



ThinkSystem SR645 Maintenance Manual



Machine Types: 7D2X and 7D2Y

Note

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

http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html

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

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

Eighteenth Edition (January 2025)

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

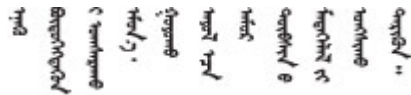
A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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



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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

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

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

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canjbinj soengq cungj vahgangj ancien siusik.

Safety inspection checklist

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

Notes:

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

CAUTION:

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

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

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

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

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

a. Go to:

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

b. In the Customize a Model pane:

- 1) Click **Select Options/Parts for a Model**.
- 2) Enter the machine type and model for your server.
- c. Click the Power tab to see all line cords.
 - Make sure that the insulation is not frayed or worn.
3. Check for any obvious non-Lenovo alterations. Use good judgment as to the safety of any non-Lenovo alterations.
4. Check inside the server for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.
5. Check for worn, frayed, or pinched cables.
6. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Chapter 1. Introduction

The ThinkSystem™ SR645 server is a 2-socket 1U server that features the new AMD® EPYC™ 7002 family of processors. The server offers a broad selection of drive and slot configurations and offers high performance and expansion for various IT workloads. Combining performance and flexibility, the server is a great choice for enterprises of all sizes.

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

The server comes with a limited warranty. For details about the warranty, see:

<https://support.lenovo.com/us/en/solutions/ht503310>

For details about your specific warranty, see:

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

Identifying your server

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

The machine type and serial number are on the ID label on the right rack latch in the front of the server.

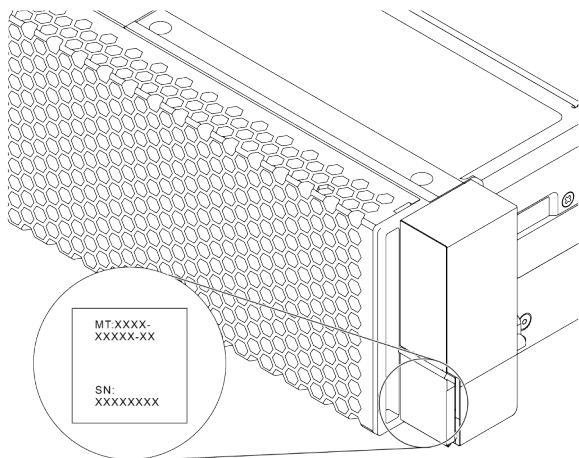


Figure 1. Location of the ID label

XClarity Controller network access label

The XClarity® Controller network access label is attached on the top side of the pull-out information tab as shown. After you get the server, peel the XClarity Controller network access label away and store it in a safe place for future use.

Note: The pull-out information tab is located on the right bottom of the front side of your server. For detailed information, see “Front view” on page 33.

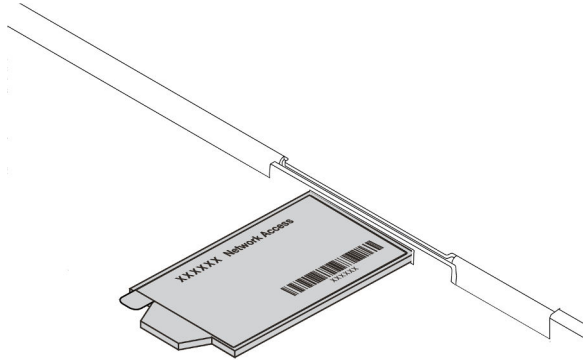


Figure 2. Location of the XClarity Controller network access label

Quick response code

The system service label, which is on the top cover, provides a quick response (QR) code for mobile access to service information. Scan the QR code with a mobile device and a QR code reader application to get quick access to the Lenovo Service Web site for this server. The Lenovo Service Information Web site provides additional information for parts installation and replacement videos, and error codes for server support.

The following illustration shows the QR code: <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr645/7d2x>



Figure 3. QR code

Specifications

This section provides technical and environment specifications of the server.

- [“Technical specifications” on page 3](#)
- [“Environment specifications” on page 13](#)

Technical specifications

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

Note: For technical rules of each component, see [“Technical rules” on page 16](#).

- [“Dimensions” on page 3](#)
- [“CPU” on page 3](#)
- [“Heat sink” on page 5](#)
- [“Memory” on page 5](#)
- [“Fan” on page 6](#)
- [“Operating systems” on page 6](#)
- [“Input/Output \(I/O\)” on page 6](#)
- [“Internal drives” on page 7](#)
- [“Expansion slots” on page 7](#)
- [“Storage controllers” on page 7](#)
- [“Network” on page 9](#)
- [“GPU” on page 9](#)
- [“Power supplies” on page 9](#)
- [“Management options” on page 10](#)
- [“Minimum configuration for debugging” on page 10](#)

Dimensions

Form factor	Height	Depth	Width	Package weight
1U	43.0 mm (1.69 inches)	771.8 mm (30.39 inches)	<ul style="list-style-type: none">• With rack latches: 481.7 mm (18.96 inches)• Without rack latches: 445 mm (17.52 inches)	Up to 35.4 kg (78.0 lb)

Note: The depth is measured with rack latches installed, but without security bezel installed.

CPU

- Up to two AMD® EPYC™ 7002 or 7003 series CPUs
- Scalable up to 64 cores per socket, 128 cores in total
- 7nm process technologies
- Designed for Land Grid Array (LGA) 4094 (SP3) socket
- Supports 3200 MHz DDR4 frequency
- TDP ratings up to 280 watts

Notes:

- For the system to support 7203, 7203P, 7303, 7303P, 7643P, and 7663P processors, the minimum UEFI version is d8e132g-3.10, and the minimum XCC version is d8bt54m-5.00.
- 7002 series CPU and 7003 series CPU cannot be mixed within a server.
- CPUs with a P suffix (for example 7232P) are single-socket capable only.

- Check “CPU, heat sink, and fan combinations” on page 16 for selecting the correct heat sinks and fans under different CPU and hardware configurations.
- For a list of supported processors, see <https://serverproven.lenovo.com/>.

7002 series CPUs

Model	Core/threads	Base Freq.	Default TDP	Group
7232P	8/16	3.1 GHz	120 W	C
7252	8/16	3.1 GHz	120 W	
7272	12/24	2.9 GHz	120 W	
7282	16/32	2.8 GHz	120 W	
7262	8/16	3.2 GHz	155 W	B
7302	16/32	3.0 GHz	155 W	
7302P	16/32	3.0 GHz	155 W	
7352	24/48	2.3 GHz	155 W	
7452	32/64	2.35 GHz	155 W	A
7F32	8/16	3.7 GHz	180 W	
7402	24/48	2.8 GHz	180 W	
7402P	24/48	2.8 GHz	180 W	
7502	32/64	2.5 GHz	180 W	
7502P	32/64	2.5 GHz	180 W	
7532	32/64	2.4 GHz	200 W	
7552	48/96	2.2 GHz	200 W	
7702	64/128	2.0 GHz	200 W	
7702P	64/128	2.0 GHz	200 W	
7542	32/64	2.9 GHz	225 W	D
7642	48/96	2.3 GHz	225 W	
7742	64/128	2.25 GHz	225 W	
7662	64/128	2.0 GHz	225 W	
7F72	24/48	3.2 GHz	240 W	
7F52	16/32	3.5GHz	240 W	
7H12	64/128	2.6 GHz	280 W	Z

7003 series CPUs

Model	Core/threads	Base Freq.	Default TDP	Group
7203	8/16	2.8 GHz	120 W	C
7203P	8/16	2.8 GHz	120 W	
7303	16/32	2.4 GHz	130 W	
7303P	16/32	2.4 GHz	130 W	
7313	16/32	3.0 GHz	155 W	B

7313P	16/32	3.0 GHz	155 W	D
72F3	8/16	3.7 GHz	180 W	
7413	24/48	2.65 GHz	180 W	
7343	16/32	3.2 GHz	190 W	
7443	24/48	2.85 GHz	200 W	
7443P	24/48	2.85 GHz	200 W	
7513	32/64	2.6 GHz	200 W	
7643P	48/96	2.3 GHz	225 W	
7663P	56/112	2.0 GHz	240 W	
7453	28/56	2.8 GHz	225 W	
7543	32/64	2.8 GHz	225 W	
7543P	32/64	2.8 GHz	225 W	
7643	48/96	2.3 GHz	225 W	
7663	56/112	2.3 GHz	225 W	
7713	64/128	2.0 GHz	225 W	
7713P	64/128	2.0 GHz	225 W	
73F3	16/32	3.5 GHz	240 W	
74F3	24/48	3.2 GHz	240 W	
75F3	32/64	2.95 GHz	280 W	Z
7763	64/128	2.45 GHz	280 W	
7473X	24/48	2.8 GHz	240 W	
7373X	16/32	3.05 GHz	240 W	
7773X	64/128	2.2 GHz	280 W	X
7573X	32/64	2.8 GHz	280 W	

Heat sink

- 1U standard heat sink
- 1U Aluminum heat sink
- 1U performance heat sink (T-shape)

Note: Performance heat sinks include 2 satellite heat sinks that connect to the main heat sink via liquid-filled copper tubes.

Memory

- 16 independent channels with interleaved feature
- 8 channels per CPU, 2 DIMM per channel(DPC)
 - Slot 1–16: CPU 1
 - Slot 17–32: CPU 2

Parameter	RDIMM	Performance+ RDIMM	3DS RDIMM
Generation	TruDDR4	TruDDR4	TruDDR4
Rank	2R	2R	2S2R/2S4R
Speed	3200 MHz	3200 MHz	3200 MHz/2933 MHz

Voltage	1.2 V	1.2 V	1.2 V
DRAM data width	x4/x8	x4/x8	x4
DRAM density	8 Gbit/16 Gbit	16 Gbit	16 Gbit
DIMM capacity	16 GB/32 GB/64 GB	32 GB/64 GB	128 GB/256 GB
Maximum memory	<ul style="list-style-type: none"> • 1 CPU: 1 TB • 2 CPUs: 2 TB 	<ul style="list-style-type: none"> • 1 CPU: 512 GB • 2 CPUs: 2 TB 	<ul style="list-style-type: none"> • 1 CPU: 4 TB • 2 CPUs: 8 TB
Minimum memory	<ul style="list-style-type: none"> • 1 CPU: 16 GB • 2 CPUs: 32 GB 	<ul style="list-style-type: none"> • 1 CPU: 32 GB • 2 CPUs: 64 GB 	<ul style="list-style-type: none"> • 1 CPU: 128 GB • 2 CPUs: 256 GB

Notes:

- The operating speed and total memory capacity depend on the processor model and UEFI settings.
- For a list of supported DIMMs, see: <https://serverproven.lenovo.com/>.

Fan

Up to 8 hot-swap fans (including 2 redundant fans)

Form factor	Rotor	Type	Speed
4056	dual	Standard	21K RPM
4056	dual	Performance	28K RPM

Note: If there is an OCP module installed, when the system is powered off but still plugged in to AC power, fans 1 and 2 may continue to spin at a much lower speed. This is the system design to provide proper cooling for the OCP module.

Operating systems

Supported and certified operating systems:

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

References:

- Complete list of available operating systems: <https://lenovopress.com/osig>.
- OS deployment instructions: See “Deploy the operating system” in *Setup Guide*.

Input/Output (I/O)

Front:

- One VGA connector (optional)
- One USB 2.0 connector
- One USB 3.1 Gen 1 connector
- One external diagnostics connector
- One diagnostics panel (optional)
- One LCD diagnostics panel (optional)

Rear:

- One VGA connector
- Three USB 3.1 Gen 1 connectors
- Ethernet connectors on OCP 3.0 Ethernet adapter (optional)
- One XClarity Controller network connector
- One serial port (optional)

For detailed information about each component, see “Front view” on page 33 and “Rear view” on page 54.

Internal drives

Front drive bays:

- 4 x 2.5" SAS/SATA
- 8 x 2.5" SAS/SATA
- 10 x 2.5" SAS/SATA
- 10 x 2.5" AnyBay (SAS/SATA/U.2 NVMe/U.3 NVMe)
- 10 x 2.5" U.2 NVMe
- 8 x 2.5" AnyBay (SAS/SATA/U.3 NVMe) + 2 x 2.5" U.2 NVMe
- 6 x 2.5" SAS/SATA + 4 x 2.5" AnyBay (SAS/SATA/U.2 NVMe/U.3 NVMe)
- 6 x 2.5" SAS/SATA + 4 x 2.5" U.2 NVMe
- 6 x 2.5" SAS/SATA + 2 x 2.5" AnyBay (SAS/SATA/U.2 NVMe/U.3 NVMe) + 2 x 2.5" U.2 NVMe
- 4 x 3.5" SAS/SATA
- 4 x 3.5" AnyBay (SAS/SATA/U.2 NVMe/U.3 NVMe)

Inside chassis:

- 2 x M.2 SATA/NVMe

Rear drive bays:

- 2 x 2.5" SAS/SATA/U.2 NVMe
- 2 x 7mm SATA/U.2 NVMe

Notes:

- For supported internal storage configurations, see <https://lenovopress.com/lp1280-thinksystem-sr645-server#internal-storage>.
- For supported external storage systems, see <https://lenovopress.com/lp1280-thinksystem-sr645-server#external-storage-systems>
- For backplane-less models, field upgrades to other models are available. For details, see <https://lenovopress.com/lp1280-thinksystem-sr645-server#field-upgrades>.

Expansion slots

Depending on the model, your server supports up to three PCIe slots in the rear.

- Your server supports up to three PCIe slots in the rear:
 - PCIe x16, low-profile
 - PCIe x16/x16, low-profile + low profile
 - PCIe x16/x16, low profile + full-height
- Your server supports up to one slot for OCP 3.0 Ethernet adapter

For locations of the PCIe slots, see “Rear view” on page 54.

Storage controllers

Support for JBOD mode and RAID level 0, 1, 10:

- 530-16i PCIe 12Gb SFF RAID adapter (Gen3)
- 540-8i PCIe 12Gb SFF RAID adapter (Gen4)
- 540-16i PCIe 12Gb SFF RAID adapter (Gen4)

Support for JBOD mode and RAID level 0, 1, 5, 10:

- 5350-8i PCIe 12Gb SFF RAID adapter (Gen3)

Support for JBOD mode and RAID level 0, 1, 5, 10, 50:

- 530-8i PCIe 12Gb SFF RAID adapter (Gen3)

Support for JBOD mode and RAID level 0, 1, 5, 6, 10, 50, 60:

- 5350-8i PCIe 12Gb Internal CFF RAID adapter (Gen 3)
- 930-8i 2 GB Flash 12Gb Internal SFF RAID adapter (Gen3)
- 930-16i 4 GB Flash 12Gb Internal SFF RAID adapter (Gen 3)
- 9350-8i 2GB Flash 12Gb Internal SFF RAID adapter (Gen 3)
- 9350-8i 2GB Flash 12Gb Internal CFF RAID adapter (Gen 3)
- 9350-16i 4GB Flash 12Gb Internal SFF RAID adapter (Gen 3)
- 9350-16i 4GB Flash 12Gb Internal CFF RAID adapter (Gen 3)
- 940-8i 4 GB Flash 12Gb Internal SFF RAID adapter (Gen4)
- 940-8i 8 GB Flash 12Gb Internal SFF RAID adapter (Gen4)
- 940-16i 4 GB Flash 12Gb Internal SFF RAID Adapter (Gen4)
- 940-16i 8 GB Flash 12Gb Internal SFF RAID adapter (Gen4)
- 940-8i 4 GB Flash 12Gb Internal SFF RAID adapter (Gen4, support Tri-Mode)
- 940-8i 8 GB Flash 12Gb Internal SFF RAID adapter (Gen4, support Tri-Mode)
- 940-16i 8 GB Flash 12Gb Internal CFF RAID adapter (Gen4, support Tri-Mode)
- 930-8e 4 GB Flash 12Gb External SFF RAID adapter (Gen3)
- 940-8e 4GB Flash 12Gb External SFF RAID adapter (Gen 4)

Support the following HBA adapter:

- 430-8i SAS/SATA 12Gb Internal SFF HBA adapter (Gen3)
- 430-16i SAS/SATA 12Gb Internal SFF HBA adapter (Gen3)
- 4350-8i SAS/SATA 12Gb Internal SFF HBA adapter (Gen3)
- 4350-16i SAS/SATA 12Gb Internal SFF HBA adapter (Gen3)
- 440-8i SAS/SATA 12Gb Internal SFF HBA adapter (Gen4)
- 440-16i SAS/SATA 12Gb Internal SFF HBA adapter (Gen4)
- 440-16i SAS/SATA 12Gb Internal CFF HBA adapter (Gen4)
- 430-8e SAS/SATA 12Gb External SFF HBA adapter (Gen3)
- 430-16e SAS/SATA 12Gb External SFF HBA adapter (Gen3)
- 440-8e SAS/SATA 12Gb External SFF HBA adapter (Gen4)
- 440-16e SAS/SATA 12Gb External SFF HBA adapter (Gen4)

Support the following Fibre Channel HBA:

- Emulex 16Gb Gen6 1-port Fibre Channel Adapter(Gen3)
- Emulex 16Gb Gen6 2-port Fibre Channel Adapter (Gen3)
- Emulex LPe35000 32Gb 1-port Fibre Channel Adapter (Gen4)
- Emulex LPe35002 32Gb 2-port Fibre Channel Adapter (Gen4)
- QLogic 16Gb Enhanced Gen5 1-port Fibre Channel Adapter(Gen3)
- QLogic 16Gb Enhanced Gen5 2-port Fibre Channel Adapter(Gen3)
- QLogic QLE2772 32Gb 2-Port Fibre Channel Adapter(Gen4)
- QLogic QLE2770 32Gb 1-Port Fibre Channel Adapter(Gen4)

Support the following controller for NVMe configuration:

- NVMe Retimer card (Gen 4)

Notes:

- **SFF:** Standard Form Factor. This type of RAID/HBA adapter is installed in the PCIe expansion slots.
- **CFF:** Custom Form Factor. This type of RAID/HBA adapter is installed between fans and front backplanes.
- **Tri-Mode:** This type of controllers are hardware RAID designed with Tri-Mode SerDes technology. Once the Tri-Mode setting is enabled, the controllers support any combinations of NVMe, SAS, and SATA devices.
- CM5 and CM6 NVMe drives are not supported when a system is configured with NVMe Retimer cards.
- The following adapters are only supported on server models with 7003 series processors:
 - 5350-8i, 9350-8i, and 9350-16i RAID adapters
 - 4350-8i and 4350-16i HBA adapters

Network

The server supports Ethernet adapters installed in a dedicated OCP 3.0 slot and the regular PCIe slots. For a list of supported OCP and PCIe Ethernet adapters, see <https://serverproven.lenovo.com/>.

Note: For detailed specifications of each Ethernet adapters, see <https://lenovopress.com/servers/options/ethernet>.

GPU

Your server supports the following GPU adapters:

Manufacturer	Form factor	Name	GPU power	Cooling	Max Qty.	PCIe Lane
NVIDIA	Single-wide, Half-length, Low profile	Tesla T4	75 W	Passive	3	x16
		A2	60 W	Passive	3	x8
		Quadro P620	40 W	Active	3	x16
	Double-wide, Half-length, Full-height	Quadro P2200	75 W	Passive	1	x16

Note: The above are all low-voltage GPU adapters, they can be powered directly by the riser slots.

Power supplies

The server supports up to two power supplies for redundancy.

The server does not support setting the redundancy mode manually. The BMC of the server can automatically set it based on the installed power supply unit quantity.

- When only 1 power supply unit is installed, the power policy is set to “Non-redundant mode”.
- When 2 power supply units are installed, the redundancy mode is set to “Redundant N+N”. If one of the power supply units fails or has been removed, the BMC will report an event and set the redundancy mode to “Non-redundant mode” automatically.

Power supply	100–127 V ac	200–240 V ac	240 V dc (Chinese Mainland only)	-48 V dc
500-watt 80 PLUS Platinum	✓	✓	✓	
750-watt 80 PLUS Platinum	✓	✓	✓	
750-watt 80 PLUS Titanium		✓	✓	
1100-watt 80 PLUS Platinum	✓	✓	✓	
1100-watt 80 PLUS Platinum				✓
1100-watt 80 PLUS Titanium		✓	✓	
1800-watt 80 PLUS Platinum		✓	✓	

CAUTION:

- Use **Lenovo Capacity Planner** to calculate the required power capacity for what is configured for your server. More information about **Lenovo Capacity Planner** is available at: [Lenovo Capacity Planner website](#)
- Ensure that the power supply units that you are installing are supported. For a list of supported power supply units for the server, go to: <https://serverproven.lenovo.com/>
- 240 V dc input (input range: 180-300 V dc) is supported in Chinese Mainland ONLY.

Minimum configuration for debugging

- One processor in processor socket 1
- One memory module in slot 14
- One power supply
- One HDD/SSD drive, one M.2 drive, or one 7mm drive (if OS is needed for debugging)
- Six system fans (with one CPU)

Management options

Overview

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

Options	Description
Lenovo XClarity Controller	<p>Baseboard management controller.</p> <p>Consolidates the service processor functionality, Super I/O, video controller, and remote presence capabilities into a single chip on the server system board.</p> <p>Interface</p> <ul style="list-style-type: none"> • CLI application • Mobile application • Web interface • REST API <p>Usage and downloads</p> <p>https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html</p> <p>Important: Lenovo XClarity Controller (XCC) supported version varies by product. All versions of Lenovo XClarity Controller are referred to as Lenovo XClarity Controller and XCC in this document, unless specified otherwise. To see the XCC version supported by your server, go to https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.</p>
Lenovo XClarity Administrator	<p>Centralized GUI tool for multi-server management.</p> <p>Interface</p> <ul style="list-style-type: none"> • GUI application • Mobile application • Web GUI interface • REST API <p>Usage and downloads</p> <p>http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/aug_product_page.html</p>

Lenovo XClarity Essentials toolset	<p>Portable and light toolset for server configuration, data collection, and firmware updates. Suitable both for single-server or multi-server management contexts.</p> <p>Interface</p> <ul style="list-style-type: none"> • OneCLI: CLI application • Bootable Media Creator: CLI application, GUI application • UpdateXpress: GUI application <p>Usage and downloads</p> <p>http://sysmgt.lenovofiles.com/help/topic/xclarity_essentials/overview.html</p>
Lenovo XClarity Provisioning Manager	<p>UEFI-based GUI tool on a single server that can simplify management tasks.</p> <p>Interface</p> <ul style="list-style-type: none"> • Web GUI interface (BMC remote access) <p>Usage and downloads</p> <p>https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html</p> <p>Important: Lenovo XClarity Provisioning Manager (LXPM) supported version varies by product. All versions of Lenovo XClarity Provisioning Manager are referred to as Lenovo XClarity Provisioning Manager and LXPM in this document, unless specified otherwise. To see the LXPM version supported by your server, go to https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.</p>
Lenovo XClarity Integrator	<p>Series of applications that can integrate management features of Lenovo XClarity Administrator and your server with software used in a certain deployment infrastructure, such as VMware vCenter, Microsoft Admin Center, or Microsoft System Center.</p> <p>Interface</p> <p>GUI application</p> <p>Usage and downloads</p> <p>https://sysmgt.lenovofiles.com/help/topic/lxce_frontend/overview.html</p>
Lenovo XClarity Energy Manager	<p>Application that can manage and monitor server power and temperature.</p> <p>Interface</p> <ul style="list-style-type: none"> • Web GUI Interface <p>Usage and downloads</p> <p>https://datacentersupport.lenovo.com/solutions/Invo-lxem</p>
Lenovo Capacity Planner	<p>Application that supports power consumption planning for a server or rack.</p> <p>Interface</p> <ul style="list-style-type: none"> • Web GUI Interface <p>Usage and downloads</p> <p>https://datacentersupport.lenovo.com/solutions/Invo-lcp</p>

Functions

Options		Functions							
		Multi-system mgmt	OS deployment	System configuration	Firmware updates ¹	Event/alert monitoring	Inventory/logs	Power mgmt	Power planning
Lenovo XClarity Controller				√	√ ²	√	√		
Lenovo XClarity Administrator		√	√	√	√ ²	√	√ ⁴		
Lenovo XClarity Essentials toolset	OneCLI	√		√	√ ²	√	√		
	Bootable Media Creator			√	√		√		
	UpdateXpress			√	√				
Lenovo XClarity Provisioning Manager			√	√	√ ³		√ ⁵		
Lenovo XClarity Integrator		√	√ ⁶	√	√	√	√	√ ⁷	
Lenovo XClarity Energy Manager		√				√		√	
Lenovo Capacity Planner									√ ⁸

Notes:

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

Environment specifications

The section provides environmental specifications of the server.

- [“Ambient temperature/Humidity/Altitude” on page 13](#)
- [“Vibration” on page 13](#)
- [“Shock” on page 13](#)
- [“Heat output” on page 14](#)
- [“Acoustical noise emissions” on page 14](#)
- [“Particulate contamination” on page 14](#)

Ambient temperature/Humidity/Altitude

Server is operating:

Specification	Description
Ambient temperature	<p>The temperature range is measured at sea level altitude.</p> <ul style="list-style-type: none">• ASHRAE class A2: 10°C to 35°C (50°F to 95°F) <p>The maximum ambient temperature decreases by 1°C for every 300 m (984 ft) increase in altitude above 900 m (2,953 ft)</p> <ul style="list-style-type: none">• ASHRAE class A3: 5°C to 40°C (41°F to 104°F) <p>The maximum ambient temperature decreases by 1°C for every 175 m (574 ft) increase in altitude above 900 m (2,953 ft)</p> <ul style="list-style-type: none">• ASHRAE class A4: 5°C to 45°C (41°F to 113°F) <p>The maximum ambient temperature decreases by 1°C for every 125 m (410 ft) increase in altitude above 900 m (2,953 ft)</p>
Relative humidity (non-condensing)	<ul style="list-style-type: none">• ASHRAE class A2: 20%–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)
Maximum altitude	3050 m (10 000 ft)

Server is not operating:

Specification	Description
Ambient temperature	<ul style="list-style-type: none">• Server off: -10°C – 60°C (14°F – 140°F)• Shipment/storage: -40°C – 70°C (-40°F – 158°F)
Relative humidity (non-condensing)	8%–90%
Maximum altitude	3050 m (10 000 ft)

Vibration

- Server is operating:
0.21 G rms at 5 Hz to 500 Hz for 15 minutes across 3 axes
- Server is not operating:
1.04 G rms at 2 Hz to 200 Hz for 15 minutes across 6 surfaces

Shock

- Server is operating:

- 15 G for 3 milliseconds in each direction (positive and negative X, Y, and Z axes)
- Server is not operating:
- 12 kg - 22 kg: 50 G for 152 in./sec velocity change across 6 surfaces

Heat output

- Minimum configuration: 900 BTU/hr, 264 W
- Maximum configuration: 2924 BTU/hr, 857 W

Acoustical noise emissions

These sound levels were measured in controlled acoustical environments according to procedures specified by ISO7779 and are reported in accordance with ISO 9296.

	Typical	Storage rich	GPU rich
Sound power levels (L _{WA,m})			
Idling	6.0 Bel	7.0 Bel	7.5 Bel
Operating	6.5 Bel	7.6 Bel	7.5 Bel
Sound pressure level (L _{pA,m})			
Idling	43 dBA	53 dBA	59 dBA
Operating	49 dBA	59 dBA	59 dBA

The declared acoustic noise levels are based on below configurations, which may change depending on configurations and conditions:

Config.	Typical	Storage rich	GPU rich
CPU	2 x 155 W	1 x 155 W	1 x 155 W
DIMM	32 x 32 GB RDIMM	32 x 64 GB RDIMM	32 x 64 GB RDIMM
Ethernet	1 x SFP28 2-port OCP	1 x SFP28 2-port OCP	1 x SFP28 2-port OCP
PSU	2 x 750 W	2 x 750 W	2 x 1100 W
RAID	930-8i RAID	930-16i RAID	930-16i RAID
Drive	10 x 2.5" HDD	12 x 2.5" HDD	10 x 2.5" HDD
GPU	NA	NA	2 x T4/A2 GPU

Note: 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.

Particulate contamination

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

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

Table 1. Limits for particulates and gases

Contaminant	Limits
Reactive gases	Severity level G1 as per ANSI/ISA 71.04-1985 ¹ : <ul style="list-style-type: none"> • The copper reactivity level shall be less than 200 Angstroms per month (around 0.0035 µg/cm²-hour weight gain).² • The silver reactivity level shall be less than 200 Angstroms per month (around 0.0035 µg/cm²-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: <ul style="list-style-type: none"> • The room air might be continuously filtered with MERV 8 filters. • Air entering a data center might be filtered with MERV 11 or preferably MERV 13 filters. For data centers with airside economizers, the choice of filters to achieve ISO class 8 cleanliness depends on the specific conditions present at that data center. <ul style="list-style-type: none"> • The deliquescent relative humidity of the particulate contamination should be more than 60% RH.⁴ • Data centers must be free of zinc whiskers.⁵
<p>¹ ANSI/ISA-71.04-1985. <i>Environmental conditions for process measurement and control systems: Airborne contaminants</i>. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.</p> <p>² The derivation of the equivalence between the rate of copper corrosion growth in the thickness of the corrosion product in Å/month and the rate of weight gain assumes that Cu₂S and Cu₂O grow in equal proportions.</p> <p>³ The derivation of the equivalence between the rate of silver corrosion growth in the thickness of the corrosion product in Å/month and the rate of weight gain assumes that Ag₂S is the only corrosion product.</p> <p>⁴ The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.</p> <p>⁵ Surface debris is randomly collected from 10 areas of the data center on a 1.5 cm diameter disk of sticky electrically conductive tape on a metal stub. If examination of the sticky tape in a scanning electron microscope reveals no zinc whiskers, the data center is considered free of zinc whiskers.</p>	

Technical rules

This section provides technical rules for the server.

- [“CPU, heat sink, and fan combinations” on page 16](#)
- [“DIMM population rules” on page 18](#)
- [“PCIe slots and configurations” on page 23](#)
- [“Thermal rules” on page 26](#)

CPU, heat sink, and fan combinations

For details about the CPU groups, see [“CPU” on page 3](#).

4 x 2.5" models

CPU group	Config.	Heat sink	Fan
C/B/A/D/Z/X	All configurations	Performance	Performance

8 x 2.5"/4 x 3.5" models

CPU group	Config.	Heat sink	Fan
C	<ul style="list-style-type: none">• Non-Mellanox ConnectX-6 NIC• Non-NVIDIA ConnectX-7 NIC	Aluminum	Standard/Performance
	All other configurations	Aluminum	Performance
B	<ul style="list-style-type: none">• Non-Mellanox ConnectX-6 NIC• Non-NVIDIA ConnectX-7 NIC	Aluminum	Standard/Performance
	All other configurations	Aluminum	Performance
A	All configurations	Standard/Performance	Performance
D	All configurations	Performance	Performance
Z/X	All configurations	Performance	Performance

10 x 2.5" models

CPU group	Config.	Heat sink	Fan
C	<ul style="list-style-type: none">• Non-Mellanox ConnectX-6 NIC• Non-NVIDIA ConnectX-7 NIC	Aluminum	Standard/Performance
	All other configurations	Aluminum	Performance
B	All configurations	Aluminum	Performance
A	All configurations	Performance	Performance
D	All configurations	Performance	Performance
Z/X	All configurations	Performance	Performance

Notes:

- One CPU requires 6 fans (slot 1–6) and 2 fan dummies (7–8), but you can also install 8 fans for one CPU; two CPUs require 8 fans (slot 1–8).
- If there is an OCP 3.0 Ethernet adapter installed, when the system is powered off but still plugged in to AC power, fans 5 and fan 6 will continue to spin at a much lower speed. This is the system design to provide proper cooling for the OCP 3.0 Ethernet adapter.

DIMM population rules

General mixing rules:

DIMMs	Coexist in a channel	Coexist in a system
RDIMMs and Performance+ RDIMMs		
3DS RDIMMs and other DIMM types		
128 GB 3DS RDIMMs and 256 GB 3DS RDIMMs		
DIMMs of different DRAM density (8Gbit and 16 Gbit)	√ ¹	√ ¹
DIMMs of different DRAM data width (x4 and x8)		√
DIMMs of different rank	√ ²	√ ²
DIMMs manufactured by different vendors	√	√
DIMMs of different voltage ³		
ECC and Non-ECC DIMMs ⁴		
<ol style="list-style-type: none"> 1. Install the one with the higher density first. 2. Install the one with the higher rank first. 3. Only support 1.2 V. 4. Only support ECC DIMMs. 		

DIMM compatibility (based on general mixing rules)

Type	Option	Capacity	DRAM data width	DRAM density
RDIMM	1	16 GB	x8	8 Gbit
	2	32 GB	x4	8 Gbit
	3	32 GB	x8	16 Gbit
	4	64 GB	x4	16 Gbit
Performance+ RDIMM	5	32 GB	x8	16 Gbit
	6	64 GB	x4	16 Gbit
3DS RDIMM	7	128 GB	x4	16 Gbit
	8	256 GB	x4	16 Gbit
Support mixing within a channel: <ul style="list-style-type: none">• Options 1 and 3• Options 2 and 4 Support mixing within a system: <ul style="list-style-type: none">• Options 1 to 4 (Install the one with higher DRAM density first.)• Options 5 and 6 (Install the one with higher capacity first.)				

Alternatively, for balancing memory and for better performance, consider below rules:

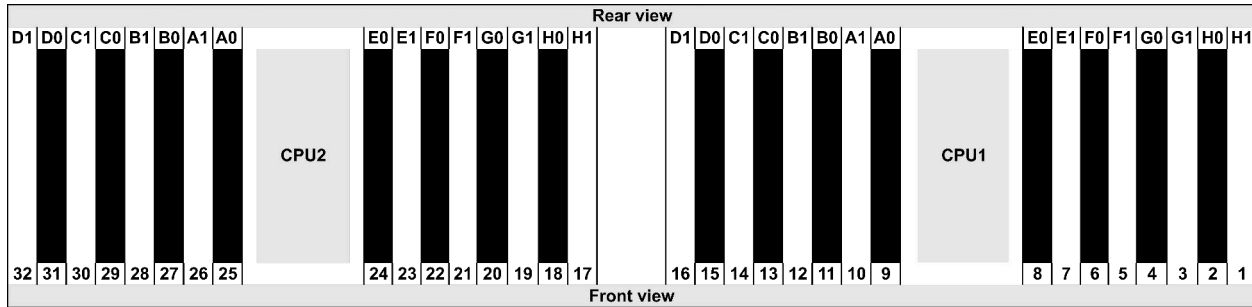
- Balance memory capacity per channel pair on a given CPU.
- Balance memory capacity per CPU socket when 2 CPUs are installed.
- In cases of using Performance+ RDIMMs to maximize memory operating speed, ensure that Performance + RDIMMs with the same capacity are populated on 2DPC. Otherwise, there will be no performance gain.
- When only one DIMM is to be populated in a given channel, it must be populated in DIMM slot 1 (physically farthest away from the CPU).
- The server supports single DIMM as a minimum configuration, however, full memory bandwidth requires one DIMM per channel (A–H) be populated. For best performance, populate all 8 channels per socket, with every channel having the same capacity.

Note: Detailed instructions for balancing memory configurations for your server can be found at:

[Balanced Memory Configurations with Second-or-Third-Generation AMD EPYC Processors](#)

Recommended population order (based on general rules)

1 CPU installed:



Qty.	DIMM population order															
1 DIMM	14															
2 DIMMs	14	16														
3 DIMMs	14	16	3													
4 DIMMs	14	16	3	1												
5 DIMMs	14	16	3	1	10											
6 DIMMs	14	16	3	1	10	12										
7 DIMMs	14	16	3	1	10	12	7									
8 DIMMs	14	16	3	1	10	12	7	5								
9 DIMMs	14	16	3	1	10	12	7	5	13							
10 DIMMs	14	16	3	1	10	12	7	5	13	15						
11 DIMMs	14	16	3	1	10	12	7	5	13	15	4					
12 DIMMs	14	16	3	1	10	12	7	5	13	15	4	2				
13 DIMMs	14	16	3	1	10	12	7	5	13	15	4	2	9			
14 DIMMs	14	16	3	1	10	12	7	5	13	15	4	2	9	11		
15 DIMMs	14	16	3	1	10	12	7	5	13	15	4	2	9	11	8	
16 DIMMs	14	16	3	1	10	12	7	5	13	15	4	2	9	11	8	6

Note: There are performance-optimized 6-DIMM and 12-DIMM configurations for server models with one 7003 series CPU and 12-DIMM and 24-DIMM configurations for server models with two 7003 series CPUs. For details, see the table below.

CPU Qty.	DIMM Qty.	Performance-optimized DIMM population order
1	6	1, 3, 7, 10, 14, 16
	12	1, 2, 3, 4, 7, 8, 9, 10, 13, 14, 15, 16
2	12	1, 3, 7, 10, 14, 16, 17, 19, 23, 26, 30, 32
	24	1, 2, 3, 4, 7, 8, 9, 10, 13, 14, 15, 16, 17, 18, 19, 20, 23, 24, 25, 26, 29, 30, 31, 32

PCIe slots and configurations

- [Slot configurations](#)
- [Quantities and slot priority](#)
- [RAID rules](#)

Slot configurations

The server supports up to 3 PCIe slots on the rear. The PCIe slot configurations vary by server model.

Notes: The slots defined in the UEFI setting are slightly different from the physical slots. For information about slots defined in the UEFI setting, refer to:

- For AMD EPYC 7002 series processors: https://thinksystem.lenovofiles.com/help/topic/uefi_amd_2p/onboard_device.html
- For AMD EPYC 7003 series processors: https://thinksystem.lenovofiles.com/help/topic/uefi_amd_2p_milan/onboard_device.html

Models	Configurations
3 PCIe slots(no rear bays)	<ul style="list-style-type: none"> • Slot 1: PCIe x16 (x8, x4, x1), low-profile • Slot 2: PCIe x16 (x8, x4, x1), full-height • Slot 3: PCIe x16 (x8, x4, x1), low-profile
2 PCIe slots(no rear bays)	<ul style="list-style-type: none"> • Slot 1: PCIe x16 (x8, x4, x1), low-profile • Slot 2: PCIe x16 (x8, x4, x1), full-height <p>Note: One rearwall bracket must be installed next to the two PCIe slots.</p>
2 PCIe slots(7mm rear bay)	<ul style="list-style-type: none"> • Slot 1: PCIe x16 (x8, x4, x1), low-profile • Slot 2: PCIe x16 (x8, x4, x1), low-profile
1 PCIe slot(2.5" rear bay)	<ul style="list-style-type: none"> • Slot 1: PCIe x16 (x8, x4, x1), low-profile

Quantities and slot priority

PCIe adapters		Max qty.	Slot priority
GPU	Tesla T4/A2/Quadro P620	3	<ul style="list-style-type: none"> • 1 CPU: slot 1---> 2 • 2 CPU: slot 1---> 3---> 2
	Quadro P2200	1	Slot 2
NIC	Intel E810-DA4	1	Slot 2
	Broadcom 57504 10/25GbE SFP28 4-port		
	Xilinx Alveo U25	2	<ul style="list-style-type: none"> • 1 CPU: slot 1 • 2 CPU: slot 1---> 3 <p>Note: When the Alveo U50 is installed, fan redundancy is not supported and the ambient temperature must be limited to 30°C or lower.</p>
Xilinx Alveo U50			

	Others	3	<ul style="list-style-type: none"> • 1 CPU: slot 1---> 2 • 2 CPU: slot 1---> 3---> 2 Notes: The following adapters require a full-height bracket and must be installed in a full-height slot: <ul style="list-style-type: none"> • ThinkSystem Broadcom 57454 10/25GbE SFP28 4-port PCIe Ethernet Adapter • ThinkSystem Broadcom 57454 10/25GbE SFP28 4-port PCIe Ethernet Adapter_Refresh (V2)
Internal SFF RAID/HBA		1	Slot 1
Internal CFF RAID/HBA		1	Front chassis
External RAID/HBA		3	NA
FC HBA		3	<ul style="list-style-type: none"> • 1 CPU: slot 1---> 2 • 2 CPU: slot 1---> 3---> 2
PCIe SSD		3	<ul style="list-style-type: none"> • 1 CPU: slot 1---> 2 • 2 CPU: slot 1---> 3---> 2
COM cable		1	Slot 3
OCP 3.0		1	OCP slot

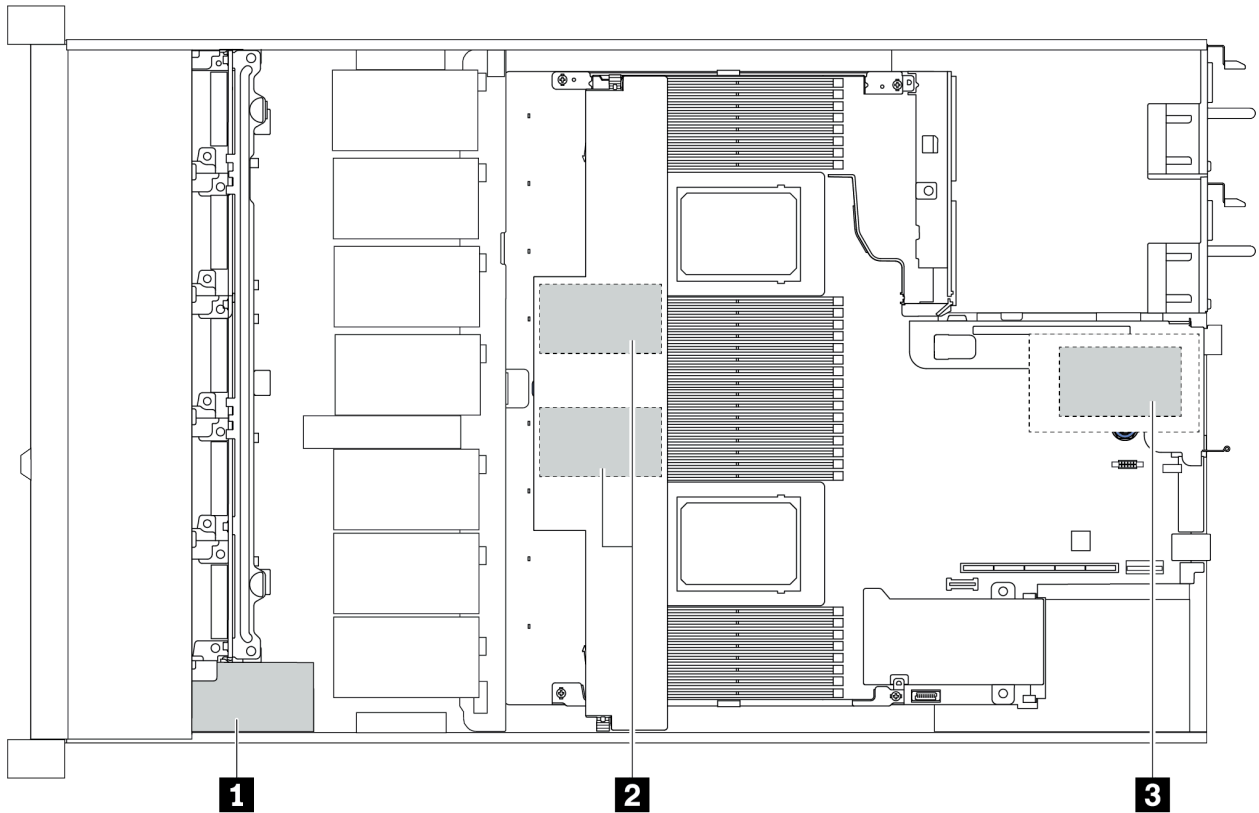
RAID rules

- Gen3 and Gen4 cannot be installed together on one riser card.
- RAID controllers of the same PCIe generation group can be installed on one riser card.
- RAID and HBA controllers can be installed on one riser card.
- The RAID/HBA 4350/5350/9350 adapters cannot be mixed with the following adapters in the same system:
 - RAID/HBA 430/530/930 adapters
 - RAID/HBA 440/940/540 adapters, except for external RAID/HBA 440-8e/440-16e/940-8e adapters
- PCIe SSD does not support RAID function.
- The RAID 940-8i or RAID 940-16i adapter supports Tri-mode. When Tri-mode is enabled, the server supports SAS, SATA and U.3 NVMe drives at the same time. NVMe drives are connected via a PCIe x1 link to the controller.

Note: To support Tri-mode with U.3 NVMe drives, **U.3 x1 mode** must be enabled for the selected drive slots on the backplane through the XCC Web GUI. Otherwise, the U.3 NVMe drives cannot be detected. For more information, see [“U.3 NVMe drive can be detected in NVMe connection, but cannot be detected in Tri-mode” on page 266.](#)

- The HBA 430/440 adapters do not support the Self-Encrypting Drive (SED) management feature.
- 930/9350/940 RAID controllers require a super capacitor.

Locations and quantities of RAID super capacitors vary by models:



	2.5" chassis		3.5" chassis		Installation priority	Location
	STD heat sink	Perf. heat sink	STD heat sink	Perf. heat sink		
1	Super cap 1	Super cap 1	NA	NA	Super cap 1---> 2--->3	Front chassis
2	Super cap 2, 3	NA	Super cap 1, 2	NA		Air baffle
3	NA	NA	NA	Super cap 1		Riser cage

Thermal rules

This topic lists the thermal rules for the server to comply with “ASHRAE class A2, A3, or A4 specifications” on page 13.

ASHARE class A2 environment

The following table lists the ambient temperature requirement for the server depending on the hardware configuration.

Model	Default TDP	Configuration	Max. Ambient Temp.
All models		<ul style="list-style-type: none"> Mellanox ConnectX-6 < 100 GbE Xilinx Alveo U25 NVIDIA Quadro P620/P2200 GPU Broadcom 57454 OCP 3.0 	35°C
		<ul style="list-style-type: none"> Mellanox ConnectX-6 100 GbE/200GbE with AOC NVIDIA ConnectX-7 200 GbE/400GbE with AOC 	30°C
4 x 2.5" models	280 W	<ul style="list-style-type: none"> Non-Mellanox ConnectX-6 NIC Non-NVIDIA ConnectX-7 NIC 	35°C
		2 Tesla T4/A2 GPUs	35°C
8 x 2.5"/4 x 3.5" models	120 W / 155 W	2 x 2.5" SSD	35°C
	180W / 190 W / 200 W	3 Tesla T4/A2 GPUs	35°C
		2 x 2.5" SSD	30°C
	225 W /240 W	<ul style="list-style-type: none"> 3 Non-Mellanox ConnectX-6 NIC 3 Non-NVIDIA ConnectX-7 NIC 2 Tesla T4/A2 GPUs 2 x 7mm SSD 	35°C
280 W	<ul style="list-style-type: none"> 2 Non-Mellanox ConnectX-6 NIC 2 Non-NVIDIA ConnectX-7 NIC 2 Tesla T4/A2 GPUs 	30°C	
10 x 2.5" models	120 W / 155 W	<ul style="list-style-type: none"> 3 Tesla T4/A2 GPUs 2 x 2.5" SSD 	35°C
	180W / 190 W / 200 W	<ul style="list-style-type: none"> Non-Mellanox ConnectX-6 NIC Non-NVIDIA ConnectX-7 NIC 2 Tesla T4/A2 GPUs 2 x 7mm SSD 	35°C
		3 Tesla T4/A2 GPUs	30°C
	225 W /240 W	<ul style="list-style-type: none"> Non-Mellanox ConnectX-6 NIC Non-NVIDIA ConnectX-7 NIC 2 Tesla T4/A2 GPUs 2 x 7mm SSD 	35°C
280 W	<ul style="list-style-type: none"> 2 Non-Mellanox ConnectX-6 NIC 2 Non-NVIDIA ConnectX-7 NIC 2 Tesla T4/A2 GPUs 	30°C	

ASHARE class A3/A4 environment

To comply with ASHARE class A3/A4 specifications, the server must NOT be configured with below components:

- CPU (TDP ≥ 170W)

- 3DS RDIMMs
- GPUs
- Mellanox ConnectX-6 100 GbE/200GbE with AOC
- NVIDIA ConnectX-7 200 GbE/400GbE with AOC
- Xilinx Alveo U25 FPGA
- Broadcom 57454 OCP 3.0
- NVMe AIC switches
- 2 x 7mm SSDs
- 2 x 2.5" SSDs

Firmware updates

Several options are available to update the firmware for the server.

You can use the tools listed here to update the most current firmware for your server and the devices that are installed in the server.

Note: Lenovo typically releases firmware in bundles called UpdateXpress System Packs (UXSPs). To ensure that all of the firmware updates are compatible, you should update all firmware at the same time. If you are updating firmware for both the Lenovo XClarity Controller and UEFI, update the firmware for Lenovo XClarity Controller first.

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

<http://lenovopress.com/LP0656>

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

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

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

Tool	In-band update	Out-of-band update	On-target update	Off-target update	Graphical user interface	Command-line interface	Supports UXSPs
Lenovo XClarity Provisioning Manager Limited to core system firmware only	√ ²			√	√		√
Lenovo XClarity Controller Supports core system firmware and most advanced I/O option firmware updates		√		√	√	√	
Lenovo XClarity Essentials OneCLI Supports all core system firmware, I/O firmware, and installed operating system driver updates	√	√	√	√		√	√
Lenovo XClarity Essentials UpdateXpress Supports all core system firmware, I/O firmware, and installed operating system driver updates	√	√	√	√	√		√

Tool	In-band update	Out-of-band update	On-target update	Off-target update	Graphical user interface	Command-line interface	Supports UXSPs
Lenovo XClarity Essentials Bootable Media Creator Supports core system firmware and I/O firmware updates. You can update the Microsoft® Windows® operating system, but device drivers are not included on the bootable image	√	√		√	√	√	√
Lenovo XClarity Administrator Supports core system firmware and I/O firmware updates	√ ¹	√ ²		√	√		
Lenovo XClarity Integrator for VMware vCenter Supports all core system firmware, I/O firmware, and installed operating system driver updates		√		√	√		√
Lenovo XClarity Integrator for Microsoft Windows Admin Center Supports all core system firmware, I/O firmware, and installed operating system driver updates	√	√	√	√	√		
Lenovo XClarity Integrator for Microsoft System Center Configuration Manager Supports all core system firmware, I/O firmware, and installed operating system driver updates	√		√		√		√
Notes: 1. For I/O firmware updates. 2. For BMC and UEFI firmware updates.							

The latest firmware can be found at the following site:

<https://datacentersupport.lenovo.com/products/servers/thinksystem/sr645/7d2x/downloads/driver-list>

- **Lenovo XClarity Provisioning Manager**

From Lenovo XClarity Provisioning Manager, you can update the Lenovo XClarity Controller firmware, the UEFI firmware, and the Lenovo XClarity Provisioning Manager software.

Note: By default, the Lenovo XClarity Provisioning Manager Graphical User Interface is displayed when you start the server and press the key specified in the on-screen instructions. If you have changed that default to be the text-based system setup, you can bring up the Graphical User Interface from the text-based system setup interface.

For additional information about using Lenovo XClarity Provisioning Manager to update firmware, see:

“Firmware Update” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.

- **Lenovo XClarity Controller**

If you need to install a specific update, you can use the Lenovo XClarity Controller interface for a specific server.

Notes:

- To perform an in-band update through Windows or Linux, the operating system driver must be installed and the Ethernet-over-USB (sometimes called LAN over USB) interface must be enabled.

For additional information about configuring Ethernet over USB, see:

“Configuring Ethernet over USB” section in the XCC documentation version compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html

- If you update firmware through the Lenovo XClarity Controller, make sure that you have downloaded and installed the latest device drivers for the operating system that is running on the server.

For additional information about using Lenovo XClarity Controller to update firmware, see:

“Updating Server Firmware” section in the XCC documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html

- **Lenovo XClarity Essentials OneCLI**

Lenovo XClarity Essentials OneCLI is a collection of command line applications that can be used to manage Lenovo servers. Its update application can be used to update firmware and device drivers for your servers. The update can be performed within the host operating system of the server (in-band) or remotely through the BMC of the server (out-of-band).

For additional information about using Lenovo XClarity Essentials OneCLI to update firmware, see:

http://sysmgt.lenovofiles.com/help/topic/toolstr_cli_lenovo/onecli_c_update.html

- **Lenovo XClarity Essentials UpdateXpress**

Lenovo XClarity Essentials UpdateXpress provides most of OneCLI update functions through a graphical user interface (GUI). It can be used to acquire and deploy UpdateXpress System Pack (UXSP) update packages and individual updates. UpdateXpress System Packs contain firmware and device driver updates for Microsoft Windows and for Linux.

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

<https://datacentersupport.lenovo.com/solutions/Invo-xpress>

- **Lenovo XClarity Essentials Bootable Media Creator**

You can use Lenovo XClarity Essentials Bootable Media Creator to create bootable media that is suitable for firmware updates, VPD updates, inventory and FFDC collection, advanced system configuration, FoD Keys management, secure erase, RAID configuration, and diagnostics on supported servers.

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

<https://datacentersupport.lenovo.com/solutions/Invo-bomc>

- **Lenovo XClarity Administrator**

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

For additional information about using Lenovo XClarity Administrator to update firmware, see:

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

- **Lenovo XClarity Integrator offerings**

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

For additional information about using Lenovo XClarity Integrator offerings to update firmware, see:

https://sysmgt.lenovofiles.com/help/topic/lxce_frontend/overview.html

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 respond to remote power-on requests sent to Lenovo XClarity Controller via Lenovo XClarity Essentials OneCLI, IPMItool, or SSH CLI.

For example, run the following command on Lenovo XClarity Essentials OneCLI to power on your server:

```
OneCli.exe ospower turnon --bmc <userid>:<password>@<host>
```

For more information about running the `ospower` command, see https://sysmgt.lenovofiles.com/help/topic/toolstr_cli_lenovo/onecli_r_ospower_command.html.

If the system UEFI power policy is set to “always on”, the system will be powered on automatically when an AC source is plugged in.

For information about powering off the server, see [“Power off the server” on page 32](#).

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):

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

- Start an orderly shutdown using the operating system (if supported by your operating system).
- Press the power button to start an orderly shutdown (if supported by your operating system).
- Press and hold the power button for more than 4 seconds to force a shutdown.
- Send remote power-off commands to Lenovo XClarity Controller via Lenovo XClarity Essentials OneCLI, IPMItool, or SSH CLI.

When in a standby state, the server can respond to remote power-on requests sent to the Lenovo XClarity Controller. For information about powering on the server, see [“Power on the server” on page 32](#).

Chapter 2. Server components

This section provides details of all components available on the server.

Front view

The front view of the server varies by model. Depending on the model, your server might look slightly different from the illustrations in this topic.

Refer to the following front view for different server models:

- [“Server models with four 2.5-inch front drive bays” on page 34](#)
- [“Server models with eight 2.5-inch front drive bays” on page 35](#)
- [“Server models with ten 2.5-inch front drive bays” on page 36](#)
- [“Server models with four 3.5-inch front drive bays” on page 37](#)
- [“Server models with four 2.5-inch front drive bays \(backplane-less\)” on page 38](#)
- [“Server models with eight 2.5-inch front drive bays \(backplane-less\)” on page 39](#)
- [“Server models with ten 2.5-inch front drive bays \(backplane-less\)” on page 40](#)
- [“Server models with four 3.5-inch front drive bays \(backplane-less\)” on page 41](#)
- [“Server models with eight 2.5-inch front drive bays \(with LCD diagnostics panel\)” on page 42](#)

Server model with four 2.5-inch drive bays

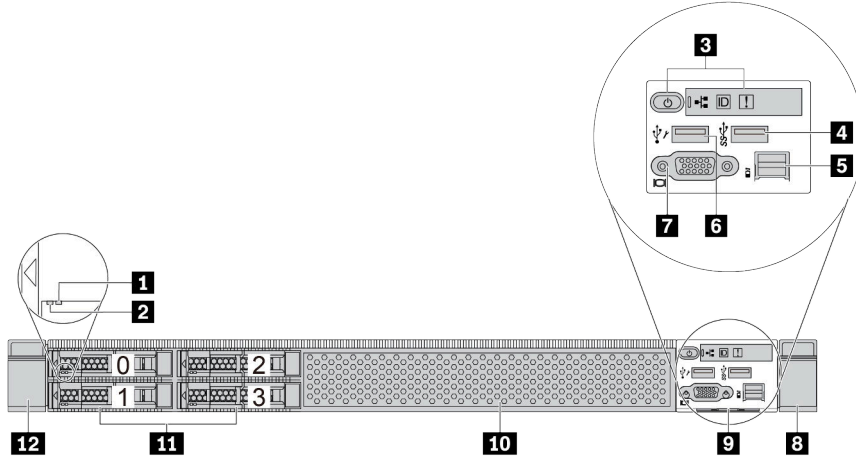


Table 2. Components on the front of the server

Callout	Callout
1 Drive status LED	2 Drive activity LED
3 Diagnostics panel	4 USB 3.1 Gen 1 connector
5 External diagnostics connector	6 XClarity Controller USB connector
7 VGA connector (optional)	8 Rack latch (right)
9 Pull-out information tab	10 Drive bay filler (1)
11 Drive bays (4)	12 Rack latch (left)

Note: For more information about each component, see [“Front components overview”](#) on page 43.

Server model with eight 2.5-inch drive bays

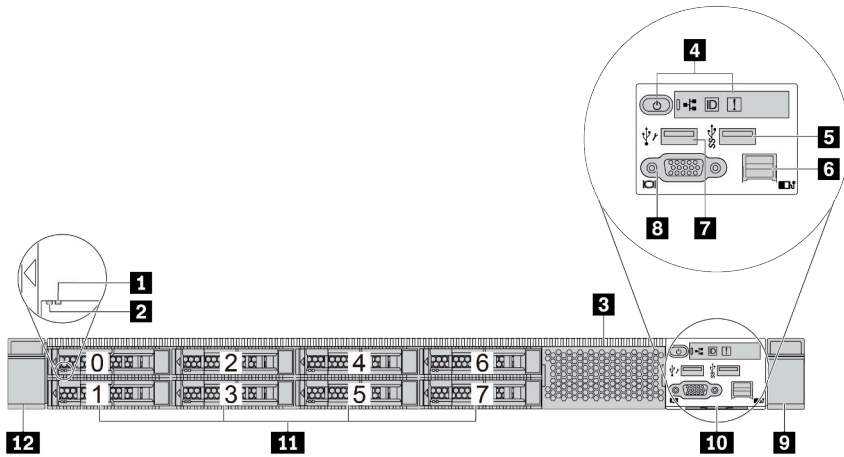


Table 3. Components on the front of the server

Callout	Callout
1 Drive status LED	2 Drive activity LED
3 Drive bay filler (1)	4 Diagnostics panel
5 USB 3.1 Gen 1 connector	6 External diagnostics connector
7 XClarity Controller USB connector	8 VGA connector (optional)
9 Rack latch (right)	10 Pull-out information tab
11 Drive bays (8)	12 Rack latch (left)

Note: For more information about each component, see [“Front components overview”](#) on page 43.

