



# ThinkSystem SR665 Maintenance Manual



**Machine Types:** 7D2V and 7D2W

## 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](http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html)

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

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

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## Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

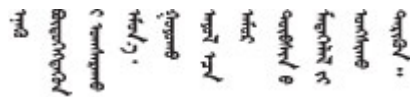
A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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



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་སྤྱད་མ་བྱས་གོང་། སྐྱོར་གྱི་ཡིད་གཟབ་  
བྱ་འདྲ་མིན་ཡིད་པའི་འོད་ཟེར་བལྟ་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

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

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## Safety inspection checklist

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

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

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



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## Chapter 1. Introduction

The ThinkSystem™ SR665 server is a 2-socket 2U server that features the new AMD® EPYC™ 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.

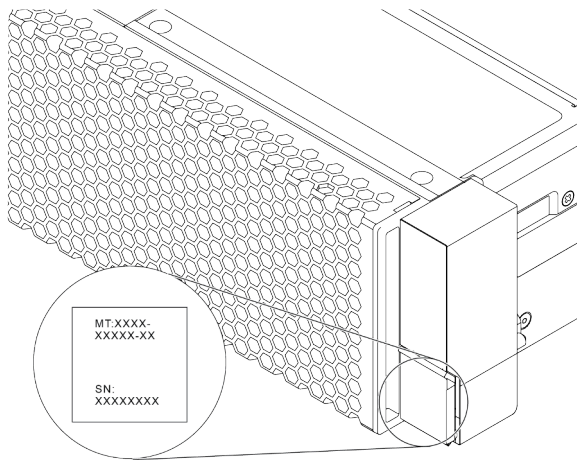
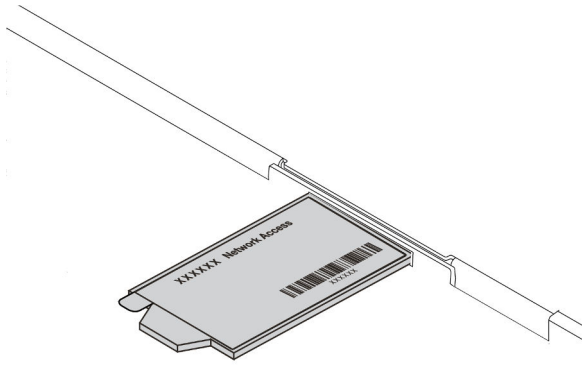


Figure 1. Location of the ID label

### XCC network access label

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

**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 37](#)



*Figure 2. Location of the XCC 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 illustrates the QR code: <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr665/7d2w>



*Figure 3. QR code*



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## Specifications

This section provides technical and environment specifications of the server.

- [“Technical specifications” on page 3](#)
- [“Environment specifications” on page 14](#)

## 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 18](#).

- [“Dimensions” on page 3](#)
- [“CPU” on page 3](#)
- [“Memory” on page 5](#)
- [“Fan” on page 6](#)
- [“Operating systems” on page 6](#)
- [“Input/Output \(I/O\)” on page 6](#)
- [“Internal drives” on page 6](#)
- [“Expansion slots” on page 7](#)
- [“Storage controller” on page 7](#)
- [“Network” on page 8](#)
- [“GPU” on page 9](#)
- [“Power supplies” on page 10](#)
- [“Management options” on page 11](#)

## Dimensions

Form factor	Height	Depth	Width	Package weight
2U	86.5 mm (3.4 inches)	763.7 mm (30.1 inches)	<ul style="list-style-type: none"><li>• With rack latches: 482.1 mm (19.0 inches)</li><li>• Without rack latches: 445.0 mm (17.5 inches)</li></ul>	Up to 38.8 kg (85.5 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 18](#) 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	
7662	64/128	2.0 GHz	225 W	
7742	64/128	2.25 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	
72F3	8/16	3.7 GHz	180 W	D
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	A
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	
7763	64/128	2.45 GHz	280 W	Z
7373X	16/32	3.05 GHz	240 W	
7473X	24/48	2.8 GHz	240 W	
7573X	32/64	2.8 GHz	280 W	
7773X	64/128	2.2 GHz	280 W	X

## 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

### Notes:

- The operating speed and total memory capacity depend on the processor model and UEFI settings.
- 256 GB 3DS RDIMMs are only available on 8 x 2.5" models, 16 x 2.5" models, and 8 x 3.5" models.
- Check “[DIMM population rules](#)” on page 20 for detailed DIMM mixing and population rules.
- For a list of supported DIMMs, see <https://serverproven.lenovo.com/>.

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"> <li>• 1 CPU: 1 TB</li> <li>• 2 CPUs: 2 TB</li> </ul>	<ul style="list-style-type: none"> <li>• 1 CPU: 512 GB</li> <li>• 2 CPUs: 2 TB</li> </ul>	<ul style="list-style-type: none"> <li>• 1 CPU: 4 TB</li> <li>• 2 CPUs: 8 TB</li> </ul>
Minimum memory	<ul style="list-style-type: none"> <li>• 1 CPU: 16 GB</li> <li>• 2 CPUs: 32 GB</li> </ul>	<ul style="list-style-type: none"> <li>• 1 CPU: 32 GB</li> <li>• 2 CPUs: 64 GB</li> </ul>	<ul style="list-style-type: none"> <li>• 1 CPU: 128 GB</li> <li>• 2 CPUs: 256 GB</li> </ul>

## Fan

Up to 6 hot-swap fans (including 1 redundant fans)

**Note:** Check “[CPU, heat sink, and fan combinations](#)” on page 18 for selecting the correct heat sinks and fans under different CPU and hardware configurations.

Form factor	Rotor	Type	Speed
6038	single	Standard	17K RPM
6056	dual	Performance	24K 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 (optional)
- One USB 3.2 Gen 1 (5 Gbps) connector and one USB 2.0 (BMC management)
- One external diagnostics connector
- One diagnostics panel or LCD diagnostics panel (optional)

### Rear:

- One VGA connector
- Three USB 3.2 Gen 1 (5 Gbps) connectors
- One XClarity Controller network connector
- Two or four Ethernet connectors on the OCP 3.0 Ethernet adapter (optional)

For detailed information about each component, see “[Front view](#)” on page 37 and “[Rear view](#)” on page 58.

## Internal drives

Front drive bays (all hot-swap):

- Up to twenty-four 2.5-inch SAS/SATA/U.2 NVMe/U.3 NVMe drives
- Up to twelve 3.5-inch SAS/SATA/U.2 NVMe drives

Middle drive bays (all hot-swap):

- Up to eight 2.5-inch SAS/SATA/U.2 NVMe drives
- Up to four 3.5-inch SAS/SATA drives

Rear drive bays (all hot-swap):

- Up to eight 2.5-inch hot-swap SAS/SATA drives
- Up to four 3.5-inch hot-swap SAS/SATA drives
- Up to two 7mm hot-swap SATA/NVMe drives

Standard air baffle, GPU air baffle, or middle drive cage:

- Up to two internal SATA/NVMe M.2 drives

**Notes:**

- For supported internal storage systems, See <https://lenovopress.com/lp1269-thinksystem-sr665-server#internal-drive-options>.
- For supported external storage systems, see <https://lenovopress.com/lp1269-thinksystem-sr665-server#external-storage-systems>
- For backplane-less models, field upgrades to other models are available. For details, see <https://lenovopress.com/lp1269-thinksystem-sr665-server#field-upgrades>.

## Expansion slots

PCIe slots 1-8:

- PCIe x16/x8/x8, full-height
- PCIe x16/x16/E\*, full-height
- PCIe E\*/x16/x16, full-height
- PCIe x16, full-height
- PCIe x16, full-height
- PCIe x16/x16, full-height
- PCIe x8/x8, full-height

Network slot:

- OCP 3.0 Ethernet adapter (2-port or 4-port)

**Note:** “E” is short for “empty”. It means the slot in the three-slot riser card is unavailable.

## Storage controller

**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.

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

- 530-16i PCIe 12Gb Internal SFF RAID adapter (Gen 3)
- 540-8i PCIe 12Gb Internal SFF RAID adapter (Gen 4)
- 540-16i PCIe 12Gb SFF RAID adapter (Gen4)

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

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

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

- 530-8i PCIe 12Gb Internal SFF RAID adapter (Gen 3)

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 2GB Flash 12Gb Internal SFF RAID adapter (Gen 3)
- 930-16i 4GB Flash 12Gb Internal SFF RAID adapter (Gen 3)
- 930-16i 8GB 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 4GB Flash 12Gb Internal SFF RAID adapter (Gen 4, support Tri-Mode)
- 940-8i 8GB Flash 12Gb Internal SFF RAID adapter (Gen 4, support Tri-Mode)
- 940-16i 4GB Flash 12Gb Internal SFF RAID adapter (Gen 4, support Tri-Mode)
- 940-16i 8GB Flash 12Gb Internal SFF RAID adapter (Gen 4, support Tri-Mode)
- 940-16i 8GB Flash 12Gb Internal CFF RAID adapter (Gen 4, support Tri-Mode)
- 940-32i 8GB Flash 12Gb Internal SFF RAID adapter (Gen 4)
- 930-8e 4GB Flash 12Gb External SFF RAID adapter (Gen 3)
- 940-8e 4GB Flash 12Gb External SFF RAID adapter (Gen 4)

Support the following HBA:

- 430-8i SAS/SATA 12Gb Internal SFF HBA adapter (Gen 3)
- 430-16i SAS/SATA 12Gb Internal SFF HBA adapter (Gen 3)
- 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 (Gen 4)
- 440-16i SAS/SATA 12Gb Internal SFF HBA adapter (Gen 4)
- 440-16i SAS/SATA 12Gb Internal CFF HBA adapter (Gen 4)
- 430-8e SAS/SATA 12Gb External SFF HBA adapter (Gen 3)
- 430-16e SAS/SATA 12Gb External SFF HBA adapter (Gen 3)
- 440-8e SAS/SATA 12Gb External SFF HBA adapter (Gen4)
- 440-16e SAS/SATA 12Gb External SFF HBA adapter (Gen 4)

Support the following RAID expander:

- 48P 12Gb Internal CFF RAID Expander

Support the following Fibre Channel HBA:

- Emulex 16Gb Gen6 1-port Fibre Channel Adapter(Gen 3)
- Emulex 16Gb Gen6 2-port Fibre Channel Adapter (Gen 3)
- Emulex LPe35000 32Gb 1-port Fibre Channel Adapter (Gen 4)
- Emulex LPe35002 32Gb 2-port Fibre Channel Adapter (Gen 4)
- Emulex LPe36002 64Gb 2-port PCIe Fibre Channel Adapter (Gen 4)
- QLogic 16Gb Enhanced Gen5 1-port Fibre Channel Adapter(Gen 3)
- QLogic 16Gb Enhanced Gen5 2-port Fibre Channel Adapter(Gen 3)
- QLogic QLE2772 32Gb 2-Port Fibre Channel Adapter(Gen 4)
- QLogic QLE2770 32Gb 1-Port Fibre Channel Adapter(Gen 4)

Support the following controllers for rich NVMe configurations:

- 1610-8P NVMe switch adapter (Gen 3)
- 1611-8P NVMe switch adapter (Gen 4)
- NVMe Retimer card (Gen 4)

#### Notes:

- CM6-V, CM6-R and CM5-V 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
  - 1611-8P NVMe switch adapter

## 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

The following configuration requirements must be met when installing GPUs:

- All GPUs installed must be identical.
- Flash storage adapters are not supported.
- Middle drive bays and rear drive bays are not supported.
- Below GPU adapters are only supported on 8 x 2.5" models, 16 x 2.5" models, and 8 x 3.5" models.
  - Tesla T4
  - NVIDIA A2
  - NVIDIA A10
  - NVIDIA A30
  - NVIDIA A40
  - NVIDIA A100
  - NVIDIA A800
  - NVIDIA H100
  - NVIDIA L4
  - NVIDIA L40
  - NVIDIA Tesla V100
  - NVIDIA Tesla V100S
  - AMD Instinct MI210
- NVIDIA A100/L40 and AMD Instinct MI210 are only supported on server models with 7003 series processors.

Your server supports the following GPU adapters:

SW: single-wide, DW: double-wide, HL: half-length, LP: low profile

Manufacturer	Name	Form factor	Power	Max Qty.	PCIe Lane	Slot supported
NVIDIA	Tesla T4	SW, HL, LP	75 W	8	x16	<ul style="list-style-type: none"> <li>• 1 CPU: 1, 2, 3, 7</li> <li>• 2 CPU: 1, 4, 5, 6, 7, 8, 2, 3</li> </ul>
	Quadro P620	SW, HL, LP	40 W	8	x16	
	A2	SW, HL, LP	60 W	8	x8	
	L4 24GB	SW, HL, LP	72 W	8	x16	
	A10	SW, FL, FH	150 W	3	x16	<ul style="list-style-type: none"> <li>• 1 CPU: 1</li> <li>• 2 CPU: 1, 4, 7</li> </ul>
	A16	DW, FL, FH	250 W	3	x16	<ul style="list-style-type: none"> <li>• 1 CPU: 2, 7</li> <li>• 2 CPU: 2, 5, 7</li> </ul>
	A30	DW, FL, FH	165 W	3	x16	
	A40	DW, FL, FH	300 W	3	x16	
	A100 32GB	DW, FL, FH	250 W	3	x16	
	A100 80GB	DW, FL, FH	300 W	3	x16	
	A800 80GB	DW, FL, FH	300 W	3	x16	
	H100 80GB	DW, FL, FH	350 W	3	x16	
	L40 48GB	DW, FL, FH	300 W	3	x16	
	Tesla V100	DW, FL, FH	250 W	3	x16	

Manufacturer	Name	Form factor	Power	Max Qty.	PCIe Lane	Slot supported
	Tesla V100S	DW, FL, FH	250 W	3	x16	
AMD	Instinct MI210	DW, FL, FH	300 W	3	x16	

**Notes:** When a double-wide GPU is installed in slot 2, 5 or 7, the adjacent slot 1, 4 and 8 respectively is not available. The riser cards listed in the following table are used with double-wide GPUs.

- Riser 1/2: ThinkSystem SR650 V2/SR665 E/x16/x16 PCIe G4 Riser 1/2 Option Kit v2
- Riser 3: ThinkSystem SR665 x16/x16 PCIe G4 Riser3 Option Kit v2

## 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.

Table 1. Electrical input for power supplies

Power supply	100–127 V ac	200–240 V ac	240 V dc	-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		✓	✓	
2600-watt 80 PLUS Titanium		✓	✓	

### 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
- One DIMM in slot 14
- One power supply
- One heatsink
- One HDD/SSD drive, one M.2 drive, or one 7mm drive (if OS is needed for debugging)
- Five system fans



## 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 (BMC)</p> <p>Consolidates the service processor functionality, Super I/O, video controller, and remote presence capabilities into a single chip on the server system board.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"><li>• CLI application</li><li>• Mobile application</li><li>• Web GUI interface</li><li>• REST API</li></ul> <p><b>Usage and downloads</b></p> <p><a href="https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html">https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html</a></p> <p><b>Important:</b> 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 <a href="https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html">https://sysmgt.lenovofiles.com/help/topic/lxcc_frontend/lxcc_overview.html</a>.</p>
Lenovo XClarity Administrator	<p>Centralized GUI tool for multi-server management.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"><li>• Web GUI interface</li><li>• Mobile application</li><li>• REST API</li></ul> <p><b>Usage and downloads</b></p> <p><a href="http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/aug_product_page.html">http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/aug_product_page.html</a></p>
Lenovo XClarity Essentials toolset	<p>Portable and light toolset for server configuration, data collection, and firmware updates. Suitable both for single-server or multi-server management contexts.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"><li>• <b>OneCLI:</b> CLI application</li><li>• <b>Bootable Media Creator:</b> CLI application, GUI application</li><li>• <b>UpdateXpress:</b> GUI application</li></ul> <p><b>Usage and downloads</b></p> <p><a href="http://sysmgt.lenovofiles.com/help/topic/xclarity_essentials/overview.html">http://sysmgt.lenovofiles.com/help/topic/xclarity_essentials/overview.html</a></p>

Lenovo XClarity Provisioning Manager	<p>UEFI-based GUI tool on a single server that can simplify management tasks.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• Web GUI interface (BMC remote access)</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html">https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html</a></p> <p><b>Important:</b>  Lenovo XClarity Provisioning Manager (LXPM) supported version varies by product. All versions of Lenovo XClarity Provisioning Manager are referred to as Lenovo XClarity Provisioning Manager and LXPM in this document, unless specified otherwise. To see the LXPM version supported by your server, go to <a href="https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html">https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html</a>.</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><b>Interface</b></p> <p>GUI application</p> <p><b>Usage and downloads</b></p> <p><a href="https://sysmgt.lenovofiles.com/help/topic/lxci/lxci_product_page.html">https://sysmgt.lenovofiles.com/help/topic/lxci/lxci_product_page.html</a></p>
Lenovo XClarity Energy Manager	<p>Application that can manage and monitor server power and temperature.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• Web GUI Interface</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://datacentersupport.lenovo.com/solutions/Invo-lxem">https://datacentersupport.lenovo.com/solutions/Invo-lxem</a></p>
Lenovo Capacity Planner	<p>Application that supports power consumption planning for a server or rack.</p> <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>• Web GUI Interface</li> </ul> <p><b>Usage and downloads</b></p> <p><a href="https://datacentersupport.lenovo.com/solutions/Invo-lcp">https://datacentersupport.lenovo.com/solutions/Invo-lcp</a></p>

## Functions

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

### Notes:

1. Most options can be updated through the Lenovo tools. Some options, such as GPU firmware or Omni-Path firmware, require the use of supplier tools.
2. The server UEFI settings for option ROM must be set to **Auto** or **UEFI** to update firmware using Lenovo XClarity Administrator, Lenovo XClarity Essentials, or Lenovo XClarity Controller.
3. Firmware updates are limited to Lenovo XClarity Provisioning Manager, Lenovo XClarity Controller, and UEFI updates only. Firmware updates for optional devices, such as adapters, are not supported.
4. The server UEFI settings for option ROM must be set to **Auto** or **UEFI** for detailed adapter card information, such as model name and firmware levels, to be displayed in Lenovo XClarity Administrator, Lenovo XClarity Controller, or Lenovo XClarity Essentials.
5. Limited inventory.
6. The Lenovo XClarity Integrator deployment check for System Center Configuration Manager (SCCM) supports Windows operating system deployment.
7. Power management function is supported by Lenovo XClarity Integrator for VMware vCenter.
8. It is 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 14](#)
- [“Vibration” on page 15](#)
- [“Shock” on page 15](#)
- [“Heat output” on page 15](#)
- [“Acoustical noise emissions” on page 15](#)
- [“Particulate contamination” on page 16](#)

### 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"><li>• ASHRAE class A2: 10°C to 35°C (50°F to 95°F)</li></ul> <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"><li>• ASHRAE class A3: 5°C to 40°C (41°F to 104°F)</li></ul> <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"><li>• ASHRAE class A4: 5°C to 45°C (41°F to 113°F)</li></ul> <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"><li>• ASHRAE class A2: 20%–80%; maximum dew point: 21°C (70°F)</li><li>• ASHRAE class A3: 8%–85%; maximum dew point: 24°C (75°F)</li><li>• ASHRAE class A4: 8%–90%; maximum dew point: 24°C (75°F)</li></ul>
Maximum altitude	3050 m (10 000 ft)

**Note:** The ambient temperature requirement for the server varies by the hardware configuration. For more information, see [“Thermal rules” on page 28](#).

Server is not operating:

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

### ASHRAE class A3/A4 requirement

To ensure that the server can operate normally under ASHRAE class A3/A4 environment, the server must NOT be configured with below components:

- CPU (TDP ≥ 170W)
- 3DS RDIMMs
- GPUs

- Mellanox ConnectX-6 100 GbE/200GbE with AOC
- Xilinx Alveo U25 FPGA
- Xilinx Alveo U50 FPGA
- Broadcom 57454 OCP 3.0
- NVMe AIC switches
- Middle/rear 2.5"/3.5" drives

## 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:
  - 23 kg - 31 kg: 35 G for 152 in./sec velocity change across 6 surfaces (3 x GPU config, 2.5" config)
  - 32 kg - 68 kg: 35 G for 136 in./sec velocity change across 6 surfaces (20 x 3.5" HDD config)

## 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	6.1 Bel	7.4 Bel	6.7 Bel
Operating	6.3 Bel	7.4 Bel	8.0 Bel
Sound pressure level ( $L_{pA,m}$ )			
Idling	43 dBA	56 dBA	51 dBA
Operating	46 dBA	56 dBA	68 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 RDIMM	32 RDIMM	32 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 1100 W	2 x 1800 W

RAID	930-8i RAID	930-16i RAID	930-8i RAID
Drive	8 x 2.5" HDD	20 x 3.5" HDD	8 x 2.5" HDD
GPU	NA	NA	3 x V100 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 2. Limits for particulates and gases

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

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## Technical rules

This section provides technical rules for the server.

- [“PCIe slots and configurations” on page 25](#)
- [“Thermal rules” on page 28](#)
- [“CPU, heat sink, and fan combinations” on page 18](#)
- [“DIMM population rules” on page 20](#)

## CPU, heat sink, and fan combinations

### 8 x 3.5"/ 8 x 2.5"/16 x 2.5" models

CPU group	Config.	Heat sink	Fan
C/B	<ul style="list-style-type: none"><li>• GPUs</li><li>• Mellanox ConnectX-6 100 GbE/200 GbE AOC</li><li>• Xilinx Alveo U25 FPGA</li><li>• Xilinx Alveo U50 FPGA</li><li>• 256 GB 3DS RDIMMs</li></ul>	1U Aluminium	Performance
	All other configurations	1U Aluminium	Standard
A	Double-wide GPUs	1U Aluminium	Performance
	<ul style="list-style-type: none"><li>• Single-wide GPUs</li><li>• Mellanox ConnectX-6 100 GbE/200 GbE AOC</li><li>• Xilinx Alveo U25 FPGA</li><li>• Xilinx Alveo U50 FPGA</li><li>• 256 GB 3DS RDIMMs</li></ul>	2U Standard	Performance
	All other configurations	2U Standard	Standard
D/Z/X	<ul style="list-style-type: none"><li>• GPUs</li><li>• Mellanox ConnectX-6 100 GbE/200 GbE AOC</li><li>• Xilinx Alveo U25 FPGA</li><li>• Xilinx Alveo U50 FPGA</li><li>• 256 GB 3DS RDIMMs</li></ul>	2U Performance	Performance
	All other configurations	2U Performance	Standard



## 24 x 2.5"/12 x 3.5" models

CPU group	Config.	Heat sink	Fan
C/B/A	<ul style="list-style-type: none"> <li>P620 GPU</li> <li>Mellanox ConnectX-6 100 GbE/200 GbE AOC</li> <li>Xilinx Alveo U25 FPGA</li> <li>Xilinx Alveo U50 FPGA</li> <li>Broadcom 57454 10GBASE-T 4-port OCP</li> </ul>	2U Standard	Performance
	Mid bays	1U Aluminium	Performance
	All other configurations	2U Standard	Standard
D/Z/X	<ul style="list-style-type: none"> <li>P620 GPU</li> <li>Mellanox ConnectX-6 100 GbE/200 GbE AOC</li> <li>Xilinx Alveo U25 FPGA</li> <li>Xilinx Alveo U50 FPGA</li> <li>Broadcom 57454 10GBASE-T 4-port OCP</li> </ul>	2U Performance	Performance
	All other configurations	2U Performance	Standard

### Notes:

- Under all of the following conditions, standard fans can be used. Otherwise, performance fans are required.
  - No GPUs
  - No Mellanox ConnectX-6 100 GbE/200 GbE with AOC
  - No Xilinx Alveo U25 FPGA
  - No Xilinx Alveo U50 FPGA
  - No Broadcom 57454 10GBASE-T 4-port OCP
  - No 256 GB 3DS RDIMMs
  - No middle drive bays or rear drive bays
- The following configurations require six fans:
  - two-processor configurations
  - one-processor configurations with middle drives, rear drives, or riser 3
- 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)	√ <sup>1</sup>	√ <sup>1</sup>
DIMMs of different DRAM data width (x4 and x8)		√
DIMMs of different rank	√ <sup>2</sup>	√ <sup>2</sup>
DIMMs manufactured by different vendors	√	√
DIMMs of different voltage <sup>3</sup>		
ECC and Non-ECC DIMMs <sup>4</sup>		
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"> <li>Options 1 and 3</li> <li>Options 2 and 4</li> </ul> Support mixing within a system: <ul style="list-style-type: none"> <li>Options 1 to 4 (Install the one with higher DRAM density first.)</li> <li>Options 5 and 6 (Install the one with higher capacity first.)</li> </ul>				

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

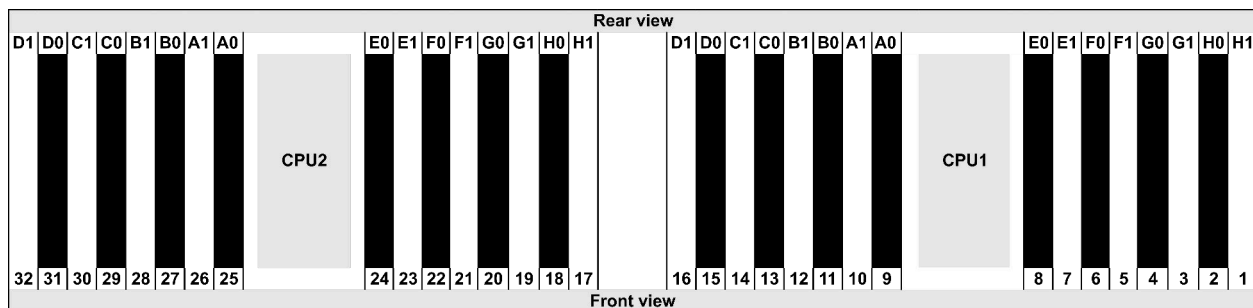
- Balance memory capacity per channel pair on a given CPU.
- Balance memory capacity per CPU socket when 2 CPUs are installed.
- In cases of using Performance+ RDIMMs to maximize memory operating speed, ensure that Performance+ RDIMMs with the same capacity are populated on 2DPC. Otherwise, there will 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](#)

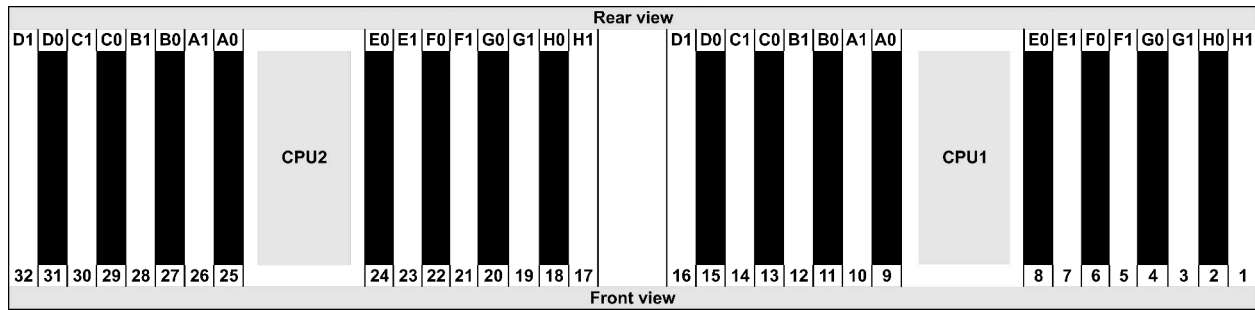
### Recommended population order (based on general rules)

#### 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

## 2 CPUs installed:



Qty.	DIMM population order																															
1 DIMM	14																															
2 DIMMs	14	30																														
3 DIMMs	14	30	16																													
4 DIMMs	14	30	16	32																												
5 DIMMs	14	30	16	32	3																											
6 DIMMs	14	30	16	32	3	19																										
7 DIMMs	14	30	16	32	3	19	1																									
8 DIMMs	14	30	16	32	3	19	1	17																								
9 DIMMs	14	30	16	32	3	19	1	17	10																							
10 DIMMs	14	30	16	32	3	19	1	17	10	26																						
11 DIMMs	14	30	16	32	3	19	1	17	10	26	12																					
12 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28																				
13 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7																			
14 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23																		
15 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5																	
16 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21																
17 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13															
18 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29														
19 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29	15													
20 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29	15	31												
21 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29	15	31	4											
22 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29	15	31	4	20										
23 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29	15	31	4	20	2									
24 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29	15	31	4	20	2	18								
25 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29	15	31	4	20	2	18	9							
26 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29	15	31	4	20	2	18	9	25						
27 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29	15	31	4	20	2	18	9	25	11					
28 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29	15	31	4	20	2	18	9	25	11	27				
29 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29	15	31	4	20	2	18	9	25	11	27	8			
30 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29	15	31	4	20	2	18	9	25	11	27	8	24		
31 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29	15	31	4	20	2	18	9	25	11	27	8	24	6	
32 DIMMs	14	30	16	32	3	19	1	17	10	26	12	28	7	23	5	21	13	29	15	31	4	20	2	18	9	25	11	27	8	24	6	22

**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

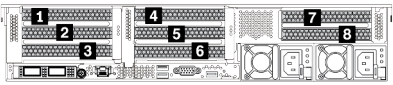
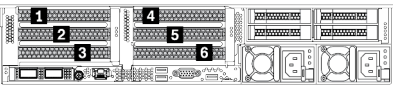
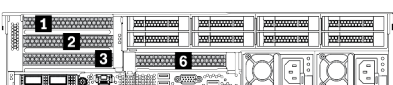
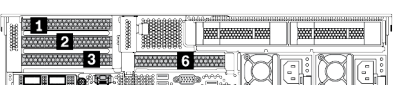
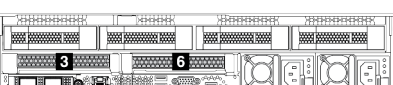
- “Slot configurations” on page 25
- “PCIe adapter and slot priority” on page 25
- “RAID rules” on page 27

### Slot configurations

The server supports up to 8 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](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](https://thinksystem.lenovofiles.com/help/topic/uefi_amd_2p_milan/onboard_device.html)

Server rear view	PCIe slots		
	Slots 1–3 on riser 1: <ul style="list-style-type: none"> <li>• Type 1: x16/x8/x8</li> <li>• Type 2: x16/x16/E</li> <li>• Type 3: E/x16/x16</li> </ul>	Slots 4–6 on riser 2: <ul style="list-style-type: none"> <li>• Type 1: x16/x8/x8</li> <li>• Type 2: x16/x16/E</li> <li>• Type 3: E/x16/x16</li> </ul>	Slots 7–8 on riser 3: <ul style="list-style-type: none"> <li>• Type 1: x16/x16</li> <li>• Type 2: x8/x8</li> </ul>
	Slots 1–3 on riser 1: <ul style="list-style-type: none"> <li>• Type 1: x16/x8/x8</li> <li>• Type 2: x16/x16/E</li> <li>• Type 3: E/x16/x16</li> </ul>	Slots 4–6 on riser 2: <ul style="list-style-type: none"> <li>• Type 1: x16/x8/x8</li> <li>• Type 2: x16/x16/E</li> <li>• Type 3: E/x16/x16</li> </ul>	NA
	Slots 1–3 on riser 1: <ul style="list-style-type: none"> <li>• Type 1: x16/x8/x8</li> <li>• Type 2: x16/x16/E</li> <li>• Type 3: E/x16/x16</li> </ul>	Slot 6 on riser 2: x16	NA
	Slots 1–3 on riser 1: <ul style="list-style-type: none"> <li>• Type 1: x16/x8/x8</li> <li>• Type 2: x16/x16/E</li> <li>• Type 3: E/x16/x16</li> </ul>	Slot 6 on riser 2: x16	NA
	Slot 3 on riser 1: x16	Slot 6 on riser 2: x16	NA

### PCIe adapter and slot priority

The following table lists the recommended physical slot sequence for common PCIe adapters.

PCIe adapters		Max. qty.	Slot priority
GPU	Single-wide LPHL (40W/75W)	8	<ul style="list-style-type: none"> <li>• 1 CPU: 1, 2, 3, 7</li> <li>• 2 CPU: 1, 4, 5, 6, 7, 8, 2, 3</li> </ul>
	Single-wide FHFL (150W)	3	<ul style="list-style-type: none"> <li>• 1 CPU: 1, 7</li> <li>• 2 CPU: 1, 4, 7</li> </ul>
	Double-wide FHFL (250W/300W)	3	<ul style="list-style-type: none"> <li>• 1 CPU: 2, 7</li> <li>• 2 CPU: 2, 5, 7</li> </ul> <p><b>Notes:</b> To install a double-wide GPU, one of the riser cages is required:</p> <ul style="list-style-type: none"> <li>• E/x16/x16 Riser 1/2 cage</li> <li>• x16/x16 Riser 3 cage</li> </ul>

PCIe adapters		Max. qty.	Slot priority
NIC	Xilinx Alveo U25 FPGA	2	<ul style="list-style-type: none"> <li>1 CPU: 1</li> <li>2 CPU: 1, 4</li> <li>2 CPU + 1 A100 GPU: 3, 4</li> </ul>
	Xilinx Alveo U50 FPGA	6	<ul style="list-style-type: none"> <li>1 CPU: 1</li> <li>2 CPU: 1, 4, 2, 5, 7, 8</li> </ul>
	Broadcom 57508 100GbE 2-port	6	<ul style="list-style-type: none"> <li>1 CPU: 1, 2, 3, 7</li> <li>2 CPU: 1, 4, 2, 5, 3, 6, 7, 8</li> </ul> <b>Note:</b> The Broadcom 57454 10/25GbE SFP28 4-port PCIe Ethernet Adapter_Refresh (V2) requires a full-height bracket and must be installed in a full-height slot.
	Broadcom 57454 10/25GbE SFP28 4-port PCIe Ethernet Adapter_Refresh (V2)		
	Mellanox ConnectX-6 HDR100 IB/100GbE VPI 1-port		
	Mellanox ConnectX-6 HDR100 IB/100GbE VPI 2-port		
	Mellanox ConnectX-6 HDR100 IB/200GbE VPI 2-port		
	Mellanox ConnectX-6 Dx 100GbE 2-port		
	Intel E810-DA4 10/25GbE SFP28 4-port		
	NVIDIA ConnectX-7 NDR400 OSFP 1-port PCIe Gen5 Adapter		
	NVIDIA ConnectX-7 NDR200/200GbE QSFP112 2-port PCIe Gen5 x16 InfiniBand Adapter		
	Others	8	<ul style="list-style-type: none"> <li>1 CPU: 2, 3, 1, 7</li> <li>2 CPU: 2, 5, 3, 6, 7, 8, 1, 4</li> </ul> <b>Note:</b> The Broadcom 57454 10/25GbE SFP28 4-port PCIe Ethernet Adapter requires a full-height bracket and must be installed in a full-height slot.
Internal SFF RAID/HBA	430-8i/4350-8i HBA	4	<ul style="list-style-type: none"> <li>1 CPU: 2, 3, 1, 7</li> <li>2 CPU: 2, 3, 5, 6, 7, 8, 1, 4</li> </ul>
	530-8i/5350-8i/540-8i/930-8i/940-8i RAID		
	430-16i/4350-16i/440-16i HBA	1	<ul style="list-style-type: none"> <li>1 CPU: 2, 3, 1, 7</li> <li>2 CPU: 2, 3, 5, 6, 7, 8, 1, 4</li> </ul>
	530-16i/540-16i/930-16i/940-16i/940-32i RAID		
	9350-8i	4	<ul style="list-style-type: none"> <li>1 CPU: <ul style="list-style-type: none"> <li>With other SFF RAID adapters: 2, 3, 1, 7</li> <li>Without other SFF RAID adapters: 3, 2, 1, 7</li> </ul> </li> <li>2 CPU: <ul style="list-style-type: none"> <li>With other SFF RAID adapters: 2, 3, 5, 6, 7, 8, 1, 4</li> <li>Without other SFF RAID adapters: 3, 2, 5, 6, 7, 8, 1, 4</li> </ul> </li> </ul>
	9350-16i	1	
Internal CFF RAID/HBA/RAID expander		1	Front chassis



PCIe adapters		Max. qty.	Slot priority
External RAID/ HBA	930-8e/940-8e RAID	4	NA
	Others	8	
NVMe Switch/ retimer	NVMe switch	4	<ul style="list-style-type: none"> <li>• 32 NVMe config: 1, 2, 4, 5</li> <li>• 16 NVMe config: <ul style="list-style-type: none"> <li>– 1 CPU: 1, 2, 3</li> <li>– 2 CPU: 1, 2, 4, 5, 3, 6, 7, 8</li> </ul> </li> </ul>
	Retimer card	4	<ul style="list-style-type: none"> <li>• 24 NVMe config: 1, 2, 4, 5</li> <li>• 16/8 NVMe config: <ul style="list-style-type: none"> <li>– 1 CPU: 1, 2, 3</li> <li>– 2 CPU: 1, 2, 4, 5, 3, 6, 7, 8</li> </ul> </li> </ul> <p><b>Note:</b> CM6-V, CM6-R and CM5-V NVMe drives are not supported when a system is configured with Retimer cards.</p>
FC HBA		8	<ul style="list-style-type: none"> <li>• 1 CPU: 2, 3, 1, 7</li> <li>• 2 CPU: 2, 5, 3, 6, 7, 8, 1, 4</li> </ul> <p><b>Note:</b> For more information about supported FC HBA adapters, see <a href="https://lenovopress.com/lp1269-thinksystem-sr665-server#fibre-channel-host-bus-adapters">https://lenovopress.com/lp1269-thinksystem-sr665-server#fibre-channel-host-bus-adapters</a>.</p>
PCIe SSD		8	<ul style="list-style-type: none"> <li>• 1 CPU: 2, 3, 1, 7</li> <li>• 2 CPU: 2, 5, 3, 6, 7, 8, 1, 4</li> </ul>
7mm drive cage		1	Slot 3 or 6
Serial port module		1	Slot 3 or 6
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:
  - Intel E810-DA2 OCP/PCIe Ethernet adapter
  - Intel E810-DA4 OCP/PCIe Ethernet adapter
  - 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 431](#).

