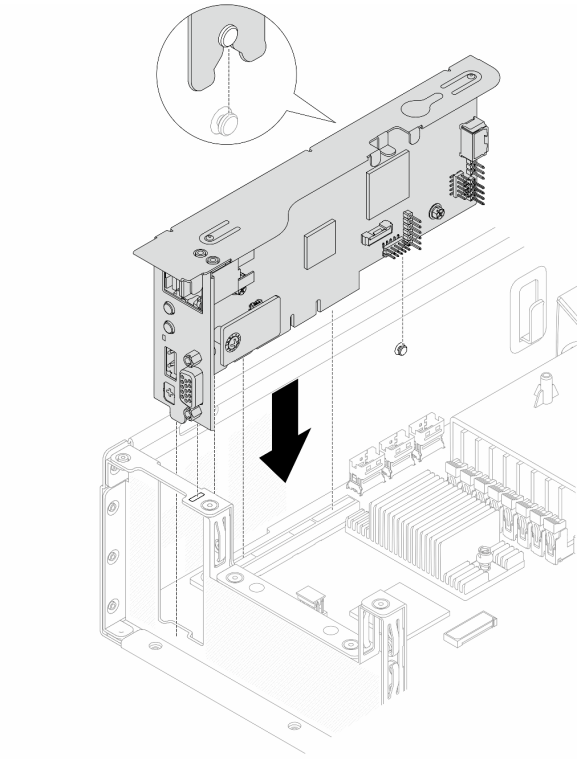


Figure 69. DC-SCM installation

Step 3. Install the top cover. See "Install the rear top cover" on page 164.

After you finish

Complete the parts replacement. See "Complete the parts replacement" on page 174.

Demo video

Watch the procedure on YouTube

Fan cage and system fan replacement

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

Remove a fan cage

Follow instructions in this section to remove an fan cage.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Remove the top cover. See “Remove the rear top cover” on page 162.

Step 2. Remove the cable routed through the clips on air baffle.

Step 3. Remove the air baffle. See “Remove the air baffle” on page 48.

Step 4. Remove the system fans. See “Remove a system fan” on page 89.

Step 5. Disconnect the cables of system fan 4 and 5 that are integrated into the fan cage. For more details, see “Cable routing for system fans” on page 183.

Step 6. Remove the fan cage.

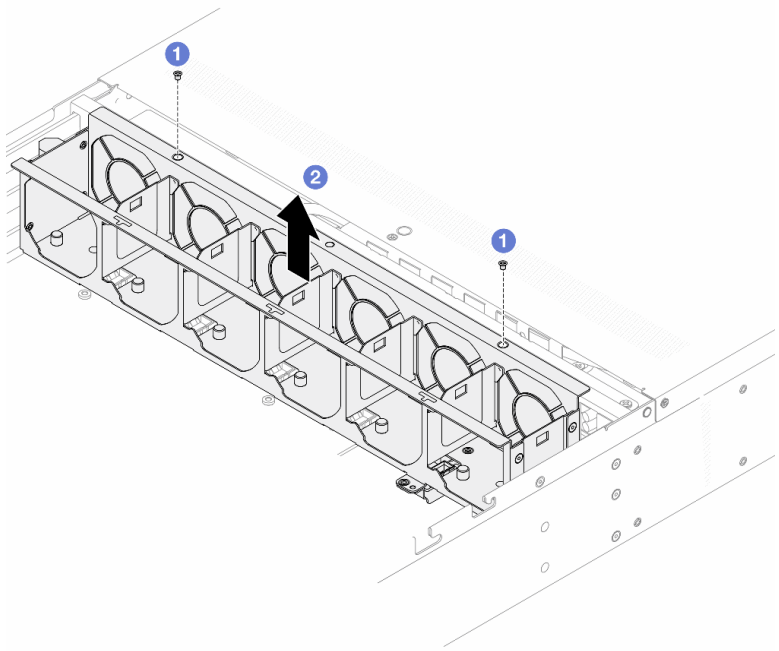


Figure 70. Fan cage removal

a. 1 Loosen the screws from the fan cage and middle wall.

b. 2 Lift the fan cage out of chassis.

After you finish

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

Demo video

Watch the procedure on YouTube

Install a fan cage

Follow instructions in this section to install a fan cage.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

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

Step 2. Install the fan cage.

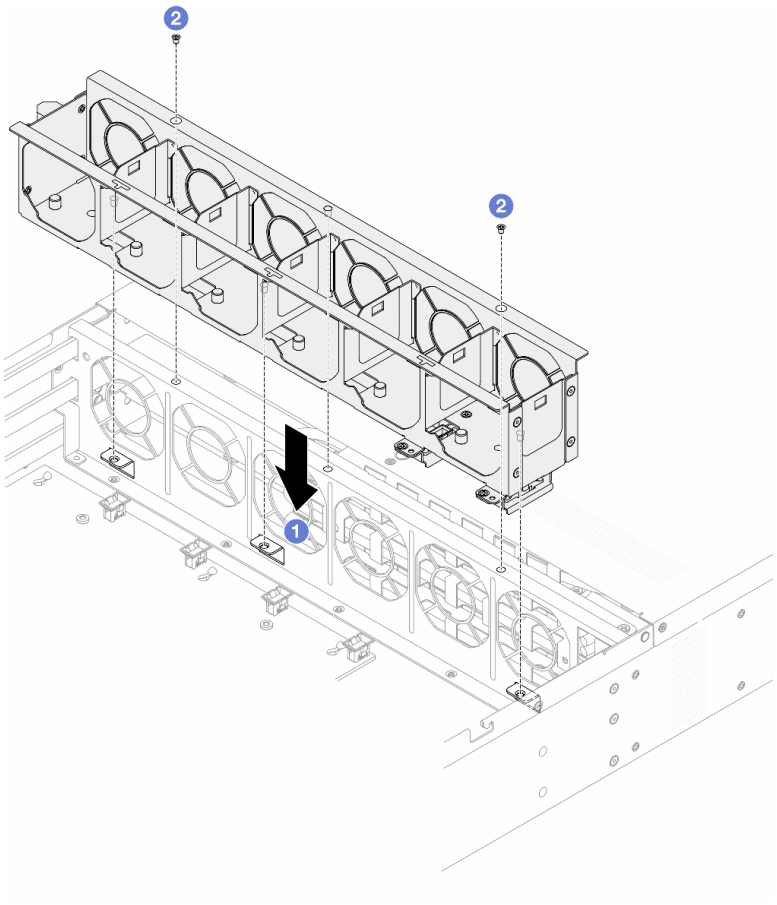


Figure 71. Fan cage installation

a. 1 Align the screw holes on the fan cage, middle wall and chassis.

b. 2 Tighten the screws to the middle wall.

Step 3. Install the system fan. See “Install a system fan” on page 91.

Step 4. Install the air baffle. See “Install the air baffle” on page 50.

Step 5. Install the top cover. See “Install the rear top cover” on page 164.

After you finish

Complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

Remove a system fan

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

About this task

S033

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

S017

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

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Procedure

Step 1. Remove the top cover. See "Remove the rear top cover" on page 162.

Step 2. Grasp the fan tabs on both ends of the system fan and carefully lift the system fan out of the server.

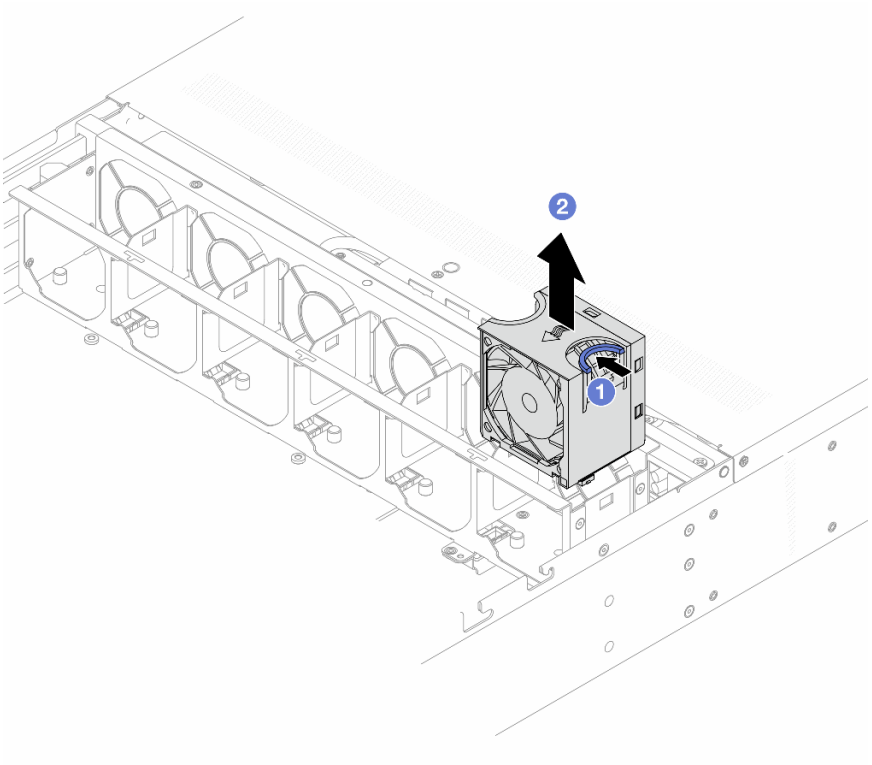


Figure 72. System fan removal

a. 1 Pinch the blue touch point on the system fan.

b. 2 Lift the system fan out of the fan cage.

After you finish

1. Install a new system fan or install a fan filler to cover the place. See “Install a system fan” on page 91.
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

Watch the procedure on YouTube

Install a system fan

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

About this task

S033

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

S017

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

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Procedure

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

Step 2. Install the system fan.

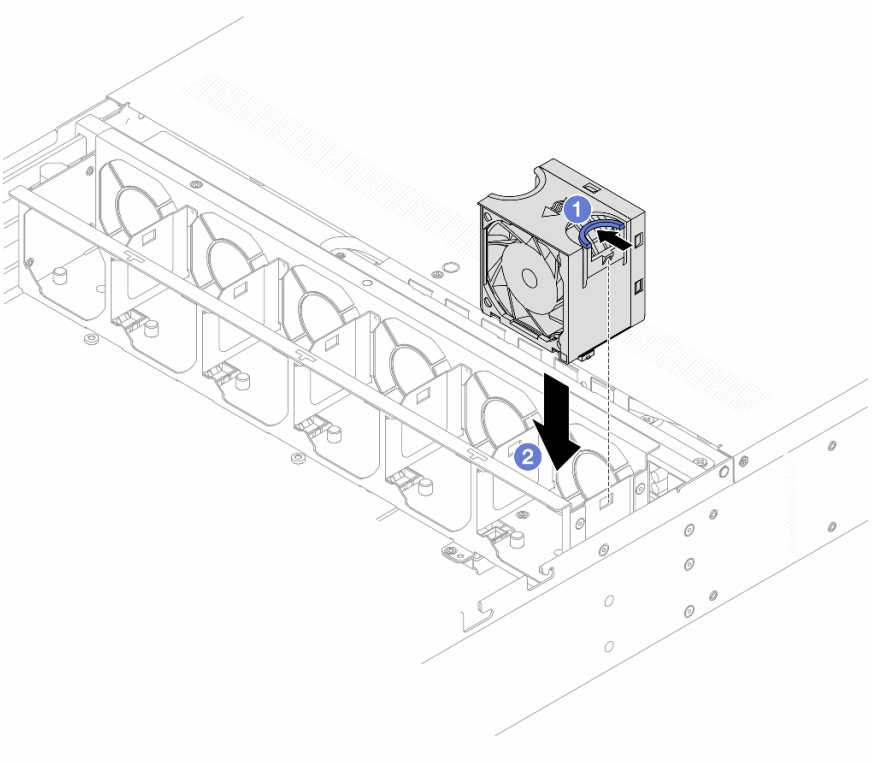


Figure 73. System fan installation

a. 1 Pinch the blue touch point on the system fan.

b. 2 Install the system fan into the fan cage.

Step 3. Install the top cover. See "Install the rear top cover" on page 164.

After you finish

Complete the parts replacement. See "Complete the parts replacement" on page 174.

Demo video

Watch the procedure on YouTube

Heat sink Torx T30 nut replacement

Use this information to remove and install a heat sink Torx T30 nut.

- "Remove a heat sink Torx T30 nut" on page 93
- "Install a heat sink Torx T30 nut" on page 95

Remove a heat sink Torx T30 nut

This task has instructions for removing a PEEK (Polyether ether ketone) Torx T30 nut on the heat sink.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.
- Do not touch the processor contacts. Contaminants on the processor contacts, such as oil from your skin, can cause connection failures.

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

Procedure

Step 1. Make preparations for this task.

a. Remove the top cover. See “Remove the rear top cover” on page 162.

b. Remove the air baffle. See “Remove the air baffle” on page 48.

c. Remove the PHM. See “Remove a processor and heat sink” on page 125.

Step 2. Remove the Torx T30 nut.

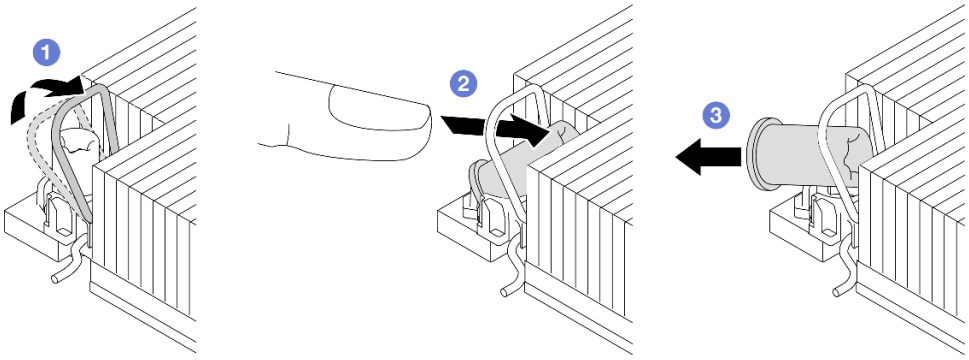


Figure 74. Removing a Torx T30 nut from the heat sink

Note: Do not touch the gold contacts on the bottom of the processor.

a. 1 Rotate the anti-tilt wire bail inwards.

b. 2 Push the upper edge of the Torx T30 nut towards the center of the heat sink until it disengages.

c. 3 Remove the Torx T30 nut.

Attention: Visually inspect the removed Torx T30 nut, if the nut is cracked or damaged, make sure no debris or broken pieces are left inside your server.

After you finish

1. Install a new Torx T30 nut. See “Install a heat sink Torx T30 nut” on page 95.
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

Watch the procedure on YouTube

Install a heat sink Torx T30 nut

This task has instructions for installing a PEEK (Polyether ether ketone) Torx T30 nut on the heat sink.

About this task

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.
- Do not touch the processor contacts. Contaminants on the processor contacts, such as oil from your skin, can cause connection failures.

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

Procedure

Step 1. Install the Torx T30 nut.

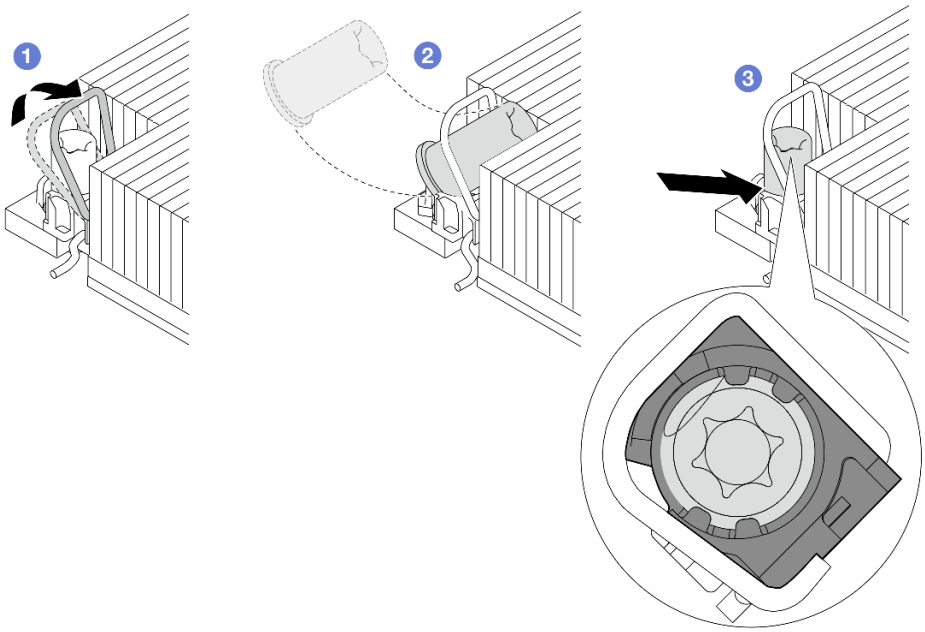


Figure 75. Installing a Torx T30 nut into the heat sink

Note: Do not touch the gold contacts on the bottom of the processor.

a. 1 Rotate the anti-tilt wire bail inwards.

b. 2 Orient the Torx T30 nut under the anti-tilt wire bail; then, align the Torx T30 nut with the socket at an angle as shown.

c. 3 Push the lower edge of the Torx T30 nut into the socket until it clicks into place. Make sure the Torx T30 nut is secured under the four clips in the socket.

After you finish

1. Reinstall the PHM. See “Install a processor and heat sink” on page 129.
2. Complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

Hot-swap drive replacement

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

Notes:

- The term “hot-swap drive” refers to all the supported types of hot-swap hard disk drives, hot-swap solid-state drives, and hot-swap NVMe drives.
- Use any documentation that comes with the drive, and follow the instructions and those in this topic.
- The electromagnetic interference (EMI) integrity and cooling of the server are protected by having all drive bays covered or occupied.
- To avoid damage to the drive connectors, ensure that the top cover is in place and fully closed whenever you install or remove a drive.
- To ensure that the drives are returned to their previous slot and tray location, and to prevent RAID array issues and failures, record drive slot and tray location before removing drives from current positions.
- “Remove a 3.5-inch hot-swap front drive” on page 96
- “Install a 3.5-inch hot-swap front drive” on page 98
- “Remove a 2.5-inch hot-swap rear drive” on page 101
- “Install a 2.5-inch hot-swap rear drive” on page 102

Remove a 3.5-inch hot-swap front drive

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

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Step 1. Pull the drive tray out steadily until the drive to be removed is fully accessible.

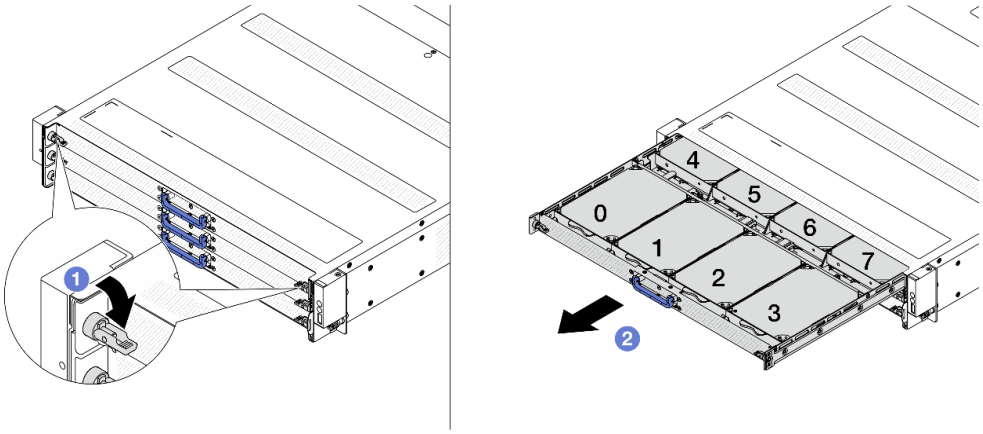


Figure 76. Extending the drive tray

a. 1 Flip both tray locks to open position as the illustration shows.

b. 2 Pull the tray out steadily by the blue handle.

Note: When pulling the tray out, pay attention to the cables that route though the cable management arm (CMA). If cables get displaced, it is required to re-route them. For more details, see "Cable routing for front backplane power" on page 176 and "Cable routing for front backplane signals" on page 177.

Step 2. Remove a front hard drive with its bracket.

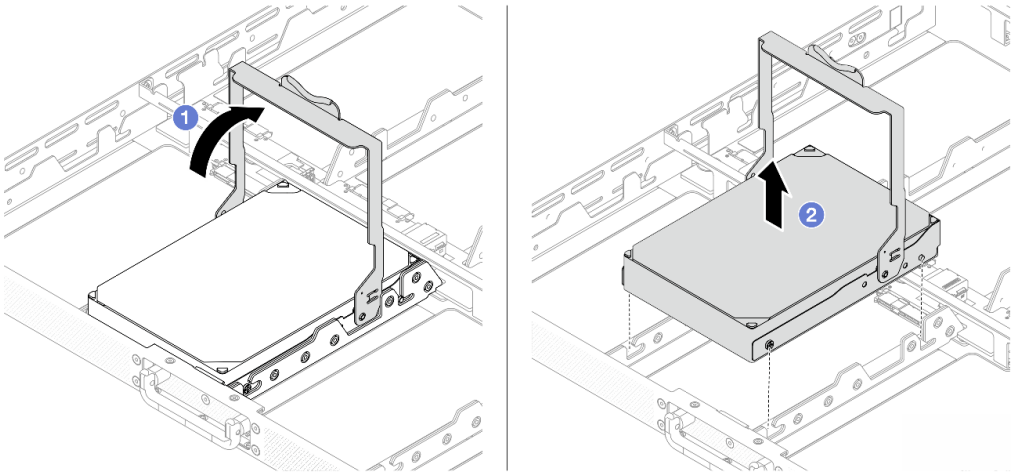


Figure 77. Opening the drive bracket

a. 1 Open the drive bracket all the way up until it stops at 90 degrees, and the drive will be disengaged from the backplane automatically by then.

b. 2 Lift the drive out by the bracket handle.

Step 3. Disengage the drive from a bracket.

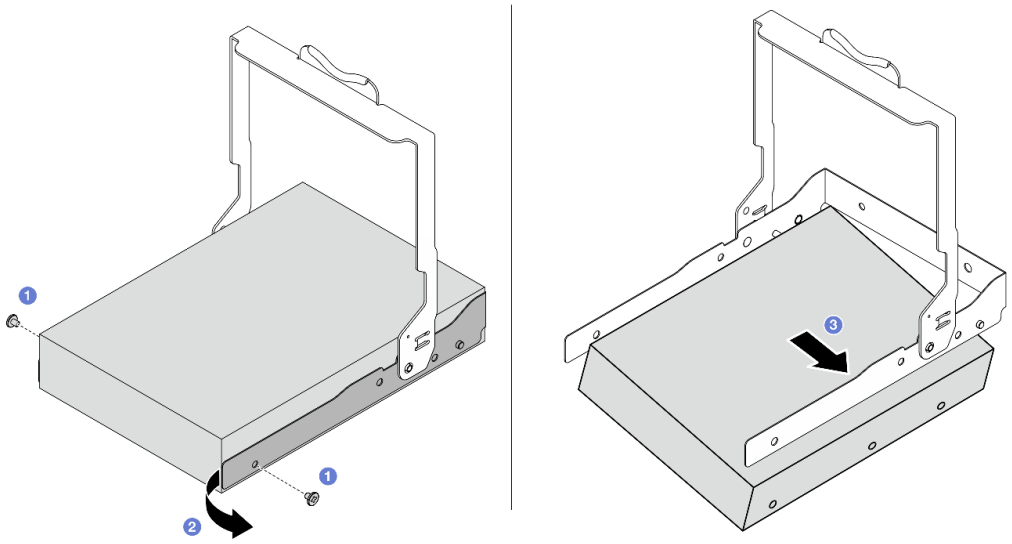


Figure 78. Releasing the drive

a. 1 Remove the screws that secure the bracket to the drive.
b. 3 Tilt the drive and remove it from the bracket.