Server model with ten 2.5-inch drive bays

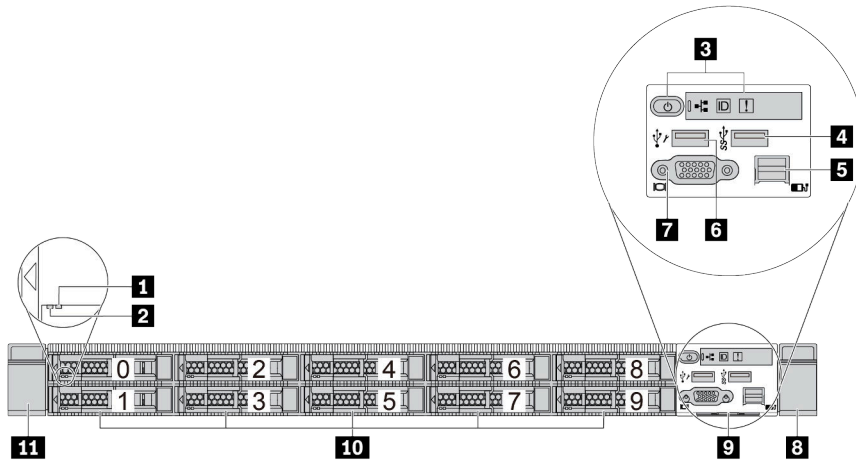


Table 4. Components on the front of the server

Callout	Callout
1 Drive status LED	2 Drive activity LED
3 Diagnostics panel	4 USB 3.1 Gen 1 connector
5 External diagnostics connector	6 XClarity Controller USB connector
7 VGA connector (optional)	8 Rack latch (right)
9 Pull-out information tab	10 Drive bays (10)
11 Rack latch (left)	

Note: For more information about each component, see [“Front components overview”](#) on page 43.

Server model with four 3.5-inch drive bays

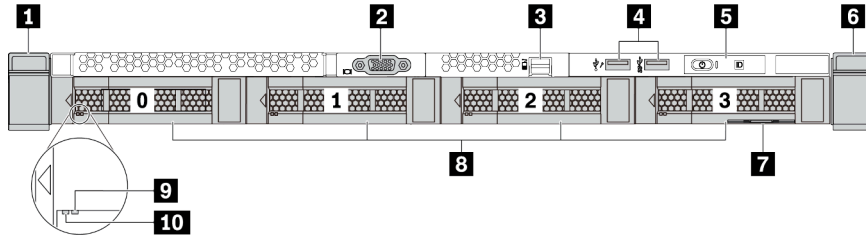


Table 5. Components on the front of the server

Callout	Callout
1 Rack latch (right)	2 VGA connector (optional)
3 External diagnostics connector	4 XClarity Controller USB connector and USB 3.1 Gen 1 connector
5 Diagnostics panel	6 Rack latch (left)
7 Pull-out information tab	8 Drive bays (4)
9 Drive status LED	10 Drive activity LED

Note: For more information about each component, see [“Front components overview”](#) on page 43.

Server model with four 2.5-inch drive bays (backplane-less)

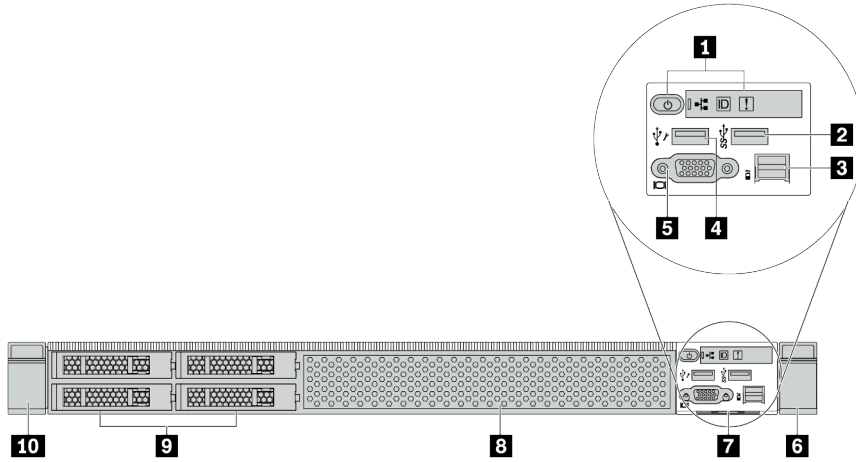


Table 6. Components on the front of the server

Callout	Callout
1 Diagnostics panel	2 USB 3.1 Gen 1 connector
3 External diagnostics connector	4 XClarity Controller USB connector
5 VGA connector (optional)	6 Rack latch (right)
7 Pull-out information tab	8 Drive bay filler (1)
9 Drive bay fillers (4)	10 Rack latch (left)

Note: For more information about each component, see [“Front components overview”](#) on page 43.

Server model with eight 2.5-inch drive bays (backplane-less)

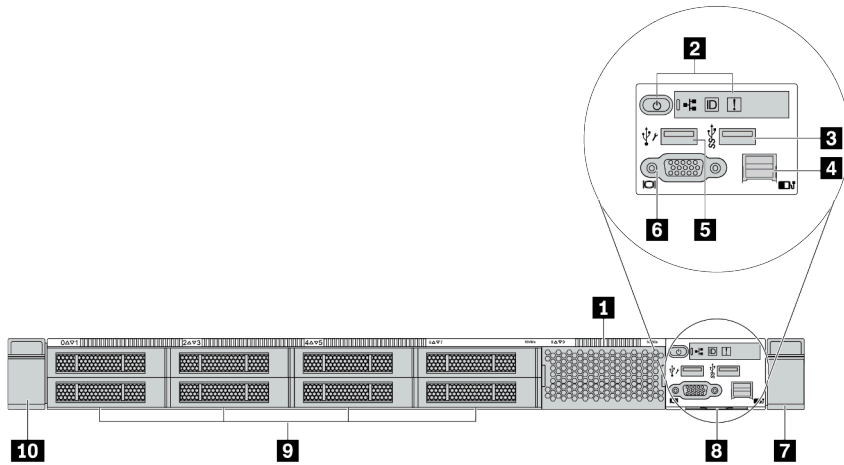


Table 7. Components on the front of the server

Callout	Callout
1 Drive bay filler (1)	2 Diagnostics panel
3 USB 3.1 Gen 1 connector	4 External diagnostics connector
5 XClarity Controller USB connector	6 VGA connector (optional)
7 Rack latch (right)	8 Pull-out information tab
9 Drive bay filler (8)	10 Rack latch (left)

Note: For more information about each component, see [“Front components overview” on page 43](#).

Server model with ten 2.5-inch drive bays (backplane-less)

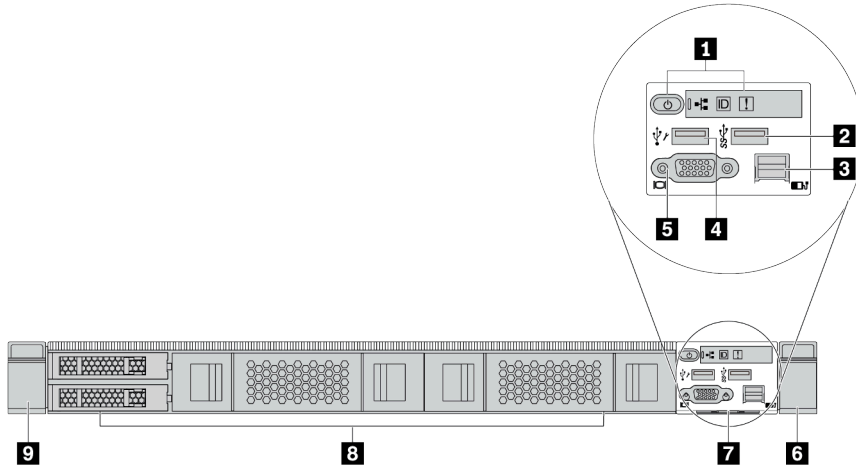


Table 8. Components on the front of the server

Callout	Callout
1 Diagnostics panel	2 USB 3.1 Gen 1 connector
3 External diagnostics connector (Reserved)	4 XClarity Controller USB connector
5 VGA connector (optional)	6 Rack latch (right)
7 Pull-out information tab	8 Drive bay fillers (4)
9 Rack latch (left)	

Note: For more information about each component, see [“Front components overview”](#) on page 43.

Server model with four 3.5-inch drive bays (backplane-less)

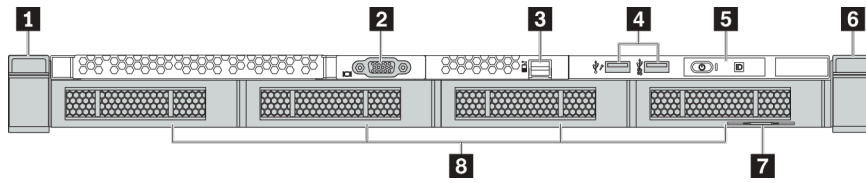


Table 9. Components on the front of the server

Callout	Callout
1 Rack latch (left)	2 VGA connector (optional)
3 External diagnostics connector	4 XClarity Controller USB connector and USB 3.1 Gen 1 connector
5 Diagnostics panel	6 Rack latch (right)
7 Pull-out information tab	8 Drive bay fillers (4)

Note: For more information about each component, see [“Front components overview”](#) on page 43.

Server model with eight 2.5-inch drive bays (with LCD diagnostics panel assembly)

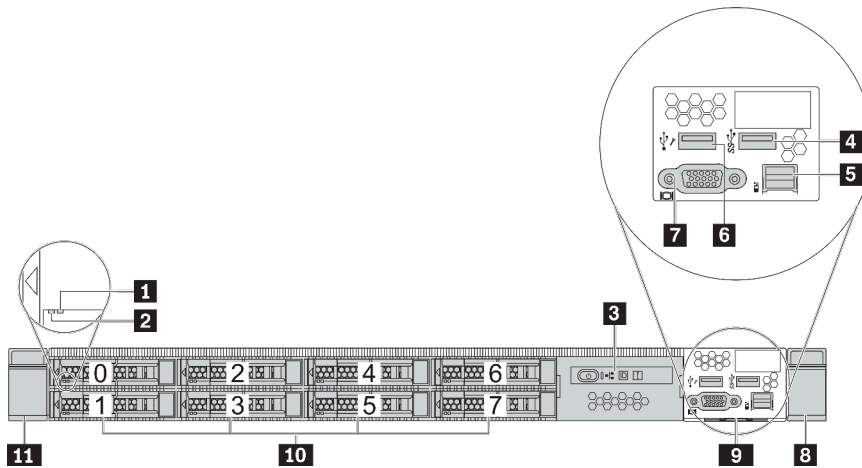


Table 10. Components on the front of the server

Callout	Callout
1 Drive status LED	2 Drive activity LED
3 LCD diagnostics panel assembly	4 USB 3.1 Gen 1 connector
5 External diagnostics connector	6 XClarity Controller USB connector
7 VGA connector (optional)	8 Rack latch (right)
9 Pull-out information tab	10 Drive bays (8)
11 Rack latch (left)	

Note: For more information about each component, see [“Front components overview”](#) on page 43.

Front components overview

Diagnostics panel

The diagnostics panel is integrated in front I/O assembly on some models. For information about the controls and status LEDs on the diagnostics panel, see [“Diagnostics panel” on page 45](#).

Drive LEDs

Each hot-swap drive comes with an activity LED and status LED and the signals are controlled by the backplanes. Different colors and speeds indicate different activities or status of the drive. The following illustration shows the LEDs on a Hard disk drive or solid-state drive.

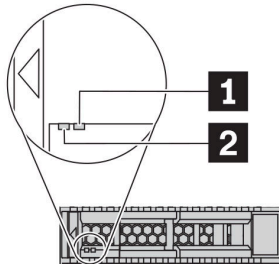


Figure 4. Drive LEDs

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

External diagnostics port

The connector is for connecting an external diagnostics handset. For more about its functions, see [“LCD diagnostics panel/handset” on page 47](#).

Hot-swap drives and drive bays

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

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

LCD diagnostics panel assembly

The assembly comes with an integrated LCD diagnostics panel that can be used to quickly obtain system status, firmware levels, network information, and health information about the system. For more about the panel functions, see [“LCD diagnostics panel/handset” on page 47](#).

Pull-out information tab

The Lenovo XClarity Controller network access label is attached on the pull-out information tab. The default Lenovo XClarity Controller hostname and the IPv6 Link Local Address (LLA) are provided on the tab.

Rack latches

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

USB 3.1 Gen 1 connectors

The USB 3.1 Gen 1 connectors can be used to attach a USB-compatible device, such as a USB keyboard, USB mouse, or USB storage device.

VGA connector

The VGA connectors on the front and 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.

XClarity Controller USB connector

The XClarity Controller USB connector can function as a regular USB 2.0 connector to the host OS. In addition, it can also be used to connect the server to an android or iOS device, where you can then install and launch the Lenovo XClarity Mobile app to manage the system using XClarity Controller.

For details about using the Lenovo XClarity Mobile app, refer to http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/lxca_usemobileapp.html.

Diagnostics panel

The diagnostics panel provides controls, connectors, and LEDs.

Note: Diagnostics panel with an LCD display is available for some models. For details, see [“LCD diagnostics panel/handset” on page 47](#).

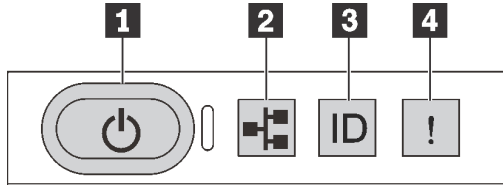


Figure 5. Diagnostics panel

1 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 several 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.

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

2 Network activity LED

Compatibility of the NIC adapter and the network activity LED

NIC adapter	Network activity LED
OCP 3.0 Ethernet adapter	Support
PCIe NIC adapter	Not support

When an OCP 3.0 Ethernet adapter is installed, the network activity LED on the front I/O assembly helps you identify the network connectivity and activity. If no OCP 3.0 Ethernet adapter is installed, this LED is off.

Status	Color	Description
On	Green	The server is connected to a network.
Blinking	Green	The network is connected and active.
Off	None	The server is disconnected from the network. Note: If the network activity LED is off when an OCP 3.0 Ethernet adapter is installed, check the network ports in the rear of your server to determine which port is disconnected.

3 System ID button with system ID LED

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

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

4 System error LED

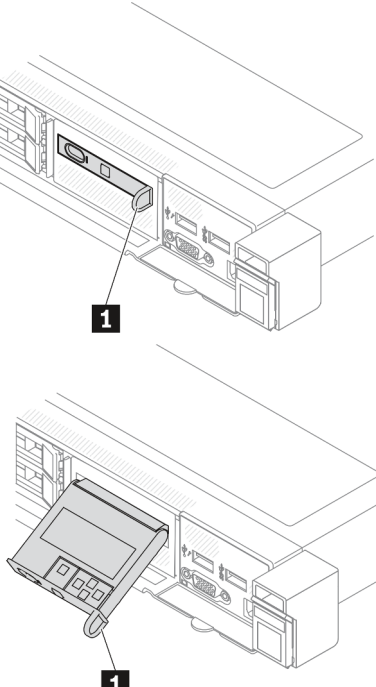
The system error LED helps you determine if there are any system errors.

Status	Color	Description	Action
On	Yellow	An error has been detected on the server. Causes might include but are not limited to the following errors: <ul style="list-style-type: none">• The temperature of the server reached the non-critical temperature threshold.• The voltage of the server reached the non-critical voltage threshold.• A fan has been detected to be running at low speed.• A hot-swap fan has been removed.• The power supply has a critical error.• The power supply is not connected to the power.	Check the event log to determine the exact cause of the error. Alternatively, follow the light path diagnostics to determine if additional LEDs are lit that will direct you to identify the cause of the error.
Off	None	The server is off or the server is on and is working correctly.	None.

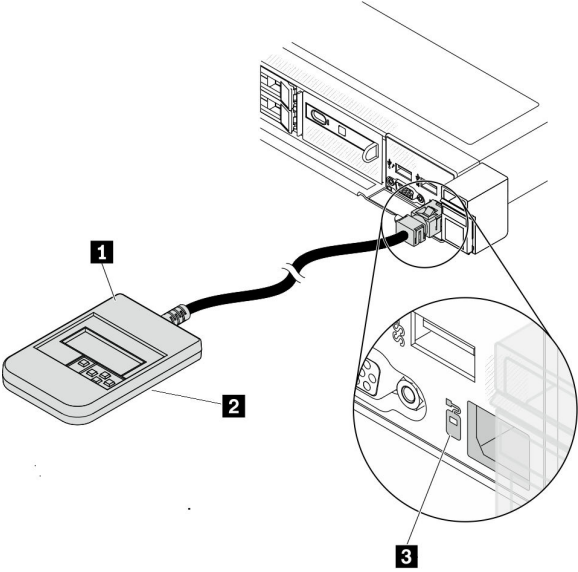
LCD diagnostics panel/handset

The LCD diagnostics panel is a component attached to the front of the server, the external LCD diagnostics handset is an external device that can be connected to the server with a cable. Functions of the integrated component and the external device are the same, both of them can be used to quickly access system information such as active errors, system status, firmware, network information, and health information.

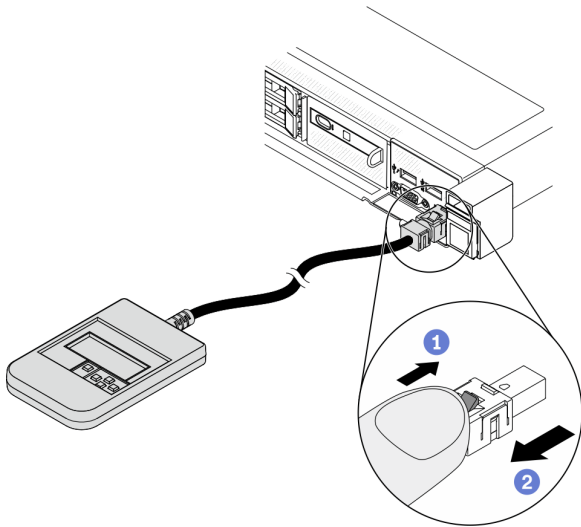
Where to find the LCD diagnostics panel

Location	Callout
<p>The LCD diagnostics panel is attached to the front of the server.</p> 	<p>1 The handle with which the panel can be pulled out and inserted into the rack.</p> <p>Notes:</p> <ul style="list-style-type: none">• The panel can be inserted or pulled out regardless of the system status.• When pulling out the panel, carefully hold it by the handle and avoid any hard pulling.

Where to find the external LCD diagnostics handset

Location	Callout
<p>The external LCD diagnostics handset is connected to the server with an external cable.</p> 	<p>1 The LCD diagnostics handset that can be connected to the server with an external cable.</p> <p>2 The magnetic bottom with which the device can be attached to the top or side of the rack. This is helpful and can free up both hands for certain service tasks.</p> <p>3 The external diagnostics connector on the front of the server that can be used to connect an external LCD diagnostics handset.</p>

Note: Pay attention to the following steps when unplugging the external handset:

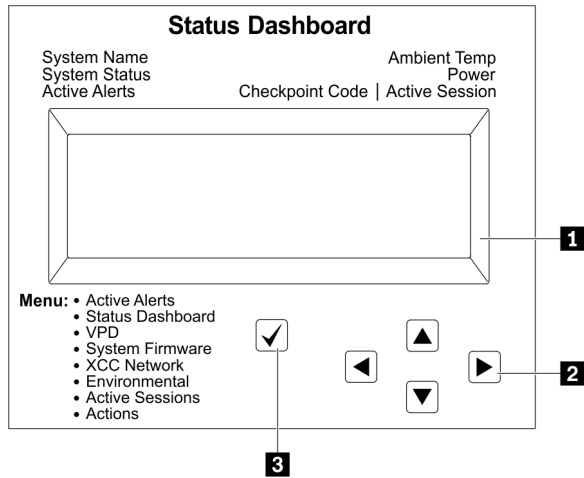


Step 1. Press the plastic clip on the plug in the shown direction.

Step 2. Gently pull out the cable from the connector while keeping the clip pressed down.

Display panel overview

Both the integrated panel and the external handset consist of an LCD display and 5 navigation buttons.



1 LCD display

2 Scroll buttons (up/down/left/right).

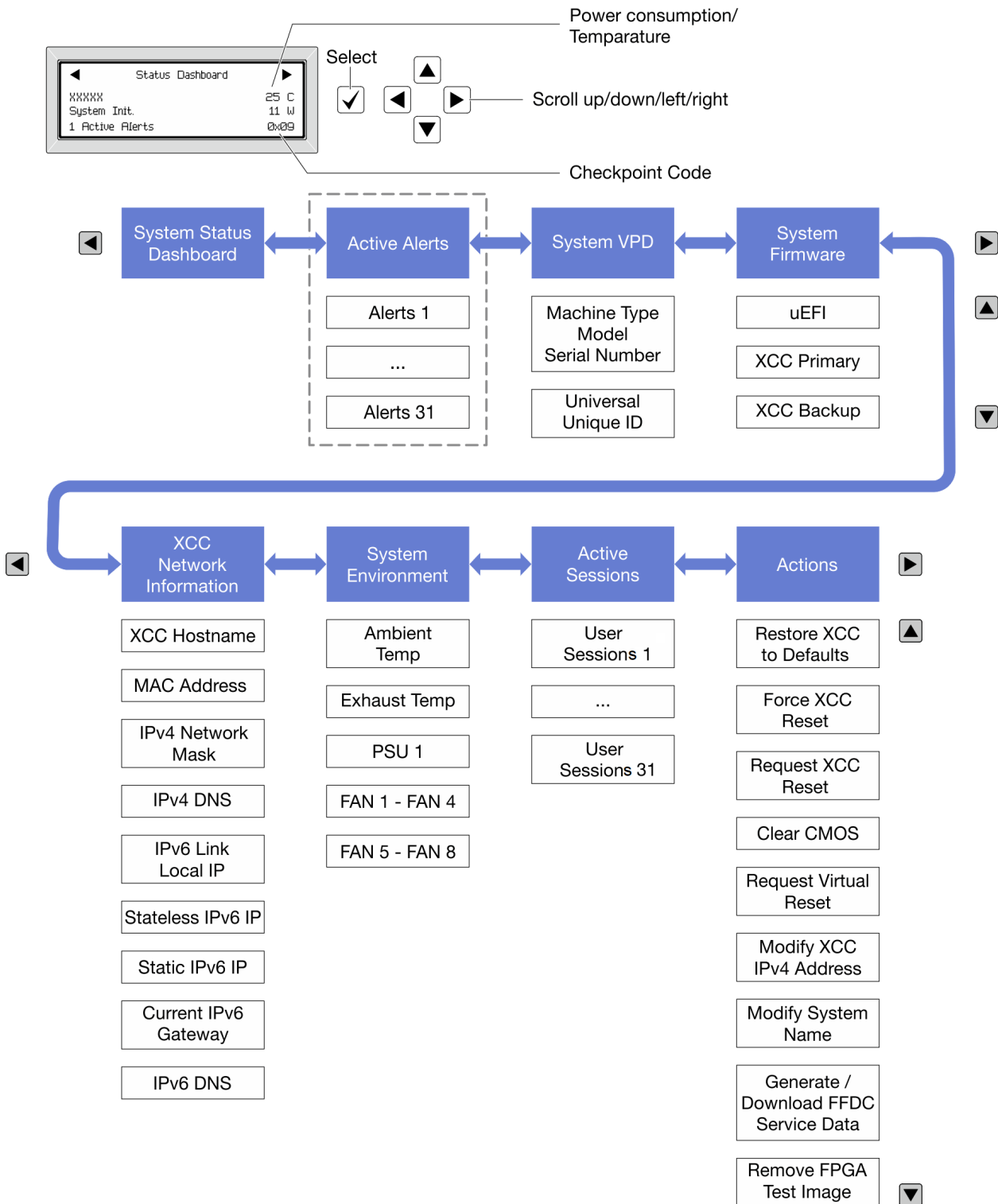
Press the scroll buttons to locate and select system information.

3 Select button.

Press the select button to select from the menu options.

Options flow diagram

The LCD diagnostics panel/handset shows various system information. Navigate through the options with the scroll keys.



Full menu list

Following is the list of options available on the LCD diagnostics panel/handset. Switch between an option and the subordinate information entries with the select button, and switch among options or information entries with the scroll buttons.

Home Menu (System Status Dashboard)

Home Menu	Example
<ul style="list-style-type: none"> 1 System name 2 System status 3 Active alert quantity 4 Temperature 5 Power consumption 6 Checkpoint code 	<p>The screenshot shows a 'Status Dashboard' screen with the following content: <ul style="list-style-type: none"> 1: A left-pointing arrow at the top left. 2: The text 'xxxxxx' below the arrow. 3: The text 'System Init.' below 'xxxxxx'. 4: The text '25 C' at the top right. 5: The text '11 W' below '25 C'. 6: The text '0x09' at the bottom right. 7: A right-pointing arrow at the top right. 8: The text '1 Active Alerts' at the bottom left. </p>

Active Alerts

Sub Menu	Example
Home screen: Active error quantity Note: The “Active Alerts” menu displays only the quantity of active errors. If no errors occur, the “Active Alerts” menu will not be available during navigation.	1 Active Alerts
Details screen: <ul style="list-style-type: none"> • Error message ID (Type: Error/Warning/Information) • Occurrence time • Possible sources of the error 	Active Alerts: 1 Press ▼ to view alert details FQXSPPU009N(Error) 04/07/2020 02:37:39 PM CPU 1 Status: Configuration Error

System VPD Information

Sub Menu	Example
<ul style="list-style-type: none"> • Machine type and serial number • Universal Unique ID (UUID) 	Machine Type: xxxx Serial Num: xxxxxx Universal Unique ID: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

System Firmware

Sub Menu	Example
UEFI <ul style="list-style-type: none"> Firmware level (status) Build ID Version number Release date 	UEFI (Inactive) Build: D0E101P Version: 1.00 Date: 2019-12-26
XCC Primary <ul style="list-style-type: none"> Firmware level (status) Build ID Version number Release date 	XCC Primary (Active) Build: DVI399T Version: 4.07 Date: 2020-04-07
XCC Backup <ul style="list-style-type: none"> Firmware level (status) Build ID Version number Release date 	XCC Backup (Active) Build: D8BT05I Version: 1.00 Date: 2019-12-30

XCC Network Information

Sub Menu	Example
<ul style="list-style-type: none"> XCC hostname MAC address IPv4 Network Mask IPv4 DNS IPv6 Link Local IP Stateless IPv6 IP Static IPv6 IP Current IPv6 Gateway IPv6 DNS <p>Note: Only the MAC address that is currently in use is displayed (extension or shared).</p>	XCC Network Information XCC Hostname: XCC-xxxx-SN MAC Address: xx:xx:xx:xx:xx:xx IPv4 IP: xx.xx.xx.xx IPv4 Network Mask :x.x.x.x IPv4 Default Gateway : x.x.x.x

System Environmental Information

Sub Menu	Example
<ul style="list-style-type: none"> • Ambient temperature • Exhaust temperature • PSU status • Spinning speed of fans by RPM 	<pre>Ambient Temp: 24 C Exhaust Temp: 30 C PSU1: Vin= 213 w Inlet= 26 C FAN1 Front: 21000 RPM FAN2 Front: 21000 RPM FAN3 Front: 21000 RPM FAN4 Front: 21000 RPM</pre>

Active Sessions

Sub Menu	Example
Quantity of active sessions	Active User Sessions: 1

Actions

Sub Menu	Example
<p>Several quick actions supported for users</p> <ul style="list-style-type: none"> • Restore XCC to Defaults • Force XCC Reset • Request XCC Reset • Clear CMOS • Request Virtual Reseat • Modify XCC Static IPv4 Address/Net mask/Gateway • Modify System Name • Generate/Download FFDC Service Data • Remove FPGA Test Image 	<pre>Request XCC Reset? This will request the BMC to reboot itself. Hold √ for 3 seconds</pre>

Rear view

The rear view of the server varies by model. Depending on the model, your server might look slightly different from the illustrations in this topic.

Refer to the following rear view for different server models:

- [“Server model with three PCIe slots” on page 55](#)
- [“Server model with two PCIe slots” on page 56](#)
- [“Server model with two hot-swap 2.5-inch rear drive bays and one PCIe slot” on page 57](#)
- [“Server model with two hot-swap 7mm rear drive bays and two PCIe slots” on page 58](#)

Server model with three PCIe slots

The following illustration shows the rear view of server model with three PCIe slots. Depending on the model, your server might look slightly different from the illustration below.

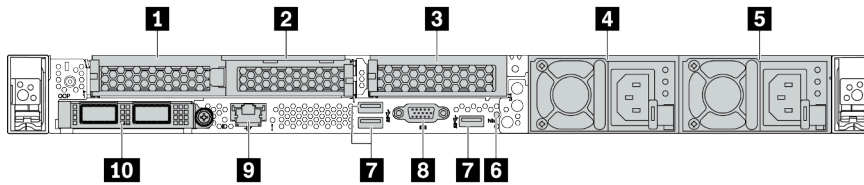


Table 11. Components on the rear of the server

Callout	Callout
1 PCIe slot 1 on riser 1 assembly	2 PCIe slot 2 on riser 1 assembly
3 PCIe slot 3 on riser 2 assembly	4 Power supply 2 (optional)
5 Power supply 1	6 NMI button
7 USB 3.1 Gen 1 connectors (3)	8 VGA connector
9 XClarity Controller network connector	10 Ethernet connectors on OCP 3.0 Ethernet adapter (optional)

Note: For more information about each component, see [“Rear components overview”](#) on page 59.

Server model with two PCIe slots

The following illustration shows the rear view of the server model with two PCIe slots. Depending on the model, your server might look slightly different from the illustration below.

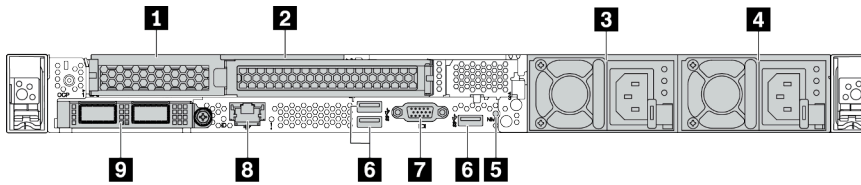


Table 12. Components on the rear of the server

Callout	Callout
1 PCIe slot 1 on riser 1 assembly	2 PCIe slot 2 on riser 1 assembly
3 Power supply 2 (optional)	4 Power supply 1
5 NMI button	6 USB 3.1 Gen 1 connectors (3)
7 VGA connector	8 XClarity Controller network connector
9 Ethernet connectors on OCP 3.0 Ethernet adapter (optional)	

Note: For more information about each component, see [“Rear components overview”](#) on page 59.

Server model with two 2.5-inch hot-swap rear drive bays and one PCIe slot

The following illustration shows the rear view of the server model with two hot-swap drive bays and one PCIe slot. Depending on the model, your server might look slightly different from the illustration below.

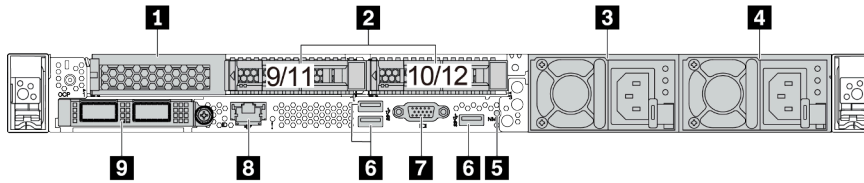


Table 13. Components on the rear of the server

1 PCIe slot 1 on riser 1 assembly	2 Rear 2.5-inch drive bays (2)
3 Power supply 2 (optional)	4 Power supply 1
5 NMI button	6 USB 3.1 Gen 1 connectors (3)
7 VGA connector	8 XClarity Controller network connector
9 Ethernet connectors on OCP 3.0 Ethernet adapter (optional)	

Note: For more information about each component, see [“Rear components overview”](#) on page 59.

Server model with two 7mm hot-swap rear drive bays and two PCIe slots

The following illustration shows the rear view of the server model with two 7mm hot-swap rear drive bays and two PCIe slots. Depending on the model, your server might look slightly different from the illustration below.

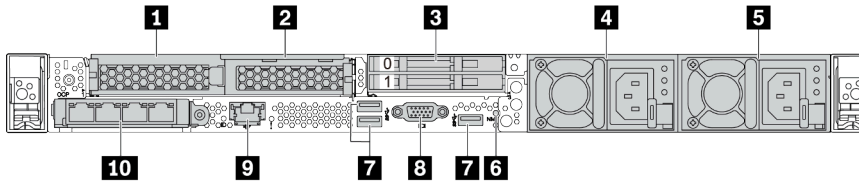


Table 14. Components on the rear of the server

1 PCIe slot 1 on riser 1 assembly	2 PCIe slot 2 on riser 1 assembly
3 Rear 7mm drive bays (2)	4 Power supply 2 (optional)
5 Power supply 1	6 NMI button
7 USB 3.1 Gen 1 connectors ((3 DCIs)	8 VGA connector
9 XClarity Controller network connector	10 Ethernet connectors on OCP 3.0 Ethernet adapter (optional, two or four connectors may be available)

Note: For more information about each component, see [“Rear components overview”](#) on page 59.

Rear components overview

Drive LEDs

Each hot-swap drive comes with an activity LED and status LED and the signals are controlled by the backplanes. Different colors and speeds indicate different activities or status of the drive. The following illustration shows the LEDs on a Hard disk drive or solid-state drive.

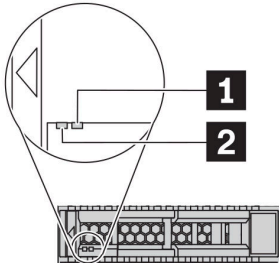


Figure 6. Drive LEDs

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

Ethernet connectors



Figure 7. OCP module (two connectors)



Figure 8. OCP module (four connectors)

Notes:

- The OCP 3.0 Ethernet adapter provides two or four extra Ethernet connectors for network connections.
- By default, Ethernet connector 1 (the first port starting from the left in the rear server view) on the OCP 3.0 Ethernet adapter can also function as a management connector using the shared management capacity. If the shared management connector fails, traffic can automatically switch over to another connector on the adapter.

w

Hot-swap drives and drive bays

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

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

NMI button

Press this button to force a nonmaskable interrupt (NMI) to the processor. By this way, you can make the operating system halt (such as Windows Blue Screen of Death) and take a memory dump. You might have to use a pen or the end of a straightened paper clip to press the button.

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. You can purchase a power supply option from Lenovo and install the power supply to provide power redundancy without turning off the server.

On each power supply, there are three status LEDs near the power cord connector. For information about the LEDs, see [“Rear view LEDs” on page 61](#).

USB 3.1 Gen 1 connectors

The USB 3.1 Gen 1 connectors can be used to attach a USB-compatible device, such as a USB keyboard, USB mouse, or USB storage device.

VGA connector

The VGA connectors on the front and 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.

XClarity Controller network connector

The XClarity Controller network connector can be used to attach an Ethernet cable to manage the baseboard management controller (BMC).

Rear view LEDs

The rear of the server provides system ID LED, system error LED, Ethernet LEDs, and power supply LEDs.

Server rear view LEDs

The following illustration shows the LEDs on the rear view of server model with two PCIe slots. The LEDs on the rear view of other server models are the same.

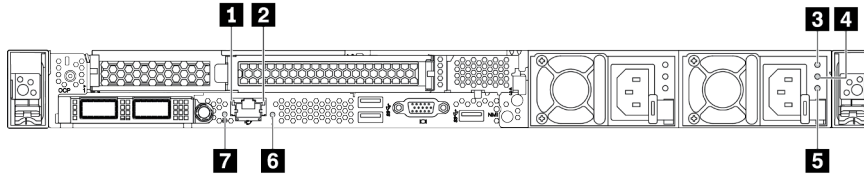


Figure 9. Rear view LEDs

Table 15. LEDs on the rear view of the server

1 Ethernet link LED	2 Ethernet activity LED
3 Power input LED	4 Power output LED
5 Power supply error LED	6 System error LED
7 System ID LED	

1 Ethernet link LED **2** Ethernet activity LED

The BMC network connector has two status LEDs.

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

3 4 5 Power supply LEDs

Each hot-swap power supply has three status LEDs.

LED	Description
3 Power input LED	<ul style="list-style-type: none">• Green: The power supply is connected to the ac power source.• Off: The power supply is disconnected from the ac power source or a power problem occurs.
4 Power output LED	<ul style="list-style-type: none">• Green: The server is on and the power supply is working normally.• Blinking green: The power supply is in the 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 the entire load. When the power load increases, the standby power supply will switch to active state to provide sufficient power to the system. <p>To disable zero-output mode, log in to the Lenovo XClarity Controller web interface, choose Server Configuration → Power Policy, disable Zero Output Mode, and then click Apply. If you disable zero-output mode, both power supplies will be in the active state.</p> <ul style="list-style-type: none">• Off: The server is powered off, or the power supply is not working properly. If the server is powered on but the LED is off, replace the power supply.
5 Power supply error LED	<ul style="list-style-type: none">• Yellow: The power supply has failed. To resolve the issue, replace the power supply.• Off: The power supply is working normally.

6 System ID LED

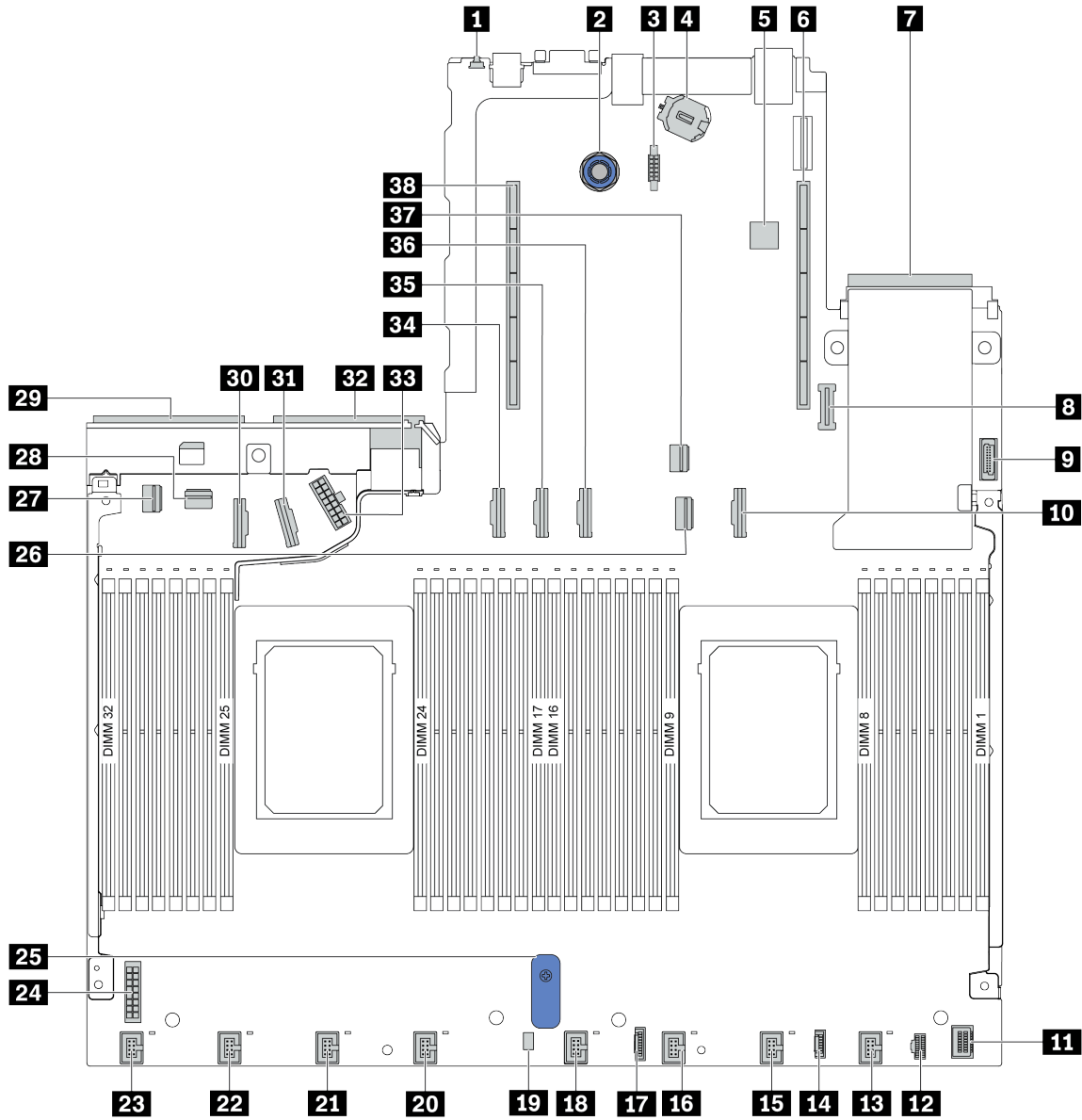
The blue system ID LED helps you visually locate the server. A system ID LED is also located on the front of the server. Each time you press the system ID button, the state of both the system ID LEDs changes. The LEDs can be changed to on, blinking, or off. You can also use the Lenovo XClarity Controller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

7 System error LED

The system error LED helps you determine if there are any system errors. For details, see [“Diagnostics panel” on page 45](#).

System board

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



1 NMI Button	21 System Board Release Pin
3 Serial Port Module Connector	4 CMOS Battery (CR2032)
5 Internal USB Connector	6 Riser 1 slot
7 OCP 3.0 Network Card Connector	8 TPM Module Connector
9 Front USB Connector	10 PCIe Connector 3
11 Front VGA Connector	12 M.2 Power Connector
13 Fan 1 connector	14 Connector for external diagnostics panel

15 Fan 2 connector	16 Fan 3 connector
17 Diagnostics panel connector	18 Fan 4 connector
19 Intrusion Switch cable Connector	20 Fan 5 connector
21 Fan 6 connector	22 Fan 7 connector
23 Fan 8 connector	24 Backplane Power Connector
25 System Board Lift Handle	26 PCIe Connector 1
27 PCIe Connector 4	28 PCIe Connector 5
29 Power Supply 1 Connector	30 PCIe Connector 7
31 PCIe Connector 8	32 Power Supply 2 Connector
33 Internal Raid Power Connector	34 PCIe Connector 6
35 PCIe Connector 9	36 PCIe Connector 10 (Reserved)
37 PCIe Connector 2	38 Riser 2 slot

System board LEDs

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

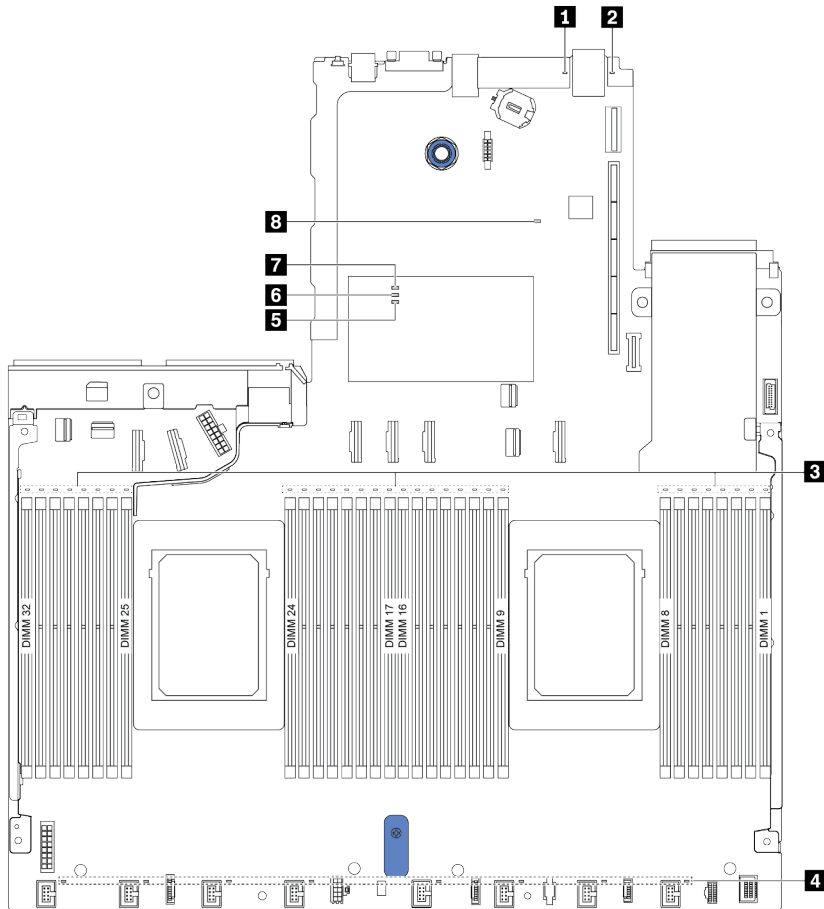


Figure 10. System board LEDs

Table 16. LEDs on the system board

Callout	Callout
1 System error LED	2 System ID LED
3 DIMM error LEDs (32)	4 Fan error LEDs (8)
5 FPGA error LED	6 FPGA heartbeat LED
7 FPGA power LED	8 XCC heartbeat LED

1 System error LED

When this yellow LED is lit, one or more LEDs elsewhere in the server might also be lit to direct you to the source of the error. For more information, see [“Rear view LEDs” on page 61](#).

2 System ID LED

The blue system ID LED helps you visually locate the server. A system ID LED is also located on the front of the server. Each time you press the system ID button, the state of both the system ID LEDs changes. The LEDs can be changed to on, blinking, or off.

3 DIMM error LEDs

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

4 Fan error LEDs

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

5 FPGA error LED

The FPGA error LED helps you identify different FPGA errors.

Status	Color	Description
On	Green	FPGA running image is test build image.
Blinking	Green	<ul style="list-style-type: none">Blinking (blinking slowly, about one flash per second): One or more power faults occur.Blinking (blinking rapidly, about four flashes per second): FPGA does not assert RSMRST_N.
Off	None	No power faults occur.

6 FPGA heartbeat LED

The FPGA heartbeat LED helps you identify different FPGA errors.

Status	Color	Description
On or Off	Green	FPGA does not work.
Blinking	Green	FPGA works normally.

7 FPGA power LED

The FPGA power LED helps you identify different FPGA errors.

Status	Color	Description
On	Green	The FPGA power is on.
Blinking	Green	<ul style="list-style-type: none">Blinking (blinking slowly, about one flash per second): The FPGA power is off.Blinking (blinking rapidly, about four flashes per second): The FPGA permission is delayed.

8 XCC heartbeat LED

The XCC heartbeat LED helps you identify the XCC status.

Status	Color	Description
On	Green	The XCC is not alive.
Blinking	Green	The XCC is alive.
Off	None	The XCC is not alive.

Switch block and jumper

The following illustrates locations and functions of the switch block and jumper on the system board.

Important:

- Before you move any jumpers, turn off the server; then, disconnect all power cords and external cables. Do not open your server or attempt any repair before reading and understanding the following information:
 - http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html
 - “Handling static-sensitive devices” on page 119
- If there is a clear protective sticker on the top of the switch blocks, you must remove and discard it to access the switches.
- Any system-board switch or jumper block that is not shown in the illustrations in this document is reserved.

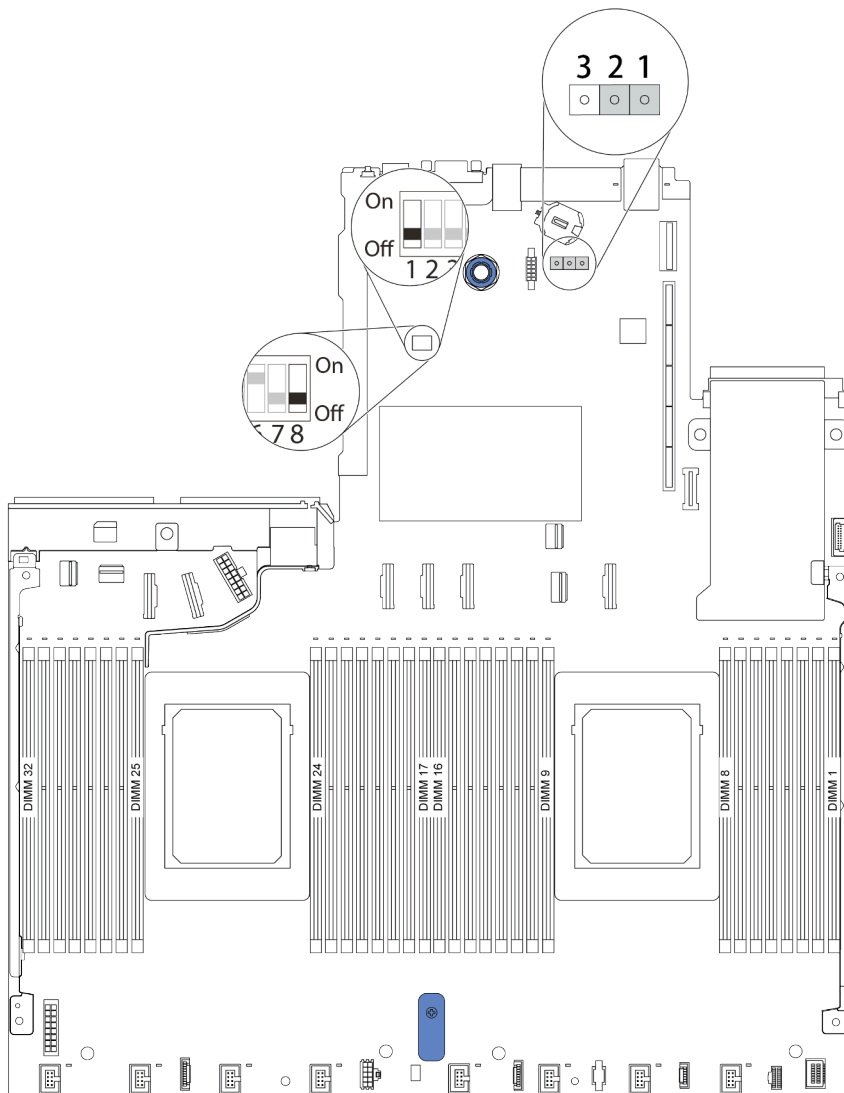


Figure 11. Switch block and jumper locations on system board

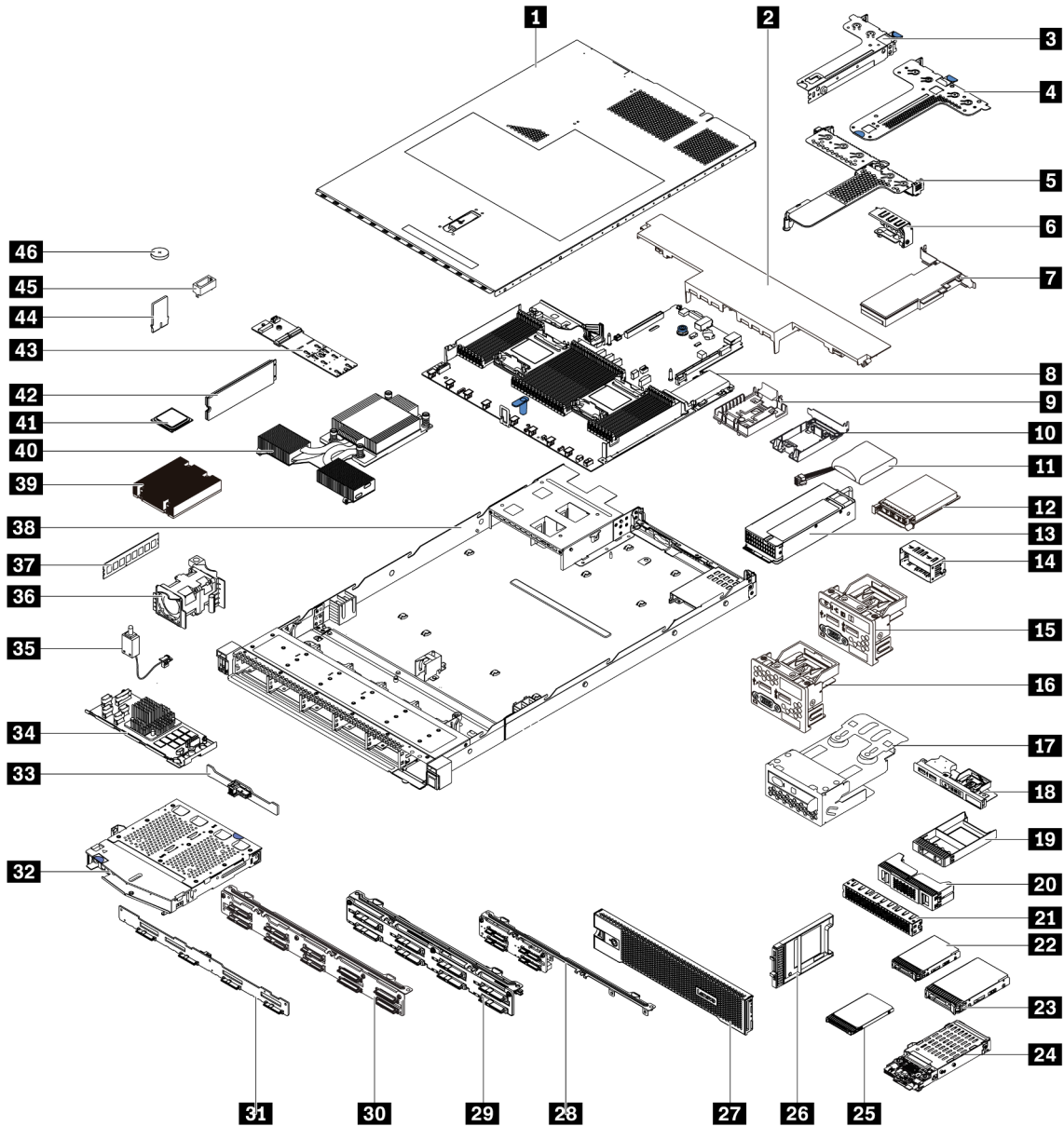
Table 17. Switch block and jumper description

Switch/jumper name	Switch/jumper number	Description
1 Switch 1 block	SW1	<ul style="list-style-type: none"> • Switch 1: One-time power-on password bypass <ul style="list-style-type: none"> – Toggle to ON or OFF to bypass the power-on password for one time. <p style="margin-left: 40px;">Note: The switch cannot skip the privilege administrator password.</p> • Switch 3: TPM physical presence status (Default setting: OFF) <ul style="list-style-type: none"> – Toggle to ON to assert host TPM physical presence, which is required for some security settings. <p style="margin-left: 40px;">Note: This switch is unavailable on servers with 7003 series CPUs.</p> • Switch 4: XCC force update (Default setting: OFF) <ul style="list-style-type: none"> – Toggle to ON to force XClarity Controller firmware to enter the booting mode (For development purpose only). • Switch 5: XCC SPI0 half ROM (Default setting: OFF) <ul style="list-style-type: none"> – Toggle to ON to force XClarity Controller to boot from a backup image. • Switch 6: Low security (Default setting: OFF) <ul style="list-style-type: none"> – Toggle to ON to enable low security mode for XClarity Controller firmware (For development purpose only). • Switch 2, 7, 8: Reserved
2 Clear CMOS jumper	J1	<ul style="list-style-type: none"> • Pins 1 and 2: The jumper is in default setting. • Pins 2 and 3: Clear the real-time clock (RTC) registry.

Parts list

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

Note: Depending on the model, your server might look slightly different from the illustration. Some parts are available only on some models. For more information about ordering the parts, go to: <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr645/7d2x/parts>



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

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

- **C:** Consumable and Structural parts. Purchase and replacement of consumable and structural parts (components, such as a filler or bezel) is your responsibility. If Lenovo acquires or installs a structural component at your request, you will be charged for the service.

Description	Type	Description	Type
1 Top cover	T1	24 7 mm drive assembly (cage+backplanes)	T1
2 Standard air baffle	C	25 7mm drive	T1
3 Riser assembly (LP)	T1	26 7mm drive bay filler	C
4 Riser assembly (LP+LP)	T1	27 Security bezel	T1
5 Riser assembly (LP+FH)	T1	28 4 x 2.5-inch front drive backplane	T1
6 Rearwall bracket	C	29 8 x 2.5-inch front drive backplane	T1
7 PCIe adapter	T1	30 10 x 2.5-inch front drive backplane	T1
8 System board	F	31 4 x 3.5-inch front drive backplane	T1
9 RAID super capacitor holder (on chassis)	C	32 2 x 2.5-inch rear drive cage	T1
10 RAID super capacitor holder (in riser cage)	C	33 2 x 2.5-inch rear drive backplane	T1
11 RAID super capacitor	T1	34 Internal RAID module	T1
12 OCP 3.0 Ethernet adapter	T1	35 Intrusion switch cable	T1
13 Power supply unit	T1	36 Fan module	T1
14 Power supply unit filler	C	37 Memory module	T1
15 Front I/O assembly with diagnostics panel (right)	T1	38 Chassis	F
16 Front I/O assembly	T1	39 Standard heat sink	F
17 LCD diagnostics panel assembly	T1	40 Performance heat sink (T-shape)	F
18 Front I/O assembly with diagnostics panel (top)	T1	41 Processor	F
19 1 x 2.5-inch drive bay filler	C	42 M.2 drive	T1
20 2 x 2 2.5-inch drive bay filler	C	43 M.2 adapter	T1
21 2 x 32.5-inch drive bay filler	C	44 M.2 retainer clip	T1
22 2.5-inch drive	T1	45 TPM adapter (for Chinese Mainland only)	F
23 3.5-inch drive	T1	46 CMOS battery (CR2032)	C

Power cords

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

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

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

Notes:

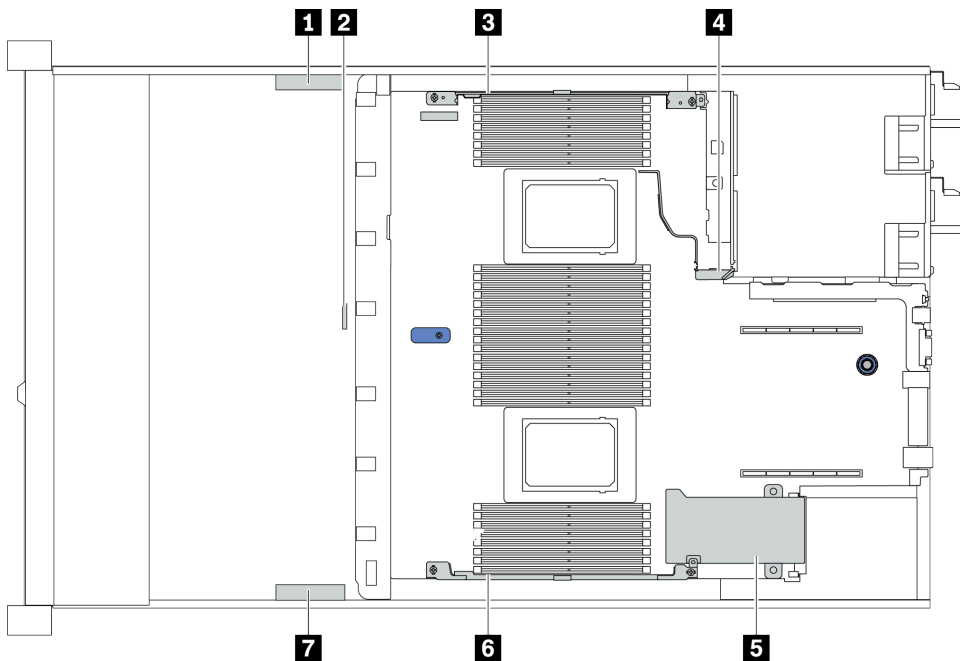
- For your safety, a power cord with a grounded attachment plug is provided to use with this product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.
- Power cords for this product that are used in the United States and Canada are listed by Underwriter's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

Chapter 3. Internal cable routing

See this section to do cable routing for specific components.

Observe the following guidelines when connecting or disconnecting internal cables:

- Turn off the server before connecting or disconnecting any internal cables.
- See the documentation that comes with any external devices for additional cabling instructions.
- Use the identifiers printed on the cables to locate the proper 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.