- The HBA 430/440 adapters do not support the Self-Encrypting Drive (SED) management feature.
- 930/9350/940 RAID controllers require a super capacitor.
- Oversubscription occurs when the system supports 32 NVMe drives using NVMe switch adapters. For details, see [NVMe drive support](#).

## Thermal rules

The topic provides the thermal rules for the server depending on the hardware configuration.

Model	CPU	Configuration	Max. Ambient Temp.
All models		<ul style="list-style-type: none"> <li>Mellanox ConnectX-6 &lt; 100 GbE</li> <li>Xilinx Alveo U25</li> <li>NVIDIA Quadro P620 GPU</li> <li>Broadcom 57454 OCP 3.0</li> </ul>	35°C
		<ul style="list-style-type: none"> <li>Mellanox ConnectX-6 100 GbE/200GbE with AOC</li> <li>Mellanox ConnectX-7 200GbE/400GbE with AOC</li> <li>Xilinx Alveo U50</li> </ul> <b>Notes:</b> <ul style="list-style-type: none"> <li>When the Xilinx Alveo U50 is installed, fan redundancy and mid/rear drive bays are not supported.</li> <li>A maximum of six U50 cards are supported in 8 x 2.5", 16 x 2.5", and 8 x 3.5" models.</li> </ul>	30°C
8 x 2.5" models	Group C/B/A/D/Z/X	T4/A2/L4 GPU	35°C
		<ul style="list-style-type: none"> <li>A10 GPU</li> <li>Double-wide GPUs</li> <li>256 GB 3DS RDIMMs</li> </ul>	30°C
8 x 3.5" / 16 x 2.5" models	Group C/B/A/D/Z/X	<ul style="list-style-type: none"> <li>Single-wide GPUs: T4/A2/L4, A10</li> <li>Double-wide GPUs</li> <li>256 GB 3DS RDIMMs</li> </ul>	30°C
24 x 2.5" models	Group C/B	<ul style="list-style-type: none"> <li>Front drive bays only</li> <li>Mid/rear 2.5" drive bays</li> </ul>	35°C
	Group A/D/Z/X	Front drive bays only	35°C
		<ul style="list-style-type: none"> <li>Mid/rear 2.5" drive bays</li> <li>7373X or 7473X processors</li> </ul>	30°C
12 x 3.5" models	Group C/B	<ul style="list-style-type: none"> <li>Front drive bays only</li> <li>Mid/rear 2.5" drive bays</li> </ul>	35°C
	Group A/D	Front drive bays only	35°C
		Mid/rear 2.5" drive bays	30°C
	Group Z/X	Front drive bays only	35°C
		<ul style="list-style-type: none"> <li>Mid/rear 2.5" drive bays</li> <li>Mid/rear 3.5" drive bays</li> <li>7373X or 7473X processors</li> </ul>	30°C

**Notes:** For the 12 x 3.5" SAS/SATA (front) + 8 x 2.5" NVMe (middle) configuration, the ambient temperature must be limited to 25°C or lower when the following NVMe SSDs are installed:

- 2.5" U.3 PM1733a 30.72TB RI NVMe SSD
- 2.5" U.3 PM1733a 15.36TB RI NVMe SSD
- 2.5" U.2 P5520 7.68TB RI NVMe SSD
- 2.5" U.2 P5520 15.36TB RI NVMe SSD
- 2.5" U.2 P5620 6.4TB NVMe SSD
- 2.5" U.2 P5620 12.8TB NVMe SSD

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## Deploy the operating system

Several options are available to deploy an operating system on one or more servers.

### Available operating systems

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

Complete list of available operating systems: <https://lenovopress.com/osig>.

### Tool-based deployment

- **Multi-server context**

Available tools:

- Lenovo XClarity Administrator

[http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/compute\\_node\\_image\\_deployment.html](http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/compute_node_image_deployment.html)

- Lenovo XClarity Essentials OneCLI

[http://sysmgt.lenovofiles.com/help/topic/toolsctr\\_cli\\_lenovo/onecli\\_r\\_uxspi\\_proxy\\_tool.html](http://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_uxspi_proxy_tool.html)

- Lenovo XClarity Integrator deployment pack for SCCM (for Windows operating system only)

[https://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxci\\_deploypack\\_sccm.doc/dpsccm\\_c\\_endtoend\\_deploy\\_scenario.html](https://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxci_deploypack_sccm.doc/dpsccm_c_endtoend_deploy_scenario.html)

- **Single-server context**

Available tools:

- Lenovo XClarity Provisioning Manager

“OS Installation” section in the LXPM documentation compatible with your server at [https://sysmgt.lenovofiles.com/help/topic/lxpm\\_frontend/lxpm\\_product\\_page.html](https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html)

- Lenovo XClarity Essentials OneCLI

[http://sysmgt.lenovofiles.com/help/topic/toolsctr\\_cli\\_lenovo/onecli\\_r\\_uxspi\\_proxy\\_tool.html](http://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_uxspi_proxy_tool.html)

- Lenovo XClarity Integrator deployment pack for SCCM (for Windows operating system only)

[https://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxci\\_deploypack\\_sccm.doc/dpsccm\\_c\\_endtoend\\_deploy\\_scenario.html](https://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxci_deploypack_sccm.doc/dpsccm_c_endtoend_deploy_scenario.html)

### Manual deployment

If you cannot access the above tools, follow the instructions below, download the corresponding OS *Installation Guide*, and deploy the operating system manually by referring to the guide.

1. Go to <https://datacentersupport.lenovo.com/solutions/server-os>.
2. Select an operating system from the navigation pane and click **Resources**.
3. Locate the “OS Install Guides” area and click the installation instructions. Then, follow the instructions to complete the operation system deployment task.

---

## 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.

- Best practices related to updating firmware is available at the following site:  
<http://lenovopress.com/LP0656>
- The latest firmware can be found at the following site:  
<https://datacentersupport.lenovo.com/products/servers/thinksystem/sr665/7d2w/parts/downloads>
- You can subscribe to product notification to stay up to date on firmware updates:  
<https://datacentersupport.lenovo.com/tw/en/solutions/ht509500>

### UpdateXpress System Packs (UXSPs)

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.

### Update method terminology

- **In-band update.** The installation or update is performed using a tool or application within an operating system that is executing on the server's core CPU.
- **Out-of-band update.** The installation or update is performed by the Lenovo XClarity Controller collecting the update and then directing the update to the target subsystem or device. Out-of-band updates have no dependency on an operating system executing on the core CPU. However, most out-of-band operations do require the server to be in the S0 (Working) power state.
- **On-Target update.** The installation or update is initiated from an installed operating system executing on the target server itself.
- **Off-Target update.** The installation or update is initiated from a computing device interacting directly with the server's Lenovo XClarity Controller.
- **UpdateXpress System Packs (UXSPs).** UXSPs are bundled updates designed and tested to provide the interdependent level of functionality, performance, and compatibility. UXSPs are server machine-type specific and are built (with firmware and device driver updates) to support specific Windows Server, Red Hat Enterprise Linux (RHEL) and SUSE Linux Enterprise Server (SLES) operating system distributions. Machine-type-specific firmware-only UXSPs are also available.

### Firmware updating tools

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

Tool	Update Methods Supported	Core System Firmware Updates	I/O Devices Firmware Updates	Graphical user interface	Command line interface	Supports UXSPs
<b>Lenovo XClarity Provisioning Manager (LXPM)</b>	In-band <sup>2</sup> On-Target	√		√		
<b>Lenovo XClarity Controller (XCC)</b>	Out-of-band Off-Target	√	Selected I/O devices	√		

Tool	Update Methods Supported	Core System Firmware Updates	I/O Devices Firmware Updates	Graphical user interface	Command line interface	Supports UXSPs
<b>Lenovo XClarity Essentials OneCLI (OneCLI)</b>	In-band Out-of-band On-Target Off-Target	√	All I/O devices		√	√
<b>Lenovo XClarity Essentials UpdateXpress (LXCE)</b>	In-band Out-of-band On-Target Off-Target	√	All I/O devices	√		√
<b>Lenovo XClarity Essentials Bootable Media Creator (BoMC)</b>	In-band Out-of-band Off-Target	√	All I/O devices	√ (BoMC application)	√ (BoMC application)	√
<b>Lenovo XClarity Administrator (LXCA)</b>	In-band <sup>1</sup> Out-of-band <sup>2</sup> Off-Target	√	All I/O devices	√		√
<b>Lenovo XClarity Integrator (LXCI) for VMware vCenter</b>	Out-of-band Off-Target	√	Selected I/O devices	√		
<b>Lenovo XClarity Integrator (LXCI) for Microsoft Windows Admin Center</b>	In-band Out-of-band On-Target Off-Target	√	All I/O devices	√		√

Tool	Update Methods Supported	Core System Firmware Updates	I/O Devices Firmware Updates	Graphical user interface	Command line interface	Supports UXSPs
<b>Lenovo XClarity Integrator (LXCI) for Microsoft System Center Configuration Manager</b>	In-band On-Target	√	All I/O devices	√		√
<b>Notes:</b> <ol style="list-style-type: none"> <li>1. For I/O firmware updates.</li> <li>2. For BMC and UEFI firmware updates.</li> </ol>						

- **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](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](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](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/toolscrt\\_cli\\_lenovo/onecli\\_c\\_update.html](http://sysmgt.lenovofiles.com/help/topic/toolscrt_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](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/lxci/lxci\\_product\\_page.html](https://sysmgt.lenovofiles.com/help/topic/lxci/lxci_product_page.html)

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## 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/toolctr\\_cli\\_lenovo/onecli\\_r\\_ospower\\_command.html](https://sysmgt.lenovofiles.com/help/topic/toolctr_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 35.



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## 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 34](#).



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## Chapter 2. Server components

This section provides information to help you locate your server components.

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### Front view

This section introduces front view of different server models.

- Server models with 2.5-inch front drive bays
  - [“Eight 2.5-inch front drive bays” on page 38](#)
  - [“Eight 2.5-inch front drive bays \(with LCD diagnostics panel\)” on page 39](#)
  - [“Sixteen 2.5-inch front drive bays” on page 40](#)
  - [“Sixteen 2.5-inch front drive bays \(with LCD diagnostics panel\)” on page 41](#)
  - [“Twenty-four 2.5-inch front drive bays” on page 42](#)
  - [“Backplane-less” on page 43](#)
- Server models with 3.5-inch front drive bays
  - [“Eight 3.5-inch front drive bays” on page 44](#)
  - [“Twelve 3.5-inch front drive bays” on page 45](#)
  - [“Backplane-less” on page 46](#)

## Server models with eight 2.5-inch front drive bays

The following illustrates the front view of server models with eight 2.5-inch drive bays.

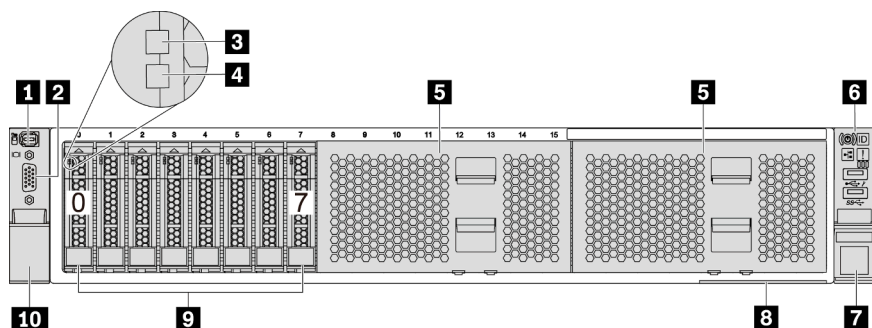


Figure 4. Server model with eight 2.5-inch front drive bays

Table 3. Components on the front of the server

Callout	Callout
<b>1</b> External diagnostics connector	<b>2</b> VGA connector (optional)
<b>3</b> Drive activity LED	<b>4</b> Drive status LED
<b>5</b> Drive bay fillers (2)	<b>6</b> Front I/O assembly with diagnostics panel
<b>7</b> Rack latch (right)	<b>8</b> Pull-out information tab
<b>9</b> Drive bays (8)	<b>10</b> Rack latch (left)

**Note:** For more information about each component, see [“Front components overview”](#) on page 47.

### Server models with eight 2.5-inch front drive bays (with LCD diagnostics panel)

The following illustrates the front view of server models with eight 2.5-inch drive bays.

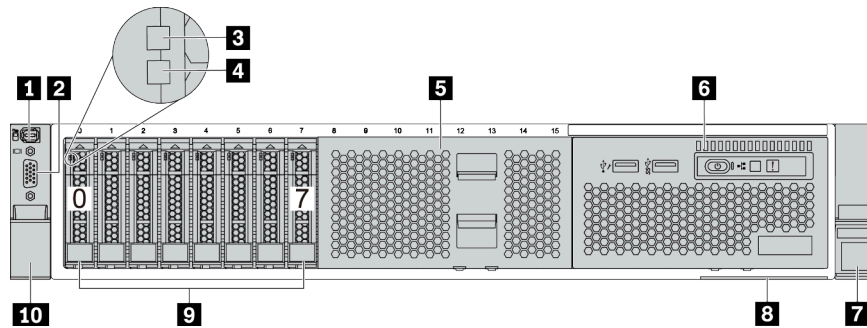


Table 4. Components on the front of the server

Callout	Callout
<b>1</b> External diagnostics connector	<b>2</b> VGA connector (optional)
<b>3</b> Drive activity LED	<b>4</b> Drive status LED
<b>5</b> Drive bay filler	<b>6</b> Front I/O assembly with LCD diagnostics panel
<b>7</b> Rack latch (right)	<b>8</b> Pull-out information tab
<b>9</b> Drive bays (8)	<b>10</b> Rack latch (left)

**Note:** For more information about each component, see [“Front components overview” on page 47](#).

## Server models with sixteen 2.5-inch drive bays

The following illustrates the front view of server models with sixteen 2.5-inch drive bays.

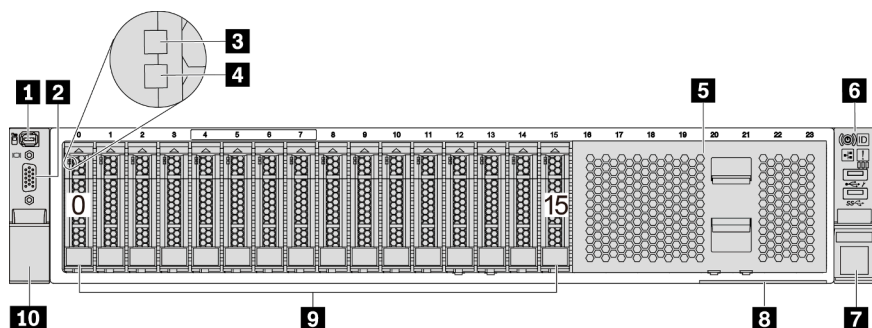


Table 5. Components on the front of server models

Callout	Callout
<b>1</b> External diagnostics connector	<b>2</b> VGA connector (optional)
<b>3</b> Drive activity LED	<b>4</b> Drive status LED
<b>5</b> Drive bay filler	<b>6</b> Front I/O assembly with diagnostics panel
<b>7</b> Rack latch (right)	<b>8</b> Pull-out information tab
<b>9</b> Drive bays (16)	<b>10</b> Rack latch (left)

**Note:** For more information about each component, see [“Front components overview”](#) on page 47.

## Server models with sixteen 2.5-inch drive bays (with LCD diagnostics panel)

The following illustrates the front view of server models with sixteen 2.5-inch drive bays.

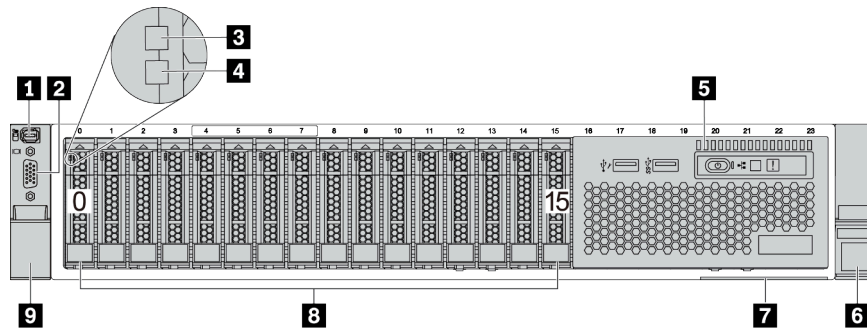


Table 6. Components on the front of the server

Callout	Callout
<b>1</b> External diagnostics connector	<b>2</b> VGA connector (optional)
<b>3</b> Drive activity LED	<b>4</b> Drive status LED
<b>5</b> Front I/O assembly with LCD diagnostics panel	<b>6</b> Rack latch (right)
<b>7</b> Pull-out information tab	<b>8</b> Drive bays (16)
<b>9</b> Rack latch (left)	

**Note:** For more information about each component, see [“Front components overview” on page 47](#).

## Server models with twenty-four 2.5-inch front drive bays

The following illustrates the front view of server models with twenty-four 2.5-inch front drive bays.

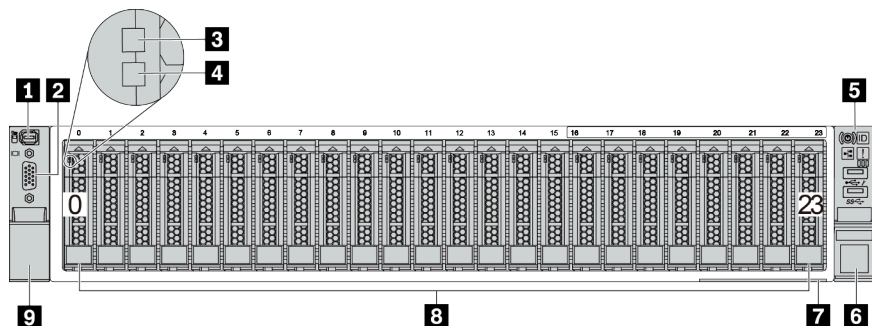


Table 7. Components on the front of server models

Callout	Callout
<b>1</b> External diagnostics connector	<b>2</b> VGA connector (optional)
<b>3</b> Drive activity LED	<b>4</b> Drive status LED
<b>5</b> Front I/O assembly with diagnostics panel	<b>6</b> Rack latch (right)
<b>7</b> Pull-out information tab	<b>8</b> Drive bays (24)
<b>9</b> Rack latch (left)	

**Note:** For more information about each component, see [“Front components overview”](#) on page 47.



## Server models with 2.5-inch front drive bays (backplane-less)

The following illustrates the front view of server models with 2.5-inch front drive bays (backplane-less).

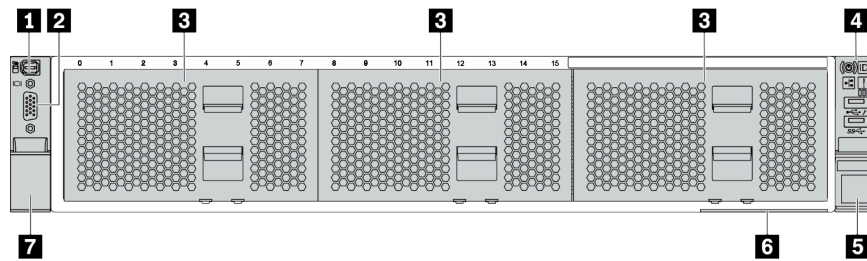


Table 8. Components on the front of server models

Callout	Callout
<b>1</b> External diagnostics connector	<b>2</b> VGA connector (optional)
<b>3</b> Drive bay fillers(3)	<b>4</b> Front I/O assembly with diagnostics panel
<b>5</b> Rack latch (right)	<b>6</b> Pull-out information tab
<b>7</b> Rack latch (left)	

**Note:** For more information about each component, see [“Front components overview” on page 47](#).

## Server models with eight 3.5-inch front drive bays

The following illustrates the front view of server models with eight 3.5-inch front drive bays.

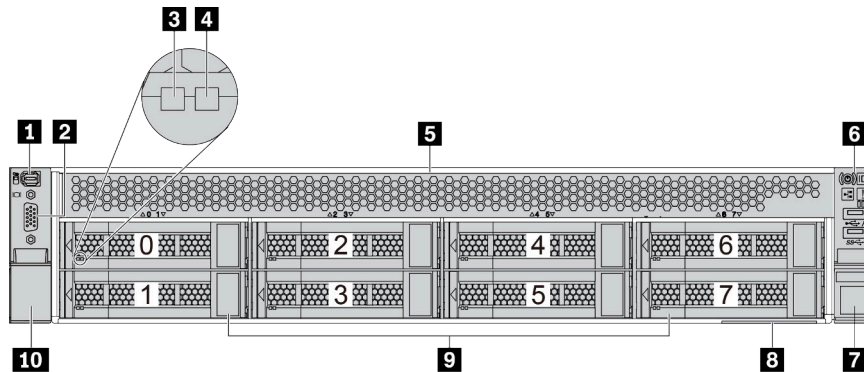


Table 9. Components on the front of server models

Callout	Callout
<b>1</b> External diagnostics connector	<b>2</b> VGA connector (optional)
<b>3</b> Drive activity LED	<b>4</b> Drive status LED
<b>5</b> Drive bay filler	<b>6</b> Front I/O assembly with diagnostics panel
<b>7</b> Rack latch (right)	<b>8</b> Pull-out information tab
<b>9</b> Drive bays (8)	<b>10</b> Rack latch (left)

**Note:** For more information about each component, see [“Front components overview” on page 47](#).

## Server models with twelve 3.5-inch front drive bays

The following illustrates the front view of server models with twelve 2.5-inch drive bays.

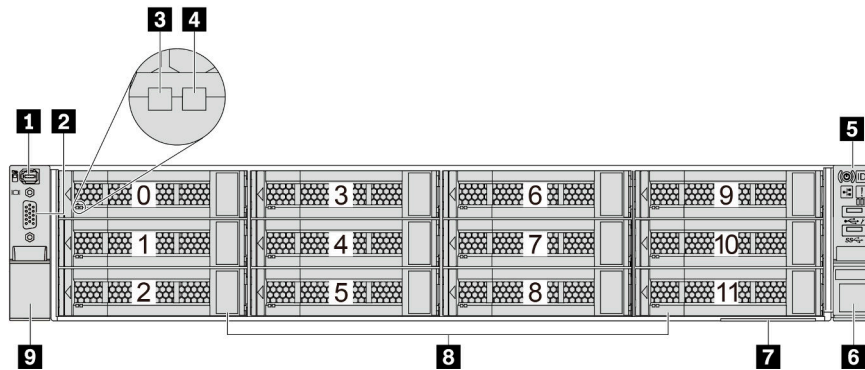


Table 10. Components on the front of server models

Callout	Callout
<b>1</b> External diagnostics connector	<b>2</b> VGA connector (optional)
<b>3</b> Drive activity LED	<b>4</b> Drive status LED
<b>5</b> Front I/O assembly with diagnostics panel	<b>6</b> Rack latch (right)
<b>7</b> Pull-out information tab	<b>8</b> Drive bays (12)
<b>9</b> Rack latch (left)	

**Note:** For more information about each component, see [“Front components overview” on page 47](#).

## Front view of server models with 3.5-inch front drive bays (backplane-less)

The following illustrates the front view of server models with 3.5-inch drive bays (backplane-less).

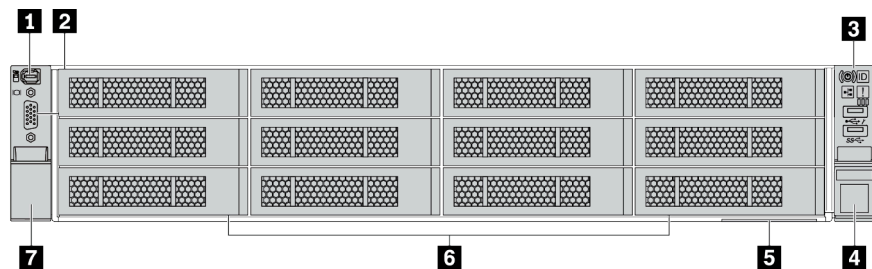


Table 11. Components on the front of server models

Callout	Callout
<b>1</b> External diagnostics connector	<b>2</b> VGA connector (optional)
<b>3</b> Front I/O assembly with diagnostics panel	<b>4</b> Rack latch (right)
<b>5</b> Pull-out information tab	<b>6</b> Drive bay fillers (12)
<b>7</b> Rack latch (left)	

**Note:** For more information about each component, see [“Front components overview” on page 47](#).

## 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 49](#).

### 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 illustrates the LEDs on a hard disk drive or solid-state drive.

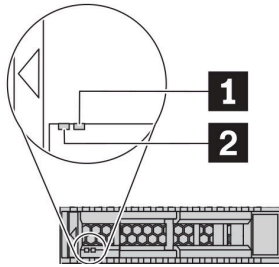


Figure 5. Drive LEDs

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 connector

The connector is for connecting an external diagnostics handset. For more about its functions, see [“LCD diagnostics panel/handset” on page 52](#).

### Front I/O assembly with LCD diagnostics panel

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 52](#).

### 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.

### **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 3.2 Gen 1 (5Gbps) connectors**

The USB 3.2 Gen 1 (5Gbps) 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](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 52](#).

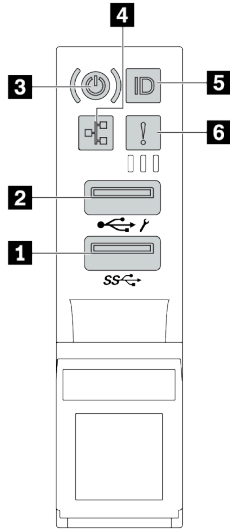


Figure 6. Front I/O assembly for server models

Table 12. Components on the front I/O assembly

Callout	Callout
<b>1</b> USB 3.2 Gen 1 (5 Gbps) connector	<b>2</b> USB 2.0 connector with XClarity Controller management
<b>3</b> Power button with power status LED	<b>4</b> Network activity LED (for OCP 3.0 Ethernet adapter)
<b>5</b> System ID button with system ID LED	<b>6</b> System error LED

### **1** USB 2.0 connector with XClarity Controller management

Depending on the setting, this connector supports USB 2.0 function, XClarity Controller management function, or both.

- If the connector is set for USB 2.0 function, you can attach a device that requires a USB 2.0 connection, such as a keyboard, a mouse, or a USB storage device.
- If the connector is set for XClarity Controller management function, you can attach a mobile device installed with the application to run XClarity Controller event logs.
- If the connector is set to have both functions, you can press the system ID button for three seconds to switch between the two functions.

### **2** USB 3.2 Gen 1 connector (5Gbps)

Used to attach a device that requires a USB 2.0 or 3.2 connection, such as a keyboard, a mouse, or a USB storage device.

### 3 Power button with power status LED

You can press the power button to turn on the server when you finish setting up the server. You also can hold the power button for several seconds to turn off the server if you cannot turn off the server from the operating system. The power status LED helps you 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.

### 4 Network activity LED

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.

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 no OCP 3.0 Ethernet adapter is installed, this LED is off.



## 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.

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.

## System error LED

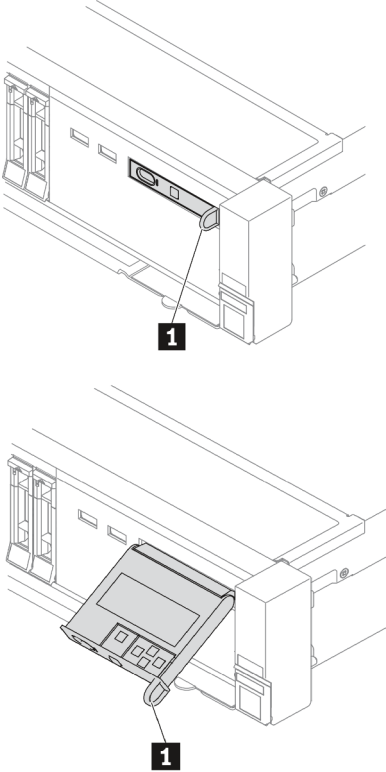
The system error LED provides basic diagnostic functions for your server. If the system error LED is lit, one or more LEDs elsewhere in the server might also be lit to direct you to the source of the error.

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"><li>• A fan failure</li><li>• A memory error</li><li>• A storage failure</li><li>• A PCIe device failure</li><li>• A power supply failure</li><li>• A CPU error</li><li>• A system board error</li></ul>	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. For information about light path diagnostics, see <a href="#">“Light path diagnostics” on page 421</a> .
Off	None	The server is off or the server is on and is working correctly.	None.

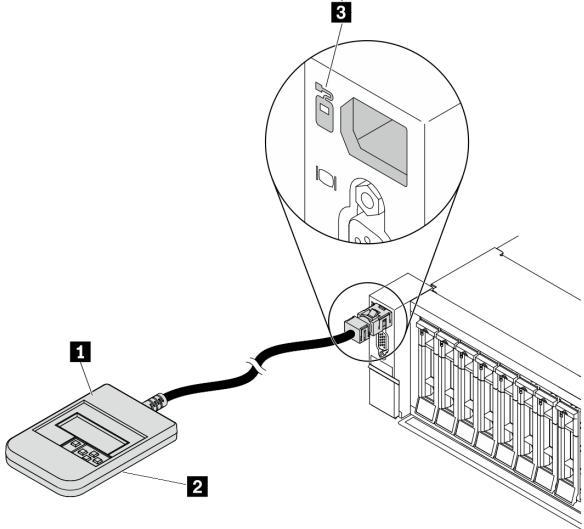
## LCD diagnostics panel/handset

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 information, network information, and health information.

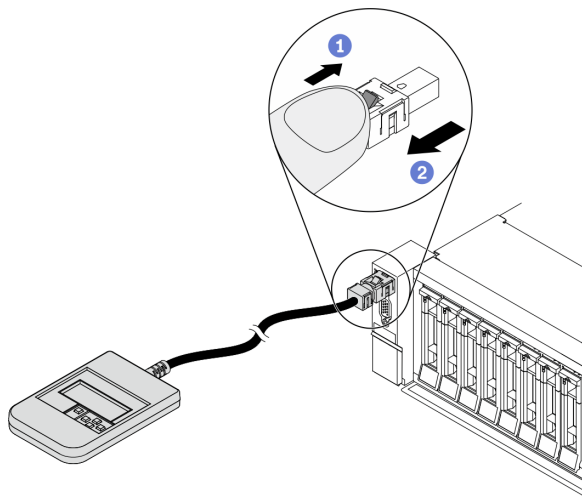
### Where to find the LCD diagnostics panel

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

## 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><b>1</b> The LCD diagnostics handset that can be connected to the server with an external cable.</p> <p><b>2</b> 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><b>3</b> The external diagnostics connector on the front of the server that can be used to connect an external LCD diagnostics handset.</p>

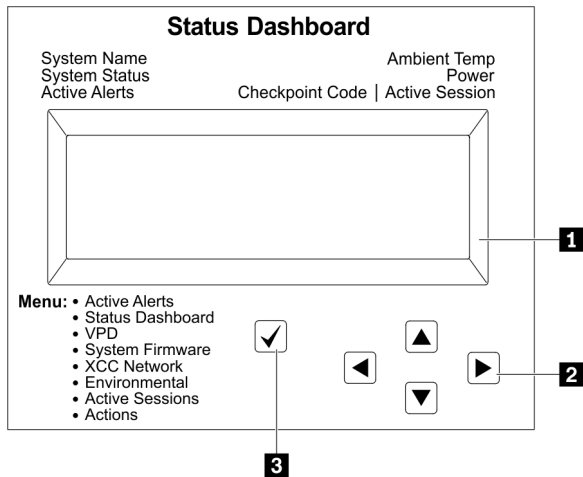
**Note:** Pay attention to the following steps when unplugging the external handset:



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.