After you finish

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

Demo video

Watch the procedure on YouTube

Install a 3.5-inch hot-swap front drive

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

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.

- 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 systems.

Procedure

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

Step 2. Assemble the hard drive and drive bracket.

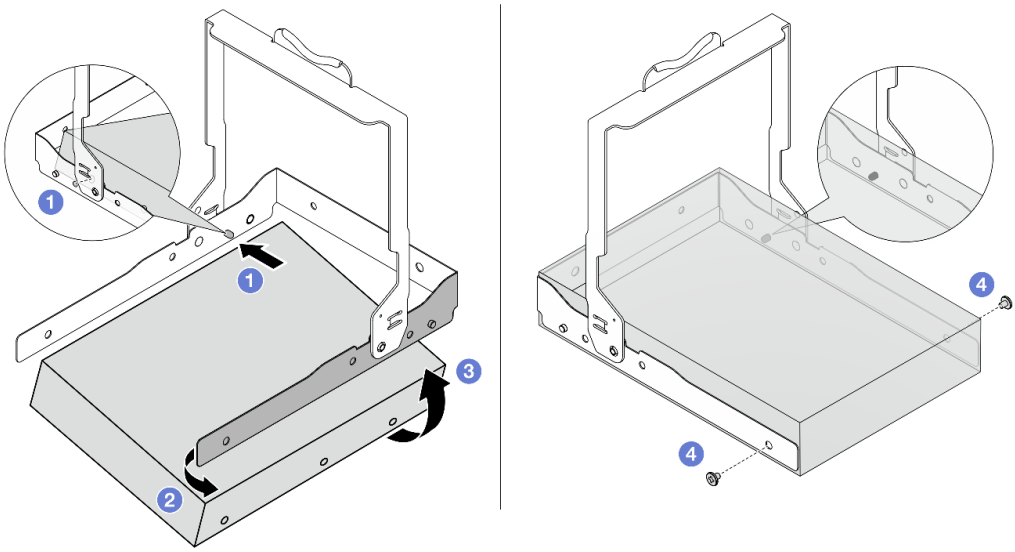


Figure 79. Assembling a drive and bracket

a. 1 Tilt the drive and align the hole to the pin on one side of the bracket.

b. 2 Push the other side of the bracket open.

c. 3 Insert the pin on the other side to the drive.

d. 4 Install the screws and make sure that the bracket is secured.

Step 3. Install the drive with bracket into the tray.

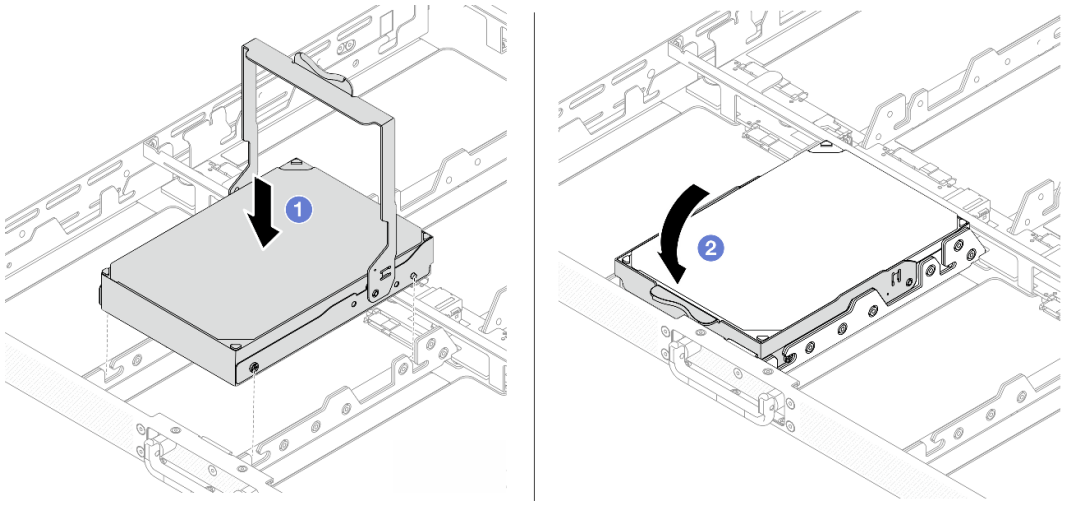


Figure 80. Placing the drive into tray

a. 1 Align the screws and guiding pins on drives with grooves on the tray.

b. 2 Flip the bracket handle down until it stops, and the drive will be connected to the backplane automatically by then.

Step 4. Close the drive tray steadily.

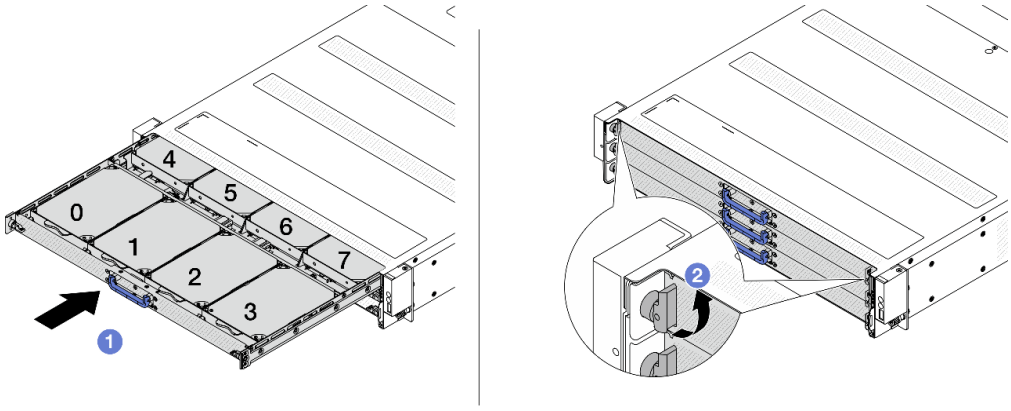


Figure 81. Closing and locking the tray

a. 1 Push the drive tray all the way in steadily by the blue handle.

b. 2 Flip both tray locks up to secure the tray so that it will not slide out.

After you finish

Complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

Remove a 2.5-inch hot-swap rear drive

Use this information to remove a 2.5-inch hot-swap rear drive.

About this task

The following describes the information that you must consider for this task:

- Ensure that you have backed up data on your drive, especially if it is part of a RAID array.
  - Before you make changes to drives, RAID adapters, or drive backplanes, back up all important data that is stored on the drives.
  - Before you remove any component of a RAID array, back up all RAID configuration information.

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding systems.
- To ensure that there is adequate system cooling, do not operate the server for more than two minutes without either a drive or a drive filler installed in each bay.

Procedure

Step 1. Remove a hot-swap drive.

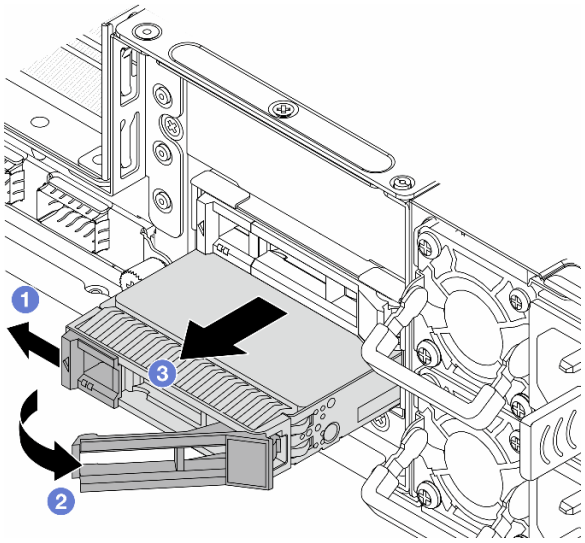


Figure 82. Remove a hot-swap drive

a. 1 Slide the release latch to the left to open the drive tray handle.

b. 2 Open the drive handle.

c. 3 Slide the drive out of the drive bay.

After you finish

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

Demo video

Watch the procedure on YouTube

Install a 2.5-inch hot-swap rear drive

Use this information to install a 2.5-inch hot-swap rear drive.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding systems.

Procedure

Step 1. Touch the static-protective package that contains the drive to any unpainted surface on the outside of the server. And then, take the drive out of the package and place it on a static-protective surface.

Step 2. Install the drive in the drive bay.

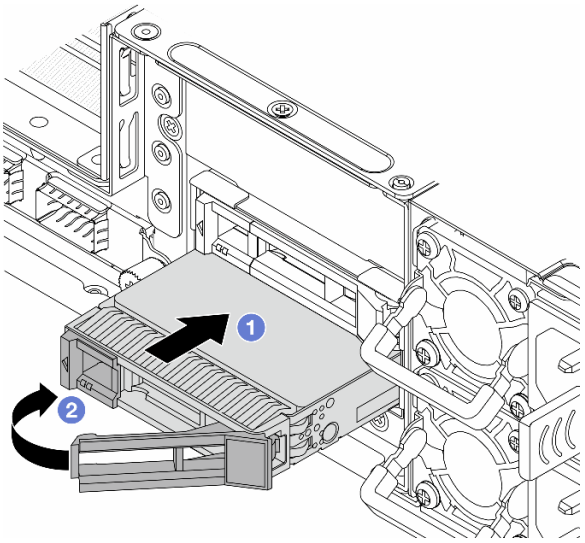


Figure 83. Hot-swap drive installation

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

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

Step 3. Check the drive LEDs to verify that the drive is operating normally. For details, see “Front backplane LEDs and rear drive LEDs” on page 24.

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

After you finish

1. Reinstall all the drives into the drive bays. See “Install a 2.5-inch hot-swap rear drive” on page 102.
2. Complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

Hot-swap power supply unit replacement

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

- “Remove a hot-swap power supply unit” on page 103
- “Install a hot-swap power supply unit” on page 105

Remove a hot-swap power supply unit

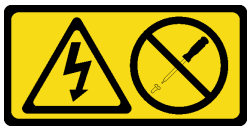
Use this information to remove a power supply unit.

About this task

If the power supply unit to be removed is the only one installed, the power supply unit is not hot-swappable. Before removing it, you must turn off the server first. To support redundancy mode or hot-swap, install an additional hot-swap power supply unit.

Safety information for AC power supplies

S035



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

S002

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

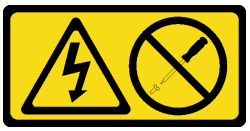
S001

DANGER

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

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

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 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding systems.

Procedure

Step 1. Disconnect the power cord from the hot-swap power supply unit.

- For AC power supply units, disconnect both ends of the power cord and keep it in an ESD-safe place.

Note: If you are replacing two power supply units, replace them one by one to ensure that the power supply to the server is not interrupted. Do not disconnect the power cord from the secondly replaced power supply unit until the power output LED for the firstly replaced power supply unit is lit. For the location of the power output LED, refer to "The LED on the power supply unit" on page 26.

Step 2. Press the release tab toward the handle and carefully pull the handle at the same time to slide the hot-swap power supply unit out of the chassis.

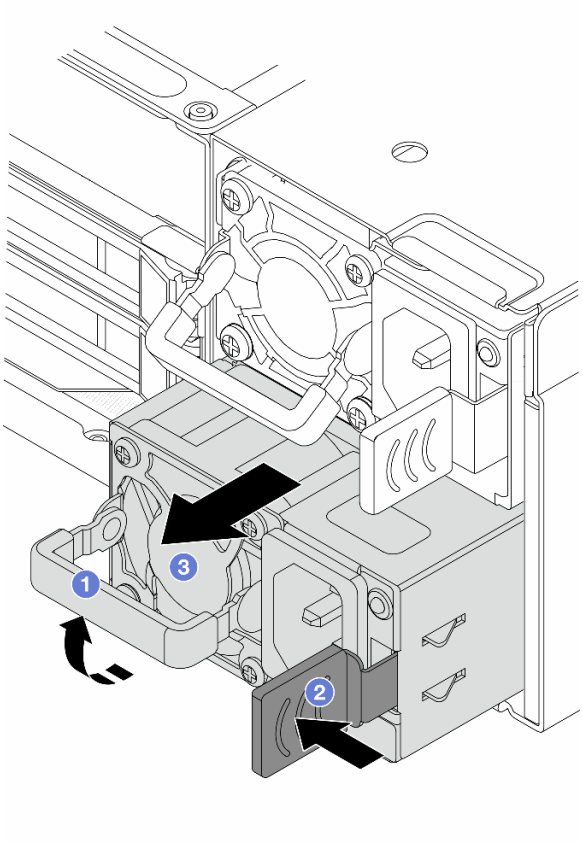


Figure 84. Hot-swap power supply removal

a. 1 Lift the pulling handle on the poser supply unit.
b. 2 Press the latch to the direction as shown.
c. 3 Pull the power supply unit out of the chassis.

After you finish

1. Install a new power supply unit. See "Install a hot-swap power supply unit" on page 105.

   Important: To ensure proper cooling during normal server operation, both power supply bays must be occupied. This means that each bay must have a power supply unit installed.
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

Watch the procedure on YouTube

Install a hot-swap power supply unit

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

About this task

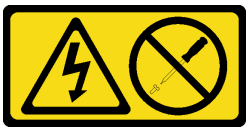
The following describes the information that you must consider when installing a power supply unit:

- If the power supply unit to be removed is the only one installed, the power supply unit is not hot-swappable. Before removing it, you must turn off the server first. To support redundancy mode or hot-swap, install an additional hot-swap power supply unit.
- If you are replacing the existing power supply with a new power supply:
  - Attach the power information label that comes with this option on the existing label near the power supply.

Figure 85. Example power supply unit label on the top cover

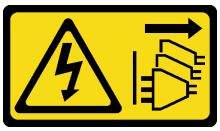
Safety information for AC power supplies

S035



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

S002



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

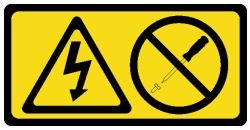
S001

DANGER

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

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

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 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding systems.

Procedure

Step 1. Touch the static-protective package that contains the hot-swap power supply unit to any unpainted surface on the outside of the server. And then, take the hot-swap power supply unit out of the package and place it on a static-protective surface.

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

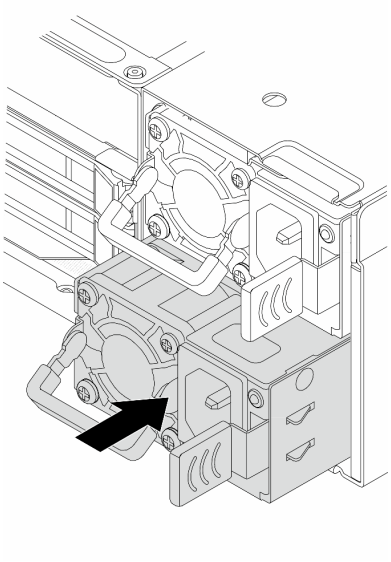


Figure 86. Hot-swap power supply installation

Step 3. Connect the power supply unit to a properly grounded electrical outlet.

After you finish

If the server is turned off, turn on the server. Ensure that both the power input LED and the power output LED on the power supply unit are lit, indicating that the power supply unit is operating properly.

Demo video

Watch the procedure on YouTube

Memory module replacement

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

- “Remove a memory module” on page 108
- “Install a memory module” on page 110

Remove a memory module

Use this information to remove a memory module.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

- If you are not installing a replacement memory module to the same slot, make sure you have memory module filler available.
- Memory modules are sensitive to static discharge and require special handling. Refer to the standard guidelines for “Handling static-sensitive devices” on page 35.
  - Always wear an electrostatic-discharge strap when removing or installing memory modules. Electrostatic-discharge gloves can also be used.
  - Never hold two or more memory modules together so that they do not touch each other. Do not stack memory modules directly on top of each other during storage.
  - Never touch the gold memory module connector contacts or allow these contacts to touch the outside of the memory module connector housing.
  - Handle memory modules with care: never bend, twist, or drop a memory module.
  - Do not use any metal tools (such as jigs or clamps) to handle the memory modules, because the rigid metals may damage the memory modules.
  - Do not insert memory modules while holding packages or passive components, which can cause package cracks or detachment of passive components by the high insertion force.

Procedure

Step 1. Power off the server and disconnect all power cords.

Step 2. Remove the top cover. See “Remove the rear top cover” on page 162.

Step 3. If your server comes with an air baffle, remove it. See “Remove the air baffle” on page 48.

Step 4. Remove the memory module from the slot.

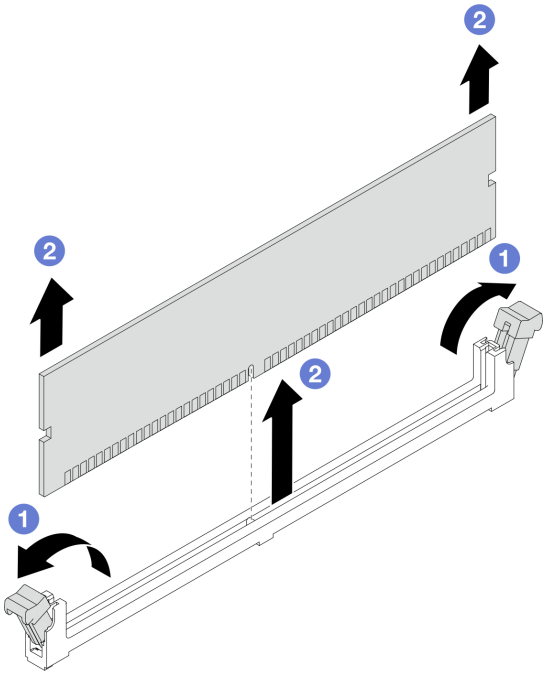


Figure 87. Memory module removal

a. 1 Open the retaining clip on each end of the memory module slot.

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

b. 2 Grasp the memory module at both ends and carefully lift it out of the slot.

After you finish

1. A memory module slot must be installed with a memory module or a memory module filler. See “Install a memory module” on page 110.
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

Watch the procedure on YouTube

Install a memory module

Follow instructions in this section to install a memory module.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.
- Make sure to adopt one of the supported configurations listed in “Memory module installation rules and order” on page 37.
- Memory modules are sensitive to static discharge and require special handling. Refer to the standard guidelines at “Handling static-sensitive devices” on page 35:
  - Always wear an electrostatic-discharge strap when removing or installing memory modules. Electrostatic-discharge gloves can also be used.
  - Never hold two or more memory modules together so that they do not touch each other. Do not stack memory modules directly on top of each other during storage.
  - Never touch the gold memory module connector contacts or allow these contacts to touch the outside of the memory module connector housing.
  - Handle memory modules with care: never bend, twist, or drop a memory module.
  - Do not use any metal tools (such as jigs or clamps) to handle the memory modules, because the rigid metals may damage the memory modules.
  - Do not insert memory modules while holding packages or passive components, which can cause package cracks or detachment of passive components by the high insertion force.

Procedure

Step 1. Power off the server and disconnect all power cords.

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

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

Note: Ensure that you observe the installation rules and sequence in “Memory module installation rules and order” on page 37.

Step 4. Install the memory module into the slot.

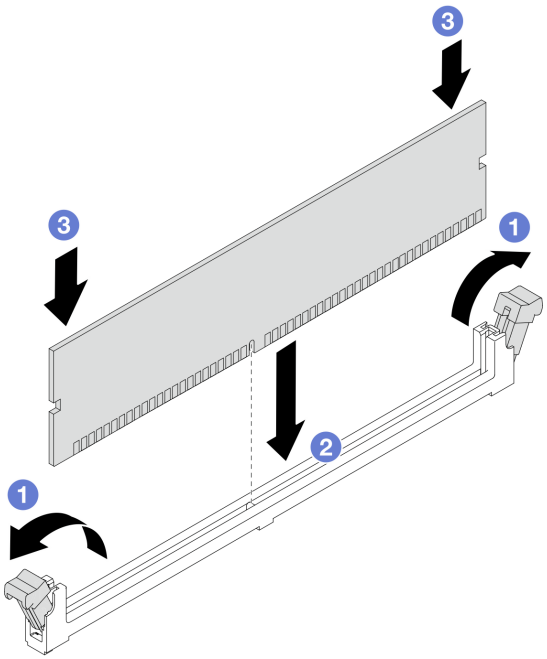


Figure 88. Memory module installation

Attention:

- Before you install a memory module into the slot, make sure that the clips are on open position, and the slot is clear of any debris.
- To avoid breaking the retaining clips or damaging the memory module slots, open and close the clips gently.

a. 1 Open the retaining clip on each end of the memory module slot.

b. 2 Identify the key on the memory module and then align the key to the slot, and gently place the memory module into the slot with both hands.

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

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

After you finish

Complete the parts replacement. See "Complete the parts replacement" on page 174.

Demo video

Watch the procedure on YouTube

M.2 cage and M.2 drive replacement

Use this information to remove and install the an M.2 cage and M.2 drive.

Remove an M.2 cage

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

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Remove the top cover. See “Remove the rear top cover” on page 162.

Step 2. Remove the cable routed through the clips on air baffle.

Step 3. Remove the air baffle. See “Remove the air baffle” on page 48.

Step 4. Remove the cables routed through the clips on M.2 cage. For more details, see Chapter 5 “Internal cable routing” on page 175.

Step 5. Remove the M.2 cage.

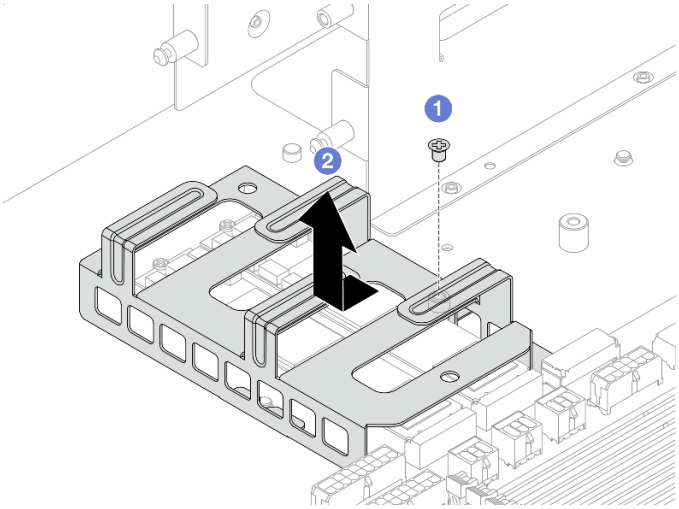


Figure 89. M.2 cage removal

a. 1 Loosen the screw from the M.2 cage and chassis.

b. 2 Slide the cage to the direction as shown to disengage the cage from pins on the chassis and lift it out.

After you finish

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

Demo video

Watch the procedure on YouTube

Install an M.2 cage

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

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Touch the static-protective package that contains the M.2 cage to any unpainted surface on the outside of the server. Then, take the M.2 cage out of the package and place it on a static-protective surface.

Step 2. Install the M.2 cage.