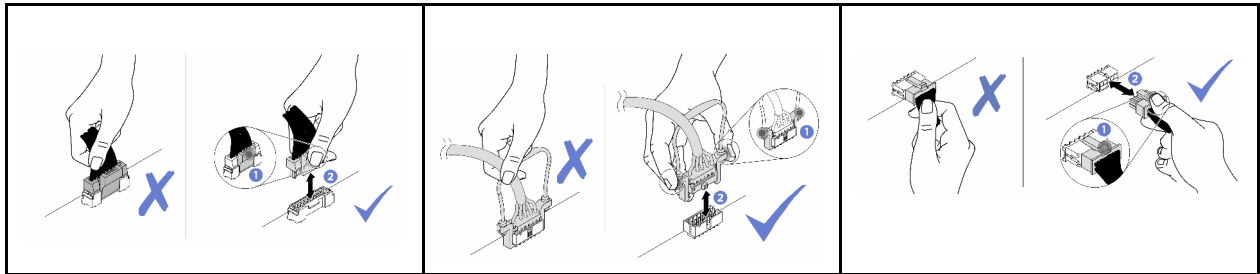


Cable holder	Route
1 3 4	Route to BP Pwr connector, Raid Pwr connector, and PCIe connectors (4, 5, 7, 8)
2	Route to intrusion switch cable
5 6 7	Route to FIO connector, LCD external connector, M.2 Pwr connector, VGA 2 connector, Front USB connector, PCIe connectors (1-3, 6, 9, 10), and Raid/HBA connectors

Attention: Strictly observe the following instructions to avoid damaging cable sockets on the system board. Any damage to the cable sockets might require replacing the system board.

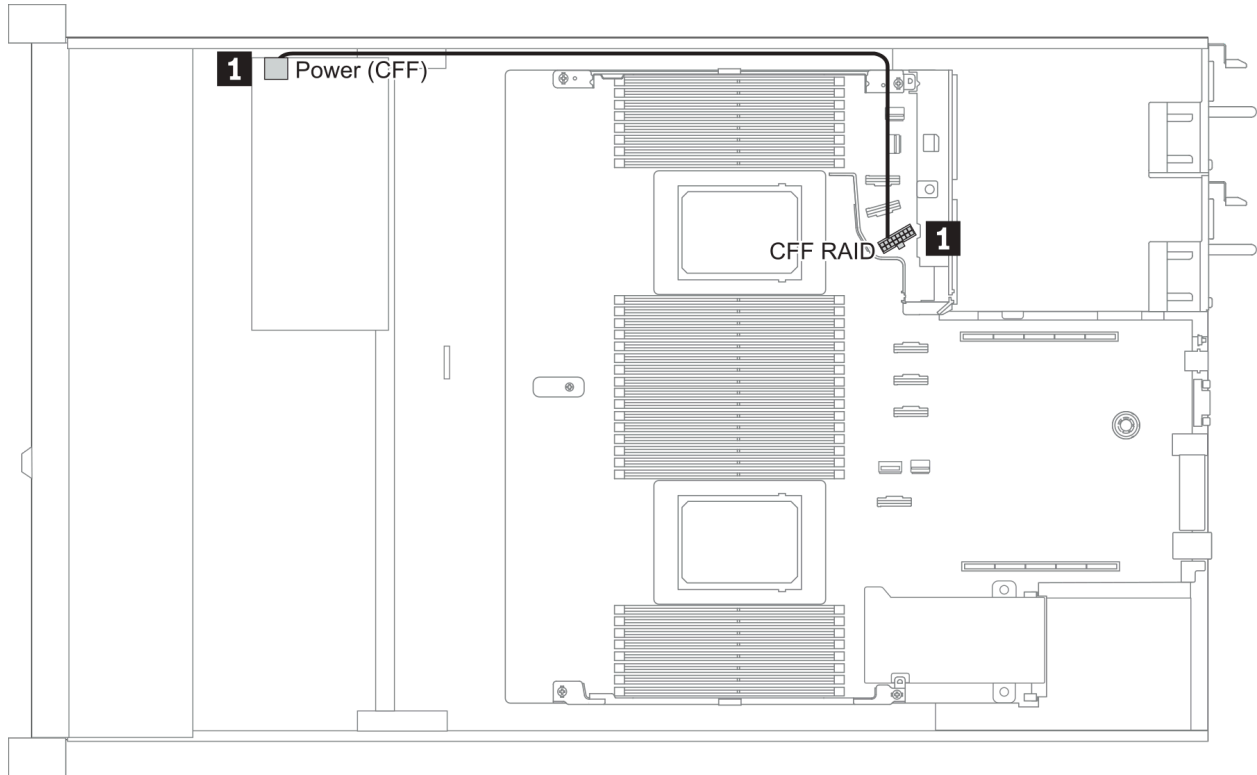
- Connect cable connectors vertically or horizontally in alignment with the orientations of the corresponding cable sockets, avoiding any tilt.
- To disconnect cables from the system board, do as follows:
 1. Press and hold all latches, release tabs, or locks on cable connectors to release the cable connectors.
 2. Remove the cable connectors vertically or horizontally in alignment with the orientations of the corresponding cable sockets, avoiding any tilt.

Note: The cable connectors might look different from those in the illustration, but the removal procedure is the same.



CFF RAIR/HBA adapter cable routing

Note: The illustration only involves power cable routing, for signal cable routing of CFF RAID/HBA adapters, see [“2.5-inch/3.5-inch drive backplane cable routing \(signal\)”](#) on page 83



From	To
1 Power connector on the CFF RAID/HBA adapter	CFF RAID connector on the system board

FIO cable routing

Note: The illustration shows the cabling scenario for server models with four 3.5-inch front drive bays. Location of each connector on the front of the server varies by models. For detailed location of front I/O components for different models, see “Front view” on page 33.

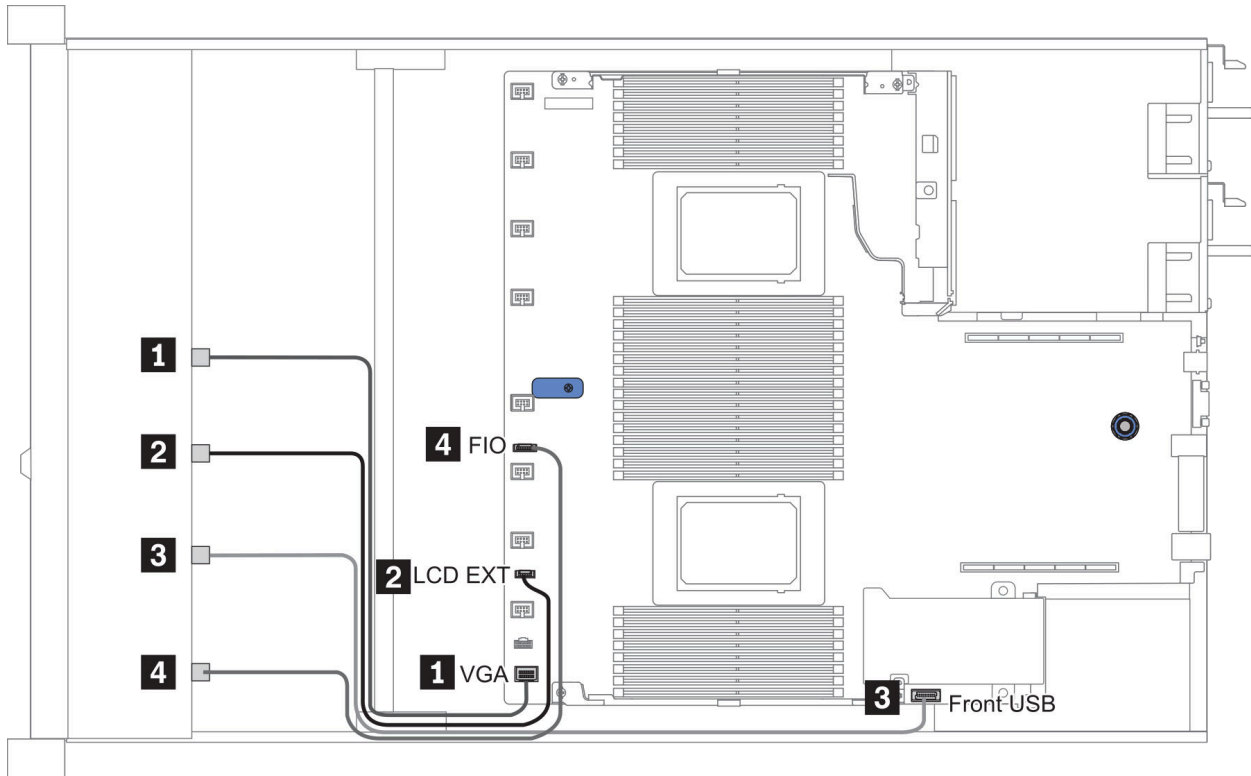


Figure 12. FIO cable routing

From	To
1 VGA cable	VGA connector on the system board
2 LCD external diagnostics handset cable	LCD EXT connector on the system board
3 USB cable	Front USB connector on the system board
4 Front diagnostic panel cable	FIO connector on the system board

Intrusion switch cable routing

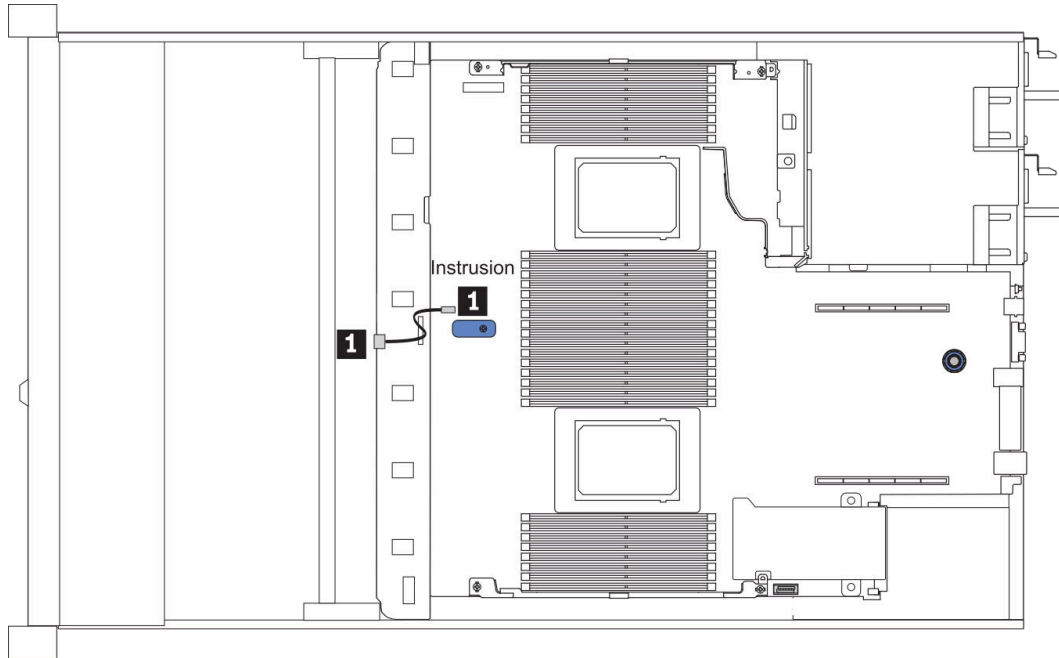
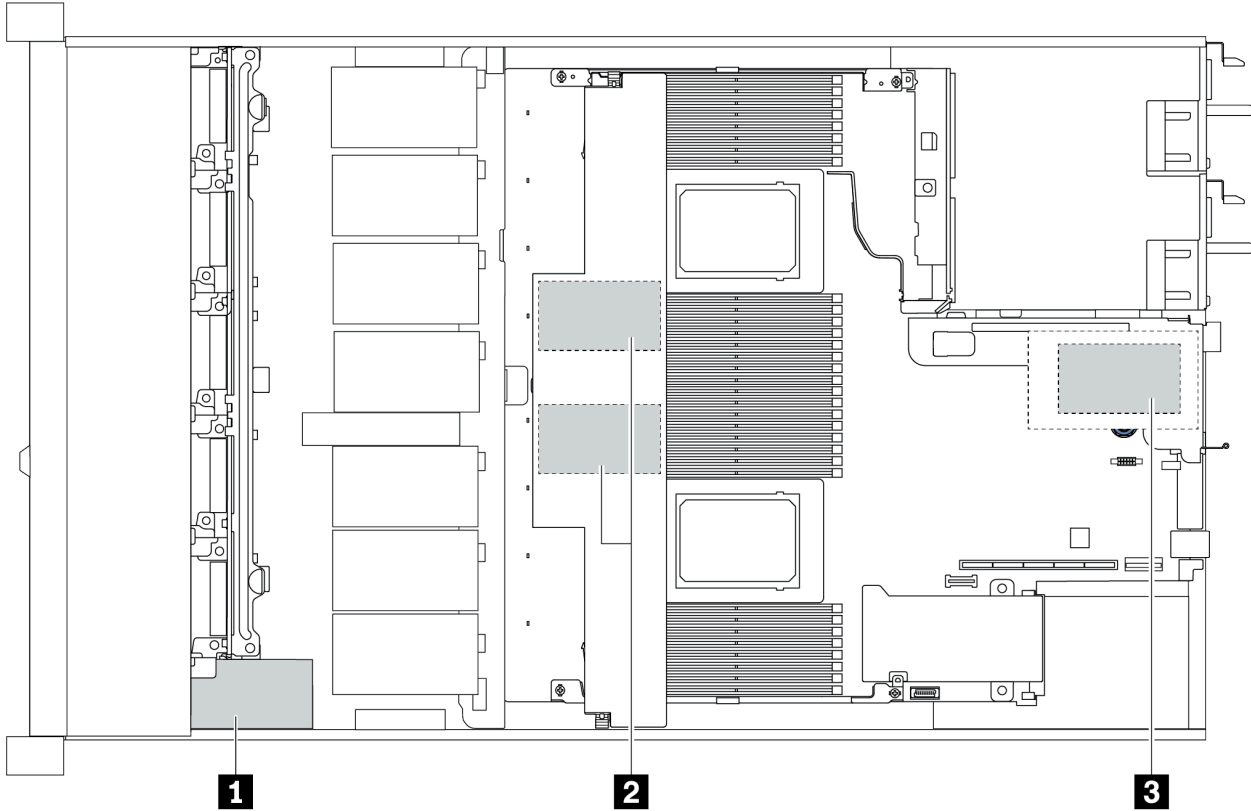


Figure 13. Intrusion switch cable routing

From	To
1 Intrusion switch cable on the fan cage	Intrusion switch connector on the system board

Super capacitor cable routing

RAID super capacitor module location



1	Super capacitor on the chassis
2	Super capacitors in the air baffle
3	Super capacitors in riser 3 assembly

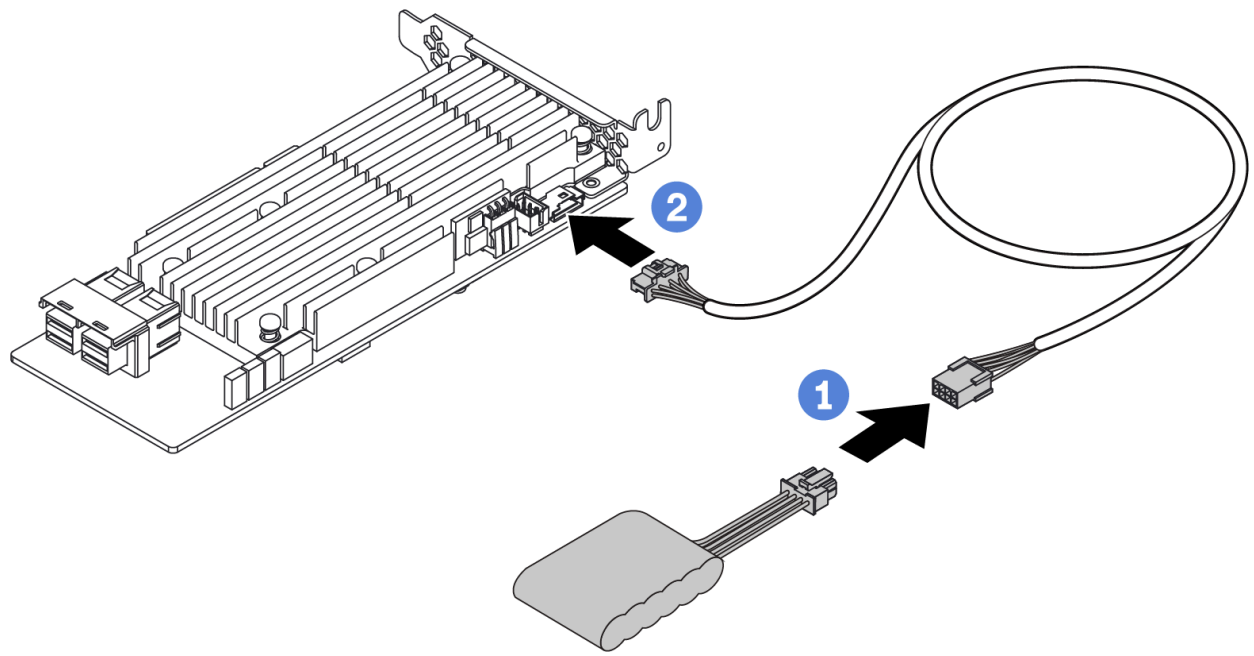


Figure 14. Super capacitor cable routing

7mm drive backplane cable routing (power & signal)

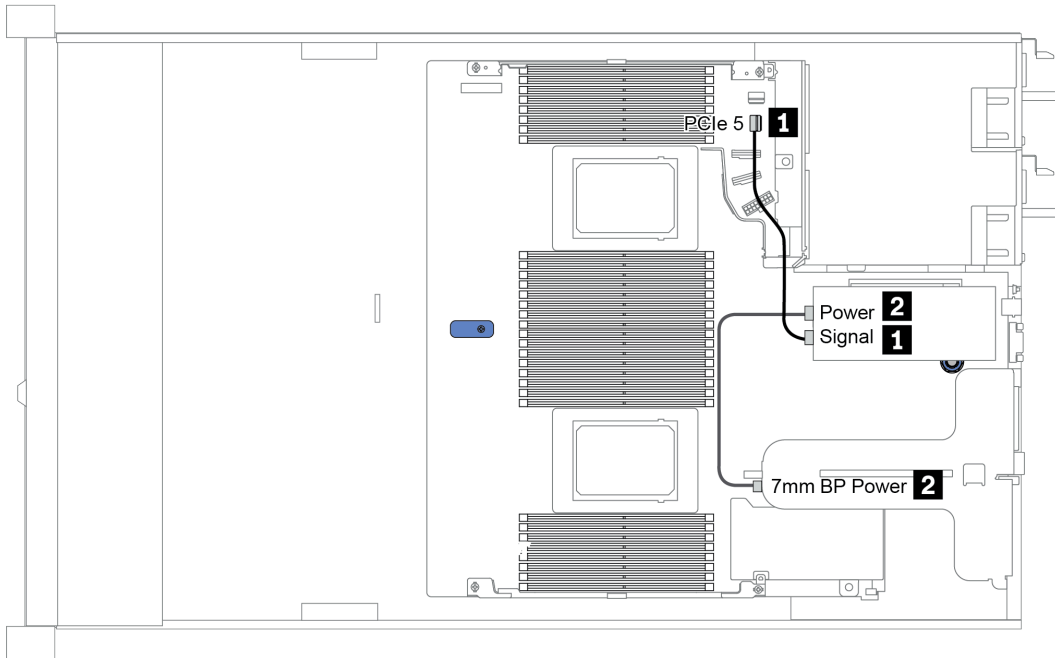


Figure 15. 7mm cable routing

From	To
1 7mm signal cable	PCIe connector 5 on the system board
2 Power cable	7mm power connector on riser 1 assembly

M.2 drive backplane cable routing (power & signal)

M.2 drives can be installed on the chassis (scenario 1) or 3.5-inch front drive cage (scenario 2). The figure illustrates cable connections in scenario 1. The cable connections for the other scenario is the same.

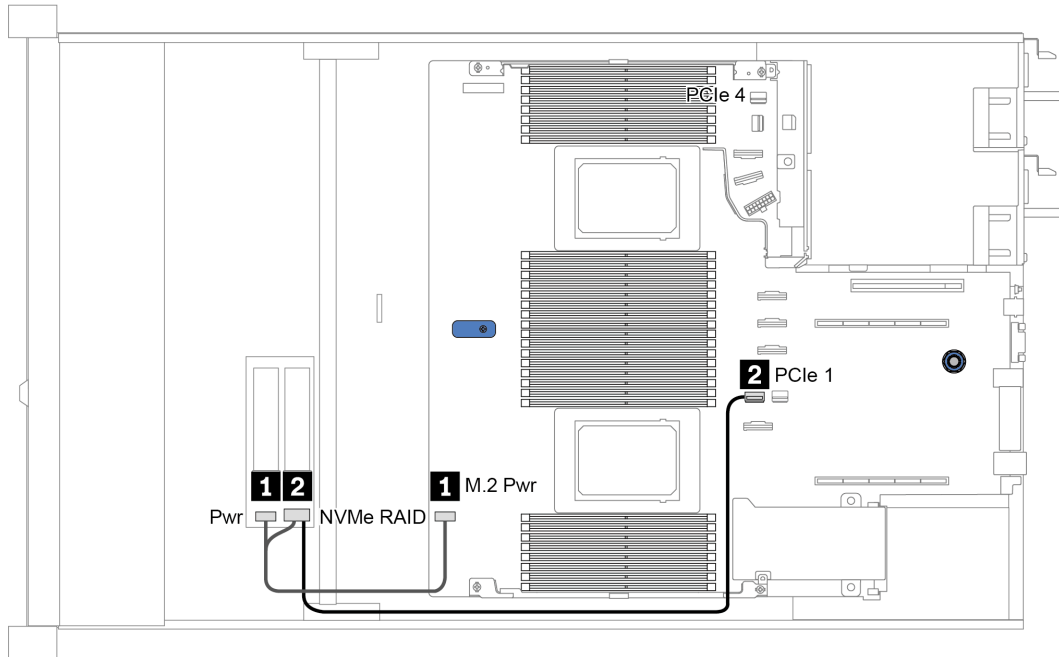
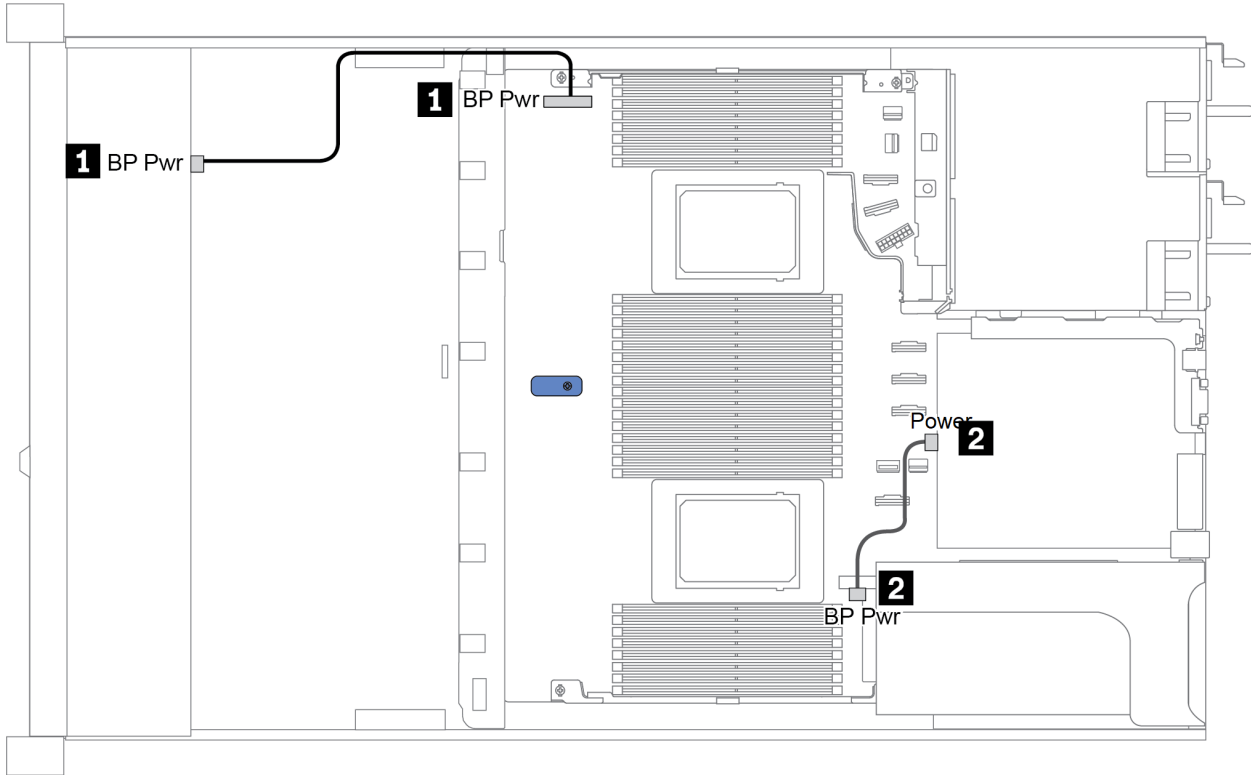


Figure 16. M.2 cable routing

From	To
1 Power cable	M.2 power connector on the system board
2 M.2 signal cable	<ul style="list-style-type: none"> • PCIe connector 1 or 4 on the system board (two processors installed)^{note} • PCIe connector 1 on the system board (one processor installed) <p>Notes: When two processors are installed, the M.2 signal cable needs to be connected to PCIe connector 4 only when your server is configured with one of the following front drive backplanes:</p> <ul style="list-style-type: none"> • 10 x 2.5" (10 AnyBay) • 10 x 2.5" (10 NVMe) • 10 x 2.5" (8 AnyBay + 2 NVMe)

2.5-inch/3.5-inch drive backplane cable routing (power)

Power cable routing for 2.5-inch or 3.5-inch drive backplanes



From	To
1 Power connector on the front drive backplane	BP power connector on the system board
2 Power connector on the rear drive backplane	Power connector on riser card on riser 1 assembly

2.5-inch/3.5-inch drive backplane cable routing (signal)

Note: The cable routing figures in the following sections illustrate only PCIe Gen 4 adapters, the routing is similar for Gen 3 adapters.

- “2.5-inch (4 SAS/SATA)” on page 84
- “2.5-inch (8 SAS/SATA)” on page 85
- “3.5-inch (4 SAS/SATA)” on page 108
- “3.5-inch (4 AnyBay)” on page 112
- “2.5-inch (10 AnyBay)” on page 90
- “2.5-inch (10 NVMe)” on page 94
- “2.5-inch (10 SAS/SATA)” on page 88
- “2.5-inch (8 AnyBay + 2 NVMe)” on page 98
- “2.5-inch (6 SAS/SATA + 4 AnyBay)” on page 100
- “2.5-inch (6 SAS/SATA + 4 NVMe)” on page 104
- “2.5-inch (6 SAS/SATA + 2 AnyBay + 2 NVMe)” on page 106

2.5-inch (4 SAS/SATA)

Configuration	Storage controller	
	Qty.	Type
Config. 1		
Config. 2	1	SFF 8i RAID/HBA

Depending on your server configurations, refer to one of the following sections for cable routing information.

Configuration 1, 2:

Front BP: 4 x 2.5" SAS/SATA BP

Config.	Front BP	System board	Storage controller
			SFF 8i RAID/HBA
1	SAS 0	PCIe 2	
2	SAS 0, SAS 1		Gen 4: C 0 Gen 3: C 0, C 1

Example

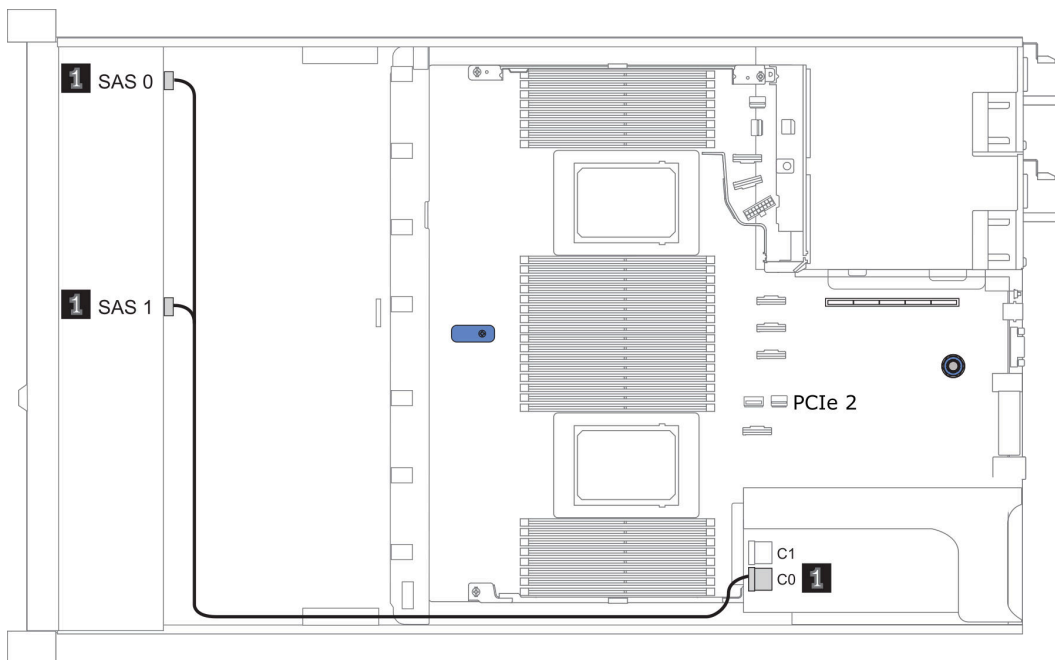


Figure 17. Configuration 2

2.5-inch (8 SAS/SATA)

Configuration	Rear BP		Storage controller	
	Qty.	Type	Qty.	Type
Config. 1				
Config. 2			1	SFF 8i RAID/HBA
Config. 3			1	CFF 8i/16i RAID/HBA
Config. 4	1	2 x 2.5" SAS/SATA		
Config. 5	1	2 x 2.5" SAS/SATA	1	SFF 8i RAID
Config. 6	1	2 x 2.5" SAS/SATA	1	CFF 16i RAID/HBA

Depending on your server configurations, refer to one of the following sections for cable routing information.

- [“Configuration 1 – 3: front BP” on page 86](#)
- [“Configuration 4 – 6: front BP + rear BP” on page 87](#)

Configuration 1 – 3:

Front BP: 8 x 2.5" SAS/SATA BP

Con-fig.	Front BP	System board	Storage controller	
			SFF 8i RAID/HBA	CFF 8i/16i RAID/HBA
1	SAS 0	PCle 2		
	SAS 1	PCle 4		
2	SAS 0, SAS 1		Gen 4: C 0 Gen 3: C 0, C 1	
3	SAS 0			C 0
	SAS 1			C 1
		<ul style="list-style-type: none"> • When two processors installed: PCIe 8 • When one processor installed: PCIe 3 		MB

Example

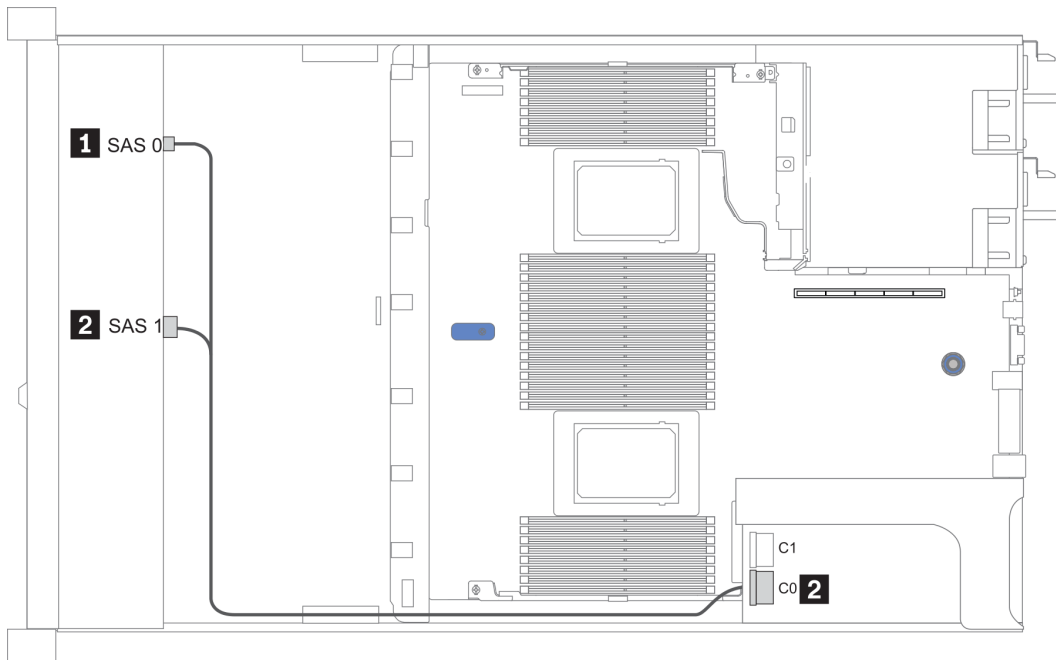


Figure 18. Configuration 2

Configuration 4 – 6:

Front BP: 8 x 2.5" SAS/SATA BP

Rear BP: 2 x 2.5" SAS/SATA BP

Con-fig.	Front BP	Rear BP	System board	Storage controller	
				SFF 8i RAID	CFF 16i RAID/HBA
4	SAS 0		PCIe 2		
	SAS 1		PCIe 4		
		SAS	PCIe 5		
5	SAS 0, SAS 1			Gen 4: C 0 Gen 3: C 0, C 1	
		SAS	PCIe 5		
6	SAS 0				C 0
	SAS 1				C 1
			PCIe 8		MB
		SAS			C 3

Example

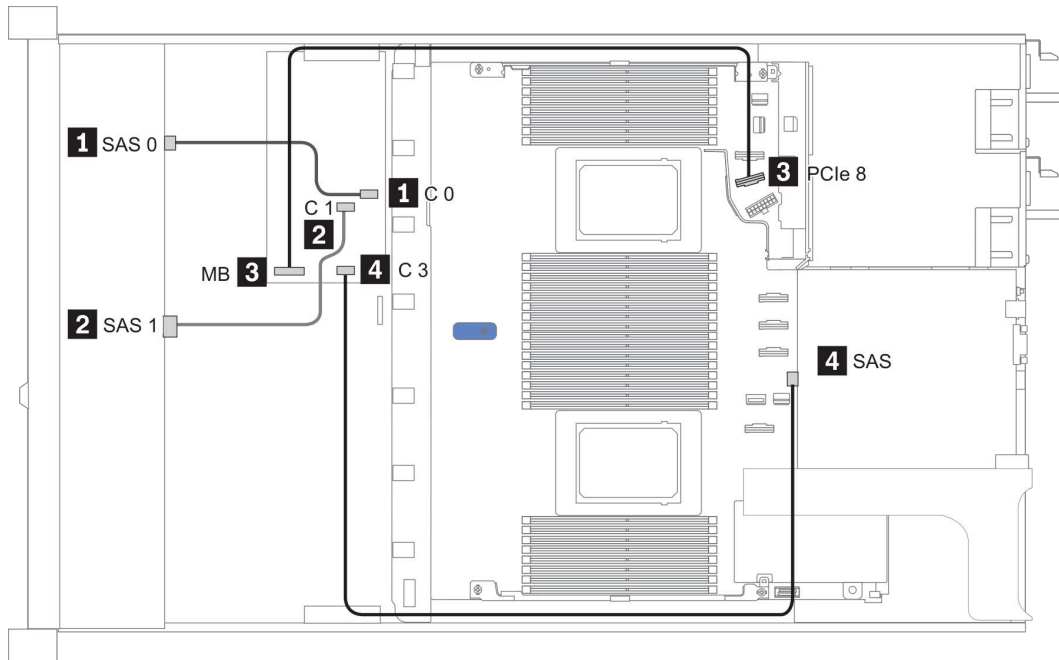


Figure 19. Configuration 6

2.5-inch (10 SAS/SATA)

Configuration	Rear BP		Storage controller	
	Qty.	Type	Qty.	Type
Config. 1			1	SFF 16i RAID/HBA
Config. 2	1	2 x 2.5" SAS/SATA		
Config. 3	1	2 x 2.5" SAS/SATA	1	SFF 16i RAID/HBA

Configuration 1:

Front BP: [6 x 2.5" SAS/SATA + 4 x 2.5" Anybay] BP used as pure SAS/SATA BP

Table 18. Cable routing information for configuration 1

Config.	Front BP	Storage controller
		SFF 16i RAID/HBA
1	SAS 0, SAS 1	Gen 4: C 0 Gen 3: C 0, C 1
	SAS 2	Gen 4: C 1 Gen 3: C 2

Example

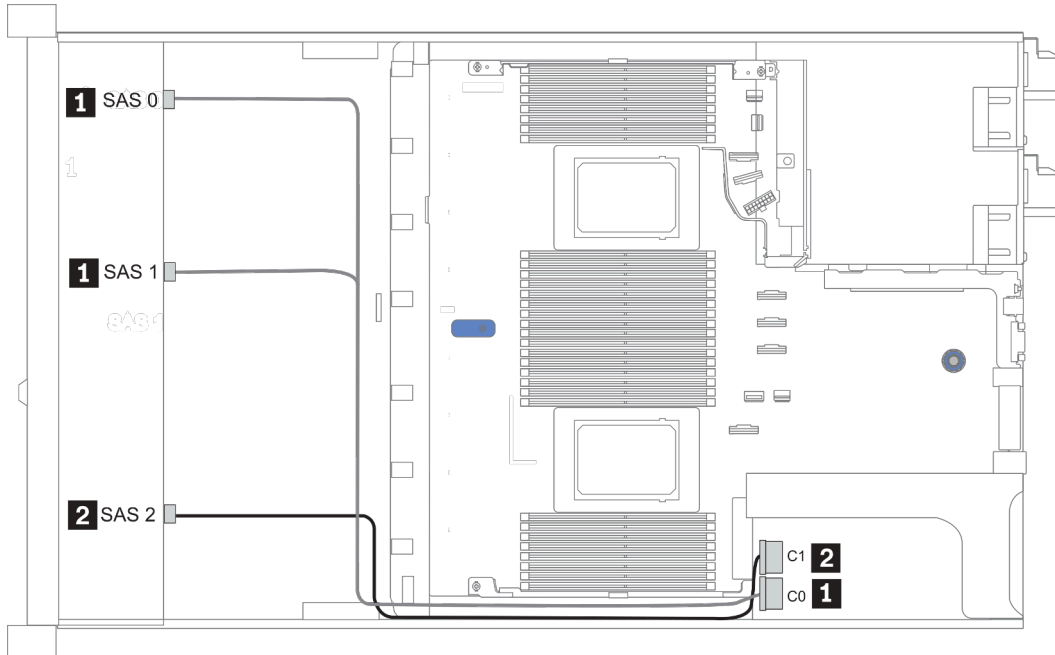


Figure 20. Configuration 1

Configurations 2-3:

Front BP: [6 x 2.5" SAS/SATA + 4 x 2.5" Anybay] BP used as pure SAS/SATA BP

Rear BP: 2 x 2.5" SAS/SATA BP

Table 19. Configurations 2-3

Config.	Front BP	Rear BP	System board	Storage controller
				SFF 16i RAID/HBA
2	NVMe 0-1		PCIe 3	
	NVMe 2-3		PCIe 7	
	SAS 0		PCIe 2	
	SAS 1		PCIe 4	
	SAS 2	SAS	PCIe 5	
3	NVMe 0-1		PCIe 3	
	NVMe 2-3		PCIe 7	
	SAS 0, SAS 1			Gen 4: C 0 Gen 3: C 0, C 1
	SAS 2	SAS		Gen 4: C 1 Gen 3: C 2, C 3

Example

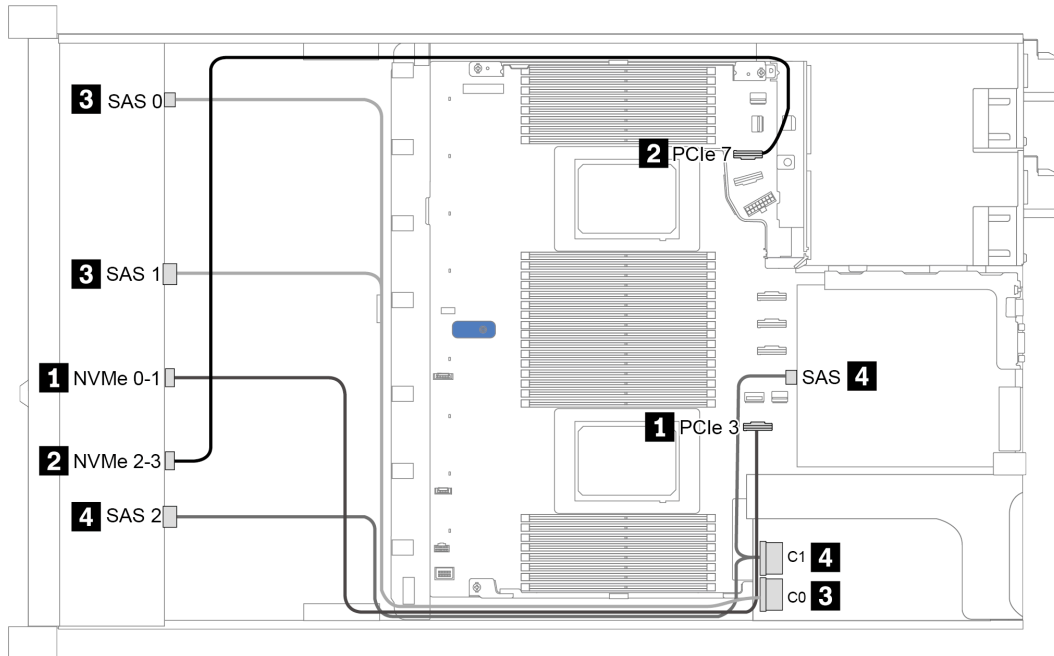


Figure 21. Configuration 3

2.5-inch (10 AnyBay)

Configuration	Rear BP		Storage controller	
	Qty.	Type	Qty.	Type
Config. 1			1	SFF 16i RAID/HBA
Config. 2			1	SFF 16i RAID(Tri-mode)
Config. 3	1	2 x 2.5" SAS/SATA	1	SFF 16i RAID/HBA
Config. 4	1	2 x 2.5" NVMe	1	SFF 16i RAID/HBA

Depending on your server configurations, refer to one of the following sections for cable routing information.

- [“Configuration 1 – 2: front BP” on page 91](#)
- [“Configuration 3 – 4: front BP + rear BP” on page 92](#)

Configuration 1:

Front BP: 10 x 2.5" AnyBay BP

Note: Connectors marked with asterisk (*) are NOT needed for single CPU configuration.

Con-fig.	Front BP	System board	Storage controller	
			SFF 16i RAID/HBA	SFF 16i RAID(Tri-mode)
1	NVMe 0-1	PCIe 1, PCIe 2		
	NVMe 2-3	PCIe 3		
	*NVMe 4-5	*PCIe 7		
	*NVMe 6-7	*PCIe 8		
	*NVMe 8-9	*PCIe 6		
	SAS 0, SAS 1		Gen 4: C 0 Gen 3: C 0, C 1	
SAS 2		Gen 3: C 2		
2	SAS 0, SAS 1			Gen 4: C 0
	SAS 2			Gen 4: C 1

Example

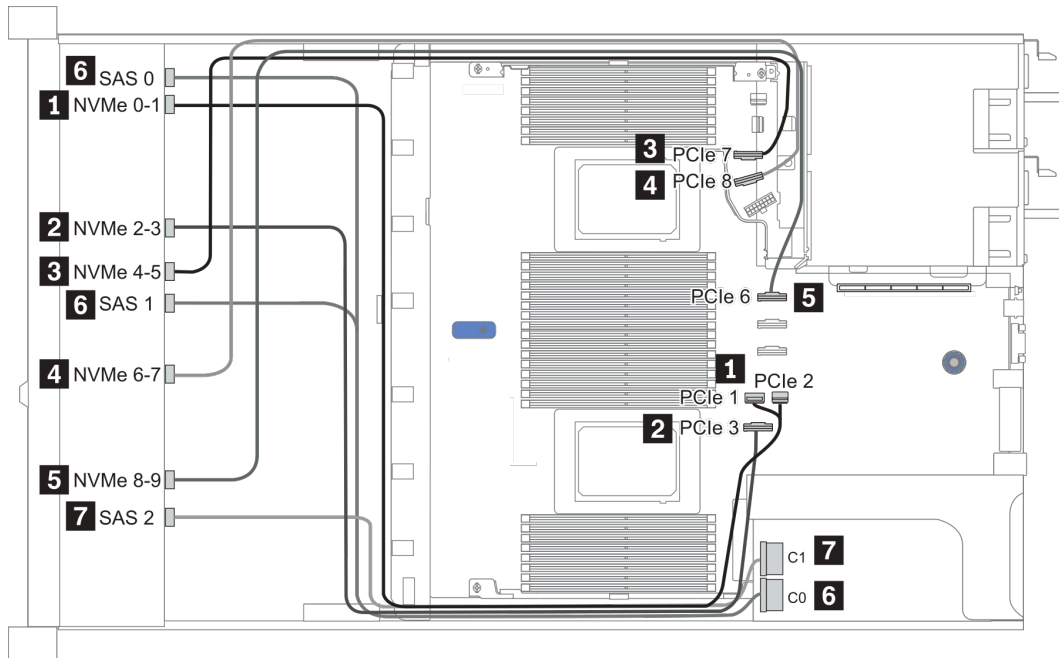


Figure 22. Configuration 1

Configuration 2 – 3:

Front BP: 10 x 2.5" AnyBay BP

Rear BP: 2 x 2.5" NVMe BP/ 2 x 2.5" SAS/SATA BP

Con-fig.	Front BP	Rear BP	System board	Storage controller
				SFF 16i RAID/HBA
3	NVMe 0-1		PCIe 1, PCIe 2	
	NVMe 2-3		PCIe 3	
	NVMe 4-5		PCIe 7	
	NVMe 6-7		PCIe 8	
	NVMe 8-9		PCIe 6	
	SAS 0, SAS 1			Gen 4: C 0 Gen 3: C 0, C 1
	SAS 2	SAS		Gen 4: C 1 Gen 3: C 2, C 3
4	NVMe 0-1		PCIe 1, PCIe 2	
	NVMe 2-3		PCIe 3	
	NVMe 4-5		PCIe 7	
	NVMe 6-7		PCIe 8	
	NVMe 8-9		PCIe 6	
	SAS 0, SAS 1			Gen 4: C 0 Gen 3: C 0, C 1
	SAS 2			Gen 4: C 1 Gen 3: C 2
		NVMe 0, NVMe 1	PCIe 9	

Example

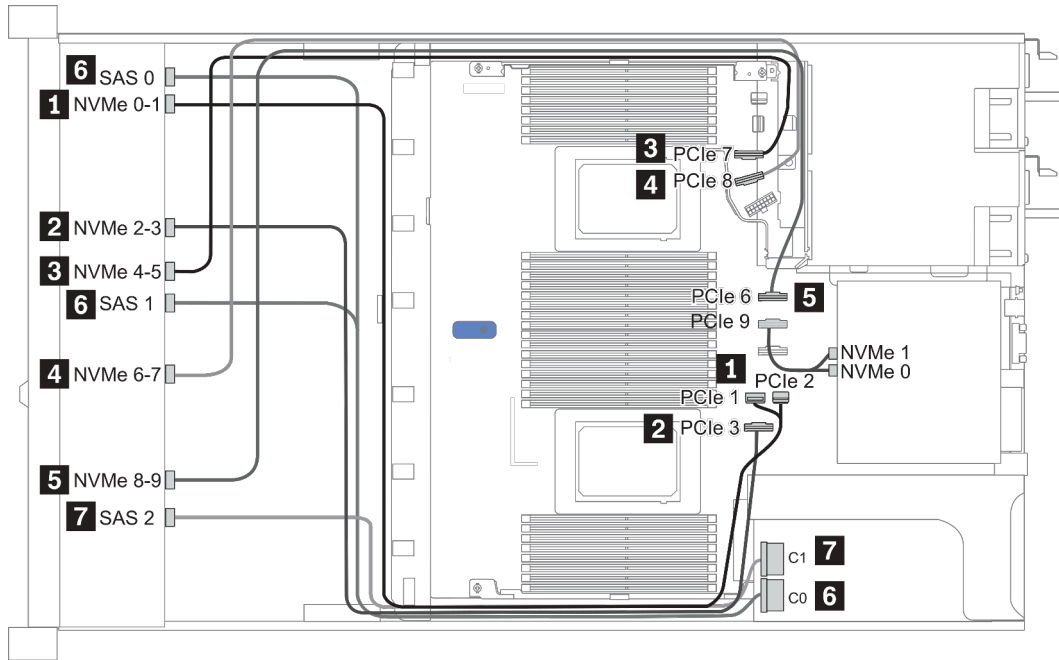


Figure 23. Configuration 3

2.5-inch (10 NVMe)

Configuration	Rear BP		Storage controller	
	Qty.	Type	Qty.	Type
Config. 1				
Config. 2			2	NVMe Retimer card
Config. 3	1	2 x 2.5" NVMe		
Config. 4	1	2 x 2.5" SAS/SATA		

Depending on your server configurations, refer to one of the following sections for cable routing information.

- [“Configuration 1: front BP \(onboard connectors\)” on page 95](#)
- [“Configuration 2: front BP \(retimer card\)” on page 95](#)
- [“Configuration 3 – 4: front BP + rear BP” on page 97](#)

Configuration 1:

Front BP: 10 x 2.5" Anybay BP used as pure NVMe BP

Table 20. Cable routing information for configuration 1

Config.	Front BP	System board
1	NVMe 0-1	PCIe 1, PCIe 2
	NVMe 2-3	PCIe 3
	NVMe 4-5	PCIe 7
	NVMe 6-7	PCIe 8
	NVMe 8-9	PCIe 6

Example

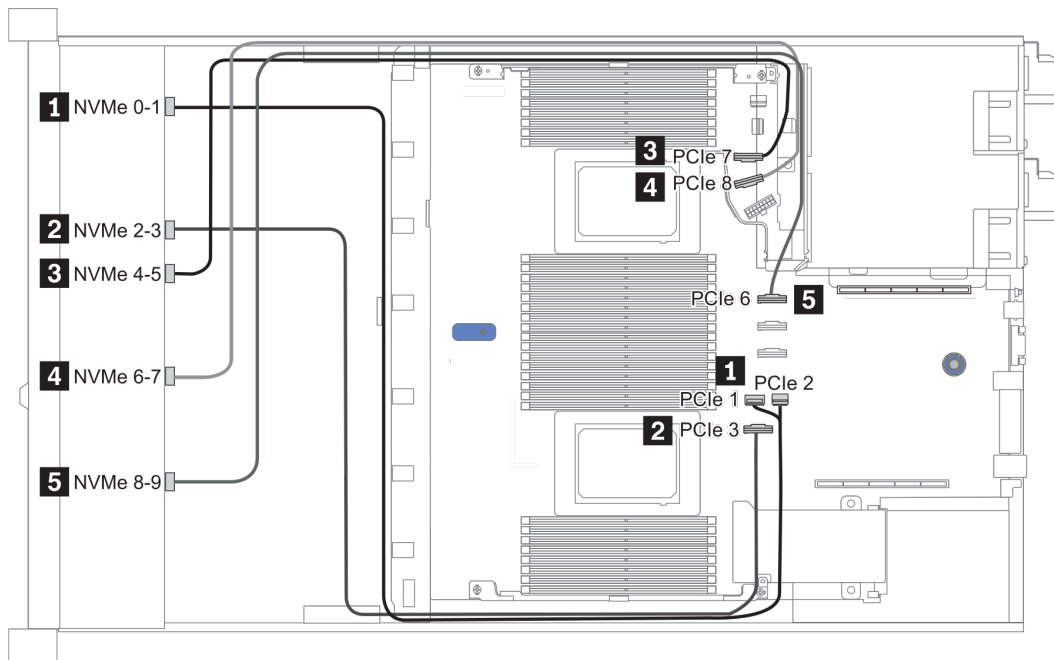


Figure 24. Configuration 1

Configuration 2:

Table 21. Cable routing information for configuration 2

Con-fig.	Front BP	System board	Retimer card	
			Slot 1	Slot 2
2	NVMe 0-1	PCIe 3		
	NVMe 2-3		C0	
	NVMe 4-5		C1	
	NVMe 6-7			C0
	NVMe 8-9			C1

Example

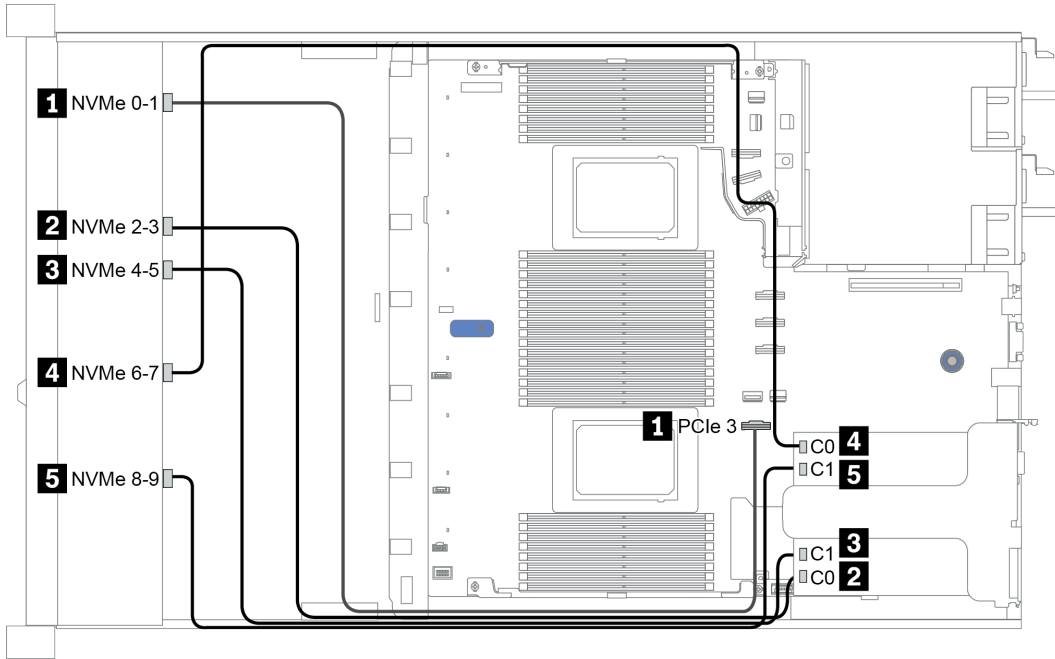


Figure 25. Configuration 2

Configuration 3 – 4:

Front BP: 10 x 2.5" Anybay BP used as pure NVMe BP

Rear BP: 2 x 2.5" NVMe BP/ 2 x 2.5" SAS/SATA BP

Config.	Front BP	Rear BP	System board
3	NVMe 0-1		PCIe 1, PCIe 2
	NVMe 2-3		PCIe 3
	NVMe 4-5		PCIe 7
	NVMe 6-7		PCIe 8
	NVMe 8-9		PCIe 6
			NVMe 0, NVMe 1
4	NVMe 0-1		PCIe 1, PCIe 2
	NVMe 2-3		PCIe 3
	NVMe 4-5		PCIe 7
	NVMe 6-7		PCIe 8
	NVMe 8-9		PCIe 6
			SAS

Example

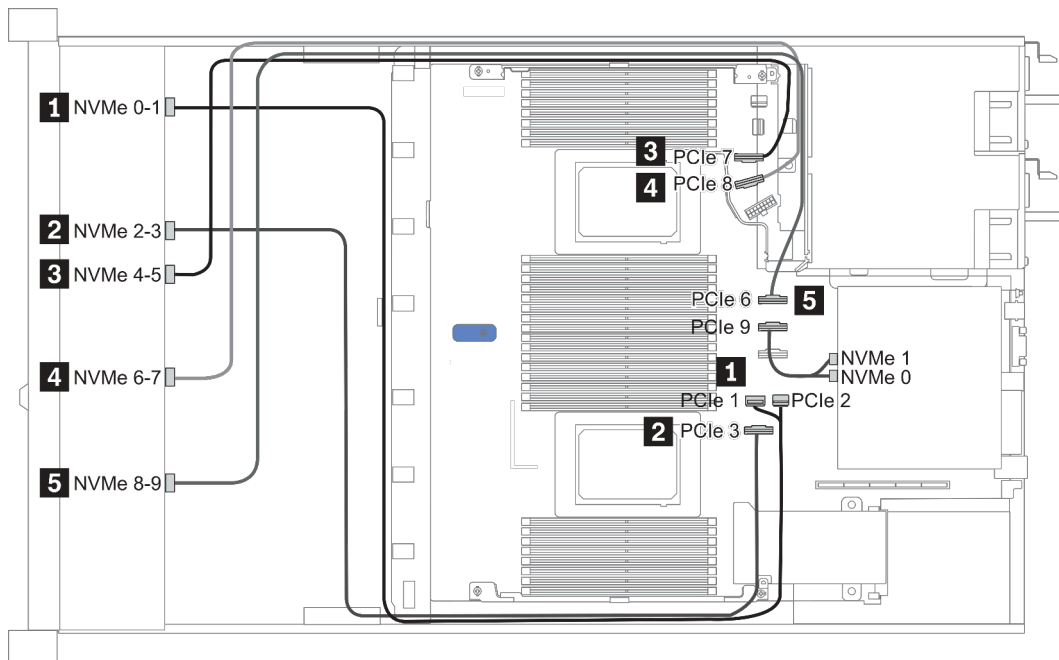


Figure 26. Configuration 3

2.5-inch (8 AnyBay + 2 NVMe)

Configuration	Storage controller	
	Qty.	Type
Config. 1		
Config. 2	1	SFF 8i RAID/HBA

Configuration 1 – 2:

Front BP: 10 x 2.5" Anybay BP used as [8 x 2.5" AnyBay + 2 x 2.5" NVMe] BP

Config.	Front BP	System board	Storage controller
			SFF 8i RAID/HBA
1	NVMe 0-1	PCIe 1, PCIe 2	
	NVMe 2-3	PCIe 3	
	NVMe 4-5	PCIe 7	
	NVMe 6-7	PCIe 8	
	NVMe 8-9	PCIe 6	
	SAS 0	PCIe 4	
	SAS 1	PCIe 5	
2	NVMe 0-1	PCIe 1, PCIe 2	
	NVMe 2-3	PCIe 3	
	NVMe 4-5	PCIe 7	
	NVMe 6-7	PCIe 8	
	NVMe 8-9	PCIe 6	
	SAS 0, SAS 1		Gen 4: C 0 Gen 3: C 0, C 1

Example

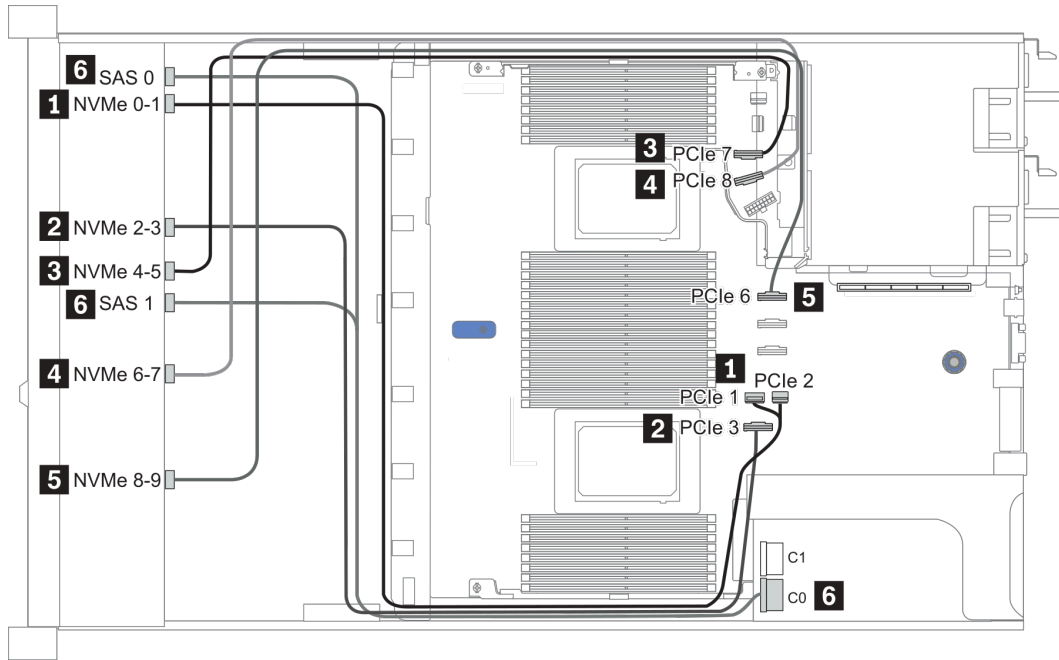


Figure 27. Configuration 1

2.5-inch (6 SAS/SATA + 4 AnyBay)

Configuration	Rear BP		Storage controller	
	Qty.	Type	Qty.	Type
Config. 1				
Config. 2			1	SFF 16i RAID/HBA
Config. 3			1	CFF 16i RAID/HBA
Config. 4	1	2 x 2.5" SAS/SATA		
Config. 5	1	2 x 2.5" SAS/SATA	1	CFF 16i RAID/HBA

Depending on your server configurations, refer to one of the following sections for cable routing information.