## LCD diagnostics panel overview



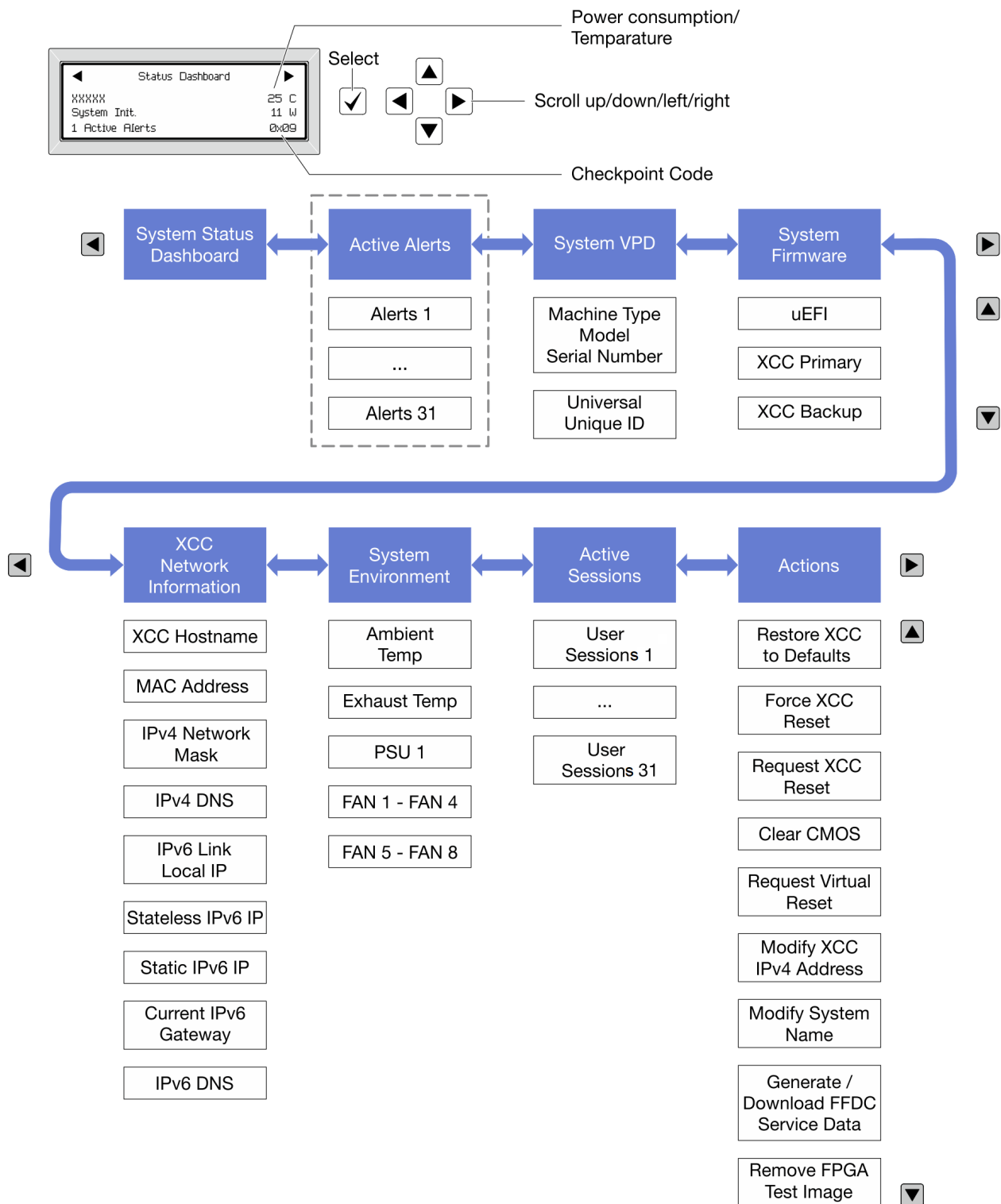
**1** LCD display

**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

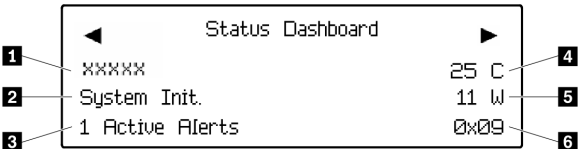
The LCD diagnostics panel/handset shows various system information. Navigate through the options with the scroll keys.



## 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
<b>1</b> System name <b>2</b> System status <b>3</b> Active alert quantity <b>4</b> Temperature <b>5</b> Power consumption <b>6</b> Checkpoint code	 <p>The screenshot shows a 'Status Dashboard' menu with the following items: 'xxxxxx' (1), 'System Init.' (2), '1 Active Alerts' (3), '25 C' (4), '11 W' (5), and '0x09' (6). Navigation arrows are visible at the top.</p>

### Active Alerts

Sub Menu	Example
Home screen: Active error quantity <b>Note:</b> 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"> <li>Error message ID (Type: Error/Warning/Information)</li> <li>Occurrence time</li> <li>Possible sources of the error</li> </ul>	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"> <li>Machine type and serial number</li> <li>Universal Unique ID (UUID)</li> </ul>	Machine Type: xxxx Serial Num: xxxxxx Universal Unique ID: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

## System Firmware

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

## XCC Network Information

Sub Menu	Example
<ul style="list-style-type: none"><li>XCC hostname</li><li>MAC address</li><li>IPv4 Network Mask</li><li>IPv4 DNS</li><li>IPv6 Link Local IP</li><li>Stateless IPv6 IP</li><li>Static IPv6 IP</li><li>Current IPv6 Gateway</li><li>IPv6 DNS</li></ul> <p><b>Note:</b> 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"><li>• Ambient temperature</li><li>• Exhaust temperature</li><li>• PSU status</li><li>• Spinning speed of fans by RPM</li></ul>	Ambient Temp: 24 C Exhaust Temp: 0 C  PSU1: Vin= 213 w Inlet= 26 C  FAN1 Front: 21000 RPM FAN2 Front: 21000 RPM FAN3 Front: 21000 RPM FAN4 Front: 21000 RPM

## Active Sessions

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

## Actions

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

---

## Rear view

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

Refer to the following rear view for different server models:

- [“Server model with eight PCIe slots” on page 59](#)
- [“Server model with four 2.5-inch rear drive bays and six PCIe slots” on page 60](#)
- [“Server model with eight 2.5-inch rear drive bays and four PCIe slots” on page 61](#)
- [“Server model with two 3.5-inch rear drive bays and four PCIe slots” on page 62](#)
- [“Server model with four 3.5-inch rear drive bays and two PCIe slots” on page 63](#)



## Server models with eight PCIe slots

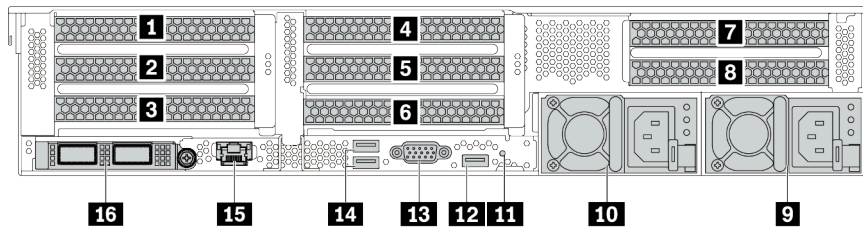


Table 13. Components on the rear of the server

Callout	Callout
<b>1</b> PCIe slot 1 (on riser 1 assembly)	<b>2</b> PCIe slot 2 (on riser 1 assembly)
<b>3</b> PCIe slot 3 (on riser 1 assembly)	<b>4</b> PCIe slot 4 (on riser 2 assembly)
<b>5</b> PCIe slot 5 (on riser 2 assembly)	<b>6</b> PCIe slot 6 (on riser 2 assembly)
<b>7</b> PCIe slot 7 (on riser 3 assembly)	<b>8</b> PCIe slot 8 (on riser 3 assembly)
<b>9</b> Power supply 1	<b>10</b> Power supply 2 (optional)
<b>11</b> NMI button	<b>12</b> USB 3.2 Gen 1 (5 Gbps) connector (1 DCI)
<b>13</b> VGA connector	<b>14</b> USB 3.2 Gen 1 (5 Gbps) connectors (2 DCIs)
<b>15</b> XClarity Controller Network connector	<b>16</b> 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 64](#).

## Server models with four 2.5-inch rear drive bays and six PCIe slots

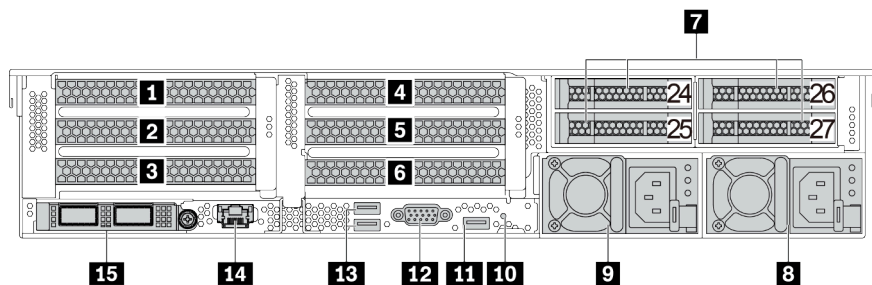


Table 14. Components on the rear of the server

Callout	Callout
<b>1</b> PCIe slot 1 (on riser 1 assembly)	<b>2</b> PCIe slot 2 (on riser 1 assembly)
<b>3</b> PCIe slot 3 (on riser 1 assembly)	<b>4</b> PCIe slot 4 (on riser 2 assembly)
<b>5</b> PCIe slot 5 (on riser 2 assembly)	<b>6</b> PCIe slot 6 (on riser 2 assembly)
<b>7</b> 2.5-inch rear drive bays (4)	<b>8</b> Power supply 1
<b>9</b> Power supply 2 (optional)	<b>10</b> NMI button
<b>11</b> USB 3.2 Gen 1 (5 Gbps) connector (1 DCI)	<b>12</b> VGA connector
<b>13</b> USB 3.2 Gen 1 (5 Gbps) connectors (2 DCIs)	<b>14</b> XClarity Controller Network connector
<b>15</b> 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 64.

## Server models with eight 2.5-inch rear drive bays and four PCIe slots

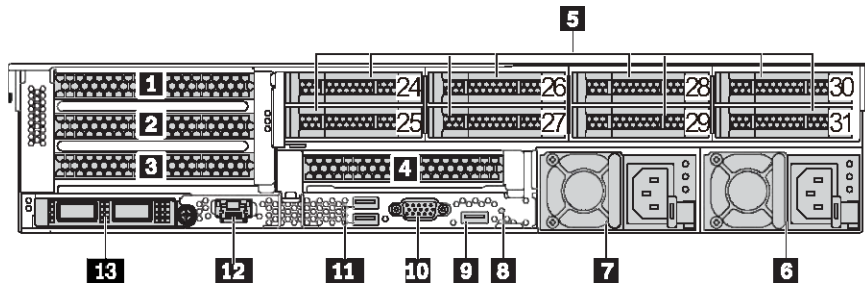


Table 15. Components on the rear of the server

Callout	Callout
<b>1</b> PCIe slot 1 (on riser 1 assembly)	<b>2</b> PCIe slot 2 (on riser 1 assembly)
<b>3</b> PCIe slot 3 (on riser 1 assembly)	<b>4</b> PCIe slot 6 (on riser 2 assembly)
<b>5</b> 2.5-inch rear drive bays (8)	<b>6</b> Power supply 1
<b>7</b> Power supply 2 (optional)	<b>8</b> NMI button
<b>9</b> USB 3.2 Gen 1 (5 Gbps) connector (1 DCI)	<b>10</b> VGA connector
<b>11</b> USB 3.2 Gen 1 (5 Gbps) connectors (2 DCIs)	<b>12</b> XClarity Controller Network connector
<b>13</b> 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 64](#).

## Server models with two 3.5-inch rear drive bays and four PCIe slots

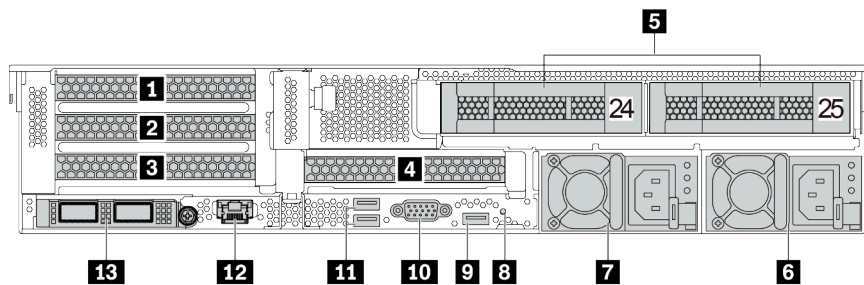


Table 16. Components on the rear of the server

Callout	Callout
<b>1</b> PCIe slot 1 (on riser 1 assembly)	<b>2</b> PCIe slot 2 (on riser 1 assembly)
<b>3</b> PCIe slot 3 (on riser 1 assembly)	<b>4</b> PCIe slot 6 (on riser 2 assembly)
<b>5</b> 3.5-inch rear drive bays (2)	<b>6</b> Power supply 1
<b>7</b> Power supply 2 (optional)	<b>8</b> NMI button
<b>9</b> USB 3.2 Gen 1 (5 Gbps) connector (1 DCI)	<b>10</b> VGA connector
<b>11</b> USB 3.2 Gen 1 (5 Gbps) connectors (2 DCIs)	<b>12</b> XClarity Controller Network connector
<b>13</b> 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 64](#).

## Server models with four 3.5-inch rear drive bays and two PCIe slots

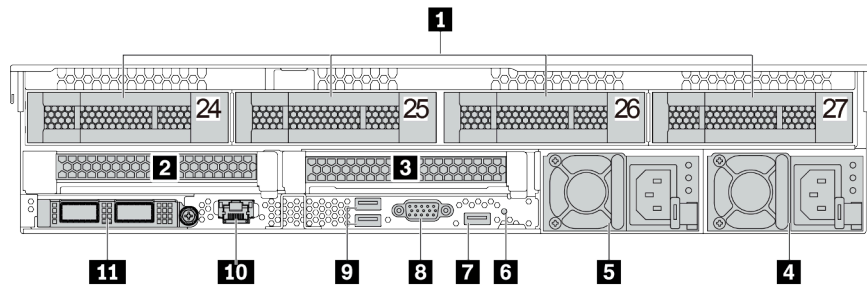


Table 17. Components on the rear of the server

Callout	Callout
<b>1</b> 3.5-inch rear drive bays (4)	<b>2</b> PCIe slot 3 (on riser 1 assembly)
<b>3</b> PCIe slot 6 (on riser 2 assembly)	<b>4</b> Power supply 1
<b>5</b> Power supply 2 (optional)	<b>6</b> NMI button
<b>7</b> USB 3.2 Gen 1 (5 Gbps) connector (1 DCI)	<b>8</b> VGA connector
<b>9</b> USB 3.2 Gen 1 (5 Gbps) connectors (2 DCIs)	<b>10</b> XClarity Controller Network connector
<b>11</b> 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 64](#).

## 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 illustrates the LEDs on a Hard disk drive or solid-state drive.

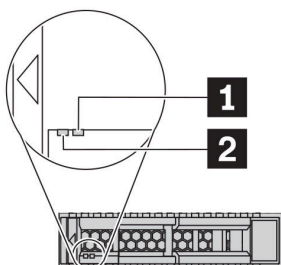


Figure 7. Drive LEDs

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 8. OCP module (two connectors)



Figure 9. 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.

### 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 eight PCIe slots on riser 1, 2, and 3 assemblies. For more information about the PCIe slots, see [“PCIe slots and configurations” on page 25](#).

Below lists all supported parts in the slots:

- COM cable (slot 3 or 6 only)
- Fiber channel HBA adapters
- GPU adapters
- RAID/HBA adapters
- Network adapters
- NVMe switch adapter
- 7mm-thick 2.5-inch SSDs (slot 3 or 6 only)
- PCIe SSDs

## **Power supplies**

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 65](#).

## **USB 3.2 Gen 1 (5 Gbps) connectors**

The USB 3.2 Gen 1 (5 Gbps) 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 illustration in this section shows the LEDs on the rear of the server.

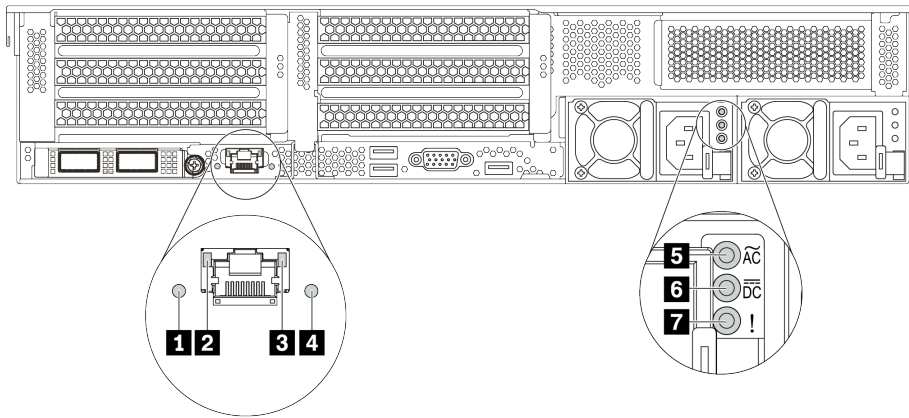


Figure 10. Rear view LEDs of the server

Table 18. LEDs on the rear of the server

Callout	Callout
<b>1</b> System ID LED	<b>2</b> Ethernet link LED
<b>3</b> Ethernet activity LED	<b>4</b> System error LED
<b>5</b> Power input LED	<b>6</b> Power output LED
<b>7</b> Power supply error LED	

#### **1 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.

#### **2 3 Ethernet status LEDs**

The BMC management connector has two status LEDs.

Ethernet status LED	Color	Status	Description
<b>2</b> Ethernet link LED	Green	On	Network link is established.
	None	Off	Network link is disconnected.
<b>3</b> Ethernet activity LED	Green	Blinking	Network link is connected and active.
	None	Off	The server is disconnected from a LAN.

#### **4 System error LED**

The system error LED provides basic diagnostic functions for your server. If the system error 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 [“Diagnostics panel” on page 49](#).

#### **5 Power input LED**

#### **6 Power output LED**

#### **7 Power supply error LED**



Each hot-swap power supply has three status LEDs.

LED	Description
<b>5</b> Power input LED	<ul style="list-style-type: none"><li>• Green: The power supply is connected to the ac power source.</li><li>• Off: The power supply is disconnected from the ac power source or a power problem occurs.</li></ul>
<b>6</b> Power output LED	<ul style="list-style-type: none"><li>• Green: The server is on and the power supply is working normally.</li><li>• Blinking green: The power supply is in zero-output mode (standby). When the server power load is low, one of the installed power supplies enters into the standby state while the other one delivers entire load. When the power load increases, the standby power supply will switch to active state to provide sufficient power to the server.  To disable zero-output mode, log in to the Lenovo XClarity Controller web interface, choose <b>Server Configuration → Power Policy</b>, disable <b>Zero Output Mode</b>, and then click <b>Apply</b>. If you disable zero-output mode, both power supplies will be in the active state.</li><li>• Off: The server is powered off, or the power supply is not working properly. If the server is powered on but the power output LED is off, replace the power supply.</li></ul>
<b>7</b> Power supply error LED	<ul style="list-style-type: none"><li>• Yellow: The power supply has failed. To resolve the issue, replace the power supply.</li><li>• Off: The power supply is working normally.</li></ul>

## System board

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

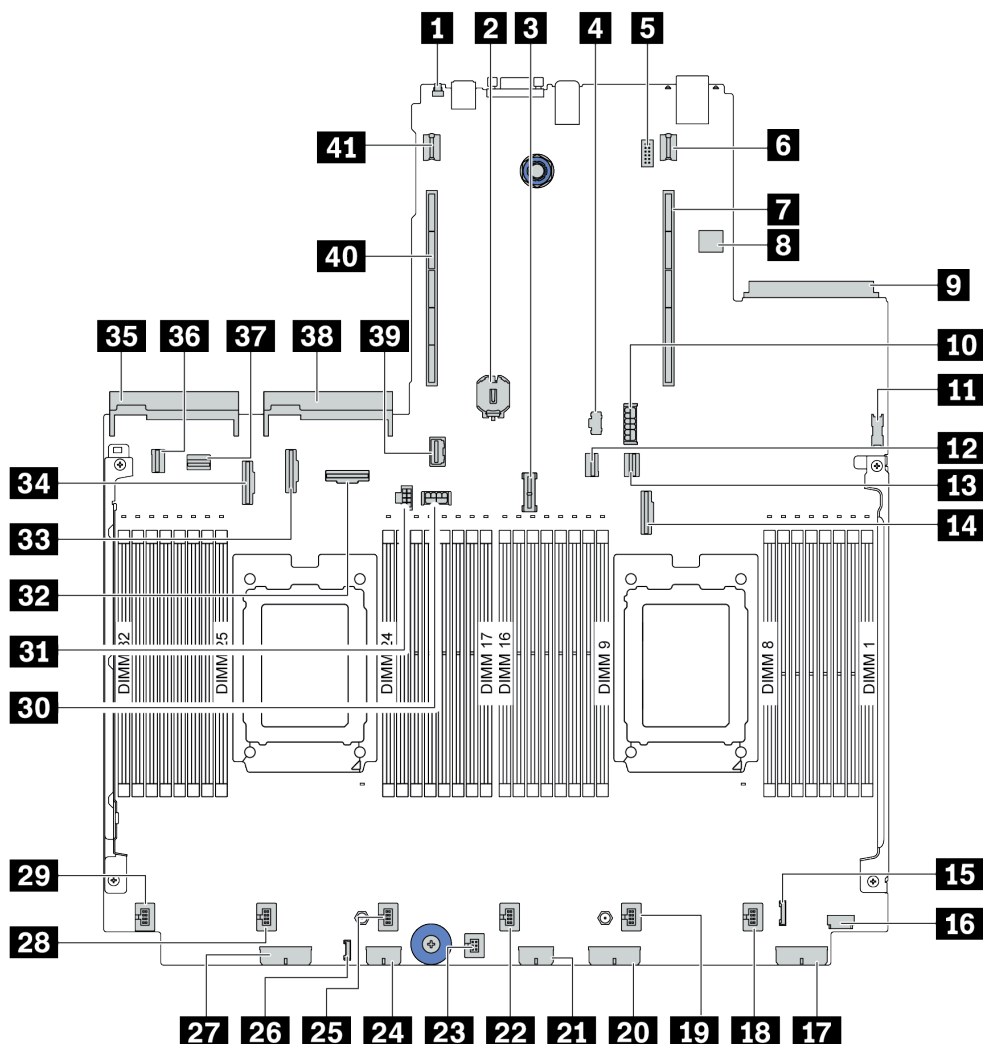


Figure 11. System board components

<b>1</b> NMI button	<b>2</b> CMOS battery (CR2032)
<b>3</b> TPM module connector	<b>4</b> M.2 power connector
<b>5</b> Serial port module connector	<b>6</b> Riser 1 power connector
<b>7</b> Riser 1 slot	<b>8</b> Internal USB connector
<b>9</b> OCP 3.0 Ethernet adapter connector	<b>10</b> 7 mm SSD power connector
<b>11</b> Front USB connector	<b>12</b> PCIe connector 1
<b>13</b> PCIe connector 2	<b>14</b> PCIe connector 3
<b>15</b> Front I/O connector	<b>16</b> Front VGA connector

<b>17</b> Backplane power connector 3	<b>18</b> Fan 1 connector
<b>19</b> Fan 2 connector	<b>20</b> Backplane power connector 2
<b>21</b> RAID expander power connector	<b>22</b> Fan 3 connector
<b>23</b> Intrusion switch connector	<b>24</b> CFF RAID/HBA power connector
<b>25</b> Fan 4 connector	<b>26</b> External LCD connector
<b>27</b> Backplane power connector 1	<b>28</b> Fan 5 connector
<b>29</b> Fan 6 connector	<b>30</b> Riser 3 GPU power connector
<b>31</b> Riser 3 power connector	<b>32</b> PCIe connector 6
<b>33</b> PCIe connector 8	<b>34</b> PCIe connector 7
<b>35</b> Power supply 1 connector	<b>36</b> PCIe connector 4
<b>37</b> PCIe connector 5	<b>38</b> Power supply 2 connector
<b>39</b> Riser 3 sideband connector	<b>40</b> Riser 2 slot
<b>41</b> Riser 2 power connector	

## System board LEDs

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

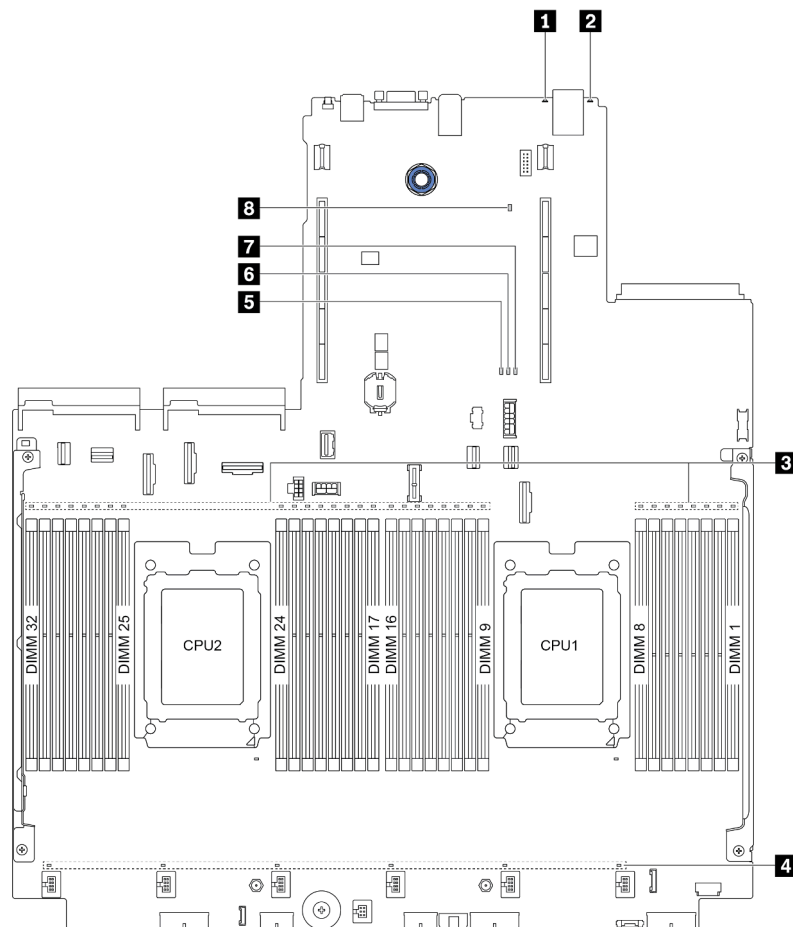


Figure 12. System board LEDs

Table 19. LEDs on the system board

Callout	Callout
<b>1</b> System error LED	<b>2</b> System ID LED
<b>3</b> DIMM error LEDs (32)	<b>4</b> Fan error LEDs (6)
<b>5</b> FPGA error LED	<b>6</b> FPGA heartbeat LED
<b>7</b> FPGA power LED	<b>8</b> 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 [“Diagnostics panel” on page 49](#).

### 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"><li>Blinking (blinking slowly, about one flash per second): One or more power faults occur.</li><li>Blinking (blinking rapidly, about four flashes per second): FPGA does not assert RSMRST_N.</li></ul>
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"><li>Blinking (blinking slowly, about one flash per second): The FPGA power is off.</li><li>Blinking (blinking rapidly, about four flashes per second): The FPGA permission is delayed.</li></ul>

### 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](http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html)
  - “Handling static-sensitive devices” on page 149
- 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.

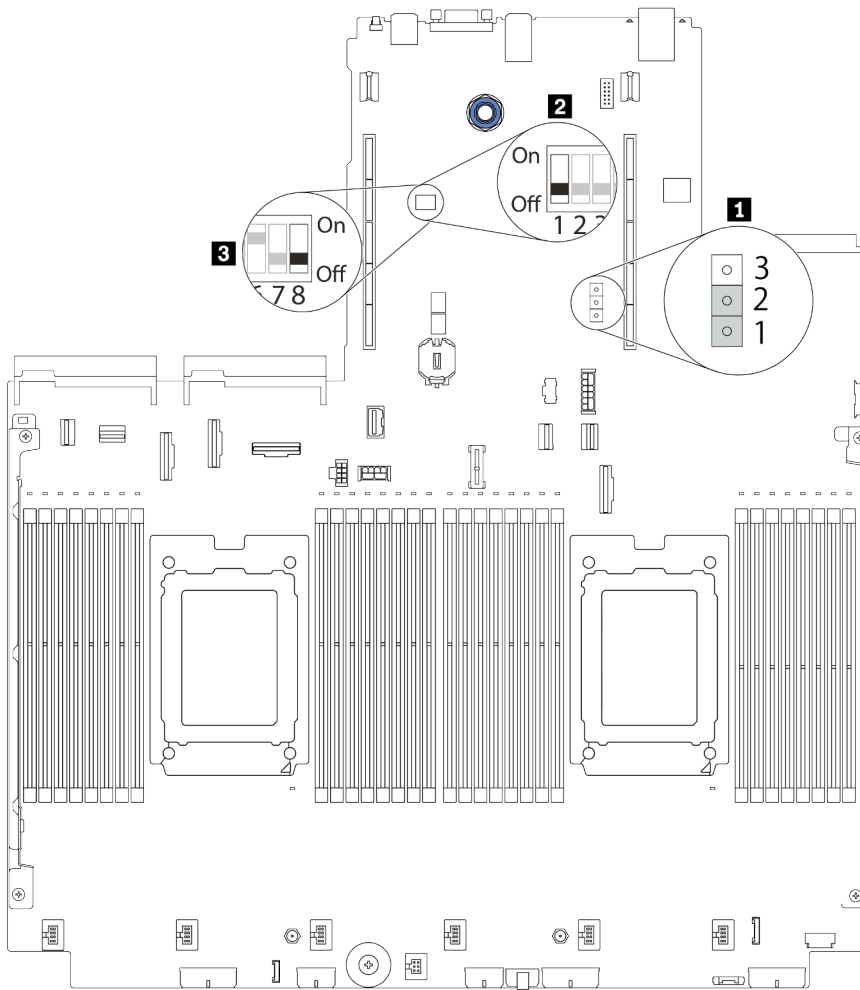


Figure 13. Switch block and jumper locations on system board

Table 20. Switch block and jumper description

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

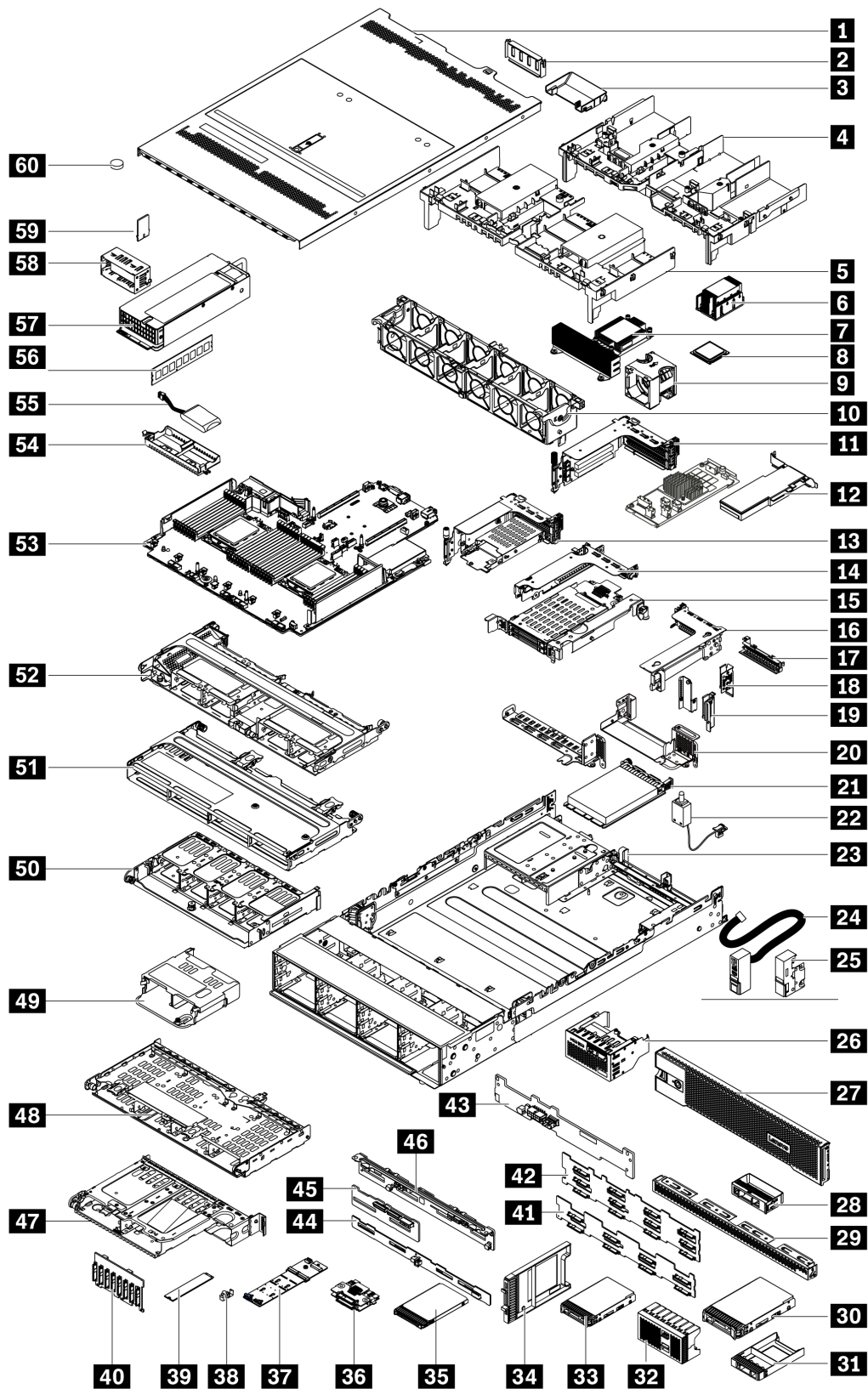
## Parts list

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/sr665/7d2w/parts>

It is highly recommended that you check the power summary data for your server using Lenovo Capacity Planner before purchasing any new 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
<b>1</b> Top cover	T1	<b>31</b> 1 x 2.5-inch drive bay filler	C
<b>2</b> GPU filler	C	<b>32</b> 4 x 2.5-inch drive bay filler	C
<b>3</b> Add-on GPU air baffle	T1	<b>33</b> 2.5-inch HDD/SSD	T1
<b>4</b> GPU air baffle	T1	<b>34</b> 7mm SSD filler	C
<b>5</b> Standard air baffle	T1	<b>35</b> 7mm SSD	T1
<b>6</b> Standard heat sink	F	<b>36</b> 7mm drive backplanes (top+bottom)	T2
<b>7</b> Performance heat sink (T-shape)	F	<b>37</b> M.2 adapter	F
<b>8</b> Processor	F	<b>38</b> M.2 retainer clip	T2
<b>9</b> Fan module	T1	<b>39</b> M.2 drive	F
<b>10</b> Fan cage	T1	<b>40</b> 8 x 2.5-inch front drive backplane	T1
<b>11</b> Riser 1/2 assembly, 3 FH	T1	<b>41</b> 8 x 3.5-inch front drive backplane	T1
<b>12</b> PCIe adapter	T1	<b>42</b> 12 x 3.5-inch front drive backplane	T1
<b>13</b> Riser 1 assembly, 7mm + 2 FH slots	T1	<b>43</b> 2 x 3.5-inch rear drive backplane	T1
<b>14</b> Riser 2 assembly, 1FH	T1	<b>44</b> 8 x 2.5-inch rear drive backplane	T1
<b>15</b> Riser 2 assembly, 7mm	T1	<b>45</b> 4 x 2.5-inch rear/middle drive backplane	T1
<b>16</b> Riser 3 assembly, 2FH	T1	<b>46</b> 4 x 3.5-inch rear/middle drive backplane	T1
<b>17</b> Riser 2 filler, 1FH	C	<b>47</b> 2 x 3.5-inch rear drive cage (BP4)	T1
<b>18</b> Rearwall bracket A1	T1	<b>48</b> 4 x 3.5-inch rear drive cage (BP4)	T1
<b>19</b> Rearwall brackets B1/B2	T1	<b>49</b> 4 x 2.5-inch rear drive cage (BP4)	T1
<b>20</b> Rearwall bracket C1/C2	T1	<b>50</b> 8 x 2.5-inch rear drive cage (BP4)	T1
<b>21</b> OCP 3.0 Ethernet adapter	T1	<b>51</b> 4 x 3.5-inch middle drive cage (BP5)	T1
<b>22</b> Intrusion switch cable	T1	<b>52</b> 8 x 2.5-inch middle drive cage (BP5, BP6)	T1
<b>23</b> Chassis	F	<b>53</b> System board	F
<b>24</b> Rack latch (with integrated front I/O)	T1	<b>54</b> RAID super capacitor holder	C
<b>25</b> Standard rack latch	T1	<b>55</b> RAID super capacitor module	T1
<b>26</b> Front I/O assembly with LCD diagnostics panel	T1	<b>56</b> Memory module	T1
<b>27</b> Security bezel	T1	<b>57</b> Power supply unit	T1
<b>28</b> 1 x 3.5-inch drive bay filler	C	<b>58</b> Power supply unit filler	C

Description	Type	Description	Type
<b>29</b> 4 x 3.5-inch drive bay filler	C	<b>59</b> TPM adapter (for Chinese Mainland only)	F
<b>30</b> 3.5-inch HDD	T1	<b>60</b> 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 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.
- For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.
- For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.
- Power cords for a specific country or region are usually available only in that country or region.