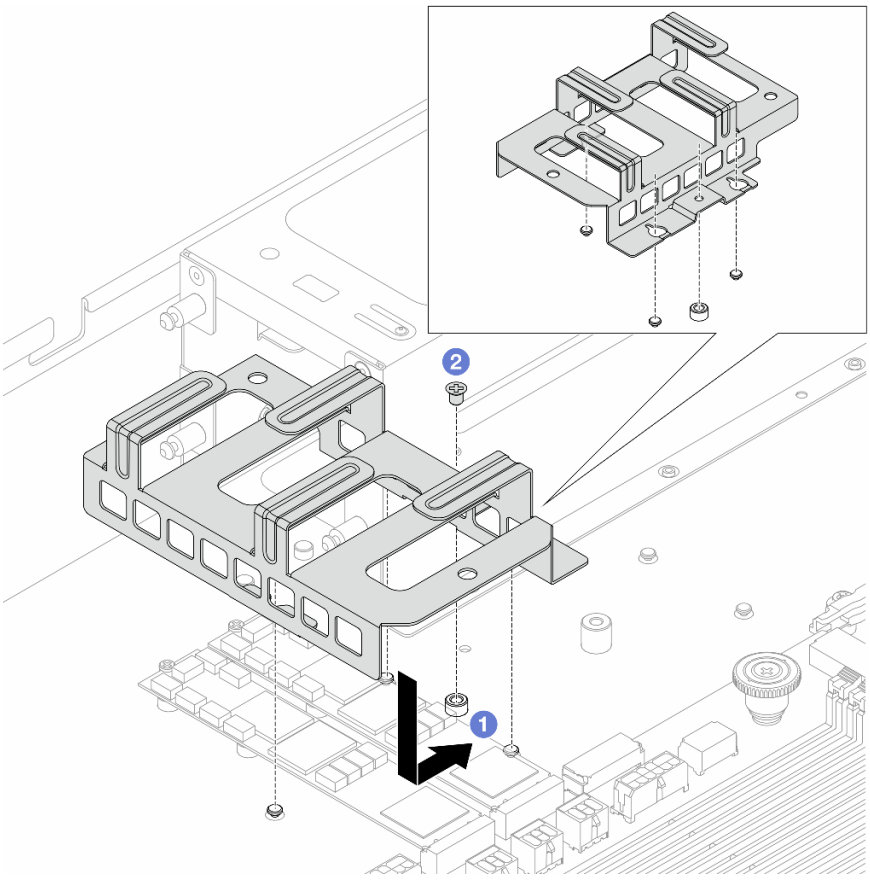


Figure 90. M.2 cage installation

a. 1 Slide the cage to the direction as shown to align the cage with pins on the chassis.

b. 2 Tighten the screw and make sure that the cage is secured in place.

Step 3. Connect the cables routed through the clips on the M.2 cage. For more details, see Chapter 5 "Internal cable routing" on page 175.

Step 4. Install the air baffle. See "Install the air baffle" on page 50.

Step 5. Install the top cover. See "Install the rear top cover" on page 164.

After you finish

Complete the parts replacement. See "Complete the parts replacement" on page 174.

Demo video

Watch the procedure on YouTube

Remove an M.2 drive

Use this information to remove the M.2 drive.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Remove the top cover. See “Remove the rear top cover” on page 162.

Step 2. Remove the air baffle. See “Remove the air baffle” on page 48.

Step 3. Remove the cables routed through the clips on M.2 cage. For more details, see Chapter 5 “Internal cable routing” on page 175.

Step 4. Remove the M.2 cage. See “Remove an M.2 cage” on page 113.

Step 5. Remove the M.2 drive from the system board.

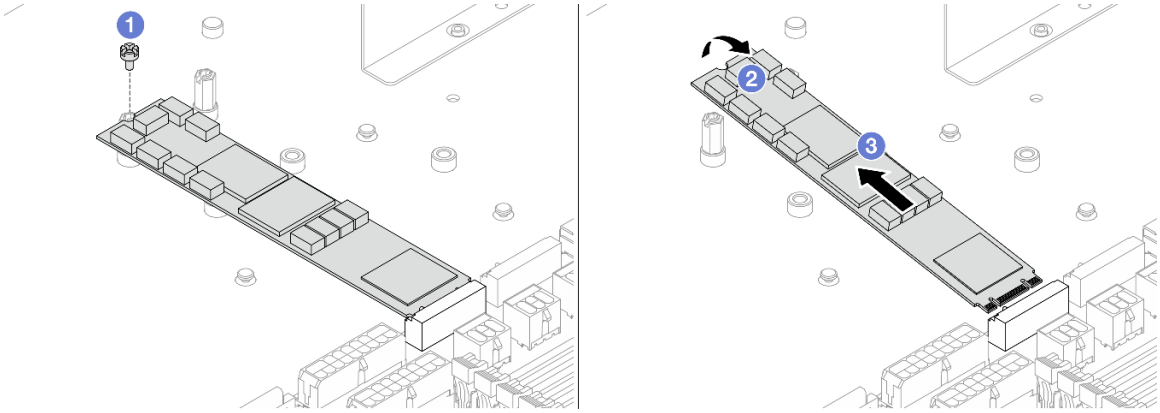


Figure 91. M.2 drive (type 22110) removal

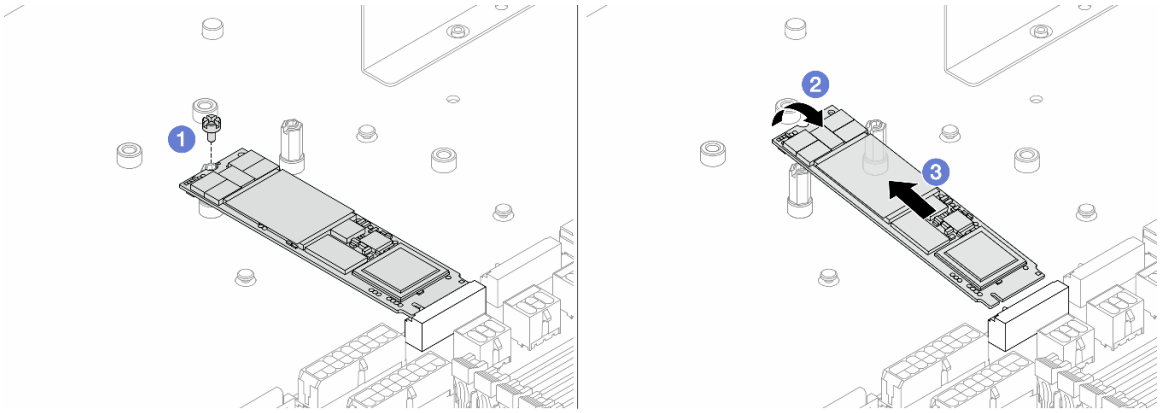


Figure 92. M.2 drive (type 2280) removal

a. 1 Loosen the screw that secures the drive to the chassis.

b. 2 Lift the M.2 drive as the illustration shows.

c. 3 Disengage the M.2 drive from the system board.

After you finish

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

Demo video

Watch the procedure on YouTube

Install an M.2 drive

Use this information to install the M.2 drive.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Touch the static-protective package that contains the M.2 drive to any unpainted surface on the outside of the server. Then, take the M.2 drive out of the package and place them on a static-protective surface.

Step 2. Locate the M.2 drive slot on the system board.

Note: The server supports two identical M.2 drives, install the M.2 drive in connector 0 first. For more details, see “System-board connectors” on page 14.

Step 3. Install the M.2 drive (type 22110) to the system board.

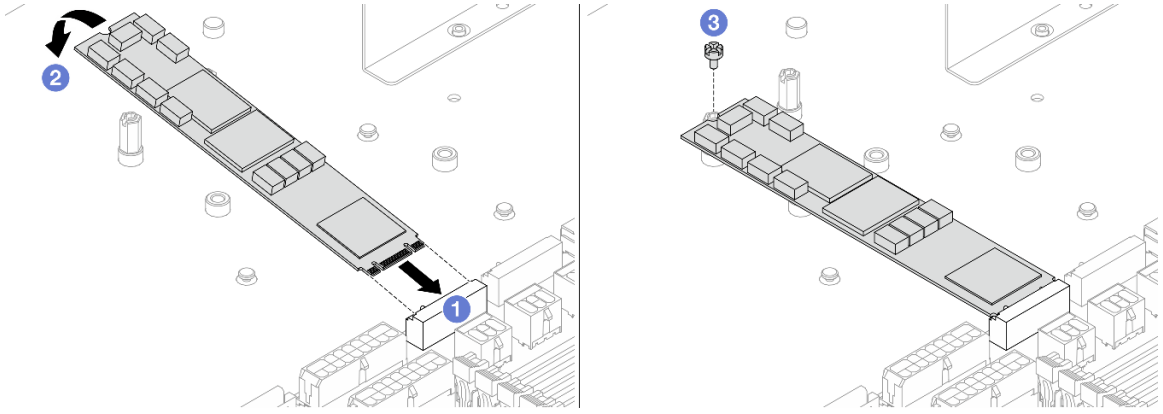


Figure 93. M.2 drive (type 22110) installation

a. 1 Insert the M.2 drive at an angle of approximately 45 degrees into the connector.

b. 2 Press the M.2 drive down to align the screw hole on the standoff.

c. 3 Tighten the screw and make sure that the M.2 drive is secured in place.

Step 4. Install the M.2 drive (type 2280) to the system board.

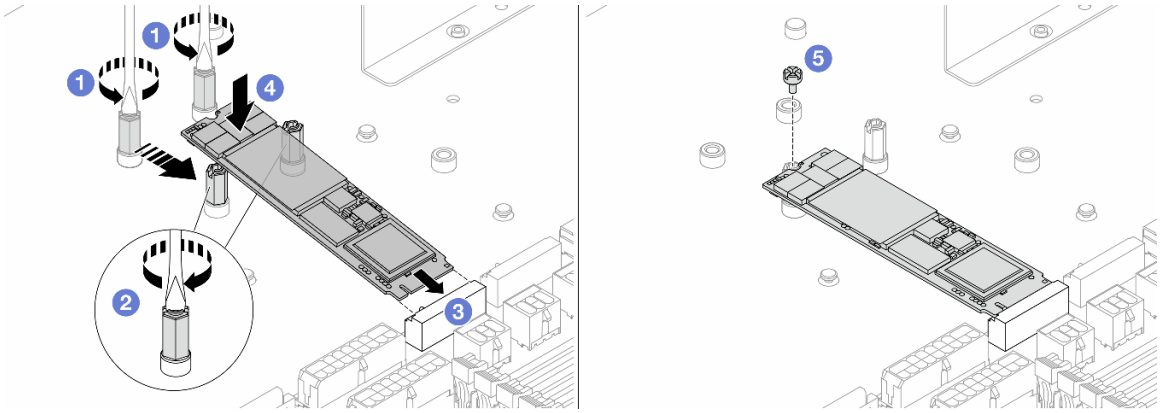


Figure 94. M.2 drive (type 2280) installation

a. 1 If the server was installed with M.2 drives (type 22110) previously, remove the pre-installed standoffs with a flat-blade screwdriver.

b. 2 Relocate the standoffs to the screw holes designated for type 2280.

c. 3 Insert the M.2 drive at an angle of approximately 45 degrees into the connector.

d. 4 Press the M.2 drive down to align the screw hole on the standoff.

e. 5 Tighten the screw and make sure that the M.2 drive is secured in place.

Step 5. Install the M.2 cage. See “Install an M.2 cage” on page 114.

Step 6. Connect the cables routed through the clips on the M.2 cage. For more details, see Chapter 5 “Internal cable routing” on page 175.

Step 7. Install the air baffle. See “Install the air baffle” on page 50.

Step 8. Install the top cover. See “Install the rear top cover” on page 164.

After you finish

Complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

OCP module replacement

Use this information to remove and install the OCP module.

Remove the OCP module

Use this information to remove the OCP module.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

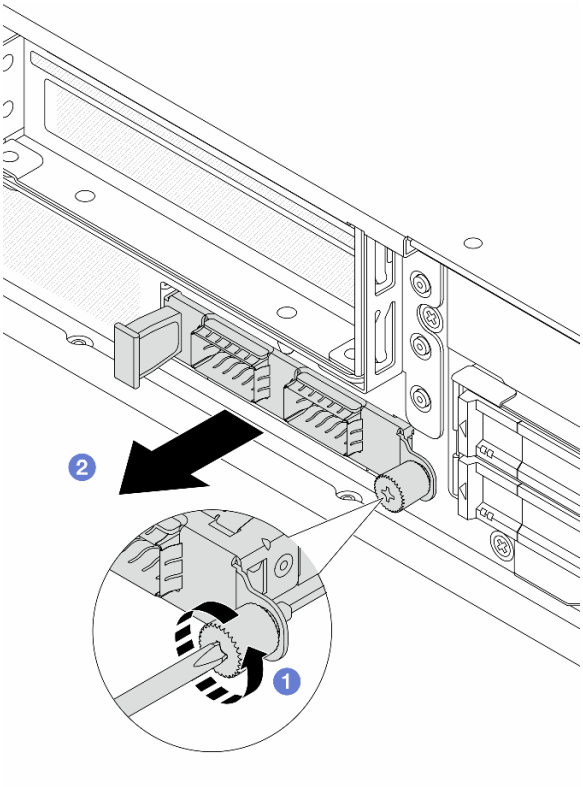


Figure 95. OCP module removal

Step 1. 1 Loosen the thumbscrew that secures the module. Use a screwdriver if necessary.

Step 2. 2 Pull out the OCP module by its handle on the left as shown.

After you finish

1. Install a new OCP module. See “Install the OCP module” on page 120.
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

Watch the procedure on YouTube

Install the OCP module

Use this information to install the OCP module.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

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

Step 2. Install the OCP module.

Notes:

- Ensure that the Ethernet adapter is fully seated and the thumbscrew is securely tightened. Otherwise, the OCP module will not get full connection and may not function.
- If there is an OCP module installed, when the system is powered off but still plugged in to AC power, system fan 1 and fan 2 will continue to spin at a much lower speed. This is the system design to provide proper cooling for the OCP module.

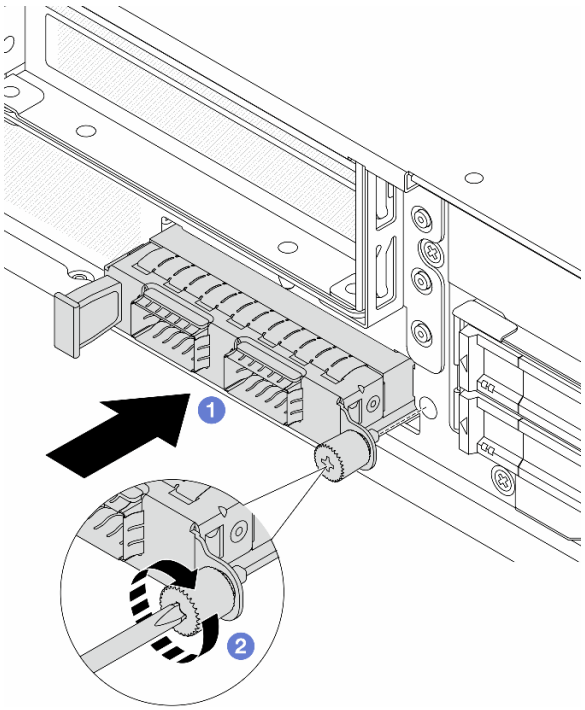


Figure 96. OCP module installation

a. 1 Push the OCP module by its handle on the left until it is fully inserted into the connector on the processor board.

b. 2 Fully tighten the thumbscrew to secure the adapter. Use a screwdriver if necessary.

After you finish

Complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

Power input board (PIB) replacement

Use this information to remove and install the power input board (PIB).

Remove the power input board (PIB)

Follow the instructions in this section to remove the power input board (PIB).

About this task

S033

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

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Remove the top cover. See “Remove the rear top cover” on page 162.

Step 2. Remove the hot-swap power supply units. See “Remove a hot-swap power supply unit” on page 103.

Step 3. Disconnect the cables attached to the PIB. For more details, see “Cable routing for power input board (PIB)” on page 179.

Step 4. Remove the PIB.

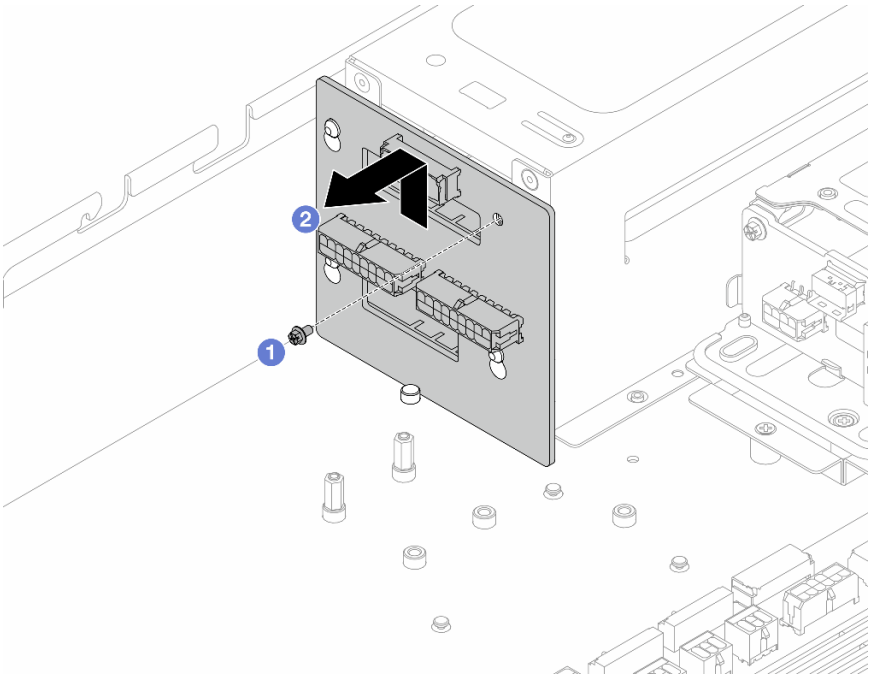


Figure 97. PIB removal

a. 1 Remove the screw that secure the PIB to the power supply unit cage.

b. 2 Lift the PIB upward first to release it from pins, and then lift it out of the chassis.

After you finish

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

Demo video

Watch the procedure on YouTube

Install the power input board (PIB)

Follow the instructions in this section to install the power input board (PIB).

About this task

S033

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

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

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

Step 2. Install the PIB to the power supply unit cage.

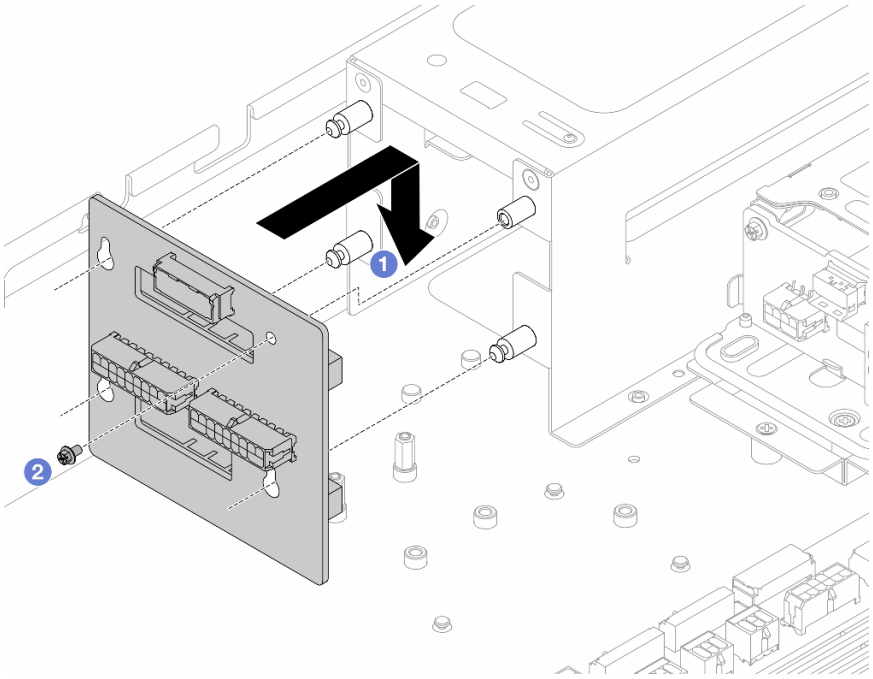


Figure 98. PIB installation

a. 1 Align the screw hole and standoff pins, and install the PIB to the cage.

b. 2 Tighten the screw to secure it in place.

Step 3. Connect the power and signal cables to the system board, see “Cable routing for power input board (PIB)” on page 179.

Step 4. Install the power supply units, see “Install a hot-swap power supply unit” on page 105.

After you finish

Complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

Processor and heat sink replacement

Follow the instruction in this section to replace an assembled processor and heat sink, known as a processor-heat-sink module (PHM), a processor, or a heat sink.

Attention: Before you begin replacing a processor, make sure that you have an alcohol cleaning pad and thermal grease.

Important: The processor in your server can throttle in response to thermal conditions, temporarily lowering its speed to reduce heat output. In instances where a few processor cores are throttled for an extremely short time period (100 ms or less), the only indication might be an entry in the operating system event log with no corresponding entry in the system BMC event log. If this situation occurs, the event can be ignored and processor replacement is not required.

- "Remove a processor and heat sink" on page 125
- "Separate the processor from carrier and heat sink" on page 128
- "Install a processor and heat sink" on page 129

Remove a processor and heat sink

This task has instructions for removing an assembled processor and heat sink, known as a processor-heat-sink module (PHM). This task requires a Torx T30 driver. 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.

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.
- If the server is installed in a rack, slide the server out on its rack slide rails to gain access to the top cover, or remove the server from the rack. See "Remove the server from the rack" on page 41.
- 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.

Note: 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.

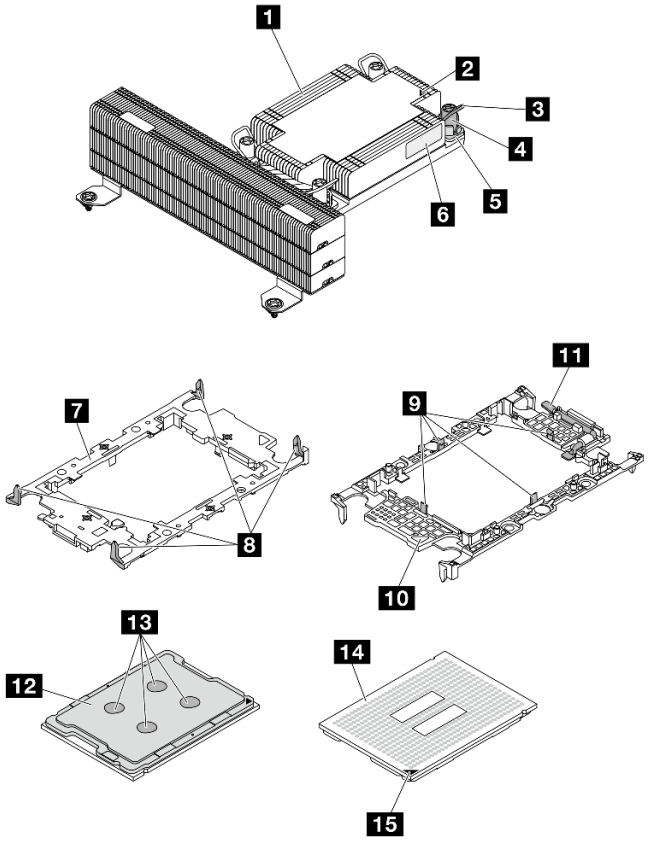


Figure 99. PHM components

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

7 Processor carrier	15 Processor triangular mark
8 Clips to secure carrier to heat sink	

Procedure

Step 1. Make preparations for this task.

a. Remove the top cover. See “Remove the rear top cover” on page 162.

b. Remove the air baffle. See “Remove the air baffle” on page 48.

c. Remove the fan cage. See “Remove a fan cage” on page 87.