- [“Configuration 1 – 3: front BP” on page 101](#)
- [“Configuration 4 – 5: front BP + rear BP” on page 103](#)

Configuration 1 – 3:

Front BP: [6 x 2.5" SAS/SATA + 4 x 2.5" Anybay] BP

Co- nfig.	Front BP	System board	Storage controller	
			SFF 16i RAID/HBA	CFF 16i RAID/HBA
1	NVMe 0-1	PCIe 3		
	NVMe 2-3	PCIe 7		
	SAS 0	PCIe 2		
	SAS 1	PCIe 4		
	SAS 2	PCIe 5		
2	NVMe 0-1	2 CPUs installed: PCIe 3 1 CPU installed: PCIe 1, PCIe 2		
	NVMe 2-3	2 CPUs installed: PCIe 7 1 CPU installed: PCIe 3		
	SAS 0, SAS 1		Gen 4: C 0 Gen 3: C 0, C 1	
	SAS 2		Gen 4: C 1 Gen 3: C 2	
3	NVMe 0-1	PCIe 3		
	NVMe 2-3	PCIe 7		
	SAS 0			C 0
	SAS 1			C 1
	SAS 2			C 2
		PCIe 8		MB

Example

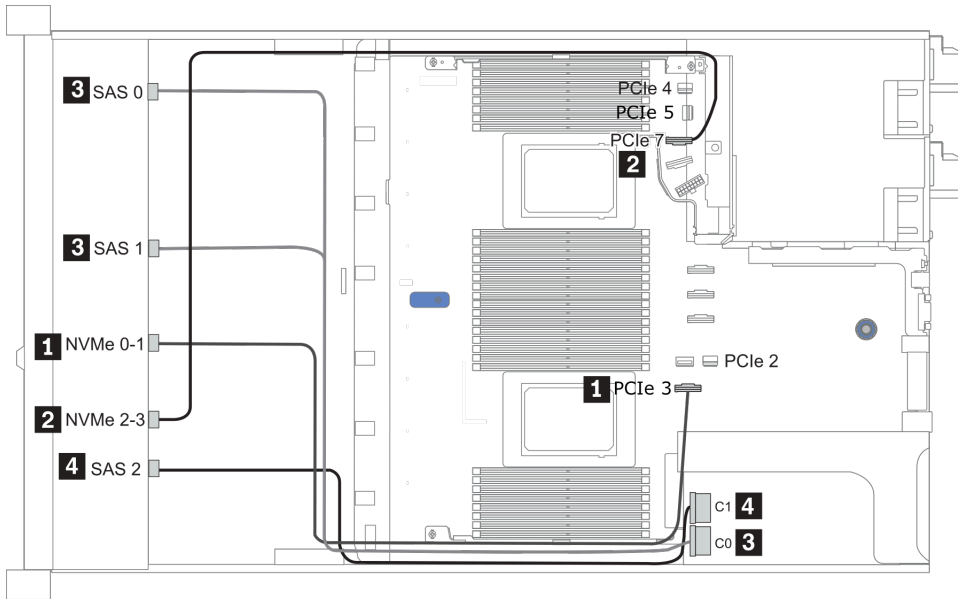


Figure 28. Configuration 2 (2 CPU installed)

Configurations 4 – 5:

Front BP: [6 x 2.5" SAS/SATA + 4 x 2.5" Anybay] BP

Rear BP: 2 x 2.5" SAS/SATA BP

Config.	Front BP	Rear BP	System board	Storage controller
				CFF 16i RAID/HBA
4	NVMe 0-1		PCIe 3	
	NVMe 2-3		PCIe 7	
	SAS 0		PCIe 2	
	SAS 1		PCIe 4	
	SAS 2	SAS	PCIe 5	
5	NVMe 0-1		PCIe 3	
	NVMe 2-3		PCIe 7	
	SAS 0			C 0
	SAS 1			C 1
	SAS 2			C 2
		SAS		C 3
			PCIe 8	MB

Example

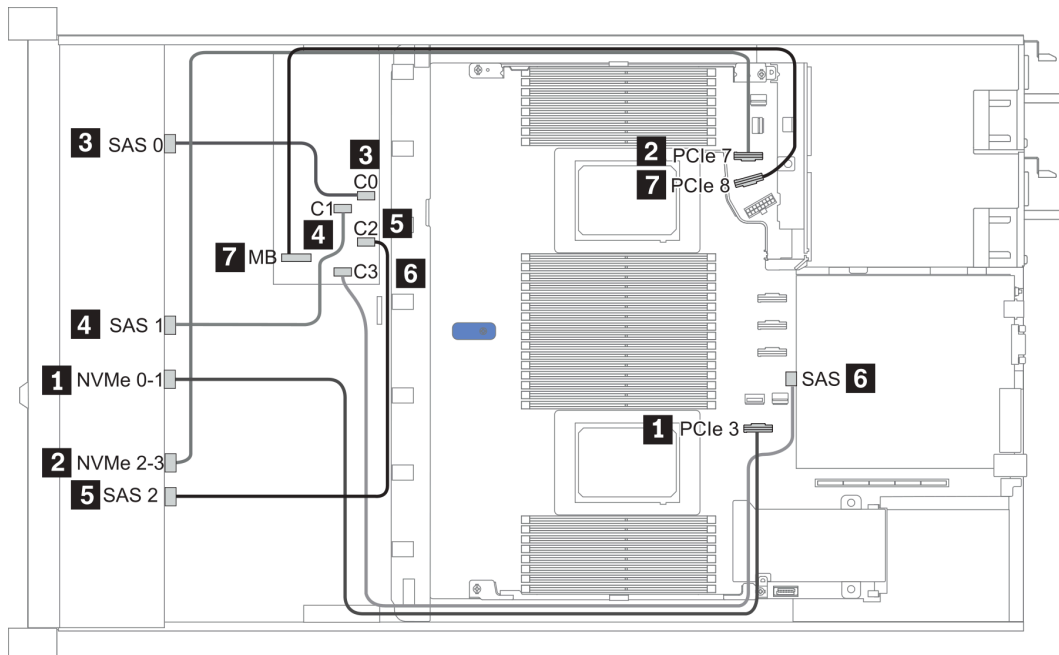


Figure 29. Configuration 5

2.5-inch (6 SAS/SATA + 4 NVMe)

Configuration	Rear BP		Storage controller	
	Qty.	Type	Qty.	Type
Config. 1	1	2 x 2.5" SAS/SATA		
Config. 2			1	Retimer card

Configuration 1

Front BP: [6 x 2.5" SAS/SATA + 4 x 2.5" Anybay] BP used as [6 x 2.5" SAS/SATA + 4 x 2.5" NVMe] BP

Config.	Front BP	Rear BP	System board
1	NVMe 0-1		PCIe 3
	NVMe 2-3		PCIe 7
	SAS 0		PCIe 2
	SAS 1		PCIe 4
			SAS

Example

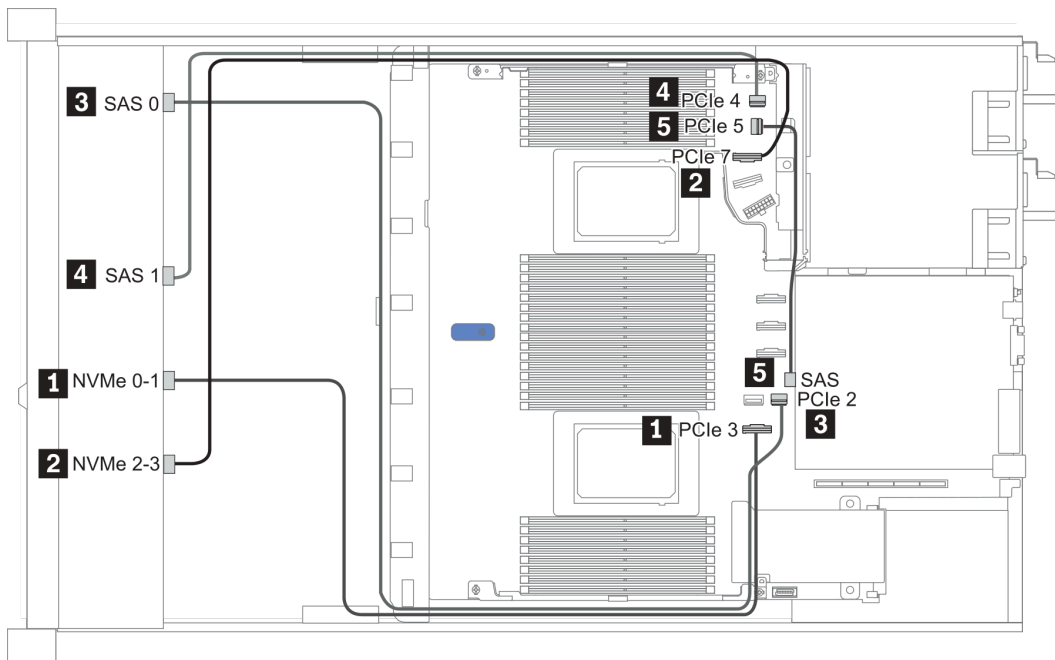


Figure 30. Configuration 1

Configuration 2

Front BP: [6 x 2.5" SAS/SATA + 4 x 2.5" Anybay] BP used as [6 x 2.5" SAS/SATA + 4 x 2.5" NVMe] BP

Config.	Front BP	System board	Retimer card
2	NVMe 6-7		C0

	NVMe 8-9		C1
	SAS 0	PCIe 2	
	SAS 1	PCIe 1	

Example

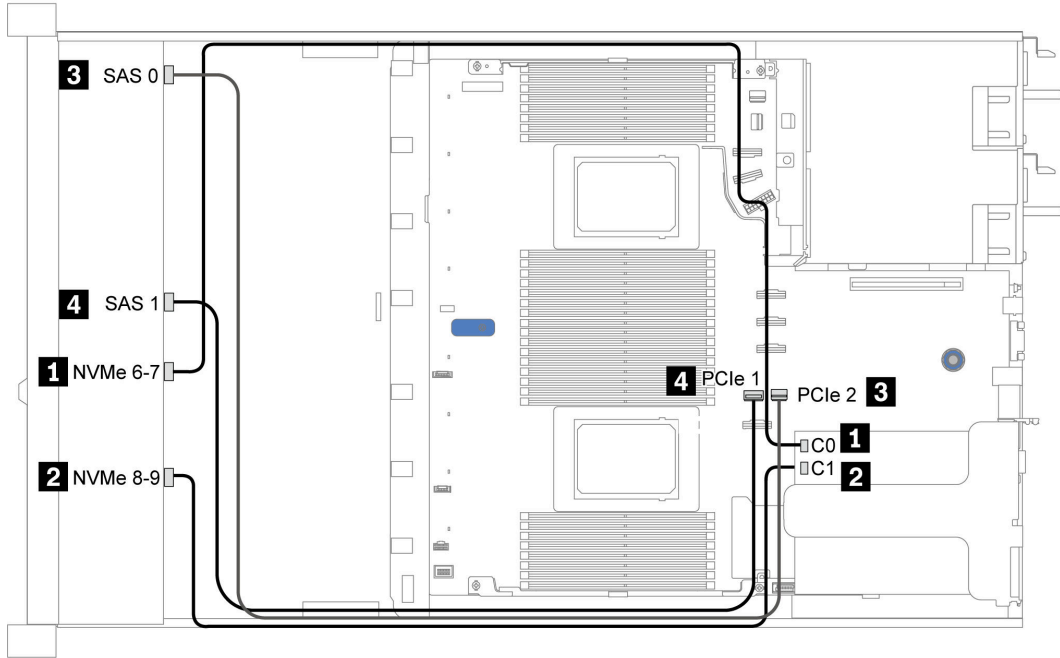


Figure 31. Configuration 2

2.5-inch (6 SAS/SATA + 2 AnyBay + 2 NVMe)

Configuration	Storage controller	
	Qty.	Type
Config. 1		
Config. 2	1	SFF 8i RAID/HBA
Config. 3	1	CFF 8i/16i RAID/HBA

Configuration 1 – 3

Front BP: [6 x 2.5" SAS/SATA + 4 x 2.5" Anybay] BP used as [6 x 2.5" SAS/SATA + 2 x 2.5" AnyBay + 2 x 2.5" NVMe] BP

Con-fig.	Front BP	System board	Storage controller	
			SFF 8i RAID/HBA	CFF 8i/16i RAID/HBA
1	NVMe 0–1	PCIe 3		
	NVMe 2–3	PCIe 7		
	SAS 0	PCIe 2		
	SAS 1	PCIe 4		
2	NVMe 0–1	PCIe 3		
	NVMe 2–3	PCIe 7		
	SAS 0, SAS 1		Gen 4: C 0 Gen 3: C 0, C 1	
3	NVMe 0–1	PCIe 3		
	NVMe 2–3	PCIe 7		
	SAS 0			C 0
	SAS 1			C 1
		PCIe 8		MB

Example

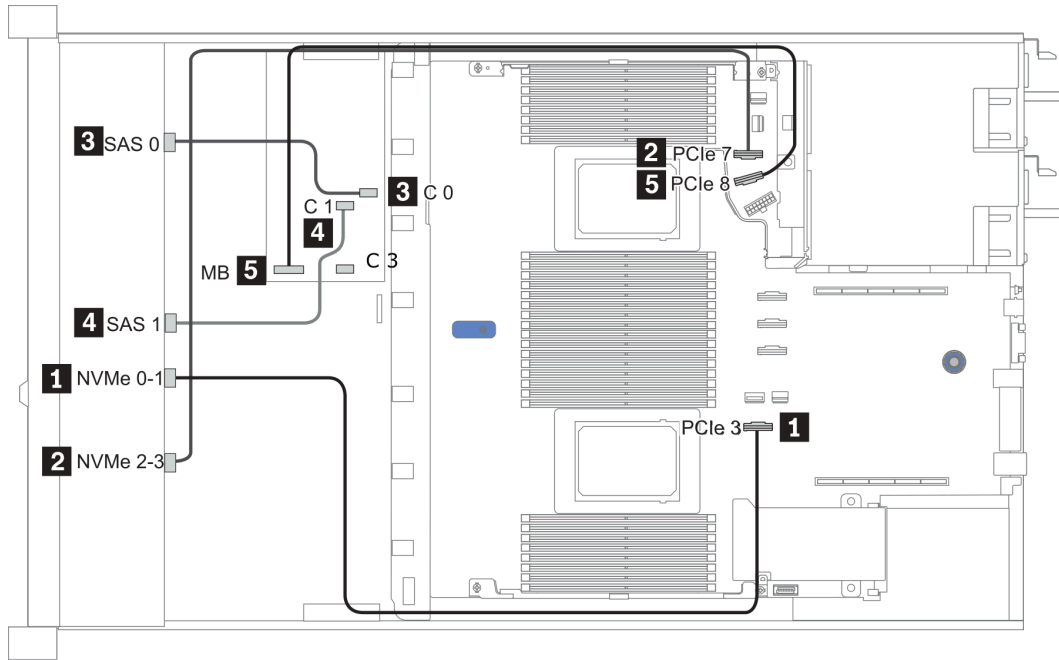


Figure 32. Configuration 3

3.5-inch (4 SAS/SATA)

Configuration option	Rear BP		Storage controller	
	Qty.	Type	Qty.	Type
Config. 1				
Config. 2			1	SFF 8i RAID/HBA
Config. 3	1	2 x 2.5" SAS/SATA		
Config. 4	1	2 x 2.5" SAS/SATA	1	SFF 8i RAID/HBA
Config. 5	1	2 x 2.5" NVMe		
Config. 6	1	2 x 2.5" NVMe	1	SFF 8i RAID/HBA

Depending on your server configurations, refer to one of the following sections for cable routing information.

- [“Configuration 1, 2: front BP” on page 109](#)
- [“Configuration 3 – 6: front BP + rear BP” on page 110](#)

Configuration 1, 2:

Front BP: 4 x 3.5" SAS/SATA BP

Config.	Front BP	System board	Storage controller
			SFF 8i RAID/HBA
1	SAS	PCIe 2	
2	SAS		Gen 4: C 0 Gen 3: C 0, C 1

Example

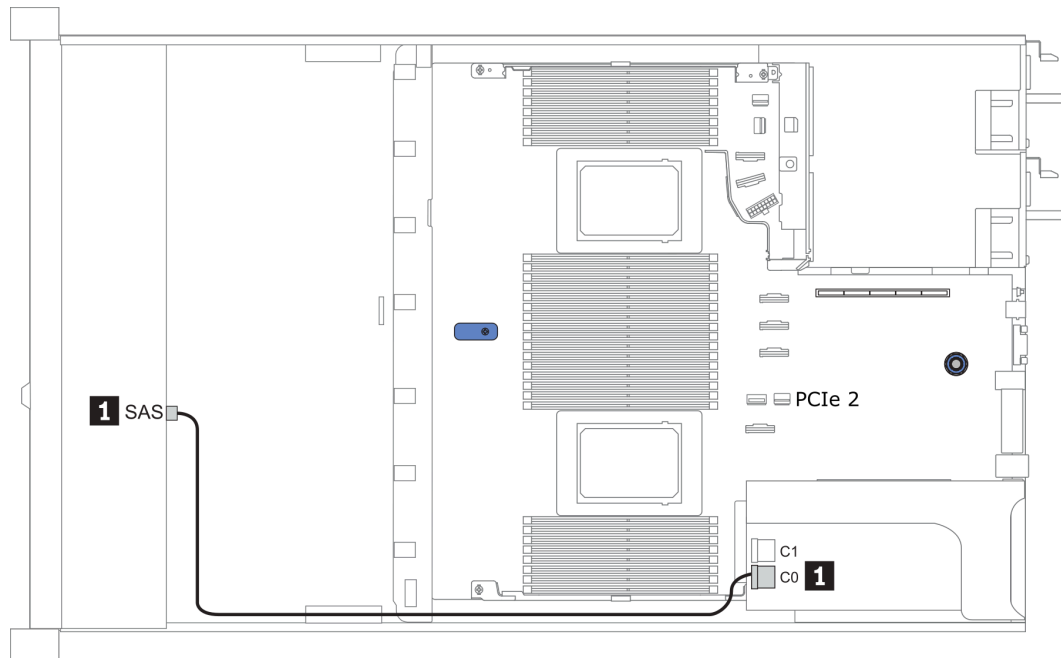


Figure 33. Configuration 2

Configuration 3 – 6:

Front BP: 4 x 3.5" SAS/SATA BP

Rear BP: 2 x 2.5" SAS/SATA BP

Config.	Front BP	Rear BP	System board	Storage controller
				SFF 8i RAID/HBA
3	SAS		PCIe 2	
		SAS	PCIe 5	
4	SAS	SAS		Gen 4: C 0 Gen 3: C 0, C 1

Example

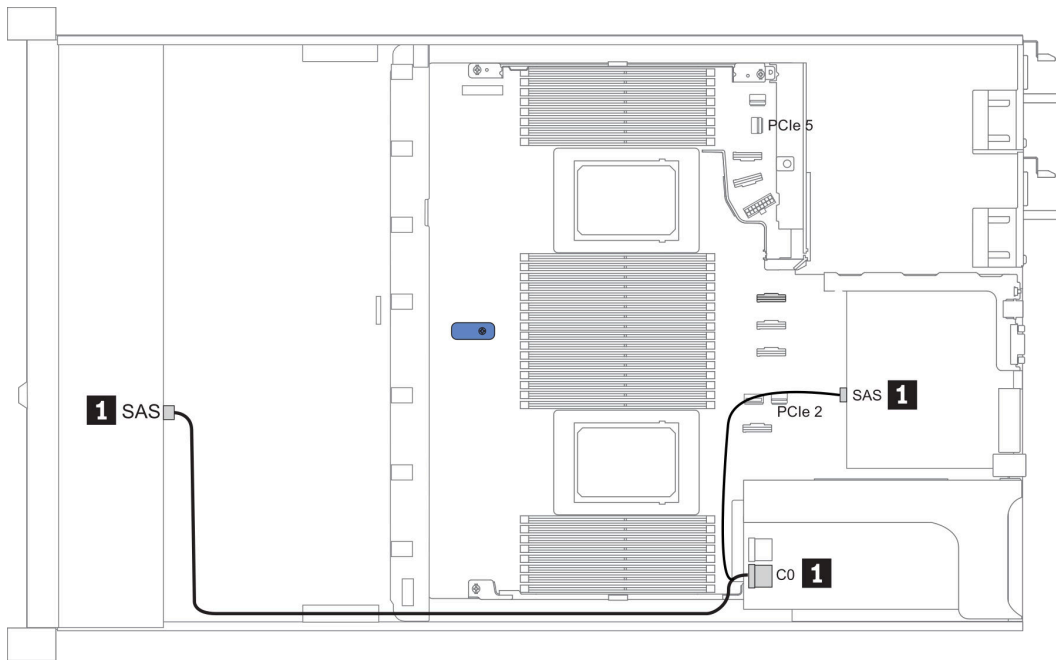


Figure 34. Configuration 4

Front BP: 4 x 3.5" SAS/SATA BP

Rear BP: 2 x 2.5" NVMe BP

Con-fig.	Front BP	Rear BP	System board	Storage controller
				SFF 8i RAID/HBA
5	SAS		PCIe 2	
		NVMe 0, NVMe 1	PCIe 6	
6	SAS			Gen 4: C 0 Gen 3: C 0, C 1
		NVMe 0, NVMe 1	PCIe 6	

Example

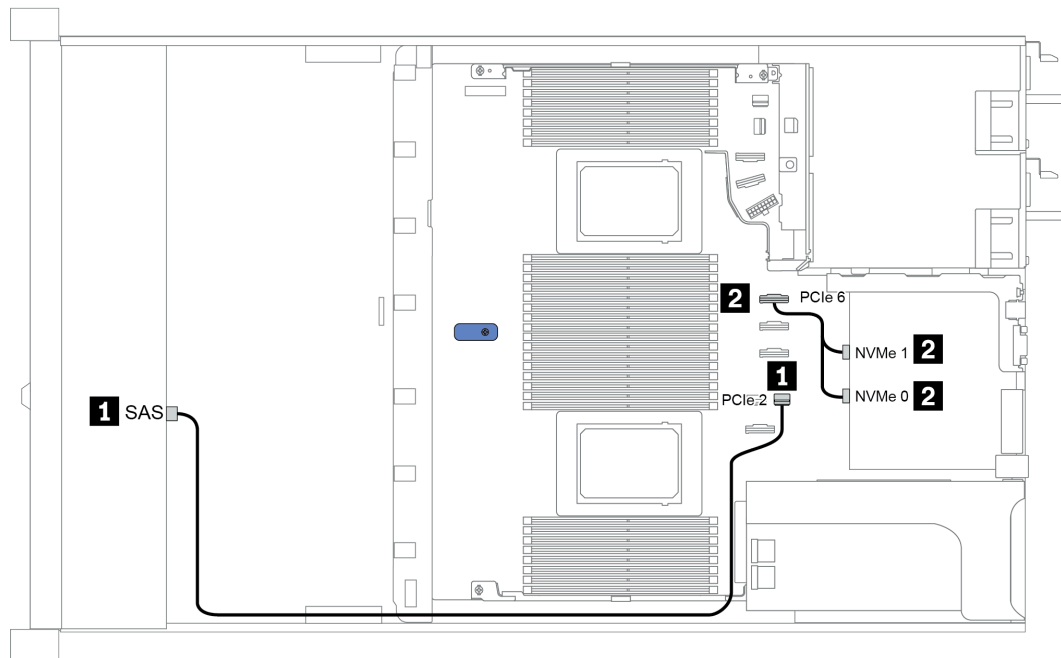


Figure 35. Configuration 5

3.5-inch (4 AnyBay)

Configuration	Rear BP		Storage controller	
	Qty.	Type	Qty.	Type
Config. 1				
Config. 2			1	SFF 8i RAID/HBA
Config. 3			1	SFF 16i RAID(Tri-mode)
Config. 4	1	2 x 2.5" SAS/SATA		
Config. 5	1	2 x 2.5" SAS/SATA	1	SFF 8i RAID/HBA
Config. 6	1	2 x 2.5" NVMe		
Config. 7	1	2 x 2.5" NVMe	1	SFF 8i RAID/HBA

Depending on your server configurations, refer to one of the following sections for cable routing information.

- [“Configuration 1 – 3: front BP” on page 112](#)
- [“Configuration 4 – 7: front BP + rear BP” on page 114](#)

Configuration 1 – 3:

Front BP: 4 x 3.5" AnyBay BP

Con-fig.	Front BP	System board	Storage controller	
			SFF 8i RAID/HBA	SFF 16i RAID(Tri-mode)
1	NVMe 0–1	PCIe 3		
	NVMe 2–3	PCIe 7		
	SAS	PCIe 2		
2	NVMe 0–1	PCIe 3		
	NVMe 2–3	PCIe 7		
	SAS		Gen 4: C 0 Gen 3: C 0, C 1	
3	SAS			Gen 4: C 0

Example

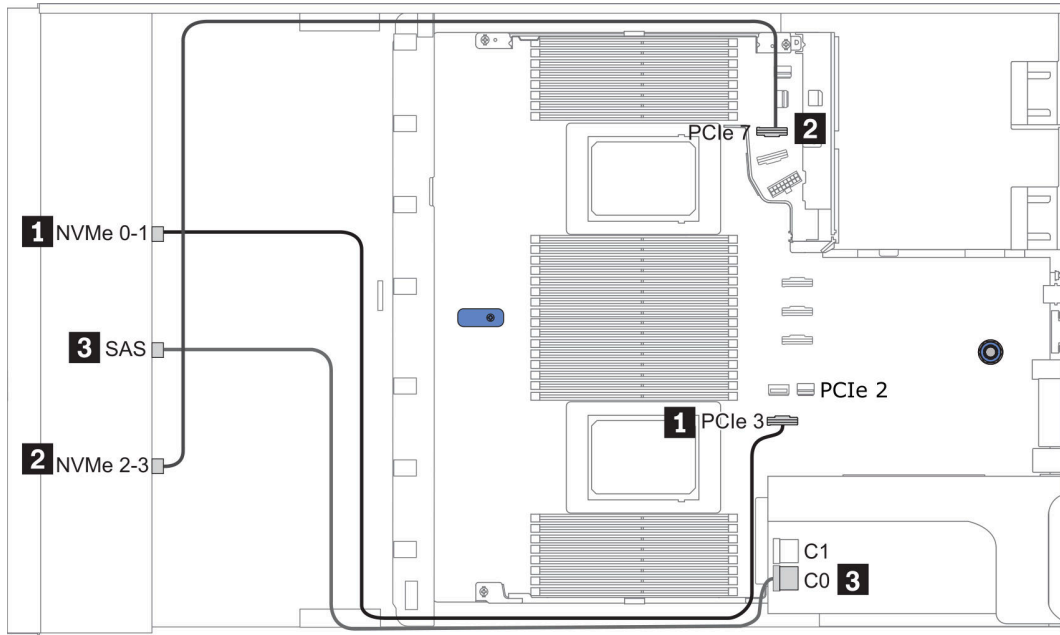


Figure 36. Configuration 2

Configuration 4 – 7:

Front BP: 4 x 3.5" AnyBay BP

Rear BP: 2 x 2.5" SAS/SATA BP

Con-fig.	Front BP	Rear BP	System board	Storage controller
				SFF 8i RAID/HBA
4	NVMe 0-1		PCle 3	
	NVMe 2-3		PCle 7	
	SAS		PCle 2	
		SAS	PCle 5	
5	NVMe 0-1		PCle 3	
	NVMe 2-3		PCle 7	
	SAS	SAS		Gen 4: C 0 Gen 3: C 0, C 1

Example

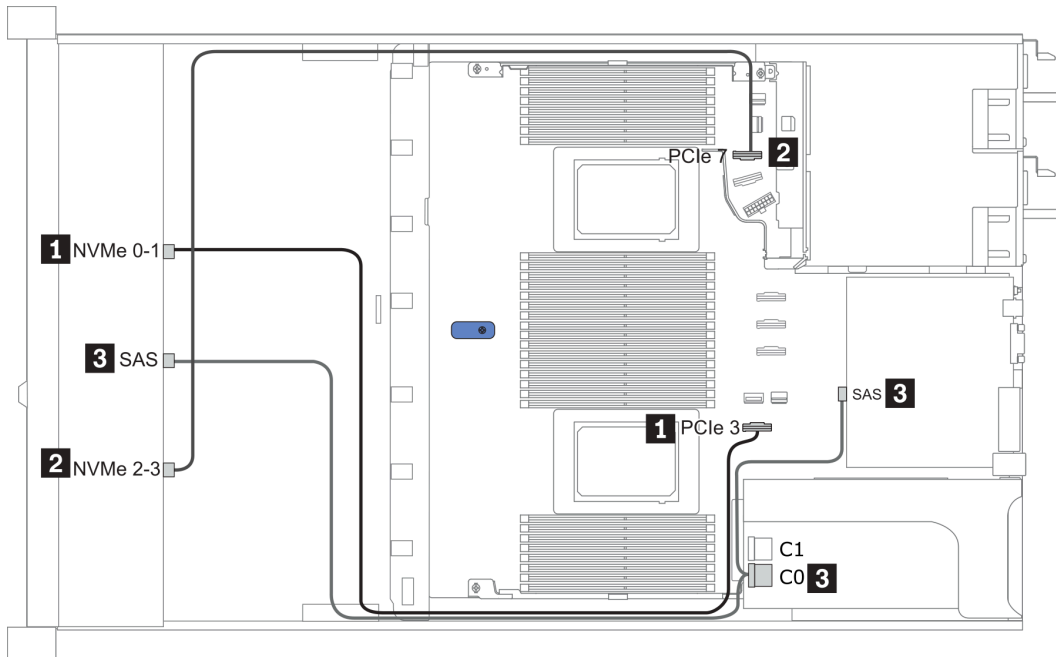


Figure 37. Configuration 5

Front BP: 4 x 3.5" AnyBay BP

Rear BP: 2 x 2.5" NVMe BP

Con-fig.	Front BP	Rear BP	System board	Storage controller
				SFF 8i RAID/HBA
6	NVMe 0-1		PCIe 3	
	NVMe 2-3		PCIe 7	
	SAS		PCIe 2	
		NVMe 0, NVMe 1	PCIe 6	
7	NVMe 0-1		PCIe 3	
	NVMe 2-3		PCIe 7	
	SAS			Gen 4: C 0 Gen 3: C 0, C 1
		NVMe 0, NVMe 1	PCIe 6	

Example

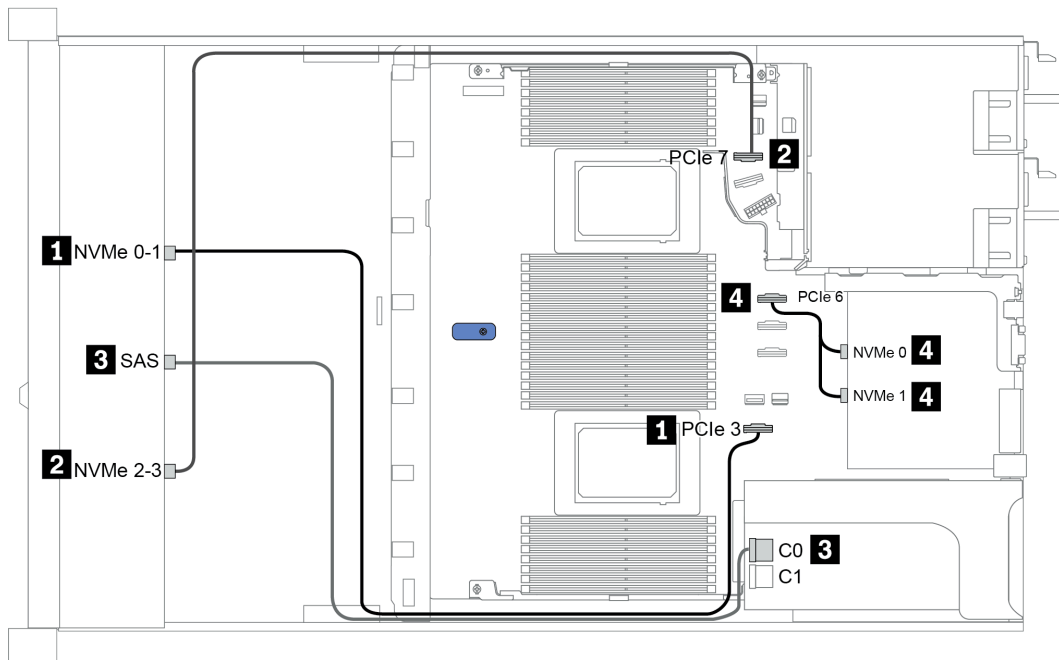


Figure 38. Configuration 7

2.5-inch (4 NVMe)

Configuration	Storage controller	
	Qty.	Type
Config. 1	1	Retimer card

Configuration 1

Front BP: [4 x 2.5" Anybay] BP used as [4 x 2.5" NVMe] BP

Config.	Front BP	Retimer card
1	NVMe 6-7	C0
	NVMe 8-9	C1

Example

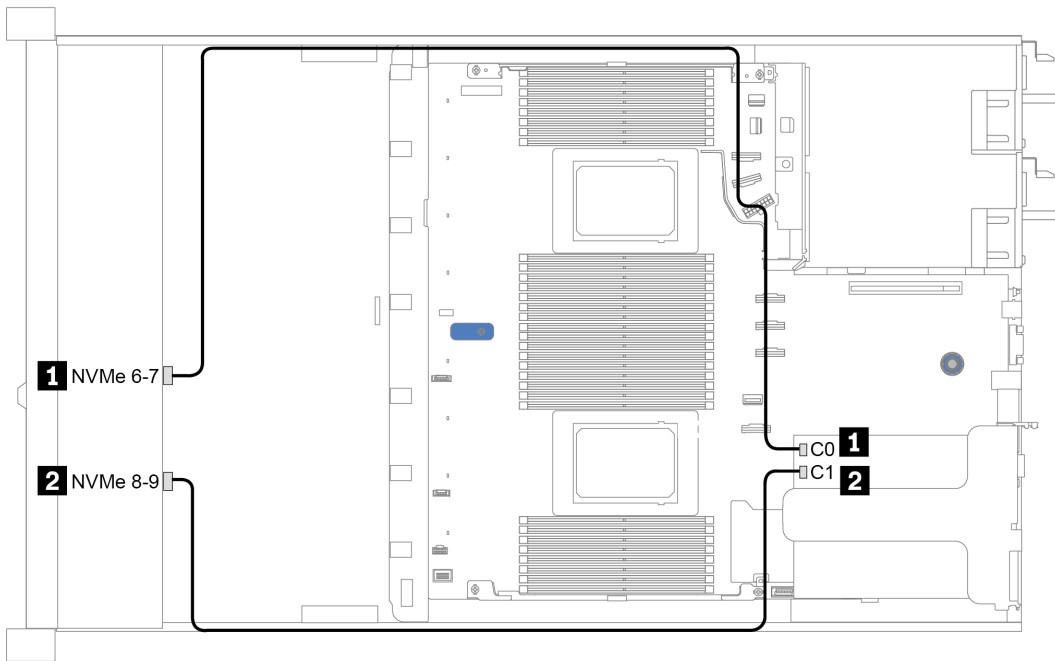


Figure 39. Configuration 1

Chapter 4. Hardware replacement procedures

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

CRU parts replacement

This section provides installation and removal procedures for all CRU parts.

Note: If you replace a part, such as an adapter, that contains firmware, you might also need to update the firmware for that part. For more information about updating firmware, see [“Firmware updates” on page 28](#).

Installation Guidelines

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

Before installing optional devices, read the following notices carefully:

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

- Read the safety information and guidelines to ensure your safety at work:
http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html
- When you install a new server, download and apply the latest firmware. This will help ensure that any known issues are addressed, and that your server is ready to work with optimal performance. Go to [ThinkSystem SR645 Drivers and Software](#) to download firmware updates for your server.

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

- It is good practice to make sure that the server is working correctly before you install an optional component.
- Keep the working area clean, and place removed components on a flat and smooth surface that does not shake or tilt.
- Do not attempt to lift an object that might be too heavy for you. If you have to lift a heavy object, read the following precautions carefully:
 - Make sure that you can stand steadily without slipping.
 - Distribute the weight of the object equally between your feet.
 - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
 - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Back up all important data before you make changes related to the disk drives.
- Have a small flat-blade screwdriver, a small Phillips screwdriver, and a T8 torx screwdriver available.
- To view the error LEDs on the system board and internal components, leave the power on.
- You do not have to turn off the server to remove or install hot-swap power supplies, hot-swap fans, or hot-plug USB devices. However, you must turn off the server before you perform any steps that involve removing or installing adapter cables, and you must disconnect the power source from the server before you perform any steps that involve removing or installing a riser card, memory, and processor.
- 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.
- The Red strip on the drives, adjacent to the release latch, indicates that the drive can be hot-swapped if the server and operating system support hot-swap capability. This means that you can remove or install the drive while the server is still running.

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

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

Safety inspection checklist

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

Notes:

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

CAUTION:

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

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

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

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

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

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

System reliability guidelines

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

Make sure the following requirements are met:

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

Working inside the server with the power on

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

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

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

Handling static-sensitive devices

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

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

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

- Keep the device from others' reach to prevent possible damages.

Air baffle replacement

Use this information to remove and install the air baffle.

Note: Air baffle is unavailable when performance heat sink is installed.

Remove the air baffle

Use this information to remove the air baffle.

About this task

Depending on the model, your server might not have an air baffle installed. The air baffle you want to remove might be different from the 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 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.

Procedure

Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).

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

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

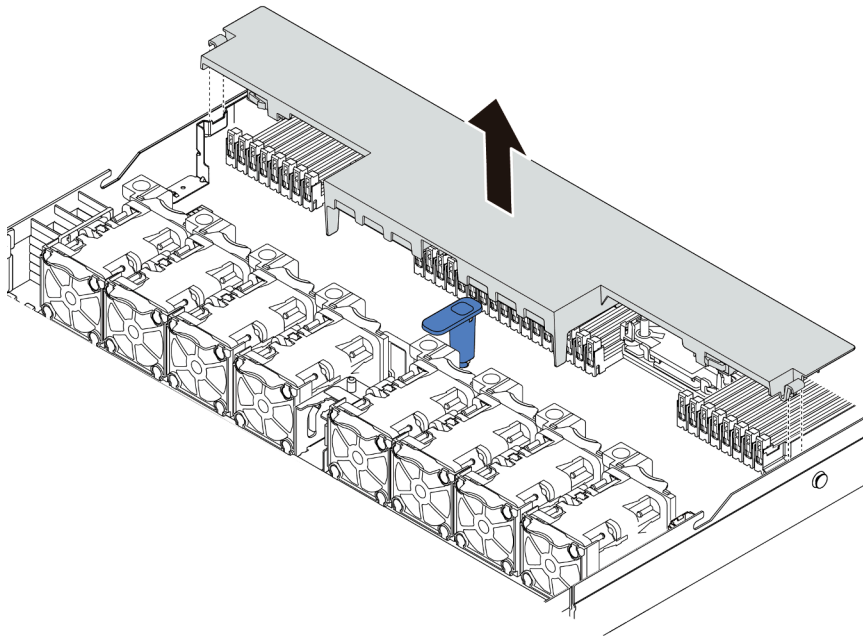


Figure 40. Air baffle removal

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 would like to reuse the RAID super capacitor module installed on the bottom of the air baffle, remove it from the air baffle. See [“Remove the RAID super capacitor module on the air baffle” on page 206](#).

Demo video

[Watch the procedure on YouTube](#)

Install the air baffle

Use this information to install the air baffle.

About this task

Depending on the model, your server might not have an air baffle installed. The air baffle you want to install might be different from the 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 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.

Procedure

- Step 1. If you need to install a RAID super capacitor module on the bottom of the air baffle, install it first. See [“Install the RAID super capacitor module on the air baffle” on page 207](#).

Step 2. Align the direction of the air baffle according to indications on it.

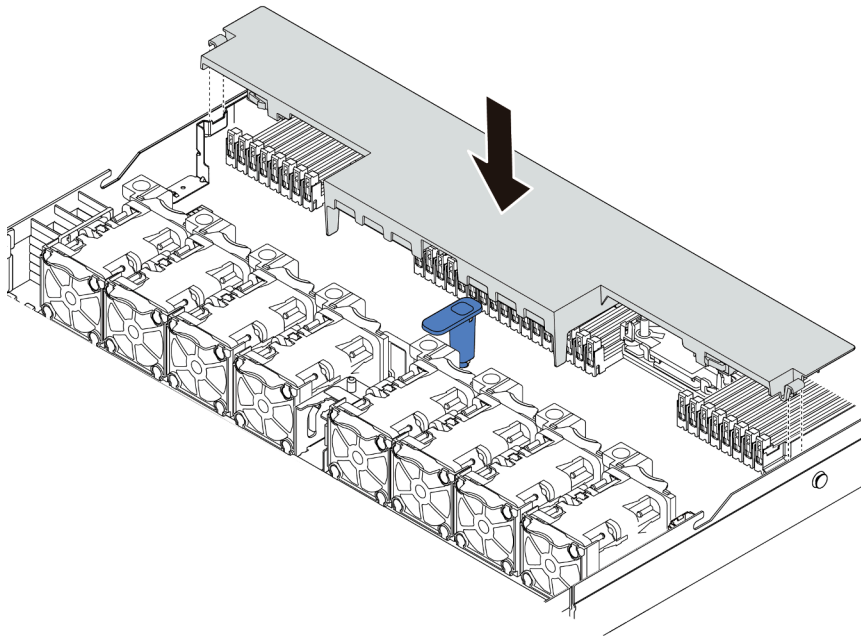


Figure 41. Air baffle installation

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

After you finish

1. If there is a RAID super capacitor module installed on the bottom of the air baffle, connect it to the RAID adapter with the extension cable that comes with the RAID super capacitor module.
2. Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).

Demo video

[Watch the procedure on YouTube](#)

CMOS battery (CR2032) replacement

Use this information to remove and install the CMOS battery.

Remove the CMOS battery (CR2032)

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 the following instructions.
- If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.
- To order replacement batteries, call 1-800-IBM-SERV within the U.S., and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your support center or business partner.

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

S004



CAUTION:

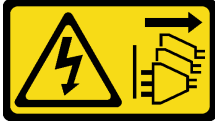
When replacing the lithium battery, use only Lenovo specified part number or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and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

Do not:

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

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

S002



CAUTION:

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

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).
- 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” on page 63](#).
- 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.

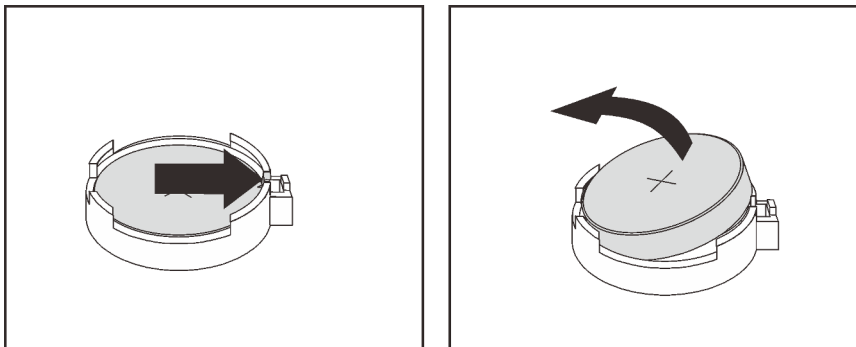


Figure 42. CMOS battery removal

After you finish

1. Install a new one. See [“Install the CMOS battery \(CR2032\)” on page 127](#).
2. Dispose of the CMOS battery as required by local ordinances or regulations.

Demo video

[Watch the procedure on YouTube](#)

Install the CMOS battery (CR2032)

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 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.

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 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. 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.

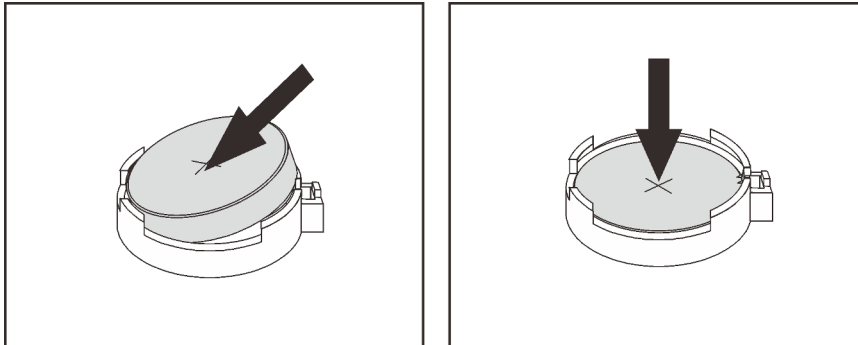


Figure 43. CMOS battery installation

After you finish

1. Complete the parts replacement. See [“Complete the parts replacement”](#) on page 230.
2. Use the Setup utility to set the date, time, and any passwords.

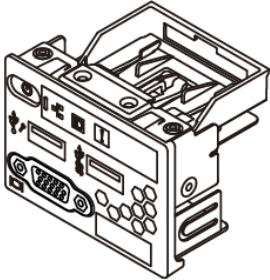
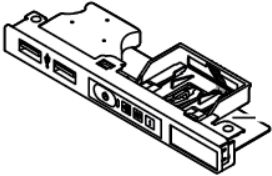
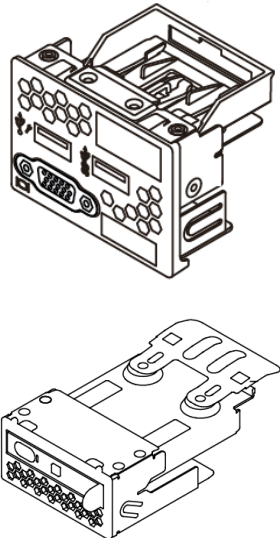
Demo video

[Watch the procedure on YouTube](#)

Front I/O assembly replacement

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

Depending on server models, your server supports the following front I/O assemblies.

Type	Front I/O assembly
<p>For server models with</p> <ul style="list-style-type: none"> • four 2.5-inch front drive bays • ten 2.5-inch front drive bays • eight 2.5-inch front drive bays (1) 	<p>Front I/O assembly with diagnostics panel (right)</p> 
<p>For server models with four 3.5-inch front drive bays.</p>	<p>Front I/O assembly with diagnostics panel (top)</p> 
<p>For server models with eight 2.5-inch front drive bays (2)</p>	<p>Front I/O assembly+ LCD diagnostics panel assembly</p> 

Remove the front I/O assembly

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

About this task

The following illustrates how to remove the front I/O assembly with diagnostics panel. You can remove other front I/O assemblies in the same way.

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).
- Step 2. If the security bezel is installed, remove it. See [“Remove the security bezel” on page 220](#).
- Step 3. Disconnect the front I/O cables from the system board. See [“FIO cable routing” on page 76](#).

Attention: To avoid damaging the system board, make sure to follow the instructions in [Chapter 3 “Internal cable routing” on page 73](#) when disconnecting cables from the system board.

- Step 4. Remove the front I/O assembly.

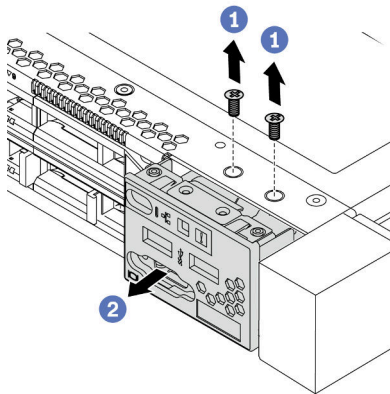


Figure 44. Removal of the front I/O assembly

- a. Remove the screws that secure the front I/O assembly.
- b. Slide the front I/O assembly out of the front chassis.

After you finish

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

Demo video

[Watch the procedure on YouTube](#)

Install the front I/O assembly

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

About this task

The following illustrates how to install the front I/O assembly with diagnostics panel. You can install other front I/O assemblies in the same way.

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the front I/O assembly to any unpainted surface on the outside of the server. Then, take the front I/O assembly out of the package and place it on a static-protective surface.
- Step 2. Install the front I/O assembly.

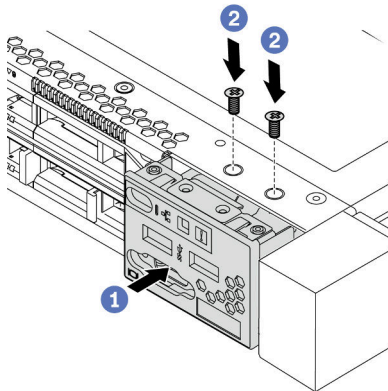


Figure 45. Installation of the front I/O assembly

- a. Insert the front I/O assembly into the front chassis.
- b. Install the screws to secure the front I/O assembly in place.

After you finish

1. Connect the front I/O cables to the system board. For detailed cable routing information, see [Chapter 3 “Internal cable routing” on page 73](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).

Demo video

[Watch the procedure on YouTube](#)

Remove the LCD diagnostics panel assembly

Use this information to remove the LCD diagnostics panel assembly.

About this task

Attention:

- Read “[Installation Guidelines](#)” on page 117 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See “[Remove the top cover](#)” on page 226.
- Step 2. If the security bezel is installed, remove it. See “[Remove the security bezel](#)” on page 220.
- Step 3. Remove the LCD diagnostics panel assembly from the chassis.

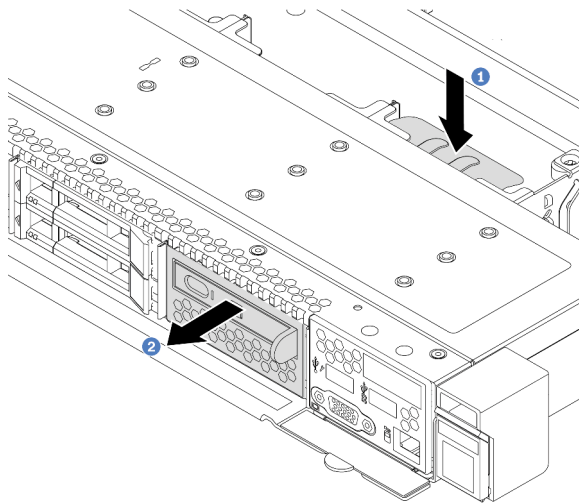


Figure 46. LCD diagnostics panel assembly removal

- a. Press down the extended tab on the other side of the front chassis.
- b. Slide the assembly out of the front chassis.

Step 4. Remove the LCD diagnostics panel from its assembly.

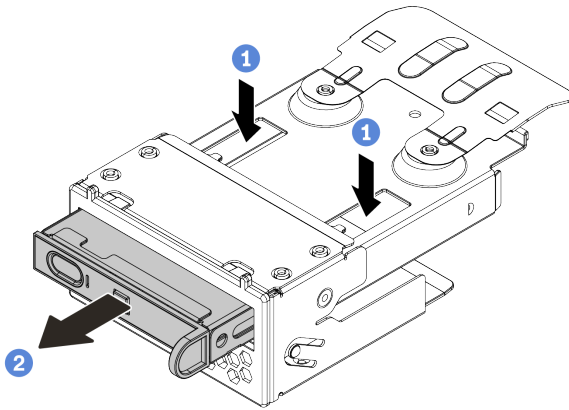


Figure 47. LCD diagnostics panel removal

- a. Press down the clips as shown.
- b. Pull the LCD diagnostics panel by its handle to get it out of its assembly.

After you finish

1. Install a new LCD diagnostics panel assembly or filler. See [“Install the LCD diagnostics panel assembly” on page 135](#).
2. If you are instructed to return the old LCD diagnostics panel assembly, follow all packaging instructions and use any packaging materials that are provided.

Demo video

[Watch the procedure on YouTube](#)

Install the LCD diagnostics panel assembly

Use this information to install the diagnostics panel assembly.

About this task

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the diagnostics panel assembly to any unpainted surface on the outside of the server. Then, take the assembly out of the package and place it on a static-protective surface.
- Step 2. If there is a filler installed on the front chassis, remove it as shown.

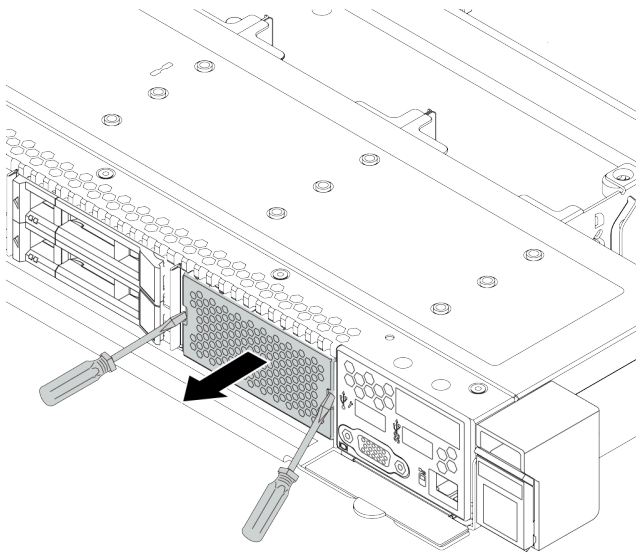


Figure 48. Filler removal

Step 3. Insert the LCD diagnostics panel into its assembly. Ensure that the panel is fully seated into its assembly.

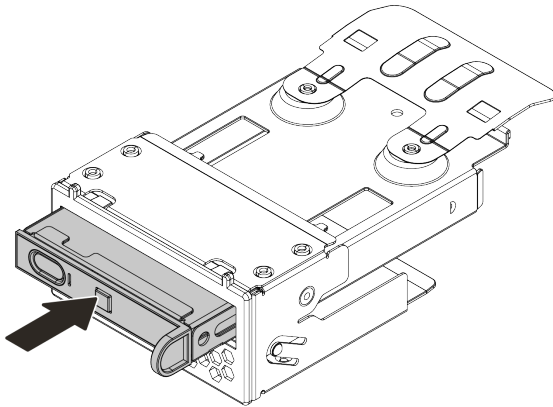


Figure 49. LCD diagnostics panel installation into its assembly

Step 4. Slide the diagnostics panel assembly into the front chassis as shown. Ensure that it is seated in place.

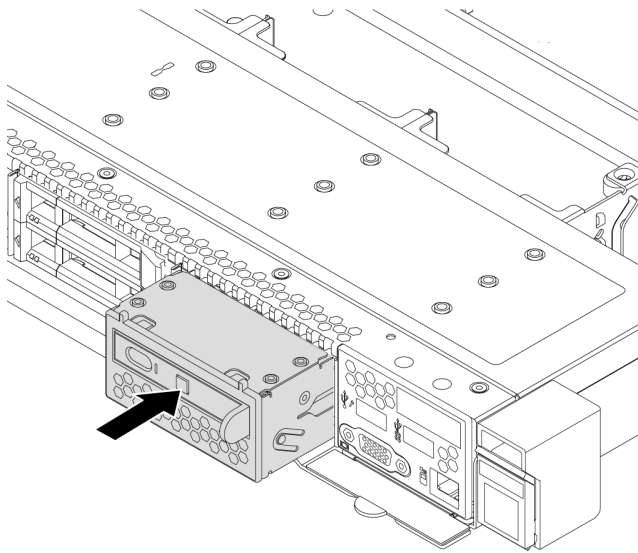


Figure 50. Diagnostics panel assembly installation

After you finish

Complete the parts replacement. See [“Complete the parts replacement”](#) on page 230.

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 those instructions in addition to the instructions in this topic.
- The electromagnetic interference (EMI) integrity and cooling of the server are protected by having all drive bays covered or occupied. The vacant bays are either covered by an EMI-protective panel or occupied by drive fillers. When installing a drive, save the removed drive filler in case that you later remove the drive and need the drive filler to cover the place.
- To avoid damage to the drive connectors, ensure that the top cover is in place and fully closed whenever you install or remove a drive.

Remove a hot-swap drive

Use this information to remove a hot-swap drive.

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.
- If one or more NVMe drives are to be removed, it is recommended to disable them first in Safely Remove Hardware and Eject Media (Windows) or filesystem (Linux). Log in to XClarity Controller and go to the **Storage** menu to identify and locate the drive type and corresponding drive bay number. If the drive bay numbers come with the term “NVMe”, it indicates the installed drives are NVMe drives.

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.
- 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. If the security bezel is installed, remove it first. See [“Remove the security bezel” on page 220](#).
- Step 2. Slide the release latch to the left to open the drive tray handle.

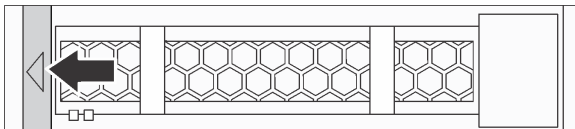


Figure 51. Opening the drive tray handle

Step 3. Grasp the handle and slide the drive out of the drive bay.