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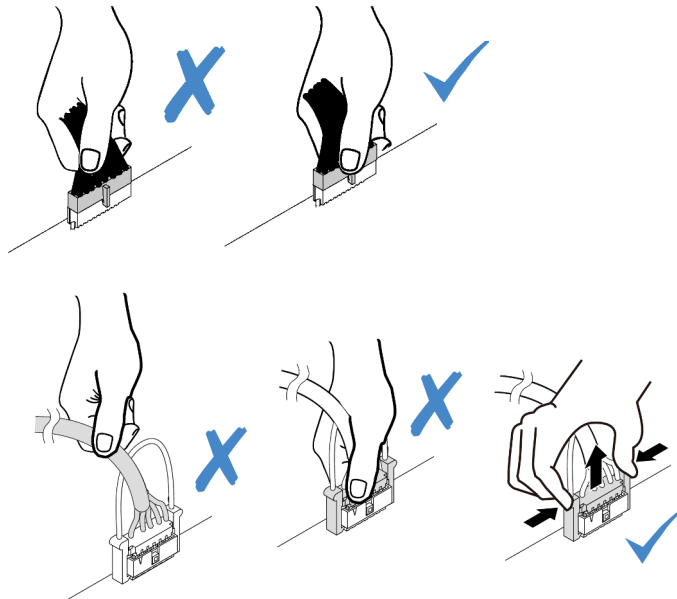
## Chapter 3. Internal cable routing

Some of the components in the server have internal cables and cable connectors.

To connect cables, observe the following guidelines:

- Turn off the server before you connect or disconnect any internal cables.
- See the documentation that comes with any external devices for additional cabling instructions. It might be easier for you to route cables before you connect the devices to the server.
- Cable identifiers of some cables are printed on the cables that come with the server and optional devices. Use these identifiers to connect the cables to the correct connectors.
- Ensure that the cable is not pinched and does not cover any connectors or obstruct any components on the system board.
- Ensure that the relevant cables pass through the cable clips.

**Note:** Disengage all latches, release tabs, or locks on cable connectors when you disconnect cables from the system board. Failing to release them before removing the cables will damage the cable sockets on the system board, which are fragile. Any damage to the cable sockets might require replacing the system board.



## Front I/O assembly

Use the section to understand the cable routing for front I/O assemblies.

**Note:** The illustration shows the cabling scenario for server models with twelve 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 37](#).

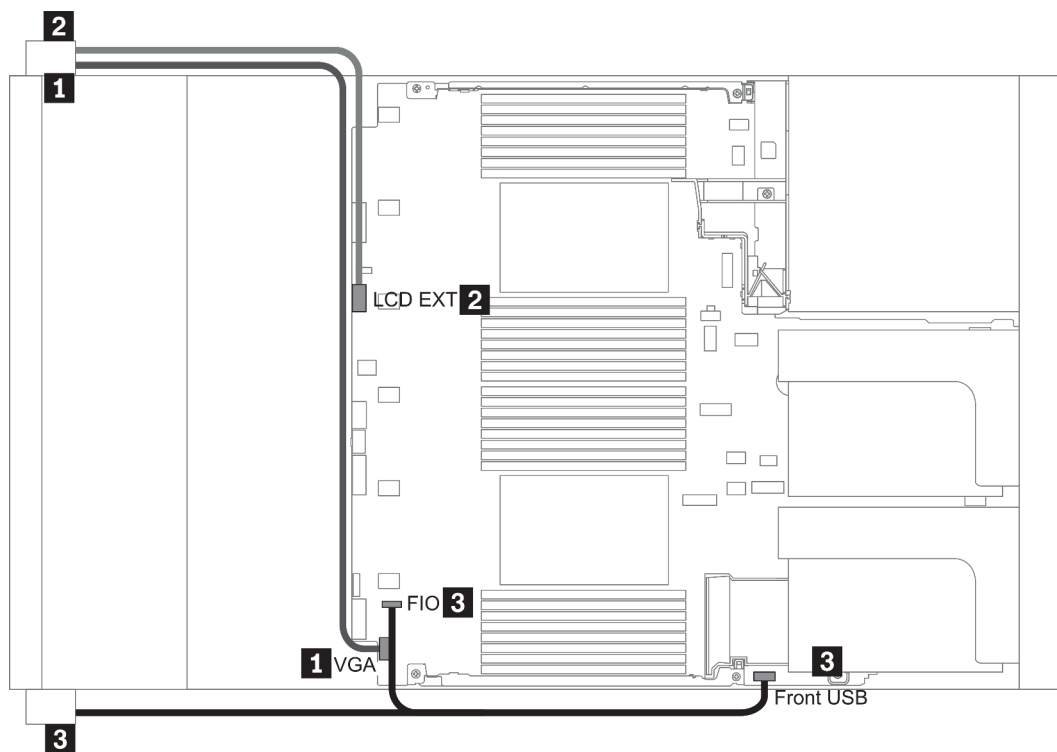


Figure 14. Front I/O assembly cable routing

From	To
<b>1</b> VGA cable on the left rack latch	VGA connector on the system board
<b>2</b> External diagnostics cable on the left rack latch	External LCD connector on the system board
<b>3</b> Front USB and panel cable on the right rack latch	Front I/O and front USB connectors on the system board

## GPUs

Use this section to understand the routing for GPUs.

**Note:** If your GPU adapter TDP is equal to or lower than 75 watts, the adapter can be powered directly by the riser slot. An extra power cable is needed for powering GPU adapters with TDP higher than 75 watts.

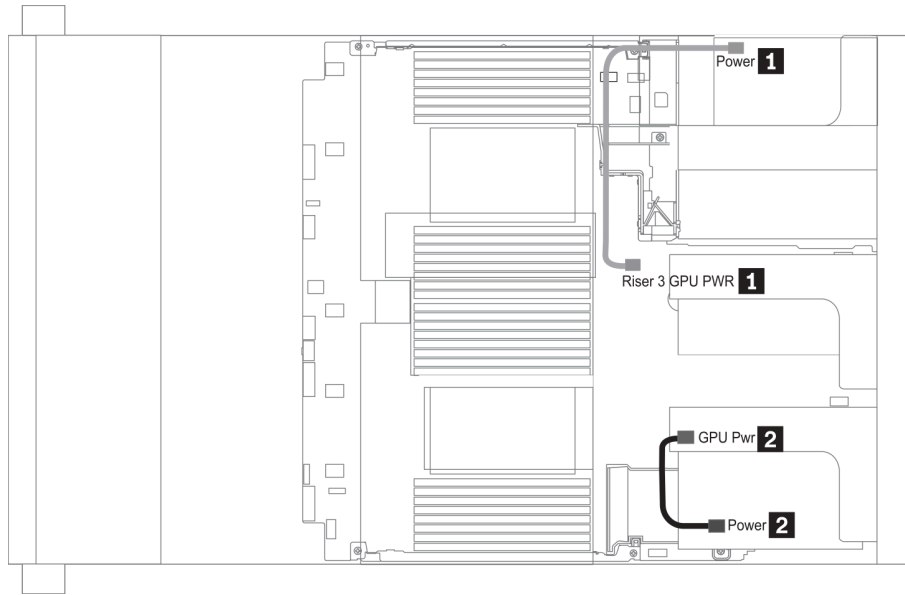
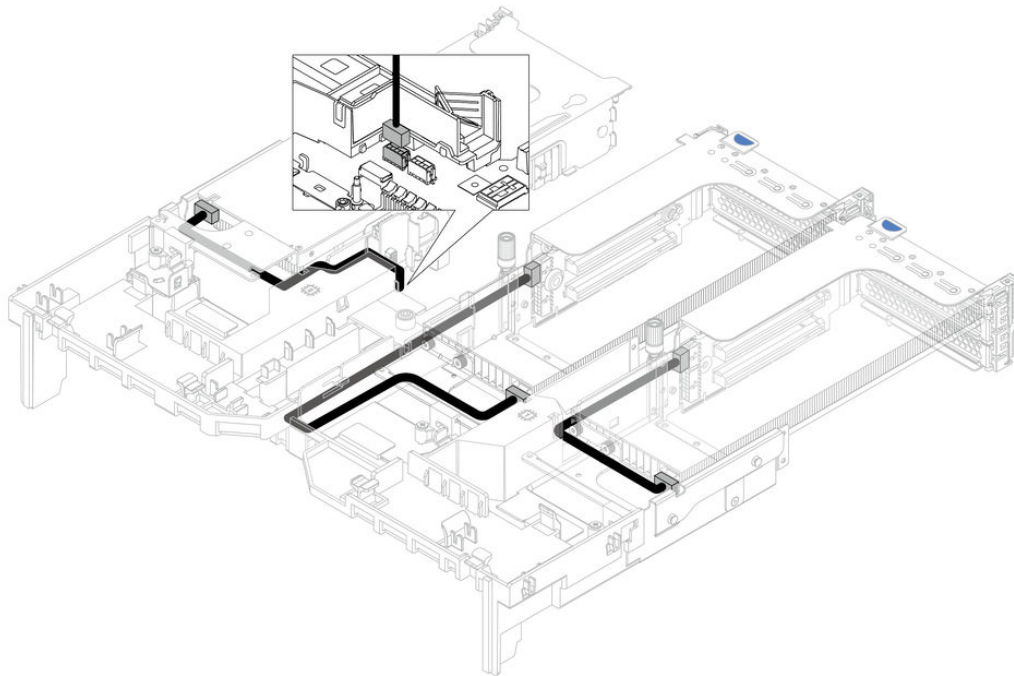


Figure 15. GPU cable routing

From	To
<b>1</b> Power connector on a GPU adapter (on riser 3 assembly)	Riser 3 GPU Pwr connector on the system board
<b>2</b> Power connector on a GPU adapter (on riser 1 or 2 assembly)	GPU Pwr connector on the riser card (on riser 1 or 2 assembly)

If you need to install an M.2 backplane on the GPU air baffle, route the GPU power cable from riser 2 beneath the M.2 backplane holder. Refer to below illustration for cable routing on the air baffle.



---

## Riser cards

Use this section to understand the cable routing for riser cards.

The server supports up to three riser cards: riser card 1, riser card 2, and riser card 3. Among which, only riser card 3 needs cable connections:

- [“Riser card 3 power and sideband connection” on page 82](#)
- [“Riser card 3 \(x8/x8 or x16/x16 PCIe\) cable connection” on page 84](#)

The riser card types vary by server model. For detailed information, see [“Rear view” on page 58](#).

### Riser card 3 power and sideband connection

**Note:** The power and sideband connections for x8/x8 PCIe riser card 3 and x16/x16 PCIe riser card 3 are the same.



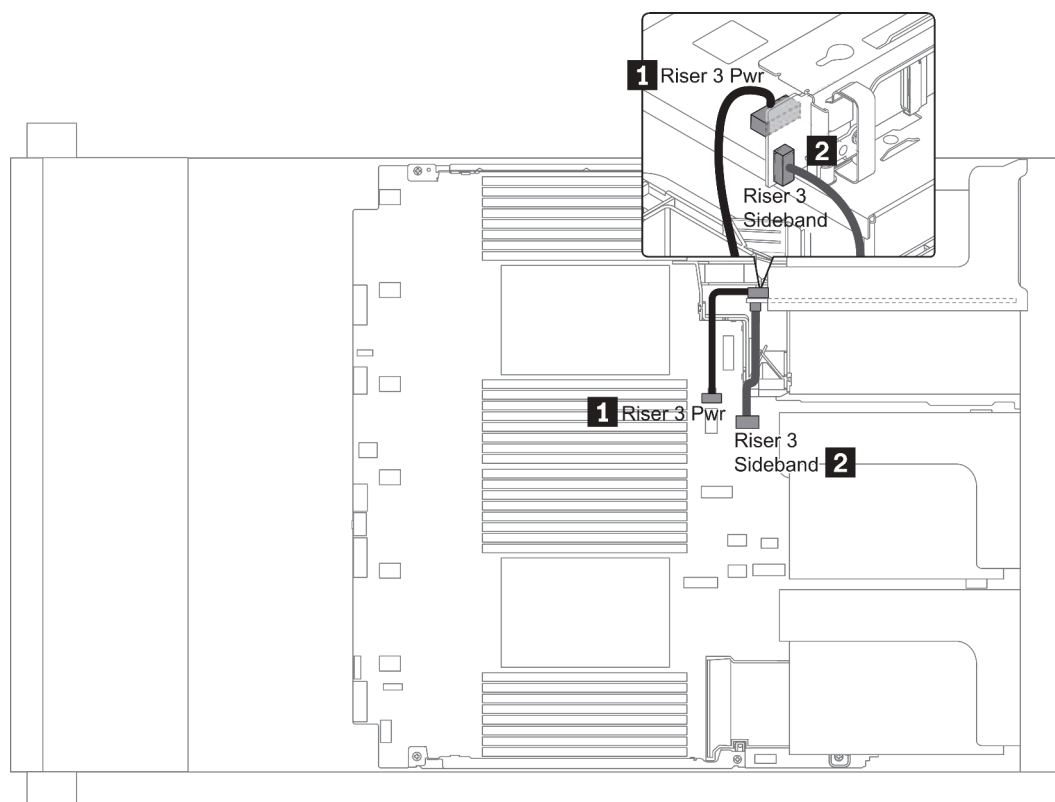


Figure 16. Riser card 3 power and sideband connection

From	To
<b>1</b> Power connector on the riser card	Riser 3 power connector on the system board
<b>2</b> Sideband connector on the riser card	Riser 3 sideband on the system board

## Riser card 3 (x8/x8 or x16/x16 PCIe) cable connection

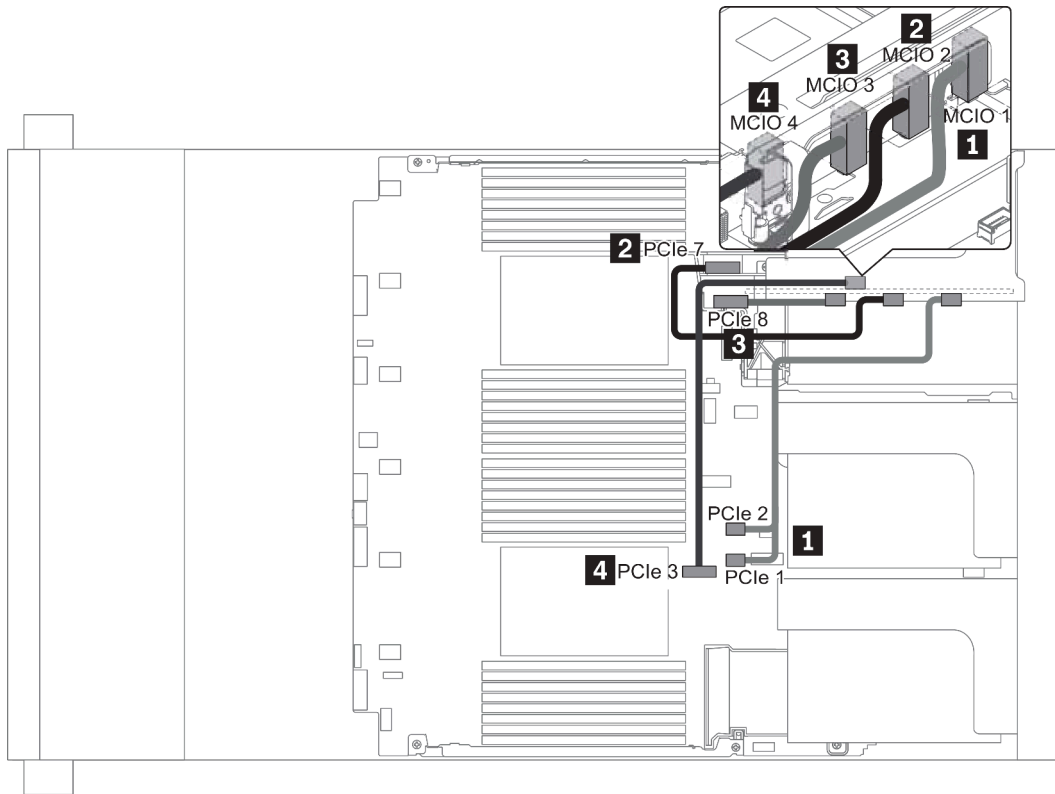


Figure 17. Cable routing for riser card 3 (x8/x8 or x16/x16 PCIe)

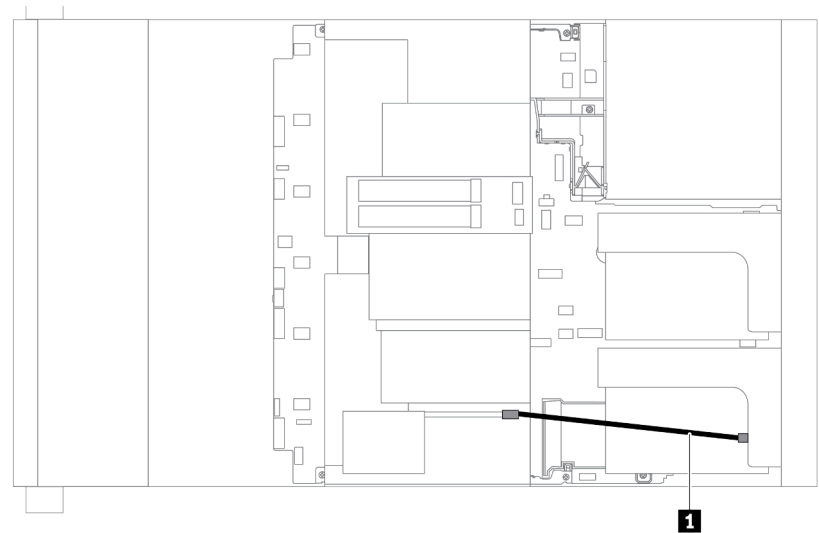
From	To
<b>1</b> MCIO 1 on the riser card	PCIe connector 1-2 on the system board
<b>2</b> MCIO 2 on the riser card	PCIe connectors 7 on the system board
<b>3</b> MCIO 3 on the riser card	PCIe connector 8 on the system board
<b>4</b> MCIO 4 on the riser card	PCIe connector 3 on the system board

**Note:** **3** and **4** are for x16/x16 PCIe riser card 3 only.

# RAID super capacitor modules

Use this section to understand the cable routing for RAID super capacitor modules.

RAID super capacitor modules can be installed on the air baffle (scenario 1), the middle drive cage (scenario 2), or the front chassis (scenario 3). The following illustrates the cable connection for scenario 1. The cable connections for other scenarios are the similar.



**Note:** An extension cable is provided for each RAID super capacitor module for connection. Connect the super capacitor cable to the super capacitor connector on the corresponding RAID adapter as shown.

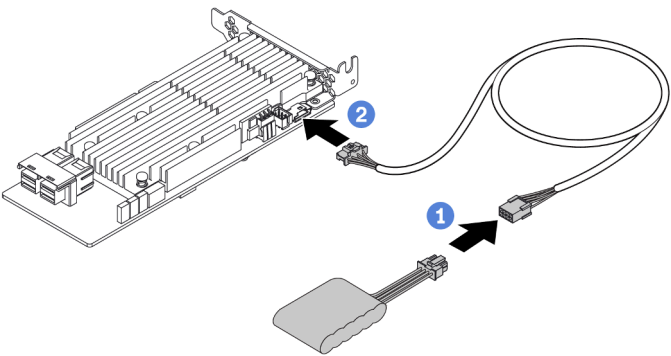


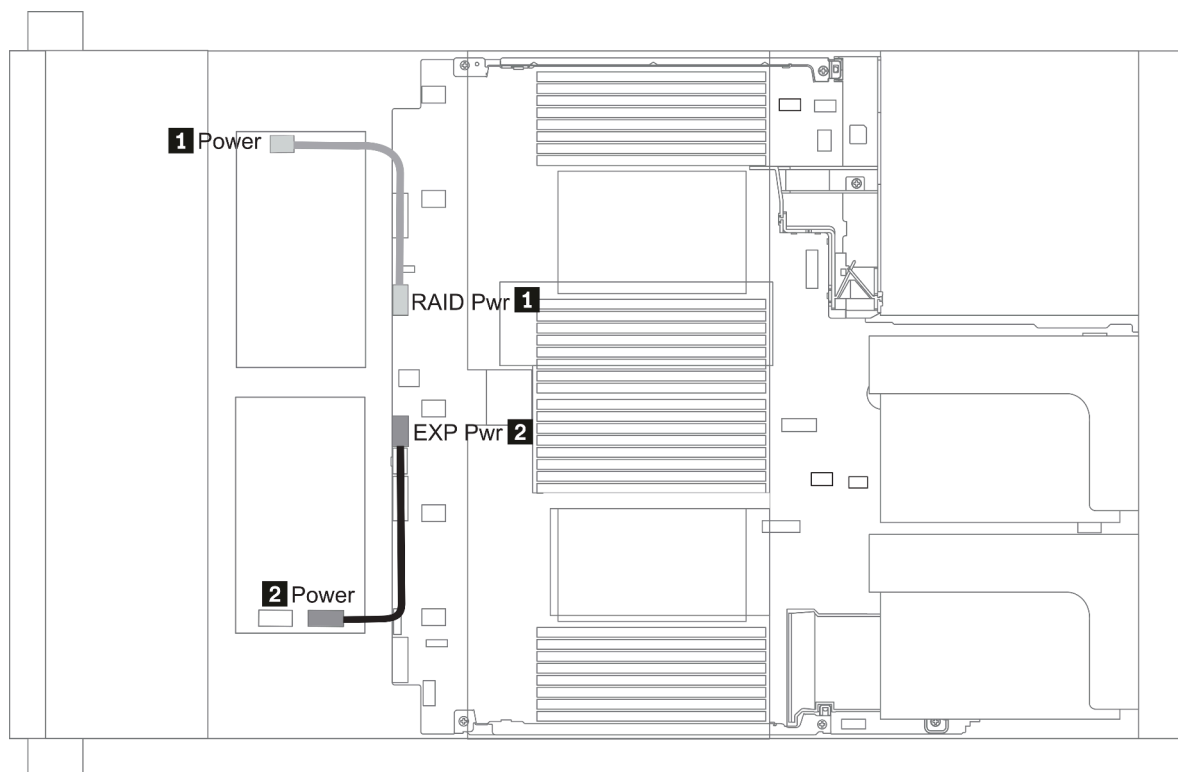
Figure 18. Connecting the RAID super capacitor module to the RAID adapter

From	To
RAID super capacitor module	Supercap connector on the RAID adapter

## Internal CFF RAID/HBA/Expander adapters (power)

Use the section to understand the power cable routing for internal CFF RAID/HBA/Expander adapter.

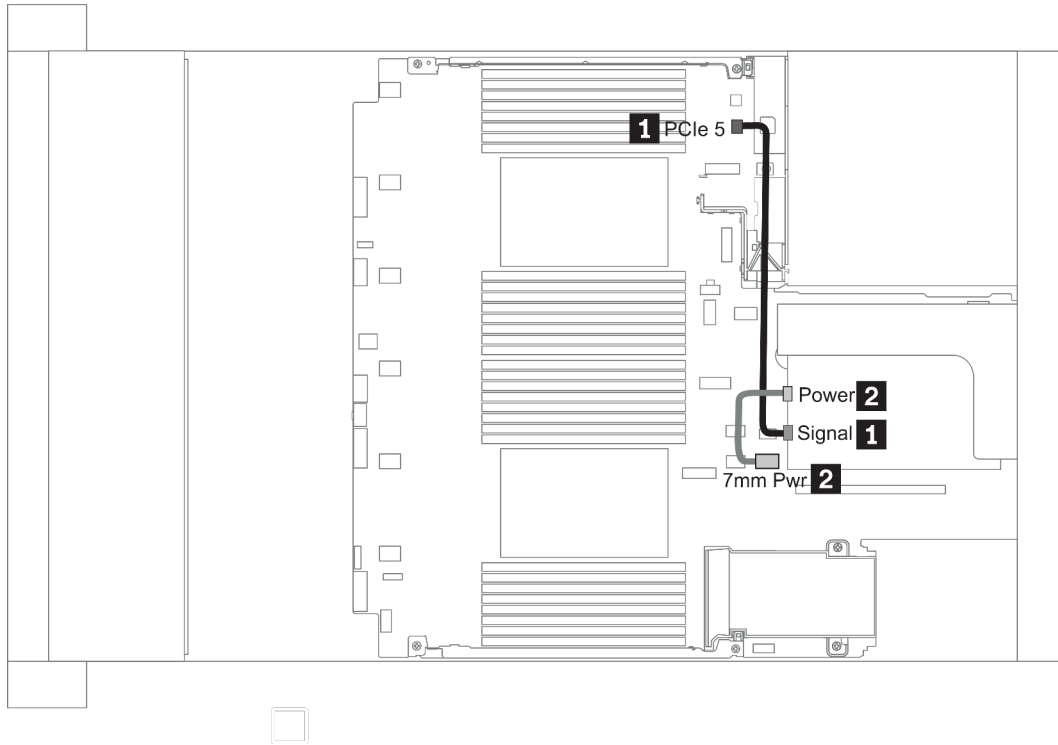
**Note:** The illustration only involves power cable routing. For signal cable routing, see [“2.5-inch/3.5-inch drive backplane \(signal\)” on page 95](#)



From	To
<b>1</b> Power connector on the CFF RAID/HBA adapter	RAID Pwr connector on the system board
<b>1</b> Power connector on the CFF RAID Expander adapter	EXP Pwr connector on the system board

## 7mm drives

This section provides cable routing information for the 7mm drives.



*Figure 19. 7mm cable routing when two processors installed*

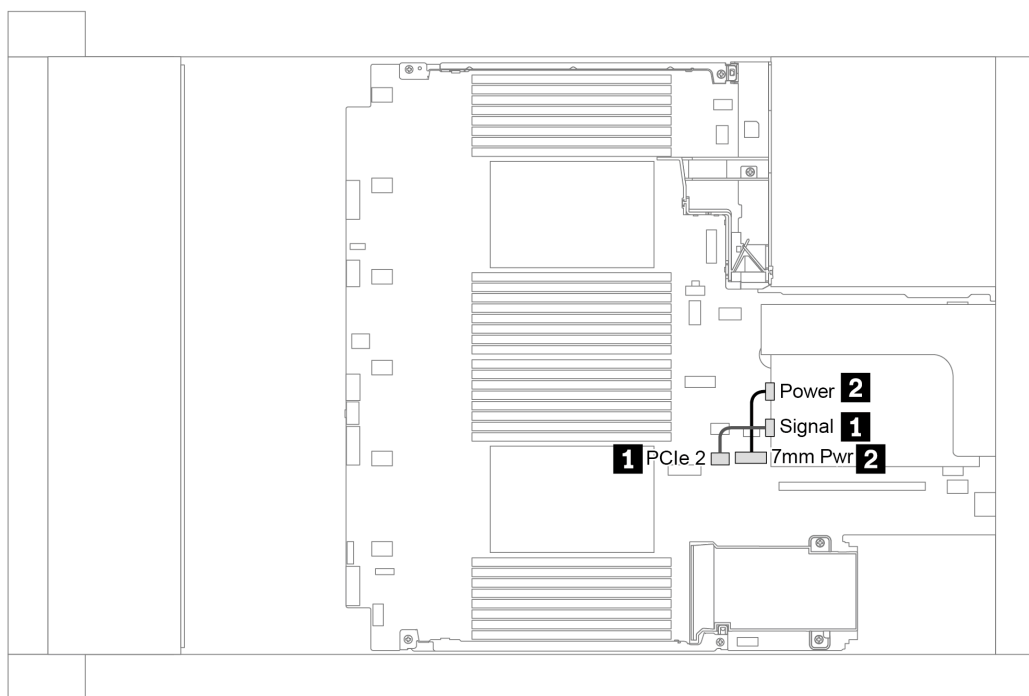


Figure 20. 7mm cable routing when one processor installed

From (7 mm drives in slot 6/ slot 3)	To
<b>1</b> 7mm signal cable	<ul style="list-style-type: none"> <li>When two processors installed: PCIe connector 5 on the system board</li> <li>When one processor installed: PCIe connector 2 on the system board</li> </ul>
<b>2</b> Power cable	7mm power connector on the system board

## M.2 drives

This section provides cable routing information for the M.2 drives.

M.2 drives can be installed on the standard air baffle (scenario 1), GPU air baffle (scenario 2), 2.5-inch middle drive cage (scenario 3), or 3.5-inch middle drive cage (scenario 4). The following illustrates the cable connection for scenario 1. The cable connections for other scenarios are the same.

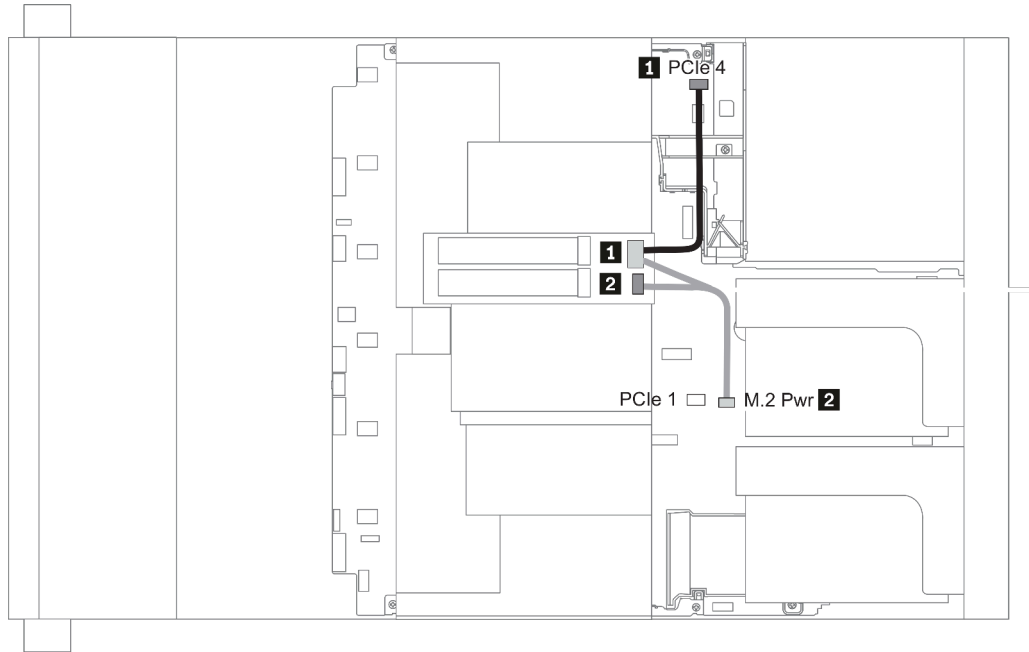


Figure 21. M.2 cable routing

From	To
<b>1</b> M.2 signal cable	<ul style="list-style-type: none"><li>• PCIe connector 4 on the system board (two processors installed)</li><li>• PCIe connector 1 on the system board (one processor installed)</li></ul>
<b>2</b> Power cable	M.2 power connector on the system board

## 2.5-inch/3.5-inch drive backplane (power)

This section provides information for backplane power connections.