Step 2. Remove the PHM from the processor board.

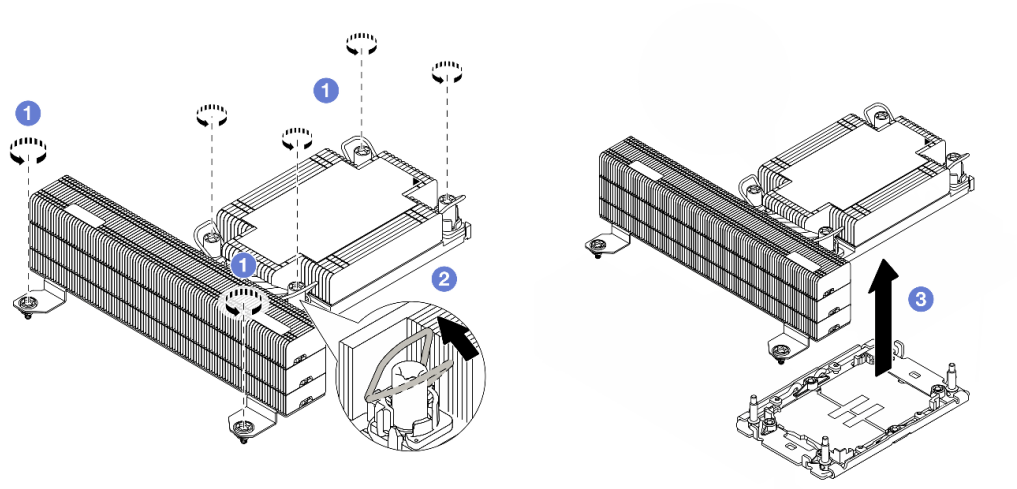


Figure 100. Removing a PHM

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

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.

Notes:

- Do not touch the contacts on the bottom of the processor.
- Keep the processor socket clean from any object to prevent possible damages.

After you finish

- Each processor socket must always contain a cover or a PHM. Protect empty processor sockets with a cover or install a new PHM.
- If you are removing the PHM as part of a processor board replacement, set the PHM aside.
- 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 128.

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

Demo video

Watch the procedure on YouTube

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

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.
- Do not touch the processor contacts. 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.

Note: The heat sink, processor, and processor carrier for your system might be different than those shown in the illustrations.

Procedure

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

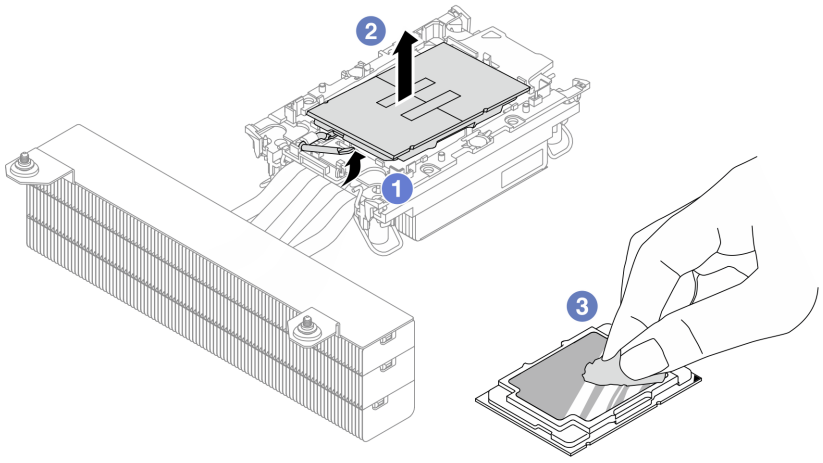


Figure 101. Separating a processor from the heat sink and carrier

Note: Do not touch the contacts on the processor.

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.

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

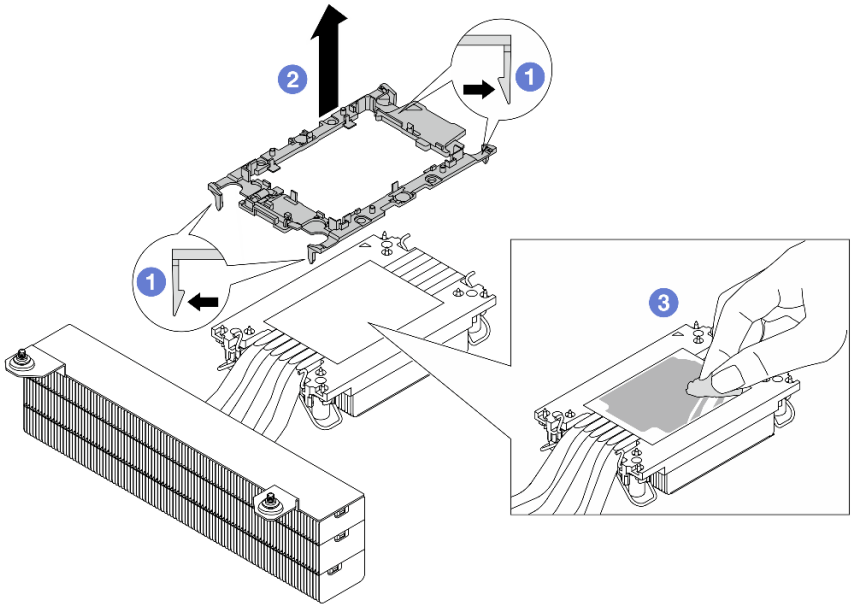


Figure 102. Separating a processor carrier the from heat sink

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

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.

After you finish

If you are instructed to return the defective component, please package the part to prevent any shipping damage. Reuse the packaging the new part arrived in and follow all packaging instructions.

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 driver. This procedure must be executed by a trained technician.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.
- 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.
- To ensure the best performance, check the manufacturing date on the new heat sink and make sure it does not exceed 2 years. Otherwise, wipe off the existing thermal grease and apply the new grease onto it for optimal thermal performance.

Notes:

- The heat sink, processor, and processor carrier for 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.
- Before you install a new PHM or replacement processor, update your system firmware to the latest level.

The following illustration shows the components of the PHM.

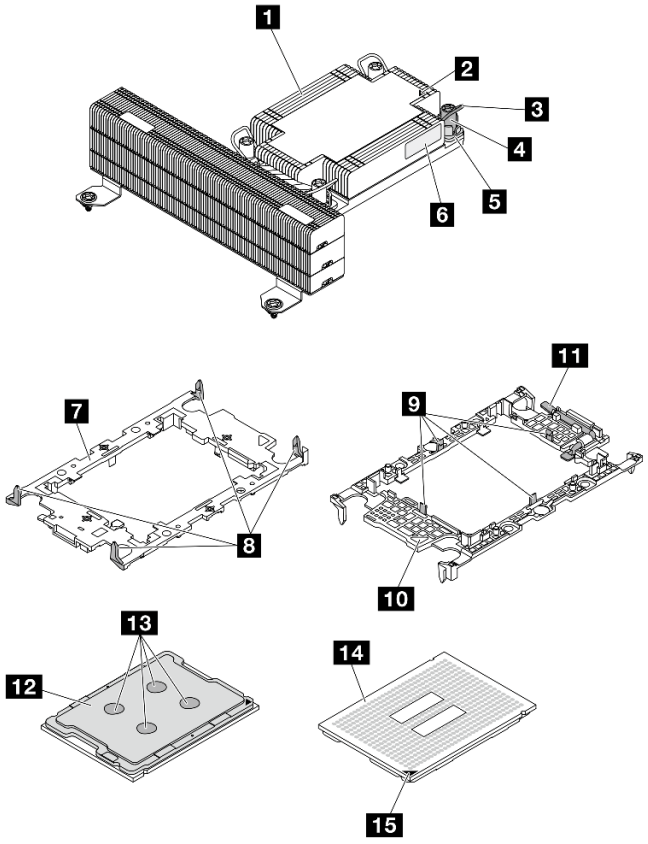


Figure 103. PHM components

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

Procedure

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

a. Remove the processor identification label from the heat sink and replace it with the new label that comes with the replacement processor.

b. 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.

a. Remove the processor identification label from the old heat sink and place it on the new heat sink in the same location. The label is on the side of the heat sink closest to the triangular alignment mark.

   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.

b. Install processor in new carrier.

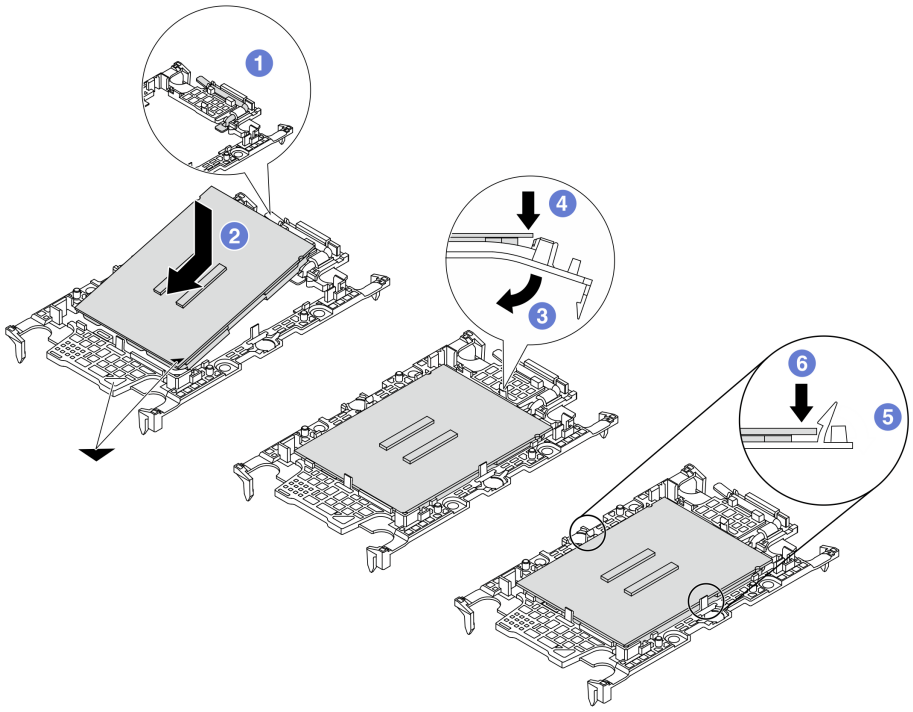


Figure 104. Installing a processor carrier

Note: Replacement heat sinks come with both gray and black processor carriers. Make sure to use the carrier with the same color as the one you discarded earlier.

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.

a. 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 aligned with the triangular mark in the shipping tray.

b. If there is any old thermal grease on the processor, gently wipe the top of the processor with an alcohol cleaning pad.

Note: Make sure the alcohol has fully evaporated before applying new thermal grease.

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

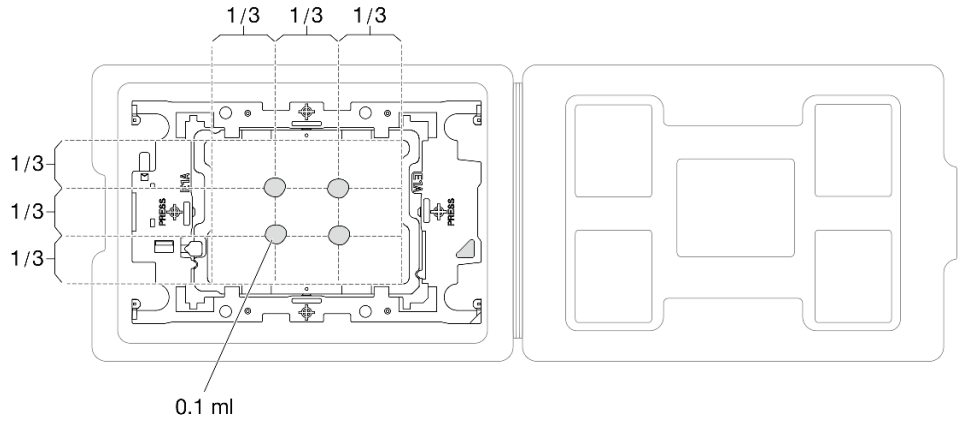


Figure 105. Thermal grease application with processor in shipping tray

Step 4. Assemble the processor and heat sink.

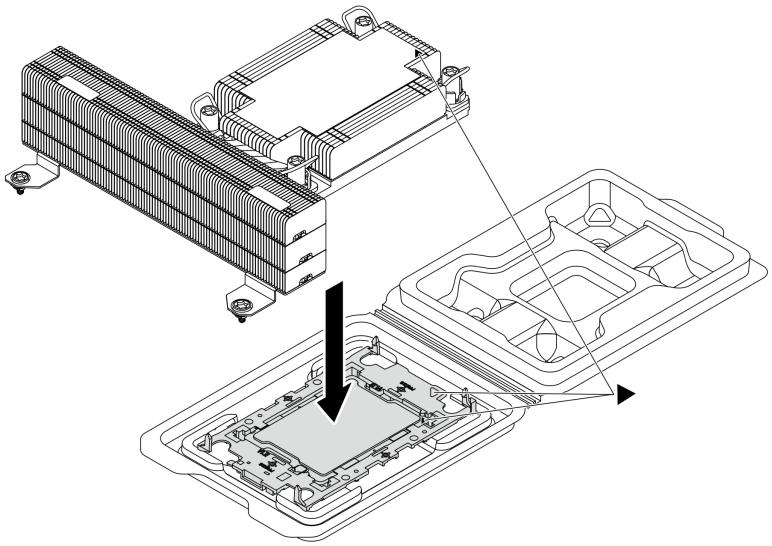


Figure 106. Assembling the PHM with processor in shipping tray

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

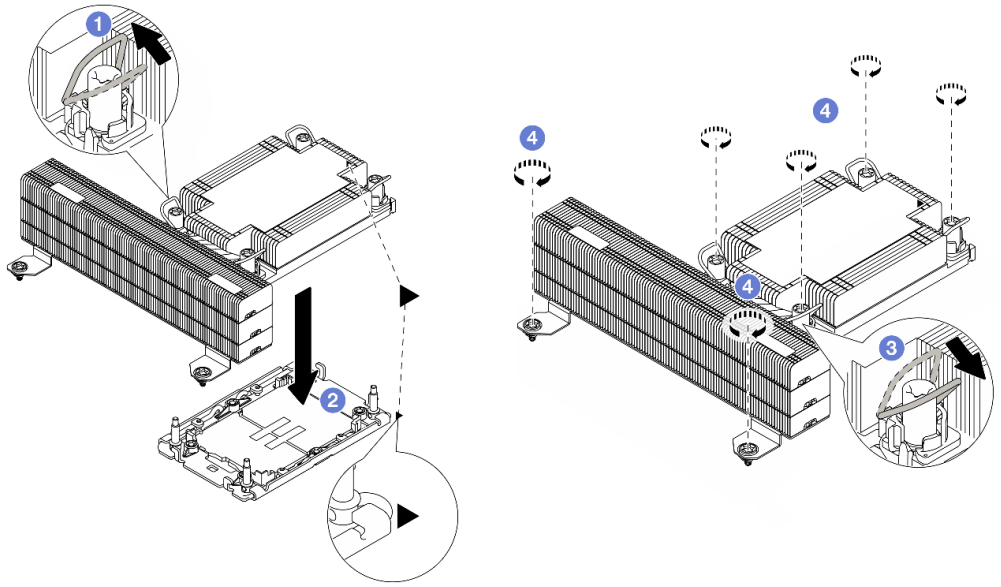


Figure 107. Installing a PHM

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. (For reference, the torque required for the fasteners to fully tighten is 0.9-1.3 newton-meters, 8-12 inch-pounds.)

After you finish

Complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

RAID flash power module replacement

The RAID flash power module protects the cache memory on the installed RAID adapter. You can purchase a RAID flash power module from Lenovo. Use this information to remove and install a RAID flash power module.

An extension cable is provided for each RAID flash power module for connection. Connect the flash power module cable to the flash power module connector on the corresponding RAID adapter as shown.

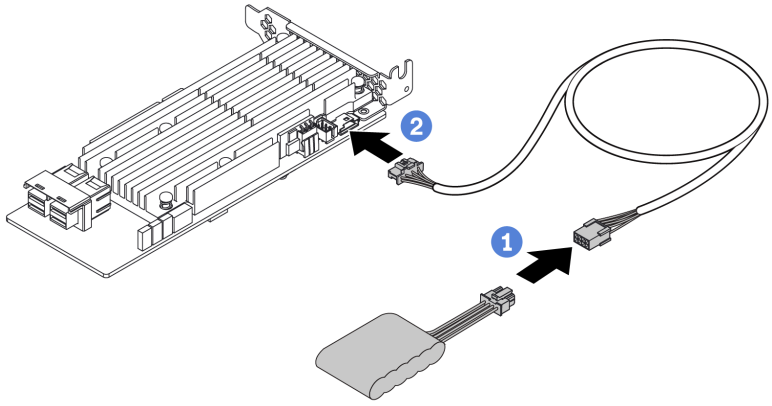


Figure 108. Power cable routing for flash power module

- 1 Connect the RAID flash power module to the extension cable.
- 2 Connect the extension cable to the RAID adapter.
- "Remove the RAID flash power module" on page 135
- "Install the RAID flash power module" on page 136

Remove the RAID flash power module

Use this information to remove the RAID flash power module on the air baffle.

About this task

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Procedure

Step 1. Remove the top cover. See "Remove the rear top cover" on page 162.

Step 2. Disconnect the cable of the RAID flash power module. For more details, see "Cable routing for RAID flash power module" on page 180.

Step 3. Remove the air baffle from the chassis. See "Remove the air baffle" on page 48.

Step 4. Remove the RAID flash power module on the air baffle.

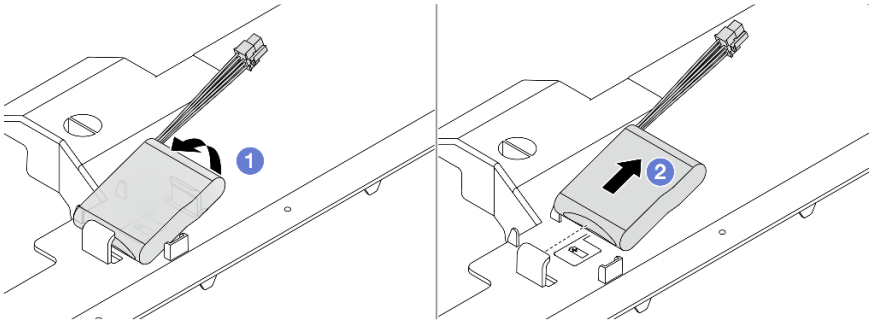


Figure 109. Removal of the RAID flash power module on the air baffle

a. 1 Open the retention clip on the holder of the RAID flash power module.

b. 2 Take the RAID flash power module out of the holder.

After you finish

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

Demo video

Watch the procedure on YouTube

Install the RAID flash power module

Use this information to install the RAID flash power module on the air baffle.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

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

Step 2. Install the RAID flash power module on the air baffle.

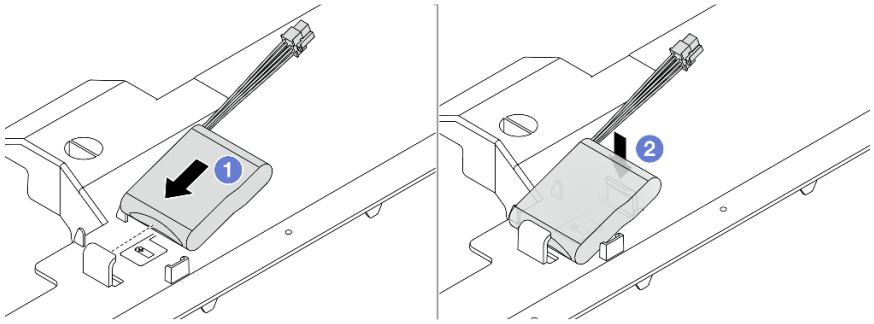


Figure 110. Installation of the RAID flash power module on the air baffle

a. 1 Tilt the RAID flash power module and insert it into the clips on the air baffle.

b. 2 Press the RAID flash power module down to secure it into the air baffle.

After you finish

1. Install the air baffle on the chassis. See "Install the air baffle" on page 50.
2. Connect the flash power module to an adapter with the extension cable that comes with the flash power module. See "Cable routing for RAID flash power module" on page 180.
3. Complete the parts replacement. See "Complete the parts replacement" on page 174.

Demo video

Watch the procedure on YouTube

Rear drive assembly replacement

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

- "Remove the 2.5-inch rear drive assembly" on page 137
- "Install the 2.5-inch rear drive assembly" on page 141

Remove the 2.5-inch rear drive assembly

Use this information to remove the 2.5-inch rear drive assembly.

About this task

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Procedure

Step 1. Remove the top cover. See “Remove the rear top cover” on page 162.

Step 2. Remove the drives installed in the 2.5-inch rear drive cage. See “Remove a 2.5-inch hot-swap rear drive” on page 101.

Step 3. Disconnect the 2.5-inch rear drive cage cables from the system board or the PCIe adapter. See Chapter 5 “Internal cable routing” on page 175.

Step 4. Remove the rear wall cover.

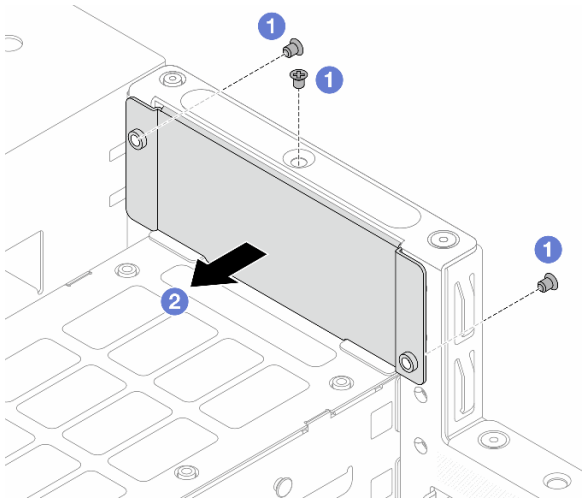


Figure 111. Rear wall cover removal

a. 1 Loosen the screws that secure the rear wall cover.

b. 2 Remove the cover from the rear wall.

Step 5. Remove the rear drive cage.

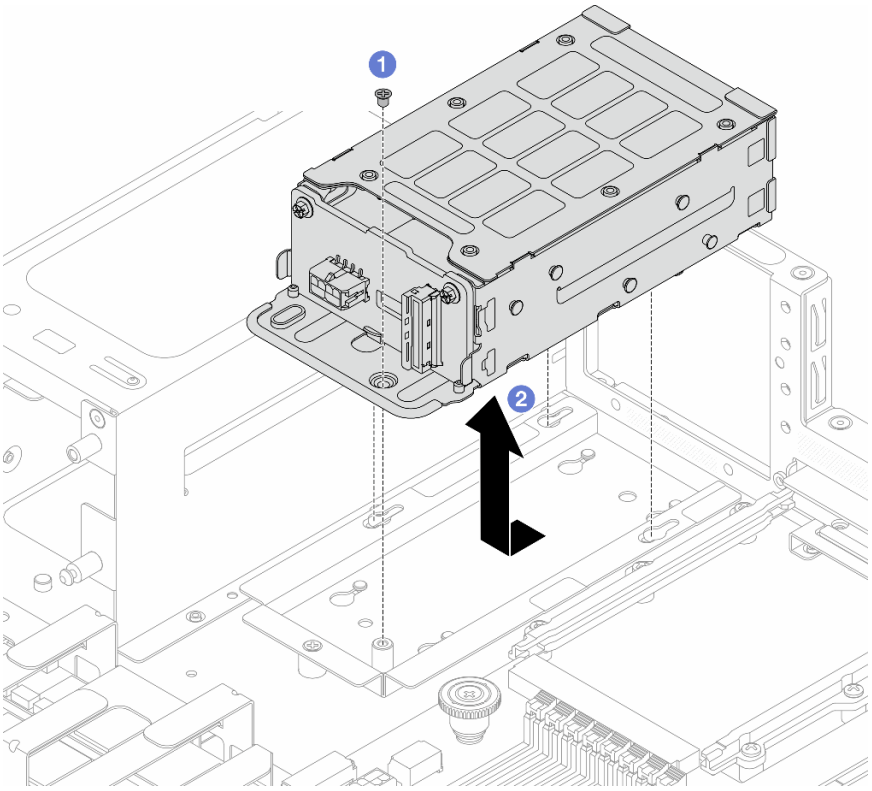


Figure 112. Rear drive cage removal

a. 1 Loosen the screw that secures the rear drive cage from drive cage holder.

b. 2 Slide the cage to the direction as shown to unlock it from the holder, and lift it out of the chassis.