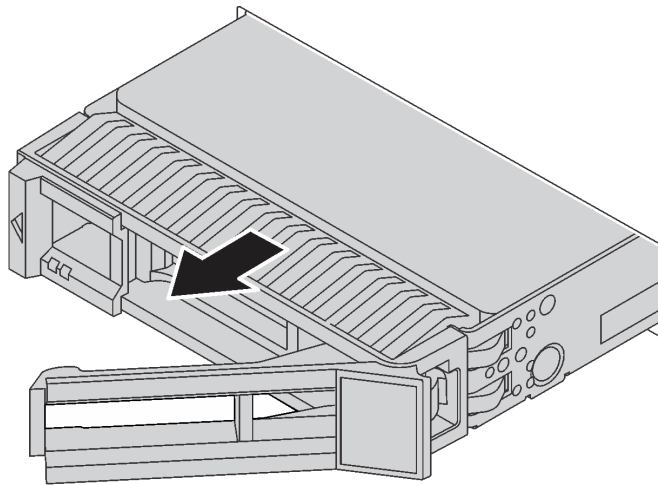


Figure 52. Hot-swap drive removal

After you finish

1. Install the drive filler or a new drive to cover the drive bay. See [“Install a hot-swap drive” on page 139](#).
2. If you are instructed to return the old hot-swap drive, follow all packaging instructions and use any packaging materials that are provided.

Demo video

[Watch the procedure on YouTube](#)

Install a hot-swap drive

Use this information to install a hot-swap drive.

About this task

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

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

Note: Ensure that drive installation meets [“Technical rules” on page 16](#).

Step 2. Remove the drive filler from the drive bay and keep the drive filler in a safe place.

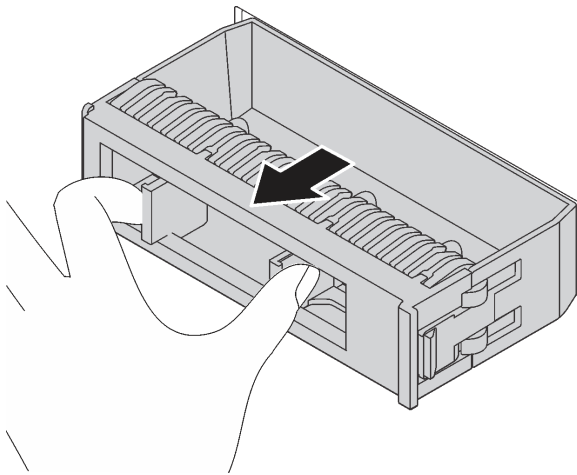


Figure 53. Drive filler removal

Step 3. Install the drive in the drive bay.

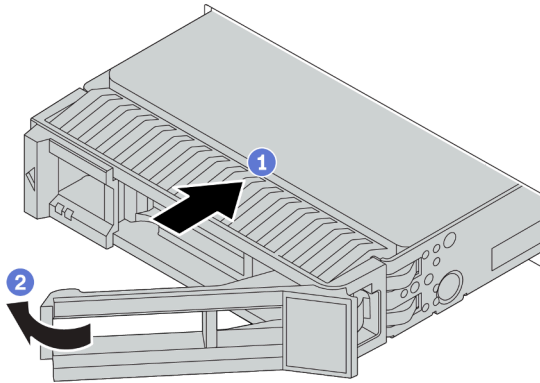


Figure 54. Hot-swap drive installation

- a. Ensure that the drive tray handle is in the open position. Slide the drive into the drive bay until it snaps into position.
- b. Close the drive tray handle to lock the drive in place.

Step 4. Check the drive LEDs to verify that the drive is operating correctly. For details, see [“Drive LEDs” on page 43](#).

Step 5. Continue to install additional hot-swap drives if necessary.

After you finish

1. Reinstall the security bezel if you have removed it. See [“Install the security bezel” on page 221](#).
2. Use the Lenovo XClarity Provisioning Manager to configure the RAID if necessary. For more information, see the “RAID Setup” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.
3. If you have installed U.3 NVMe drives on a 2.5-inch AnyBay 10-bay backplane for Tri-mode, enable **U.3 x1 mode** for the selected drive slots on the backplane through the XCC Web GUI. See [“U.3 NVMe drive can be detected in NVMe connection, but cannot be detected in Tri-mode” on page 266](#).

Demo video

[Watch the procedure on YouTube](#)

Backplane replacement

Use this information to remove and install a backplane.

Remove the front 2.5-inch-drive backplane

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

About this task

The following describes how to remove the backplane for ten 2.5-inch hot-swap drives. You can remove the backplane for eight 2.5-inch hot-swap drives in the same way.

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).
- Step 2. Remove all the installed drives and drive fillers from the drive bays. See [“Remove a hot-swap drive” on page 137](#).
- Step 3. Grasp the backplane and carefully lift it out of the chassis.

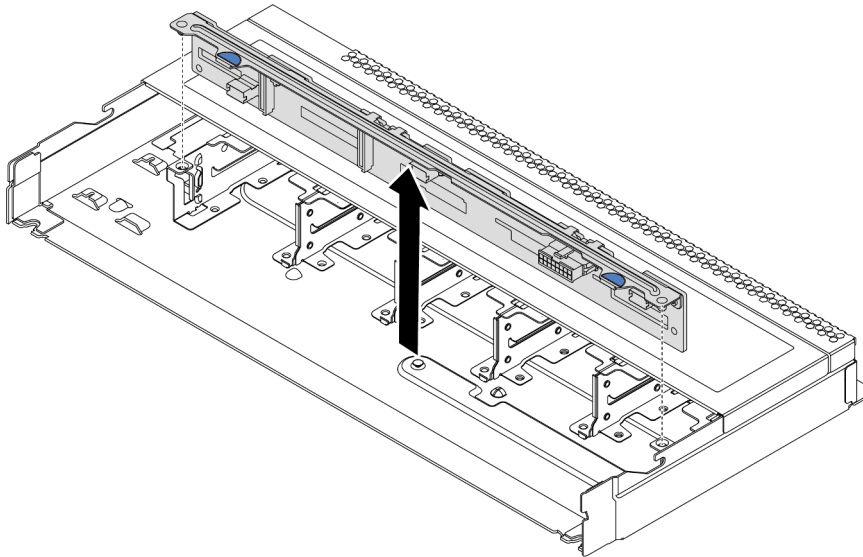


Figure 55. Removal of backplane for ten 2.5-inch hot-swap drives

- Step 4. Disconnect the cables from the backplane. See [“2.5-inch/3.5-inch drive backplane cable routing \(power\)” on page 82](#) and [“2.5-inch/3.5-inch drive backplane cable routing \(signal\)” on page 83](#).

After you finish

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

Demo video

[Watch the procedure on YouTube](#)

Install the front 2.5-inch-drive backplane

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

About this task

The following describes how to install the backplane for ten 2.5-inch hot-swap drives. You can install the backplane for eight 2.5-inch hot-swap drives in the same way.

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. 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. Connect the cables to the backplane. See [“2.5-inch/3.5-inch drive backplane cable routing \(power\)” on page 82](#) and [“2.5-inch/3.5-inch drive backplane cable routing \(signal\)” on page 83](#).
- Step 3. Align the two pins on the backplane with the corresponding holes in the chassis.

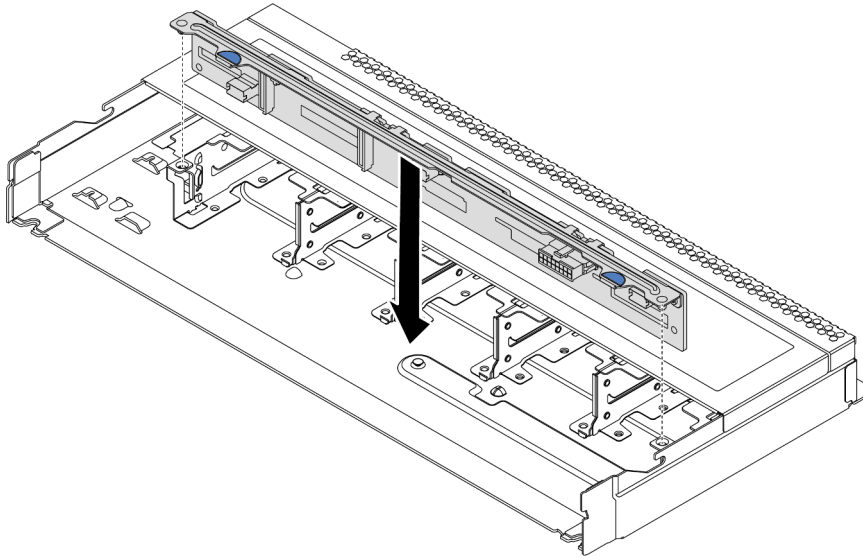


Figure 56. Installation of backplane for ten 2.5-inch hot-swap drives

- Step 4. Lower the backplane into the chassis. Ensure that the pins pass through the holes and the backplane is fully seated in place.

After you finish

1. Reinstall all the drives and drive fillers into the drive bays. See [“Install a hot-swap drive” on page 139](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).
3. If you have installed a 2.5-inch AnyBay 10-bay backplane with U.3 NVMe drives for Trimode, enable **U.3 x1 mode** for the selected drive slots on the backplane through the XCC Web GUI. See [“U.3 NVMe drive can be detected in NVMe connection, but cannot be detected in Tri-mode” on page 266](#).

Demo video

[Watch the procedure on YouTube](#)

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 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Note: Depending on the specific type, your backplane might look different from the illustration in this topic.

Step 1. Prepare your server.

- a. Remove the top cover. See [“Remove the top cover” on page 226](#).
- b. Remove the system fan cage for easier operation. See [“Remove a system fan” on page 216](#).
- c. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 137](#).

Step 2. Remove the backplane from the chassis.

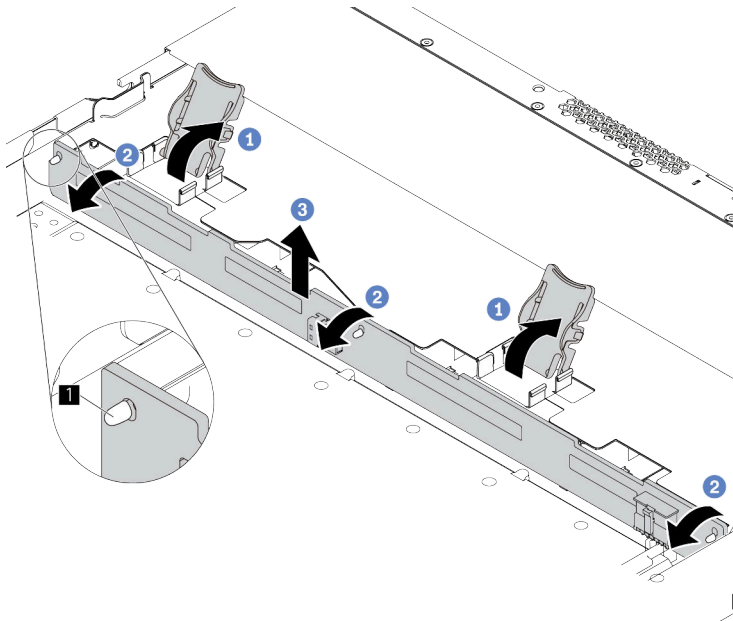


Figure 57. 3.5-inch-drive backplane removal

- a. Open the release latches that secure the backplane.
- b. Rotate the backplane backward slightly to release it from the three pins on the front drive cage.
- c. Slightly lift the backplane up.

Step 3. Record the cable connections on the backplane and then disconnect all cables from the backplane. See [“2.5-inch/3.5-inch drive backplane cable routing \(power\)” on page 82](#) and [“2.5-inch/3.5-inch drive backplane cable routing \(signal\)” on page 83](#).

After you finish

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

Demo video

[Watch the procedure on YouTube](#)

Install the front 3.5-inch-drive backplane

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

About this task

The following describes how to install the backplane for four 3.5-inch hot-swap drives.

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. 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. Connect the cables to the system board or expansion slots. See [“2.5-inch/3.5-inch drive backplane cable routing \(power\)” on page 82](#) and [“2.5-inch/3.5-inch drive backplane cable routing \(signal\)” on page 83](#).

Step 3. Put the backplane down into place.

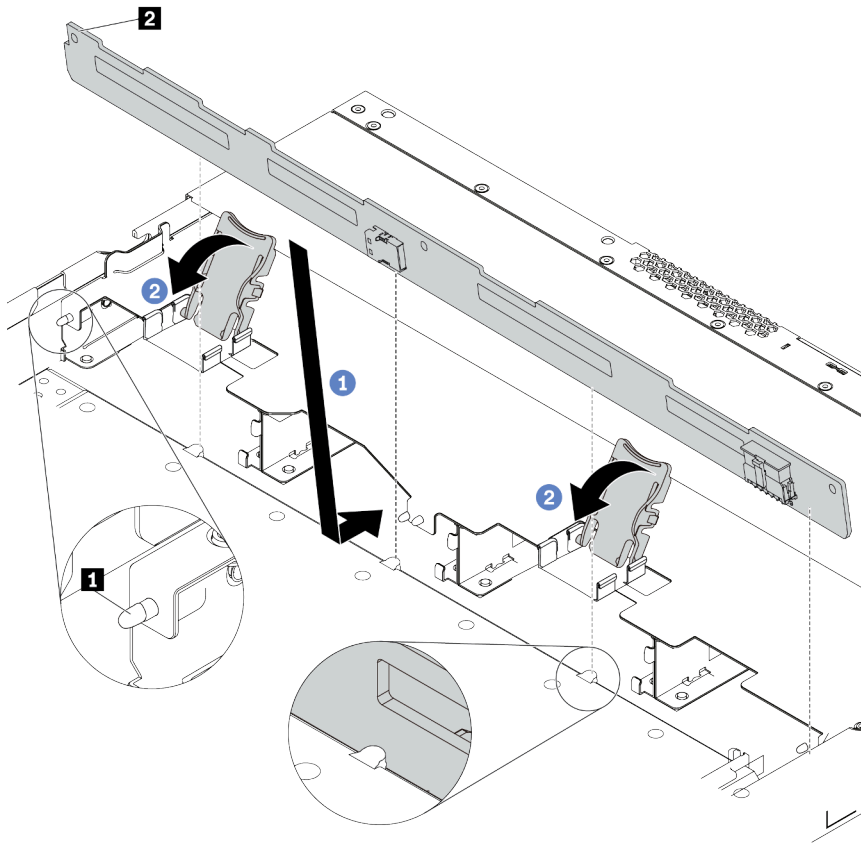


Figure 58. Installation of backplane for four 3.5-inch hot-swap drives

- a. Put the backplane under the front I/O assembly cables, align it with the chassis, and lower it into the chassis. Put the backplane into place with it leaning backward slightly so that the three pins **1** on the chassis pass through the three holes **2** in the backplane.
- b. Close the release latches to secure the backplane in place.

Step 4. Connect the cables to the system board or expansion slots. See [“2.5-inch/3.5-inch drive backplane cable routing \(power\)”](#) on page 82 and [“2.5-inch/3.5-inch drive backplane cable routing \(signal\)”](#) on page 83.

After you finish

1. Reinstall all the drives and drive fillers into the drive bays. See [“Install a hot-swap drive”](#) on page 139.
2. Complete the parts replacement. See [“Complete the parts replacement”](#) on page 230.

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 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. Prepare your server.

- a. Remove the top cover. See [“Remove the top cover” on page 226](#).
- b. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 137](#).
- c. Record the cable connections for 7mm drives and then disconnect all cables from the backplanes. For information about the backplane cable routing, see [“2.5-inch/3.5-inch drive backplane cable routing \(power\)” on page 82](#) and [“2.5-inch/3.5-inch drive backplane cable routing \(signal\)” on page 83](#).

Step 2. Gently press and hold the tab on the rear hot-swap drive cage as shown and remove the air baffle from the rear hot-swap drive cage.

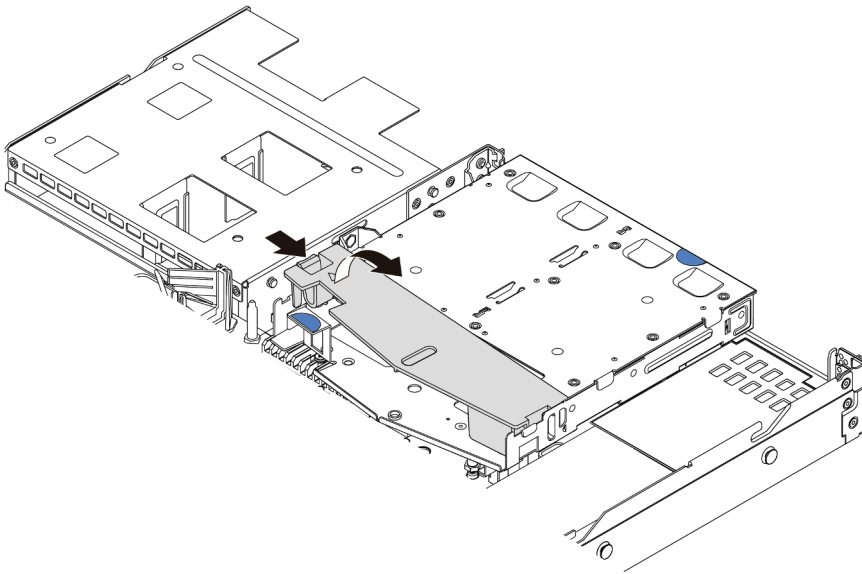


Figure 59. Air baffle removal

Step 3. Disconnect the cables from the 2.5-inch rear drive backplane.

Step 4. Carefully lift the 2.5-inch rear drive backplane out of the rear hot-swap drive cage.

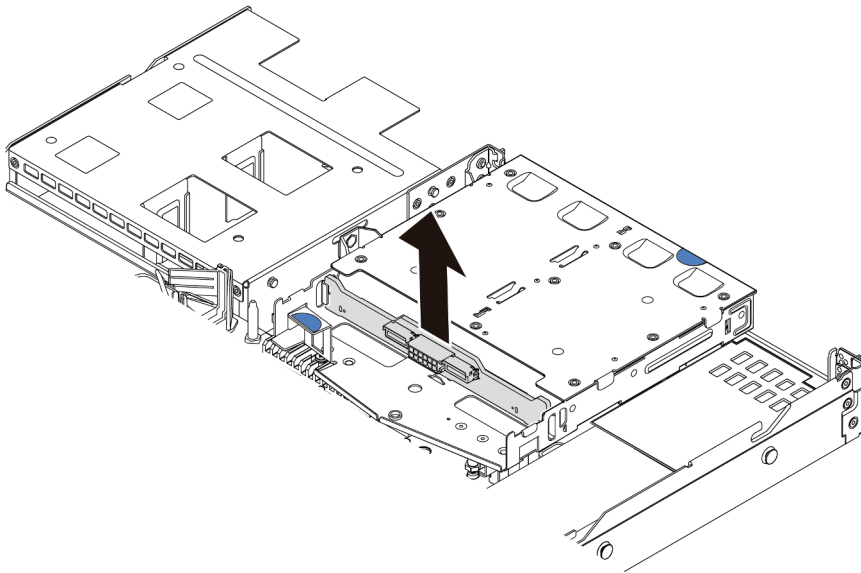


Figure 60. 2.5-inch rear drive backplane removal

After you finish

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

Demo video

[Watch the procedure on YouTube](#)

Install the 2.5-inch rear drive backplane

Use this information to install the rear backplane.

About this task

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. 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. Align the rear backplane with the rear hot-swap drive cage and lower it into the rear hot-swap drive cage.

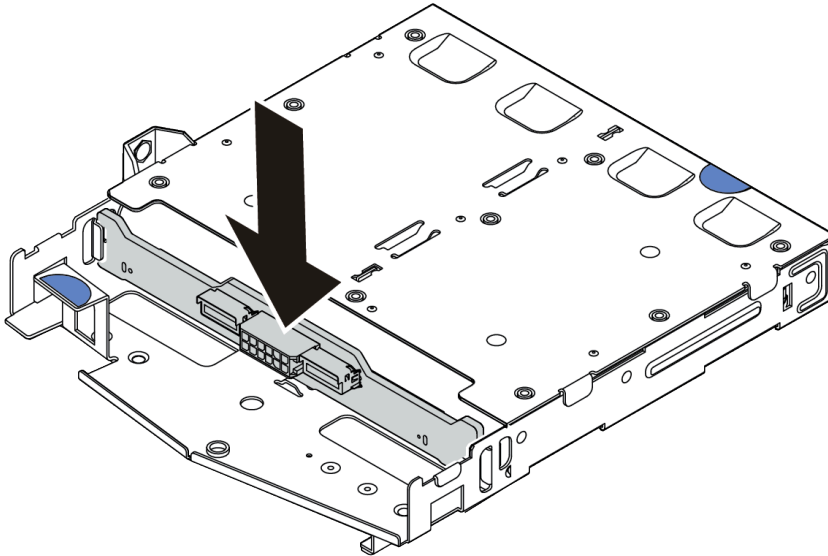


Figure 61. Rear backplane installation

- Step 3. Connect the signal cable and the power cable on the rear backplane. You can refer to the [Chapter 3 “Internal cable routing” on page 73](#) and locate the cable routing information for your configuration options.
- Step 4. Install the air baffle into the rear hot-swap drive cage as shown.

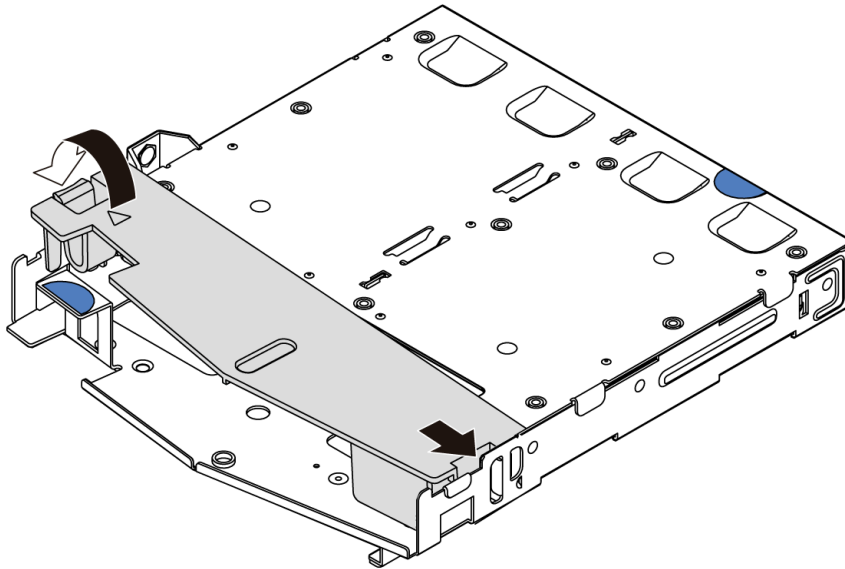


Figure 62. Air baffle installation

After you finish

1. Reinstall the drives or drive fillers into the rear hot-swap drive cage. See [“Install a hot-swap drive” on page 139](#).
2. Reinstall the drive assembly to the server. See [“Install the hot-swap rear drive assembly” on page 159](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).

Demo video

[Watch the procedure on YouTube](#)

Remove the 7mm drive backplane

Use this information to remove the 7mm drive backplane.

About this task

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Note: Depending on the specific type, your backplane might look different from the illustration in this topic.

Step 1. Prepare your server.

- a. Remove the top cover. See [“Remove the top cover” on page 226](#).
- b. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 137](#).
- c. Record the cable connections for 7mm drives and then disconnect all cables from the backplanes. For information about the backplane cable routing, see [“7mm drive backplane cable routing \(power & signal\)” on page 80](#).
- d. Remove the 7mm drive assembly (if any) from the rear chassis. See [“Remove the hot-swap rear drive assembly” on page 157](#).

Step 2. Remove the 7mm drive backplane on the top.

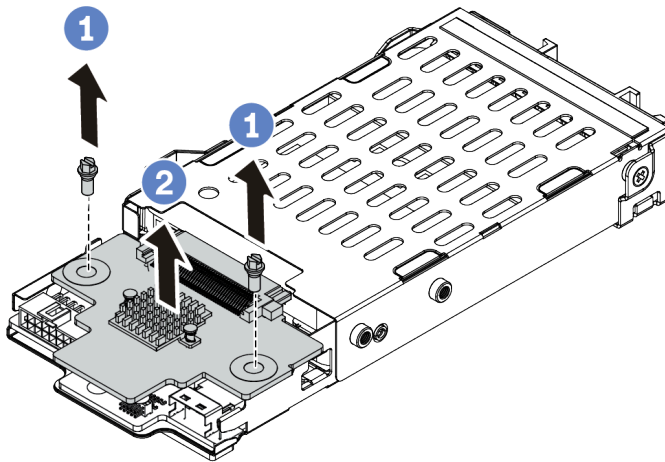


Figure 63. 7mm drive backplane removal (top)

- a. Remove the two screws as shown.
- b. Vertically lift the backplane up and put it aside.

Step 3. Remove the 7mm drive backplane at the bottom.

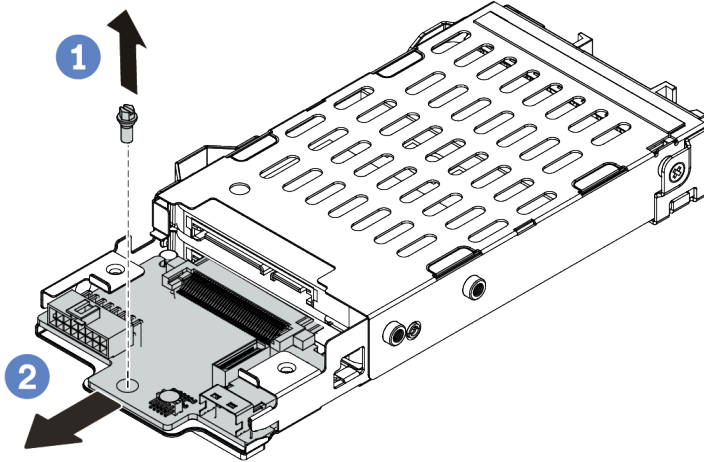


Figure 64. 7mm drive backplane removal (bottom)

- a. Remove the screw as shown.
- b. Remove the backplane horizontally from the cage as shown.

After you finish

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

Install the 7mm drive backplanes

Use this information to install the 7mm drive backplanes.

About this task

Attention:

- Read “[Installation Guidelines](#)” on page 117 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the new backplane to any unpainted surface on the outside of the server. Then, take the new backplane out of the package and place it on a static-protective surface.
- Step 2. Install the 7mm drive backplane at the bottom.

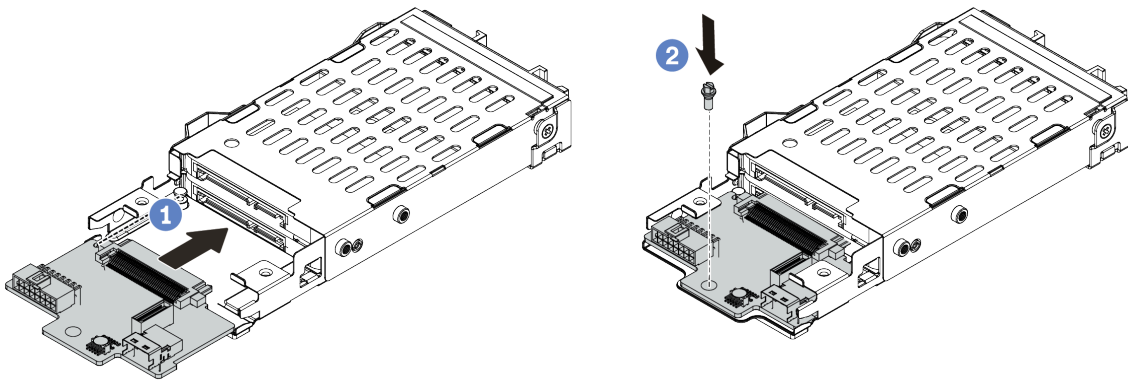


Figure 65. 7mm drive backplane installation (bottom)

- a. Align the pin on the cage and slightly slide the backplane into the cage until it is fully seated.
- b. Install the screw as shown.

- Step 3. Install the 7mm drive backplane on the top.

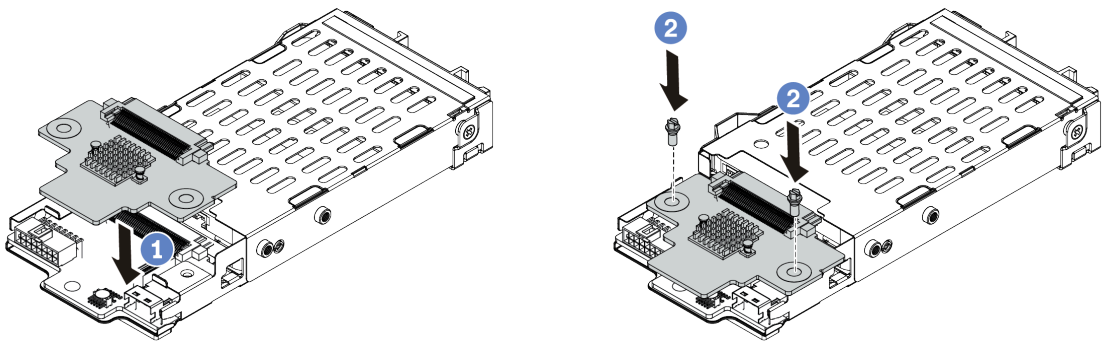


Figure 66. 7mm drive backplane installation (top)

- a. Put the backplane down on the cage as shown.
- b. Install the two screws to secure the backplane in place

Step 4. Connect the cables from the backplanes to the system board and riser slot. See [“7mm drive backplane cable routing \(power & signal\)” on page 80](#).

After you finish

1. Install the 7mm drive cage assembly on the rear chassis. See [“Install the hot-swap rear drive assembly” on page 159](#).
2. Reinstall all the drives and fillers (if any) into the drive bays. See [“Install a hot-swap drive” on page 139](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).

Hot-swap rear drive assembly replacement

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

Note: The term “hot-swap drive” refers to all the supported types of 2.5-inch hot-swap hard disk drives and hot-swap solid-state drives.

Remove the hot-swap rear drive assembly

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

About this task

The following illustrates how to remove the 2.5-inch rear drive assembly. You can remove the 7mm rear drive assembly in the same way.

Attention:

- Read “[Installation Guidelines](#)” on page 117 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See “[Remove the top cover](#)” on page 226.
- Step 2. Remove the drives or drive fillers installed in the hot-swap rear drive cage. See “[Remove a hot-swap drive](#)” on page 137.
- Step 3. Disconnect the hot-swap rear drive cage cables from the system board or the PCIe adapter.

Attention: To avoid damaging the system board, make sure to follow the instructions in [Chapter 3 “Internal cable routing”](#) on page 73 when disconnecting cables from the system board.

- Step 4. Hold the two blue touch points and directly lift the hot-swap rear drive cage out of the chassis.

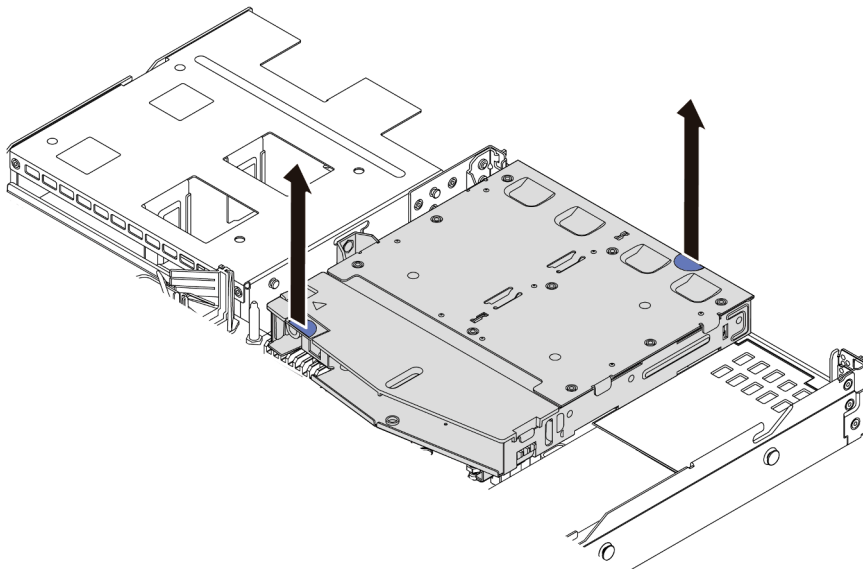


Figure 67. Hot-swap rear drive cage removal

Step 5. If the rear backplane is reused, remove the rear backplane. See [“Remove the 2.5-inch rear drive backplane” on page 149](#).

After you finish

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

Demo video

[Watch the procedure on YouTube](#)

Install the hot-swap rear drive assembly

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

About this task

The following illustrates how to install the 2.5-inch rear drive assembly. You can install the 7mm rear drive assembly in the same way.

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the hot-swap rear drive cage to any unpainted surface on the outside of the server. Then, take the hot-swap rear drive cage out of the package and place it on a static-protective surface.
- Step 2. Gently press and hold the tab on the hot-swap rear drive cage as shown and remove the air baffle from the hot-swap rear drive cage.

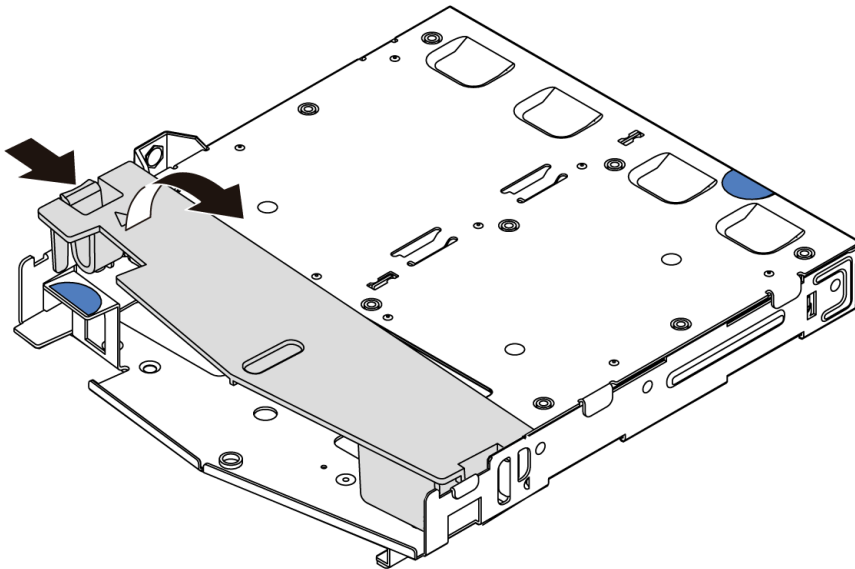


Figure 68. Air baffle removal

- Step 3. Align the rear backplane with the hot-swap rear drive cage and lower it into the hot-swap rear drive cage.

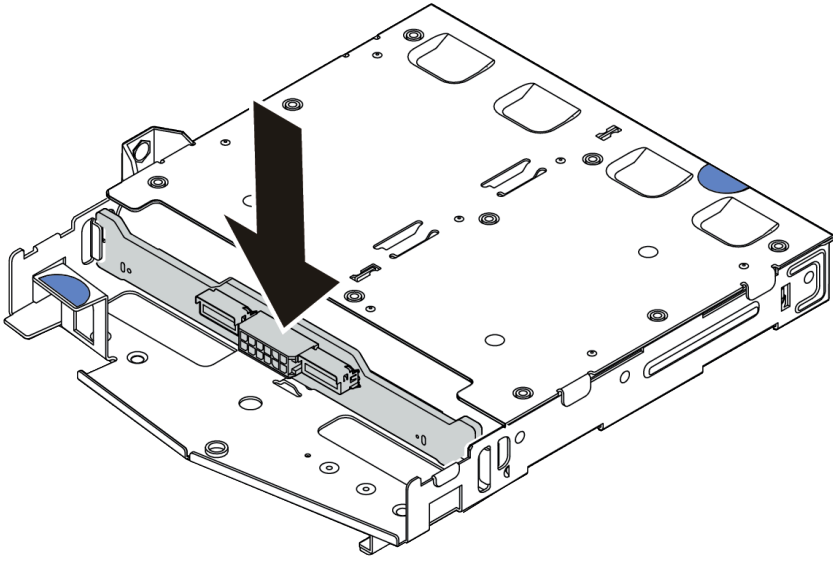


Figure 69. Rear backplane installation

- Step 4. Connect the signal cable and the power cable on the rear backplane. You can refer to the [Chapter 3 “Internal cable routing” on page 73](#) and locate the cable routing information for your configuration options.
- Step 5. Install the air baffle into the hot-swap rear drive cage as shown.

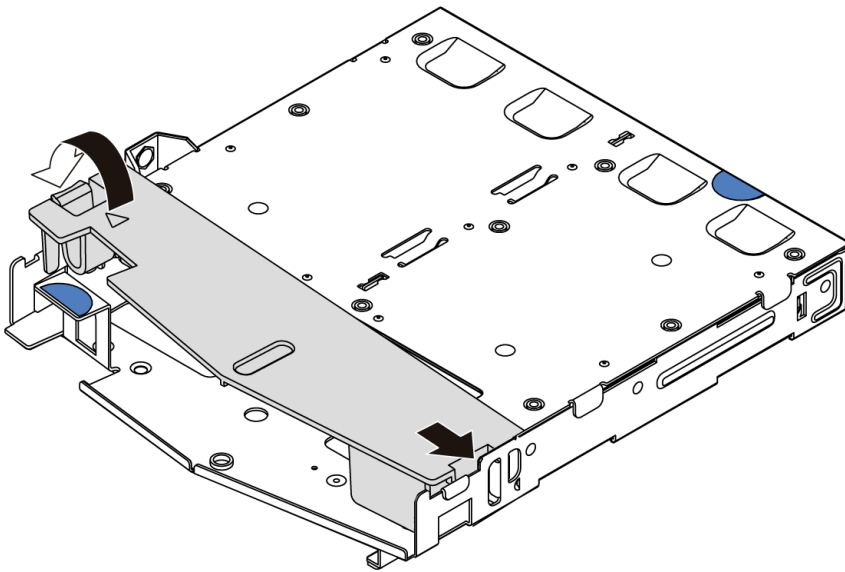


Figure 70. Air baffle installation

Step 6. Align the pins on the hot-swap rear drive cage with the corresponding hole and slot in the chassis. Then, lower the hot-swap rear drive cage into the chassis until it is fully seated.

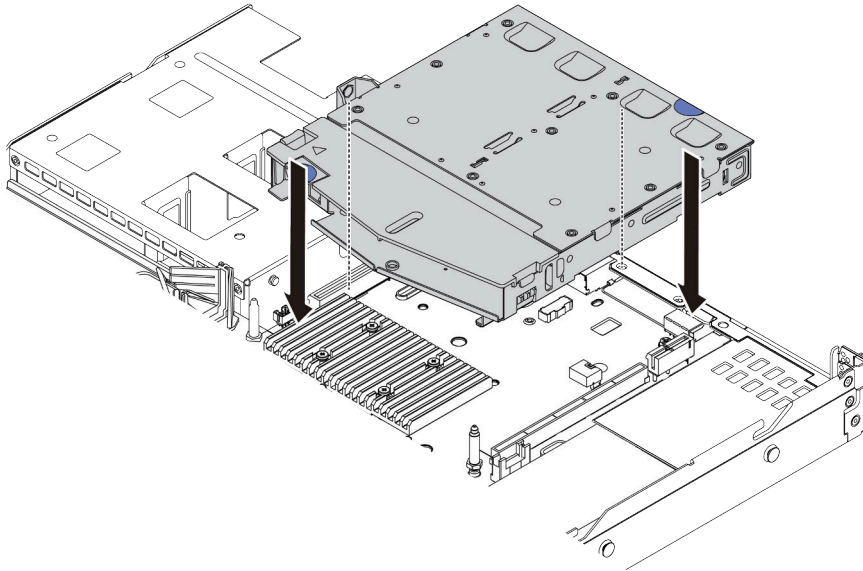


Figure 71. Hot-swap rear drive cage installation

Step 7. Connect the signal cable and connect the power cable to the system board. You can refer to the [Chapter 3 “Internal cable routing” on page 73](#) and locate the cable routing information for your configuration options.

After you finish

1. Reinstall the drives or drive fillers into the hot-swap rear drive cage. See [“Install a hot-swap drive” on page 139](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).

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.

Safety precautions

Understand and apply the safety precautions before removing or installing a power supply unit.

AC power supply units

S001



DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

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

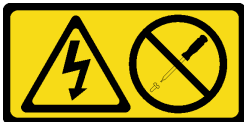
S002



CAUTION:

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

S035



CAUTION:

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

DC power supply units

CAUTION:



240 V DC input (input range: 180-300 V) is supported in Chinese Mainland ONLY.

Perform the following steps to safely remove the power cord of one 240 V DC power supply unit. Otherwise, there can be data loss and other damages to the equipment. Damages and losses resulting from inappropriate operations will not be covered by the manufacturer's warranty.

1. Turn off the server.
2. Disconnect the power cord from the power source.
3. Disconnect the power cord from the power supply unit.

S035



CAUTION:

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

S019



CAUTION:

The power-control button on the device does not turn off the electrical current supplied to the device. The device also might have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals.

S029



DANGER

**For -48V dc power supply, electrical current from power cables is hazardous.
To avoid a shock hazard:**

- **To connect or disconnect -48V dc power cables when you need to remove/install redundancy power supply unit(s).**

To Connect:

1. Turn OFF subject dc power source(s) and equipment (s) that are attached to this product.
2. Install the power supply unit(s) into the system housing.
3. Attach dc power cable(s) to the product.
 - Ensure correct polarity of -48 V dc connections: RTN is + and -Vin (typical -48 V) dc is -. Earth ground should use a two-hole lug for safety.
4. Connect dc power cable(s) to subject power source (s).
5. Turn ON all the power source(s).

To Disconnect:

1. Disconnect or turn off the subject dc power source(s) (at the breaker panel) before removing the power supply unit(s).
2. Remove the subject dc cable(s).
3. Unplug the subject power supply unit(s) from the system housing.

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 is non-hot-swap and before removing it, you must turn off the server first. To support redundancy mode or hot-swap, install an additional hot-swap power supply.
- You don't need to set the power redundancy mode yourself. The BMC of the server can automatically set it based on the installed power supply unit quantity.
 - When only 1 power supply unit is installed, the redundancy mode is set to “Non-redundant mode”.
 - When 2 power supply units are installed, the redundancy mode is set to “Redundant N+N”. If one of the power supply units fails or has been removed, the BMC will report an event and set the redundancy mode to “Non-redundant mode” automatically.

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. If the server is in a rack, adjust the cable management arm (CMA) to gain access to the power supply bay.

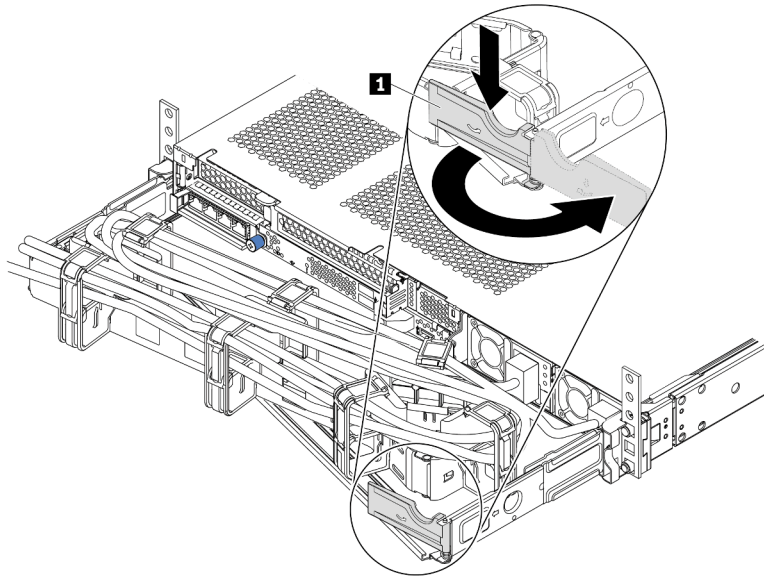


Figure 72. CMA adjustment

1. Press down the stop bracket **1** and rotate it to the open position.
 2. Rotate the CMA out of the way to gain access to the power supply.
- Step 2. Disconnect the power cord from the hot-swap power supply and the electrical outlet.
- For 240 V DC power supply units, turn off the server, then, disconnect both ends of the power cord and keep it in an ESD-safe place.
 - For AC power supply units, disconnect both ends of the power cord and keep it in an ESD-safe place.
 - For -48V DC power supply units:
 1. Disconnect the power cords from the electrical outlet.
 2. Use a slotted screwdriver to loosen the captive screws on the power supply terminal block.
 3. Disconnect the power cords from the power supply unit and keep them in an ESD-safe place.

Note: If you are replacing two power supplies, 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 until the power output LED for the firstly replaced power supply is lit. For the location of the power output LED, refer to [“Rear view LEDs” on page 61](#).

- Step 3. Press the release tab toward the handle and carefully pull the handle at the same time to slide the hot-swap power supply out of the chassis.

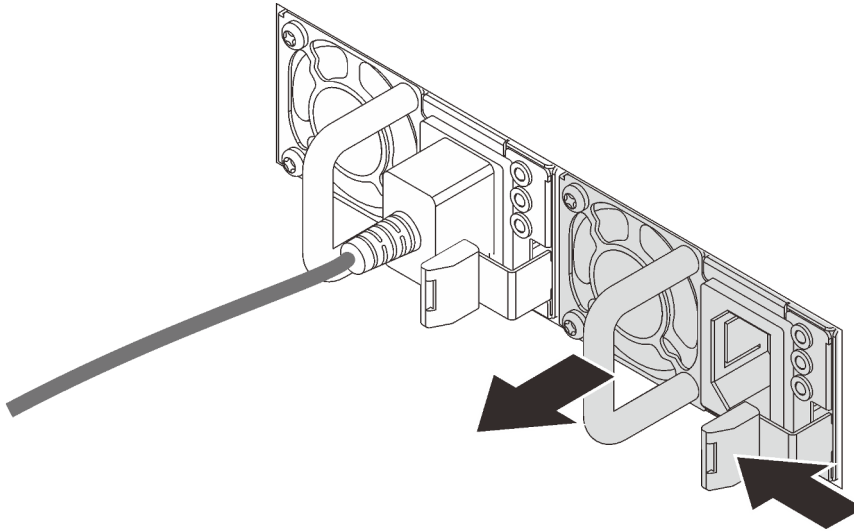


Figure 73. Hot-swap power supply removal

After you finish

1. Install a new power supply or install the power-supply filler to cover the power supply bay. See [“Install a hot-swap power supply unit”](#) on page 168.

Important: To ensure proper cooling during normal server operation, both of the power supply bays must be occupied. This means that each bay must have a power supply installed; or one has a power supply installed and the other has a power supply filler installed.

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

Demo video

[Watch the procedure on YouTube](#)

Install a hot-swap power supply unit

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

About this task

- The server is shipped with only one power supply by default. In this case, the power supply is non-hot-swap and before removing it, you must turn off the server first. To support redundancy mode or hot-swap, install an additional hot-swap power supply.
- The server does not support setting the redundancy mode manually. The BMC of the server can automatically set it based on the installed power supply unit quantity.
 - When only 1 power supply unit is installed, the redundancy mode is set to “Non-redundant mode”.
 - When 2 power supply units are installed, the redundancy mode is set to “Redundant (N+N)”. If one of the power supply units fails or has been removed, the BMC will report an event and set the redundancy mode to “Non-redundant mode” automatically.
- If you are replacing the existing power supply with a new power supply:
 - Use Lenovo Capacity Planner to calculate the required power capacity for what is configured for your server. For details, see:
<https://datacentersupport.lenovo.com/solutions/Invo-lcp>
 - Ensure that the devices that you are installing are supported. For details, see:
<https://serverproven.lenovo.com/>
 - Attach the label coming with this option onto the existing label near the power supply.



Figure 74. Example label

Attention:

- Read “Installation Guidelines” on page 117 to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Take the new part out of the package and place it on a static-protective surface.
- Step 2. If there is a power-supply filler installed, remove it.

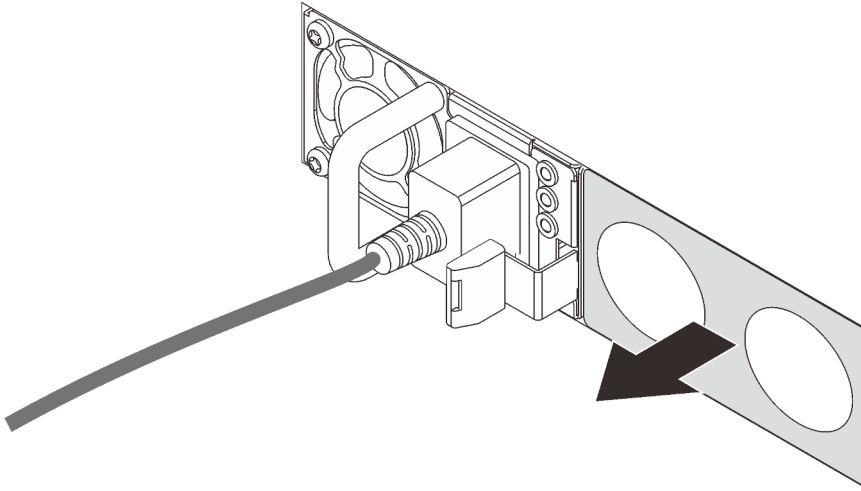


Figure 75. Hot-swap power supply filler removal

- Step 3. Slide the new hot-swap power supply into the bay until it snaps into position.

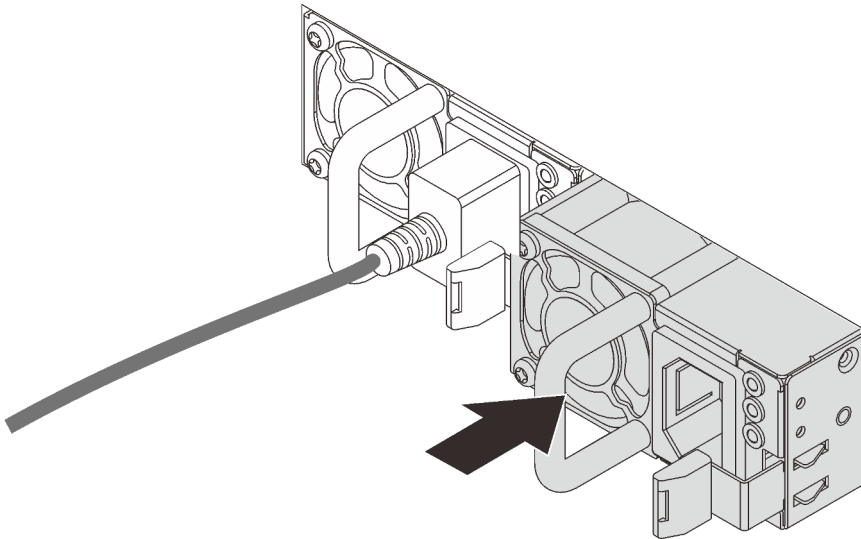



Figure 76. Hot-swap power supply installation

- Step 4. Connect the power supply unit to a properly grounded electrical outlet.
 - For 240 V DC power supply units:
 1. Turn off the server.
 2. Connect one end of the power cord to the power connector on the power supply unit.
 3. Connect the other end of the power cord to a properly grounded electrical outlet.
 - For AC power supply units:
 1. Connect one end of the power cord to the power connector on the power supply unit.
 2. Connect the other end of the power cord to a properly grounded electrical outlet.

- For –48V DC power supply units:
 1. Use a slotted screwdriver to loosen the 3 captive screws on the power supply terminal block.
 2. Check the type label on the power supply block and each power cord.

Type	PSU terminal block	Power cord
Input	-Vin	-Vin
Ground		GND
Output	RTN	RTN

3. Face the groove side of each power cord pin upwards, and then plug the pins into corresponding holes on the power block. Use the table above for guidance to ensure that the pins find correct slots.
4. Tighten the captive screws on the power block. Ensure that the screws and cord pins are secured in place and no bare metal parts are shown.
5. Connect the other end of the cables to a properly grounded electrical outlet. Ensure that the cable ends find correct outlets.

After you finish

1. If you have adjusted the CMA to gain access to the power supply bay, properly readjust the CMA back in place.
2. 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 are lit, indicating that the power supply is operating properly.

Demo video

[Watch the procedure on YouTube](#)

Internal CFF RAID/HBA adapter replacement

Use this information to remove and install the internal CFF RAID/HBA adapter.

Remove the internal CFF RAID/HBA adapter

Use this information to remove the internal CFF RAID/HBA adapter.

About this task

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).
- Step 2. Remove any components that may impede access to the internal CFF RAID/HBA adapter.
- Step 3. Disconnect all cables from the internal CFF RAID/HBA adapter.

Attention: To avoid damaging the system board, make sure to follow the instructions in [Chapter 3 “Internal cable routing” on page 73](#) when disconnecting cables from the system board.

- Step 4. Lift the release pin, slightly slide the internal CFF RAID/HBA adapter as shown, and carefully lift it out of the chassis.

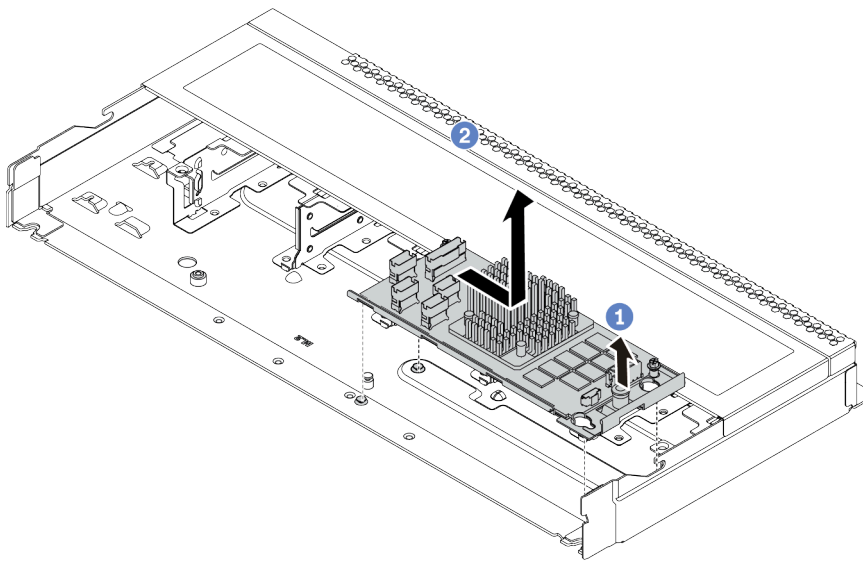


Figure 77. Internal CFF RAID/HBA adapter removal

After you finish

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

Demo video

[Watch the procedure on YouTube](#)

Install the internal CFF RAID/HBA adapter

Use this information to install the internal CFF RAID/HBA adapter.

About this task

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the internal CFF RAID/HBA adapter to any unpainted surface on the outside of the server. Then, take the internal CFF RAID/HBA adapter out of the package and place it on a static-protective surface.
- Step 2. Align the notches on the tray with the pins on the chassis, place down the internal CFF RAID/HBA adapter, and slightly slide it as shown to secure it on the chassis.

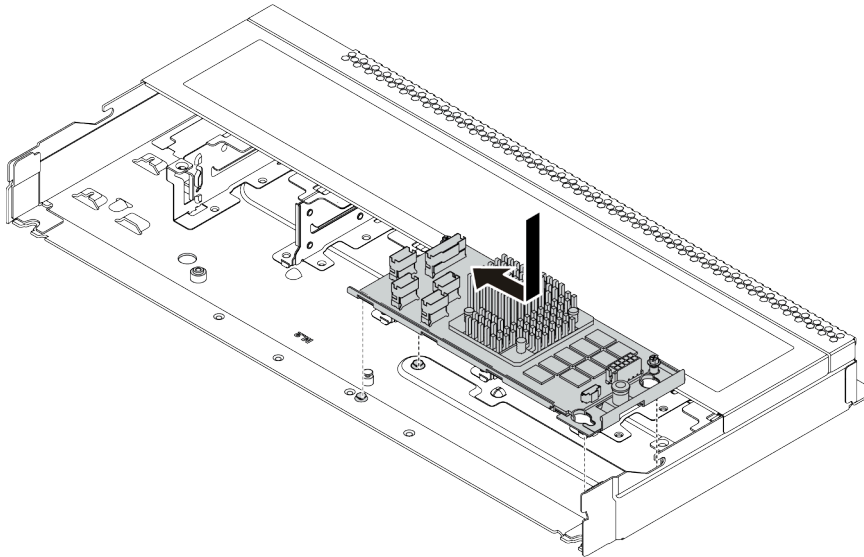


Figure 78. Internal CFF RAID/HBA adapter installation

- Step 3. Connect cables to the internal CFF RAID/HBA adapter. See [“CFF RAID/HBA adapter cable routing” on page 75](#) and [“2.5-inch/3.5-inch drive backplane cable routing \(signal\)” on page 83](#).

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).

Demo video

[Watch the procedure on YouTube](#)

Intrusion switch replacement

Use this information to remove and install an intrusion switch.

The intrusion switch informs you that the server cover is not properly installed or closed by creating an event in the system event log (SEL).

Remove an intrusion switch

Use this information to remove an intrusion switch.

About this task

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).
- Step 2. Disconnect the cable of the intrusion switch from the system board. For the location of the intrusion switch connector and cable routing information, refer to [“System board” on page 63](#) and [“Intrusion switch cable routing” on page 77](#).

Attention: To avoid damaging the system board, make sure to follow the instructions in [Chapter 3 “Internal cable routing” on page 73](#) when disconnecting cables from the system board.

- Step 3. Slide the intrusion switch as shown to remove it.

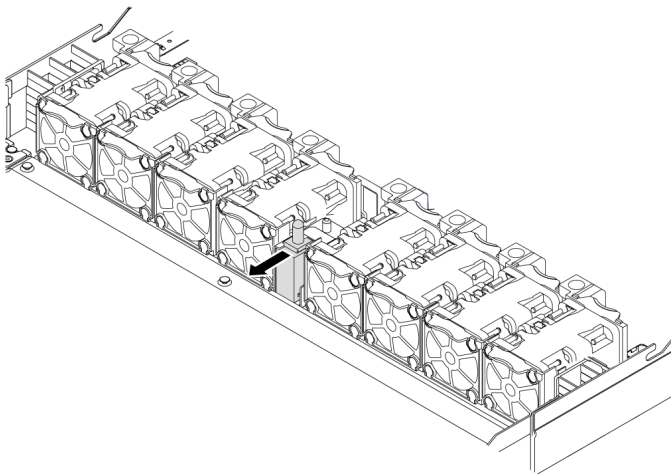


Figure 79. Intrusion switch removal

After you finish

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

Demo video

[Watch the procedure on YouTube](#)

Install an intrusion switch

Use this information to install an intrusion switch.

About this task

Attention:

- Read [“Installation Guidelines” on page 117](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the intrusion switch to any unpainted surface on the outside of the server. Then, take the intrusion switch out of the package and place them on a static-protective surface.
- Step 2. Insert the intrusion switch and push it in the direction as shown until it is fully seated.