- “Front BP” on page 90
- “Mid BP” on page 92
- “Rear BP” on page 94

### Front BP

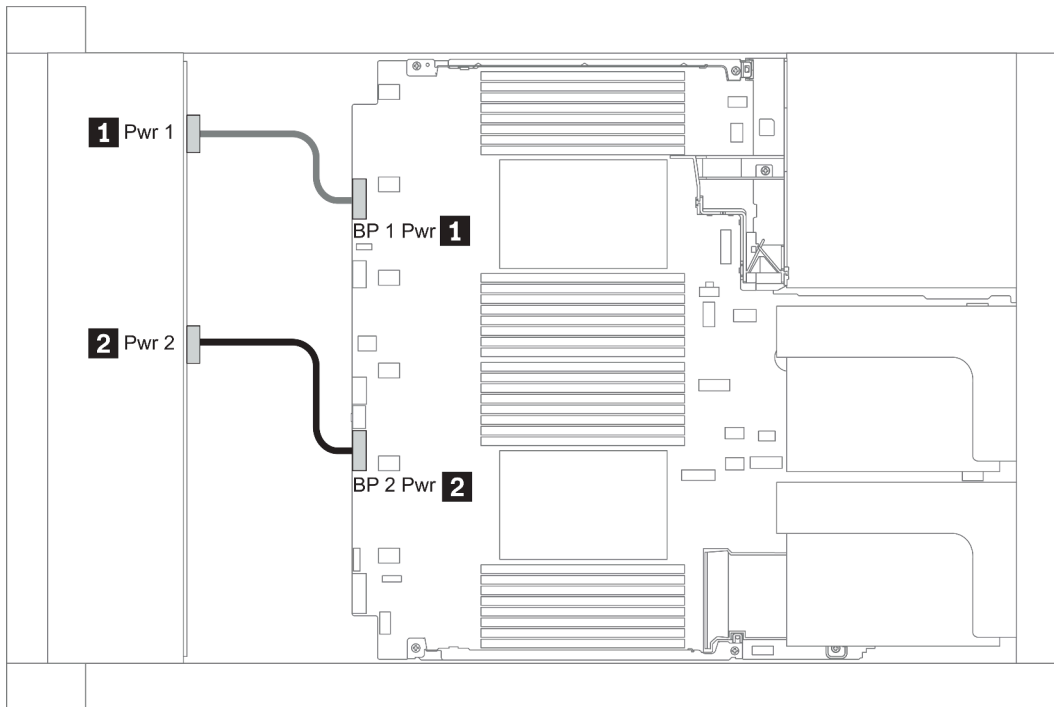


Figure 22. 3.5"

From	To
<b>1</b> Power 1 connector on backplane	Front backplane 1 power connector on the system board
<b>2</b> Power 2 connector on backplane	Front backplane 2 power connector on the system board



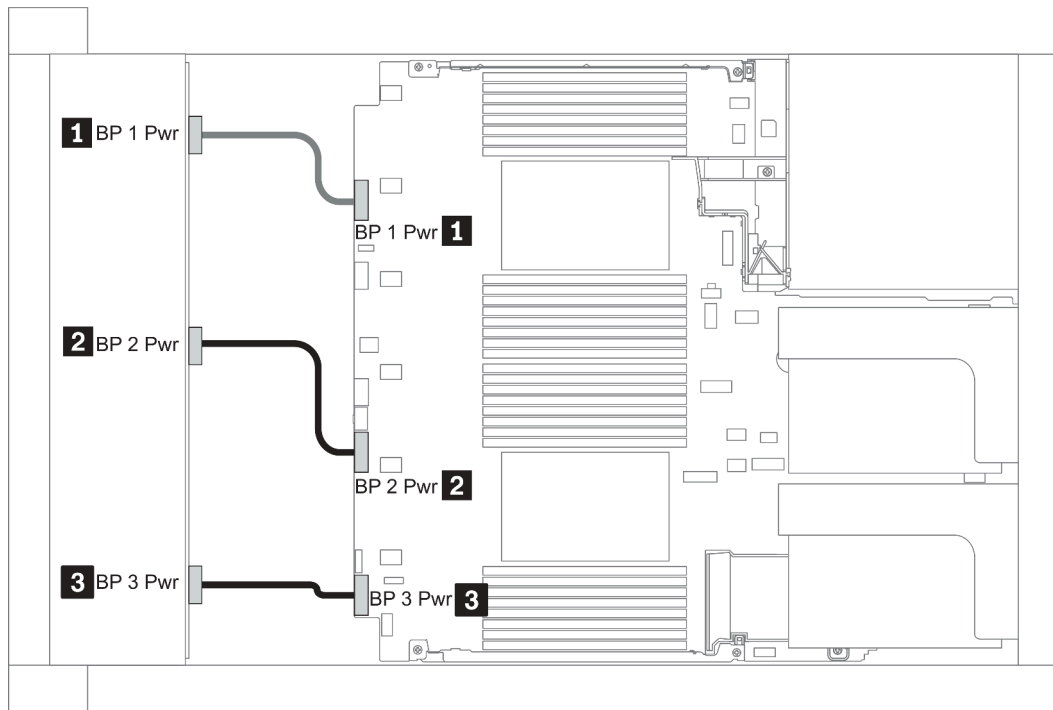


Figure 23. 2.5"

From	To
<b>1</b> Power connector on backplane 1	Front backplane 1 power connector on the system board
<b>2</b> Power connector on backplane 2	Front backplane 2 power connector on the system board
<b>3</b> Power connector on backplane 3	Front backplane 3 power connector on the system board

## Mid BP

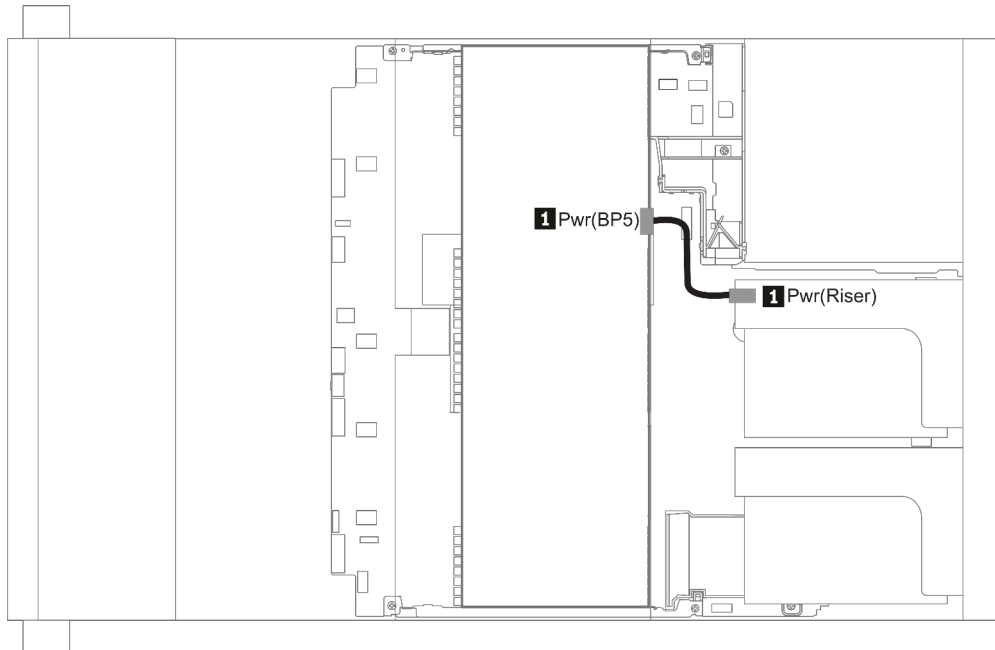


Figure 24. 3.5"

From	To
<b>1</b> Power connector on backplane 5	Power connector on riser 1 or 2 assembly

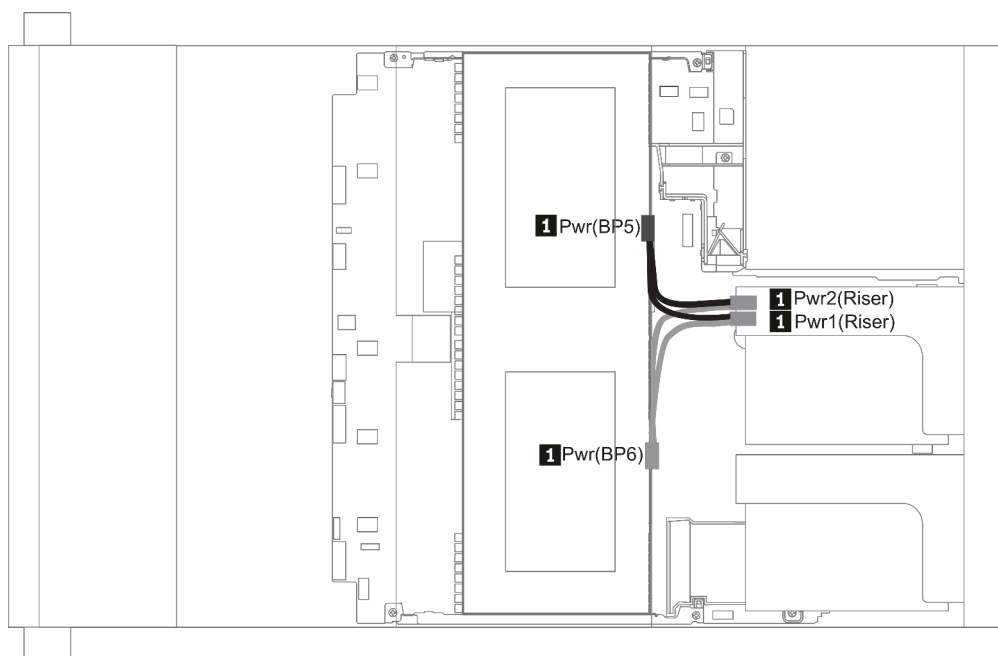


Figure 25. 2.5"

From	To
<b>1</b> Power connector on backplane 5 and backplane 6	Power connector 1 and power connector 2 on riser 1 or 2 assembly

## Rear BP

**Note:** The illustration shows the cable routing for the 4 x 2.5-inch rear drive backplane, routing for the other rear drive backplanes is similar.

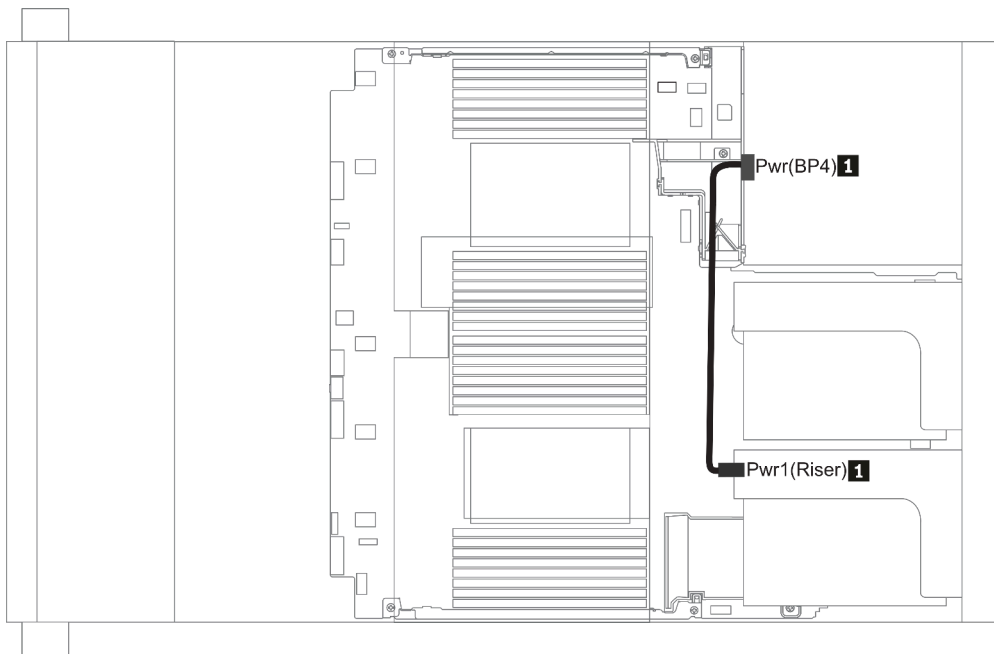


Figure 26. 2.5"/3.5"

From	To
<b>1</b> Power connector on backplane 4	Power connector on riser 1or 2 assembly

---

## 2.5-inch/3.5-inch drive backplane (signal)

Use the section to understand the cable routing for signal cable connections for 2.5-inch/3.5-inch drive backplanes.

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

### 3.5"

- [“8 x 3.5-inch front drive bays \(SAS/SATA\)” on page 133](#)
- [“12 x 3.5-inch front drive bays \(SAS/SATA\)” on page 134](#)
- [“12 x 3.5-inch front drive bays \(AnyBay\)” on page 139](#)

### 2.5"

- [“8 x 2.5-inch front drive bays \(SAS/SATA\)” on page 96](#)
- [“8 x 2.5-inch front drive bays \(AnyBay\)” on page 98](#)
- [“8 x 2.5-inch front drive bays \(NVMe\)” on page 100](#)
- [“16 x 2.5-inch front drive bays \(SAS/SATA\)” on page 101](#)
- [“16 x 2.5-inch front drive bays \(NVMe\)” on page 103](#)
- [“16 x 2.5-inch front drive bays \(AnyBay\)” on page 104](#)
- [“16 x 2.5-inch front drive bays \(8SAS+8AnyBay\)” on page 105](#)
- [“16 x 2.5-inch front drive bays \(8SAS/SATA+8NVMe\)” on page 107](#)
- [“16 x 2.5-inch front drive bays \(8AnyBay+8NVMe\)” on page 109](#)
- [“24 x 2.5-inch front drive bays \(8SAS/SATA+16NVMe\)” on page 111](#)
- [“24 x 2.5-inch front drive bays \(16SAS/SATA+8AnyBay\)” on page 113](#)
- [“24 x 2.5-inch front drive bays \(16SAS/SATA+8NVMe\)” on page 119](#)
- [“24 x 2.5-inch front drive bays \(SAS/SATA\)” on page 122](#)
- [“24 x 2.5-inch front drive bays \(NVMe\)” on page 129](#)
- [“8 x 3.5-inch front drive bays \(SAS/SATA\)” on page 133](#)
- [“12 x 3.5-inch front drive bays \(SAS/SATA\)” on page 134](#)
- [“12 x 3.5-inch front drive bays \(AnyBay\)” on page 139](#)

## 8 x 2.5-inch front drive bays (SAS/SATA)

This section provides cable routing information for the server model with 8 x 2.5-inch SAS/SATA front drive bays.

Configuration	Storage controller	
	Qty.	Type
Config. 1		
Config. 2	1	SFF 8i RAID/HBA
Config. 3	1	SFF 16i RAID/HBA
Config. 4	1	CFF 8i/16i RAID/HBA

### Configuration 1 – 4:

BP1: 8 x 2.5" SAS/SATA BP

Con-fig.	Front BP	System board	Storage controller		
			SFF 8i RAID/HBA	SFF 16i RAID/HBA	CFF 8i/16i RAID/HBA
1	BP 1: SAS	PCIe 1, PCIe 2			
2	BP 1: SAS		Gen 4: C 0 Gen3: C 0, C 1		
3	BP 1: SAS			Gen 4: C 0 Gen3: C 0, C 1	
4	SAS				C 0, C1
		<ul style="list-style-type: none"> <li>When two processors installed: PCIe 6</li> <li>When one processor installed: PCIe 3</li> </ul>			MB

## Example

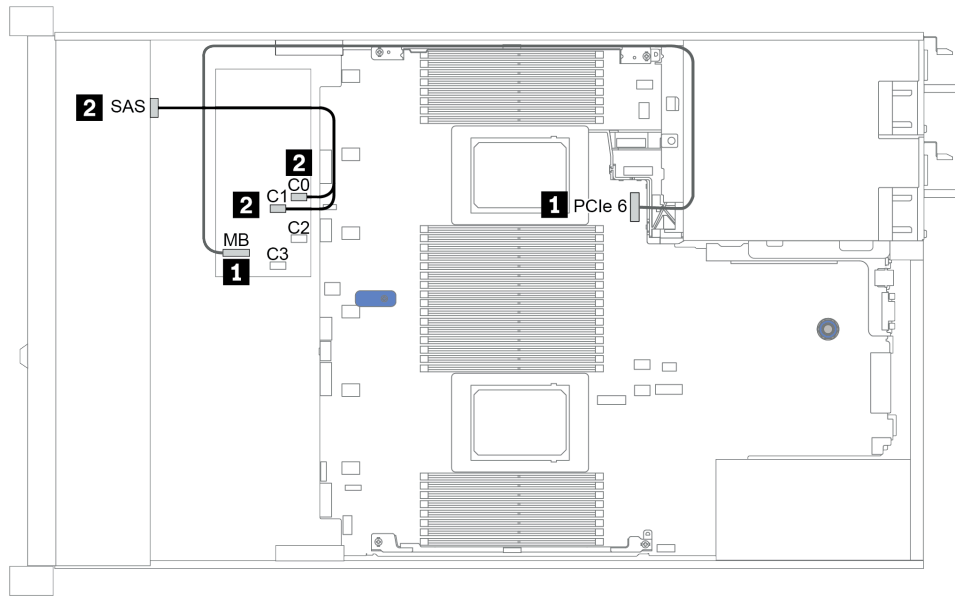


Figure 27. Configuration 4

## 8 x 2.5-inch front drive bays (AnyBay)

This section provides cable routing information for the server model with eight 2.5-inch front drive bays.

Configuration	Storage controllers	
	Qty.	Type
Config. 1	1	SFF 8i RAID/HBA
Config. 2	1	SFF 8i RAID (Tri-Mode)
Config. 3	1	SFF 16i RAID/HBA
Config. 4	1	SFF 16i RAID (Tri-Mode)
Config. 5	1	CFF 16i RAID/HBA
Config. 6	1	CFF 16i RAID (Tri-Mode)

### Configuration 1 – 6:

BP1: 8 x 2.5" AnyBay BP

Con- fig.	Front BP	System board	Storage controller			
			SFF 8i RAID/HBA	SFF 8i RAID (Tri-Mode)	SFF 16i RAID/HBA	SFF 16i RAID (Tri- Mode)
1	BP1:NVMe 0–1	PCIe 1, PCIe 2				
	BP1: NVMe 2–3	PCIe 3				
	BP1: NVMe 4–5	PCIe 7				
	BP1: NVMe 6–7	PCIe 8				
	BP1: SAS		Gen 4: C 0 Gen3: C 0, C 1			
2	BP1: SAS			C 0		
3	BP1:NVMe 0–1	PCIe 1, PCIe 2				
	BP1: NVMe 2–3	PCIe 3				
	BP1: NVMe 4–5	PCIe 7				
	BP1: NVMe 6–7	PCIe 8				
	BP1: SAS				Gen 4: C 0 Gen3: C 0, C 1	
4	BP1: SAS					C 0



Con- fig.	Front BP	System board	Storage controller	
			CFF 16i RAID/HBA	CFF 16i RAID (Tri-Mode)
5	BP1:NVMe 0-1	PCIe 1, PCIe 2		
	BP1: NVMe 2-3	PCIe 3		
	BP1: NVMe 4-5	PCIe 7		
	BP1: NVMe 6-7	PCIe 8		
	BP1: SAS		C 0, C 1	
		PCIe 6	MB	
6	BP1: SAS			C 0, C 1
		PCIe 6		MB

### Example

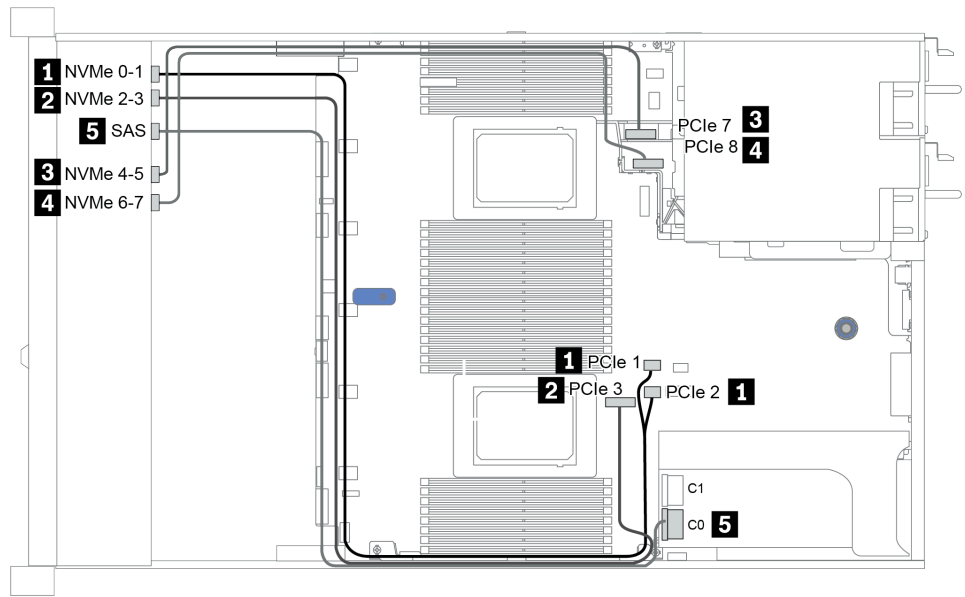


Figure 28. Configuration 3

## 8 x 2.5-inch front drive bays (NVMe)

This section provides cable routing information for the server model with eight 2.5-inch front drive bays.

**Note:** The AnyBay backplane (BP 1) is used as a pure NVMe backplane.

Configuration	Storage controller	
	Qty.	Type
Config. 1		
Config. 2	1	NVMe retimer

### Configuration 1 – 2:

BP1: 8 x 2.5" NVMe BP

Config.	Front BP	System board	Storage controller
			NVMe retimer
1	BP1: NVMe 0–1	PCIe 1, PCIe 2	
	BP1: NVMe 2–3	PCIe 3	
	BP1: NVMe 4–5	PCIe 7	
	BP1: NVMe 6–7	PCIe 8	
2	BP1: NVMe 0–1	PCIe 1, PCIe 2	
	BP1: NVMe 2–3	PCIe 3	
	BP 1: NVMe 4–5, NVMe 6–7		C0, C1

### Example

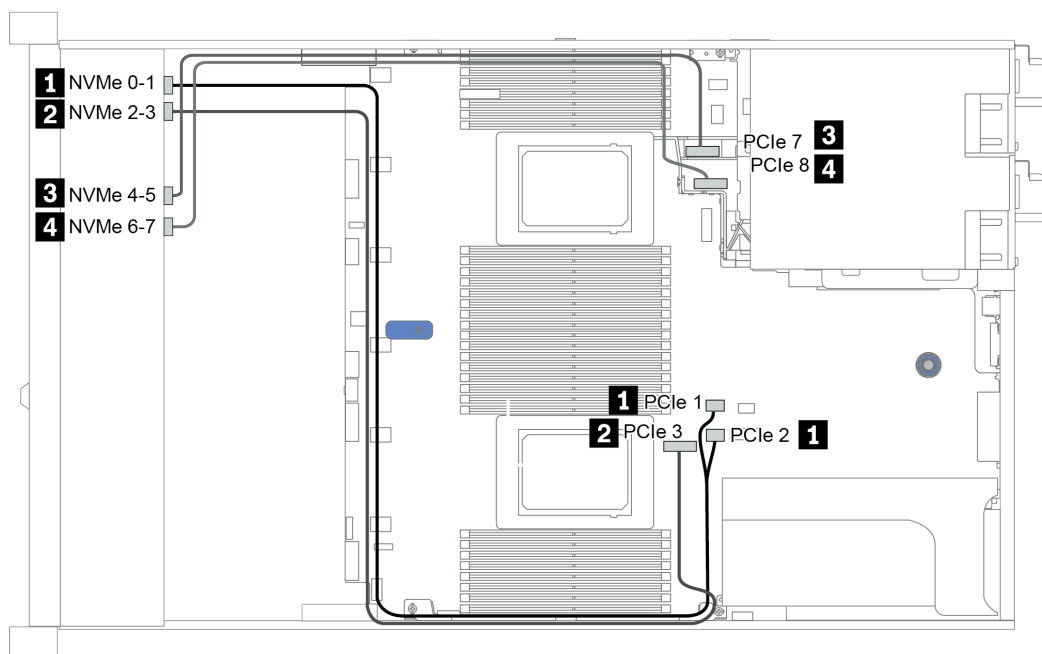


Figure 29. Configuration 2

## 16 x 2.5-inch front drive bays (SAS/SATA)

This section provides cable routing information for the server model with 16 x 2.5-inch SAS/SATA front drive bays.

Configuration	Storage controller	
	Qty.	Type
Config. 1		
Config. 2	2	SFF 8i RAID/HBA
Config. 3	1	SFF 16i RAID/HBA
Config. 4	1	CFF 16i RAID/HBA

### Configuration 1 – 4:

BP 1 + BP 2: 16 x 2.5" SAS/SATA

Con- fig.	Front BP	System board	Storage controller		
			SFF 8i RAID/HBA	SFF 16i RAID/HBA	CFF 16i RAID/HBA
1	BP 1: SAS	PCle 1, PCle 2			
	BP 2: SAS	PCle 4, PCle 5			
2	BP 1: SAS		Gen 4: C 0 Gen3: C 0, C 1		
	BP 2: SAS		Gen 4: C 0 Gen3: C 0, C 1		
3	BP 1: SAS,			Gen 4: C 0 Gen3: C 0, C 1	
	BP 2: SAS			Gen 4: C 1 Gen3: C 2, C 3	
4	BP 1: SAS				C 0, C1
	BP 2: SAS				C 2, C3
		<ul style="list-style-type: none"> <li>When two processors installed: PCle 6</li> <li>When one processor installed: PCle 3</li> </ul>			MB

## Example

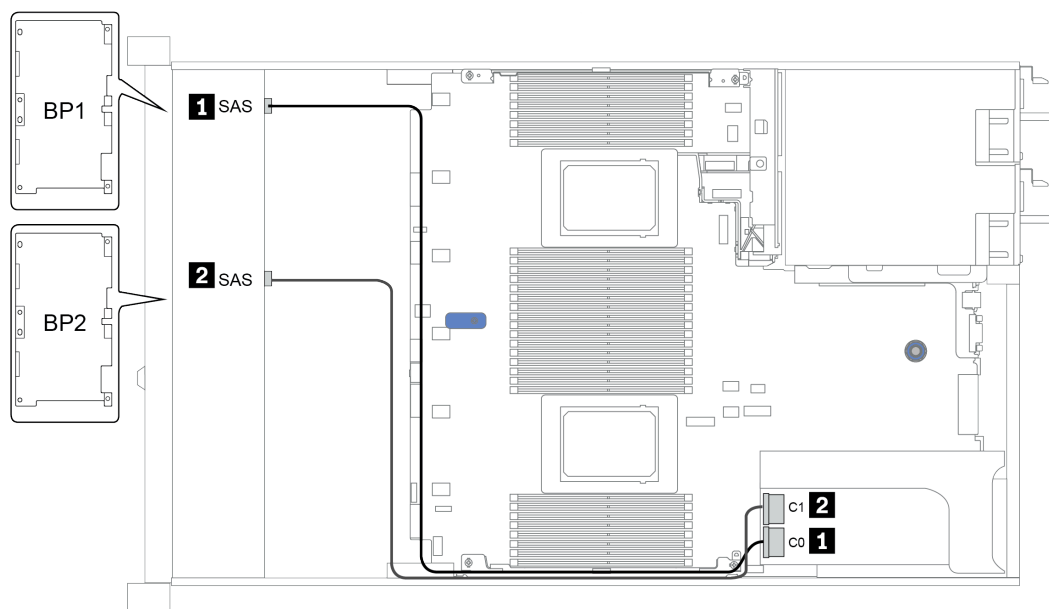


Figure 30. Configuration 3

## 16 x 2.5-inch front drive bays (NVMe)

This section provides cable routing information for the server model with 16 x 2.5-inch NVMe front drive bays.

**Note:** The two AnyBay backplanes are used as two pure NVMe backplanes.

Configuration	Storage controller	
	Qty.	Type
Config. 1	1	NVMe switch
Config. 2	1	NVMe retimer

### Configuration 1 – 2:

BP 1 + BP 2: 2 x 8 x 2.5" NVMe

Config.	Front BP	System board	Storage controller
			NVMe switch/retimer
1/2	BP 1: NVMe 0–1	PCIe 1, PCIe 2	
	BP 1: NVMe 2–3	PCIe 3	
	BP 1: NVMe 4–5, NVMe 6–7		C 0, C1
	BP 2: NVMe 0–1	PCIe 4, PCIe 5	
	BP 2: NVMe 2–3	PCIe 6	
	BP 2: NVMe 4–5	PCIe 7	
	BP 2: NVMe 6–7	PCIe 8	

### Example

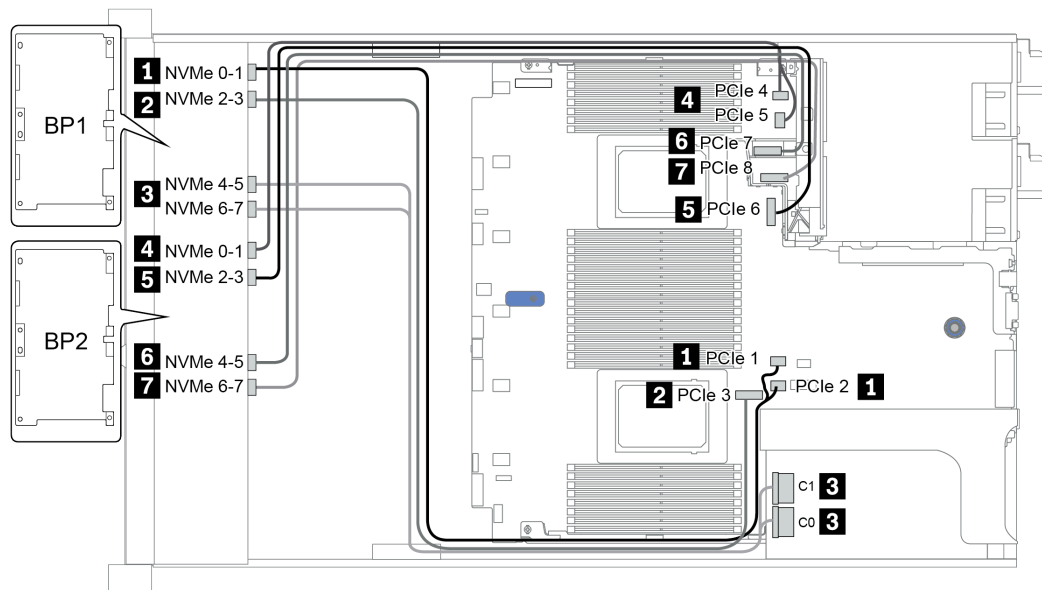


Figure 31. Configuration 1

## 16 x 2.5-inch front drive bays (AnyBay)

This section provides cable routing information for the server model with 16 x 2.5-inch AnyBay front drive bays.

Configuration	Storage controller	
	Qty.	Type
Config. 1	2	SFF 8i RAID (Tri-Mode)
Config. 2	1	SFF 16i RAID (Tri-Mode)
Config. 3	1	CFF 16i RAID (Tri-Mode)

### Configuration 1 – 3:

BP 1 + BP 2: 2 x 8 x 2.5" AnyBay

Config.	Front BP	System board	Storage controller		
			SFF 8i RAID (Tri-Mode)	SFF 16i RAID (Tri-Mode)	CFF 16i RAID (Tri-Mode)
1	BP 1: SAS		C 0		
	BP 2: SAS		C 0		
2	BP 1: SAS			C 0	
	BP 2: SAS			C 1	
3	BP 1: SAS				C 0
	BP 2: SAS				C 1
		PCIe 6			MB

### Example

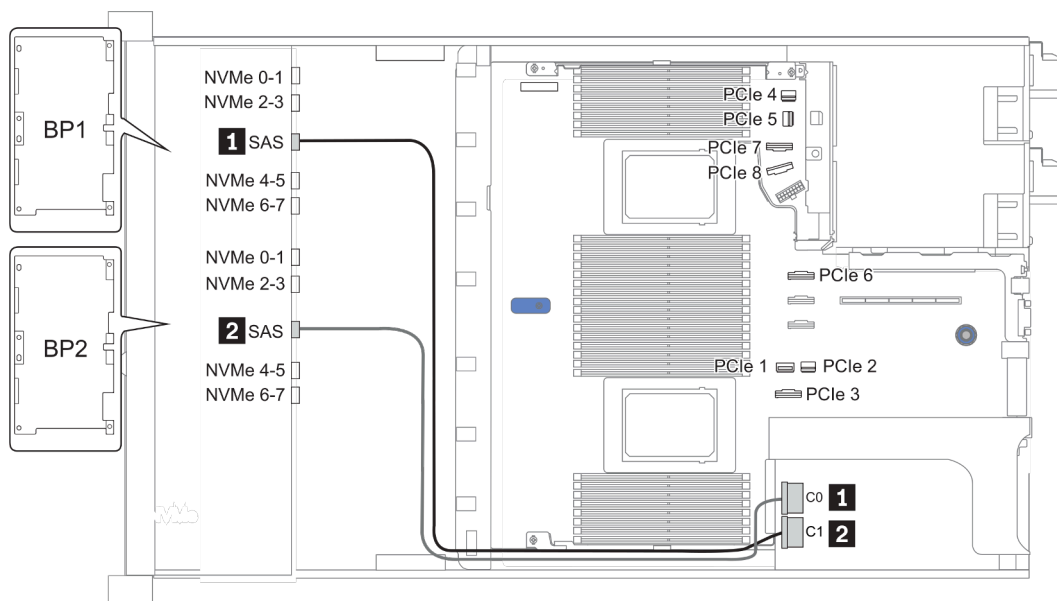


Figure 32. Configuration 2

## 16 x 2.5-inch front drive bays (8SAS+8AnyBay)

This section provides cable routing information for the server model with 16 x 2.5-inch front drive bays (8SAS+8AnyBay).

Configuration	Storage controller	
	Qty.	Type
Config. 1	2	SFF 8i RAID/HBA
Config. 2	1	SFF 16i RAID/HBA
Config. 3	1	CFF 16i RAID/HBA
Config. 4	1	SFF 32i RAID

### Configuration 1 – 4:

BP 1 + BP 2: 8 x 2.5" SAS/SATA BP + 8 x 2.5" AnyBay BP

- SFF 8i RAID/HBA
- SFF 16i RAID/HBA

Config.	Front BP	System board	Storage controller	
			SFF 8i RAID/HBA	SFF 16i RAID/HBA
1	BP 1: SAS		Gen 4: C 0 Gen3: C 0, C 1	
	BP 2: SAS		Gen 4: C 0 Gen3: C 0, C 1	
	BP 2: NVMe 0–1	PCIe 1, PCIe 2		
	BP 2: NVMe 2–3	PCIe 3		
	BP 2: NVMe 4–5	PCIe 7		
	BP 2: NVMe 6–7	PCIe 8		
2	BP 1: SAS			Gen 4: C 0 Gen3: C 0, C 1
	BP 2: SAS			Gen 4: C 1 Gen3: C 2, C 3
	BP 2: NVMe 0–1	PCIe 1, PCIe 2		
	BP 2: NVMe 2–3	PCIe 3		
	BP 2: NVMe 4–5	PCIe 7		
	BP 2: NVMe 6–7	PCIe 8		

BP 1 + BP 2: 8 x 2.5" SAS/SATA BP + 8 x 2.5" AnyBay BP

- CFF 16i RAID/HBA
- SFF 32i RAID/HBA

Con- fig.	Front BP	System board	Storage controller	
			CFF 16i RAID/HBA	SFF 32i RAID/HBA
3	BP 1: SAS		C 0, C 1	
	BP 2: SAS		C 2, C 3	
	BP 2: NVMe 0–1	PCIe 1, PCIe 2		
	BP 2: NVMe 2–3	PCIe 3		
	BP 2: NVMe 4–5	PCIe 7		
	BP 2: NVMe 6–7	PCIe 8		
4	BP 1: SAS			C 0
	BP 2: SAS			C 1
	BP 2: NVMe 0–1	PCIe 1, PCIe 2		
	BP 2: NVMe 2–3	PCIe 3		
	BP 2: NVMe 4–5	PCIe 7		
	BP 2: NVMe 6–7	PCIe 8		

## Example

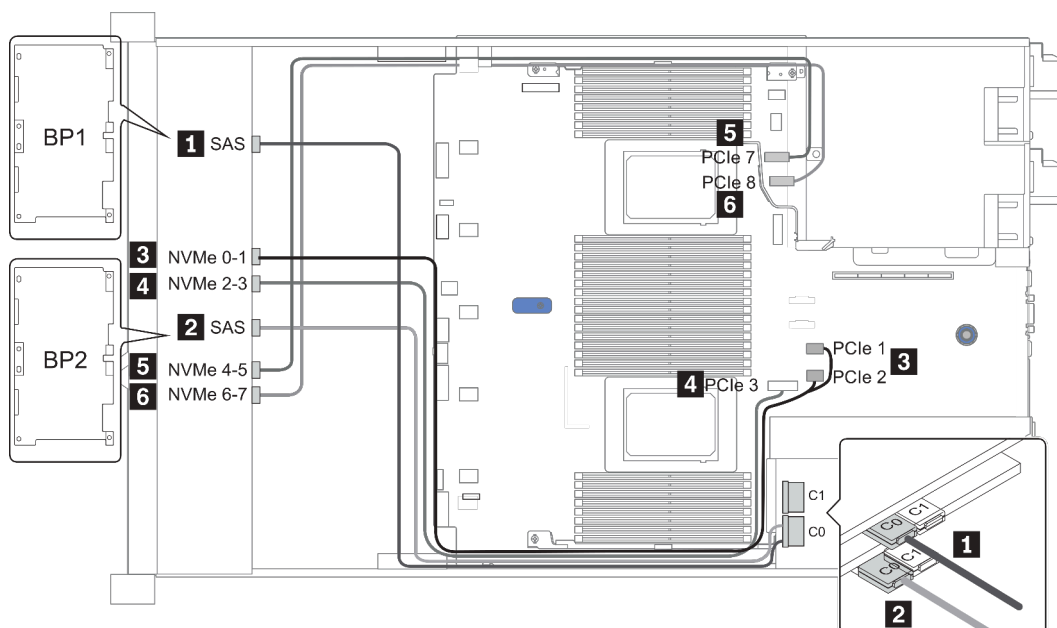


Figure 33. Configuration 1



## 16 x 2.5-inch front drive bays (8SAS/SATA+8NVMe)

This section provides cable routing information for the server model with 16 x 2.5-inch front drive bays (8SAS/SATA+8NVMe).