Step 6. Remove the drive cage holder.

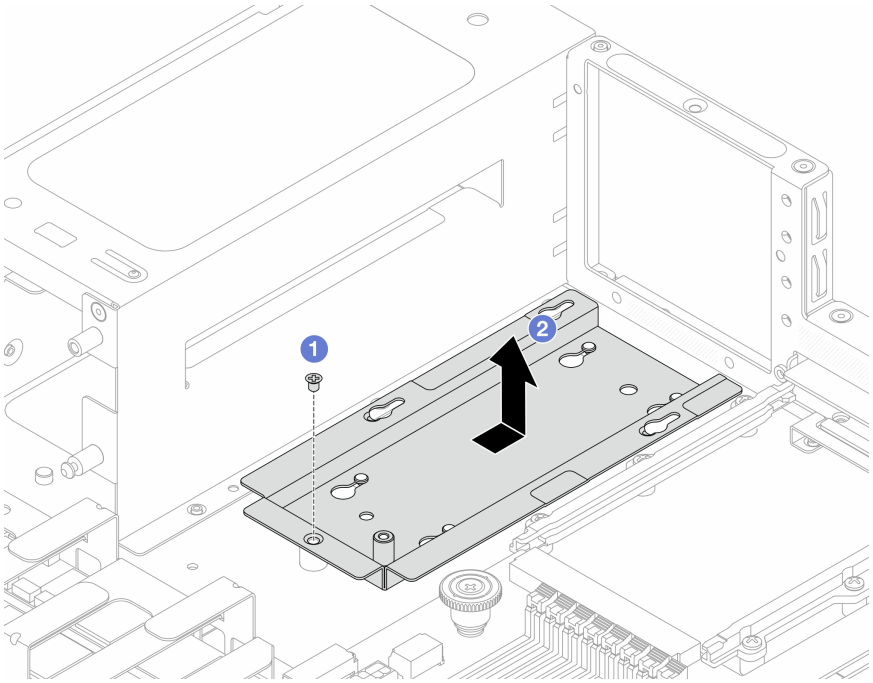


Figure 113. Drive cage holder removal

a. 1 Loosen the screw that secures the rear drive holder from chassis.

b. 2 Slide the cage to the direction as shown to unlock it from the chassis and lift it out.

Step 7. Install a 4-bay filler to the rear wall after removing the rear drive assembly.

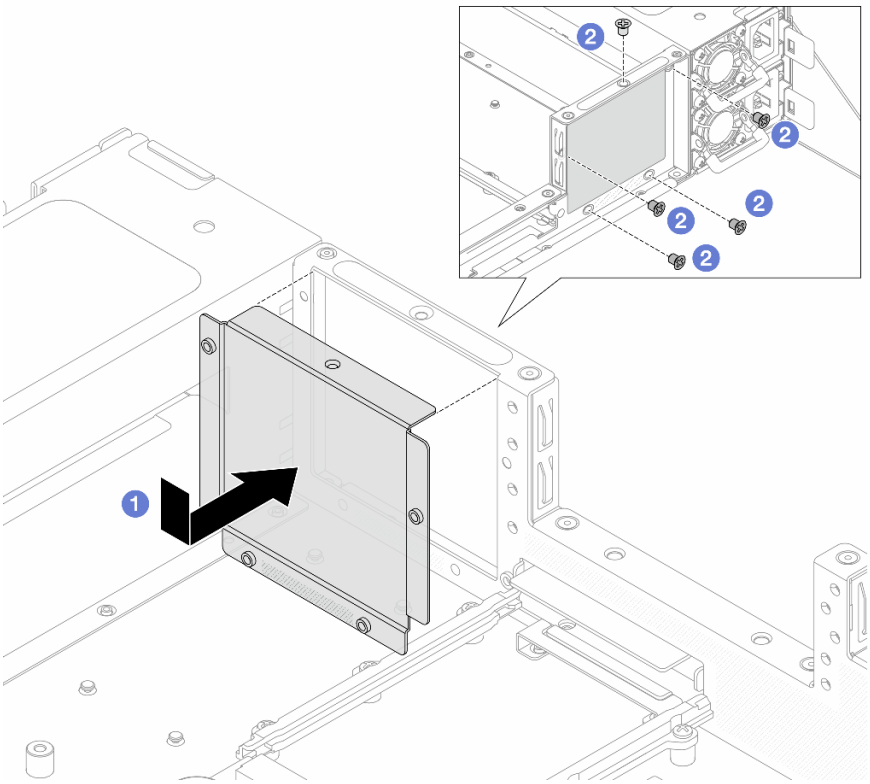


Figure 114. Installing a 4-bay filler

a. 1 Insert the 4-bay filler from inside of the server.

b. 2 Tighten the screws and make sure that they are secured in place.

Step 8. If the rear backplane is for reuse, remove the rear backplane. See "Remove the 2.5-inch rear drive backplane" on page 54.

After you finish

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

Demo video

Watch the procedure on YouTube

Install the 2.5-inch rear drive assembly

Use this information to install the 2.5-inch rear drive assembly.

About this task

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.

- 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 systems.

Procedure

Step 1. Touch the static-protective package that contains the 2.5-inch rear drive cage to any unpainted surface on the outside of the server. And then, take the 2.5-inch rear drive cage out of the package and place it on a static-protective surface.

Step 2. If the rear wall has a 4-bay filler installed, remove it first.

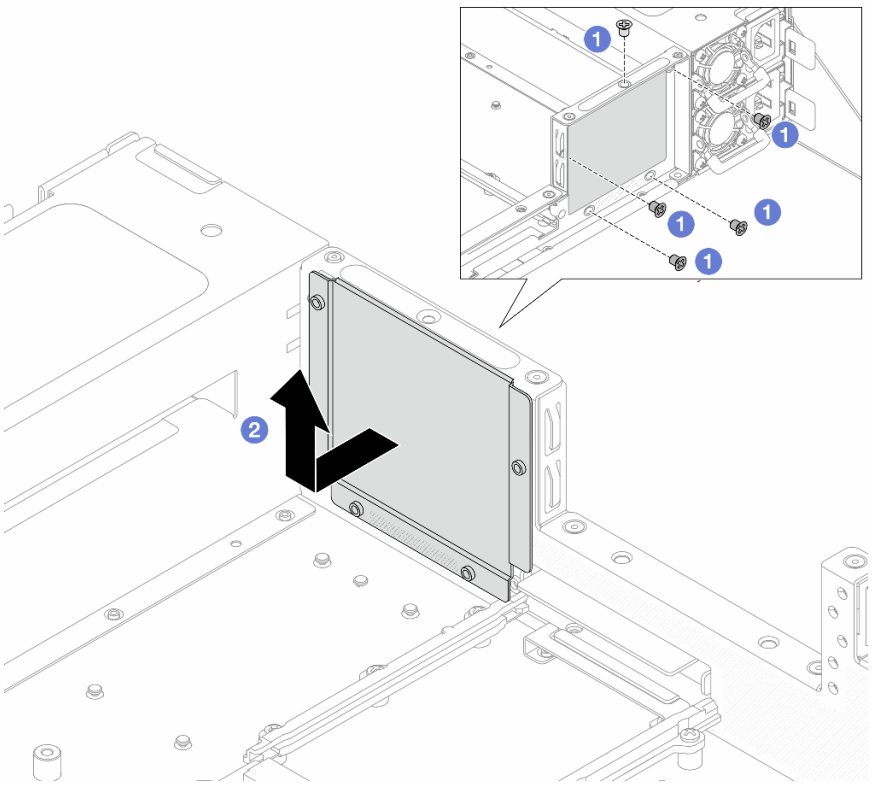


Figure 115. Removing a 4-bay filler

a. 1 Loosen the screws.

b. 2 Pull the 4-bay filler to the direction as illustrated above and lift it out of the chassis.

Step 3. Install the drive cage holder.

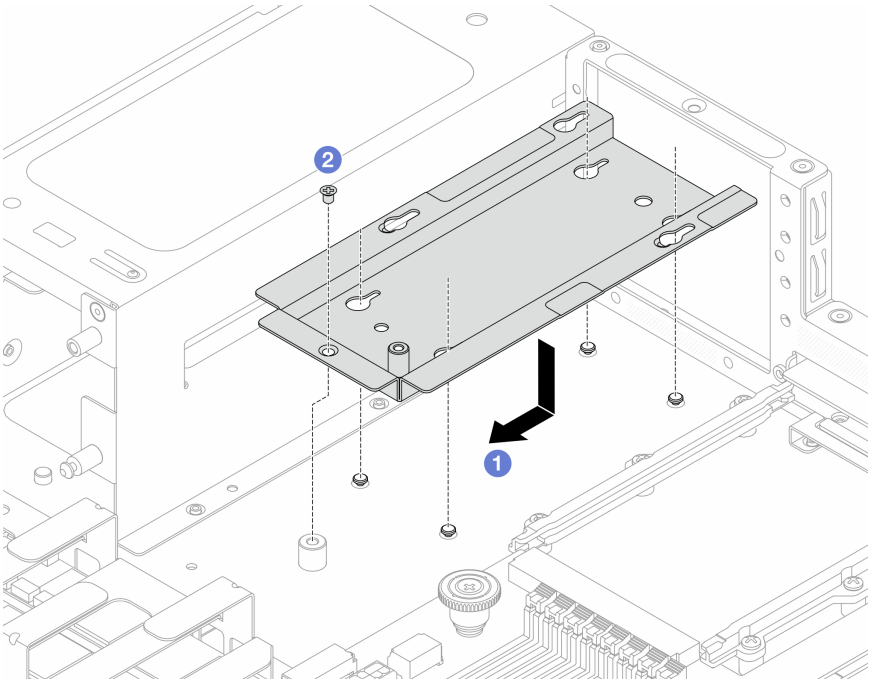


Figure 116. Drive cage holder installation

a. 1 Align the guiding pins and a screw hole on both rear drive cage holder and chassis, and slide the holder to the direction as shown to lock it to the chassis.

b. 2 Tighten the screw to secure it to the chassis.

Step 4. Before installing the rear drive cage, install the rear backplane first. See “Install the 2.5-inch rear drive backplane” on page 55.

Step 5. Install the rear drive cage.

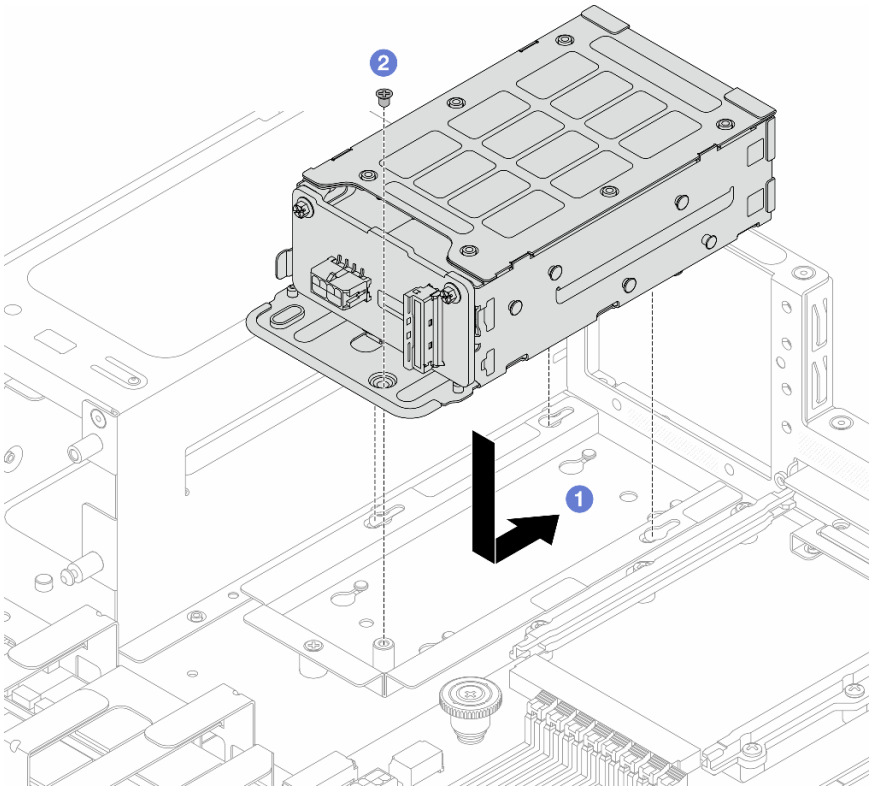


Figure 117. Rear drive cage installation

a. 1 Align the guiding pins and a screw hole on both rear drive cage and holder, and slide the cage to the direction as shown to lock it to the holder.

b. 2 Tighten the screw to secure it to the holder.

Step 6. Install the rear wall cover.

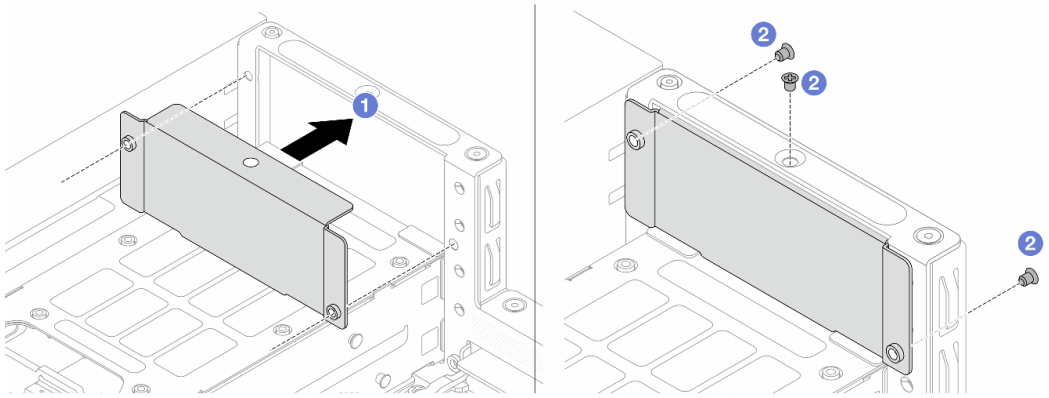


Figure 118. Rear wall cover installation

a. 1 Align the screw holes on both rear wall cover and server rear wall.

b. 2 Tighten the screws to secure the cover to the wall. Pay attention to the direction that the screws are placed.

Step 7. Connect the cables to the backplane.

After you finish

1. Reinstall the drives into the 2.5-inch rear drive cage. See “Install a 2.5-inch hot-swap rear drive” on page 102.
2. Complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

Riser card and PCIe adapter replacement

Use this information to remove and install a riser card and PCIe adapter.

- “Remove riser 1 assembly (HBA/RAID)” on page 145
- “Install riser 1 assembly (HBA/RAID)” on page 148
- “Remove the riser 2 assembly” on page 150
- “Install the riser 2 assembly” on page 152

Remove riser 1 assembly (HBA/RAID)

Use this information to remove the riser 1 assembly.

About this task

The riser assembly you want to remove might be different from the following illustrations, but the removal method is the same.

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Remove the top cover. See “Remove the rear top cover” on page 162.

Step 2. Remove riser 1 assembly.

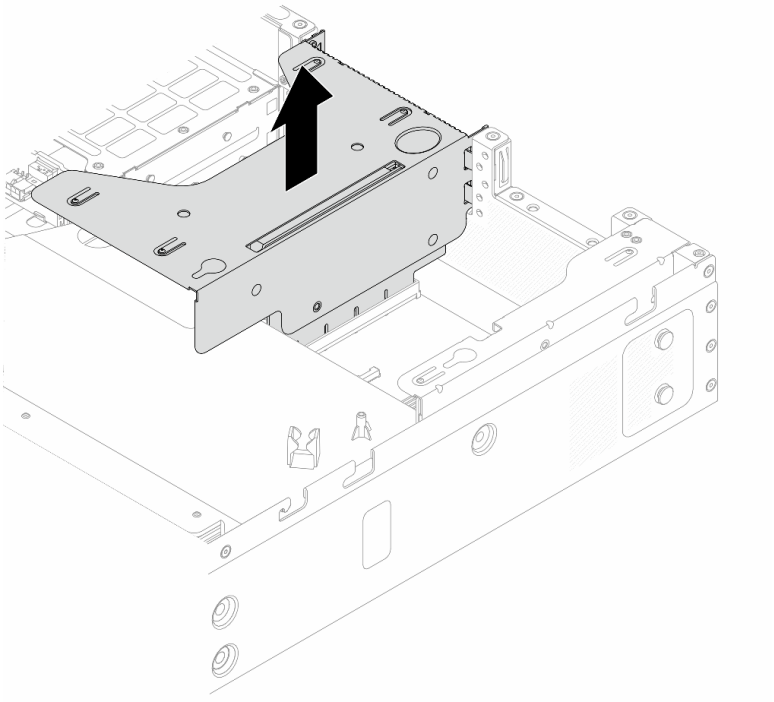


Figure 119. Riser assembly removal

Step 3. Disconnect all cables that are routed to 9600-24i HBA or 9670-24i RAID adapter. For more information, see “Cable routing for 9600-24i HBA” on page 178 and “Cable routing for 9670-24i RAID adapter” on page 178.

Step 4. Remove a PCIe adapter.

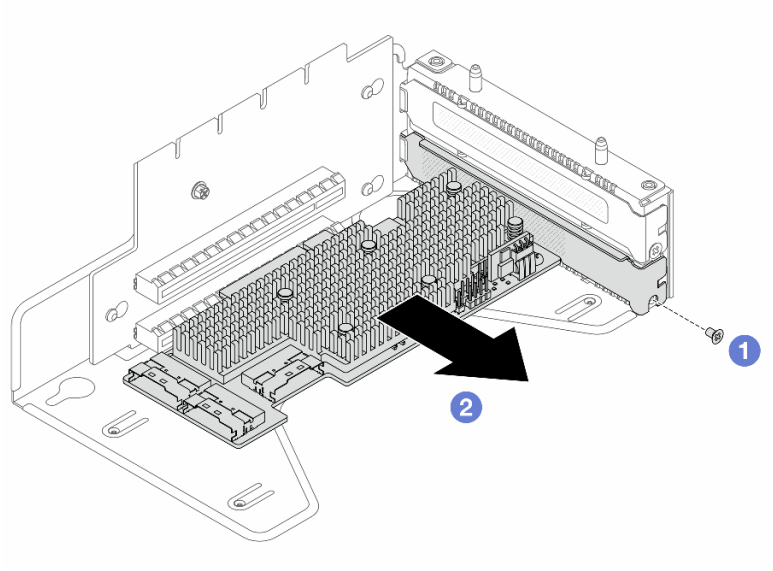


Figure 120. 9600-24i HBA removal

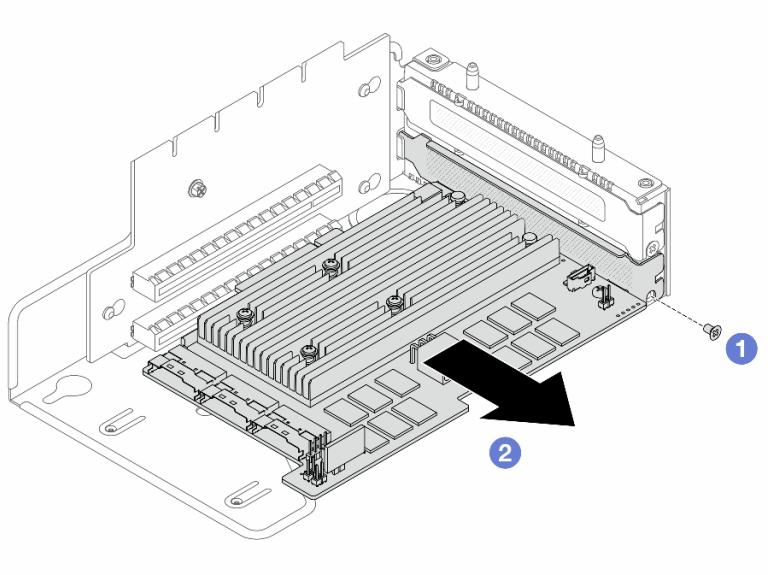


Figure 121. 9670-24i RAID adapter removal

a. 1 Remove the screw that secure the adapter to the bracket.
b. 2 Remove the PCIe adapter.

Step 5. Remove the riser card from the bracket.

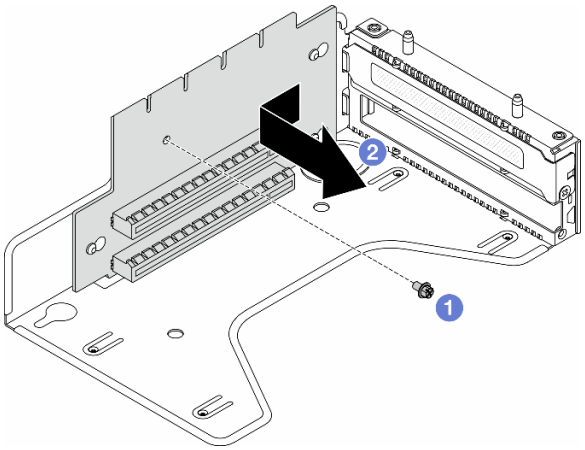


Figure 122. Riser card removal

a. 1 Remove the screw that secure the riser card to the bracket.
b. 2 Slide the riser card to the left and remove it from the bracket.

After you finish

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

Demo video

Watch the procedure on YouTube

Install riser 1 assembly (HBA/RAID)

Use this information to install the riser 1 assembly.

About this task

The riser assembly you want to install might be different from the following illustrations, but the installation method is the same.

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Procedure

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

Step 2. Install the riser card and secure it to the bracket.

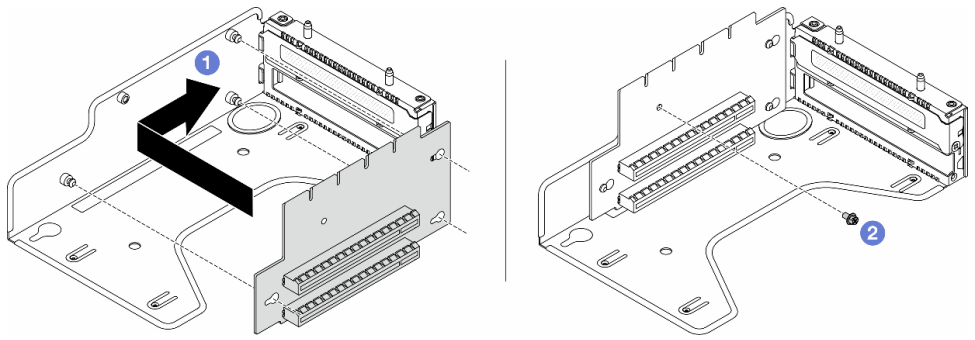


Figure 123. Riser card installation

1. 1 Align the screw holes in the riser card with the corresponding ones in the bracket.
2. 2 Install the screw to secure the riser card to the bracket.