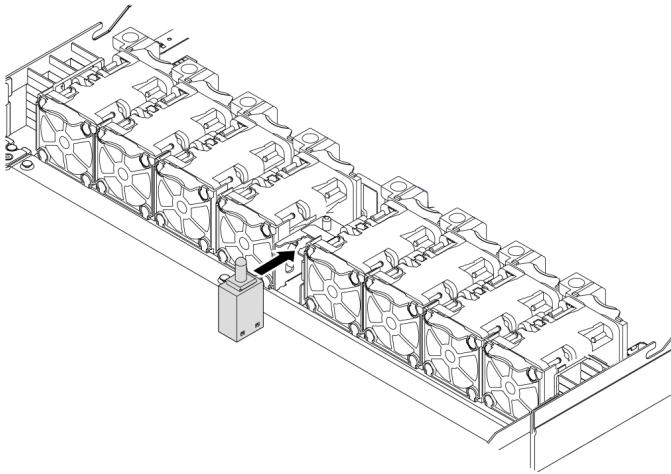


Figure 80. Intrusion switch installation

After you finish

1. Connect the cable of the intrusion switch to the intrusion switch connector on the system board by referring to [“Intrusion switch cable routing” on page 77](#). For the location of the intrusion switch connector, refer to [“System board” on page 63](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).

Demo video

[Watch the procedure on YouTube](#)

Memory module replacement

Use this information to remove and install a memory module.

Remove a memory module

Use this information to remove a memory module.

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Memory modules are sensitive to static discharge and require special handling. Refer to the standard guidelines for [“Handling static-sensitive devices” on page 119](#).
 - 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 touch. 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. Remove the top cover. See [“Remove the top cover” on page 226](#).
- Step 2. If your server comes with an air baffle, remove it. See [“Remove the air baffle” on page 121](#).

Step 3. Remove the memory module from the slot.

mm

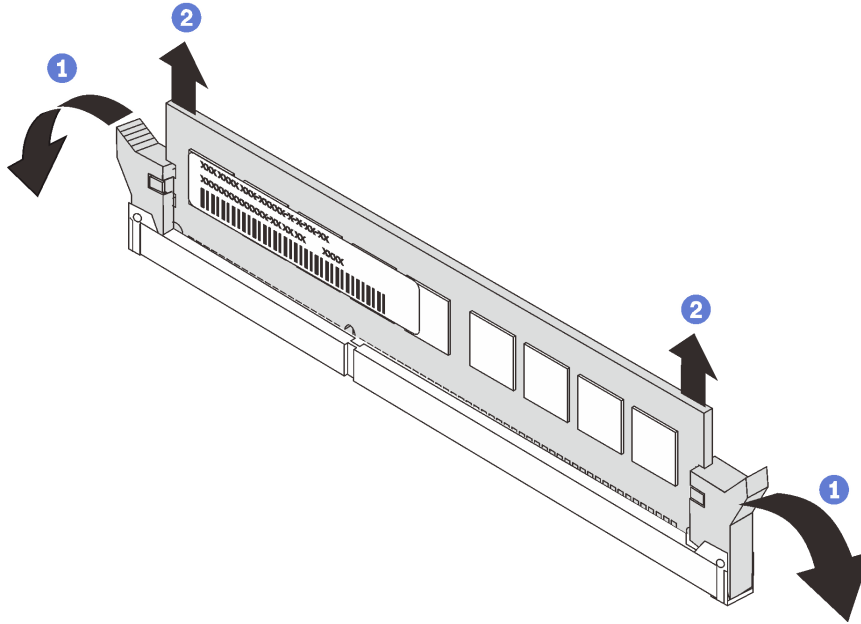


Figure 81. Memory module removal

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

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

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

After you finish

1. Install a memory module filler or a new memory module to cover the slot. See [“Install a memory module” on page 179](#).
2. If you are instructed to return the old memory module, follow all packaging instructions and use any packaging materials that are provided.

Demo video

[Watch the procedure on YouTube](#)

Install a memory module

Use this information to install a memory module.

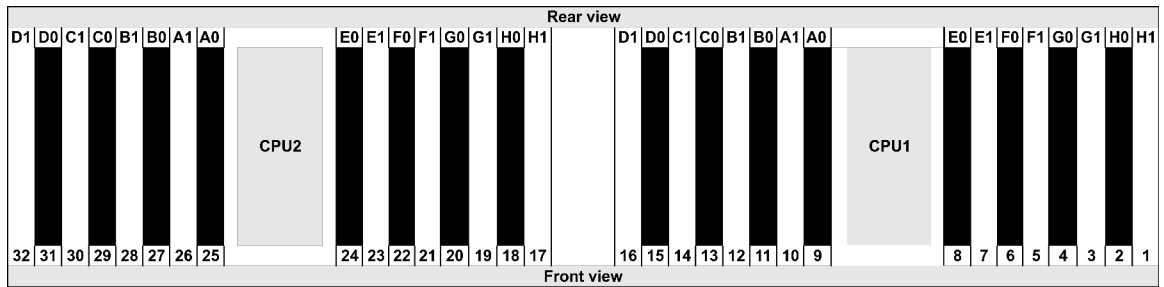
About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Memory modules are sensitive to static discharge and require special handling. Refer to the standard guidelines for [“Handling static-sensitive devices” on page 119](#):
 - 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. 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 2. Check the technical rules and make sure you have selected the correct memory modules. See [“DIMM population rules” on page 18](#).
- Step 3. Locate the channels and slots on the system board.



- Step 4. Install the memory module into the slot.

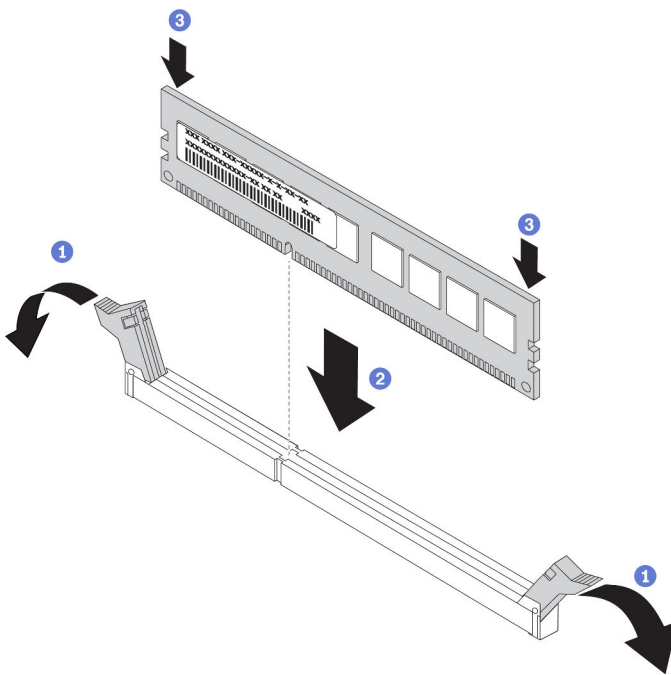


Figure 82. Memory module installation

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

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

- b. Align the memory module with the slot, and gently place the memory module on the slot with both hands.
- c. Firmly 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 230](#).

Demo video

[Watch the procedure on YouTube](#)

M.2 adapter and M.2 drive replacement

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

Remove the M.2 adapter and M.2 drive

Use this information to remove the M.2 adapter and M.2 drive.

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).

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

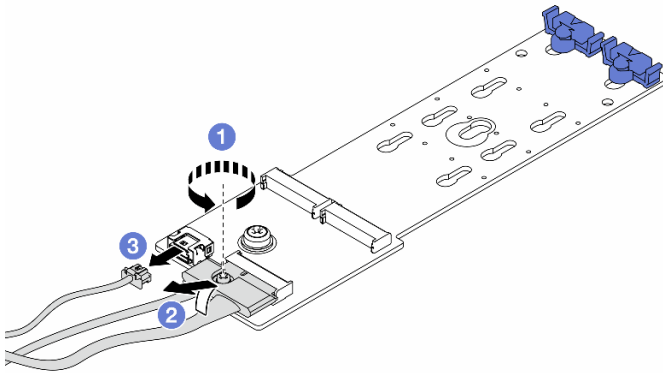


Figure 83. Disconnecting M.2 cables

- a. Loosen the screw on the signal cable.
- b. Tilt the connector and remove it.
- c. Remove the power cable.

Step 3. Remove the M.2 drive from the M.2 adapter.

Note: The M.2 adapter you want to remove might be different from the following illustrations, but the removal method is the same.

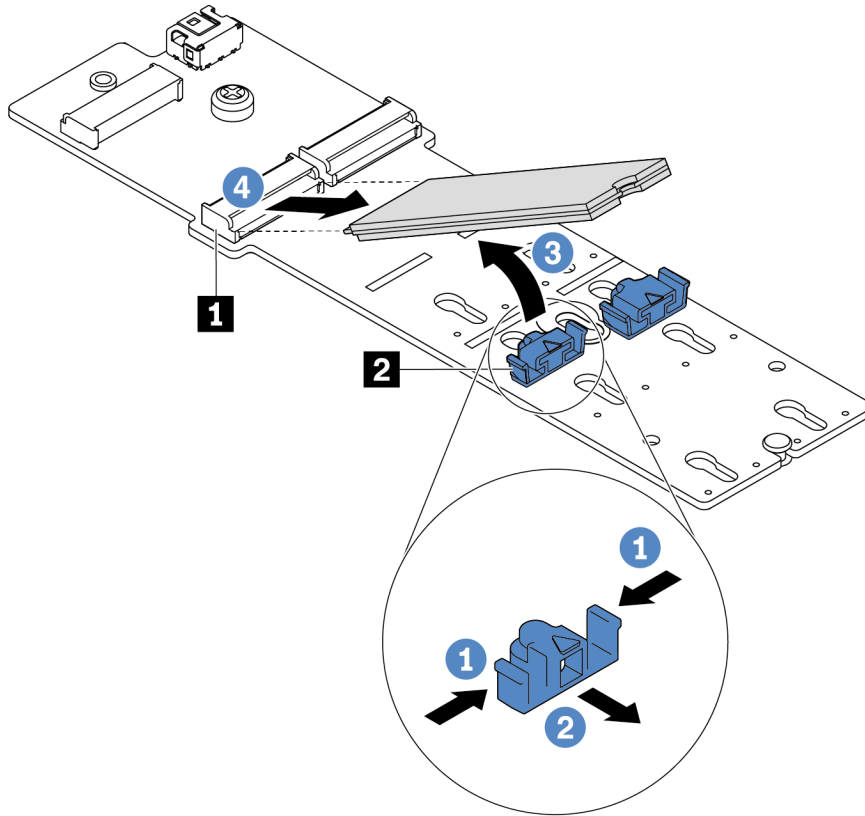


Figure 84. M.2 drive removal

- Press both sides of the retainer **2**.
- Slide the retainer backward to loosen the M.2 drive from the M.2 adapter.
- Rotate the M.2 drive away from the M.2 adapter.
- Pull the M.2 drive away from the connector **4** at an angle of approximately 30 degrees.

Step 4. Remove the M.2 module from the chassis.

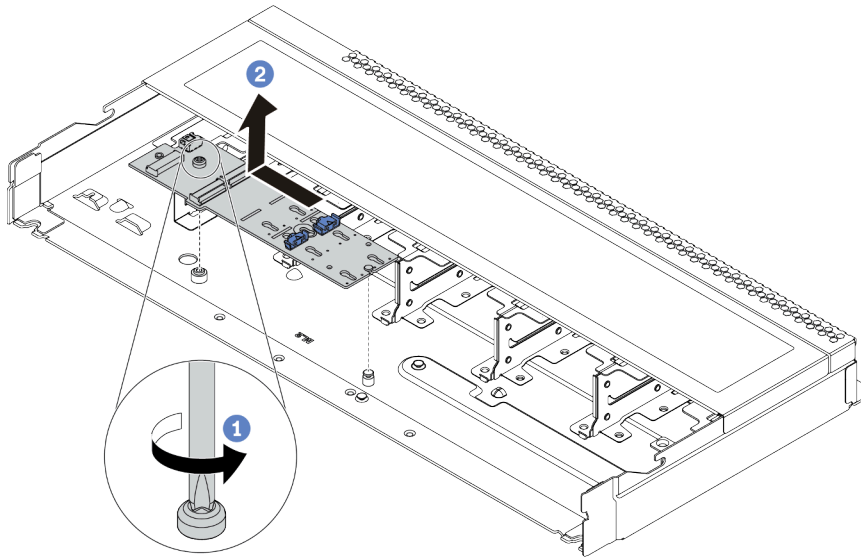


Figure 85. M.2 module removal

- a. Loosen the screw.
- b. Release the M.2 adapter from the pin and carefully lift the M.2 adapter out from the chassis.

Step 5. Disconnect all M.2 cables from the system board.

- a. Press the release tab to release the connector.
- b. Disengage the connector from the cable socket.

Note: Failing to release the tab before removing the cables will damage the cable sockets on the system board. Any damage to the cable sockets might require replacing the system board.

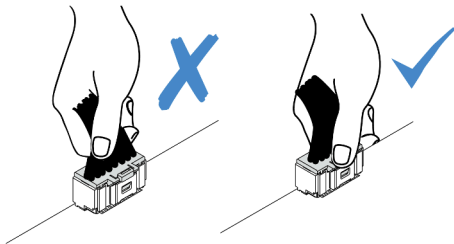


Figure 86. Disconnecting the M.2 cables

After you finish

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

Demo video

[Watch the procedure on YouTube](#)

Adjust the retainer on the M.2 adapter

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

About this task

Attention:

- Read “[Installation Guidelines](#)” on [page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Note: The M.2 adapter you want to adjust might be different from the following illustrations, but the adjustment method is the same.

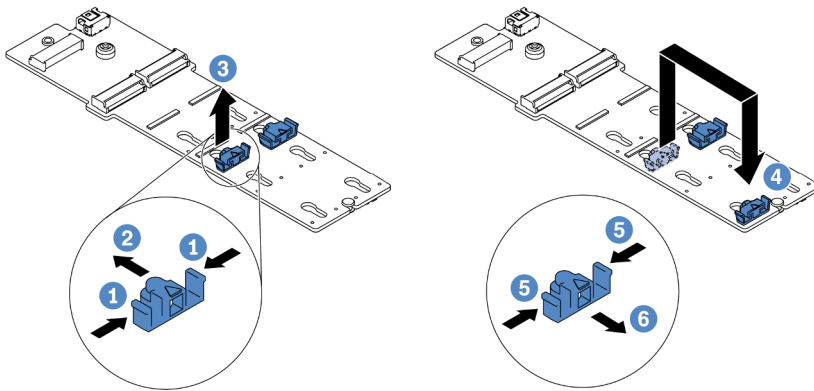


Figure 87. M.2 retainer adjustment

- Step 1. Press both sides of the retainers.
- Step 2. Move the retainer forward until it is in the large opening of the keyhole.
- Step 3. Take the retainer out of the keyhole.
- Step 4. Insert the retainer into the correct keyhole into which the retainer should be installed to accommodate the particular size of the M.2 drive you wish to install.
- Step 5. Press both sides of the retainer.
- Step 6. Slide the retainer backwards until it is seated in place.

Install the M.2 adapter and M.2 drive

Use this information to install the M.2 adapter and M.2 drive.

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

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

Notes:

- The M.2 adapter module is shipped with a loose screw, but the screw is not necessarily used for the installation.
- The M.2 adapter you want to install might be different from the following illustrations, but the installation method is the same.

Step 2. Adjust the retainer on the M.2 adapter to accommodate the particular size of the M.2 drive you wish to install. See [“Adjust the retainer on the M.2 adapter” on page 185](#).

Step 3. Locate the M.2 drive slot on the M.2 adapter.

Note: For some M.2 adapters that support two identical M.2 drives, install the M.2 drive in slot 0 first.

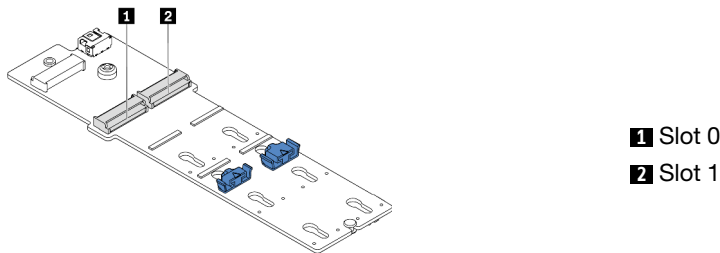


Figure 88. M.2 drive slot

Step 4. Install the M.2 adapter onto the chassis.

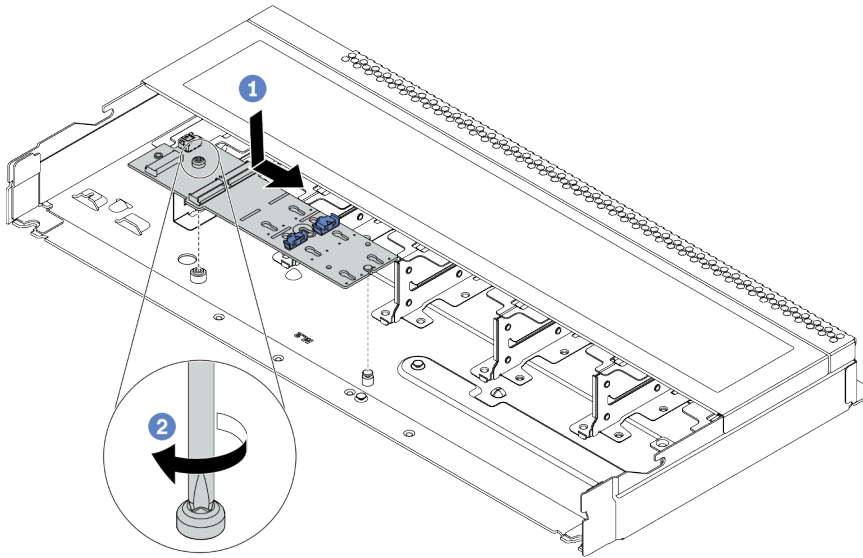


Figure 89. M.2 adapter installation

- a. Align the notch of the M.2 adapter with the pin on the chassis, and then place down the M.2 adapter.
- b. Tighten the screw to secure the M.2 adapter.

Step 5. Install the M.2 drive on the M.2 adapter.

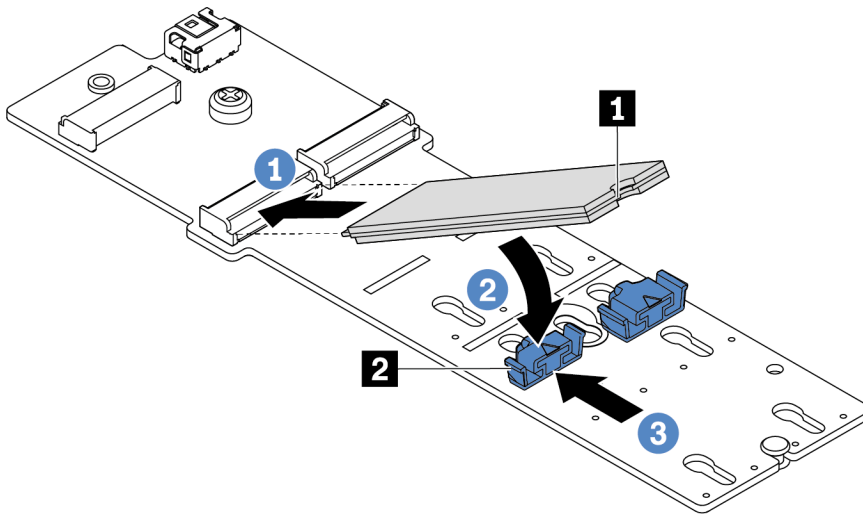


Figure 90. M.2 drive installation

- a. Insert the M.2 drive at an angle of approximately 30 degrees into the connector.
- b. Rotate the M.2 drive down until the notch **1** catches on the lip of the retainer **2**.
- c. Slide the retainer forward (toward the connector) to secure the M.2 drive into place.

Step 6. Connect the cables to the M.2 backplane and system board. See [“M.2 drive backplane cable routing \(power & signal\)”](#) on page 81.

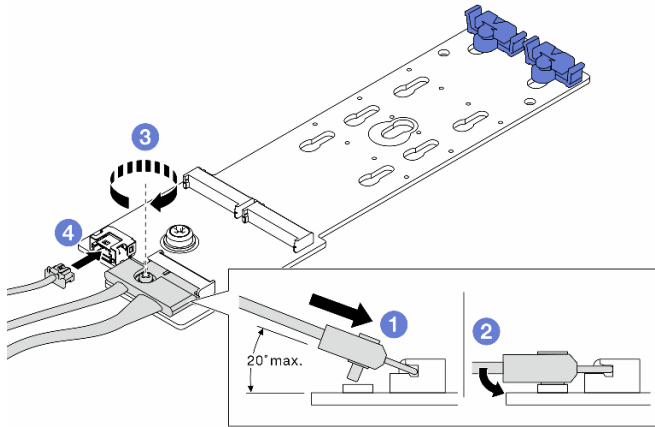


Figure 91. Connecting M.2 cables

- a. Tilt the connector at an angle of 20 degrees or lower, and insert it until its bottom surface reaches the ramp.
- b. Press the connector down flat.
- c. Tighten the screw on the signal cable.
- d. Connect the power cable.

After you finish

1. Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).
2. Use the Lenovo XClarity Provisioning Manager to configure the RAID. For more information, see the “RAID Setup” section in the LXPM documentation compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.

Demo video

[Watch the procedure on YouTube](#)

OCP 3.0 Ethernet adapter replacement

Use this information to remove and install the OCP 3.0 Ethernet adapter.

Note: The OCP 3.0 Ethernet adapter is available only on some models.

Remove the OCP 3.0 Ethernet adapter

Use this information to remove the OCP 3.0 Ethernet adapter.

About this task

Attention:

- Read “[Installation Guidelines](#)” on [page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

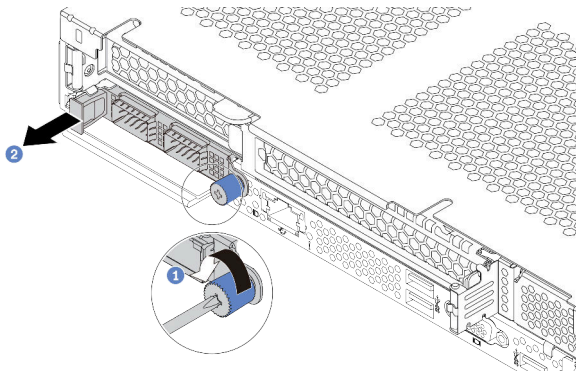


Figure 92. OCP 3.0 Ethernet adapter removal

Step 1. Loosen the thumbscrew that secures the adapter.

Step 2. Pull out the OCP 3.0 Ethernet adapter by its handle on the left as shown.

After you finish

Install a new OCP 3.0 Ethernet adapter or a card filler. See “[Install the OCP 3.0 Ethernet adapter](#)” on [page 190](#).

Demo video

[Watch the procedure on YouTube](#)

Install the OCP 3.0 Ethernet adapter

Use this information to install the OCP 3.0 Ethernet adapter.

About this task

Attention:

- Read “[Installation Guidelines](#)” on page 230 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the OCP 3.0 Ethernet adapter to any unpainted surface on the outside of the server. Then, take the OCP 3.0 Ethernet adapter out of the package and place it on a static-protective surface.
- Step 2. Install the OCP 3.0 Ethernet adapter.

Notes:

- Ensure that the Ethernet adapter is fully seated and the thumbscrew is securely tightened. Otherwise, the OCP 3.0 Ethernet adapter will not get full connection and may not function.
- If there is an OCP 3.0 Ethernet adapter installed, when the system is powered off but still plugged in to AC power, system fans will continue to spin at a much lower speed. This is the system design to provide proper cooling for the OCP 3.0 Ethernet adapter.

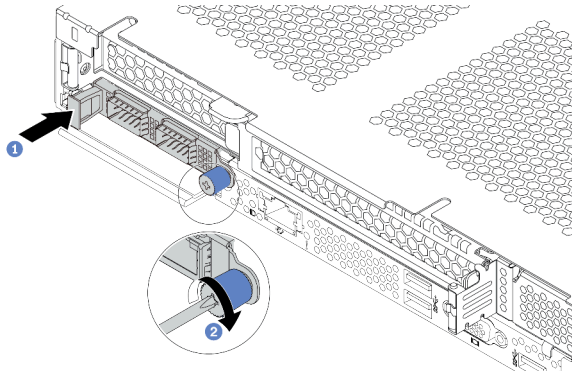


Figure 93. OCP 3.0 Ethernet adapter installation

- a. Push the OCP 3.0 Ethernet adapter by its handle on the left until it is fully inserted into the connector on the system board.
- b. Fully tighten the thumbscrew to secure the adapter.



Figure 94. OCP module (two connectors)



Figure 95. OCP module (four connectors)

Notes:

- The OCP 3.0 Ethernet adapter provides two or four extra Ethernet connectors for network connections.
- By default, Ethernet connector 1 (the first port starting from the left in the rear server view) on the OCP 3.0 Ethernet adapter can also function as a management connector using the shared management capacity. If the shared management connector fails, traffic can automatically switch over to another connector on the adapter.

After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).

Demo video

[Watch the procedure on YouTube](#)

PCIe adapter replacement

Use this information to remove and install a PCIe adapter.

The PCIe adapter can be an Ethernet adapter, a host bus adapter (HBA), a PCIe RAID adapter, a PCIe interposer adapter, a PCIe solid-state drive, a PCIe GPU, and any other supported PCIe adapter.

Notes:

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

Remove a PCIe adapter

Use this information to remove a PCIe adapter.

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).
- Step 2. Remove the riser assembly. See [“Remove a riser assembly” on page 211](#).
- Step 3. Remove the PCIe adapter from the riser assembly.

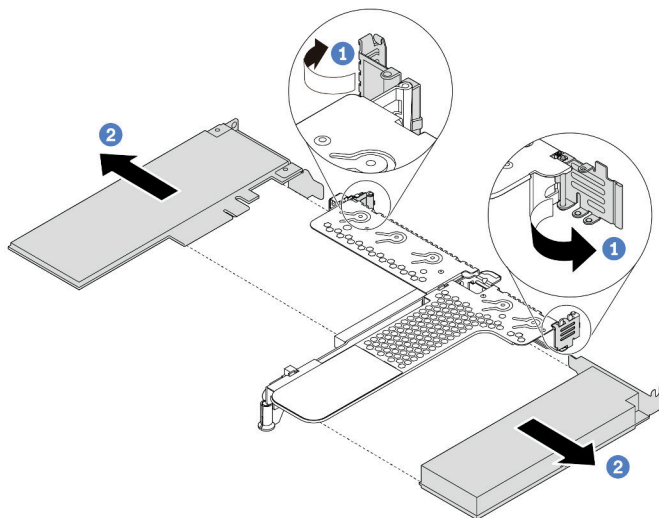


Figure 96. PCIe adapter removal from the LP-FH riser assembly

- a. Rotate the latch on the riser bracket to the open position.
- b. 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. In this topic, the LP-FH riser assembly is used as an example.

After you finish

1. Install a PCIe adapter or PCIe adapter filler. See [“Install a PCIe adapter” on page 194](#).
2. If you are instructed to return the old PCIe adapter, follow all packaging instructions and use any packaging materials that are provided.

Demo video

[Watch the procedure on YouTube](#)

Install a PCIe adapter

Use this information to install a PCIe adapter.

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. 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 54](#) and [“PCIe slots and configurations” on page 23](#).
- Step 3. Install the PCIe adapter and secure it to the riser assembly.

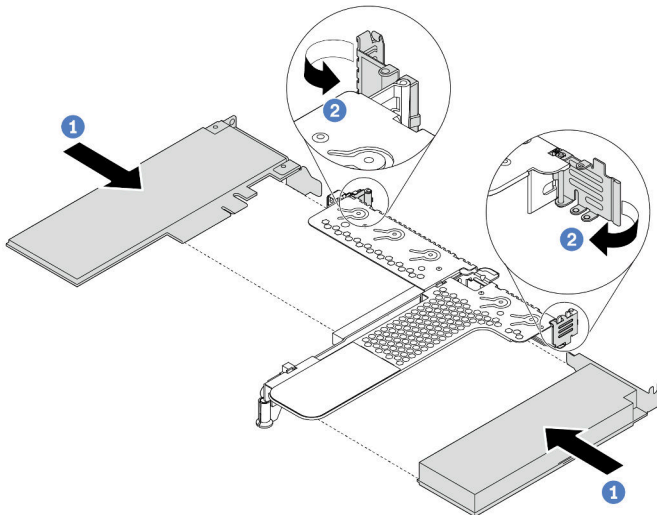


Figure 97. PCIe adapter installation into the LP-FH riser assembly

- a. Align the PCIe adapter with the PCIe slot on the riser card. Then, carefully press the PCIe adapter straight into the slot until it is securely seated and its bracket also is secured.
- b. Rotate the latch on the riser bracket to the closed position.

Notes:

1. Ensure that PCIe adapter installation meets [“Technical rules” on page 16](#).
2. The procedure for installing a PCIe adapter is similar for different types of riser assembly. In this topic, the LP-FH riser assembly is used as an example.

- Step 4. Connect the cables to the PCIe adapter in the riser assembly. You can refer to the [Chapter 3 “Internal cable routing” on page 73](#) and locate the cable routing information for your configuration options.

After you finish

1. Reinstall the riser assembly. See [“Install a riser assembly”](#) on page 214.
2. Complete the parts replacement. See [“Complete the parts replacement”](#) on page 230.

Demo video

[Watch the procedure on YouTube](#)

Rack latches replacement

Use this information to remove and install the rack latches.

Remove the rack latches

Use this information to remove the rack latches.

About this task

Attention: Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.

Procedure

- Step 1. If the server is installed with the security bezel, remove it first. See [“Remove the security bezel” on page 220](#).
- Step 2. Use a flat-blade screwdriver to remove the ID label plate on the right rack latch and place it in a safe place.

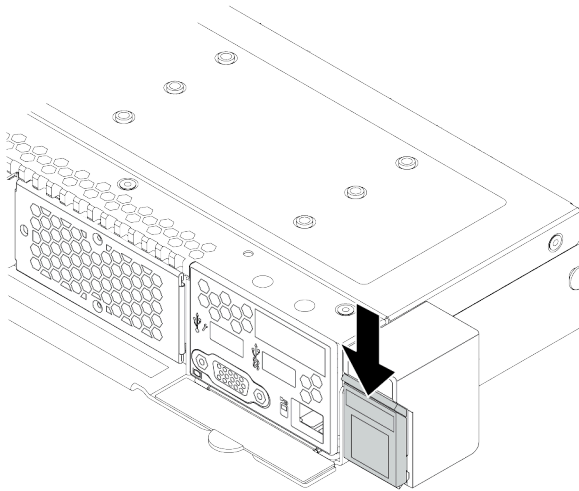


Figure 98. ID label plate removal

Step 3. On each side of the server, remove the two screws that secure the rack latch.

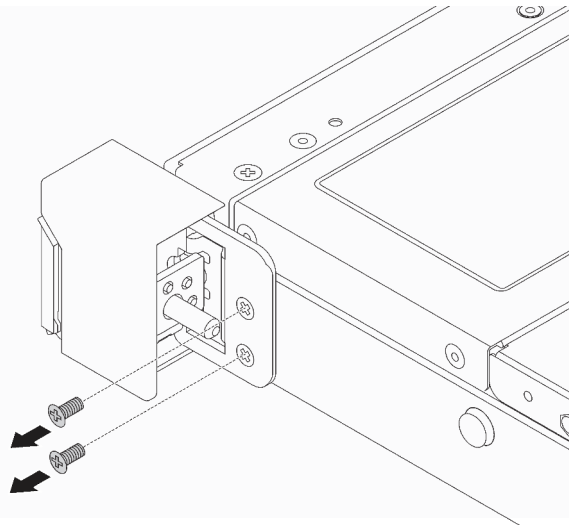


Figure 99. Rack latch screws removal

Step 4. On each side of the server, remove the rack latch from the chassis as shown.

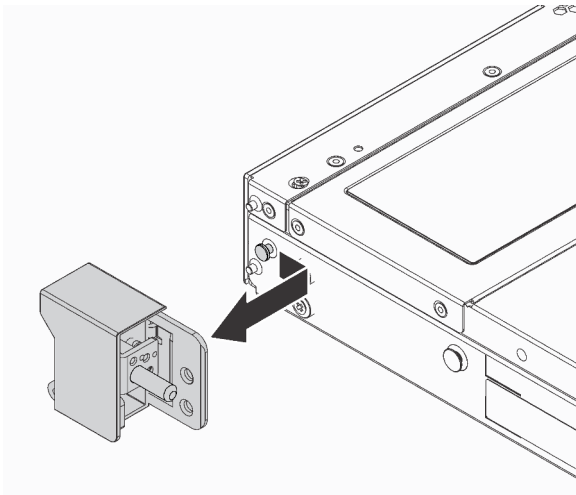


Figure 100. Rack latch removal

After you finish

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

Demo video

[Watch the procedure on YouTube](#)

Install the rack latches

Use this information to install the rack latches.

About this task

Attention: Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.

Procedure

- Step 1. Touch the static-protective package that contains the rack latches to any unpainted surface on the outside of the server. Then, take the rack latches out of the package and place them on a static-protective surface.
- Step 2. On each side of the server, align the rack latch with the pin on the chassis. Then, press the rack latch onto the chassis and slightly slide it forward as shown.

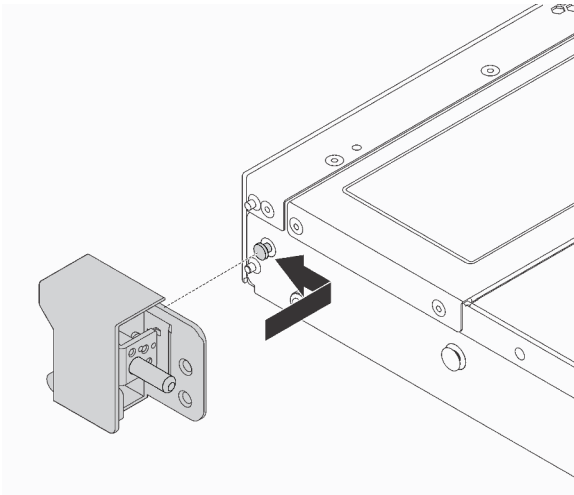


Figure 101. Rack latch installation

- Step 3. Install the two screws to secure the rack latch on each side of the server.

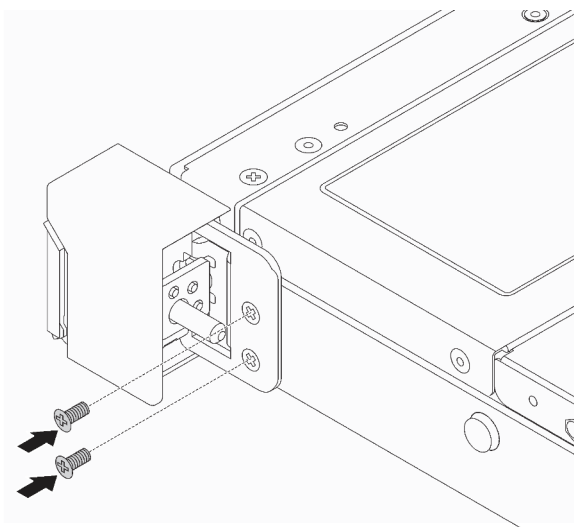


Figure 102. Rack latch screws installation

After you finish

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

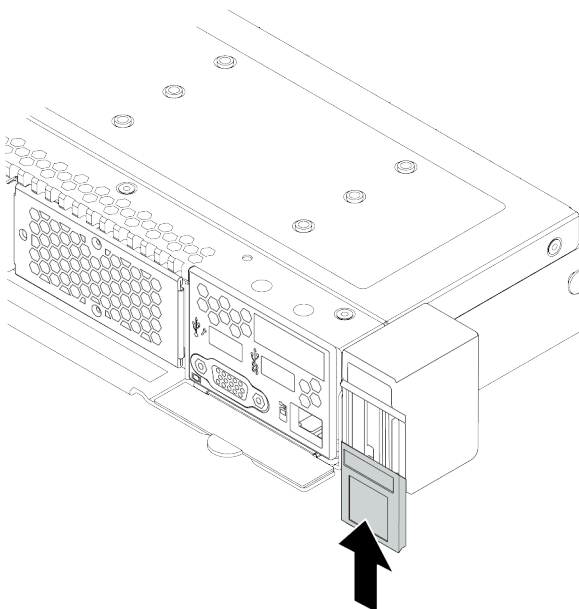


Figure 103. ID label plate installation

2. Complete the parts replacement. See [“Complete the parts replacement”](#) on page 230.

Demo video

[Watch the procedure on YouTube](#)

RAID super capacitor module replacement

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

Remove the RAID super capacitor module on the chassis

Use this information to remove the RAID super capacitor module on the chassis.

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).
- Step 2. Disconnect the cable of the RAID super capacitor module.
- Step 3. Remove the RAID super capacitor module on the chassis.

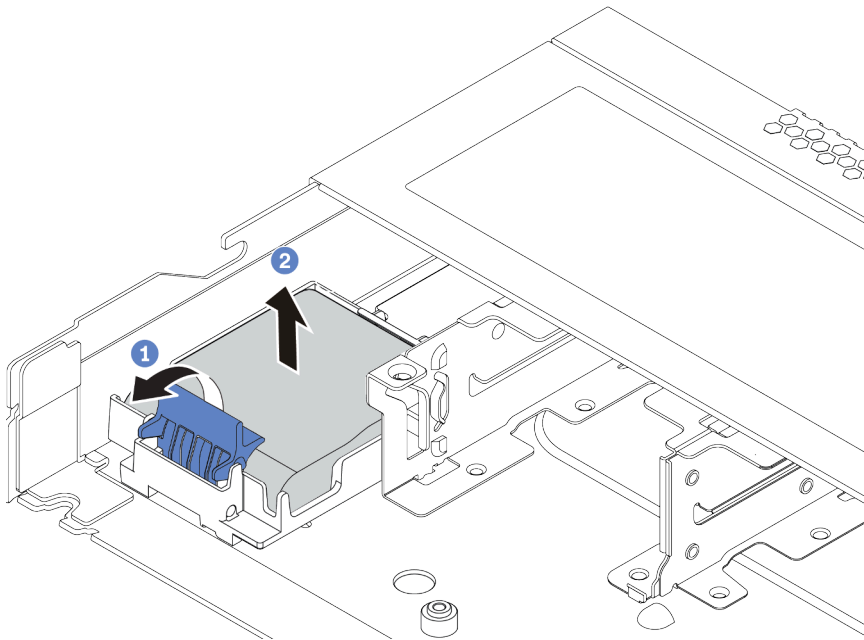


Figure 104. Removal of the RAID super capacitor module on the chassis

- a. Open the retention clip on the holder of the RAID super capacitor module.
- b. Take the RAID super capacitor module out of the holder.

Step 4. Remove the RAID super capacitor module holder as shown if necessary.

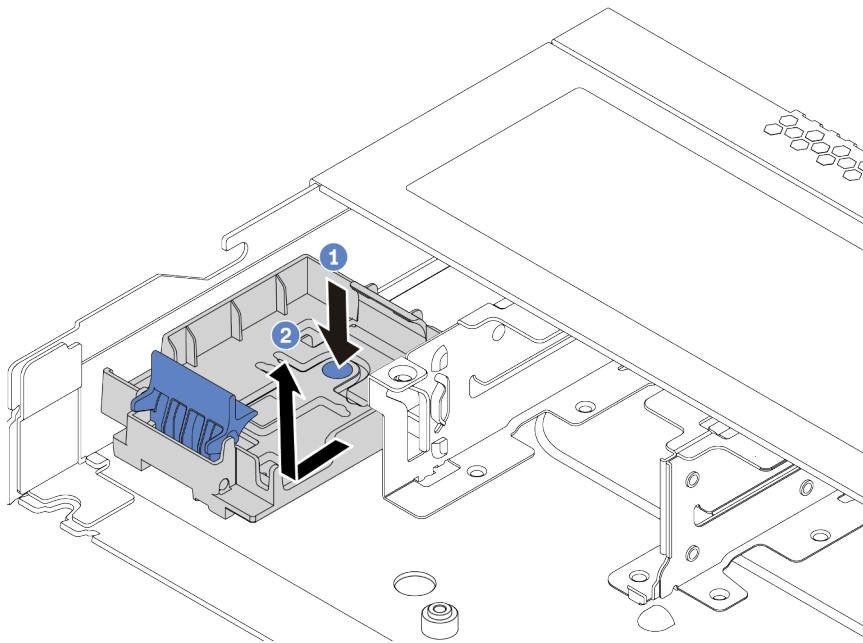


Figure 105. RAID super capacitor module holder removal

After you finish

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

Demo video

[Watch the procedure on YouTube](#)

Install the RAID super capacitor module on the chassis

Use this information to install the RAID super capacitor module on the chassis.

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the RAID super capacitor module to any unpainted surface on the outside of the server. Then, take the RAID super capacitor module out of the package and place it on a static-protective surface.
- Step 2. Check the installation rules for super capacitors. See [“PCIe slots and configurations” on page 23](#).
- Step 3. If the server comes with a tray that covers the place of the RAID super capacitor module on the chassis, remove it first.

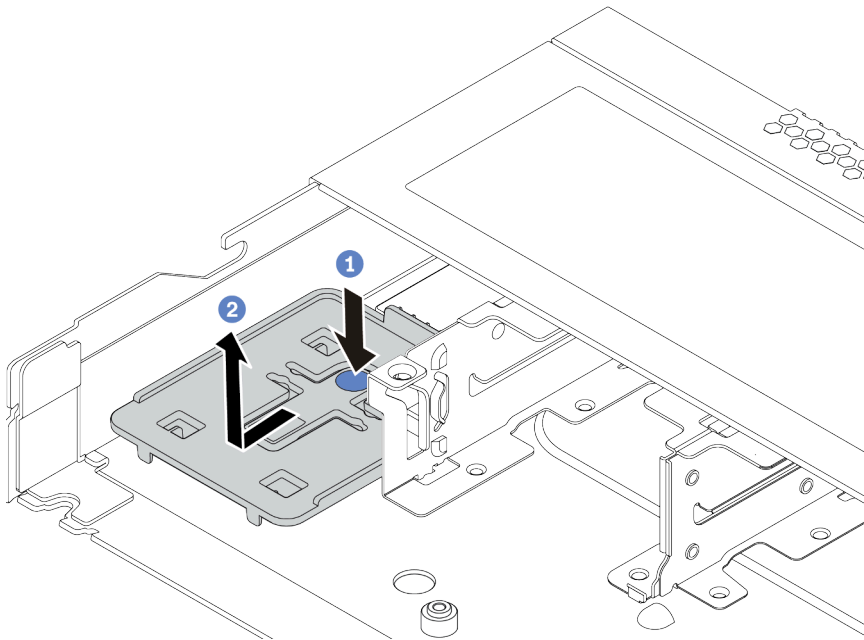


Figure 106. Tray removal

Step 4. If the server does not have a RAID super capacitor module holder on the chassis, install one first.

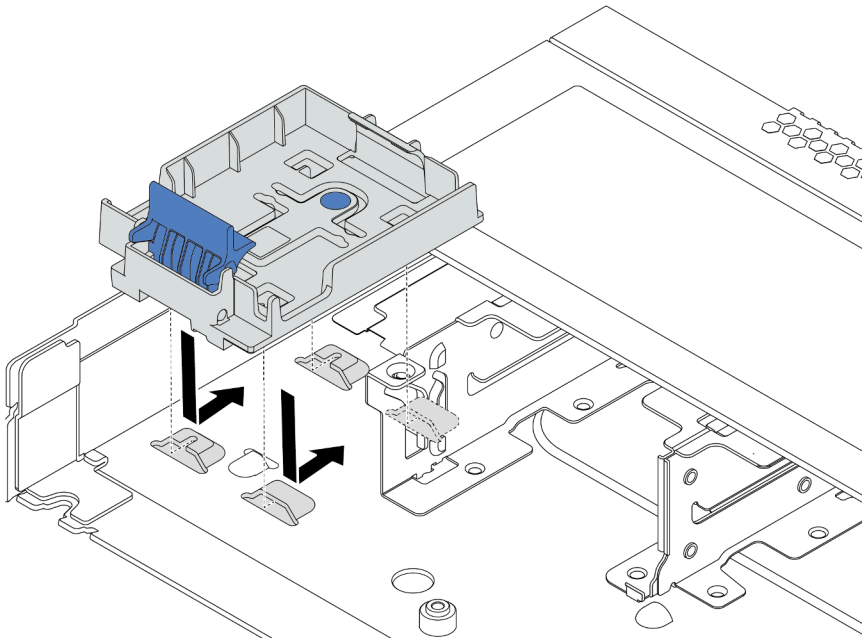


Figure 107. RAID super capacitor module holder installation

Step 5. Install the RAID super capacitor module on the chassis.

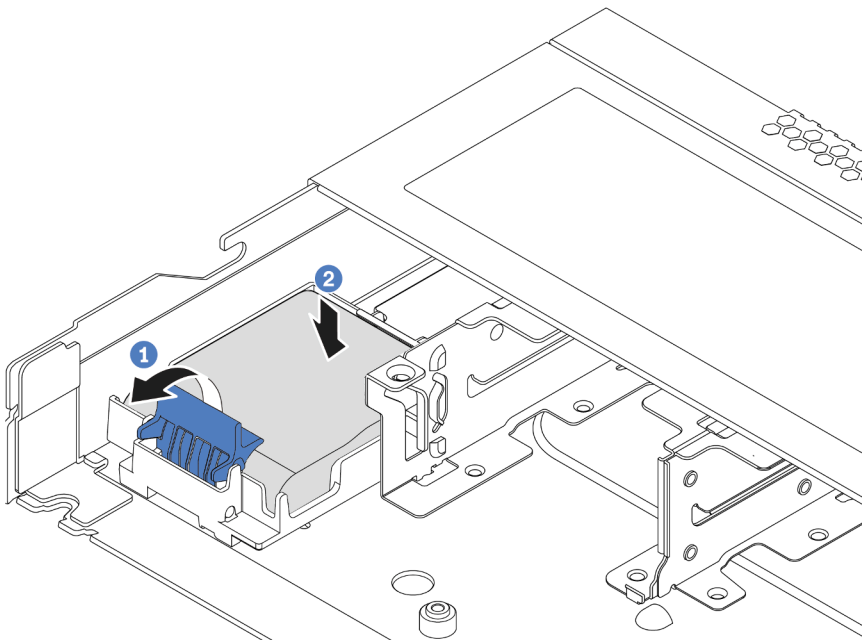


Figure 108. Installation of the RAID super capacitor module on the chassis

- a. Open the retention clip on the holder.
- b. Put the RAID super capacitor module into the holder and press it down to secure it into the holder.

After you finish

1. Connect the super capacitor module to an adapter with the extension cable that comes with the super capacitor module. For detailed cable routing information, see [Chapter 3 “Internal cable routing” on page 73](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).

Demo video

[Watch the procedure on YouTube](#)

Remove the RAID super capacitor module on the air baffle

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

About this task

Attention:

- Read “[Installation Guidelines](#)” on page 230 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See “[Remove the top cover](#)” on page 226.
- Step 2. Disconnect the cable of the RAID super capacitor module.
- Step 3. Remove the air baffle from the chassis. See “[Remove the air baffle](#)” on page 121.
- Step 4. Remove the RAID super capacitor module on the air baffle.

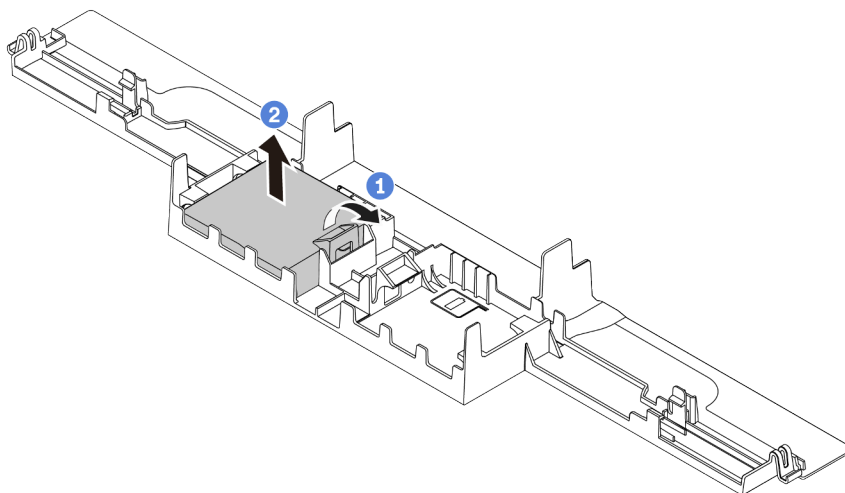


Figure 109. Removal of the RAID super capacitor module on the air baffle

- a. Open the retention clip on the holder of the RAID super capacitor module.
- b. Take the RAID super capacitor module out of the holder.

After you finish

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

Demo video

[Watch the procedure on YouTube](#)

Install the RAID super capacitor module on the air baffle

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

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the RAID super capacitor module to any unpainted surface on the outside of the server. Then, take the RAID super capacitor module out of the package and place it on a static-protective surface.
- Step 2. Check the installation rules for super capacitors. See [“PCIe slots and configurations” on page 23](#).
- Step 3. Install the RAID super capacitor module on the air baffle.

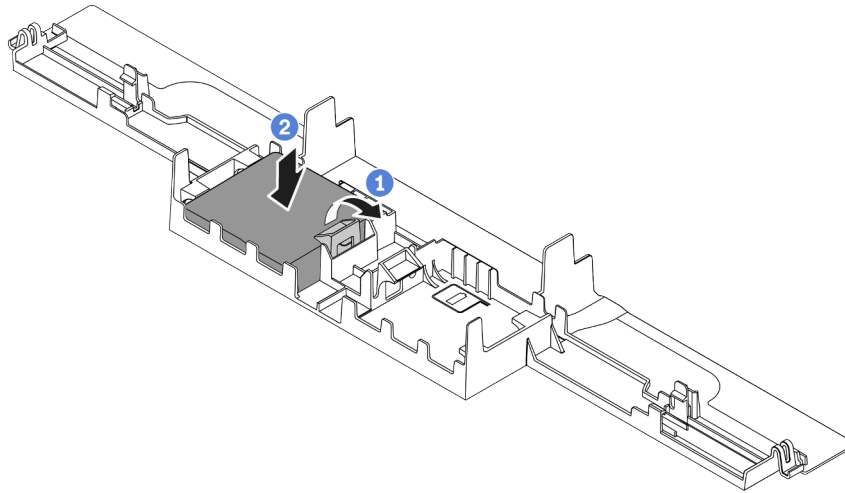


Figure 110. Installation of the RAID super capacitor module on the air baffle

- a. Open the retention clip on the holder.
- b. Put the RAID super capacitor module into the air baffle and press it 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 123](#).
2. Connect the super capacitor module to an adapter with the extension cable that comes with the super capacitor module. For detailed cable routing information, see [Chapter 3 “Internal cable routing” on page 73](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).

Demo video

[Watch the procedure on YouTube](#)

Remove the RAID super capacitor module on the riser

Use this information to remove the RAID super capacitor module on the riser.

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).
- Step 2. Disconnect the cable of the RAID super capacitor module.
- Step 3. Remove the riser assembly. See [“Remove a riser assembly” on page 211](#).
- Step 4. Remove the RAID super capacitor module from the riser.

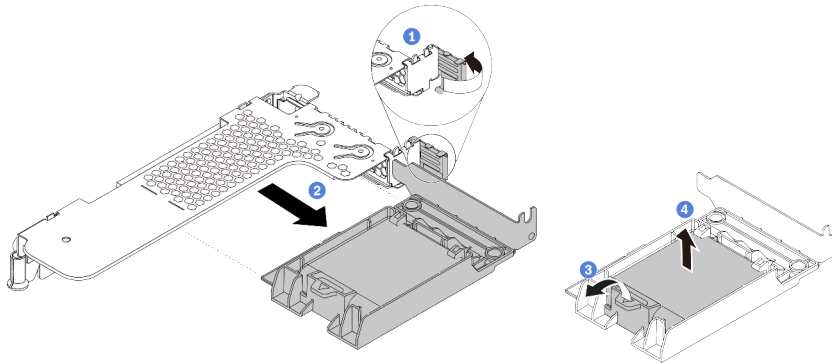


Figure 111. Removal of the RAID super capacitor assembly from the riser

- a. Rotate the latch on the riser bracket to the open position.
- b. Remove the RAID super capacitor assembly from the riser.
- c. Open the retention clip on the holder of the RAID super capacitor module.
- d. Take the RAID super capacitor module out of the holder.

After you finish

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

Install the RAID super capacitor module on the riser

Use this information to install the RAID super capacitor module on the riser.

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Touch the static-protective package that contains the RAID super capacitor module to any unpainted surface on the outside of the server. Then, take the RAID super capacitor module out of the package and place it on a static-protective surface.
- Step 2. Check the installation rules for super capacitors. See [“PCIe slots and configurations” on page 23](#).
- Step 3. Install the RAID super capacitor module on the riser.

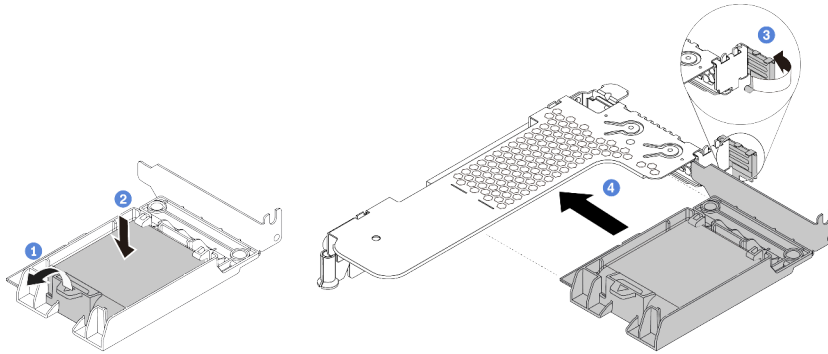


Figure 112. Installation of the RAID super capacitor module on the riser

- a. Open the retention clip on the holder.
- b. Put the RAID super capacitor module into the holder and press it down to secure it into the holder.
- c. Rotate the latch on the riser bracket to the open position.
- d. Align the RAID super capacitor assembly with the slot on the riser card. Then, carefully press the RAID super capacitor assembly straight into the slot until it is securely seated and its bracket also is secured.

After you finish

1. Install the riser assembly on the chassis. See [“Install a riser assembly” on page 214](#).
2. Connect the super capacitor module to an adapter with the extension cable that comes with the super capacitor module. For detailed cable routing information, see [Chapter 3 “Internal cable routing” on page 73](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).

Riser assembly replacement

Use this information to remove and install a riser assembly.

There are different types of riser assembly configurations. The removal or installation procedure of the riser assembly is similar for all types of riser assembly. The following takes the LP-FH riser assembly as an example.

Remove a riser assembly

Use this information to remove a riser 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. The following takes the LP-FH riser assembly as an example.

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).
- Step 2. If there is any PCIe adapter installed on the riser assembly, record the cable connections first. Then, disconnect all cables from the PCIe adapter.
- Step 3. Grasp the riser assembly by its edges and carefully lift it out of the chassis.

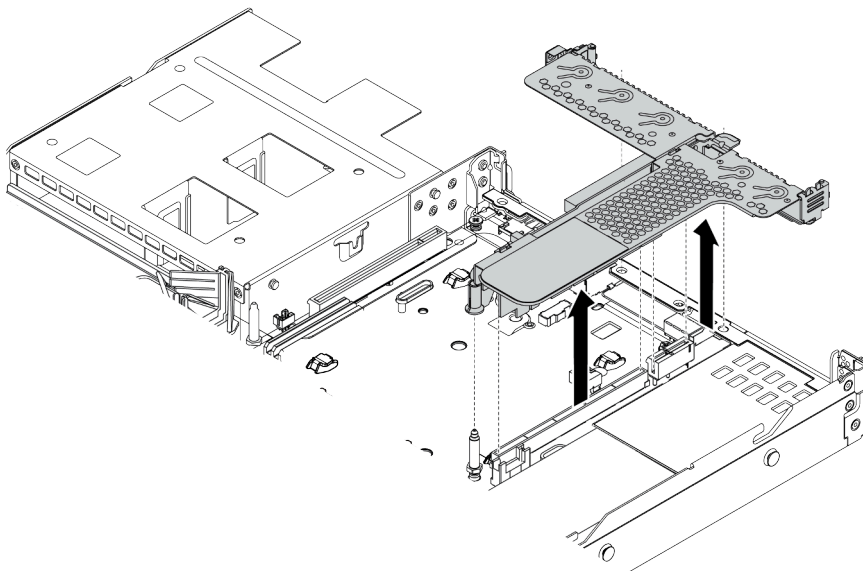


Figure 113. Riser assembly removal

- Step 4. If necessary, remove the PCIe adapters that are installed on the riser assembly. See [“Remove a PCIe adapter” on page 192](#).

Step 5. Remove the riser assembly from the bracket.

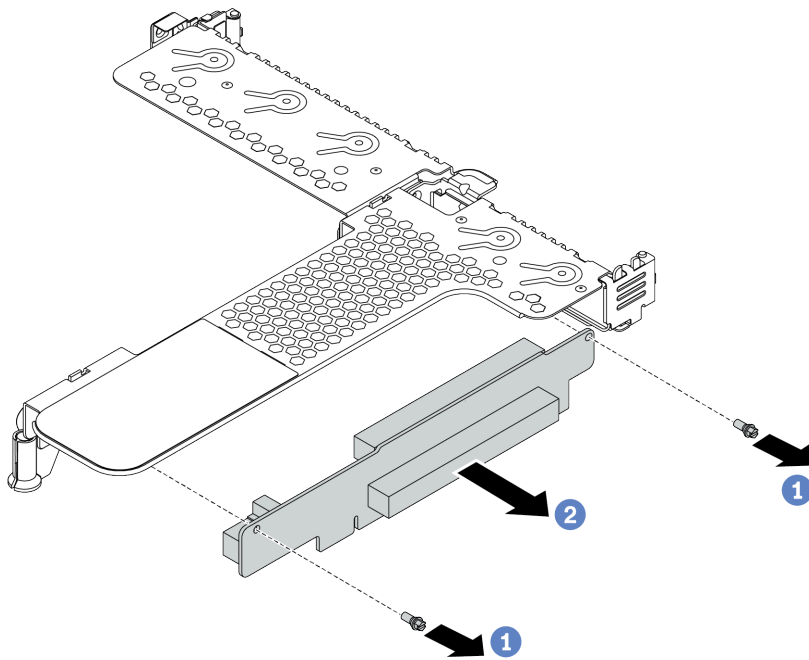


Figure 114. riser assembly removal

- a. Remove the two screws that secure the riser assembly to the bracket.
- b. Remove the riser assembly.

After you finish

1. If you are instructed to return the old riser assembly, follow all packaging instructions and use any packaging materials that are provided.
2. Remove the rear wall bracket if you would like to install a non-LP-FH riser assembly.

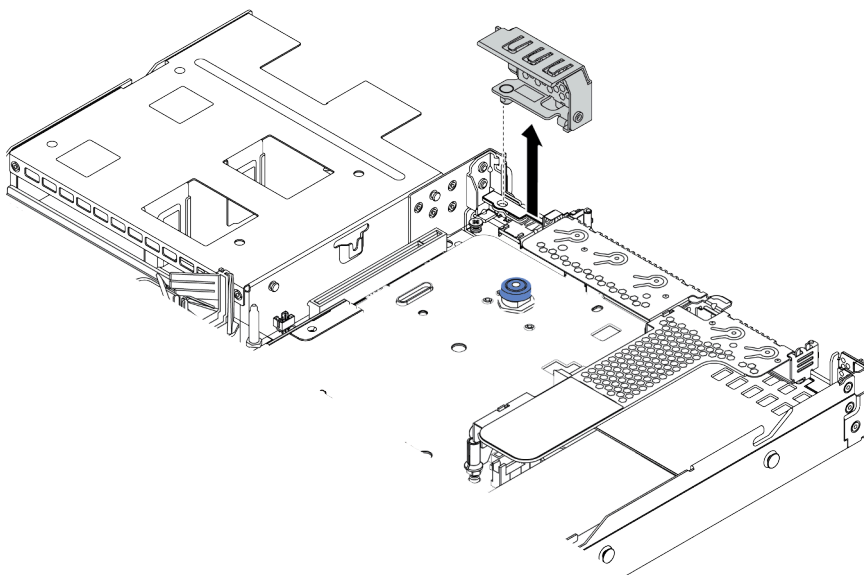


Figure 115. Rear wall bracket removal

Demo video

[Watch the procedure on YouTube](#)

Install a riser assembly

Use this information to install a riser 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. The following takes the LPFH riser assembly as an example.