**Note:** The AnyBay backplane (BP2) is used as pure NVMe backplane.

Configuration	Storage controller	
	Qty.	Type
Config. 1		
Config. 2	2	SFF 8i RAID/HBA
Config. 3	1	SFF 16i RAID/HBA
Config. 4	1	CFF 16i RAID/HBA

### Configuration 1 – 4:

BP 1 + BP 2: 8 x 2.5" SAS/SATA BP + 8 x 2.5" NVMe BP

Con- fig.	Front BP	System board	Storage controller		
			SFF 8i RAID/HBA	SFF 16i RAID/ HBA	CFF 16i RAID/ HBA
1	BP 1: SAS	PCle 4, PCle 5			
	BP 2: NVMe 0–1	PCle 1, PCle 2			
	BP 2: NVMe 2–3	PCle 3			
	BP 2: NVMe 4–5	PCle 7			
	BP 2: NVMe 6–7	PCle 8			
2	BP 1: SAS		Gen 4: C 0 Gen3: C 0, C 1		
	BP 2: NVMe 0–1	PCle 1, PCle 2			
	BP 2: NVMe 2–3	PCle 3			
	BP 2: NVMe 4–5	PCle 7			
	BP 2: NVMe 6–7	PCle 8			
3	BP 1: SAS			Gen 4: C 0 Gen3: C 0, C 1	
	BP 2: NVMe 0–1	PCle 1, PCle 2			
	BP 2: NVMe 2–3	PCle 3			
	BP 2: NVMe 4–5	PCle 7			
	BP 2: NVMe 6–7	PCle 8			
4	BP 1: SAS				C 0, C 1
		PCle 6			MB
	BP 2: NVMe 0–1	PCle 1, PCle 2			
	BP 2: NVMe 2–3	PCle 3			

	BP 2: NVMe 4–5	PCIe 7			
	BP 2: NVMe 6–7	PCIe 8			

## Example

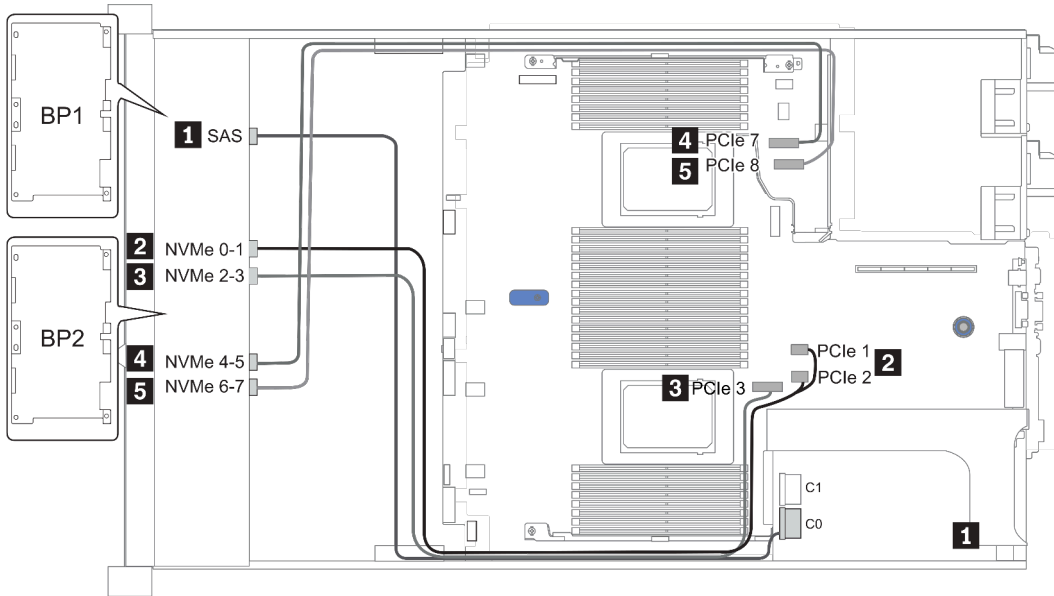


Figure 34. Configuration 3

## 16 x 2.5-inch front drive bays (8AnyBay+8NVMe)

This section provides cable routing information for the server model with 16 x 2.5-inch front drive bays (8AnyBay+8NVMe).

**Note:** The AnyBay backplane (BP2) is used as pure NVMe backplane.

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

### Configuration 1 – 2:

BP 1 + BP 2: 8 x 2.5" AnyBay BP + 8 x 2.5" NVMe BP

Con- fig.	Front BP	System board	Storage controller		
			NVMe switch	SFF 8i RAID/HBA	SFF 16i RAID/ HBA
1	BP 1: NVMe 0–1	PCle 1, PCle 2			
	BP 1: NVMe 2–3	PCle 3			
	BP 1: NVMe 4–5, NVMe 6–7		C 0, C 1		
	BP 1: SAS			Gen 4: C 0 Gen3: C 0, C 1	
	BP 2: NVMe 0–1	PCle 4, PCle 5			
	BP 2: NVMe 2–3	PCle 6			
	BP 2: NVMe 4–5	PCle 7			
	BP 2: NVMe 6–7	PCle 8			
2	BP 1: NVMe 0–1	PCle 1, PCle 2			
	BP 1: NVMe 2–3	PCle 3			
	BP 1: NVMe 4–5, NVMe 6–7		C 0, C 1		
	BP 1: SAS				Gen 4: C 0 Gen3: C 0, C 1
	BP 2: NVMe 0–1	PCle 4, PCle 5			
	BP 2: NVMe 2–3	PCle 6			
	BP 2: NVMe 4–5	PCle 7			
	BP 2: NVMe 6–7	PCle 8			

## Example

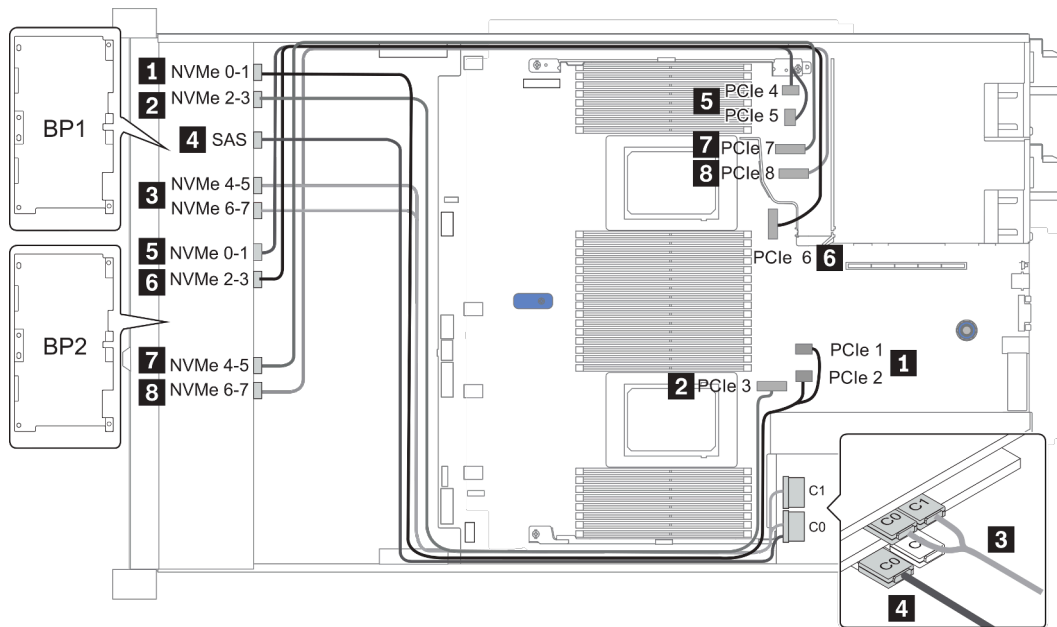


Figure 35. Configuration 2

## 24 x 2.5-inch front drive bays (8SAS/SATA+16NVMe)

This section provides cable routing information for the server model with 24 x 2.5-inch front drive bays (8SAS/SATA+16NVMe).

**Note:** The AnyBay backplanes (BP2 and BP3) are used as pure NVMe backplanes.

Configuration	Storage controller	
	Qty.	Type
Config. 1	2	NVMe switch +SFF 8i RAID/HBA
Config. 2	2	NVMe retimer +SFF 8i RAID/HBA
Config. 3	2	NVMe switch +SFF 16i RAID/HBA
Config. 4	2	NVMe retimer +SFF 16i RAID/HBA

### Configuration 1 – 4:

BP 1 + BP 2 + BP 3: 8 x 2.5" SAS/SATA backplane + 2 x 8 x 2.5" NVMe BP

Co- nfig.	Front BP	System board	Storage controller		
			NVMe switch/ retimer	SFF 8i RAID/HBA	SFF 16i RAID/ HBA
1/2	BP 1: SAS			Gen 4: C 0 Gen3: C 0, C 1	
	BP 2: NVMe 0–1	PCle 1, PCle 2			
	BP 2: NVMe 2–3	PCle 3			
	BP 2: NVMe 4–5, NVMe 6–7		C 0, C 1		
	BP3: NVMe 0–1	PCle 4, PCle 5			
	BP3: NVMe 2–3	PCle 6			
	BP3: NVMe 4–5	PCle 7			
	BP3: NVMe 6–7	PCle 8			
3/4	BP 1: SAS				Gen 4: C 0 Gen3: C 0, C 1
	BP 2: NVMe 0–1	PCle 1, PCle 2			
	BP 2: NVMe 2–3	PCle 3			
	BP 2: NVMe 4–5, NVMe 6–7		C 0, C 1		
	BP3: NVMe 0–1	PCle 4, PCle 5			
	BP3: NVMe 2–3	PCle 6			
	BP3: NVMe 4–5	PCle 7			
	BP3: NVMe 6–7	PCle 8			

## Example

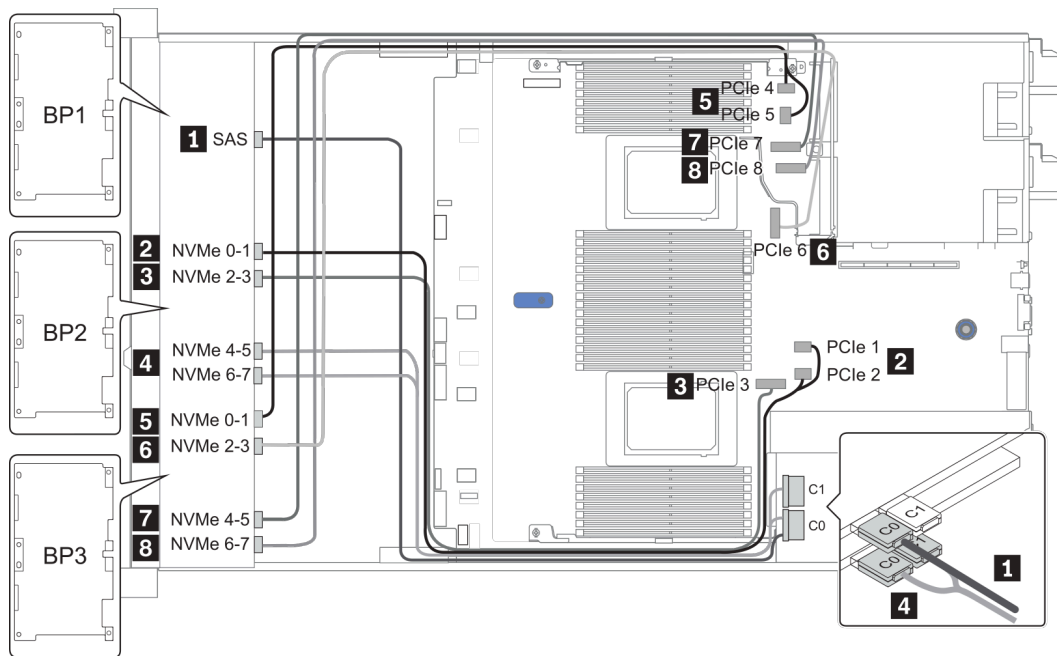


Figure 36. Configuration 3

## 24 x 2.5-inch front drive bays (16SAS/SATA+8AnyBay)

This section provides cable routing information for the server model with 24 x 2.5-inch front drive bays (16SAS/SATA+8AnyBay).

Configuration	Rear BP		Storage controller	
	Qty.	Type	Qty.	Type
Config. 1			2	CFF 16i RAID/HBA + CFF 48P RAID Expander
Config. 2			2	SFF 8i RAID/HBA +CFF 48P RAID Expander
Config. 3			3	SFF 8i RAID/HBA
Config. 4			1	SFF 32i RAID
Config. 5	1	Rear: 4 x 2.5" SAS/SATA	2	CFF 16i RAID/HBA + CFF 48P RAID Expander
Config. 6	1	Rear: 4 x 2.5" SAS/SATA	2	SFF 8i RAID/HBA + CFF 48P RAID Expander
Config. 7	1	Rear: 4 x 2.5" SAS/SATA	3	SFF 8i RAID/HBA
Config. 8	1	Rear: 4 x 2.5" SAS/SATA	1	SFF 32i RAID

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

- [Configuration 1 – 4: BP 1 + BP 2 + BP 3](#)
- [Configuration 5 – 8: BP 1 + BP 2 + BP 3 + BP 4](#)

### Configuration 1 – 4:

BP 1 + BP 2 + BP 3: 8 x 2.5" SAS/SATA BP + 8 x 2.5" SAS/SATA BP + 8 x 2.5" AnyBay BP

Con- fig.	Front BP	System board	Storage controller		
			CFF 48P RAID Expander	CFF 16i RAID/HBA	SFF 8i RAID/HBA
1	BP 1: SAS		C 0		
	BP 2: SAS		C 1		
	BP 3: SAS		C 2		
			RAID/HBA	C 0, C 1	
		PCIe 6		MB	
	BP 3: NVMe 0–1	PCIe 1, PCIe 2			
	BP 3: NVMe 2–3	PCIe 3			
	BP 3: NVMe 4–5	PCIe 7			
	BP3: NVMe 6–7	PCIe 8			
2	BP 1: SAS		C 0		
	BP 2: SAS		C 1		
	BP 3: SAS		C 2		
			RAID/HBA		Gen 4: C 0 Gen3: C 0, C 1
	BP 3: NVMe 0–1	PCIe 1, PCIe 2			
	BP 3: NVMe 2–3	PCIe 3			
	BP 3: NVMe 4–5	PCIe 7			
	BP3: NVMe 6–7	PCIe 8			



Config.	Front BP	System board	Storage controller	
			SFF 8i RAID/HBA	SFF 32i RAID
3	BP 1: SAS		Gen 4: C 0 Gen3: C 0, C 1	
	BP 2: SAS		Gen 4: C 0 Gen3: C 0, C 1	
	BP 3: SAS		Gen 4: C 0 Gen3: C 0, C 1	
	BP 3: NVMe 0–1	PCIe 1, PCIe 2		
	BP 3: NVMe 2–3	PCIe 3		
	BP 3: NVMe 4–5	PCIe 7		
	BP3: NVMe 6–7	PCIe 8		
4	BP 1: SAS			C 0
	BP 2: SAS			C 1
	BP 3: SAS			C 2
	BP 3: NVMe 0–1	PCIe 1, PCIe 2		
	BP 3: NVMe 2–3	PCIe 3		
	BP 3: NVMe 4–5	PCIe 7		
	BP3: NVMe 6–7	PCIe 8		

## Example

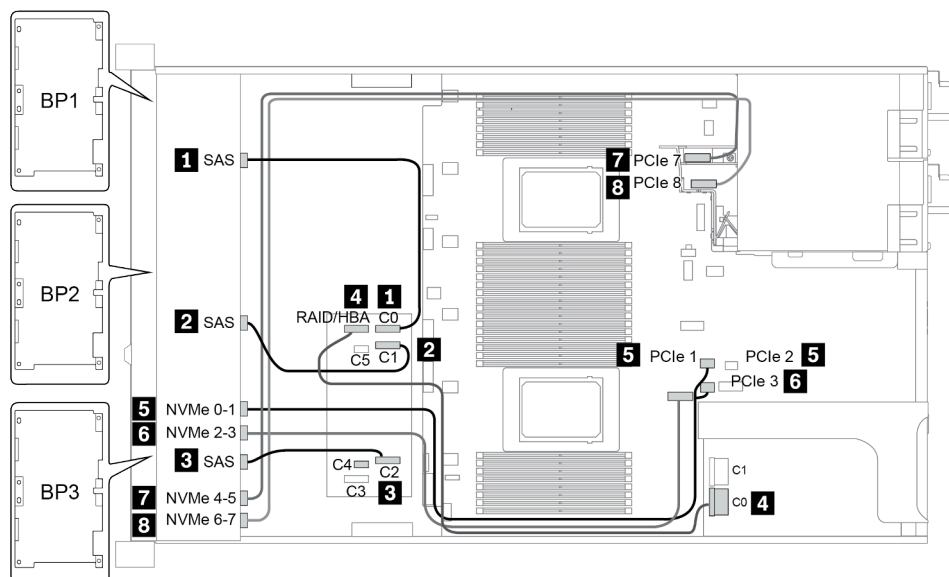


Figure 37. Configuration 2

### Configuration 5 – 8:

BP 1 + BP 2 + BP 3: 8 x 2.5" SAS/SATA BP + 8 x 2.5" SAS/SATA BP + 8 x 2.5" AnyBay BP

BP 4: 4 x 2.5" SAS/SATA BP

Co- nfi- g.	Front BP	Rear BP	System board	Storage controller		
				CFF 48P RAID Expander	CFF 16i RAID/HBA	SFF 8i RAID/HBA
5	BP 1: SAS			C 0		
	BP 2: SAS			C 1		
	BP 3: SAS			C 2		
				RAID/HBA	C 0/C 2, C 1/C 3	
			PCle 6		MB	
		BP 4: SAS		C 3		
	BP 3: NVMe 0–1		PCle 1, PCle 2			
	BP 3: NVMe 2–3		PCle 3			
	BP 3: NVMe 4–5		PCle 7			
	BP3: NVMe 6–7		PCle 8			
6	BP 1: SAS			C 0		
	BP 2: SAS			C 1		
	BP 3: SAS			C 2		
		BP 4: SAS		C 3		
				RAID/HBA		Gen 4: C 0 Gen3: C 0, C 1
	BP 3: NVMe 0–1		PCle 1, PCle 2			
	BP 3: NVMe 2–3		PCle 3			
	BP 3: NVMe 4–5		PCle 7			
	BP3: NVMe 6–7		PCle 8			

Co- nfi- g.	Front BP	Rear BP	System board	Storage controller	
				SFF 8i RAID/HBA	SFF 32i RAID
7	BP 1: SAS			<b>Slot 2:</b> Gen 4: C 0/C 1 Gen3: C 0	
	BP 2: SAS			<b>Slot 3:</b> Gen 4: C 0/C 1 Gen3: C 0	
	BP 3: SAS			<b>Slot 4:</b> Gen 4: C 0/C 2 Gen3: C 0/C 1	
		BP 4: SAS		<b>Slot 5: C 0</b>	
	BP 3: NVMe 0–1		PCle 1, PCle 2		
	BP 3: NVMe 2–3		PCle 3		
	BP 3: NVMe 4–5		PCle 7		
	BP3: NVMe 6–7		PCle 8		
8	BP 1: SAS				C 0
	BP 2: SAS				C 1
	BP 3: SAS				C 2
		BP 4: SAS			C 3
	BP 3: NVMe 0–1		PCle 1, PCle 2		
	BP 3: NVMe 2–3		PCle 3		
	BP 3: NVMe 4–5		PCle 7		
	BP3: NVMe 6–7		PCle 8		

## Example

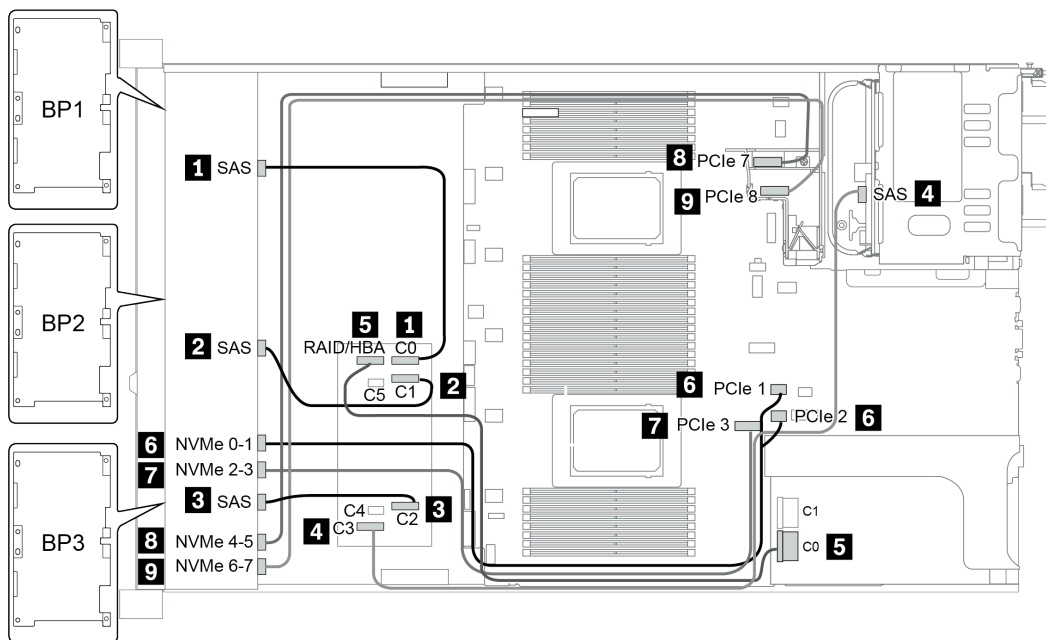


Figure 38. Configuration 5

## 24 x 2.5-inch front drive bays (16SAS/SATA+8NVMe)

This section provides cable routing information for the server model with 24 x 2.5-inch front drive bays (16SAS/SATA+8NVMe).

**Note:** The AnyBay backplane (BP3) is used as a pure NVMe backplane.

Configuration	Storage controller	
	Qty.	Type
Config. 1	2	SFF 8i RAID/HBA
Config. 2	1	SFF 16i RAID/HBA
Config. 3	1	CFF 16i RAID/HBA
Config. 4	1	SFF 32i RAID

#### Configuration 1 – 4:

BP 1 + BP 2 + BP 3: 8 x 2.5" SAS/SATA BP + 8 x 2.5" SAS/SATA BP + 8 x 2.5" pure NVMe BP

- SFF 8i RAID/HBA
- SFF 16i RAID/HBA

Co-nfig.	Front BP	System board	Storage controller	
			SFF 8i RAID/HBA	SFF 16i RAID/HBA
1	BP 1: SAS		Gen 4: C 0 Gen 3: C 0, C 1	
	BP 2: SAS		Gen 4: C 0 Gen3: C 0, C 1	
	BP 3: NVMe 0–1	PCle 1, PCle 2		
	BP 3: NVMe 2–3	PCle 3		
	BP 3: NVMe 4–5	PCle 7		
	BP3: NVMe 6–7	PCle 8		
2	BP 1: SAS			Gen 4: C 0 Gen3: C 0, C 1
	BP 2: SAS			Gen 4: C 1 Gen3: C 2, C 3
	BP 3: NVMe 0–1	PCle 1, PCle 2		
	BP 3: NVMe 2–3	PCle 3		
	BP 3: NVMe 4–5	PCle 7		
	BP3: NVMe 6–7	PCle 8		

- CFF 16i RAID/HBA
- SFF 32i RAID/HBA

Co-nfi-g.	Front BP	System board	Storage controller	
			CFF 16i RAID/HBA	SFF 32i RAID/HBA
3	BP 1/BP 2: SAS		C 0/C 2, C 1/C 3	
		PCle 6	MB	
	BP 3: NVMe 0–1	PCle 1, PCle 2		
	BP 3: NVMe 2–3	PCle 3		
	BP 3: NVMe 4–5	PCle 7		
	BP3: NVMe 6–7	PCle 8		
4	BP 1: SAS			C 0
	BP 2: SAS			C 1
	BP 3: NVMe 0–1	PCle 1, PCle 2		
	BP 3: NVMe 2–3	PCle 3		
	BP 3: NVMe 4–5	PCle 7		

	BP3: NVMe 6-7	PCIe 8		
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# **Example**

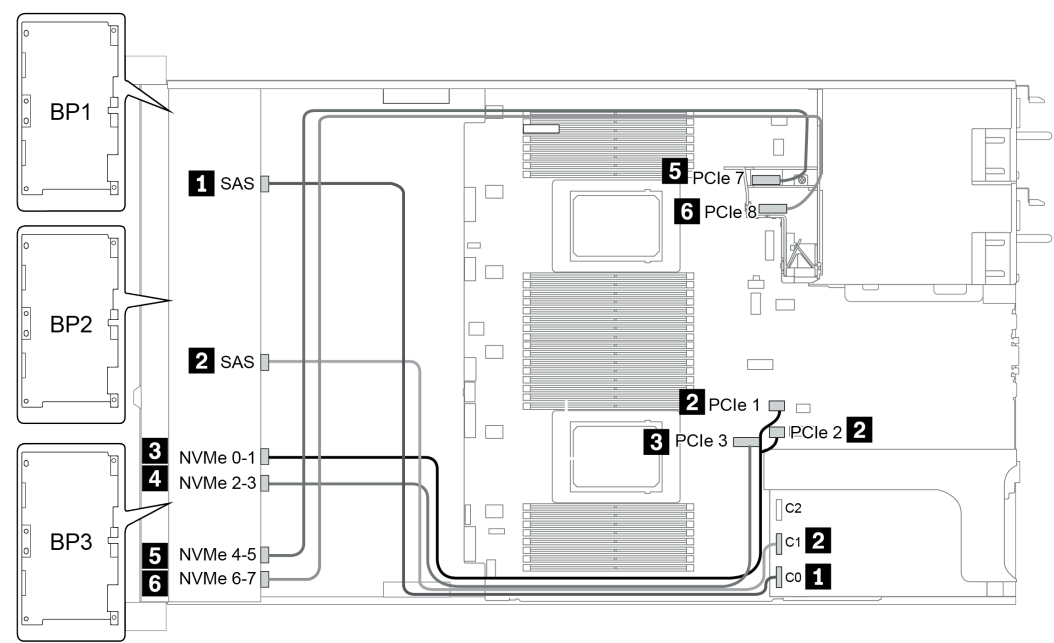


Figure 39. Configuration 4

## 24 x 2.5-inch front drive bays (SAS/SATA)

This section provides cable routing information for the server model with 24 x 2.5-inch front drive bays (SAS/SATA).

Configuration	Mid or Rear BP		Storage controller	
	Qty.	Type	Qty.	Type
Config. 1			2	CFF 8i/16i RAID/HBA + CFF 48P RAID Expander
Config. 2			2	SFF 8i RAID/HBA + CFF 48P RAID Expander
Config. 3			3	SFF 8i RAID/HBA
Config. 4			1	SFF 32i RAID
Config. 5	1	Rear: 4 x 2.5" SAS/SATA	2	CFF 8i/16i RAID/HBA + CFF 48P RAID Expander
Config. 6	1	Rear: 4 x 2.5" SAS/SATA	2	SFF 8i RAID/HBA + CFF 48P RAID Expander
Config. 7	1	Rear: 4 x 2.5" SAS/SATA	4	SFF 8i RAID/HBA
Config. 8	1	Rear: 4 x 2.5" SAS/SATA	1	SFF 32i RAID
Config. 9	3	Mid: 4 x 2.5" SAS/SATA Mid: 4 x 2.5" SAS/SATA Rear: 8 x 2.5" SAS/SATA	2	CFF 16i RAID/HBA + CFF 48P RAID Expander
Config. 10	3	Mid: 4 x 2.5" SAS/SATA Mid: 4 x 2.5" SAS/SATA Rear: 4 x 2.5" SAS/SATA	2	CFF 16i RAID/HBA + CFF 48P RAID Expander
Config. 11	3	Mid: 4 x 2.5" SAS/SATA Mid: 4 x 2.5" SAS/SATA Rear: 4 x 2.5" SAS/SATA	2	SFF 8i RAID/HBA + CFF 48P RAID Expander

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

- [Configuration 1 – 4: BP 1 + BP 2 + BP 3](#)
- [Configuration 5 – 8: BP 1 + BP 2 + BP 3 + BP4](#)
- [Configuration 9 – 11: BP 1 + BP 2 + BP 3 + BP4 + BP5](#)



### Configuration 1 – 4:

BP 1 + BP 2 + BP 3: 3 x 8 x 2.5-inch SAS/SATA BP

- CFF RAID expander + CFF 8i/16i RAID/HBA
- CFF RAID expander + SFF 8i RAID/HBA

Co-nfig.	Front BP	System board	Storage controller			
			CFF 48P RAID Expander	CFF 8i/16i RAID/HBA	SFF 8i RAID/HBA	SFF 32i RAID
1	BP 1: SAS		C 0			
	BP 2: SAS		C 1			
	BP 3: SAS		C 2			
			RAID/HBA	C 0, C 1		
		<ul style="list-style-type: none"> <li>• When two processors installed: PCIe 6</li> <li>• When one processor installed: PCIe 3</li> </ul>		MB		
2	BP 1: SAS		C 0			
	BP 2: SAS		C 1			
	BP 3: SAS		C 2			
			RAID/HBA		Gen 4: C 0 Gen 3: C 0/C 1	
3	BP 1: SAS				Gen 4: C 0 Gen 3: C 0/C 1	
	BP 2: SAS				Gen 4: C 0 Gen 3: C 0/C 1	
	BP 3: SAS				Gen 4: C 0/C 2 Gen 3: C 0/C 1	
4	BP 1: SAS					C 0
	BP 2: SAS					C 1
	BP 3: SAS					C 2

## Example

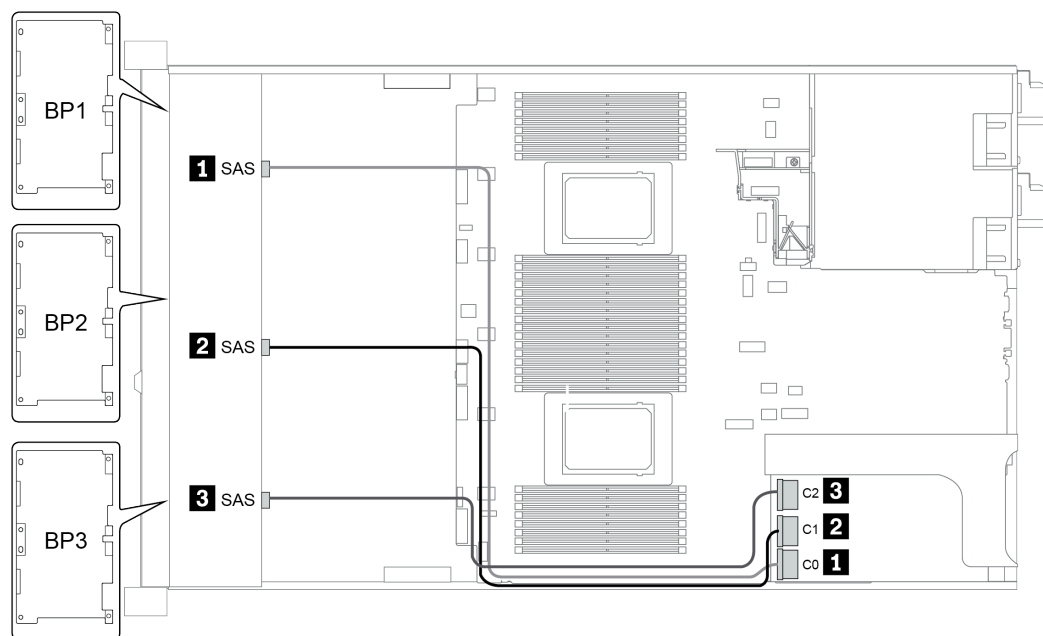


Figure 40. Configuration 4

### Configuration 5 – 8:

BP 1 + BP 2 + BP 3: 3 x 8 x 2.5-inch SAS/SATA BP

BP4: 4 x 2.5" SAS/SATA BP

Co- nfi- g.	Front BP	Rear BP	System board	Storage controller		
				CFF 48P RAID Expander	CFF 8i/16i RAID/HBA	SFF 8i RAID/ HBA
5	BP 1: SAS			C 0		
	BP 2: SAS			C 1		
	BP 3: SAS			C 2		
		BP 4: SAS		C 3		
			<ul style="list-style-type: none"> <li>When two processors installed: PCIe 6</li> <li>When one processor installed: PCIe 3</li> </ul>		MB	
				RAID/HBA	C 0, C 1	
6	BP 1: SAS			C 0		
	BP 2: SAS			C 1		
	BP 3: SAS			C 2		
		BP 4: SAS		C 3		
				RAID/HBA		Gen 4: C 0 Gen 3: C 0/C 1

Configura- tion option	Front BP	Rear BP	Storage controller	
			SFF 8i RAID/HBA	SFF 32i RAID
7	BP 1: SAS		<b>Slot 2:</b>  Gen 4: C 0  Gen 3: C 0/C 1	
	BP 2: SAS		<b>Slot 3:</b>  Gen 4: C 0  Gen 3: C 0/C 1	
	BP 3: SAS		<b>Slot 5:</b>  Gen 4: C 0/C 2  Gen 3: C 0/C 1	

		BP 4: SAS	<b>Slot 6:</b> Gen 4: C 0 Gen 3: C 0/C 1	
8	BP 1: SAS			C 0
	BP 2: SAS			C 1
	BP 3: SAS			C 2
		BP 4: SAS		C 3

**Example**

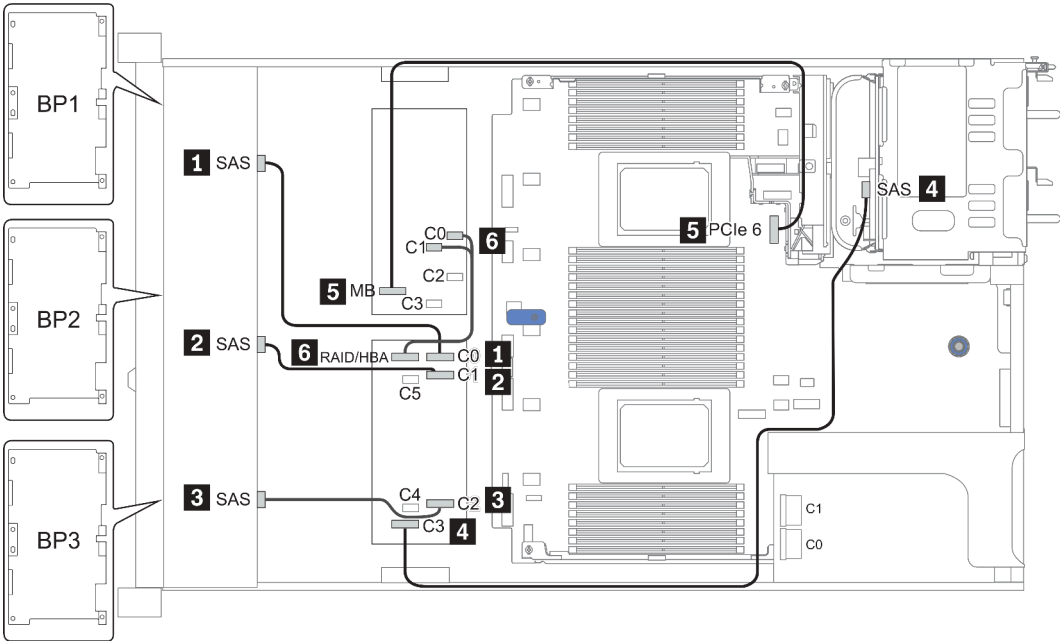


Figure 41. Configuration 5

### Configuration 9 – 11:

BP 1 + BP 2 + BP 3: 3 x 8 x 2.5-inch SAS/SATA BP

BP 4: 8 x 2.5" SAS/SATA BP

BP 5 + BP 6: 2 x 4 x 2.5" SAS/SATA BP

Config.	Front BP	Mid/Rear BP	System board	Storage controller	
				CFF 48P RAID Expander	CFF 16i RAID/HBA
9	BP 1: SAS			C 0	
	BP 2: SAS			C 1	
	BP 3: SAS			C 2	
		BP 4: SAS 0			C 2
		BP 4: SAS 1			C 3
		BP5: SAS, SAS		C 3	
			PCIe 6		MB
				RAID/HBA	C 0, C 1

Con- fig.	Front BP	Mid/Rear BP	Sys- tem board	Storage controller		
				CFF 48P RAID Expander	CFF 16i RAID/HBA	SFF 8i RAID/HBA
10	BP 1: SAS			C 0		
	BP 2: SAS			C 1		
	BP 3: SAS			C 2		
		BP 4: SAS, BP 5: SAS		C 3		
		BP 6: SAS		C 4		
				RAID/HBA	C 0, C 1	
			PCIe 6		MB	
11	BP 1: SAS			C 0		
	BP 2: SAS			C 1		
	BP 3: SAS			C 2		
		BP 4: SAS, BP 5: SAS		C 3		
		BP 6: SAS		C 4		
				RAID/HBA		Gen 4: C 0 Gen 3: C 0/C 1

## Example

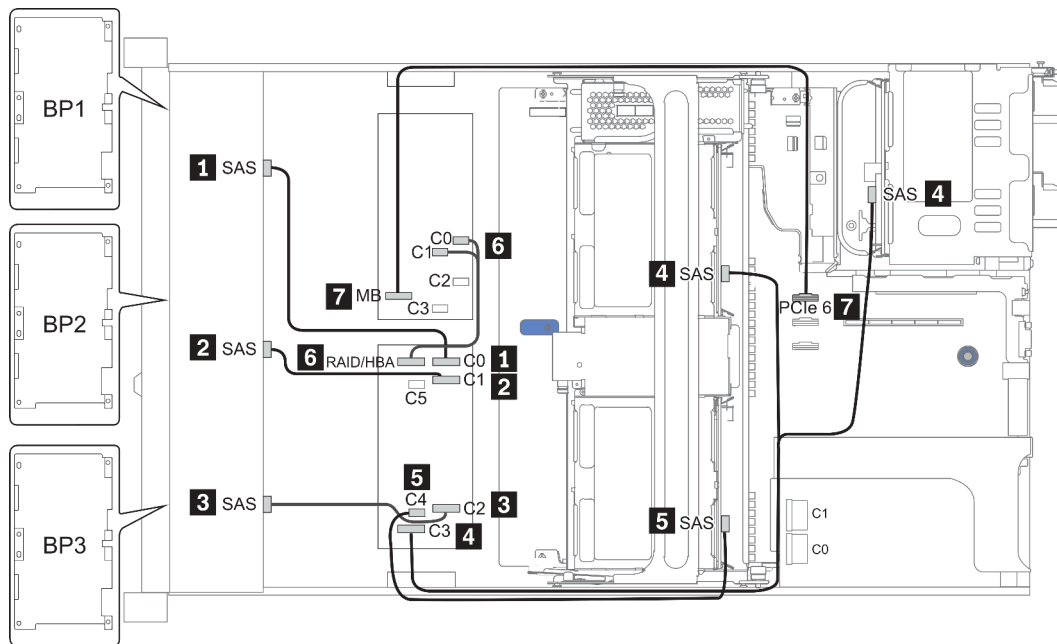


Figure 42. Configuration 10

## 24 x 2.5-inch front drive bays (NVMe)

This section provides cable routing information for the server model with 24 x 2.5-inch front drive bays (NVMe).