Step 3. Install a PCIe adapter.

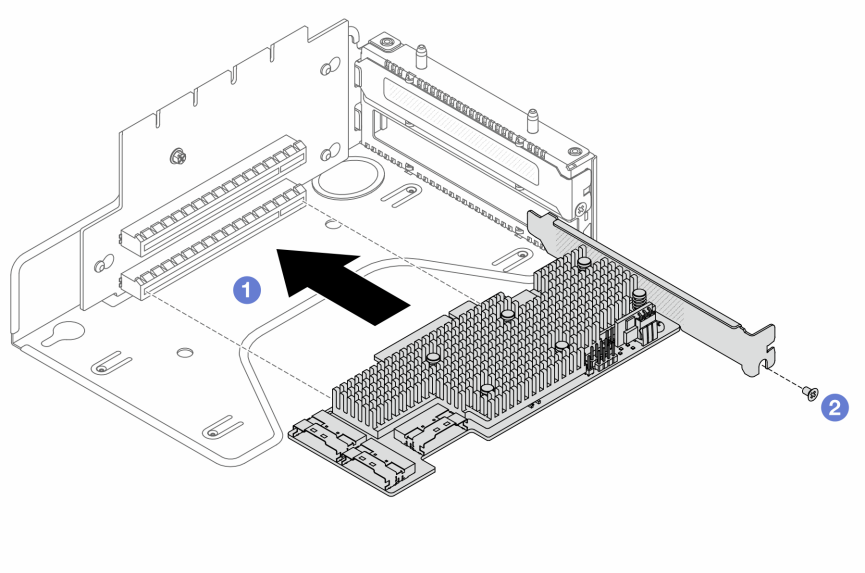


Figure 124. 9600-24i HBA installation

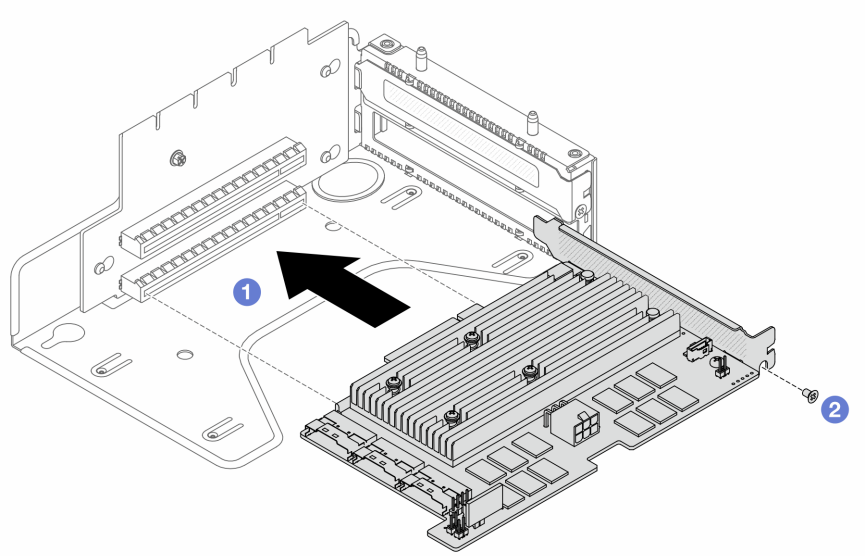


Figure 125. 9670-24i RAID adapter installation

a. 1 Align the screw hole and riser slot, and install the adapter to the bracket.

b. 2 Tighten the screw to secure it in place.

Step 4. Connect all cables that are routed to 9600-24i HBA or 9670-24i RAID adapter. For more information, see “Cable routing for 9600-24i HBA” on page 178 and “Cable routing for 9670-24i RAID adapter” on page 178.

Step 5. Position the riser assembly on the chassis. Align the plastic clip and two pins on the bracket with the guide pin and two holes on the chassis. Then, carefully press the riser assembly straight down into the slot until it is fully seated.

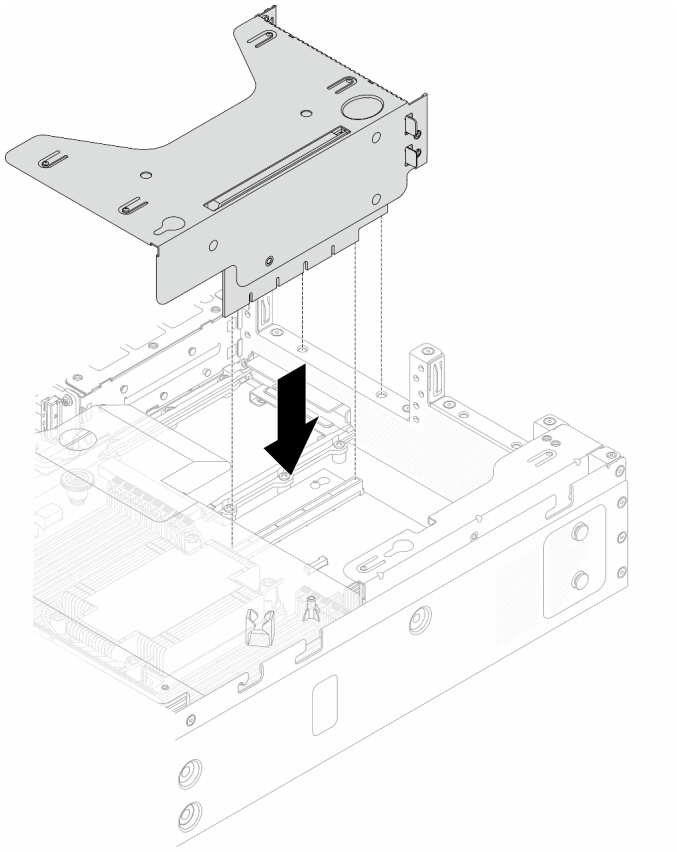


Figure 126. Riser assembly installation

Step 6. Install the top cover. See “Install the rear top cover” on page 164.

After you finish

Complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

Remove the riser 2 assembly

Use this information to remove the riser 2 assembly.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.

- 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 systems.

Procedure

Step 1. Remove the top cover. See “Remove the rear top cover” on page 162.

Step 2. Remove riser 2 assembly.

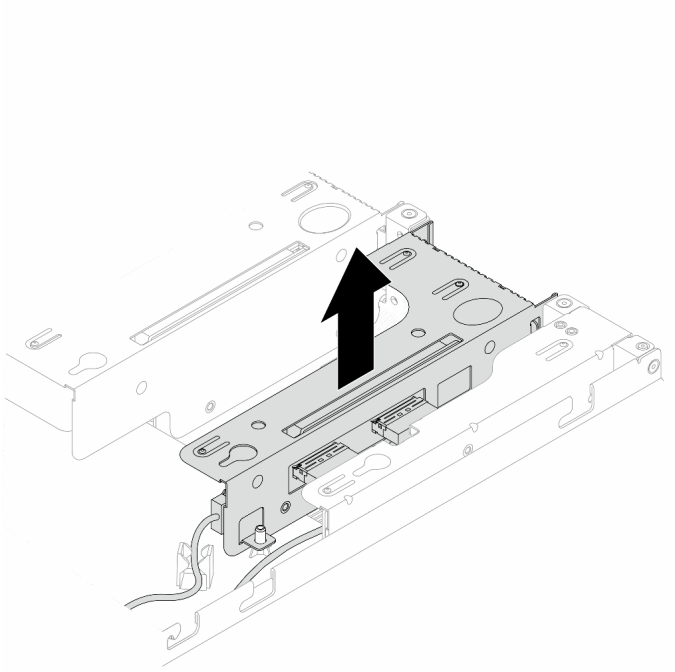


Figure 127. Riser assembly removal

Step 3. Disconnect the cables of riser 2 cards from system board. For more details, see “Cable routing for riser 2 card” on page 182.

Step 4. Remove the PCIe adapter from the riser assembly.

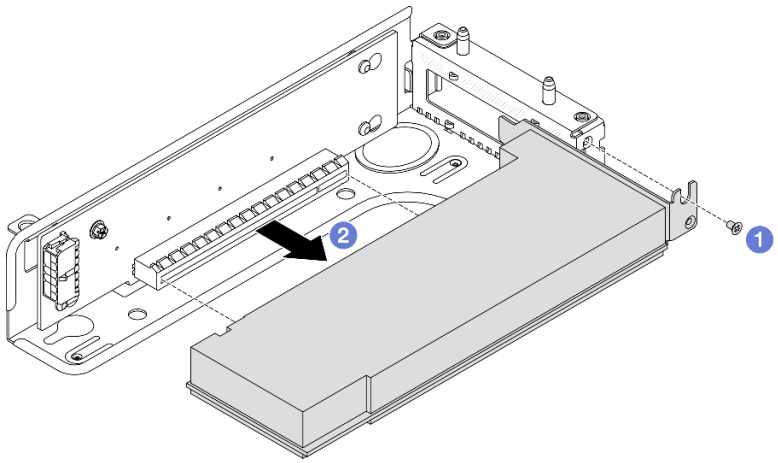


Figure 128. PCIe adapter removal from the riser 2 assembly

a. 1 Remove the screw that secures the PCIe adapter.

b. 2 Grasp the PCIe adapter by its edges and carefully pull it out of the PCIe adapter slot on the riser card.

Note: The procedure for removing a PCIe adapter is similar for different types of riser assembly.

Step 5. Remove riser 2 card.

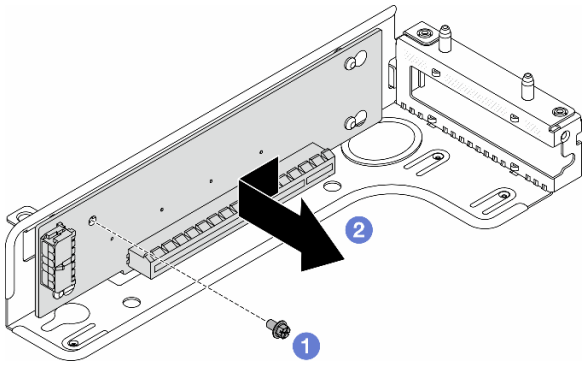


Figure 129. Riser card removal

a. 1 Remove the screw that secure the riser card to the bracket.

b. 2 Slide the riser card to the left and remove it from the bracket.

After you finish

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

Demo video

Watch the procedure on YouTube

Install the riser 2 assembly

Use this information to install the riser 2 assembly.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

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

Step 2. Locate the correct PCIe slot for the PCIe adapter. For information about the PCIe slots and supported PCIe adapters, see “Rear view” on page 12.

Step 3. Install riser 2 card.

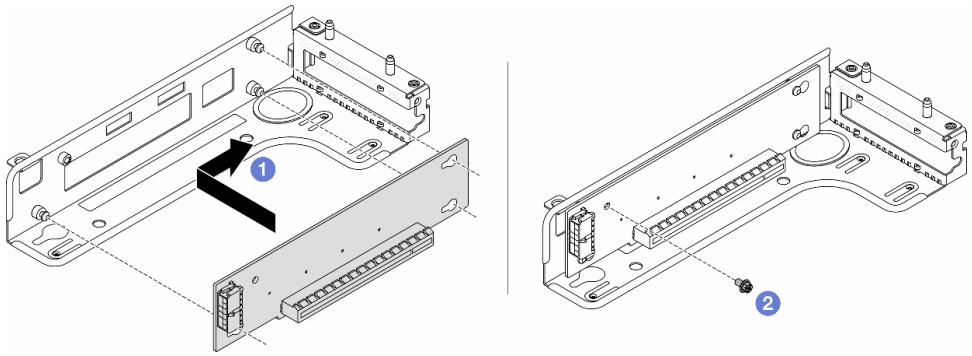


Figure 130. Riser card installation

1. 1 Align the screw holes in the riser card with the corresponding ones in the bracket.
2. 2 Install the screw to secure the riser card to the bracket.

Step 4. Install the PCIe adapter and secure it to the riser assembly.

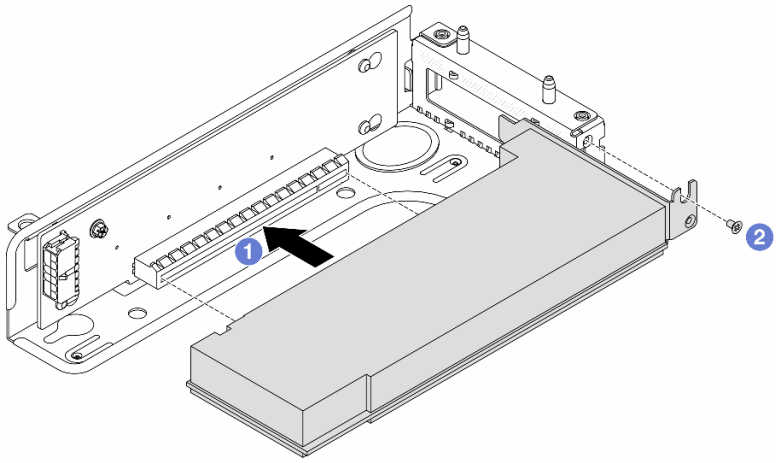


Figure 131. PCIe adapter installation

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

b. 2 Tighten the screw to secure it in place..

Notes:

1. Ensure that PCIe adapter installation meets the rules in “PCIe slots and adapters” on page 38.
2. The procedure for installing a PCIe adapter is similar for different types of riser assembly.

Step 5. Connect cables to the PCIe adapter in the riser assembly. See “Cable routing for riser 2 card” on page 182.

Notes:

- The power cable of riser 2 card routes through the clip on the air baffle. The signal cables route under the air baffle.
- Connect the cables before installing the air baffle. To install an air baffle, see “Install the air baffle” on page 50.

Step 6. Install the riser 2 assembly.

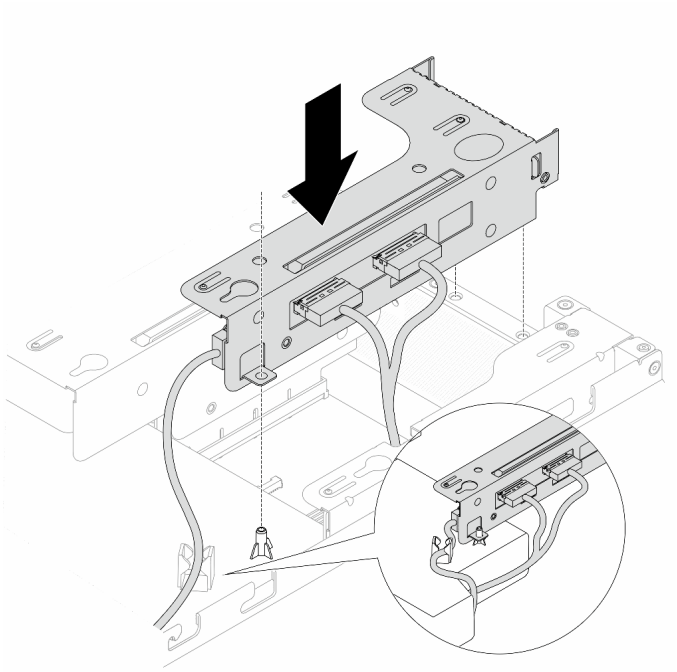


Figure 132. Riser 2 assembly installation

Step 7. Install the top cover. See “Install the rear top cover” on page 164.

After you finish

Complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

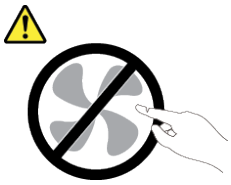
Watch the procedure on YouTube

System board replacement (trained technicians only)

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

Important: This task must be operated by trained technicians that are certified by Lenovo Service. Do no attempt to remove or install it without proper training and qualification.

CAUTION:
Hazardous moving parts. Keep fingers and other body parts away.



CAUTION:

The heat sinks and processors might be very hot. Turn off the server and wait several minutes to let the server cool before removing the server cover.

- “Remove the system board” on page 155
- “Install the system board” on page 157

Remove the system board

Follow instructions in this section to remove the system board.

About this task

A system board provides different connectors or slots to connect different components or peripherals of the system for communication. If the system board fails, it must be replaced.

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Prepare your server.

a. Remove the top cover. See “Remove the rear top cover” on page 162.

b. If your server comes with an air baffle, remove it first. See “Remove the air baffle” on page 48.

c. Record where the cables are connected to the system board assembly; then, disconnect all the cables.

Attention: Disengage all latches, cable clips, release tabs, or locks on cable connectors beforehand. Failing to release them before removing the cables will damage the cable connectors on the system board assembly. Any damage to the cable connectors may require replacing the system board assembly.

d. Remove any of the following components that are installed on the system board and put them in a safe, static-protective place.

- “Processor and heat sink” on page 125

- “Memory modules” on page 108
- “System fans” on page 86
- “Riser assemblies” on page 145
- “CMOS battery” on page 79
- “OCP module” on page 118
- “M.2 drive” on page 115

Step 2. Remove the system board from the chassis.

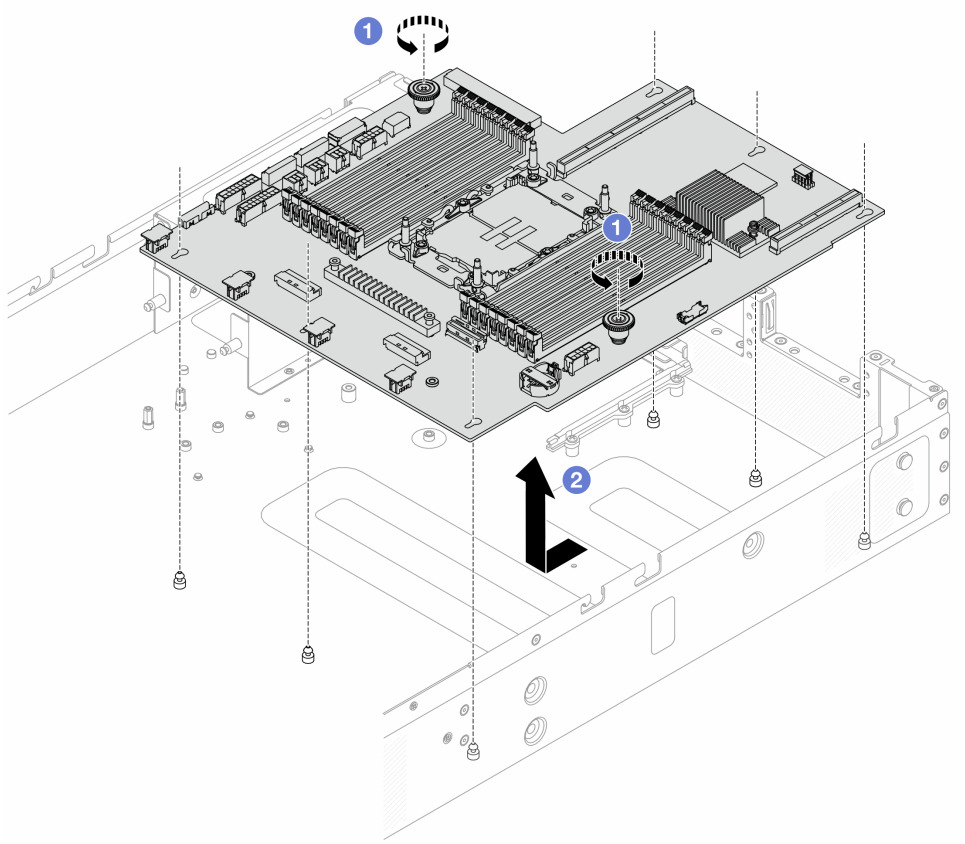


Figure 133. System board removal

a. 1 Use a screwdriver to loosen the screws on two plungers.

b. 2 Slide the system board toward the front of the server, and lift it out of the chassis.

After you finish

Important: Before you return the system board, make sure that the processor socket is covered. There is a processor external cap covering the processor socket on the new system board. Slide the processor external cap out from the processor socket on the new system board, and install the external cap on the processor socket on the removed system board.

Demo video

Watch the procedure on YouTube

Install the system board

Follow instructions in this section to install the system board.

About this task

A system board provides different connectors or slots to connect different components or peripherals of the system for communication. If the system board fails, it must be replaced.

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

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

Step 2. Install the system board to the server.

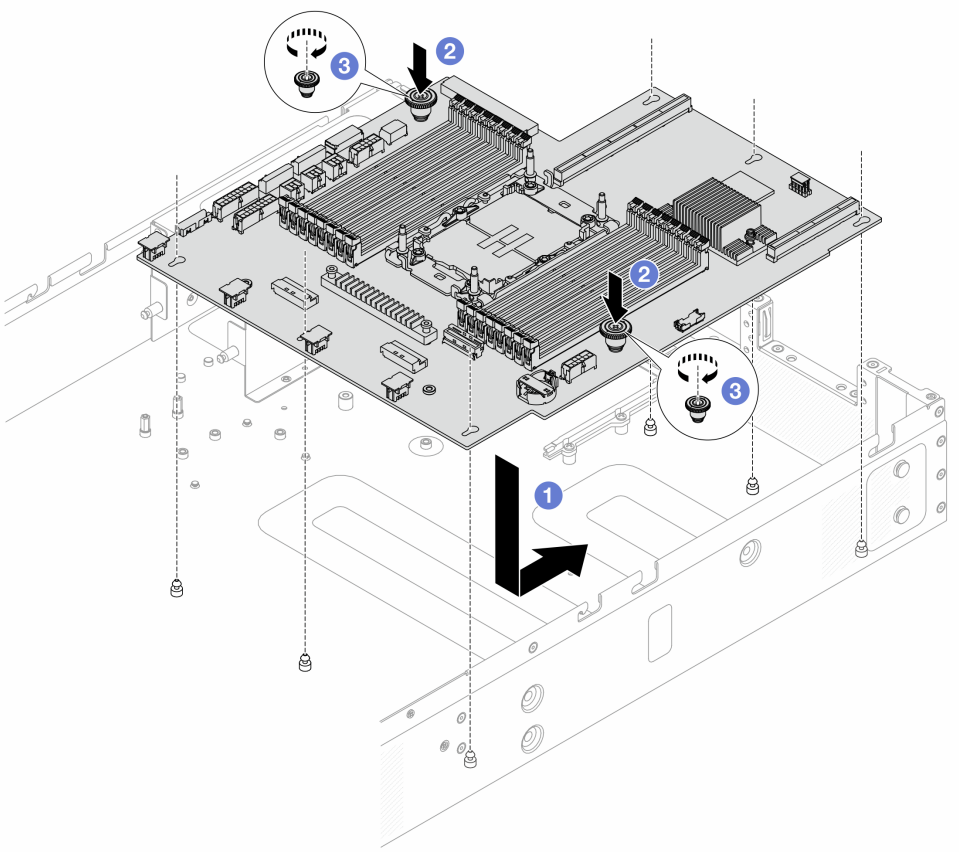


Figure 134. System board installation

a. 1 Hold the plungers at the same time to lower the system board into the chassis. And slide the system board assembly to the rear of the server until the system board assembly snaps into position.

b. 2 Tighten the plunger screws.

c. 3 Use a screwdriver to tighten screws if necessary.

After you finish

1. Install any components that you have removed from the failing system board assembly.
   - “Processor and heat sink” on page 125
   - “Memory modules” on page 108
   - “System fans” on page 86
   - “Riser assemblies” on page 145
   - “CMOS battery” on page 79
   - “OCP module” on page 118
   - “M.2 drive” on page 117
2. Properly route and secure the cables in the server. Refer to detailed cable routing information for each component in Chapter 5 “Internal cable routing” on page 175.