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

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

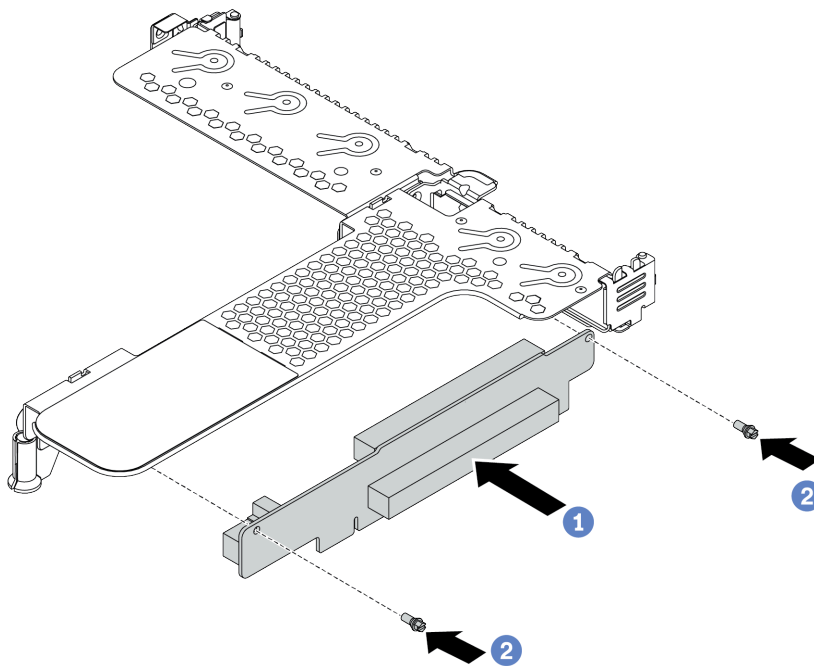


Figure 116. riser assembly installation

1. Align the screw holes in the riser assembly with the corresponding ones in the bracket.
 2. Install the two screws to secure the riser assembly to the bracket
- Step 3. If necessary, reinstall the PCIe adapters on the riser assembly. See [“Install a PCIe adapter” on page 194](#). Then, refer to your note to reconnect any cables of the PCIe adapters on the riser assembly. Or you can refer to the [Chapter 3 “Internal cable routing” on page 73](#) and locate the cable routing information for your configuration options.

Step 4. 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 and align the riser assembly with the riser slot on the system board. Then, carefully press the riser assembly straight down into the slot until it is fully seated.

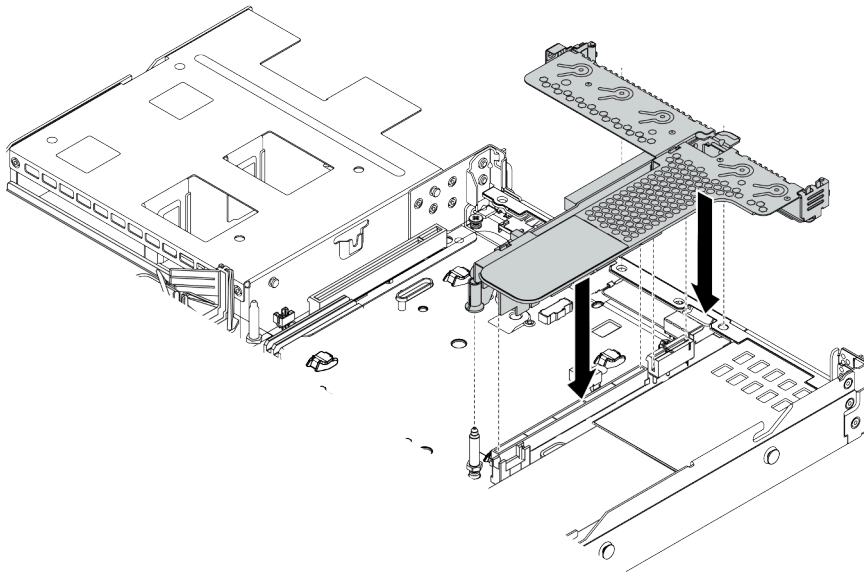


Figure 117. Riser assembly installation

After you finish

Complete the parts replacement. See [“Complete the parts replacement”](#) on page 230.

Demo video

[Watch the procedure on YouTube](#)

System fan replacement

Use this information to remove and install a system fan.

Remove a system fan

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

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 230](#) to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).

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

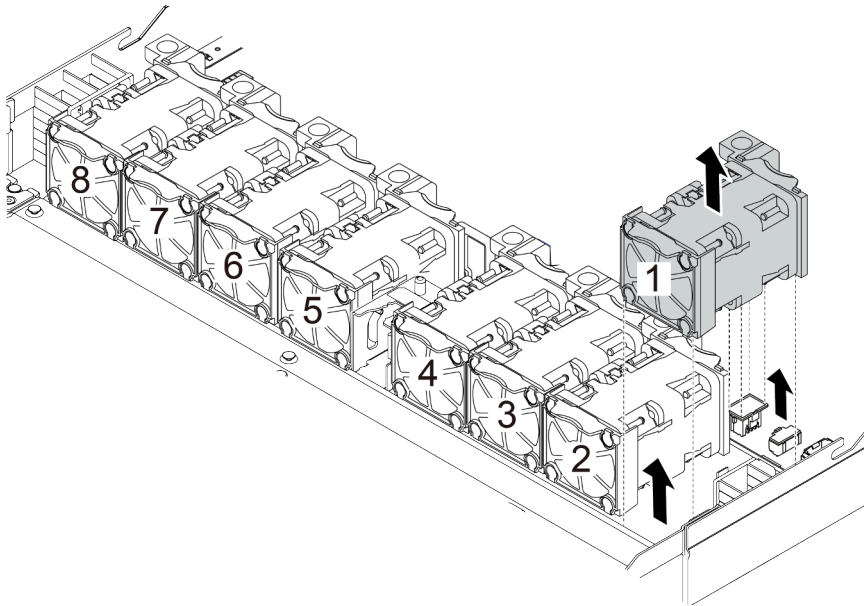


Figure 118. System fan removal

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 218](#).
2. If you are instructed to return the old system fan, follow all packaging instructions and use any packaging materials that are provided.

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 230](#) to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

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. Place the system fan down in the slot and then press the point on its edge to secure it in place. Ensure that the fan connector is installed correctly to the connector on the system board.

Note: Ensure that fan installation meets “[Thermal rules](#)” on page 26.

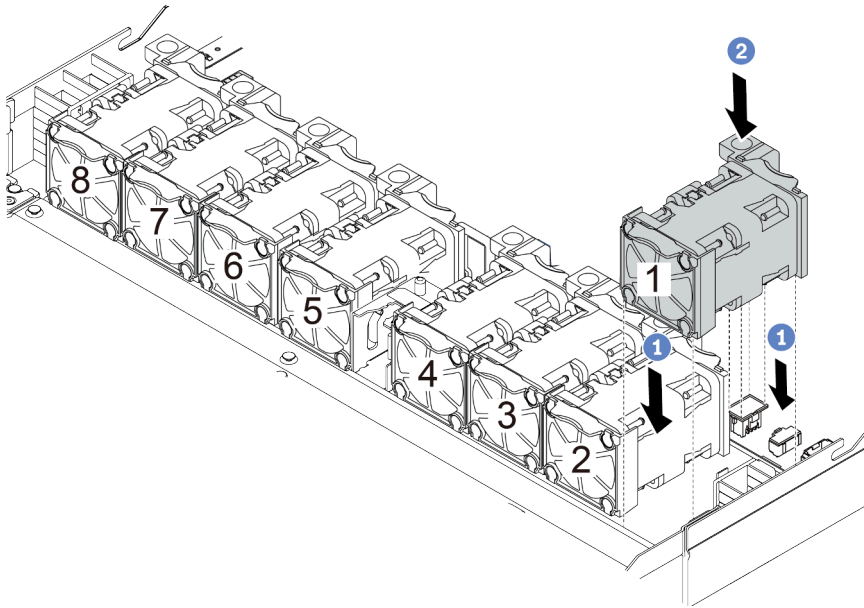


Figure 119. System fan installation

After you finish

Complete the parts replacement. See “[Complete the parts replacement](#)” on page 230.

Demo video

[Watch the procedure on YouTube](#)

Security bezel replacement

Use this information to remove and install the security bezel.

Note: The security bezel is available on some models.

Remove the security bezel

Use this information to remove the security bezel.

About this task

Attention: Read “[Installation Guidelines](#)” on page 230 to ensure that you work safely.

Procedure

Step 1. Use the key to unlock the security bezel.

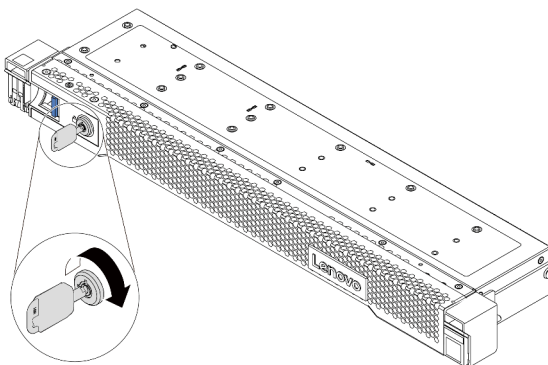


Figure 120. Unlocking the security bezel

Step 2. Press the release latch **1** and rotate the security bezel outward to remove it from the chassis.

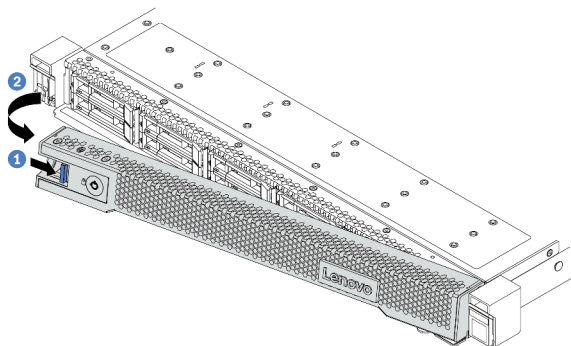


Figure 121. Security bezel removal

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

Demo video

[Watch the procedure on YouTube](#)

Install the security bezel

Use this information to install the security bezel.

About this task

Attention: Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.

Procedure

- Step 1. If you have removed the rack latches, reinstall them. See [“Install the rack latches” on page 198](#).
- Step 2. If the key is held inside the security bezel, remove it out of the security bezel.
 - a. Press the latch to release the key.
 - b. Remove the key from the retaining clip in the shown direction.

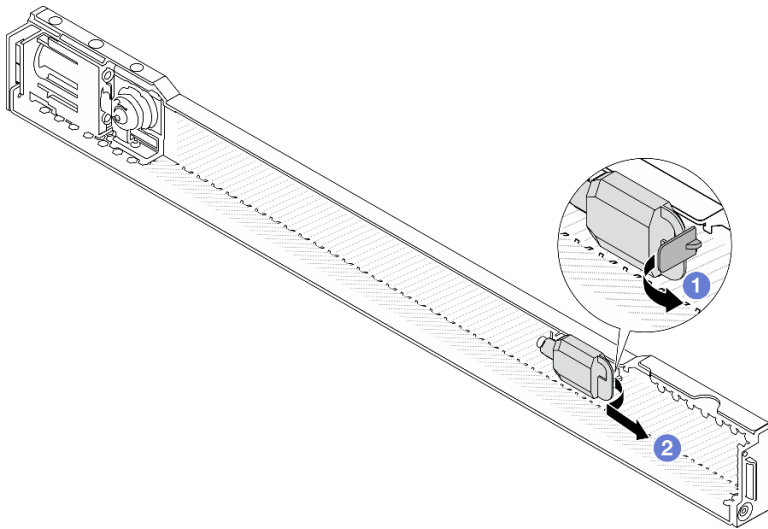


Figure 122. Key removal

- Step 3. Carefully insert the tab on the security bezel into the slot on the right rack latch. Then, press and hold the blue release latch and rotate the security bezel inward until the other side clicks into place.

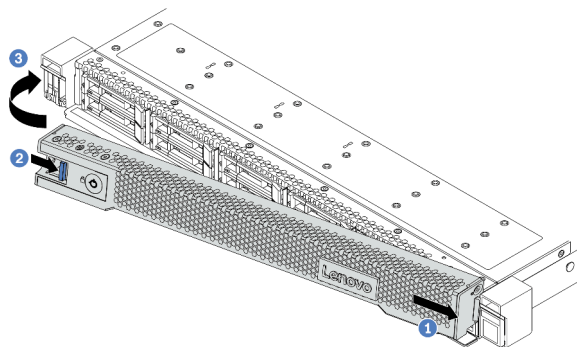


Figure 123. Security bezel installation

Step 4. Use the key to lock the security bezel to the closed position.

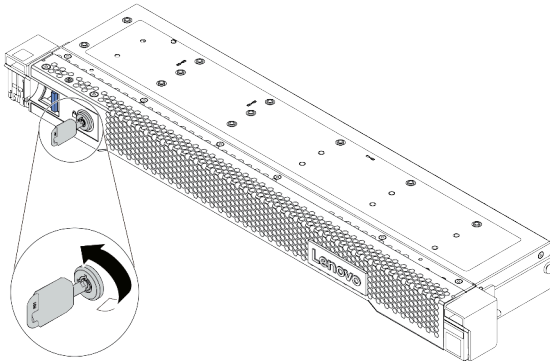


Figure 124. Locking the security bezel

Demo video

[Watch the procedure on YouTube](#)

Serial port module replacement

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

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

Remove the serial port module

Use this information to remove the serial port module.

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).
- Step 2. Disconnect the cable of the serial port module from the system board.

Attention: To avoid damaging the system board, make sure to follow the instructions in [Chapter 3 “Internal cable routing” on page 73](#) when disconnecting cables from the system board.

- Step 3. Remove the riser assembly from the system. See [“Riser assembly replacement” on page 211](#).
- Step 4. Open the retention latch and remove the serial port module from the riser bracket.
- Step 5. (Optional) If you need to replace the serial port bracket, use a 5 mm wrench to disassemble the serial port cable from the bracket.

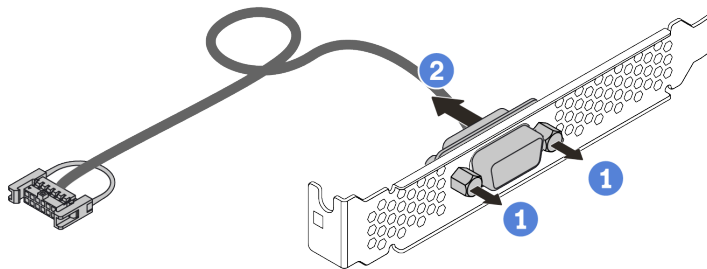


Figure 125. Serial port module disassembling

After removing the serial port module:

1. Install a new serial port module, a PCIe adapter, or a PCIe slot bracket to cover the place. See [“Install the serial port module” on page 225](#).
2. If you are instructed to return the old serial port module, follow all of the packaging instructions and use any packaging materials that are provided.

Install the serial port module

Use this information to install the serial port module.

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

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. Use a 5 mm wrench to install the serial port cable into the bracket.

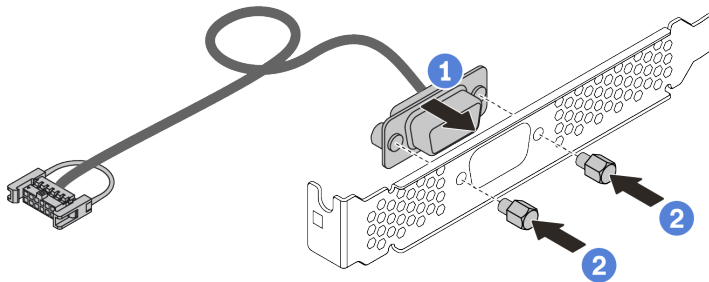


Figure 126. Serial port module installation

- Step 3. Remove the needed riser bracket from the system board. See [“Remove a riser assembly” on page 211](#).
- Step 4. Install the serial port assembly to the riser bracket.
- Step 5. Install the riser assembly back to the server. See [“Install a riser assembly” on page 214](#).
- Step 6. Connect the cable of the serial port module to the serial-port-module connector on the system board. For the location of the serial-port-module connector, refer to [“System board” on page 63](#).

After installing the serial port module:

1. Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).
2. To enable the serial port module, do one of the following according to the installed operating system:
 - For Linux operating system:

Open the ipmitool and enter the following command to disable the Serial over LAN (SOL) feature:

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

- For Microsoft Windows operating system:
 - a. Open the ipmitool and enter the following command to disable the SOL feature:

```
-I lanplus -H IP -U USERID -P PASSWORD sol deactivate
```
 - b. Open Windows PowerShell and enter the following command to disable the Emergency Management Services (EMS) feature:

```
Bcdedit /ems no
```
 - c. Restart the server to ensure that the EMS setting takes effect.

Top cover replacement

Use this information to remove and install the top cover.

Remove the top cover

Use this information to remove the 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 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. If the server is installed in a rack, remove the server from the rack. See the Rack Installation Guide that comes with the rail kit for your server.

Step 2. Remove the top cover.

Attention: Handle the top cover carefully. Dropping the top cover with the cover latch open might damage the cover latch.

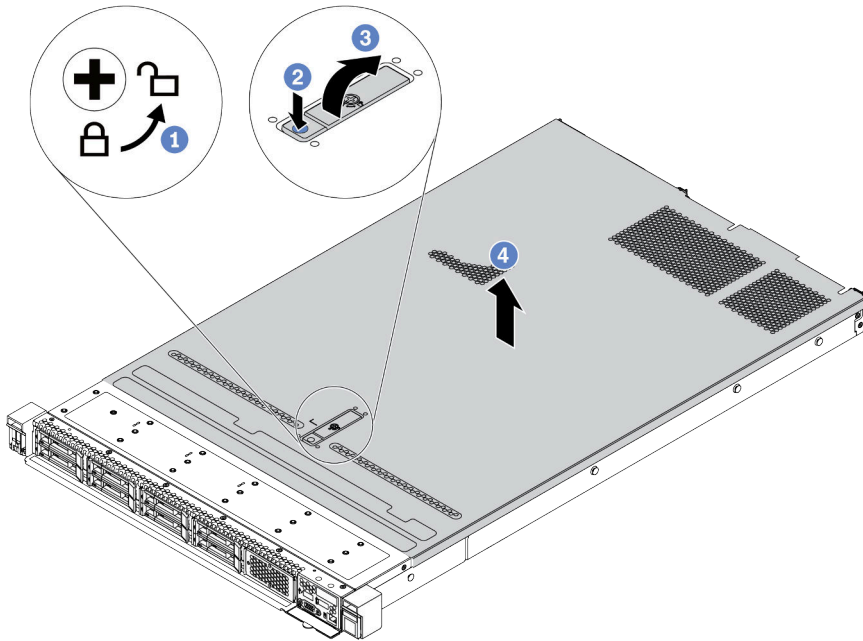


Figure 127. Top cover removal

- Use a screwdriver to turn the cover lock to the unlocked position as shown.
- Press the release button on the cover latch. The cover latch then gets released to some extent.
- Fully open the cover latch as shown.
- Slide the top cover to the rear until it is disengaged from the chassis. Then, lift the top cover off the chassis and place the top cover on a flat clean surface.

After you finish

Replace any options as required or install a new top cover. See [“Install the top cover” on page 228](#).

Demo video

[Watch the procedure on YouTube](#)

Install the top cover

Use this information to install the 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 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

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 3 “Internal cable routing” on page 73](#).

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 latch.

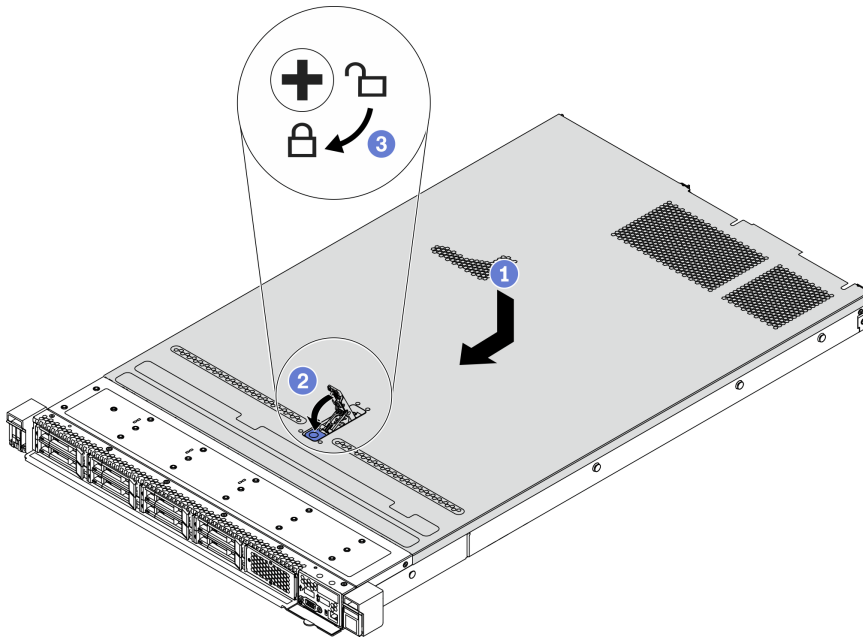


Figure 128. Top cover installation

- a. Ensure that the cover latch is in the open position. Lower the top cover onto the chassis until both sides of the top cover engage the guides on both sides of the chassis. 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. Press down the cover latch and ensure that the cover latch is completely closed.
- c. Use a screwdriver to turn the cover lock to the locked position.

After you finish

After installing the top cover, complete the parts replacement. See [“Complete the parts replacement” on page 230](#).

Demo video

[Watch the procedure on YouTube](#)

Complete the parts replacement

Use this information to complete the parts replacement.

To complete the parts replacement, do the following:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your server.
2. Properly route and secure the cables in the server. Refer to detailed cable routing information for each component in [Chapter 3 “Internal cable routing” on page 73](#).
3. If you have removed the top cover, reinstall it. See [“Install the top cover” on page 228](#).
4. Reconnect external cables and power cords to the server.

Attention: To avoid component damage, connect the power cords last.

5. Update the server configuration if necessary.
 - Download and install the latest device drivers: <http://datacentersupport.lenovo.com>
 - Update the system firmware. See [“Firmware updates” on page 28](#).
 - Use the Lenovo XClarity Provisioning Manager to configure the RAID if you have installed or removed a hot-swap drive, a RAID adapter, or the M.2 backplane and M.2 drive. For more information, see the “RAID Setup” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.

FRU parts replacement

This section provides installation and removal procedures for all FRU parts.

Notes:

- FRUs can only be installed or removed by trained service technicians.
- If you replace a part, such as an adapter, that contains firmware, you might also need to update the firmware for that part. For more information about updating firmware, see [“Firmware updates” on page 28](#).

Installation Guidelines

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

Before installing optional devices, read the following notices carefully:

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

- Read the safety information and guidelines to ensure your safety at work: http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html
- When you install a new server, download and apply the latest firmware. This will help ensure that any known issues are addressed, and that your server is ready to work with optimal performance. Go to [ThinkSystem SR645 Drivers and Software](#) to download firmware updates for your server.

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

- It is good practice to make sure that the server is working correctly before you install an optional component.
- Keep the working area clean, and place removed components on a flat and smooth surface that does not shake or tilt.
- Do not attempt to lift an object that might be too heavy for you. If you have to lift a heavy object, read the following precautions carefully:
 - Make sure that you can stand steadily without slipping.
 - Distribute the weight of the object equally between your feet.

- Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
- To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Back up all important data before you make changes related to the disk drives.
- Have a small flat-blade screwdriver, a small Phillips screwdriver, and a T8 torx screwdriver available.
- To view the error LEDs on the system board and internal components, leave the power on.
- You do not have to turn off the server to remove or install hot-swap power supplies, hot-swap fans, or hot-plug USB devices. However, you must turn off the server before you perform any steps that involve removing or installing adapter cables, and you must disconnect the power source from the server before you perform any steps that involve removing or installing a riser card, memory, and processor.
- 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.
- The Red strip on the drives, adjacent to the release latch, indicates that the drive can be hot-swapped if the server and operating system support hot-swap capability. This means that you can remove or install the drive while the server is still running.

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

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

Safety inspection checklist

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

Notes:

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

CAUTION:

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

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

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

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

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

- a. Go to:
 - <http://dcsc.lenovo.com/#/>
- b. In the Customize a Model pane:
 - 1) Click **Select Options/Parts for a Model**.
 - 2) Enter the machine type and model for your server.
- c. Click the Power tab to see all line cords.

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

System reliability guidelines

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

Make sure the following requirements are met:

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

Working inside the server with the power on

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

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

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

Handling static-sensitive devices

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

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

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

Processor and heat sink replacement

Use this information to remove and install a processor and heat sink assembly.

Important:

- Make sure that all server power cords are disconnected from their power sources before performing this procedure.
- Before replacing a processor, check the current PSB fuse policy. See *Service process before replacement* at <https://glosse4lenovo.lenovo.com/wiki/glosse4lenovo/view/How%20To/System%20related/How%20to%20update%20PSB%20fuse%20state%20on%20ThinkSystem%20AMD%20SR645%20%28MT%3A%207D2X%2C%207D2Y%2C%207D5U%29%20and%20SR665%20%28MT%3A%207D2V%2C%207D2W%2C%207D43%29%20machines/?srid=TGOwCrOA> (Lenovo service technicians only).
- After replacing a processor, ensure that the processor fuse status is expected without unexpected XCC event logs. See *Service process after replacing a processor* at <https://glosse4lenovo.lenovo.com/wiki/glosse4lenovo/view/How%20To/System%20related/How%20to%20update%20PSB%20fuse%20state%20on%20ThinkSystem%20AMD%20SR645%20%28MT%3A%207D2X%2C%207D2Y%2C%207D5U%29%20and%20SR665%20%28MT%3A%207D2V%2C%207D2W%2C%207D43%29%20machines/?srid=TGOwCrOA> (Lenovo service technicians only). The fuse status must be the same as the original fuse status of the server.
- Check if the firmware version of the system meets the requirement stated in <https://support.lenovo.com/solutions/TT2087> before installing the following processors: 7203, 7203P, 7303, 7303P, 7643P, and 7663P. If no, update the firmware to the required version by following the instructions provided.

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

- [“Remove a standard heat sink” on page 234](#)
- [“Remove a T-shaped heat sink” on page 236](#)
- [“Remove a processor” on page 238](#)
- [“Install a processor” on page 239](#)
- [“Install a standard heat sink” on page 240](#)
- [“Install a T-shaped heat sink” on page 242](#)

Remove a standard heat sink

Use this information to remove a standard heat sink.

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Notes:

- It may take some time for the heat sink to cool down after the system has been powered down.
- The heat sink is necessary to maintain proper thermal conditions for the processor. Do not power on the server with the heat sink removed.

Procedure

Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).

- Step 2. Remove the air baffle. See [“Remove the air baffle” on page 121](#).
- Step 3. Remove any parts and disconnect any cables that might impede your access to the heat sink and processor.
- Step 4. Remove the heat sink.

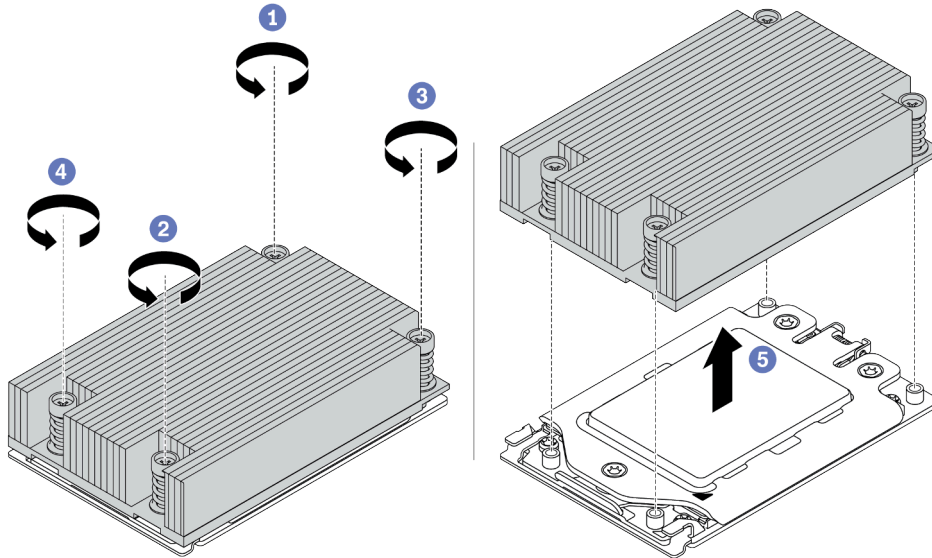


Figure 129. Heat sink removal

- a. Use a Torx #T20 screwdriver to loosen all the captive screws in the *removal sequence* shown on the heat-sink label. After loosening each captive screw, wait for several seconds for the heat sink to loosen from the processor.
- b. Slightly lift the heat sink away from the system.

After you finish

- If you are replacing a heat sink, install a new heat sink. See [“Install a standard heat sink” on page 240](#).
- If you are replacing a processor, remove the processor. See [“Remove a processor” on page 238](#).

Demo video

[Watch the procedure on YouTube](#)

Remove a T-shaped heat sink

Use this information to remove a T-shaped heat sink.

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Notes:

- It may take some time for the heat sink to cool down after the system has been powered down.
- The heat sink is necessary to maintain proper thermal conditions for the processor. Do not power on the server with the heat sink removed.

Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 226](#).
- Step 2. Remove any parts and disconnect any cables that might impede your access to the heat sink and processor.

Attention: To avoid damaging the system board, make sure to follow the instructions in [Chapter 3 “Internal cable routing” on page 73](#) when disconnecting cables from the system board.

Step 3. Remove the heat sink.

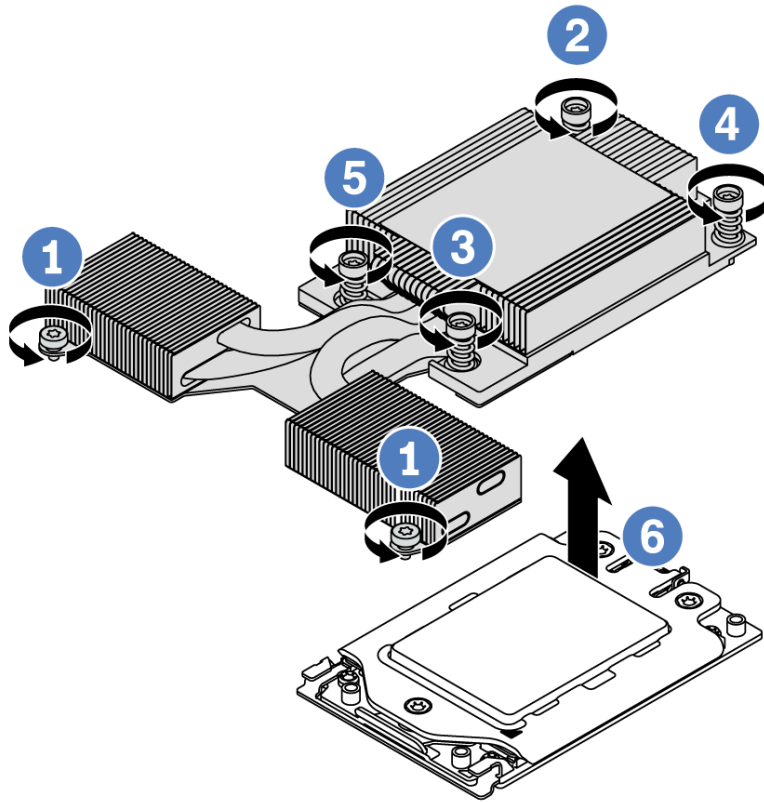


Figure 130. Heat sink removal

- Loosen the two screws in the front of the T-shaped heat sink.
- Use a Torx #T20 screwdriver to loosen all the captive screws in the *removal sequence* shown on the heat-sink label. After loosening each captive screw, wait for several seconds for the heat sink to loosen from the processor.
- Slightly lift the heat sink away from the system.

After you finish

- If you are replacing a heat sink, install a new heat sink. See “[Install a T-shaped heat sink](#)” on page 242.
- If you are replacing a processor, remove the processor. See “[Remove a processor](#)” on page 238.

Demo video

[Watch the procedure on YouTube](#)

Remove a processor

Use this information to remove a processor.

About this task

Attention:

- Read “[Installation Guidelines](#)” on [page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.
- The system will load factory default UEFI settings when Processor 1 is removed. In this case, make sure to back up the UEFI settings before processor removal.

Procedure

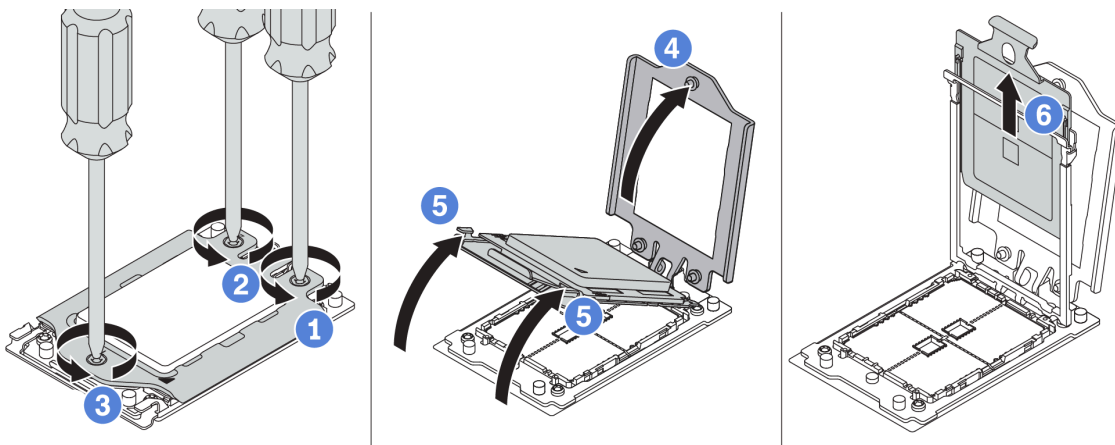


Figure 131. Processor removal

- Step 1. Use a Torx #T20 screwdriver to loosen the captive screws in the *removal sequence* shown on the force frame.
- Step 2. Slightly lift up the force frame and the rail frame in the direction shown. The processor in the rail frame is spring-loaded.
- Step 3. Hold the blue tab of the processor carrier and slide the processor carrier out of the rail frame.

After you finish

Install a new processor. See “[Install a processor](#)” on [page 239](#).

Demo video

[Watch the procedure on YouTube](#)

Install a processor

Use this information to install a processor.

About this task

Attention:

- Read “[Installation Guidelines](#)” on page 230 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Notes:

- See <https://serverproven.lenovo.com/> for a list of processors supported for your server. All processors on the system board must have the same speed, number of cores, and frequency.
- Before you install a new processor, update your system firmware to the latest level. See “[Firmware updates](#)” on page 28.
- Optional devices available for your system might have specific processor requirements. See “[Technical rules](#)” on page 16.

Procedure

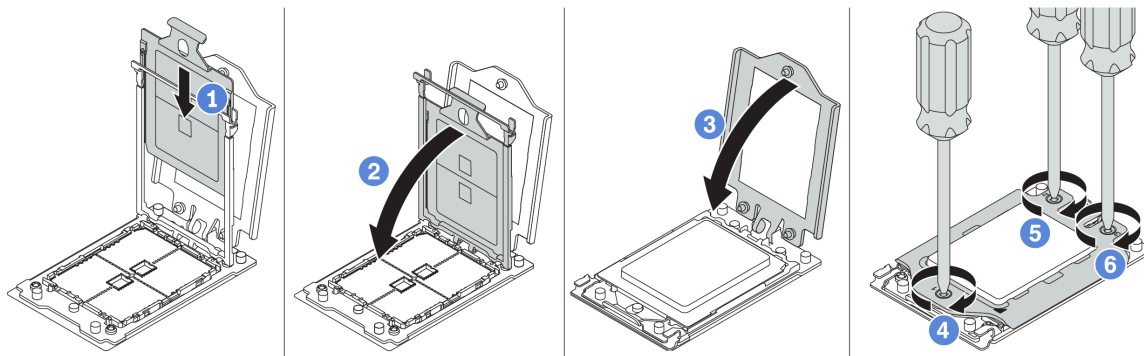


Figure 132. Processor installation

- Step 1. Slide the processor carrier into the rail frame.
- Step 2. Push the rail frame down until the blue latches lock into place.
- Step 3. Close the force frame.
- Step 4. Tighten the screws in the *installation sequence* shown on the force frame.

Note: Use an ESD safe screwdriver and set the maximum torque value to 14.0 ± 0.5 inch-pounds.

After you finish

Install the heat sink. See “[Install a standard heat sink](#)” on page 240 or “[Install a T-shaped heat sink](#)” on page 242.

Demo video

[Watch the procedure on YouTube](#)

Install a standard heat sink

Use this information to install a standard heat sink.

About this task

Attention:

- Read “[Installation Guidelines](#)” on page 230 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Before installing the heat sink:

- If you use the existing heat sink:
 1. Remove the thermal grease on the heat sink by using an alcohol cleaning pad.
 2. Apply new thermal grease in a quadrilateral design on the top of the processor.

Note: Do not apply too much thermal grease. Too much thermal grease can result in excess grease coming in contact with and contaminating the processor socket.

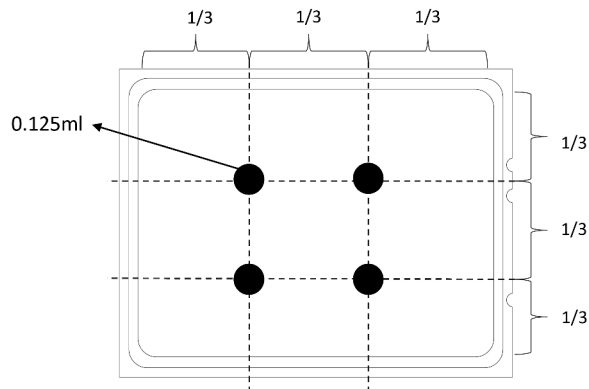


Figure 133. Applying thermal grease

- If you use a new heat sink, the thermal grease is pre-applied to the heat sink. Remove the protective cover and install the heat sink.

Procedure

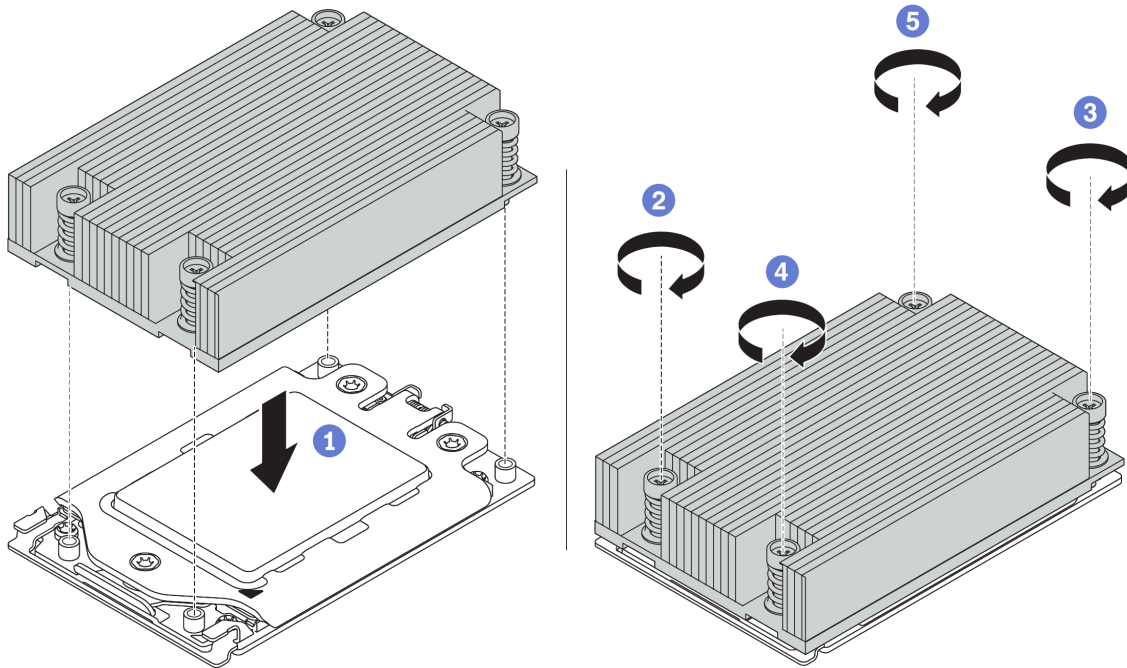


Figure 134. Heat sink installation

- Step 1. Orient the heat sink with the screw holes on the processor plate. The captive screws on the heat sink should align with the screw holes on the processor plate.
- Step 2. Tighten all the captive screws in the *installation sequence* shown on the heat-sink label.

After you finish

1. Install the air baffle. See [“Install the air baffle” on page 123](#).
2. Install any parts that you have removed.
3. Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).

Demo video

[Watch the procedure on YouTube](#)

Install a T-shaped heat sink

Use this information to install a T-shaped heat sink.

About this task

Attention:

- Read “[Installation Guidelines](#)” on page 230 to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Before installing the heat sink:

- If you use the existing heat sink:
 1. Remove the thermal grease on the heat sink by using an alcohol cleaning pad.
 2. Apply new thermal grease in a quadrilateral design on the top of the processor.

Note: Do not apply too much thermal grease. Too much thermal grease can result in excess grease coming in contact with and contaminating the processor socket.

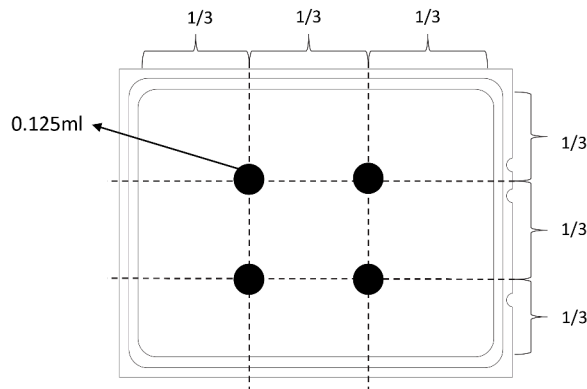


Figure 135. Applying thermal grease

- If you use a new heat sink, the thermal grease is pre-applied to the heat sink. Remove the protective cover and install the heat sink.

Procedure

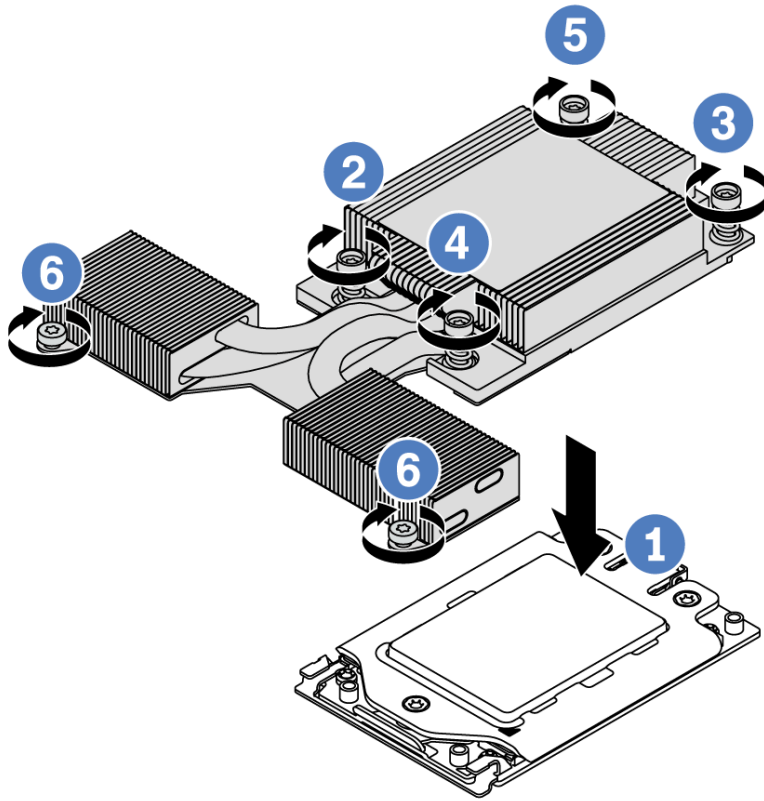


Figure 136. Heat sink installation

- Step 1. Orient the heat sink with the screw holes on the processor plate. The captive screws on the heat sink should align with the screw holes on the processor plate.
- Step 2. Tighten all the captive screws in the *installation sequence* shown on the heat-sink label.
- Step 3. Tighten the two screws located in the front of the T-shaped heat sink.

After you finish

1. Install any parts that you have removed.
2. Complete the parts replacement. See [“Complete the parts replacement” on page 230](#).

Demo video

[Watch the procedure on YouTube](#)

System board replacement

Use this information to remove and install the system board.

Important:

- This task must be operated by trained technicians that are certified by Lenovo Service. Do not attempt to remove or install the part without proper training and qualification.
- Check the current PSB fuse policy before replacement. See *Service process before replacement* at <https://glosse4lenovo.lenovo.com/wiki/glosse4lenovo/view/How%20To/System%20related/How%20to%20update%20PSB%20fuse%20state%20on%20ThinkSystem%20AMD%20SR645%20%28MT%3A%207D2X%2C%207D2Y%2C%207D5U%29%20and%20SR665%20%28MT%3A%207D2V%2C%207D2W%2C%207D43%29%20machines/?srid=TGOwCrOA> (Lenovo service technicians only).
- Ensure that the processor fuse status is expected without unexpected XCC event logs after replacement. See *Service process after replacing a system board* at <https://glosse4lenovo.lenovo.com/wiki/glosse4lenovo/view/How%20To/System%20related/How%20to%20update%20PSB%20fuse%20state%20on%20ThinkSystem%20AMD%20SR645%20%28MT%3A%207D2X%2C%207D2Y%2C%207D5U%29%20and%20SR665%20%28MT%3A%207D2V%2C%207D2W%2C%207D43%29%20machines/?srid=TGOwCrOA> (Lenovo service technicians only). The fuse status must be the same as the original fuse status of the server.
- Check if the firmware version of the system meets the requirement stated in <https://support.lenovo.com/solutions/TT2087> before installing the following processors: 7203, 7203P, 7303, 7303P, 7643P, and 7663P. If no, update the firmware to the required version by following the instructions provided.

S017



CAUTION:

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

S012



CAUTION:

Hot surface nearby.

Remove the system board

Use this information to remove the system board.

About this task

A system board, also known as the motherboard, 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 230 to ensure that you work safely.

- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

Step 1. Prepare your server.

- Remove the top cover. See [“Remove the top cover” on page 226](#).
- If your server comes with an air baffle, remove it first. See [“Remove the air baffle” on page 121](#).
- If your server comes with a rear drive assembly, remove it first. See [“Remove the hot-swap rear drive assembly” on page 157](#).
- Record where the cables are connected to the system board; then, disconnect all the cables.

Attention: To avoid damaging the system board, make sure to follow the instructions in [Chapter 3 “Internal cable routing” on page 73](#) when disconnecting cables from the system board.

- 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 234](#)
 - [“Memory modules” on page 177](#)
 - [“System fans” on page 216](#)
 - [“RAID super capacitor modules” on page 200](#)
 - [“Riser assemblies” on page 211](#)
 - [“CMOS battery” on page 125](#)
 - [“OCP 3.0 Ethernet adapter” on page 189](#)
- Pull out the power supplies slightly. Ensure that they are disconnected from the system board.

Step 2. Remove the system board.

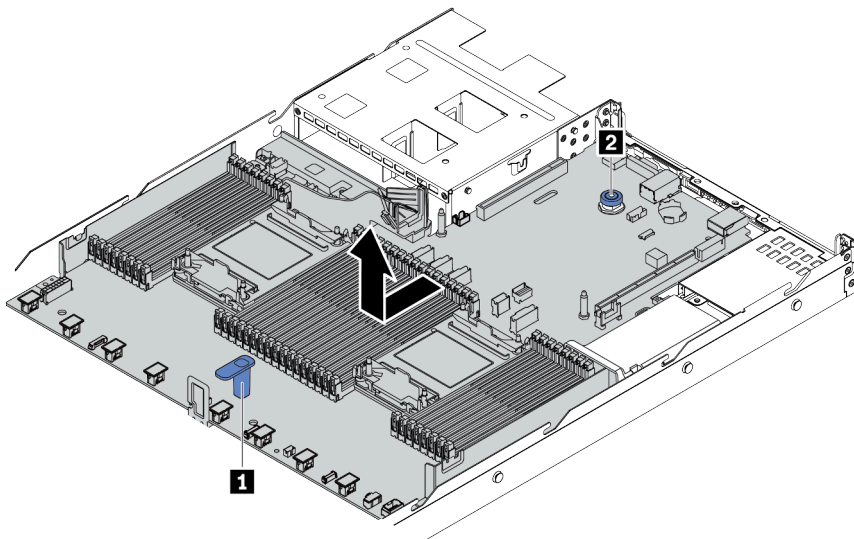


Figure 137. System board removal

- Hold the lift handle **1** and lift the release pin **2** at the same time and slide the system board toward the front of the server.
- Lift the system board out of the chassis.

After you finish

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

Important: Before you return the system board, make sure that the CPU socket is covered. There is a CPU external cap covering the CPU socket on the new system board. Slide the CPU external cap out from the CPU socket on the new system board, and install the external cap on the CPU socket on the removed system board.

If you are planning to recycle the system board, follow the instructions in [Appendix A “Disassemble hardware for recycle” on page 277](#) for compliance with local regulations.

Demo video

[Watch the procedure on YouTube](#)

Install the system board

Use this information to install the system board.

About this task

Attention:

- Read [“Installation Guidelines” on page 230](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

Procedure

- Step 1. 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.

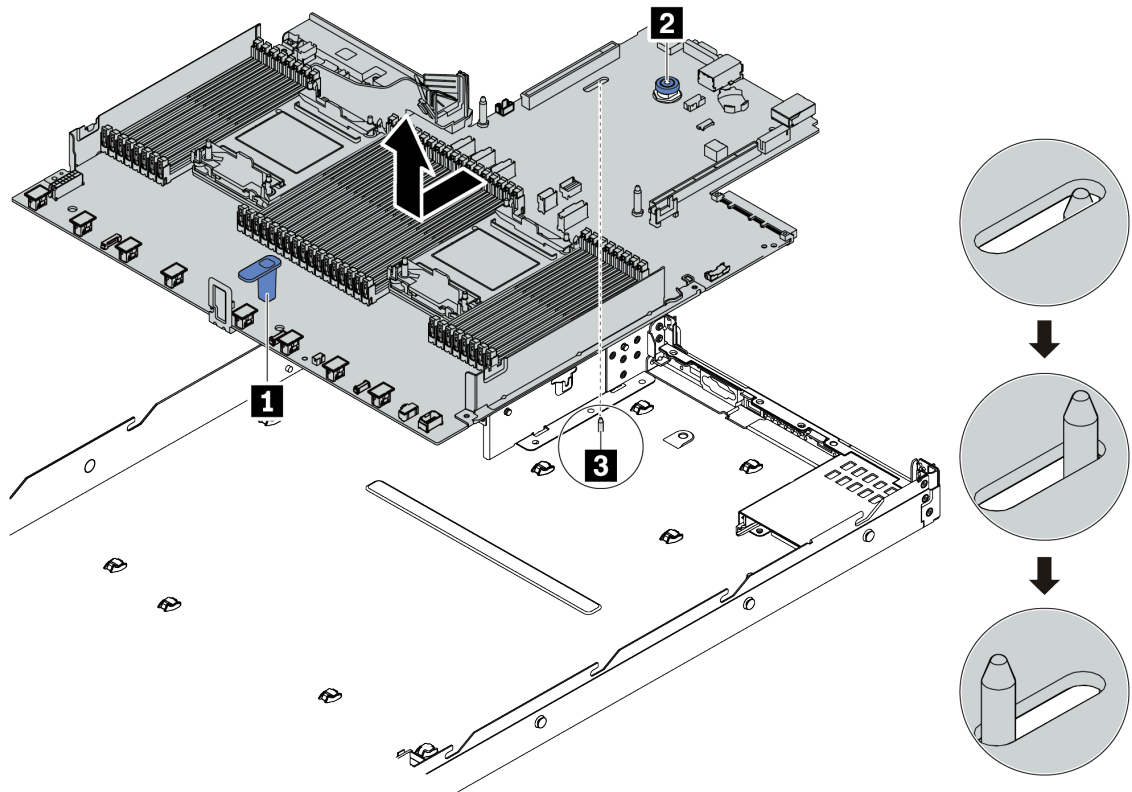


Figure 138. System board installation

- a. Hold the lift handle **1** and the release pin **2** at the same time to lower the system board into the chassis.
- b. Slide the system board to the rear of the server until the system board snaps into position. Ensure that:
 - The new system board is engaged by the locating pin **3** on the chassis.
 - The rear connectors on the new system board are inserted into the corresponding holes in the rear panel.
 - The release pin **2** secures the system board in place.

After you finish

1. Install any components that you have removed from the failing system board.
 - “Processor and heat sink” on page 234
 - “Memory modules” on page 177
 - “System fans” on page 216
 - “RAID super capacitor modules” on page 200
 - “Riser assemblies” on page 211
 - “CMOS battery” on page 125
 - “OCP 3.0 Ethernet adapter” on page 189
2. Properly route and secure the cables in the server. Refer to detailed cable routing information for each component in [Chapter 3 “Internal cable routing” on page 73](#).
3. Install the rear drive cage if you have removed it. See [“Install the hot-swap rear drive assembly” on page 159](#).
4. Install the air baffle if you have removed it. See [“Install the air baffle” on page 123](#).

5. Install the top cover. See [“Install the top cover” on page 228](#).
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.
8. Update the VPD. See [“Update the Vital Product Data \(VPD\)” on page 248](#).
 - (Required) Machine type
 - (Required) Serial number
 - (Optional) Asset tag
 - (Optional) UUID
9. Configure the security settings. See [“Configure security settings” on page 250](#).
 - (Required) Set the TPM policy
 - (Required) Lock the TPM policy
 - (Optional) Assert Physical Presence
 - (Optional) Set the TPM version
 - (Optional) Enable UEFI secure boot

Demo video

[Watch the procedure on YouTube](#)

Update the Vital Product Data (VPD)

Use this topic to update the Vital Product Data (VPD).

VPD to be updated after system board replacement:

- (Required) Machine type
- (Required) Serial number
- (Optional) Asset tag
- (Optional) UUID

Recommended tools:

- Lenovo XClarity Provisioning Manager
- Lenovo XClarity Essentials OneCLI commands

Using Lenovo XClarity Provisioning Manager

Steps:

1. Start the server and press the key according to the on-screen instructions. The Lenovo XClarity Provisioning Manager interface is displayed by default.
2. Choose **System Summary**. The “System Summary” tab page is displayed.
3. Click **Update VPD**, and then follow on-screen instructions to update the VPD.

Using Lenovo XClarity Essentials OneCLI commands

- Updating **machine type**
`onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model>[access_method]`
- Updating **serial number**
`onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n> [access_method]`
- Updating **asset tag**
`onecli config set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag> [access_method]`
- Updating **UUID**
`onecli config createuuid SYSTEM_PROD_DATA.SysInfoUUID [access_method]`

Variable	Description
<m/t_model>	The server machine type and model number. Type xxxxyyyyyy, where xxxx is the machine type and yyyyyy is the server model number.

<s/n>	<p>The serial number on the server.</p> <p>Type zzzzzzzz (length 8-10 characters), where zzzzzzzz is the serial number.</p>
<asset_tag>	<p>The server asset tag number.</p> <p>Type aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa, where aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa is the asset tag number.</p>
[access_method]	<p>The access method that you select to access the target server.</p> <ul style="list-style-type: none"> • Online KCS (unauthenticated and user restricted): You can directly delete [access_method] from the command. • Online authenticated LAN: In this case, specify below LAN account information at the end of the OneCLI command: --bmc -username <user_id> --bmc -password <password> • Remote WAN/LAN: In this case, specify below XCC account information and IP address at the end of the OneCLI command: --bmc <bmc_user_id>:<bmc_password>@<bmc_external_IP> <p>Notes:</p> <ul style="list-style-type: none"> - <bmc_user_id> The BMC account name (1 of 12 accounts). The default value is USERID. - <bmc_password> The BMC account password (1 of 12 accounts).

Configure security settings

Use this section to configure security settings after the system board is replaced.

Security settings	Outside Chinese Mainland		Chinese Mainland	
	7002 CPU	7003 CPU	7002 CPU	7003 CPU
Physical presence assertion	Required ¹		Required ¹	
TPM policy setting & locking	Required	Required	Required	Required
TPM version toggling	Optional ²	Optional ²		

1. Required only when certain UEFI firmware versions and processors are installed. For details, see “(Optional) Assert physical presence” on page 250.

2. Optional versions for toggling vary when different processors and UEFI firmware versions are installed. For details, see “(Optional) Toggle the TPM version” on page 256.

- “(Optional) Assert physical presence” on page 250
- “(Required) Set the TPM policy” on page 252
- “(Optional) Toggle the TPM version” on page 256
- “(Optional) Enable UEFI Secure Boot” on page 258

(Optional) Assert physical presence

Use this topic to assert physical presence.

Important:

- Check your UEFI firmware version to decide whether asserting physical presence is required before any changes to security settings.
 - UEFI firmware before v2.02
Asserting physical presence is required.
 - UEFI firmware v2.02 and later
Asserting physical presence is no longer required, all local accounts and some authorized remote accounts can directly change the settings.
- Note that a Local IPMI user and password must be setup in Lenovo XClarity Controller for remote accessing to the target system.
- Before you can assert Physical Presence, the Physical Presence Policy must be enabled. By default, the Physical Presence Policy is enabled with a timeout of 30 minutes.

Recommended tools

- Lenovo XClarity Controller
- Hardware jumper on the system board

Using Lenovo XClarity Controller

Complete the following steps to assert Physical Presence through the Lenovo XClarity Controller:

1. Log in to the Lenovo XClarity Controller interface.

For information about logging in to the Lenovo XClarity Controller, see the “Opening and Using the XClarity Controller Web Interface” section in the XCC documentation version compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

2. Click **BMC Configuration** → **Security** and verify that Physical Presence is set to **assert**.

Using the hardware jumper

You can also assert hardware Physical Presence through a jumper on the system board. For more information about the jumper, see [“Switch block and jumper” on page 67](#).

(Required) Set the TPM policy

Use this topic to set the TPM policy.