**Note:** The AnyBay backplanes are used as pure NVMe backplanes.

Configuration	Mid or Rear BP		Storage controller	
	Qty.	Type	Qty.	Type
Config. 1			3	NVMe switch
Config. 2			4	NVMe retimer
Config. 3	2	Mid: 4 x 2.5" NVMe	4	NVMe switch

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

- [Configuration 1 – 2: BP 1 + BP 2 + BP 3](#)
- [Configuration 3: BP 1 + BP 2 + BP 3 +BP 5 + BP 6](#)

## Configuration 1 – 2:

BP 1 + BP 2 + BP 3: 3 x 8 x 2.5-inch NVMe BP

Con- fig.	Front BP	System board	Storage controller	
			NVMe switch	NVMe retimer
1	BP1: NVMe 0–1		<b>Slot 1</b> C 0, C 1, C3, C4	
	BP1: NVMe 2–3			
	BP1: NVMe 4–5			
	BP1: NVMe 6–7			
	BP2: NVMe 0–1		<b>Slot 2</b> C 0, C 1, C3, C4	
	BP2: NVMe 2–3			
	BP2: NVMe 4–5			
	BP2: NVMe 6–7			
	BP3: NVMe 0–1		<b>Slot 4</b> C 0, C 1, C3, C4	
	BP3: NVMe 2–3			
	BP3: NVMe 4–5			
	BP3: NVMe 6–7			
2	BP1: NVMe 0–1	PCIe 1, PCIe 2		
	BP1: NVMe 2–3	PCIe 3		
	BP1: NVMe 4–5, NVMe 6–7			<b>Slot 1</b> C 0, C 1
	BP2: NVMe 0–1, NVMe 2–3			<b>Slot 2</b> C 0, C 1
	BP2: NVMe 4–5, NVMe 6–7			<b>Slot 5</b> C 0, C 1
	BP3: NVMe 0–1	PCIe 7		
	BP3: NVMe 2–3	PCIe 8		
	BP3: NVMe 4–5, NVMe 6–7			<b>Slot 4</b> C 0, C 1



## Example

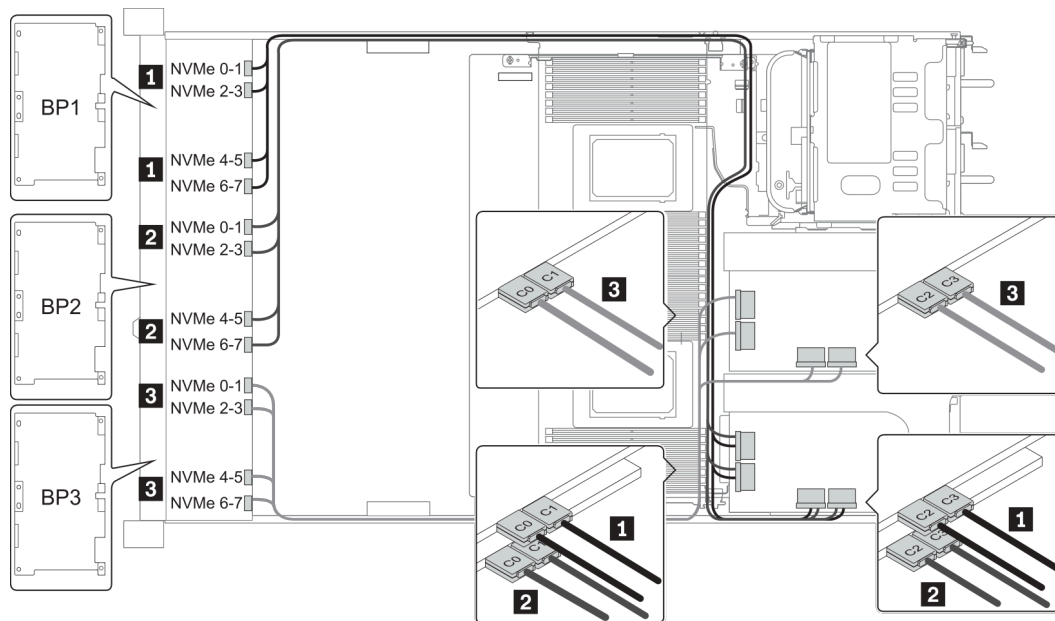


Figure 43. Configuration 1

### Configuration 3:

BP 1 + BP 2 + BP 3: 3 x 8 x 2.5-inch NVMe BP

BP 5+BP 6: 2 x 4 x 2.5" NVMe BP

Co-nfig.	Front BP	Mid BP	Storage controller
			NVMe switch
3	BP 1: NVMe 0-1, NVMe 2-3 NVMe 4-5, NVMe 6-7		<b>Slot 1</b> C 0, C 1, C 2, C 3
	BP 2: NVMe 0-1, NVMe 2-3 NVMe 4-5, NVMe 6-7		<b>Slot 2</b> C 0, C 1, C 2, C 3
	BP 3: NVMe 0-1, NVMe 2-3 NVMe 4-5, NVMe 6-7		<b>Slot 4</b> C 0, C 1, C 2, C 3
		BP 5: NVMe 0-1, NVMe 2-3 BP 6: NVMe 0-1, NVMe 2-3	<b>Slot 5</b> C 0, C 1, C 2, C 3

### Example

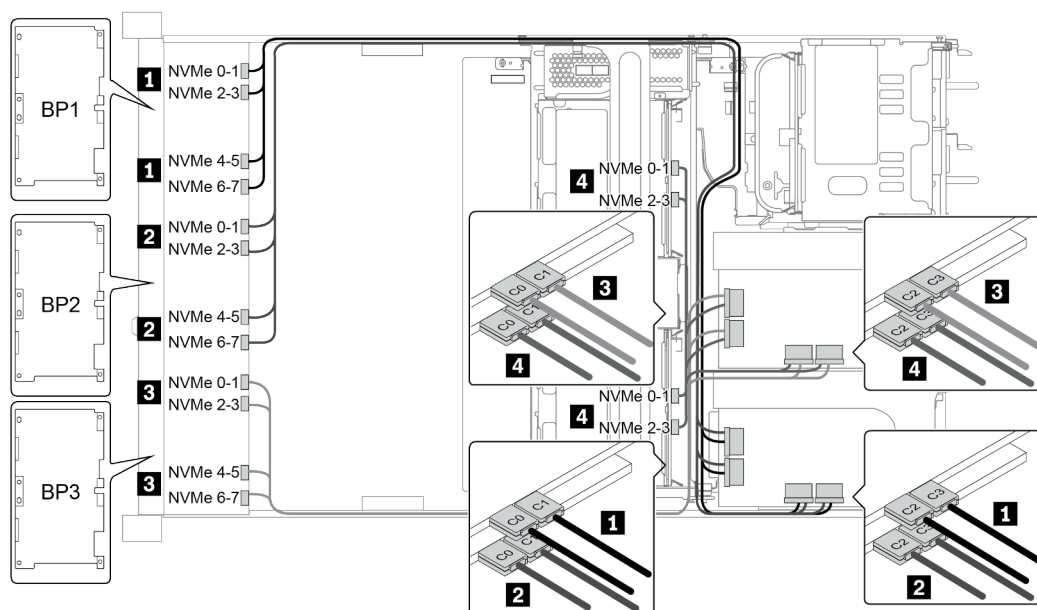


Figure 44. Configuration 3

## 8 x 3.5-inch front drive bays (SAS/SATA)

This section provides cable routing information for the server model with 8 x 2.5-inch SAS/SATA front drive bays.

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

### Configuration 1 – 2:

BP1: 8 x 3.5-inch SAS/SATA BP

Con-fig.	Front BP	System board	Storage controller
			SFF 16i RAID/HBA
1	SAS 0	PCIe 1	
	SAS 1	PCIe 2	
2	SAS 0, SAS 1		Gen 4: C 0 Gen3: C 0, C 1

### Example

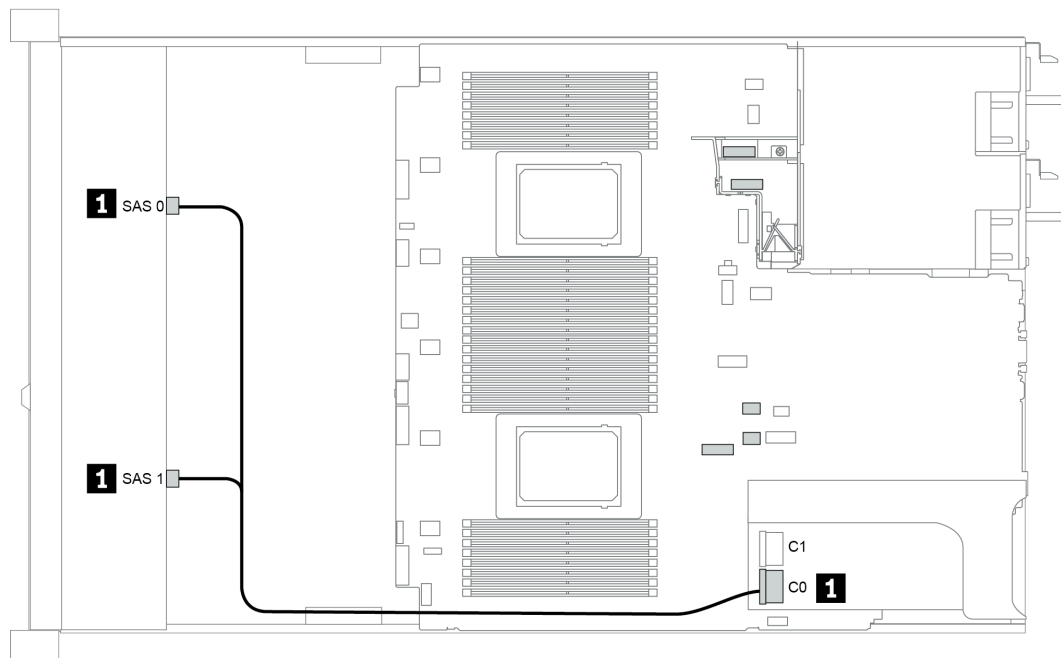


Figure 45. Configuration 2

## 12 x 3.5-inch front drive bays (SAS/SATA)

This section provides cable routing information for the server model with 12 x 3.5-inch SAS/SATA front drive bays.

Configuration	Mid/Rear BP		Storage controller	
	Qty.	Type	Qty.	Type
Config. 1				
Config. 2			1	SFF 16i RAID/HBA
Config. 3	2	Mid: 4 x 2.5" NVMe	1	SFF 16i RAID/HBA
Config. 4	1	Rear: 2 x 3.5" SAS/SATA	1	SFF 16i RAID/HBA
Config. 5	1	Rear: 2 x 3.5" SAS/SATA	2	SFF 8i HBA + SFF 16i RAID/HBA
Config. 6	1	Rear: 4 x 3.5" SAS/SATA	1	SFF 16i RAID/HBA
Config. 7	1	Rear: 4 x 3.5" SAS/SATA	2	SFF 8i HBA + SFF 16i RAID/HBA
Config. 8	1	Rear: 4 x 2.5" SAS/SATA	1	SFF 16i RAID/HBA
Config. 9	1	Rear: 4 x 2.5" SAS/SATA	2	SFF 8i HBA + SFF 16i RAID/HBA
Config. 10	2	Mid: 4 x 3.5" SAS/SATA Rear: 4 x 3.5" SAS/SATA	1	SFF 8i HBA
Config. 11	2	Mid: 4 x 3.5" SAS/SATA Rear: 4 x 3.5" SAS/SATA	1	SFF 32i RAID
Config. 12	2	Mid: 4 x 3.5" SAS/SATA Rear: 4 x 2.5" SAS/SATA	1	SFF 8i HBA
Config. 13	2	Mid: 4 x 3.5" SAS/SATA Rear: 4 x 2.5" SAS/SATA	1	SFF 32i RAID

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

- [“Configuration 1 – 2: BP 1” on page 135](#)
- [“Configuration 3: BP 1 + BP 5” on page 136](#)
- [“Configuration 4 – 11: BP 1 + BP 4” on page 137](#)
- [“Configuration 12 – 13: BP1 + BP 4 + BP 5” on page 138](#)

## Configuration 1 – 2:

BP 1: 12 x 3.5" SAS/SATA BP

Con- fig.	Front BP	System board	Storage controller	
			SFF 16i RAID/HBA	SFF 16i RAID (Tri-Mode)
1	SAS 0	PCle 1		
	SAS 1	PCle 2		
2	SAS 0, SAS 1		Gen 4: C 0 Gen3: C 0/ C 1	
	SAS 2		Gen 4: C 1 Gen3: C 2/ C 3	

## Example

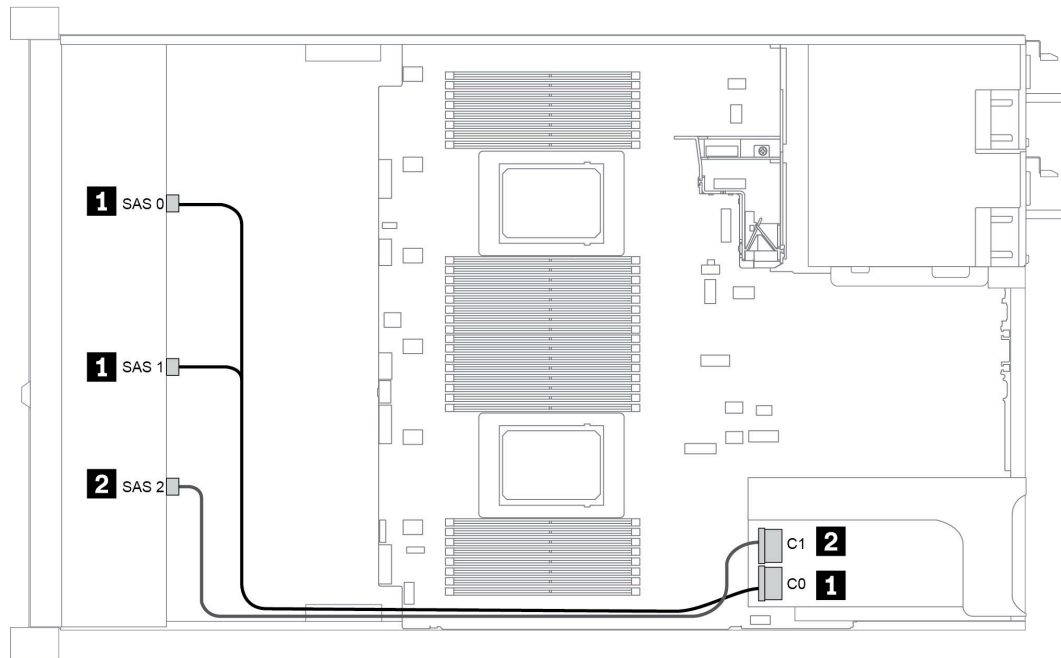


Figure 46. Configuration 2

### Configuration 3:

BP 1: 12 x 3.5" SAS/SATA BP

BP 5 + BP 6: 2 x 4 x 2.5" NVMe BP

Con- fig.	Front BP	Mid BP	System board	Storage controller
				SFF 16i RAID/HBA
3	SAS 0, SAS 1			Gen 4: C 0 Gen3: C 0/ C 1
	SAS 2			C 1
		BP 5: NVMe 0-1	PCle 1, PCle 2	
		BP 5: NVMe 2-3	PCle 3	
		BP 6: NVMe 0-1	PCle 7	
		BP 6: NVMe 2-3	PCle 8	

### Example

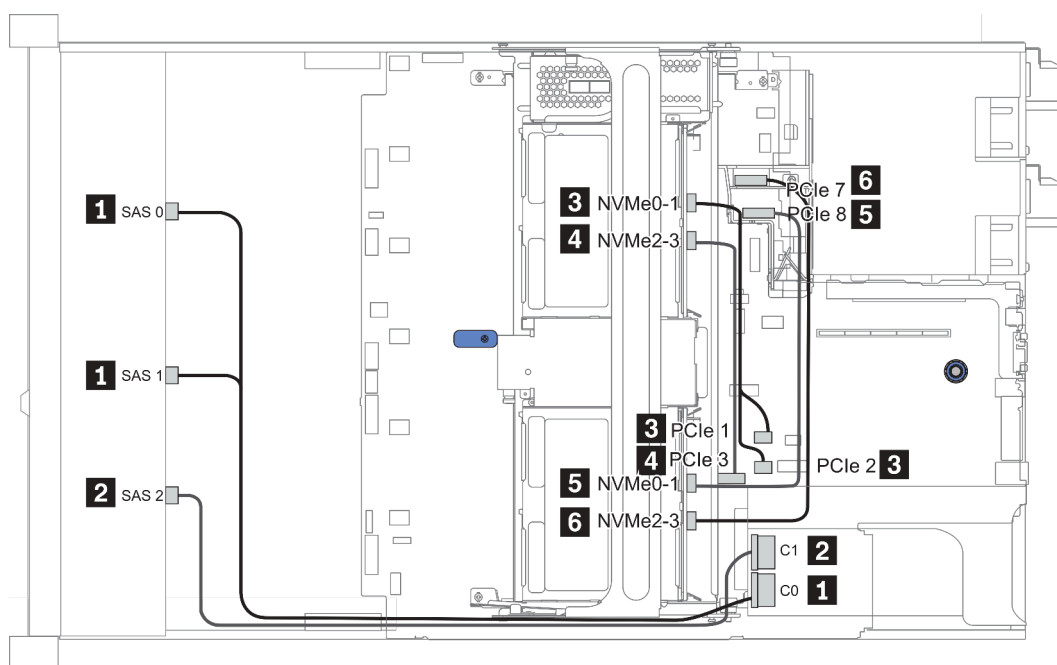


Figure 47. Configuration 3

### Configuration 4 – 9:

BP 1: 12 x 3.5" SAS/SATA BP

BP 4: 4 x 2.5" SAS/SATA BP/ 2 x 3.5" SAS/SATA BP/ 4 x 3.5" SAS/SATA BP

Config.	Front BP	Rear BP	Storage controller	
			SFF 16i RAID/HBA	SFF 8i RAID
4/6/8	SAS 0, SAS 1		Gen 4: C 0 Gen3: C 0/C 1	
	SAS 2	BP 4: SAS	Gen 4: C 1 Gen3: C 2/C 3	
5/7/9	SAS 0, SAS 1		Gen 4: C 0 Gen3: C 0/C 1	
	SAS 2		Gen 4: C 1 Gen3: C 2	
		BP 4: SAS		Gen 4: C 0 Gen3: C 0

### Example

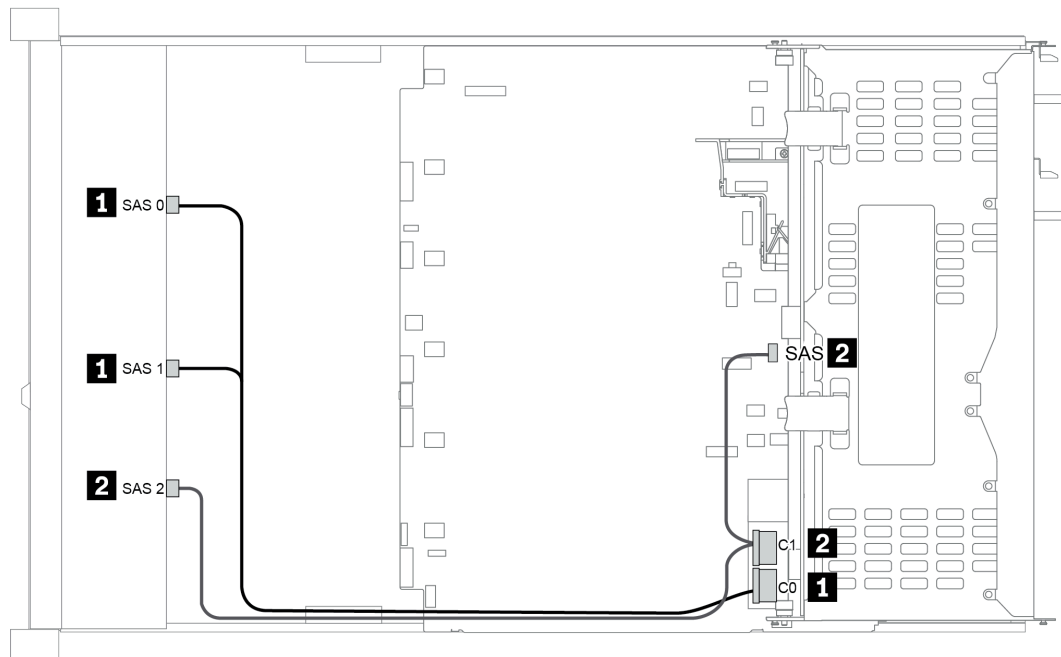


Figure 48. Configuration 6

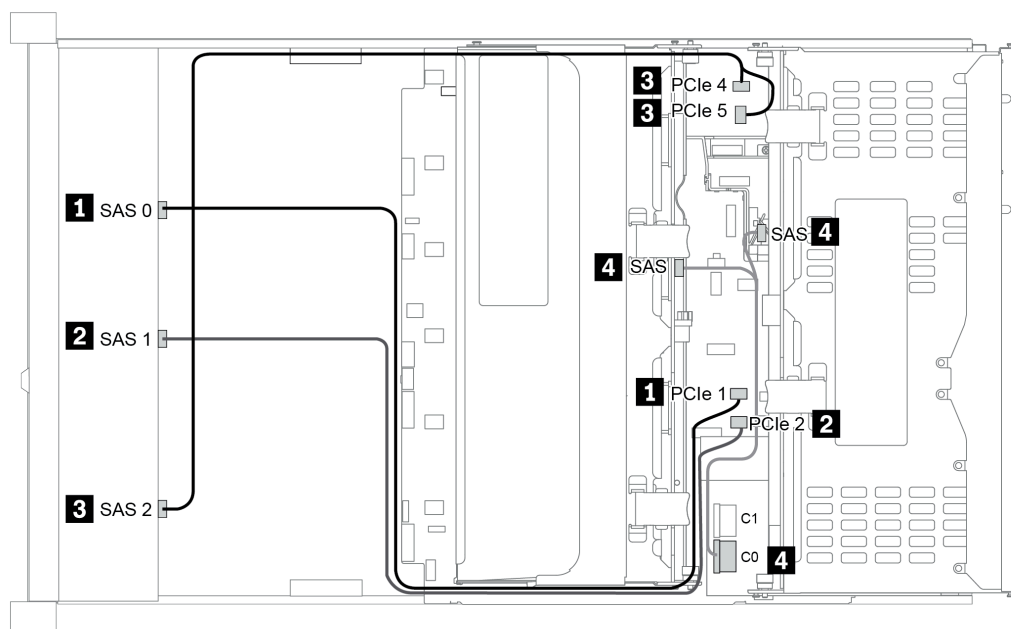
**Configuration 10 – 13:**

BP 1: 12 x 3.5" SAS/SATA BP

BP 4: 4 x 2.5" SAS/SATA BP/ 4 x 3.5" SAS/SATA BP

BP 5: 4 x 3.5" SAS/SATA BP

Co-nfig.	Front BP	Mid/Rear BP	System board	Storage controller	
				SFF 8i HBA	SFF 32i RAID
10/ 12	SAS 0		PCle 1		
	SAS 1		PCle 2		
	SAS 2		PCle 4, PCle 5		
		BP 4: SAS BP 5: SAS		Gen 4: C 0 Gen3: C 0/C 1	
11/ 13	SAS 0, SAS 1				C 0
	SAS 2	BP 4: SAS			C 1
		BP 5: SAS			C 2

**Example***Figure 49. Configuration 10*



## 12 x 3.5-inch front drive bays (AnyBay)

This section provides cable routing information for the server model with 12 x 3.5-inch AnyBay front drive bays.

Configuration	Mid/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	Rear: 4 x 3.5" SAS/SATA	1	SFF 16i RAID/HBA
Config. 4	1	Rear: 4 x 3.5" SAS/SATA	2	SFF 8i HBA + SFF 16i RAID/HBA
Config. 5	2	Mid: 4 x 3.5" SAS/SATA Rear: 4 x 3.5" SAS/SATA	1	SFF 32i RAID

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

- [“Configuration 1 – 2: BP 1” on page 140](#)
- [“Configuration 3 – 4: BP 1 + BP 4” on page 141](#)
- [“Configuration 5: BP 1 + BP 4 + BP 5” on page 142](#)

**Configuration 1 – 2:**

BP 1: 12 x 3.5" AnyBay BP

Con- fig.	Front BP	System board	Storage controller
			SFF 16i RAID/HBA
1	NVMe 0–1	PCIe 1, PCIe 2	
	NVMe 2–3	PCIe 3	
	NVMe 4–5	PCIe 4, PCIe 5	
	NVMe 6–7	PCIe 6	
	NVMe 8–9	PCIe 7	
	NVMe 10–11	PCIe 8	
	SAS 0, SAS 1		Gen 4: C 0 Gen3: C 0/ C 1
	SAS 2		C 1
2	SAS 0, SAS 1		Gen 4: C 0 Gen3: C 0/ C 1
	SAS 2		Gen 4: C 1 Gen3: C 2/ C 3

**Configuration 3 – 4:**

BP 1: 12 x 3.5" AnyBay BP

BP 4: 4 x 3.5" SAS/SATA BP

Co- nfig.	Front BP	Rear BP	System board	Storage controller	
				SFF 16i RAID/HBA	SFF 8i RAID
3	NVMe 0–1		PCIe 1, PCIe 2		
	NVMe 2–3		PCIe 3		
	NVMe 4–5		PCIe 4, PCIe 5		
	NVMe 6–7		PCIe 6		
	NVMe 8–9		PCIe 7		
	NVMe 10–11		PCIe 8		
	SAS 0, SAS 1			Gen 4: C 0 Gen3: C 0/ C 1	
	SAS 2	BP 4: SAS		Gen 4: C 1 Gen3: C 2/C 3	
4	NVMe 0–1		PCIe 1, PCIe 2		
	NVMe 2–3		PCIe 3		
	NVMe 4–5		PCIe 4, PCIe 5		
	NVMe 6–7		PCIe 6		
	NVMe 8–9		PCIe 7		
	NVMe 10–11		PCIe 8		
	SAS 0, SAS 1			Gen 4: C 0 Gen3: C 1	
	SAS 2			Gen 4: C 1 Gen3: C 0	
		BP 4: SAS			Gen 4: C 0 Gen3: C 0

**Configuration 5:**

BP 1: 12 x 3.5" AnyBay BP

BP 4: 4 x 3.5" SAS/SATA BP

BP 5: 4 x 3.5" SAS/SATA BP

Con- fig.	Front BP	Rear BP	System board	Storage controller
				SFF 32i RAID
5	NVMe 0–1		PCle 1, PCle 2	
	NVMe 2–3		PCle 3	
	NVMe 4–5		PCle 4, PCle 5	
	NVMe 6–7		PCle 6	
	NVMe 8–9		PCle 7	
	NVMe 10–11		PCle 8	
	SAS 0, SAS 1			C 0
	SAS 2	BP 4: SAS		C 1
		BP 5: SAS		C 2

## Example

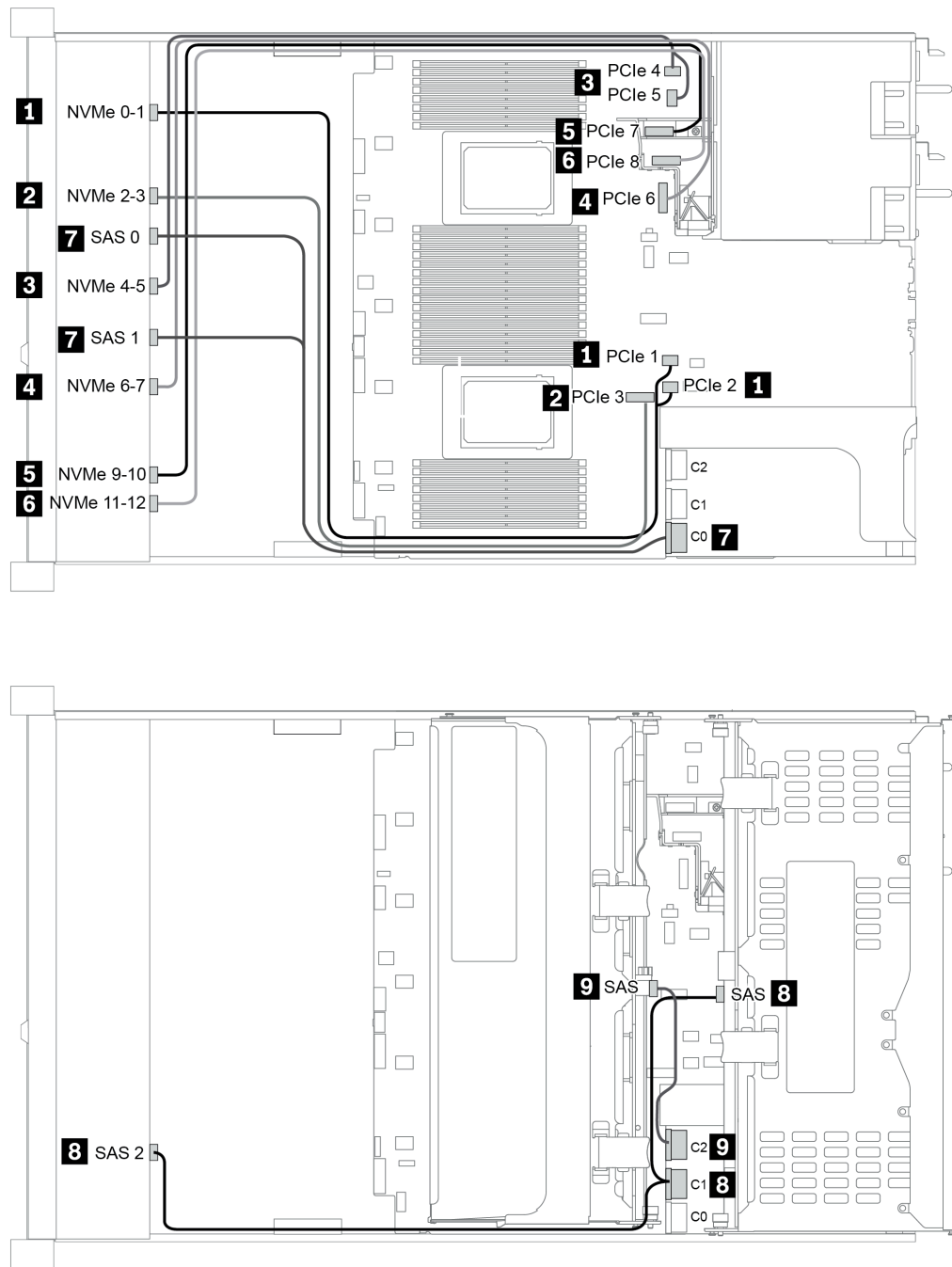


Figure 50. Configuration 5



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## 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.

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### 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 29](#).

### 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](http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html)
- Make sure the components you are installing are supported by the server. For a list of supported optional components for the server, see <https://serverproven.lenovo.com/>.
- 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 SR665 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, or 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. Click **Preconfigured Model** or **Configure to order**.
  - c. Enter the machine type and model for your server to display the configurator page.
  - d. Click **Power → Power Cables** to see all line cords.
- Make sure that the insulation is not frayed or worn.
3. Check for any obvious non-Lenovo alterations. Use good judgment as to the safety of any non-Lenovo alterations.
4. Check inside the server for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.
5. Check for worn, frayed, or pinched cables.
6. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.



## System reliability guidelines

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

Make sure the following requirements are met:

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

## Working inside the server with the power on

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

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

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

## Handling static-sensitive devices

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

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

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



## Air baffle replacement

Use this information to remove and install the air baffle.

- [“Remove the air baffle” on page 151](#)
- [“Install the air baffle” on page 155](#)

Figure 51. Standard air baffle

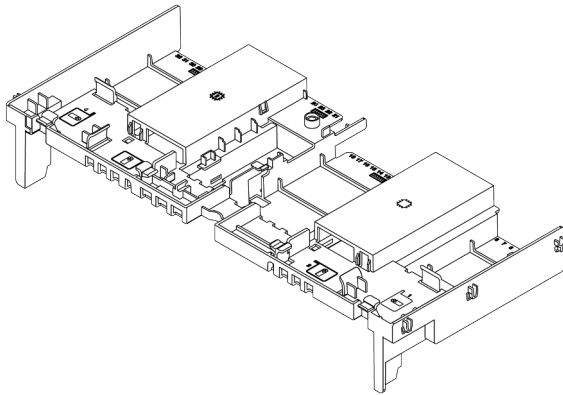
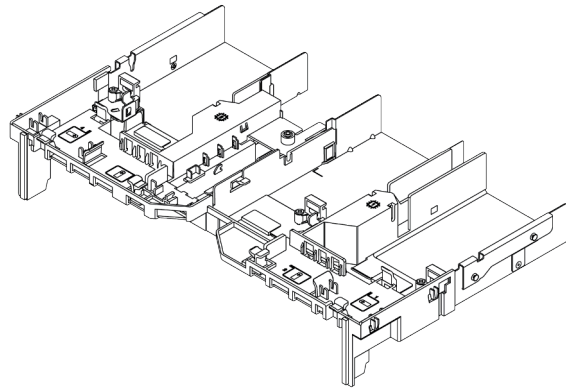


Figure 52. Air baffle for GPU



### Remove the air baffle

Use this information to remove the air baffle.

### About this task

**Attention:** For proper cooling and airflow, install the air baffle before you turn on the server. Operating the server without the air baffle might damage server components.

#### 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 145](#) 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.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 2. (Only for GPU air baffle) Remove the air baffle fillers or extenders (if any).