3. Install the rear drive cage if you have removed it. See “Install the 2.5-inch rear drive assembly” on page 141.
4. Install the air baffle if you have removed it. See “Install the air baffle” on page 50.
5. Install the top cover. See “Install the rear top cover” on page 164.
6. Push the power supplies into the bays until they click into place.
7. Connect power cords to the server and turn on the server.

Demo video

Watch the procedure on YouTube

Top cover replacement

Follow instructions in this section to remove and install the top cover.

- “Remove the front top cover” on page 159
- “Install the front top cover” on page 160
- “Remove the rear top cover” on page 162
- “Install the rear top cover” on page 164

Remove the front top cover

Follow instructions in this section to remove the front top cover.

About this task

S033

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

S014

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

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.

- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. If the server is installed in a rack, remove the server from the rack. See “Remove the server from the rack” on page 41.

Step 2. Remove the front top cover.

Attention: Handle the top cover carefully. Dropping the top cover with the cover latch open might damage the cover latches.

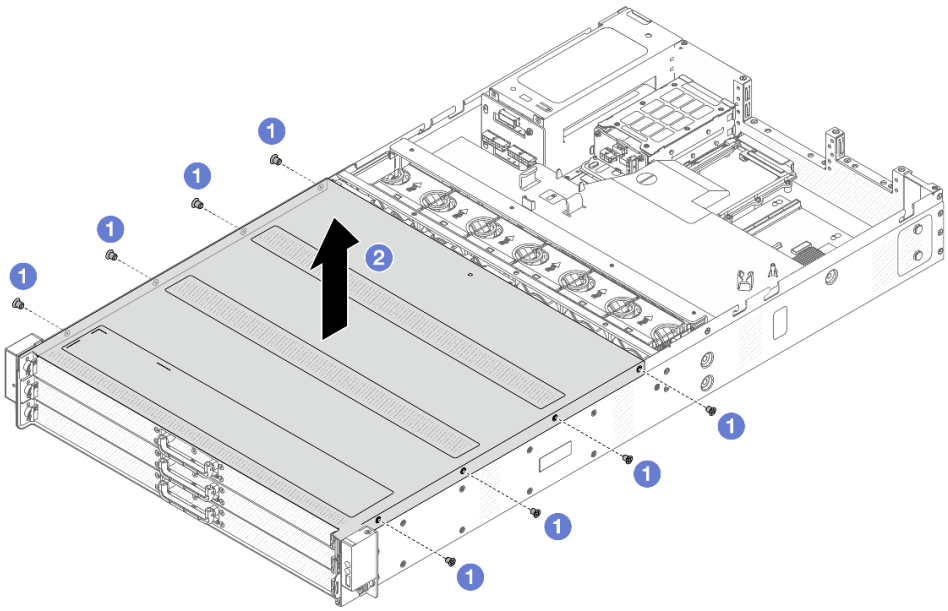


Figure 135. Top cover removal

a. 1 Use a screwdriver to remove the screws that locks the front top cover.

b. 2 Lift the front cover up and remove it.

After you finish

1. Replace any options as required or install a new top cover. See “Install the front top cover” on page 160.
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

Watch the procedure on YouTube

Install the front top cover

Follow instructions in this section to install the front top cover.

About this task

S033

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

S014

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

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Operating the server with the top cover removed might damage server components. For proper cooling and airflow, install the top cover before you turn on the server.

Note: A new top cover comes without a service label attached. If you need a service label, order it together with the new top cover and attach the service label to the new top cover first.

Procedure

Step 1. Check your server and ensure that:

- All cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server.
- All internal cables are connected and routed correctly. See Chapter 5 "Internal cable routing" on page 175.

Step 2. Install the top cover to your server.

Attention: Handle the top cover carefully. Dropping the top cover with the cover latch open might damage the cover latches.

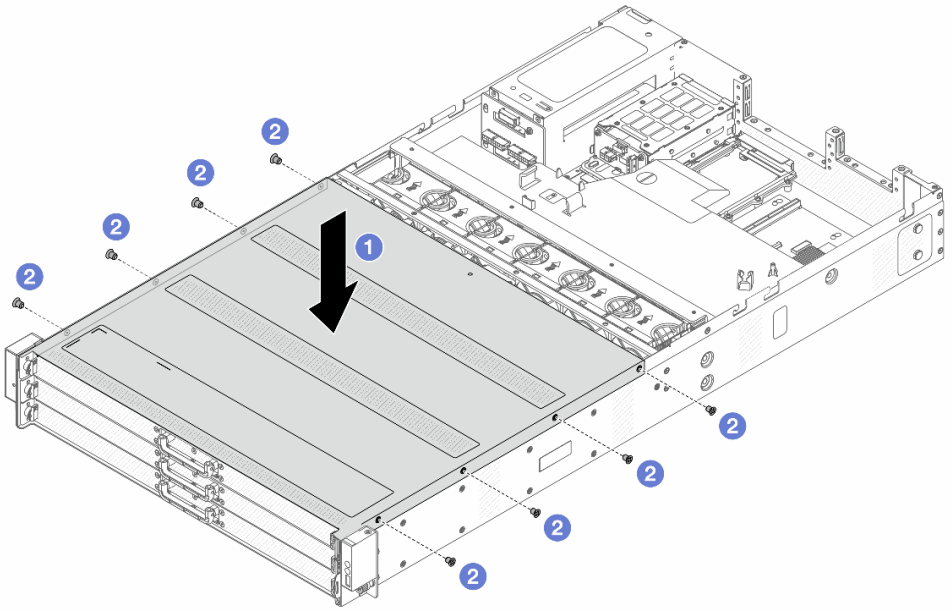


Figure 136. Top cover installation

a. 1 Lower the front top cover onto the chassis until both sides of the top cover engage the guides on both sides of the chassis.

b. 2 Use a screwdriver to install the screws to secure the front top cover.

Step 3. Install the server into the racks. See “Install the server to the rack” on page 44.

After you finish

After installing the top cover, complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

Remove the rear top cover

Follow instructions in this section to remove the rear top cover.

About this task

S033

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

S014

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

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Procedure

Step 1. If the server is installed in a rack, remove the server from the rack. See "Remove the server from the rack" on page 41.

Step 2. Remove the rear top cover.

Attention: Handle the top cover carefully. Dropping the top cover with the cover latch open might damage the cover latches.

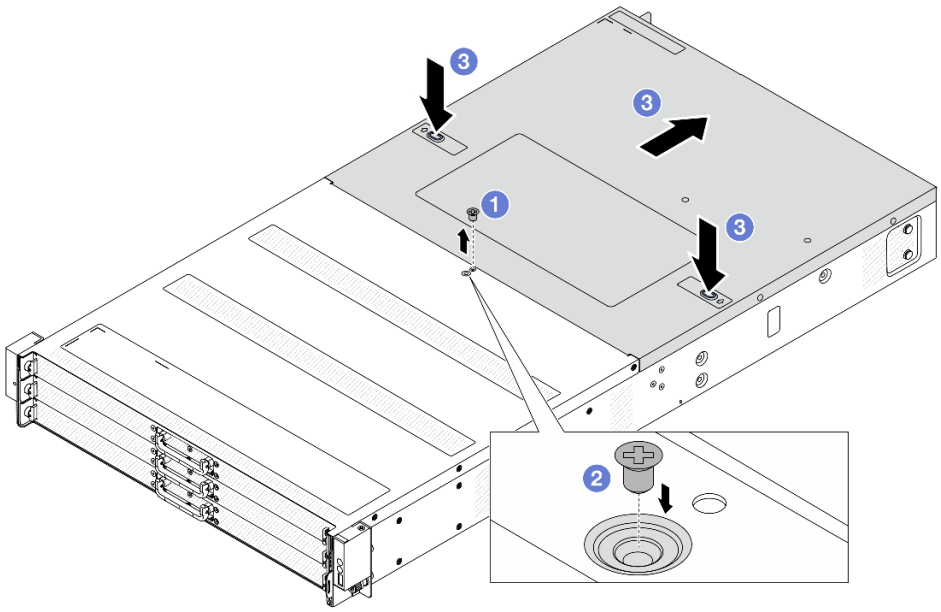


Figure 137. Top cover removal

a. Use a screwdriver to remove the screw that locks the rear top cover.

b. Install the screw to the backup screw hole beside to keep it for future use.

c. Press the release buttons on the cover and pull it backwards.

After you finish

1. Replace any options as required or install a new top cover. See "Install the rear top cover" on page 164.
2. If you are instructed to return the component or optional device, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Demo video

Watch the procedure on YouTube

Install the rear top cover

Follow instructions in this section to install the rear top cover.

About this task

S033

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

S014

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

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Operating the server with the top cover removed might damage server components. For proper cooling and airflow, install the top cover before you turn on the server.

Note: A new top cover comes without a service label attached. If you need a service label, order it together with the new top cover and attach the service label to the new top cover first.

Procedure

Step 1. Check your server and ensure that:

- All cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server.
- All internal cables are connected and routed correctly. See Chapter 5 “Internal cable routing” on page 175.

Step 2. Install the top cover to your server.

Attention: Handle the top cover carefully. Dropping the top cover with the cover latch open might damage the cover latches.

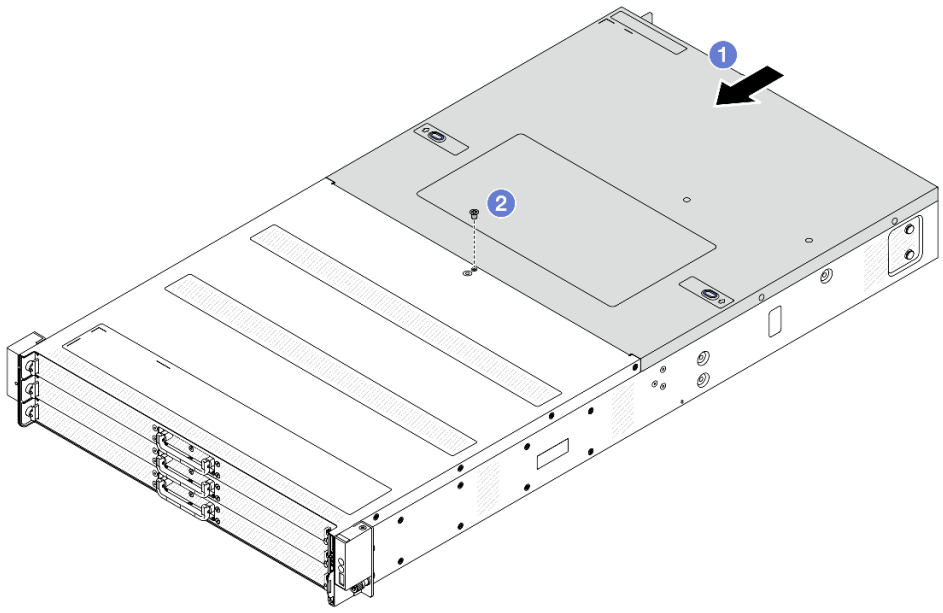


Figure 138. Top cover installation

a. 1 Lower the top cover onto the chassis until both sides of the top cover engage the guides on both sides of the chassis. Then, slide the top cover to the front of the chassis.

Note: Before you slide the top cover forward, ensure that all the tabs on the top cover engage the chassis correctly.

b. 2 Use a screwdriver to install the screw to secure the top cover.

Step 3. Install the server into the racks. See "Install the server to the rack" on page 44.

After you finish

After installing the top cover, complete the parts replacement. See "Complete the parts replacement" on page 174.

Demo video

Watch the procedure on YouTube

TPM replacement

Follow instructions in this section to remove and install TPM.

Remove TPM

Follow the instructions in this section to remove TPM.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Remove the rear top cover. See “Remove the rear top cover” on page 162.

Step 2. Remove the Datacenter Secure Control Module (DC-SCM), see “Remove the Datacenter Secure Control Module (DC-SCM)” on page 84.

Step 3. Remove TPM.

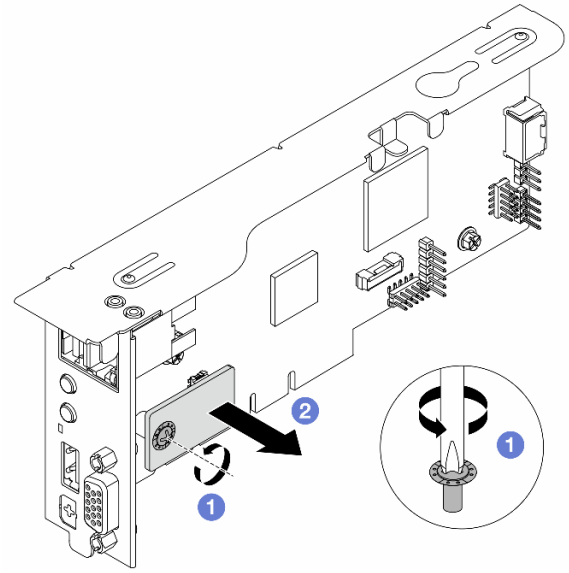


Figure 139. Removing TPM

a. 1 Use a cross screwdriver to loosen the screw that locks TPM.

b. 2 Disengage the TPM connector from DC-SCM.

After you finish

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

Demo video

Watch the procedure on YouTube

Install TPM

Follow the instructions in this section to install TPM.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

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

Step 2. Install TPM to DC-SCM.

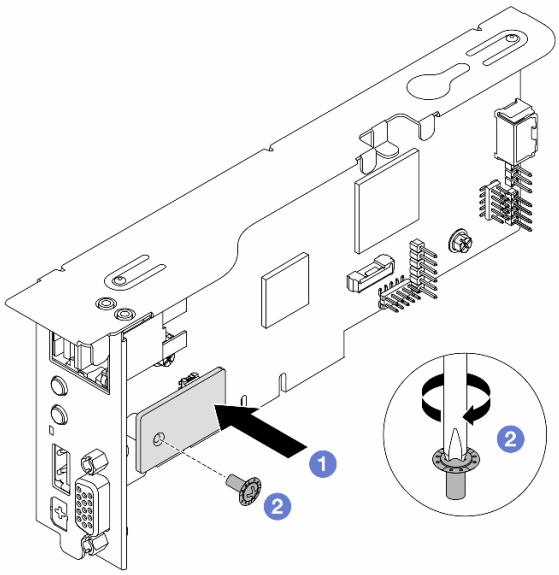


Figure 140. Installing TPM

a. 1 Align the screw holes and connectors on the back of TPM and DC-SCM, and install TPM to DC-SCM.

b. 2 Tighten the screw with a cross screwdriver.

Step 3. Install the DC-SCM, see “Install the Datacenter Secure Control Module (DC-SCM)” on page 85.

Step 4. Install the top cover. See “Install the rear top cover” on page 164.

After you finish

Complete the parts replacement. See “Complete the parts replacement” on page 174.

Demo video

Watch the procedure on YouTube

VGA cable replacement

Follow the instructions in this section to remove or install the VGA cable.

Remove the VGA cable

Follow instructions in this section to remove the VGA cable on the DC-SCM.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

Step 1. Remove the rear top cover. See “Remove the rear top cover” on page 162.

Step 2. Remove the DC-SCM. See “Remove the Datacenter Secure Control Module (DC-SCM)” on page 84.

Step 3. Remove the VGA cable.

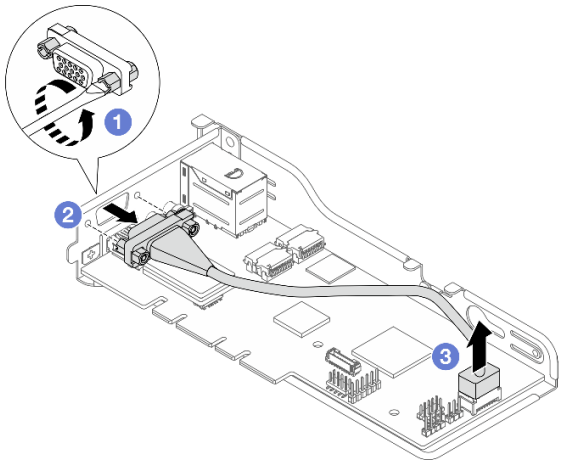


Figure 141. Removing VGA cable

a. (1) Use a flat-blade screwdriver (5mm in tip width) to loosen the screws that lock the VGA connector.

b. (2) Disengage the connector from the bracket.

c. (3) Pull the other connector off from the module.

After you finish

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

Install the VGA cable

Follow instructions in this section to install the VGA cable on the DC-SCM.

About this task

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Procedure

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

Step 2. Install the VGA cable.

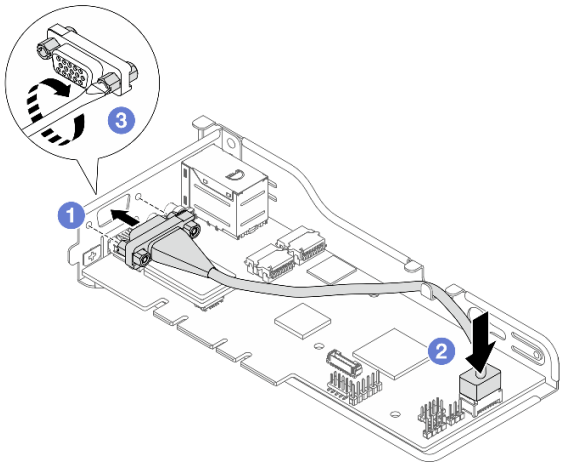


Figure 142. Installing VGA cable

a. (1) Align the screw holes and install the connector to the bracket.

b. (2) Plug the other connector to the module.

c. 3 Use a flat-blade screwdriver (5mm in tip width) to tighten the screws and make sure that they are securely locked.

Notes:

1. Make sure that the cable goes through the clip on the bracket.
2. For more details about cable routing, see "Cable routing for VGA and front panel" on page 184.

Step 3. Install the DC-SCM into the chassis. See "Install the Datacenter Secure Control Module (DC-SCM)" on page 85.

Step 4. Install the rear top cover. See "Install the rear top cover" on page 164.

After you finish

Complete the parts replacement. See "Complete the parts replacement" on page 174.

VRoC key replacement

Follow instructions in this section to remove and install the VRoC key.

- "Remove VRoC key" on page 171
- "Install VRoC key" on page 172

Remove VRoC key

Follow instructions in this section to remove the VRoC key.

About this task

Attention:

- Read "Installation Guidelines" on page 33 and "Safety inspection checklist" on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See "Power off the server" on page 40.
- 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 systems.

Procedure

Step 1. Remove the rear top cover. See "Remove the rear top cover" on page 162.

Step 2. Remove riser assembly 1 and 2. See "Remove riser 1 assembly (HBA/RAID)" on page 145 and "Remove the riser 2 assembly" on page 150.

Step 3. Remove the air baffle. See "Remove the air baffle" on page 48.

Step 4. Remove VRoC key. Remove the key with both hands as illustrated below, and unplug the key gently.

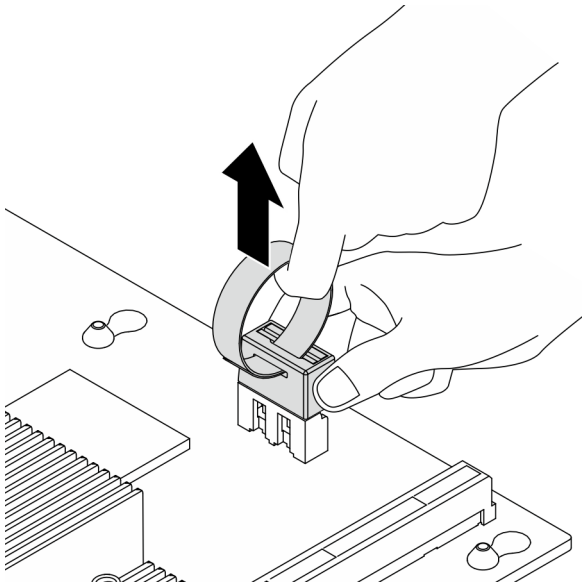


Figure 143. VRoC key removal

After you finish

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

Demo video

Watch the procedure on YouTube

Install VRoC key

Follow instructions in this section to install the VRoC key.

About this task

Attention:

- Read “Installation Guidelines” on page 33 and “Safety inspection checklist” on page 34 to ensure that you work safely.
- Power off the server and peripheral devices and disconnect the power cords and all external cables. See “Power off the server” on page 40.
- 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 systems.

Procedure

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

Step 2. Install VRoC key. Press the key down to the system board until it is securely seated.

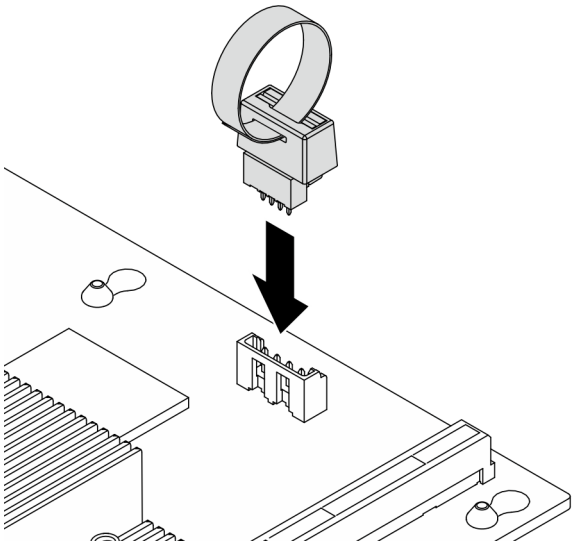


Figure 144. VRoC key installation

Step 3. Install the air baffle. See "Install the air baffle" on page 50.

Step 4. Install riser assembly 1 and 2. See "Install riser 1 assembly (HBA/RAID)" on page 148 and "Install the riser 2 assembly" on page 152.

Step 5. Install the rear top cover. See "Install the rear top cover" on page 164.

After you finish

1. Complete the parts replacement. See "Complete the parts replacement" on page 174.
2. Enable Intel® VRoC. Before setting up RAID for NVMe drives, follow the below steps to enable VRoC:
   a. Restart the system. Before the operating system starts up, press the key specified in the on-screen instructions to enter the Setup Utility.
   b. Go to **Socket Configuration** > **IIO Configuration** > **Intel® VMD technology** > **Intel VMD for Volume Management Device on Socket 0** > **VMD Config for IOU 1** and enable the option **VMD port A to D**.
   c. Save the changes and reboot the system.
3. Intel® offers various VROC configurations with different RAID level and SSD support. See the following for more details.

Intel VROC configurations for PCIe NVMe SSDs	Requirements
Intel VROC Standard[Note]	• Supports RAID levels 0, 1, and 10 • Requires an activation key
Intel VROC Premium[Note]	• supports RAID levels 0, 1, 5, and 10 • Requires an activation key

Note: Intel VROC Standard and Premium listed above in the table are VRoC capacity offerings. The actual VRoC capacity depends on the model delivered.

Demo video

Watch the procedure on YouTube

Complete the parts replacement

Go through the checklist to complete parts replacement

To complete the parts replacement, do the following:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your server.
2. Properly route and secure the cables in the server.
3. If you have removed the top cover, reinstall it.
4. Reconnect external cables and power cords to the server.

   Attention: To avoid component damage, connect the power cords last.