Important:

- Check your UEFI firmware version to decide whether asserting physical presence is required before any changes to security settings.
 - UEFI firmware before v2.02

Asserting physical presence is required.
 - UEFI firmware v2.02 and later

Asserting physical presence is no longer required, all local accounts and some authorized remote accounts can directly change the settings.
- Note that a Local IPMI user and password must be setup in Lenovo XClarity Controller for remote accessing to the target system.

Recommended tools

- [“Using Lenovo XClarity Provisioning Manager” on page 253](#)
- [“Using Lenovo XClarity Essentials OneCLI” on page 254](#)

Using Lenovo XClarity Provisioning Manager

Use this topic to set the TPM policy using Lenovo XClarity Provisioning Manager.

Steps:

1. Start the server and press the key according to the on-screen instructions to display the Lenovo XClarity Provisioning Manager interface.

Note: Lenovo XClarity Provisioning Manager is the default System Setup interface. If you need to switch to the text mode interface, go to: https://thinksystem.lenovofiles.com/help/topic/dcg_uefi/overview_dcg_uefi.html

2. If the power-on Administrator password is required, enter the password.
3. From the System Summary page, click **Update VPD**.
4. Set the policy to one of the following settings.

Important:

- The policy to be set must match with the TPM hardware device. For example, when the hardware device is an onboard chip for customers outside Chinese Mainland, if the policy is set to “NationZ TPM 2.0 enabled - China only”, the setting will fail.
- The policy will be automatically locked once it is set via Lenovo XClarity Provisioning Manager.
- Once the policy is successfully set and locked, the policy cannot be unlocked and reset on field sites.

TPM Policy	Description
Undefined	The default setting and must be changed to one of the other 3 policies.
NationZ TPM 2.0 enabled - China only	Customers in Chinese Mainland that intend to enable TPM should select this TPM policy.
TPM enabled - ROW	Customers outside Chinese Mainland that intend to enable TPM should select this TPM policy.
Permanently disabled	Customers in Chinese Mainland with no TPM or customers that require to disable TPM should enable this policy.

Using Lenovo XClarity Essentials OneCLI

Use this section to set the TPM policy using Lenovo XClarity Essentials OneCLI.

Setting the policy

Important:

- The policy to be set must match with the TPM hardware device. For example, when the hardware device is an onboard chip for customers outside Chinese Mainland, if the policy is set to “NationZ TPM 2.0 enabled - China only”, the setting will fail.
- After the policy is set using OneCLI commands, for security reasons, it must be locked on field sites.
- Once the policy is successfully set and locked, the policy cannot be unlocked and reset on field sites.

Steps:

1. Read TpmTcmPolicyLock to check whether the TPM_TCM_POLICY has been locked:
`OneCli.exe config show imm.TpmTcmPolicyLock --override --bmc <userid>:<password>@<ip_address>`

Note: The imm.TpmTcmPolicyLock value must be “Disabled”, which means TPM_TCM_POLICY is NOT locked and changes to the TPM_TCM_POLICY are permitted. If the return code is “Enabled” then no changes to the policy are permitted. The planar may still be used if the desired setting is correct for the system being replaced.

2. Configure the TPM_TCM_POLICY into XCC:
 - NationZ TPM 2.0 enabled - China only

Customers in Chinese Mainland that intend to enable TPM should select this TPM policy.

```
OneCli.exe config set imm.TpmTcmPolicy "NationZTPM20Only" --override --bmc <userid>:<password>@<ip_address>
```

- TPM enabled - ROW

Customers outside Chinese Mainland that intend to enable TPM should select this TPM policy.

```
OneCli.exe config set imm.TpmTcmPolicy "TpmOnly" --override --bmc <userid>:<password>@<ip_address>
```

- Permanently disabled

Customers in Chinese Mainland with no TPM or customers that require to disable TPM should select this policy.

```
OneCli.exe config set imm.TpmTcmPolicy "NeitherTpmNorTcm" --override --bmc <userid>:<password>@<ip_address>
```

3. Issue reset command to reset system:
`OneCli.exe misc ospower reboot --bmc <userid>:<password>@<ip_address>`
4. Read back the value to check whether the change has been accepted:
`OneCli.exe config show imm.TpmTcmPolicy --override --bmc <userid>:<password>@<ip_address>`

Notes: If the read back value is matched it means the TPM_TCM_POLICY has been set correctly.

imm.TpmTcmPolicy is defined as below:

- Value 0 use string “Undefined”, which means UNDEFINED policy.
- Value 1 use string “NeitherTpmNorTcm”, which means TPM_PERM_DISABLED.
- Value 2 use string “TpmOnly”, which means TPM_ALLOWED.
- Value 4 use string “NationZTPM20Only”, which means NationZTPM20_ALLOWED.

Locking the TPM policy

Steps:

1. Read TpmTcmPolicyLock to check whether the TPM_TCM_POLICY has been locked:
`OneCli.exe config show imm.TpmTcmPolicyLock --override --bmc <userid>:<password>@<ip_address>`

Note: The value must be “Disabled”, it means TPM_TCM_POLICY is NOT locked and must be set.

2. Lock the TPM_TCM_POLICY:

```
OneCli.exe config set imm.TpmTcmPolicyLock "Enabled" --override --bmc <userid>:<password>@<ip_address>
```

3. Issue reset command to reset system, command as below:

```
OneCli.exe misc ospower reboot --bmc <userid>:<password>@<ip_address>
```

During the reset, UEFI will read the value from imm.TpmTcmPolicyLock, if the value is “Enabled” and the imm.TpmTcmPolicy value is valid, UEFI will lock the TPM_TCM_POLICY setting.

The valid value for imm.TpmTcmPolicy includes “NeitherTpmNorTcm”, “TpmOnly”, and “NationZTPM20Only”.

If the imm.TpmTcmPolicyLock is set as “Enabled” but imm.TpmTcmPolicy value is invalid, UEFI will reject the 'lock' request and change imm.TpmTcmPolicyLock back to “Disabled”.

4. Read back the value to check whether the “Lock” is accepted or rejected. command as below:

```
OneCli.exe config show imm.TpmTcmPolicy --override --bmc <userid>:<password>@<ip_address>
```

Note: If the read back value is changed from “Disabled” to “Enabled” that means the TPM_TCM_POLICY has been locked successfully. There is no method to unlock a policy once it has been set other than replacing system board.

imm.TpmTcmPolicyLock is defined as below:

Value 1 use string “Enabled”, which means lock the policy. Other values are not accepted.

(Optional) Toggle the TPM version

Use this topic to set the TPM version.

Installing the corresponding UEFI firmware version is required before you can upgrade the TPM firmware to a certain version. Check the following table for the supported upgrade paths with different UEFI firmware versions and processors.

UEFI firmware	Processor	TPM 1.2 <-> TPM 2.0 (7.4.0.0<->7.2.1.0) ¹	TPM 1.2 upgrade (7.4.0.0->7.4.0.1)	TPM 2.0 upgrade (7.2.1.0->7.2.2.0)
Before v2.0.2	7002 series	√ ²		
v2.0.2 and later	7002 series		√ ³	√ ³
v2.0.2 and later	7003 series			√ ³

Notes:

1. Supports a maximum of 128 times toggling.
2. Toggling between TPM 1.2 and TPM 2.0 (7.4.0.0<->7.2.1.0) is supported when the following requirements are met at the same time.
 - UEFI firmware before v2.02 installed.
 - 7002 series processors installed.
 - Original TPM firmware version is either 7.4.0.0 or 7.2.1.0.
3. Once the TPM firmware version has been upgraded, it cannot be rolled back.

Important:

- Check your UEFI firmware version to decide whether asserting physical presence is required before any changes to security settings.
 - UEFI firmware before v2.02
Asserting physical presence is required.
 - UEFI firmware v2.02 and later
Asserting physical presence is no longer required, all local accounts and some authorized remote accounts can directly change the settings.
- Note that a Local IPMI user and password must be setup in Lenovo XClarity Controller for remote accessing to the target system.

Recommended tools:

Lenovo XClarity Essentials OneCLI commands

Using Lenovo XClarity Essentials OneCLI commands

Use the following commands to toggle the TPM firmware version.

TPM 1.2 (7.4.0.0) -> TPM 1.2 (7.4.0.1):

```
OneCli.exe config set TrustedComputingGroup.DeviceOperation "Update to TPM 1.2 firmware version 7.4.0.1" --bmc  
<userid>:<password>@<ip_address>
```

TPM 2.0 (7.2.1.0) -> TPM 2.0 (7.2.2.0):

```
OneCli.exe config set TrustedComputingGroup.DeviceOperation "Update to TPM 2.0 firmware version 7.2.2.0" --bmc  
<userid>:<password>@<ip_address>
```

TPM 2.0 (7.2.1.0) -> TPM 1.2 (7.4.0.0):

```
OneCli.exe config set TrustedComputingGroup.DeviceOperation "Update to TPM1.2 compliant" --bmc  
<userid>:<password>@<ip_address>
```

TPM 1.2 (7.4.0.0) -> TPM 2.0 (7.2.1.0):

```
OneCli.exe config set TrustedComputingGroup.DeviceOperation "Update to TPM2.0 compliant" --bmc  
<userid>:<password>@<ip_address>
```

where:

- <userid>:<password> are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSWORD (zero, not an uppercase O)
- <ip_address> is the IP address of the BMC.

(Optional) Enable UEFI Secure Boot

Use this topic to enable UEFI Secure Boot.

Important:

- Check your UEFI firmware version to decide whether asserting physical presence is required before any changes to security settings.
 - UEFI firmware before v2.02

Asserting physical presence is required.

- UEFI firmware v2.02 and later

Asserting physical presence is no longer required, all local accounts and some authorized remote accounts can directly change the settings.

- Note that a Local IPMI user and password must be setup in Lenovo XClarity Controller for remote accessing to the target system.

Recommended tools:

- Lenovo XClarity Provisioning Manager
- Lenovo XClarity Essentials OneCLI

Using Lenovo XClarity Provisioning Manager

Steps:

1. Start the server and press the key specified in the on-screen instructions to display the Lenovo XClarity Provisioning Manager interface. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.)
2. If the power-on Administrator password is required, enter the password.
3. From the UEFI Setup page, click **System Settings** → **Security** → **Secure Boot**.
4. Enable Secure Boot and save the settings.

Using Lenovo XClarity Essentials OneCLI

Run the following command to enable Secure Boot:

```
OneCli.exe config set SecureBootConfiguration.SecureBootSetting Enabled --bmc <userid>:<password>@<ip_address>
```

where:

- <userid>:<password> are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSWORD (zero, not an uppercase o)
- <ip_address> is the IP address of the BMC.

Chapter 5. Problem determination

Use the information in this section to isolate and resolve issues that you might encounter while using your server.

Lenovo servers can be configured to automatically notify Lenovo Support if certain events are generated. You can configure automatic notification, also known as Call Home, from management applications, such as the Lenovo XClarity Administrator. If you configure automatic problem notification, Lenovo Support is automatically alerted whenever a server encounters a potentially significant event.

To isolate a problem, you should typically begin with the event log of the application that is managing the server:

- If you are managing the server from the Lenovo XClarity Administrator, begin with the Lenovo XClarity Administrator event log.
- If you are using some other management application, begin with the Lenovo XClarity Controller event log.

Event logs

An *alert* is a message or other indication that signals an event or an impending event. Alerts are generated by the Lenovo XClarity Controller or by UEFI in the servers. These alerts are stored in the Lenovo XClarity Controller Event Log.

Note: For a listing of events, including user actions that might need to be performed to recover from an event, see the *Messages and Codes Reference*, which is available at: https://thinksystem.lenovofiles.com/help/topic/7D2X/pdf_files.html

Lenovo XClarity Controller event log

The Lenovo XClarity Controller monitors the physical state of the server and its components using sensors that measure internal physical variables such as temperature, power-supply voltages, fan speeds, and component status. The Lenovo XClarity Controller provides various interfaces to systems management software and to system administrators and users to enable remote management and control of a server.

The Lenovo XClarity Controller monitors all components of the server and posts events in the Lenovo XClarity Controller event log.

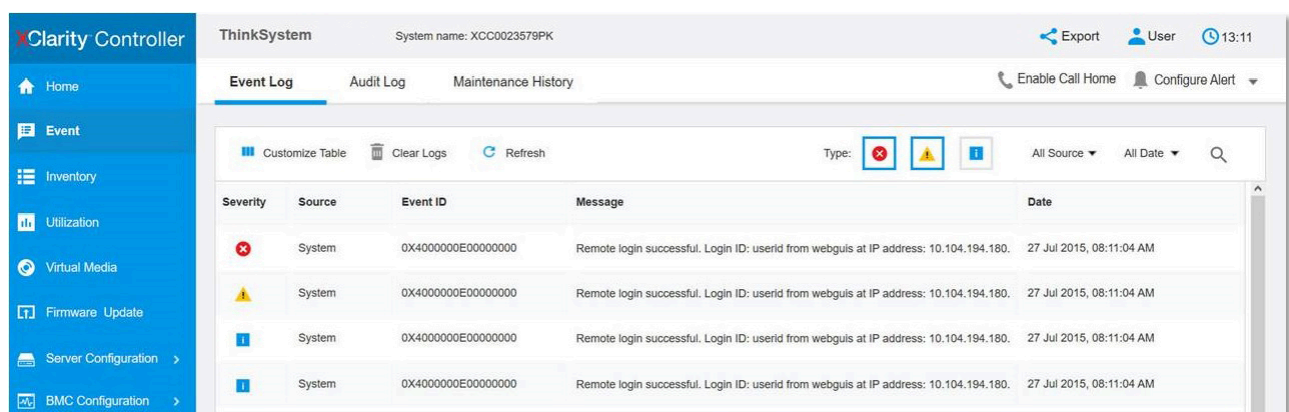


Figure 139. Lenovo XClarity Controller event log

For more information about accessing the Lenovo XClarity Controller event log, see:

“Viewing Event Logs” section in the XCC documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/ixcc_frontend/ixcc_overview.html.

Light path diagnostics

Light path diagnostics is a system of LEDs on various external and internal components of the server that leads you to the failed component. When an error occurs, LEDs are lit on the front I/O assembly, the rear panel, the system board, and the failed component. By viewing the following LEDs, you can often identify the system and device status and diagnose problems.

- “Front view” on page 33
 - “Diagnostics panel” on page 45
 - “LCD diagnostics panel/handset” on page 47
 - “Rear view LEDs” on page 61
 - “System board LEDs” on page 65
-

General problem determination procedures

Use the information in this section to resolve problems if the event log does not contain specific errors or the server is inoperative.

If you are not sure about the cause of a problem and the power supplies are working correctly, complete the following steps to attempt to resolve the problem:

1. Power off the server.
2. Make sure that the server is cabled correctly.
3. Remove or disconnect the following devices, one at a time, until you find the failure. Power on and configure the server each time you remove or disconnect a device.
 - Any external devices.
 - Surge-suppressor device (on the server).
 - Printer, mouse, and non-Lenovo devices.
 - Each adapter.
 - Hard disk drives.
 - Memory modules until you reach the minimum configuration that is supported for the server.

Note: The minimum configuration required for the server to start is one processor and one 2 GB DIMM.

4. Power on the server.

If the problem is solved when you remove an adapter from the server, but the problem recurs when you install the same adapter again, suspect the adapter. If the problem recurs when you replace the adapter with a different one, try a different PCIe slot.

If the problem appears to be a networking problem and the server passes all system tests, suspect a network cabling problem that is external to the server.

Resolving suspected power problems

Power problems can be difficult to solve. For example, a short circuit can exist anywhere on any of the power distribution buses. Usually, a short circuit will cause the power subsystem to shut down because of an overcurrent condition.

Complete the following steps to diagnose and resolve a suspected power problem.

Step 1. Check the event log and resolve any errors related to the power.

Note: Start with the event log of the application that is managing the server. For more information about event logs, see “Event logs” on page 259.

- Step 2. Check for short circuits, for example, if a loose screw is causing a short circuit on a circuit board.
- Step 3. Remove the adapters and disconnect the cables and power cords to all internal and external devices until the server is at the minimum configuration that is required for the server to start. See [“Technical specifications” on page 3](#) to determine the minimum configuration for your server.
- Step 4. Reconnect all ac power cords and turn on the server. If the server starts successfully, reseal the adapters and devices one at a time until the problem is isolated.

If the server does not start from the minimum configuration, replace the components in the minimum configuration one at a time until the problem is isolated.

Resolving suspected Ethernet controller problems

The method that you use to test the Ethernet controller depends on which operating system you are using. See the operating-system documentation for information about Ethernet controllers, and see the Ethernet controller device-driver readme file.

Complete the following steps to attempt to resolve suspected problems with the Ethernet controller.

- Step 1. Make sure that the correct device drivers, which come with the server are installed and that they are at the latest level.
- Step 2. Make sure that the Ethernet cable is installed correctly.
 - The cable must be securely attached at all connections. If the cable is attached but the problem remains, try a different cable.
 - Make sure that the cable rating is applicable for the network speed selected. For example, an SFP+ cable is only suitable for 10G operation. An SFP25 cable is needed for 25G operation. Likewise for Base-T operation, a CAT5 cable is required for 1G Base-T operation while a CAT6 cable is required for 10G Base-T operation.
- Step 3. Set both the adapter port and the switch port to auto-negotiation. If auto-negotiation is not supported on one of the ports, try configuring both ports manually to match each other.
- Step 4. Check the Ethernet controller LEDs on the server. These LEDs indicate whether there is a problem with the connector, cable, or hub.

Although some adapters may vary, when installed vertically the adapter link LED is typically on the left of the port and the activity LED is typically on the right.

- The Ethernet link status LED is lit when the Ethernet controller receives a link indication from the switch. If the LED is off, there might be a defective connector or cable or a problem with the switch.
 - The Ethernet transmit/receive activity LED is lit when the Ethernet controller sends or receives data over the Ethernet network. If the Ethernet transmit/receive activity is off, make sure that the hub and network are operating and that the correct device drivers are installed.
- Step 5. Check the Network activity LED on the rear of the server. The Network activity LED is lit when data is active on the Ethernet network. If the Network activity LED is off, make sure that the hub and network are operating and that the correct device drivers are installed.
 - Step 6. Check for operating-system-specific causes of the problem, and also make sure that the operating system drivers are installed correctly.
 - Step 7. Make sure that the device drivers on the client and server are using the same protocol.

If the Ethernet controller still cannot connect to the network but the hardware appears to be working, the network administrator must investigate other possible causes of the error.

Troubleshooting by symptom

Use this information to find solutions to problems that have identifiable symptoms.

To use the symptom-based troubleshooting information in this section, complete the following steps:

1. Check the event log of Lenovo XClarity Controller and follow the suggested actions to resolve any event codes.

For more information about event logs, see [“Event logs” on page 259](#)

2. Review this section to find the symptoms that you are experiencing and follow the suggested actions to resolve the issue.
3. If the problem persists, contact support (see [“Contacting Support” on page 281](#)).

Power on and power off problems

Use this information to resolve issues when powering on or powering off the server.

- [“Embedded hypervisor is not in the boot list” on page 262](#)
- [“The power button does not work \(server does not start\)” on page 262](#)
- [“Server does not power on” on page 263](#)

Embedded hypervisor is not in the boot list

Complete the following steps until the problem is solved.

1. If the server has been installed, moved, or serviced recently, or if this is the first time the embedded hypervisor is being used, make sure that the device is connected properly and that there is no physical damage to the connectors.
2. See the documentation that comes with the optional embedded hypervisor flash device for setup and configuration information.
3. Check <https://serverproven.lenovo.com/> to validate that the embedded hypervisor device is supported for the server.
4. Make sure that the embedded hypervisor device is listed in the list of available boot options. From the management controller user interface, click **Server Configuration → Boot Options**.

For information about accessing the management controller user interface, see the “Opening and Using the XClarity Controller Web Interface” section in the XCC documentation version compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

5. Check <http://datacentersupport.lenovo.com> for any tech tips (service bulletins) related to the embedded hypervisor and the server.
6. Make sure that other software works on the server to ensure that it is working properly.

The power button does not work (server does not start)

Note: The power button will not function until approximately 1 to 3 minutes after the server has been connected to ac power to allow time for BMC to initialize.

Complete the following steps until the problem is resolved:

1. Make sure that the power button on the server is working correctly:
 - a. Disconnect the server power cords.
 - b. Reconnect the server power cords.
 - c. Reseat the operator information panel cable, and then repeat steps a and b.
 - If the server starts, reseat the operator information panel.
 - If the problem remains, replace the operator information panel.
2. Make sure that:
 - The power cords are correctly connected to the server and to a working electrical outlet.
 - The LEDs on the power supply do not indicate a problem.

- The Power button LED is lit on and flash slowly.
 - The push force is enough and with button force response.
3. If the power button LED didn't lit on or flash correctly, reseal all the power supplies and make sure AC LED on PSU rear side are lit on.
 4. If you have just installed an optional device, remove it, and restart the server.
 5. If the issue is still observed or without power button LED lit on, implement the minimum configuration to check whether any specific components lock the power permission. Replace the each power supply and check the power button function after installing the each one.
 6. If everything is still done and the issue cannot be resolved, collect the failure information with system logs captured to Lenovo support.

Server does not power on

Complete the following steps until the problem is resolved:

1. Check the event log for any events related to the server not powering on.
2. Check for any LEDs that are flashing amber.
3. Check the power LED on the system board.
4. Check if AC power LED is lit on or the amber LED is lit on at the PSU rear side.
5. AC cycle the system.
6. Remove the CMOS battery for at least ten seconds, then, reinstall the CMOS battery.
7. Try to power on the system by IPMI command through XCC or by the power button.
8. Implement the minimum configuration (one processor, one DIMM and one PSU without any adapter and any drive installed).
9. Reseat all power supplies and make sure that AC LEDs on the PSU rear side are lit.
10. Replace the each power supply and check the power button function after installing the each one.
11. If the issue cannot be resolved by above actions, call service to review the issue symptom and see whether the system board replacement is necessary.

Memory problems

Use this information to resolve issues related to memory.

- [“Displayed system memory is less than installed physical memory” on page 263](#)
- [“Multiple rows of DIMMs in a branch identified as failing” on page 264](#)
- [“DIMM PFA issue” on page 264](#)

Displayed system memory is less than installed physical memory

Complete the following steps until the problem is resolved.

Note: Each time you install or remove a DIMM, you must disconnect the server from the power source; then, wait 10 seconds before restarting the server.

1. Make sure that:
 - Memory modules from different vendors are not in the same channel.
 - No error LEDs are lit on the operator information panel.
 - No DIMM error LEDs are lit on the system board.
 - Memory mirrored channel does not account for the discrepancy.
 - The memory modules are seated correctly.
 - You have installed the correct type of memory.
 - If you changed the memory, you updated the memory configuration in the Setup utility.
 - All banks of memory are enabled. The server might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled.
 - There is no memory mismatch when the server is at the minimum memory configuration.
2. Reseat the DIMMs and then restart the server.
3. Run the memory module diagnostics. When you start a server and press the key according to the on-screen instructions, the Lenovo XClarity Provisioning Manager interface is displayed by default. You can

perform memory diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → Memory test**.

4. Check the POST error log:
 - If a DIMM was disabled by a systems-management interrupt (SMI), replace the DIMM.
 - If a DIMM was disabled by the user or by POST, reseal the DIMM; then, run the Setup utility and enable the DIMM.
5. Reseat the DIMM.
6. Restart the server.

Multiple rows of DIMMs in a branch identified as failing

1. Reseat the DIMMs; then, restart the server.
2. Remove the lowest-numbered DIMM pair of those that are identified and replace it with an identical known good DIMM; then, restart the server. Repeat as necessary. If the failures continue after all identified DIMMs are replaced, go to step 4.
3. Return the removed DIMMs, one at a time, to their original connectors, restarting the server after each DIMM, until a DIMM fails. Replace each failing DIMM with an identical known good DIMM, restarting the server after each DIMM replacement. Repeat step 3 until you have tested all removed DIMMs.
4. Replace the lowest-numbered DIMM of those identified; then, restart the server. Repeat as necessary.
5. Reverse the DIMMs between the channels (of the same processor), and then restart the server. If the problem is related to a DIMM, replace the failing DIMM.
6. Swap processors to see if the memory issue followed by the processors or DIMMs. If it follows the failing components, then replace the failing components.
7. (Trained technician only) Replace the system board.

DIMM PFA issue

1. Update the UEFI and XCC firmware to the latest version.
2. Reseat the failing DIMMs.
3. Swap processors and make sure that there are no damages to processor socket pins.
4. (Train service only) Ensure there is no abnormal material in any DIMM slot.
5. Run the memory module diagnostics. When you start a server and press the key according to the on-screen instructions, the Lenovo XClarity Provisioning Manager interface is displayed by default. You can perform memory diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → Memory test**.
6. Replace the failing DIMMs that fails Memory Test.

Hard disk drive problems

Use this information to resolve issues related to the hard disk drives.

- [“Server cannot recognize a hard drive” on page 264](#)
- [“Multiple hard drives fail” on page 265](#)
- [“Multiple hard drives are offline” on page 265](#)
- [“A replacement hard disk drive does not rebuild” on page 266](#)
- [“Green hard disk drive activity LED does not represent actual state of associated drive” on page 266](#)
- [“U.3 NVMe drive can be detected in NVMe connection, but cannot be detected in Tri-mode” on page 266](#)

Server cannot recognize a hard drive

Complete the following steps until the problem is solved.

1. Observe the associated yellow hard disk drive status LED. If the LED is lit, it indicates a drive fault.
2. If the status LED is lit, remove the drive from the bay, wait 45 seconds, and reinsert the drive, making sure that the drive assembly connects to the hard disk drive backplane.
3. Observe the associated green hard disk drive activity LED and the yellow status LED and perform corresponding operations in different situations:

- If the green activity LED is flashing and the yellow status LED is not lit, the drive is recognized by the controller and is working correctly. Run the diagnostics tests for the hard disk drives. When you start a server and press the key according to the on-screen instructions, the Lenovo XClarity Provisioning Manager interface is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.) You can perform hard drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → HDD test/Disk Drive Test**.
 - If the green activity LED is flashing and the yellow status LED is flashing slowly, the drive is recognized by the controller and is rebuilding.
 - If neither LED is lit or flashing, check whether the hard disk drive backplane is correctly seated. For details, go to step 4.
 - If the green activity LED is flashing and the yellow status LED is lit, replace the drive. If the activity of the LEDs remains the same, go to step Hard disk drive problems. If the activity of the LEDs changes, return to step 1.
4. Make sure that the hard disk drive backplane is correctly seated. When it is correctly seated, the drive assemblies correctly connect to the backplane without bowing or causing movement of the backplane.
 5. Reseat the backplane power cable and repeat steps 1 through 3.
 6. Reseat the backplane signal cable and repeat steps 1 through 3.
 7. Suspect the backplane signal cable or the backplane:
 - Replace the affected backplane signal cable.
 - Replace the affected backplane.
 8. Run the diagnostics tests for the hard disk drives. When you start a server and press the key according to the on-screen instructions, the Lenovo XClarity Provisioning Manager interface is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.) You can perform hard drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → HDD test/Disk Drive Test**.

Based on those tests:

- If the backplane passes the test but the drives are not recognized, replace the backplane signal cable and run the tests again.
- Replace the backplane.
- If the adapter fails the test, disconnect the backplane signal cable from the adapter and run the tests again.
- If the adapter fails the test, replace the adapter.

Multiple hard drives fail

Complete the following steps until the problem is solved:

- View the Lenovo XClarity Controller event log for events related to power supplies or vibration issues and resolve those events.
- Make sure that the device drivers and firmware for the hard disk drive and server are at the latest level

Important: Some cluster solutions require specific code levels or coordinated code updates. If the device is part of a cluster solution, verify that the latest level of code is supported for the cluster solution before you update the code.

Multiple hard drives are offline

Complete the following steps until the problem is solved:

- View the Lenovo XClarity Controller event log for events related to power supplies or vibration issues and resolve those events.
- View the storage subsystem log for events related to the storage subsystem and resolve those events.

One or two 7mm drives identified as failing

Complete the following steps until the problem is solved:

1. Remove and reinstall the reported drive(s) in the same drive bay or another drive bay.
2. If the problem persists, consider replacing the current drives with new ones.
3. If the problem persists, consider replacing the bottom backplane.
4. If the problem persists, consider replacing the top backplane.

A replacement hard disk drive does not rebuild

Complete the following steps until the problem is solved:

1. Make sure that the hard disk drive is recognized by the adapter (the green hard disk drive activity LED is flashing).
2. Review the SAS/SATA RAID adapter documentation to determine the correct configuration parameters and settings.

Green hard disk drive activity LED does not represent actual state of associated drive


Complete the following steps until the problem is solved:

1. If the green hard disk drive activity LED does not flash when the drive is in use, run the diagnostics tests for the hard disk drives. When you start a server and press the key according to the on-screen instructions, the Lenovo XClarity Provisioning Manager interface is displayed by default. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://systemt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.) You can perform hard drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → HDD test/Disk Drive Test**.
2. If the drive passes the test, replace the backplane.
3. If the drive fails the test, replace the drive.

U.3 NVMe drive can be detected in NVMe connection, but cannot be detected in Tri-mode

In Tri-mode, NVMe drives are connected via a PCIe x1 link to the controller. To support Tri-mode with U.3 NVMe drives, **U.3 x1 mode** must be enabled for the selected drive slots on the backplane through the XCC Web GUI. By default, the backplane setting is **U.2 x4 mode**.

Complete the following steps to enable **U.3 x1 mode**:

1. Log into the XCC Web GUI, and choose **Storage → Detail** from the navigation tree on the left.
2. In the window that is displayed, click the icon  next to **Backplane**.
3. In the dialog box that is displayed, select the target drive slots and click **Apply**.
4. Do a DC power cycle to make the setting take effect.

Note: *Depending on the LXPM version, you may see **HDD test** or **Disk Drive Test**.

Monitor and video problems

Use this information to solve problems related to a monitor or video.

- “Incorrect characters are displayed” on page 266
- “Screen is blank” on page 267
- “Screen goes blank when you start some application programs” on page 267
- “The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted” on page 267
- “The wrong characters appear on the screen” on page 267

Incorrect characters are displayed

Complete the following steps:

1. Verify that the language and locality settings are correct for the keyboard and operating system.
2. If the wrong language is displayed, update the server firmware to the latest level. See “[Firmware updates](#)” on page 28.

Screen is blank

Note: Make sure that the expected boot mode has not been changed from the UEFI to Legacy or vice versa.

1. If the server is attached to a KVM switch, bypass the KVM switch to eliminate it as a possible cause of the problem: connect the monitor cable directly to the correct connector on the rear of the server.
2. The management controller remote presence function is disabled if you install an optional video adapter. To use the management controller remote presence function, remove the optional video adapter.
3. If the server is installed with the graphical adapters while turning on the server, the Lenovo logo is displayed on the screen after approximately 3 minutes. This is normal operation while the system loads.
4. Make sure that:
 - The server is turned on and there is power supplied to the server.
 - The monitor cables are connected correctly.
 - The monitor is turned on and the brightness and contrast controls are adjusted correctly.
5. Make sure that the correct server is controlling the monitor, if applicable.
6. Make sure that the video output is not affected by corrupted server firmware; see [“Firmware updates” on page 28](#).
7. If the problem remains, contact Lenovo Support.

Screen goes blank when you start some application programs

1. Make sure that:
 - The application program is not setting a display mode that is higher than the capability of the monitor.
 - You installed the necessary device drivers for the application.

The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted

1. If the monitor self-tests show that the monitor is working correctly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescents, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor.

Attention: Moving a color monitor while it is turned on might cause screen discoloration.

Move the device and the monitor at least 305 mm (12 in.) apart, and turn on the monitor.

Notes:

- a. To prevent diskette drive read/write errors, make sure that the distance between the monitor and any external diskette drive is at least 76 mm (3 in.).
- b. Non-Lenovo monitor cables might cause unpredictable problems.
2. Reseat the monitor cable.
3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time:
 - a. Monitor cable
 - b. Video adapter (if one is installed)
 - c. Monitor
 - d. (Trained technician only) System board.

The wrong characters appear on the screen

Complete the following steps until the problem is solved:

1. Verify that the language and locality settings are correct for the keyboard and operating system.
2. If the wrong language is displayed, update the server firmware to the latest level. See [“Firmware updates” on page 28](#).

Keyboard, mouse, KVM switch or USB-device problems

Use this information to solve problems related to a keyboard, mouse, KVM switch or USB-device problems.

- [“All or some keys on the keyboard do not work” on page 268](#)
- [“Mouse does not work” on page 268](#)
- [“KVM switch problems” on page 268](#)
- [“USB-device does not work” on page 268](#)

All or some keys on the keyboard do not work

1. Make sure that:
 - The keyboard cable is securely connected.
 - The server and the monitor are turned on.
2. If you are using a USB keyboard, run the Setup utility and enable keyboardless operation.
3. If you are using a USB keyboard and it is connected to a USB hub, disconnect the keyboard from the hub and connect it directly to the server.
4. Replace the keyboard.

Mouse does not work

1. Make sure that:
 - The mouse cable is securely connected to the server.
 - The mouse device drivers are installed correctly.
 - The server and the monitor are turned on.
 - The mouse option is enabled in the Setup utility.
2. If you are using a USB mouse and it is connected to a USB hub, disconnect the mouse from the hub and connect it directly to the server.
3. Replace the mouse.

KVM switch problems

1. Make sure that the KVM switch is supported by your server.
2. Make sure that the KVM switch is powered on correctly.
3. If the keyboard, mouse or monitor can be operated normally with direct connection to the server, then replace the KVM switch.

USB-device does not work

1. Make sure that:
 - The correct USB device driver is installed.
 - The operating system supports USB devices.
2. Make sure that the USB configuration options are set correctly in system setup.

Restart the server and press the key according to the on-screen instructions to display the Lenovo XClarity Provisioning Manager system setup interface. Then, click **System Settings → Devices and I/O Ports → USB Configuration**.

3. If you are using a USB hub, disconnect the USB device from the hub and connect it directly to the server.

Optional-device problems

Use this information to solve problems related to optional devices.

- [“External USB device is not recognized” on page 268](#)
- [“PCIe adapter is not recognized or is not functioning” on page 269](#)
- [“A Lenovo optional device that worked previously does not work now” on page 270](#)
- [“A Lenovo optional device that was just installed does not work.” on page 269](#)
- [“A Lenovo optional device that worked previously does not work now” on page 270](#)

External USB device is not recognized

Complete the following steps until the problem is resolved:

1. Update the UEFI firmware to the latest version.
2. Make sure that the proper drivers are installed on the compute node. See the product documentation for the USB device for information about device drivers.
3. Use the Setup utility to make sure that the device is configured correctly.
4. If the USB device is plugged into a hub or the console breakout cable, unplug the device and plug it directly into the USB port on the front of the server.

PCIe adapter is not recognized or is not functioning

Complete the following steps until the problem is resolved:

1. Update the UEFI firmware to the latest version.
2. Check the event log and resolve any issues related to the device.
3. Validate that the device is supported for the server (see <https://serverproven.lenovo.com/>). Make sure that the firmware level on the device is at the latest supported level and update the firmware if applicable.
4. Make sure that the adapter is installed in a correct slot.
5. Make sure that the proper device drivers are installed for the device.
6. Resolve any resource conflicts if running legacy mode (UEFI). Check legacy ROM boot orders and modify the UEFI setting for MM config base.

Note: Ensure that you modify the ROM boot order associated with the PCIe adapter to the first execution order.

7. Check <http://datacentersupport.lenovo.com> for any tech tips (also known as retain tips or service bulletins) that might be related to the adapter.
8. Ensure any adapter external connections are correct and that the connectors are not physically damaged.
9. Make sure that the PCIe adapter is installed with the supported operating system.

Insufficient PCIe resources are detected.

If you see an error message stating “Insufficient PCI Resources Detected,” complete the following steps until the problem is resolved:

1. Press Enter to access System Setup Utility.
2. Select **System Settings → Devices and I/O Ports → MM Config Base**; then, modify the setting to increase the device resources. For example, modify 3 GB to 2 GB or modify 2 GB to 1 GB.
3. Save the settings and restart the system.
4. If the error recurs with the highest device resource setting (1GB), shutdown the system and remove some PCIe devices; then, power on the system.
5. If the reboot failed, repeat step 1 to step 4.
6. If the error recurs, press Enter to access System Setup Utility.
7. Select **System Settings → Devices and I/O Ports → PCI 64-Bit Resource Allocation**, then; modify the setting from **Auto** to **Enable**.
8. If the Boot Device does not support MMIO above 4GB for Legacy Boot, use UEFI Boot Mode or remove/disable some PCIe devices.
9. DC cycle the system and ensure the system is enter UEFI boot menu or the operating system; then, capture the FFDC log.
10. Contact Lenovo technical support.

A Lenovo optional device that was just installed does not work.

1. Make sure that:
 - The device is supported for the server (see <https://serverproven.lenovo.com/>).
 - You followed the installation instructions that came with the device and the device is installed correctly.
 - You have not loosened any other installed devices or cables.
 - You updated the configuration information in system setup. When you start a server and press the key according to the on-screen instructions to display the Setup Utility. Whenever memory or any other device is changed, you must update the configuration.

2. Reseat the device that you have just installed.
3. Replace the device that you have just installed.
4. Reseat the cable connection and check there is no physical damage to the cable.
5. If there is any cable damages, then replace the cable.

A Lenovo optional device that worked previously does not work now

1. Make sure that all of the cable connections for the device are secure.
2. If the device comes with test instructions, use those instructions to test the device.
3. Reseat the cable connection and check if any physical parts have been damaged.
4. Replace the cable.
5. Reseat the failing device.
6. Replace the failing device.

Serial-device problems

Use this information to solve problems with serial ports or devices.

- [“Number of displayed serial ports is less than the number of installed serial ports” on page 270](#)
- [“Serial device does not work” on page 270](#)

Number of displayed serial ports is less than the number of installed serial ports

Complete the following steps until the problem is solved.

1. Make sure that:
 - Each port is assigned a unique address in the Setup utility and none of the serial ports is disabled.
 - The serial-port adapter (if one is present) is seated correctly.
2. Reseat the serial port adapter.
3. Replace the serial port adapter.

Serial device does not work

1. Make sure that:
 - The device is compatible with the server.
 - The serial port is enabled and is assigned a unique address.
 - The device is connected to the correct connector.
2. Reseat the following components:
 - a. Failing serial device.
 - b. Serial cable.
3. Replace the following components:
 - a. Failing serial device.
 - b. Serial cable.
4. (Trained technician only) Replace the system board.

Intermittent problems

Use this information to solve intermittent problems.

- [“Intermittent external device problems” on page 270](#)
- [“Intermittent KVM problems” on page 271](#)
- [“Intermittent unexpected reboots” on page 271](#)

Intermittent external device problems

Complete the following steps until the problem is solved.

1. Update the UEFI and XCC firmware to the latest versions.
2. Make sure that the correct device drivers are installed. See the manufacturer's website for documentation.

3. For a USB device:
 - a. Make sure that the device is configured correctly.

Restart the server and press the key according to the on-screen instructions to display the Lenovo XClarity Provisioning Manager system setup interface. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.) Then, click **System Settings → Devices and I/O Ports → USB Configuration**.

- b. Connect the device to another port. If using a USB hub, remove the hub and connect the device directly to the server. Make sure that the device is configured correctly for the port.

Intermittent KVM problems

Complete the following steps until the problem is solved.

Video problems:

1. Make sure that all cables and the console breakout cable are properly connected and secure.
2. Make sure that the monitor is working properly by testing it on another server.
3. Test the console breakout cable on a working server to ensure that it is operating properly. Replace the console breakout cable if it is defective.

Keyboard problems:

Make sure that all cables and the console breakout cable are properly connected and secure.

Mouse problems:

Make sure that all cables and the console breakout cable are properly connected and secure.

Intermittent unexpected reboots

Note: Some uncorrectable errors require that the server reboot so that it can disable a device, such as a memory DIMM or a processor to allow the machine to boot up properly.

1. If the reset occurs during POST and the POST watchdog timer is enabled, make sure that sufficient time is allowed in the watchdog timeout value (POST Watchdog Timer).

To check the POST watchdog time, restart the server and press the key according to the on-screen instructions to display the Lenovo XClarity Provisioning Manager system setup interface. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at https://sysmgmt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html.) Then, click **BMC Settings → POST Watchdog Timer**.

2. See the management controller event log to check for an event code that indicates a reboot. See “[Event logs](#)” on page 259 for information about viewing the event log. If you are using Linux base operating system, then capture all logs back to Lenovo support for further investigation.

Power problems

Use this information to resolve issues related to power.

System error LED is on and event log "Power supply has lost input" is displayed

To resolve the problem, ensure that:

1. The power supply is properly connected to a power cord.
2. The power cord is connected to a properly grounded electrical outlet for the server.
3. Make sure that the power supply AC source is stable within the supported range.
4. Swap the power supply to see if the issue follows the power supply, if it follows the power supply, then replace the failing one.

5. Review the event log and see how the problem it is to follow the event log actions to resolve the problems.

Network problems

Use this information to resolve issues related to networking.

- [“Cannot wake server using Wake on LAN” on page 272](#)
- [“Could not log in using LDAP account with SSL enabled” on page 272](#)

Cannot wake server using Wake on LAN

Complete the following steps until the problem is resolved:

1. If you are using the dual-port network adapter and the server is connected to the network using Ethernet 5 connector, check the system-error log or IMM2 system event log (see [“Event logs” on page 259](#)), make sure:
 - a. Fan 3 is running in standby mode, if Emulex dual port 10GBase-T embedded adapter is installed.
 - b. The room temperature is not too high (see [“Technical specifications” on page 3](#)).
 - c. The air vents are not blocked.
 - d. The air baffle is installed securely.
2. Reseat the dual-port network adapter.
3. Turn off the server and disconnect it from the power source; then, wait 10 seconds before restarting the server.
4. If the problem still remains, replace the dual-port network adapter.

Could not log in using LDAP account with SSL enabled

Complete the following steps until the problem is resolved:

1. Make sure that the license key is valid.
2. Generate a new license key and log in again.

Observable problems

Use this information to solve observable problems.

- [“Server hangs during the UEFI boot process” on page 272](#)
- [“The server immediately displays the POST Event Viewer when it is turned on” on page 273](#)
- [“Server is unresponsive \(POST is complete and operating system is running\)” on page 273](#)
- [“Server is unresponsive \(POST failed and cannot start System Setup\)” on page 273](#)
- [“Voltage planar fault is displayed in the event log” on page 274](#)
- [“Unusual smell” on page 274](#)
- [“Server seems to be running hot” on page 274](#)
- [“Cannot enter legacy mode after installing a new adapter” on page 274](#)
- [“Cracked parts or cracked chassis” on page 274](#)

Server hangs during the UEFI boot process

If the system hangs during the UEFI boot process with the message UEFI: DXE INIT on the display, make sure that Option ROMs were not configured with a setting of **Legacy**. You can remotely view the current settings for Option ROMs by running the following command using the Lenovo XClarity Essentials OneCLI:

```
onecli config show EnableDisableAdapterOptionROMSupport --bmc xcc_userid:xcc_password@xcc_ipaddress
```

To recover a system that hangs during the boot process with Legacy Option ROM settings, see the following Tech Tip:

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

If legacy Option ROMs must be used, do not set slot Option ROMs to **Legacy** on the Devices and I/O Ports menu. Instead, set slot Option ROMs to **Auto** (the default setting), and set the System Boot Mode to **Legacy Mode**. Legacy option ROMs will be invoked shortly before the system boots.

The server immediately displays the POST Event Viewer when it is turned on

Complete the following steps until the problem is solved.

1. Correct any errors that are indicated by the light path diagnostics LEDs.
2. Make sure that the server supports all the processors and that the processors match in speed and cache size.

You can view processor details from system setup.

To determine if the processor is supported for the server, see <https://serverproven.lenovo.com/>.

3. (Trained technician only) Make sure that processor 1 is seated correctly
4. (Trained technician only) Remove processor 2 and restart the server.
5. Replace the following components one at a time, in the order shown, restarting the server each time:
 - a. (Trained technician only) Processor
 - b. (Trained technician only) System board

Server is unresponsive (POST is complete and operating system is running)

Complete the following steps until the problem is solved.

- If you are in the same location as the server, complete the following steps:
 1. If you are using a KVM connection, make sure that the connection is operating correctly. Otherwise, make sure that the keyboard and mouse are operating correctly.
 2. If possible, log in to the server and verify that all applications are running (no applications are hung).
 3. Restart the server.
 4. If the problem remains, make sure that any new software has been installed and configured correctly.
 5. Contact your place of purchase of the software or your software provider.
- If you are accessing the server from a remote location, complete the following steps:
 1. Make sure that all applications are running (no applications are hung).
 2. Attempt to log out of the system and log back in.
 3. Validate the network access by pinging or running a trace route to the server from a command line.
 - a. If you are unable to get a response during a ping test, attempt to ping another server in the enclosure to determine whether it is a connection problem or server problem.
 - b. Run a trace route to determine where the connection breaks down. Attempt to resolve a connection issue with either the VPN or the point at which the connection breaks down.
 4. Restart the server remotely through the management interface.
 5. If the problem remains, verify that any new software has been installed and configured correctly.
 6. Contact your place of purchase of the software or your software provider.

Server is unresponsive (POST failed and cannot start System Setup)

Configuration changes, such as added devices or adapter firmware updates, and firmware or application code problems can cause the server to fail POST (the power-on self-test).

If this occurs, the server responds in either of the following ways:

- The server restarts automatically and attempts POST again.
- The server hangs, and you must manually restart the server for the server to attempt POST again.

After a specified number of consecutive attempts (automatic or manual), the server reverts to the default UEFI configuration and starts System Setup so that you can make the necessary corrections to the configuration and restart the server. If the server is unable to successfully complete POST with the default configuration, there might be a problem with the system board.

You can specify the number of consecutive restart attempts in System Setup. Restart the server and press the key according to the on-screen instructions to display the Lenovo XClarity Provisioning Manager system setup interface. Then, click **System Settings → Recovery and RAS → POST Attempts → POST Attempts Limit**. Available options are 3, 6, 9, and disable.

If the issue cannot be resolved by the actions mentioned above, call the service team to review the issue symptom and confirm whether the system board replacement is necessary.

Voltage planar fault is displayed in the event log

Complete the following steps until the problem is solved.

1. Revert the system to the minimum configuration. See [“Minimum configuration for debugging” on page 10](#) for the minimally required number of processors and DIMMs.
2. Restart the system.
 - If the system restarts, add each of the removed items one at a time and restart the system each time until the error occurs. Replace the item for which the error occurs.
 - If the system does not restart, suspect the system board.

Unusual smell

Complete the following steps until the problem is solved.

1. An unusual smell might be coming from newly installed equipment.
2. If the problem remains, contact Lenovo Support.

Server seems to be running hot

Complete the following steps until the problem is solved.

Multiple servers or chassis:

1. Make sure that the room temperature is within the specified range (see [“Ambient temperature/Humidity/Altitude” on page 13](#)).
2. Make sure that the fans are installed correctly.
3. Update the UEFI and XCC to the latest versions.
4. Make sure that the fillers in the server are installed correctly (see *Maintenance Manual* for detailed installation procedures).
5. Use the IPMI command to ramp up the fan speed to the full fan speed to see whether the issue can be resolved.

Note: The IPMI raw command should only be used by trained technician and the each system has its own specific PMI raw command.

6. Check the management processor event log for rising temperature events. If there are no events, the server is running within normal operating temperatures. Note that you can expect some variation in temperature.

Cannot enter legacy mode after installing a new adapter

Complete the following steps until the problem is solved.

1. Go to **UEFI Setup → Devices and I/O Ports → Set Option ROM Execution Order**.
2. Move the RAID adapter with operation system installed to the top of the list.
3. Select **Save**.
4. Reboot the system and auto boot to operation system.

Cracked parts or cracked chassis

Contact Lenovo Support.

Software problems

Use this information to solve software problems.

1. To determine whether the problem is caused by the software, make sure that:
 - The server has the minimum memory that is needed to use the software. For memory requirements, see the information that comes with the software.

Note: If you have just installed an adapter or memory, the server might have a memory-address conflict.

- The software is designed to operate on the server.
 - Other software works on the server.
 - The software works on another server.
2. If you receive any error messages while you use the software, see the information that comes with the software for a description of the messages and suggested solutions to the problem.
 3. Contact your place of purchase of the software.

Appendix A. Disassemble hardware for recycle

Follow the instructions in this section to recycle components with compliance with local laws or regulations.

Disassembling the system board for recycle

Follow the instructions in this section to disassemble the system board before recycling.

Before disassembling the system board:

1. Remove the system board from the server (see [“Remove the system board” on page 244](#)).
2. Refer to local environmental, waste or disposal regulations to ensure compliance.

Complete the following steps to disassemble the system board:

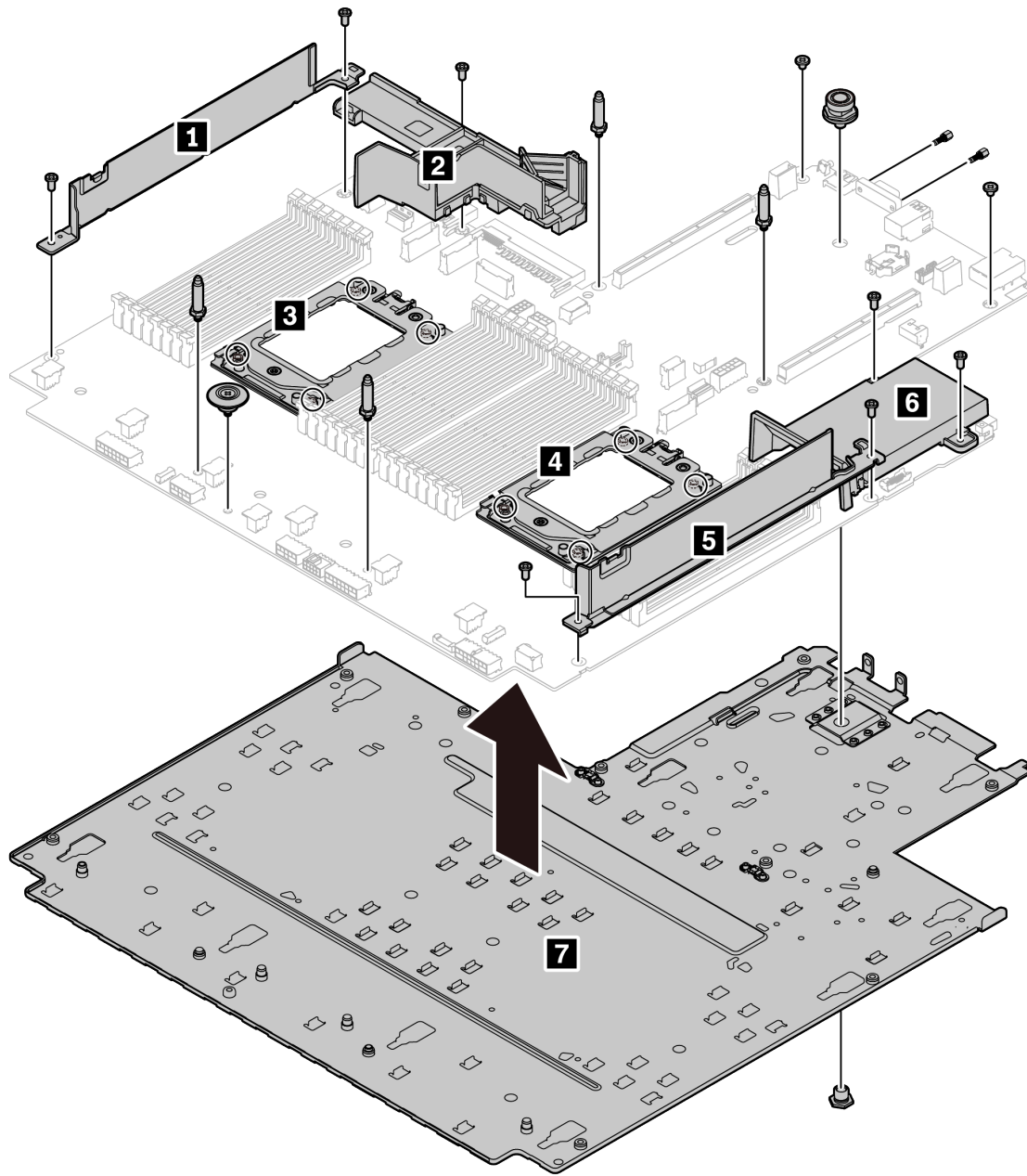


Figure 140. Disassembling the system board

Step 1. Remove the following screws as illustrated:

- 12 slotted screws (with PH2 screwdriver)
- Two guiding pin standoffs (with 7 mm wrench)
- One plunger (with 11 mm and 16 mm wrench)
- Eight T20 screws on the CPU sockets (with T20 screwdriver)
- Two hexagon bolts on the VGA connector (with 5 mm wrench)

Step 2. Separate the components **1 2 3 4 5 6 7** from the system board.

After disassembling the system board, comply with local regulations when recycling.

Appendix B. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about Lenovo products, you will find a wide variety of sources available from Lenovo to assist you.

On the World Wide Web, up-to-date information about Lenovo systems, optional devices, services, and support are available at:

<http://datacentersupport.lenovo.com>

Note: This section includes references to IBM Web sites and information about obtaining service. IBM is Lenovo's preferred service provider for ThinkSystem.

Tech Tips

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

To find the Tech Tips available for your server:

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

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

Security advisories

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

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

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

Before you call

Before you call, there are several steps that you can take to try and solve the problem yourself. If you decide that you do need to call for assistance, gather the information that will be needed by the service technician to more quickly resolve your problem.

Attempt to resolve the problem yourself

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The Lenovo product documentation also describes the diagnostic tests that you can perform. The documentation for most systems, operating systems, and programs contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

You can find the product documentation for your ThinkSystem products at the following location:

<http://thinksystem.lenovofiles.com/help/index.jsp>

You can take these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated software, firmware, and operating-system device drivers for your Lenovo product. The Lenovo Warranty terms and conditions state that you, the owner of the Lenovo product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
- If you have installed new hardware or software in your environment, check <https://serverproven.lenovo.com/> to make sure that the hardware and software are supported by your product.
- Go to <http://datacentersupport.lenovo.com> and check for information to help you solve the problem.
 - Check the Lenovo forums at https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg to see if someone else has encountered a similar problem.

Gathering information needed to call Support

If you require warranty service for your Lenovo product, the service technicians will be able to assist you more efficiently if you prepare the appropriate information before you call. You can also go to <http://datacentersupport.lenovo.com/warrantylookup> for more information about your product warranty.

Gather the following information to provide to the service technician. This data will help the service technician quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.

- Hardware and Software Maintenance agreement contract numbers, if applicable
- Machine type number (Lenovo 4-digit machine identifier)
- Model number
- Serial number
- Current system UEFI and firmware levels
- Other pertinent information such as error messages and logs

As an alternative to calling Lenovo Support, you can go to <https://support.lenovo.com/servicerequest> to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to the service technicians. The Lenovo service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

Collecting service data

To clearly identify the root cause of a server issue or at the request of Lenovo Support, you might need collect service data that can be used for further analysis. Service data includes information such as event logs and hardware inventory.

Service data can be collected through the following tools:

- **Lenovo XClarity Provisioning Manager**

Use the Collect Service Data function of Lenovo XClarity Provisioning Manager to collect system service data. You can collect existing system log data or run a new diagnostic to collect new data.

- **Lenovo XClarity Controller**

You can use the Lenovo XClarity Controller web interface or the CLI to collect service data for the server. The file can be saved and sent to Lenovo Support.

- For more information about using the web interface to collect service data, see the “Downloading service data” section in the XCC documentation version compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.
- For more information about using the CLI to collect service data, see the “ffdc command” section in the XCC documentation version compatible with your server at https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html.

- **Lenovo XClarity Administrator**

Lenovo XClarity Administrator can be set up to collect and send diagnostic files automatically to Lenovo Support when certain serviceable events occur in Lenovo XClarity Administrator and the managed endpoints. You can choose to send diagnostic files to Lenovo Support using Call Home or to another service provider using SFTP. You can also manually collect diagnostic files, open a problem record, and send diagnostic files to the Lenovo Support Center.

You can find more information about setting up automatic problem notification within the Lenovo XClarity Administrator at http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/admin_setupcallhome.html.

- **Lenovo XClarity Essentials OneCLI**

Lenovo XClarity Essentials OneCLI has inventory application to collect service data. It can run both in-band and out-of-band. When running in-band within the host operating system on the server, OneCLI can collect information about the operating system, such as the operating system event log, in addition to the hardware service data.

To obtain service data, you can run the `getinfor` command. For more information about running the `getinfor`, see http://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_getinfor_command.html.

Contacting Support

You can contact Support to obtain help for your issue.

You can receive hardware service through a Lenovo Authorized Service Provider. To locate a service provider authorized by Lenovo to provide warranty service, go to <https://datacentersupport.lenovo.com/serviceprovider> and use filter searching for different countries. For Lenovo support telephone numbers, see <https://datacentersupport.lenovo.com/supportphonenumber> for your region support details.

Appendix C. Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area.

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Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

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Important notes

Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1 024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard-disk-drive bays with the largest currently supported drives that are available from Lenovo.

Maximum memory might require replacement of the standard memory with an optional memory module.

Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write cycles that it can be subjected to, expressed as total bytes written (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. Lenovo is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

Lenovo makes no representations or warranties with respect to non-Lenovo products. Support (if any) for the non-Lenovo products is provided by the third party, not Lenovo.

Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

Telecommunication regulatory statement

This product may not be certified in your country for connection by any means whatsoever to interfaces of public telecommunications networks. Further certification may be required by law prior to making any such connection. Contact a Lenovo representative or reseller for any questions.

Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

Additional electronic emissions notices are available at:

<http://thinksystem.lenovofiles.com/help/index.jsp>

Taiwan Region BSMI RoHS declaration

單元 Unit	限用物質及其化學符號 Restricted substances and its chemical symbols					
	鉛Lead (Pb)	汞Mercury (Hg)	鎘Cadmium (Cd)	六價鉻 Hexavalent chromium (Cr ⁶⁺)	多溴聯苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
機架	○	○	○	○	○	○
外部蓋板	○	○	○	○	○	○
機械組零件	-	○	○	○	○	○
空氣傳動設備	-	○	○	○	○	○
冷卻組零件	-	○	○	○	○	○
內存模組	-	○	○	○	○	○
處理器模組	-	○	○	○	○	○
電纜組零件	-	○	○	○	○	○
電源供應器	-	○	○	○	○	○
儲備設備	-	○	○	○	○	○
電路卡	-	○	○	○	○	○
光碟機	-	○	○	○	○	○

備考1. “超出0.1 wt %” 及 “超出0.01 wt %” 係指限用物質之百分比含量超出百分比含量基準值。
 Note1: “exceeding 0.1wt%” and “exceeding 0.01 wt%” indicate that the percentage content of the restricted substance exceeds the reference percentage value of presence condition.

備考2. “○” 係指該項限用物質之百分比含量未超出百分比含量基準值。
 Note2: “○” indicates that the percentage content of the restricted substance does not exceed the percentage of reference value of presence.

備考3. “-” 係指該項限用物質為排除項目。
 Note3: The “-” indicates that the restricted substance corresponds to the exemption.

Taiwan Region import and export contact information

Contacts are available for Taiwan Region import and export information.

委製商/進口商名稱: 台灣聯想環球科技股份有限公司
 進口商地址: 台北市南港區三重路 66 號 8 樓
 進口商電話: 0800-000-702

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