Chapter 5. Internal cable routing

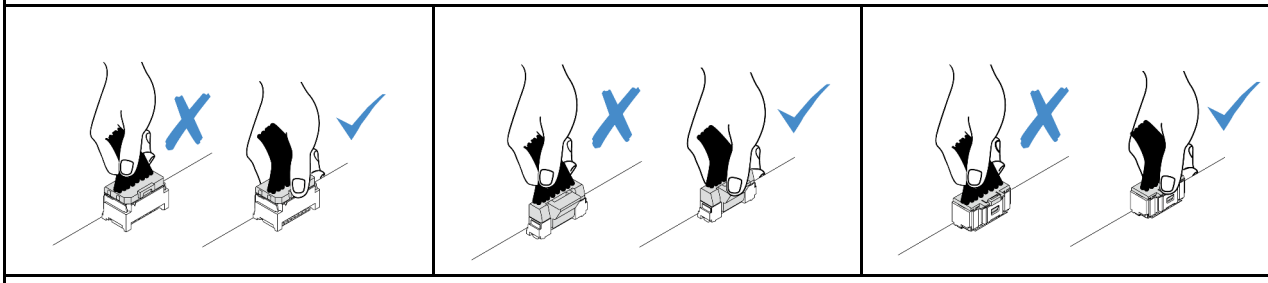
See this section to do cable routing for specific components.

Notes: Follow below guidelines when connecting cables:

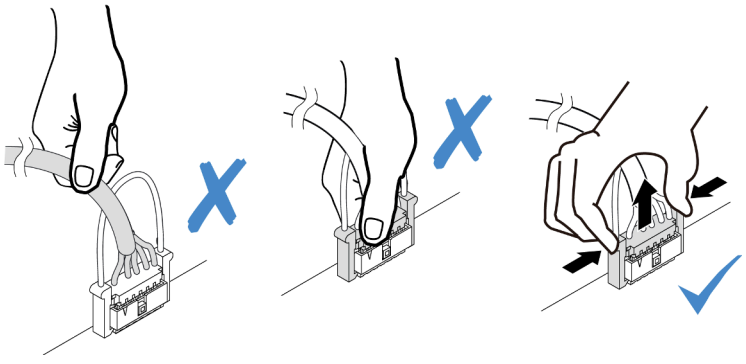
- Turn off the server before you connect or disconnect any internal cables.
- See the documentation that comes with any external devices for additional cabling instructions. It might be easier for you to route cables before you connect the devices to the server.
- Cable identifiers of some cables are printed on the cables that come with the server and optional devices. Use these identifiers to connect the cables to the correct connectors.
- Ensure that the cable is not pinched and does not cover any connectors or obstruct any components on the system board.
- Ensure that the relevant cables pass through the cable clips.

Note: Disengage all latches, release tabs, or locks on cable connectors when you disconnect cables from the system board. Failing to release them before removing the cables will damage the cable ports on the system board. Any damage to the cable ports might require replacing the system board.

Disconnect cables by pressing the release latches



Disconnect cables by pinching the release latches



For the cables that are routed through the M.2 cage clips, follow the suggested routing priority listed in the table below.

Table 17. Recommended routing priority for different types of cables

Routing priority	Cable routing section
1. Rear backplane signal cable	Cable 2 in "Cable routing for rear drive backplane" on page 181
2. Rear backplane power cable	Cable 1 in "Cable routing for rear drive backplane" on page 181
3. PIB signal cable	Cable 3 in "Cable routing for power input board (PIB)" on page 179
4. PIB power cable 0	Cable 1 in "Cable routing for power input board (PIB)" on page 179
5. PIB power cable 1	Cable 2 in "Cable routing for power input board (PIB)" on page 179
6. Front backplane power cable 1	Cable 1 in "Cable routing for front backplane power" on page 176
7. Front backplane power cable 2	Cable 2 in "Cable routing for front backplane power" on page 176
8. Front backplane power cable 3	Cable 3 in "Cable routing for front backplane power" on page 176
9. Front backplane signal cables 1–3Note	Cable 1 2 3 in "Cable routing for front backplane signals" on page 177

Note: No particular orders for the front backplane signal cables routed through the M.2 cage clips.

- "Cable routing for front backplane power" on page 176
- "Cable routing for front backplane signals" on page 177
- "Cable routing for power input board (PIB)" on page 179
- "Cable routing for RAID flash power module" on page 180
- "Cable routing for rear drive backplane" on page 181
- "Cable routing for riser 2 card" on page 182
- "Cable routing for system fans" on page 183
- "Cable routing for VGA and front panel" on page 184

Cable routing for front backplane power

Use the section to understand the power cable routing for front drive backplanes.

- The backplanes your server supports require power connection. This section singles out the power connection from signal connection for better understanding. For backplane signal connection, see "Cable routing for front backplane signals" on page 177.
- For the locations of backplane signal connectors on the system board, see "System-board connectors" on page 14 for details.

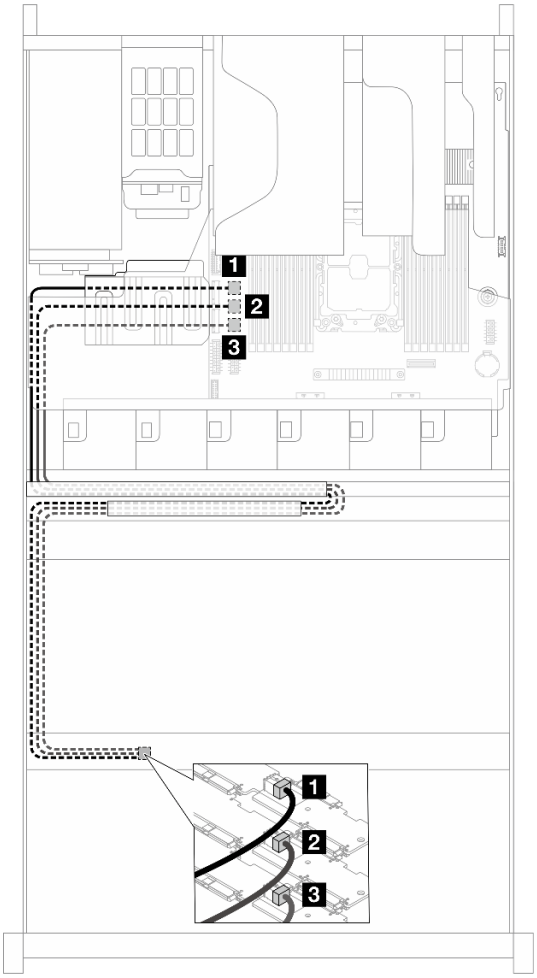


Figure 145. Backplane power cable connection

From	To
1 Power and sideband connector on front backplane 1	1 Front BP power connector 1
2 Power and sideband connector on front backplane 2	2 Front BP power connector 2
3 Power and sideband connector on front backplane 3	3 Front BP power connector 3

Cable routing for front backplane signals

In this section, you can find cable routing of front backplane signals.

- Each backplane your server supports offers multiple signal connections. This section singles out the signal connection from power connection for better understanding. For backplane power connection, see "Cable routing for front backplane power" on page 176.
- For the locations of backplane signal connectors on the system board, see "System-board connectors" on page 14 for details.

- "Cable routing for 9600-24i HBA" on page 178
- "Cable routing for 9670-24i RAID adapter" on page 178

Cable routing for 9600-24i HBA

This section offers the cable routing between front drive backplanes with Broadcom 9600-24i SAS HBA.

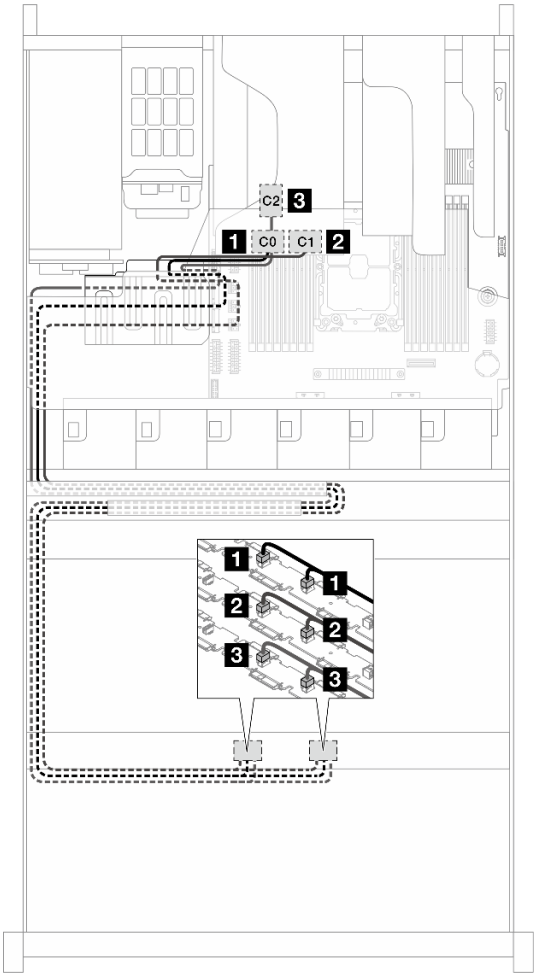


Figure 146. Cable routing for front backplanes and an HBA

From	To
1 Slimline 0 and 1 connectors on front backplane 1	1 HBA C0
2 Slimline 0 and 1 connectors on front backplane 2	2 HBA C1
3 Slimline 0 and 1 connectors on front backplane 3	3 HBA C2

Cable routing for 9670-24i RAID adapter

This section offers the cable routing between front drive backplanes with Broadcom 9670-24i 05-50123-00 Tri RAID.

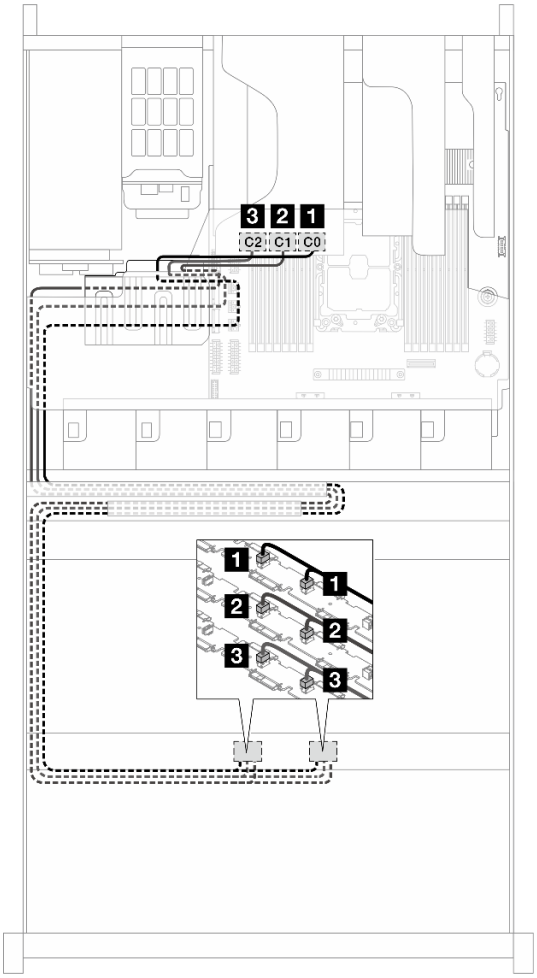


Figure 147. Cable routing for front backplanes and an HBA

From	To
1 Slimline 0 and 1 connectors on front backplane 1	1 RAID C0
2 Slimline 0 and 1 connectors on front backplane 2	2 RAID C1
3 Slimline 0 and 1 connectors on front backplane 3	3 RAID C2

Cable routing for power input board (PIB)

Use the section to understand the power and signal cable routing for the power input board (PIB).

For the locations of PIB power and signal connectors on the system board, see "System-board connectors" on page 14 for details.

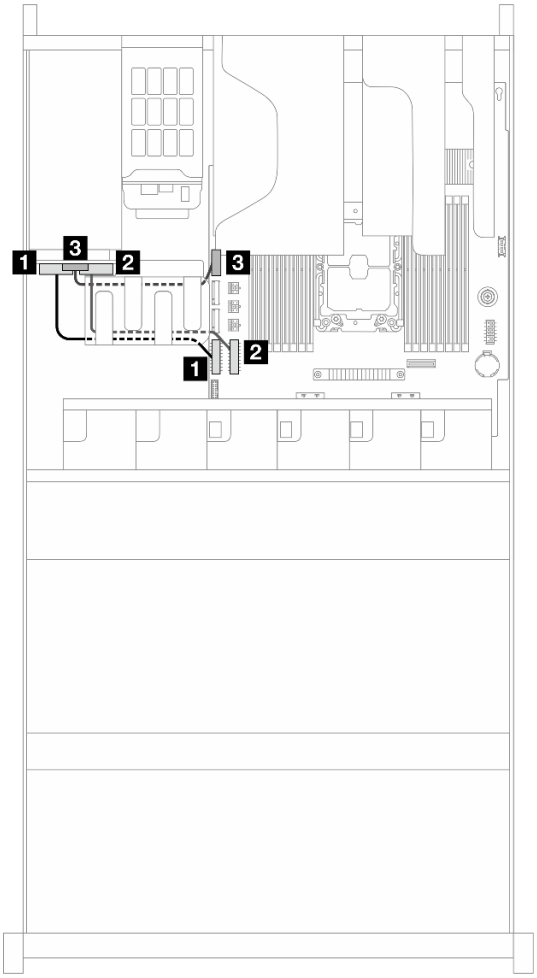


Figure 148. Cable routing for power input board (PIB)

From	To
1 PSU PWR 0	1 PIB power connector 0
2 PSU PWR 1	2 PIB power connector 1
3 PSU signal	3 PIB signal connector

Cable routing for RAID flash power module

Use the section to understand the cable routing for RAID flash power modules.

For the location of the connector on the RAID flash power module, refer to "RAID flash power module replacement" on page 134 for details.

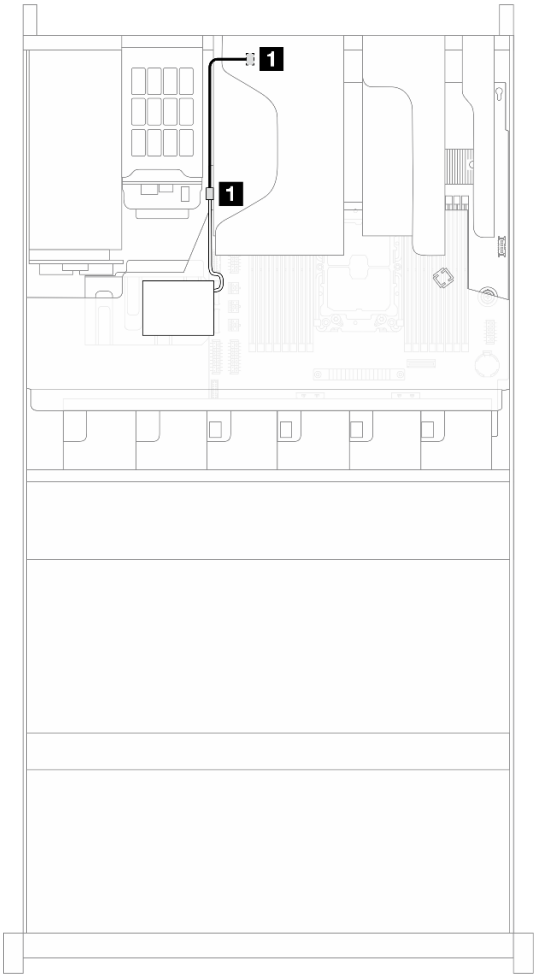


Figure 149. Cable routing for RAID flash power module

From	To
1 RAID flash power module	1 RAID flash power port on RAID adapters

Cable routing for rear drive backplane

Use the section to understand the power and signal cable routing for the rear drive backplane.

For the locations of backplane power and signal connectors on the system board, see “System-board connectors” on page 14 for details.

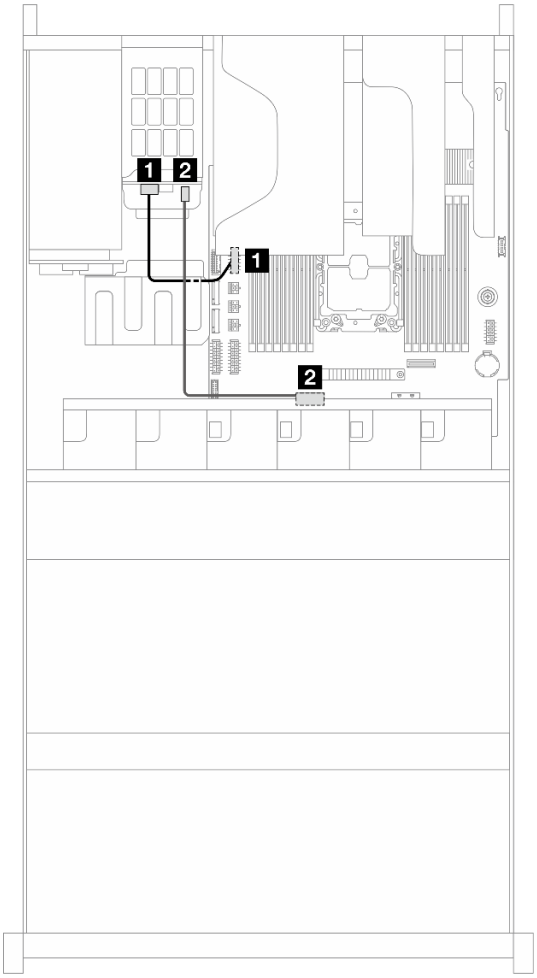


Figure 150. Cable routing for rear drive backplane

From	To
1 Power connector on the rear drive backplane	1 Rear BP power connector
2 Signal connector on the rear drive backplane	2 MCIO 1 for NVMe SSD

Cable routing for riser 2 card

Use the section to understand the power and signal cable routing for the riser 2 card.

For the locations of riser 2 card power and signal connectors on the system board, see “System-board connectors” on page 14 for details.

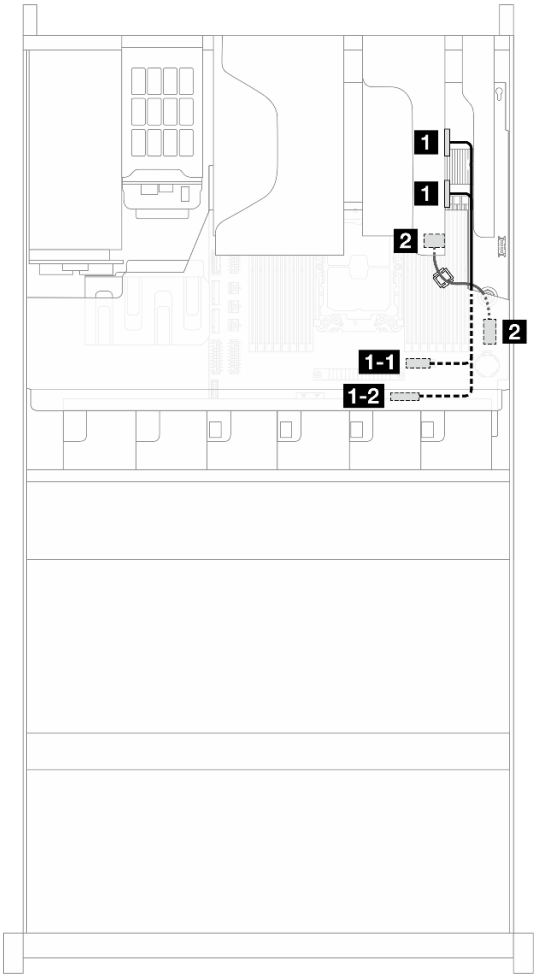


Figure 151. Cable routing for riser 2 card

From	To
1 MCIO 0 and 1 connector on riser 2 card	1–1 MCIO 2 for riser 2 1–2 MCIO 3 for riser 2
2 Power connector on riser 2 card	2 Riser 2 power connector

Cable routing for system fans

Use the section to understand the cable routing for system fans.

For the locations of system fan power connector on the system board, see “System-board connectors” on page 14 for details.

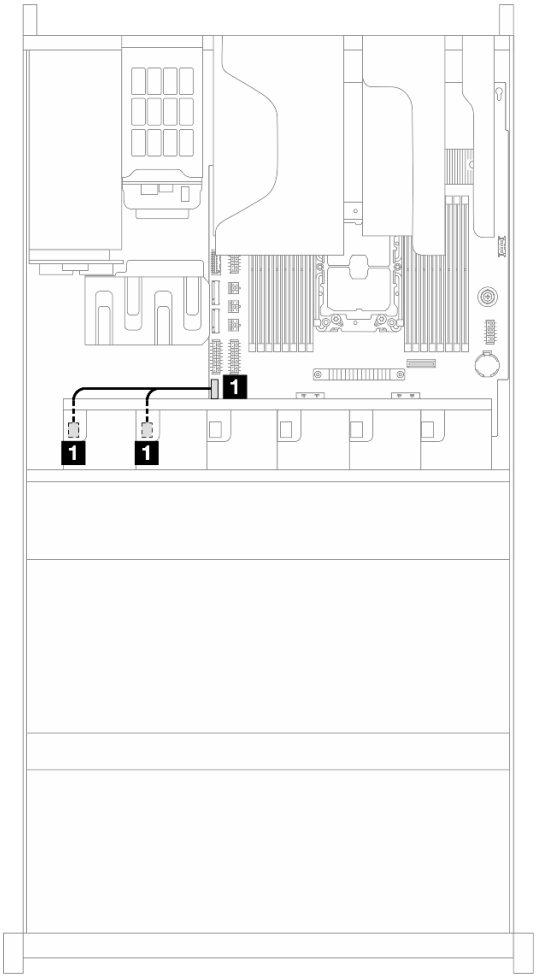


Figure 152. Cable routing for system fans

From	To
1 System fan 4 and 5 connectors	1 Fan 4 & 5 connector

Cable routing for VGA and front panel

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

For the locations of front panel connector on the system board, see “System-board connectors” on page 14 for details.

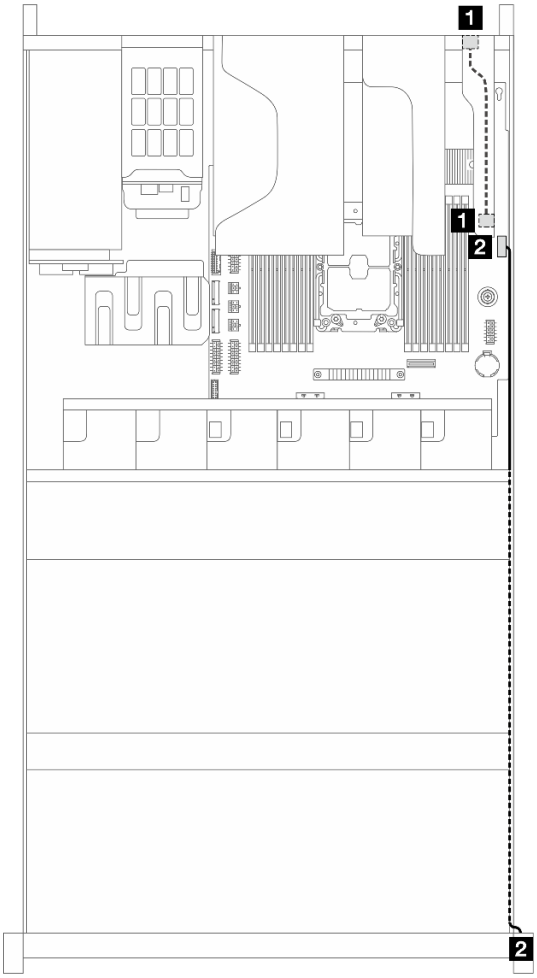


Figure 153. Cable routing for VGA and front panel

From	To
1 VGA port on the rear of the server	1 VGA connector on DC-SCM
2 Front panel	2 Front panel connector

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