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

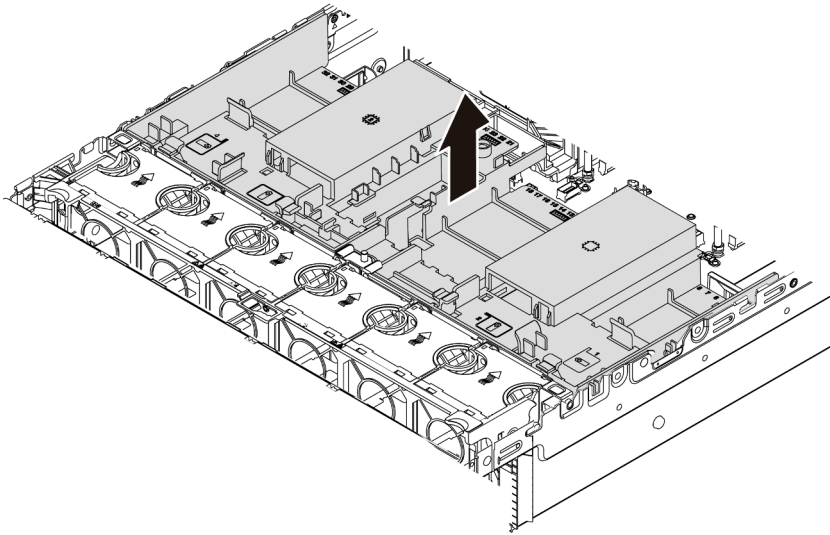


Figure 53. Removal of the standard air baffle

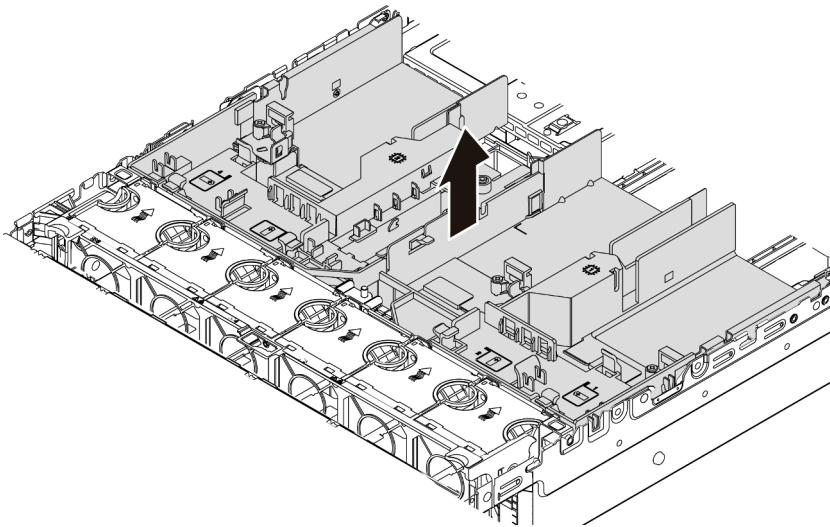
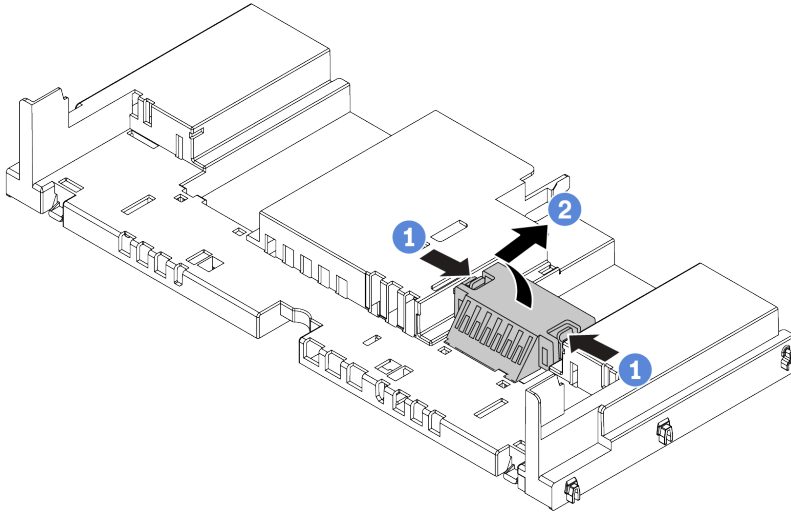


Figure 54. Removal of the GPU air baffle

**Attention:** For proper cooling and airflow, install the air baffle before you turn on the server. Operating the server without the air baffle might damage server components.

- Step 4. If you are using 1U standard heat sinks and need to change to 2U standard or performance heat sinks, remove the fillers from the air baffle after air baffle removal.



*Figure 55. Removal of the fillers from standard air baffle*

### After you finish

1. If you have removed a RAID super capacitor module, reinstall it and connect it to the RAID adapter with the extension cable. See [“Install a super capacitor module on the air baffle” on page 318](#).
2. If you have removed a GPU, reinstall it. See [“Install a GPU adapter” on page 179](#).
3. Reinstall the standard or GPU air baffle if needed. See [“Install the air baffle” on page 155](#).
4. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### Demo video

[Watch the procedure on YouTube](#)



## Install the air baffle

Use this information to install the air baffle.

### 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:**

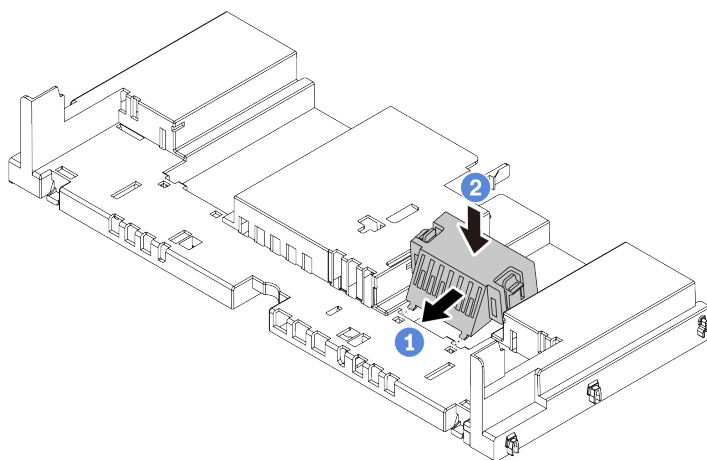
**Hazardous moving fan blades nearby. Keep fingers and other body parts away.**

#### **Attention:**

- Read [“Installation Guidelines” on page 145](#) 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

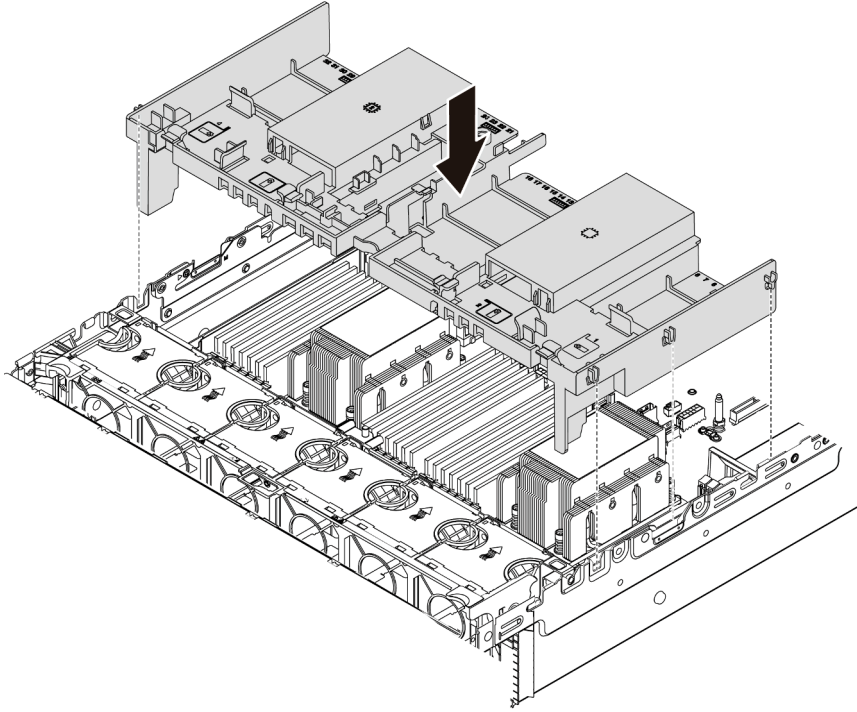
- Step 1. Take the new part out of the package and place it on a static-protective surface.
- Step 2. Prepare your server.
1. Power off the server.
  2. Remove the top cover. See [“Remove the top cover” on page 378](#).
  3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
  4. Remove any components that are impeding the procedure.
  5. Install any components that are required before installing or removing the component(s).
- Step 3. If 1U standard heat sink is installed, install the 2 fillers to fill the gap between the heat sink and the air baffle.



*Figure 56. Installing the fillers to the standard air baffle*

- Step 4. Note the orientation of the air baffle.
- Step 5. Align the tabs on both sides of the air baffle with the corresponding slots on both sides of the chassis. Then, lower the air baffle into the chassis and press the air baffle down until it is securely seated.

**Note:** The illustrated air baffle is a standard air baffle. The installation procedure is the same for GPU air baffle.



*Figure 57. Installing the standard air baffle*

## **After you finish**

1. If you have removed a RAID super capacitor module, reinstall it and connect it to the RAID adapter with the extension cable. See [“Install a super capacitor module on the air baffle” on page 318](#).
2. If you have removed a GPU, reinstall it. See [“Install a GPU adapter” on page 179](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## **Demo video**

[Watch the procedure on YouTube](#)

## Cable holder replacement

Use this information to remove and install the cable holders.

- [“Remove the cable holders” on page 158](#)
- [“Install the cable holders” on page 160](#)

### Remove the cable holders

Use this information to remove full-height or half-height cable holders.

### About this task

The removal steps for full-height(for 32 NVMe models) or half-height(for other models) cable holders are the same.

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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. Prepare your server.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 2. Remove the cable holders.

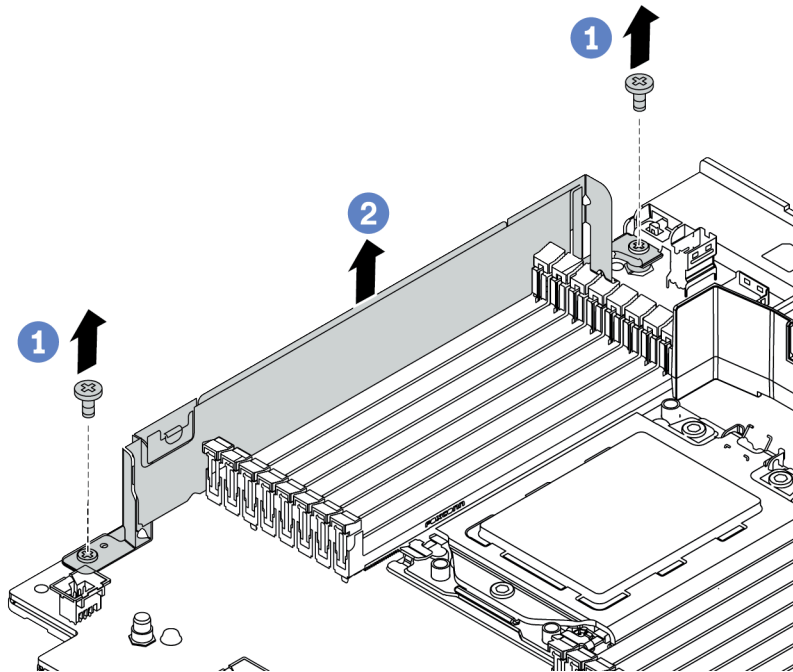


Figure 58. Cable holders removal

- a. Remove the two screws.
- b. Lift up the holders from the system board as shown.

## After you finish

1. Connect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Install the cable holders

Use this information to install the cable holders.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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. Prepare your server.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 3. Install the cable holders.

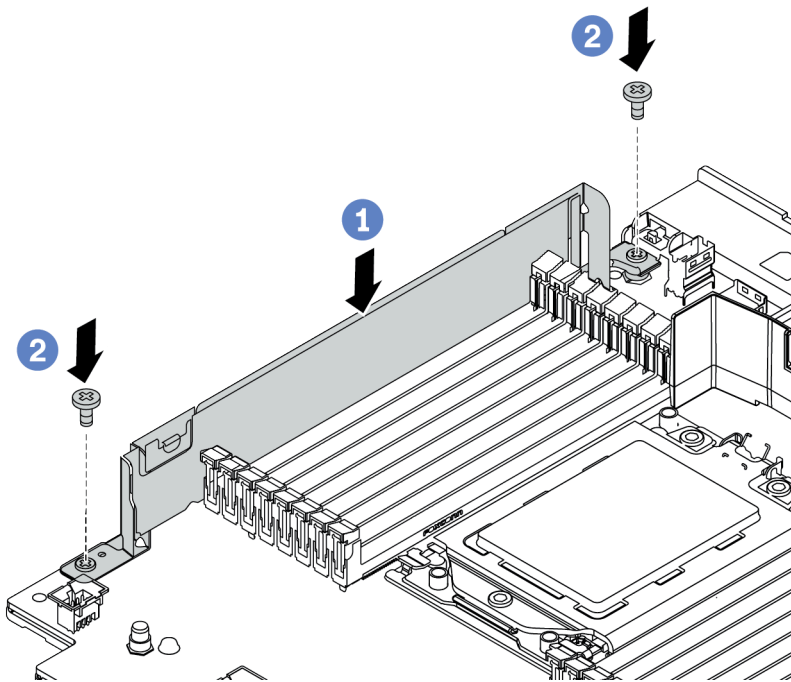


Figure 59. Cable holder installation

- a. Align the two holes on the system board. Install the holder to the system board as shown.
- b. Install the two screws to secure the holder.

## After you finish

1. Connect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## CMOS battery replacement

Use this information to remove and install the CMOS battery.

- [“Remove the CMOS battery” on page 162](#)
- [“Install the CMOS battery” on page 165](#)

### Remove the CMOS battery

Use this information to remove the CMOS battery.

#### About this task

##### Attention:

- 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.
- Power off the server and disconnect all power cords for this task.

##### S002



##### CAUTION:

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

- 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 378](#).
- 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 68](#).
- Step 4. Press the battery clip as shown and carefully lift 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.

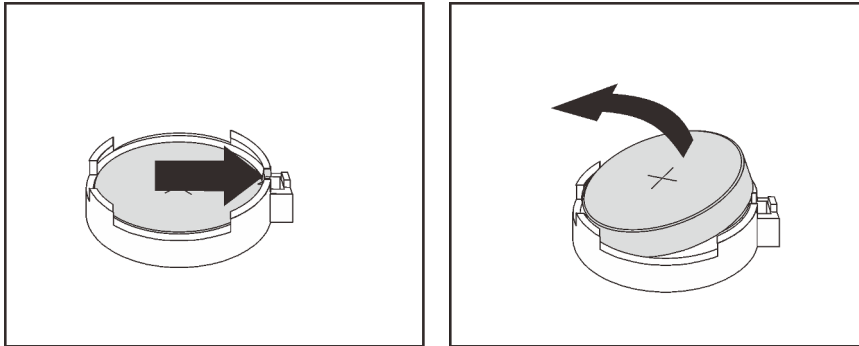


Figure 60. CMOS battery removal

## After you finish

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

1. Install a new one. See [“Install the CMOS battery” on page 165](#).
2. Dispose of the CMOS battery as required by local ordinances or regulations.

### 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.

## Demo video

[Watch the procedure on YouTube](#)

## Install the CMOS battery

Use this information to install the CMOS battery.

### About this task

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

- Lenovo has designed this product with your safety in mind. The lithium 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.

#### Attention:

- Read [“Installation Guidelines” on page 145](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.

#### S002



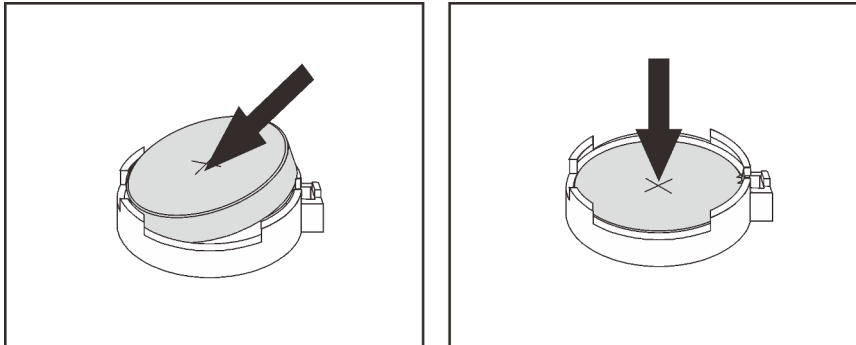
#### CAUTION:

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

- 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 61. CMOS battery installation*

## After you finish

1. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).
2. Use the Setup utility to set the date, time, and any passwords.

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

## Demo video

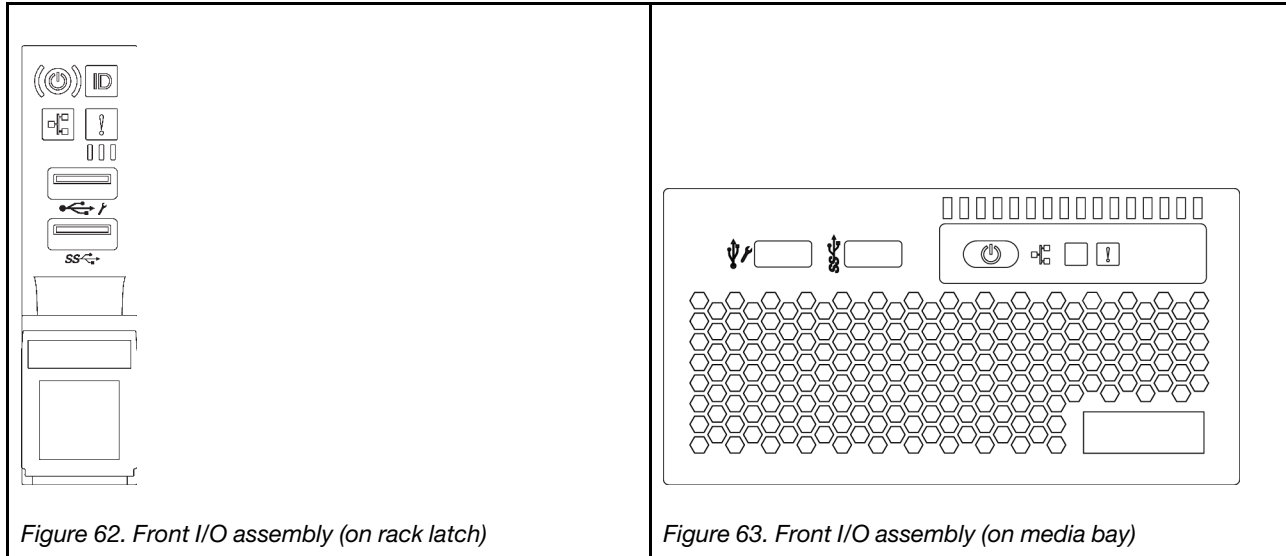
[Watch the procedure on YouTube](#)

## Front I/O assembly replacement

Use this information to remove and install the media bay.

**Notes:** The front I/O connectors for most models are integrated on rack latches. The front I/O assembly illustrated in this topic comes with an LCD diagnostics panel and is supported only in the following server models:

- Server models with eight 2.5-inch front drive bays
- Server models with sixteen 2.5-inch front drive bays



To replace the front I/O assembly on the rack latch, see [“Rack latches replacement” on page 303](#).

- [“Remove the front I/O assembly” on page 168](#)
- [“Install the front I/O assembly” on page 172](#)

## Remove the front I/O assembly

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

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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 378](#).
- Step 2. If the security bezel is installed, remove it. See [“Remove the security bezel” on page 361](#).
- Step 3. Disconnect the cables of the front I/O assembly from the system board. See [“Front I/O assembly” on page 80](#).
  - 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.

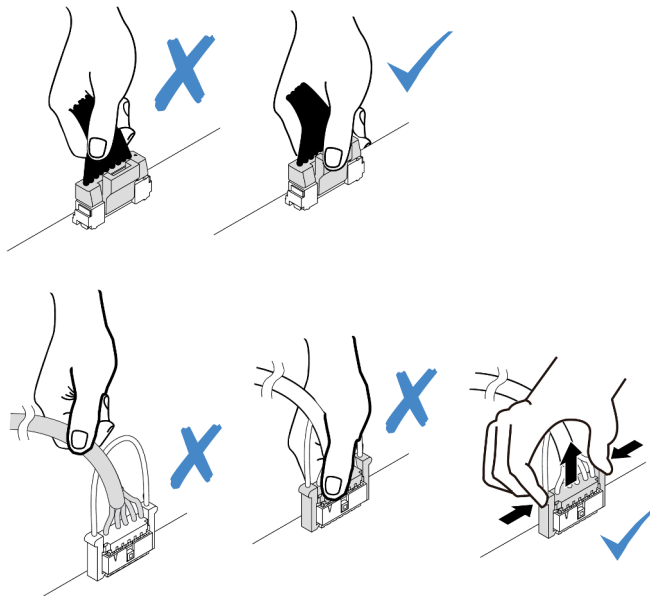


Figure 64. Disconnecting the front I/O assembly cables

Step 4. Remove the front I/O assembly from the front chassis.

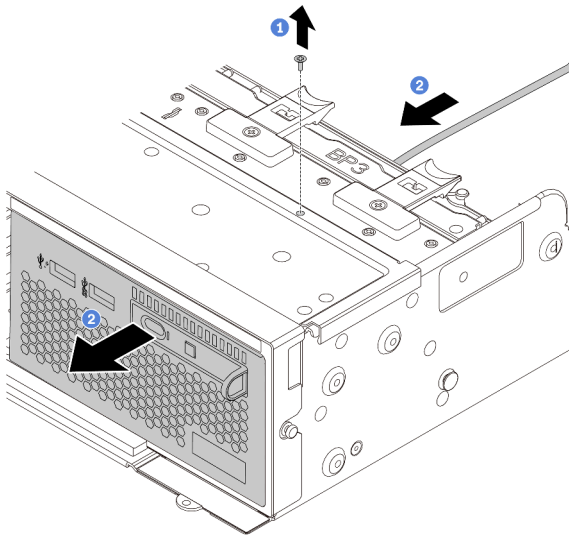


Figure 65. Front I/O assembly removal

1. Remove the screws that secure the front I/O assembly.
2. Slide the media bay out of the front chassis.

Step 5. Remove the LCD diagnostics panel from its assembly.

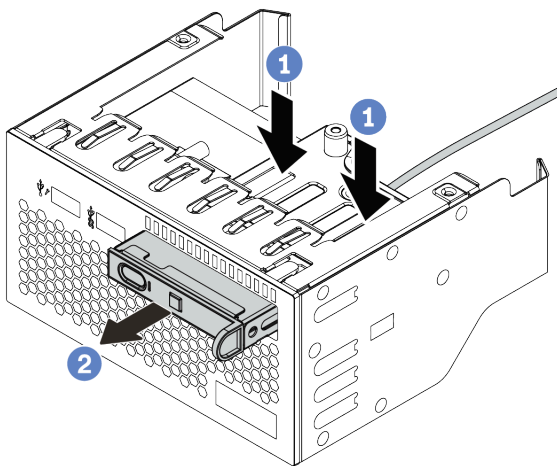


Figure 66. LCD diagnostic panel removal

- 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

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

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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 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.

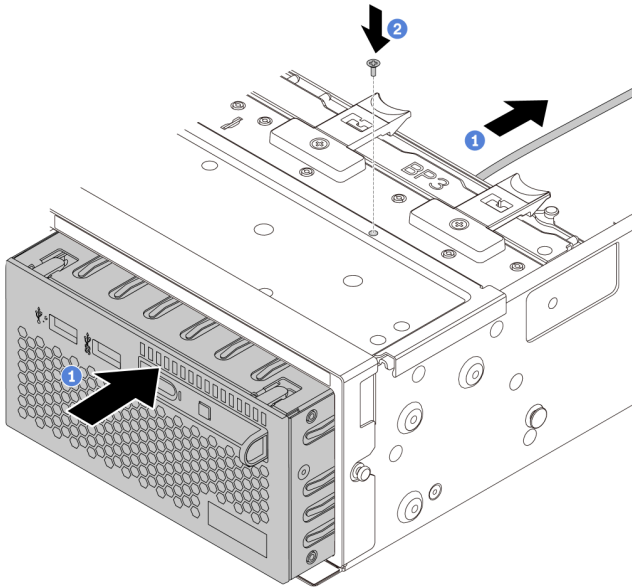


Figure 67. Front I/O assembly installation

1. Insert the front I/O assembly into the front chassis.
  2. Install the screws to secure the front I/O assembly in place.
- Step 3. Insert the LCD diagnostics panel into the assembly. Ensure that the panel is fully seated into the assembly.

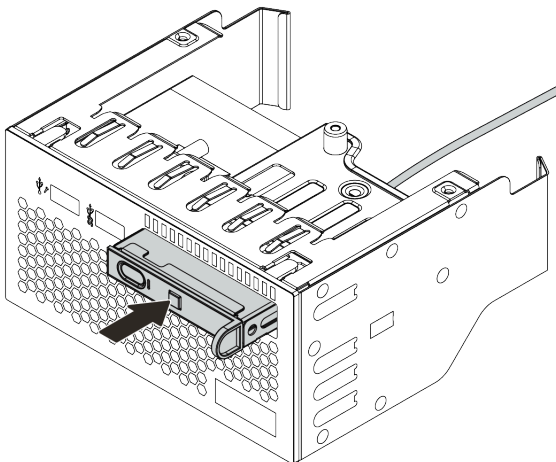


Figure 68. LCD diagnostics panel installation

## After you finish

1. Connect the cables of the front I/O assembly to the system board. See [“Front I/O assembly” on page 80](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

**Demo video**

[Watch the procedure on YouTube](#)

## GPU replacement

Use this information to remove and install a GPU adapter.

- [“Remove a GPU adapter” on page 175](#)
- [“Install a GPU adapter” on page 179](#)

### Remove a GPU adapter

Use this information to remove a GPU adapter.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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.
- Depending on the specific type, your GPU adapter might look different from the illustration in this topic.
- Use any documentation that comes with the GPU adapter and follow those instructions in addition to the instructions in this topic.

## Procedure

- Step 1. Remove the top cover. See [“Remove the top cover” on page 378](#).
- Step 2. (Optional) If the riser assembly that has the GPU adapter is installed on riser 3 slot, disconnect the power cable from the GPU adapter.
- Step 3. Remove the riser assembly from the system board.

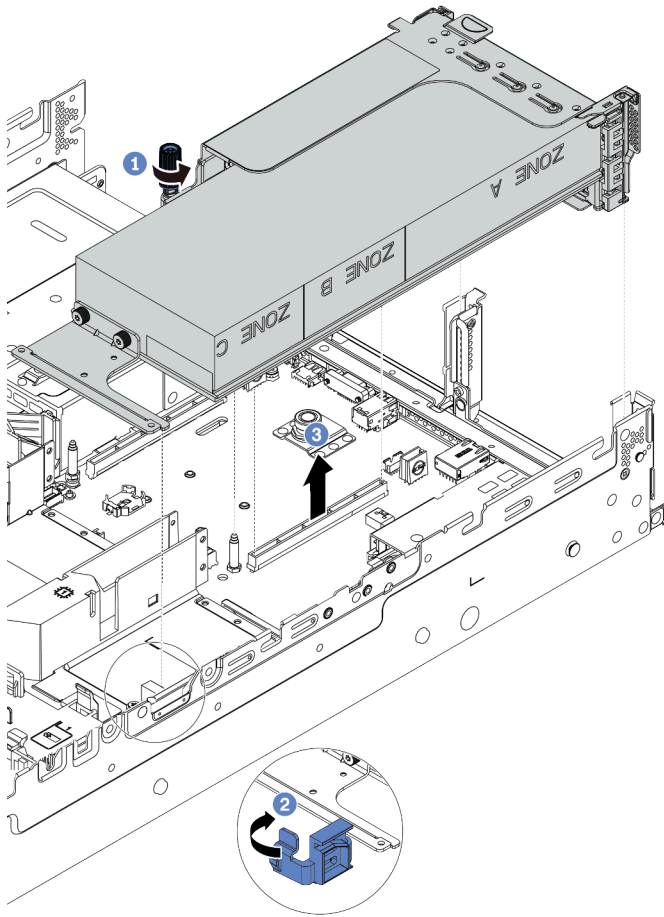
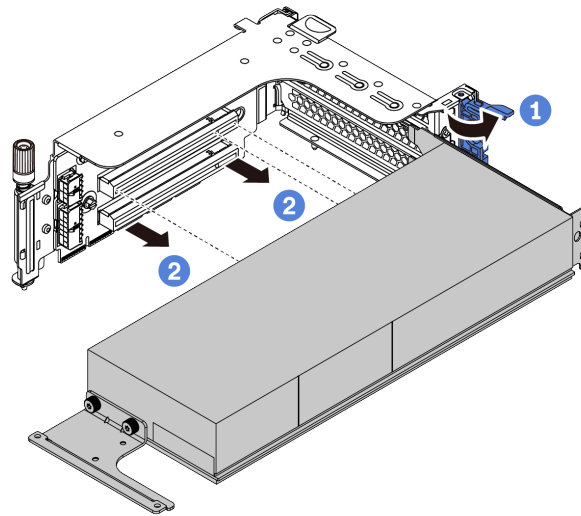


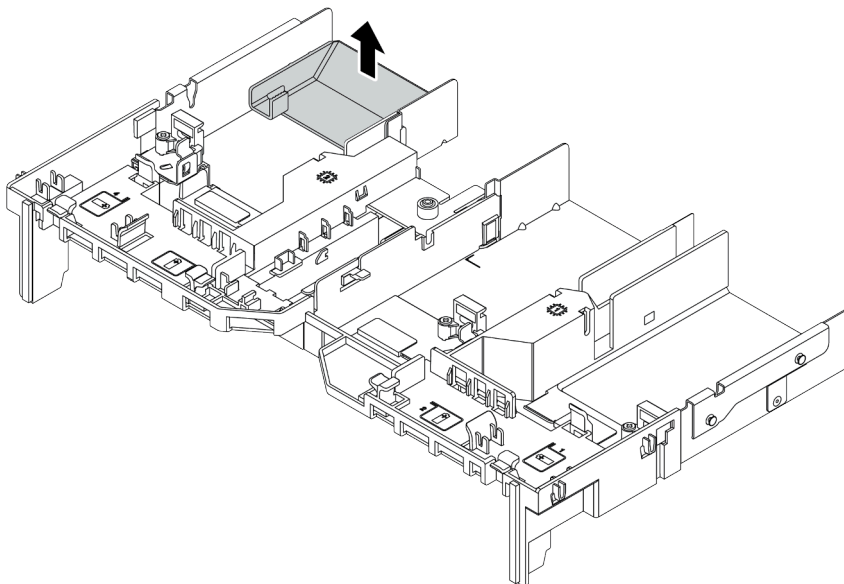
Figure 69. Removing the riser assembly

- Step 4. (Optional) If the riser assembly is installed on riser 1 or riser 2 slot, disconnect the power cable from the GPU adapter.
- Step 5. Remove the GPU adapter from the riser bracket.



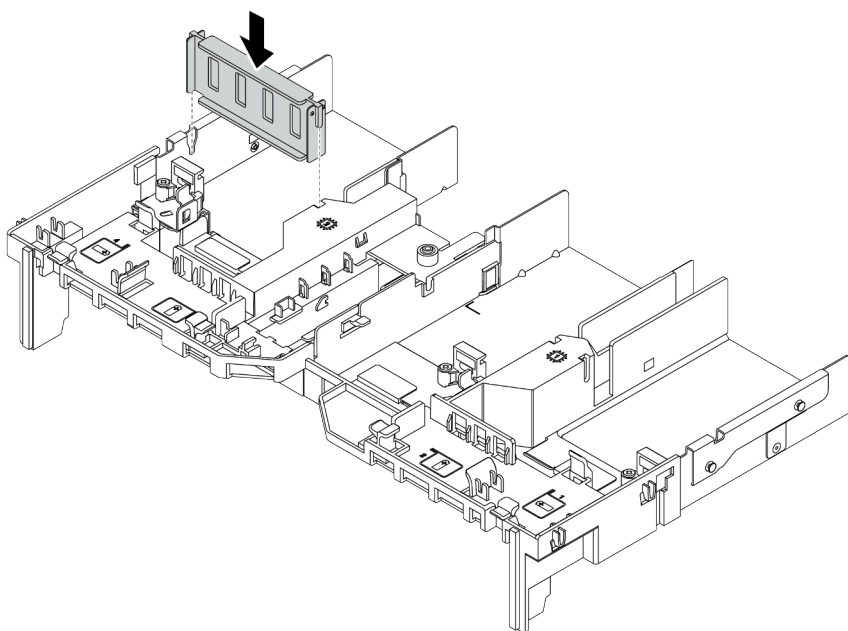
*Figure 70. Removing the GPU adapter*

- Step 6. (Optional) If the removed GPU adapter is a single-wide GPU adapter, remove the corresponding add-on air baffle.



*Figure 71. Removing the add-on air baffle*

- Step 7. Install GPU fillers to any empty slots on the GPU air baffle.



*Figure 72. Installing the GPU filler*

## **After you finish**

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



## Install a GPU adapter

Use this information to install a GPU adapter.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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.
- GPU adapters are supported on some server models with requirements. See [“Technical rules” on page 18](#).
- Depending on the specific type, your GPU adapter might look different from the illustration in this topic.
- Use any documentation that comes with the GPU adapter and follow those instructions in addition to the instructions in this topic.

## Procedure

- Step 1. Install the GPU air baffle.
- Step 2. Locate the appropriate PCIe slot for the GPU adapter. See [“Technical rules” on page 18](#)
- Step 3. (Optional) If a single-wide 150W GPU adapter (FHFL) is installed on PCIe slot 1, 4, or 7, but the adjacent slot (slot 2, 5, or 8 respectively) is left empty or is installed with a half-length adapter, install an add-on air baffle on the GPU air baffle.

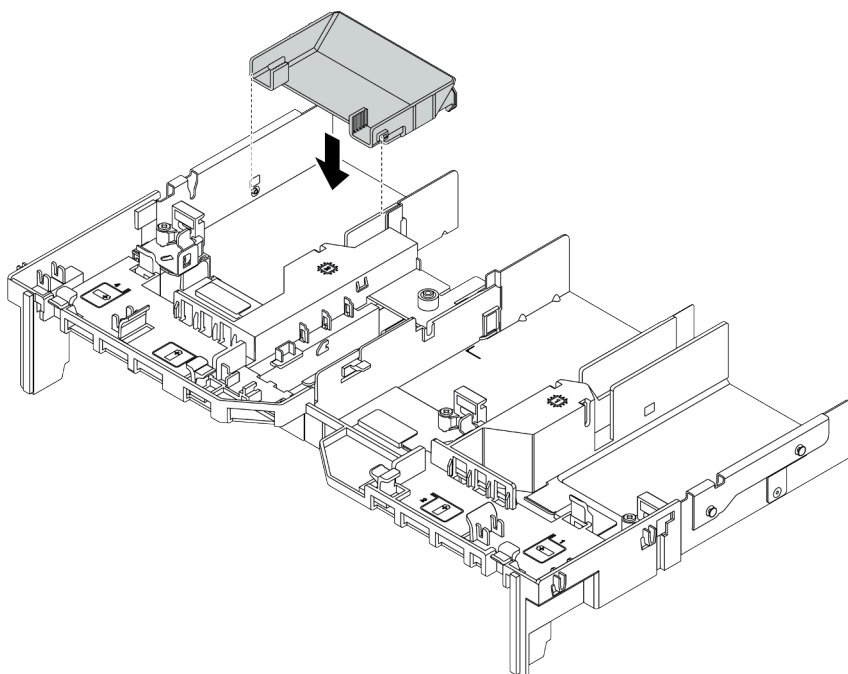


Figure 73. Installing the add-on GPU air baffle

- Step 4. Install the GPU adapter to the riser cage.
1. Open the blue latch on the riser cage.
  2. Align the GPU adapter with the PCIe slot on the riser card. Then, carefully press the GPU adapter straight into the slot until it is securely seated.
  3. Close the blue latch.

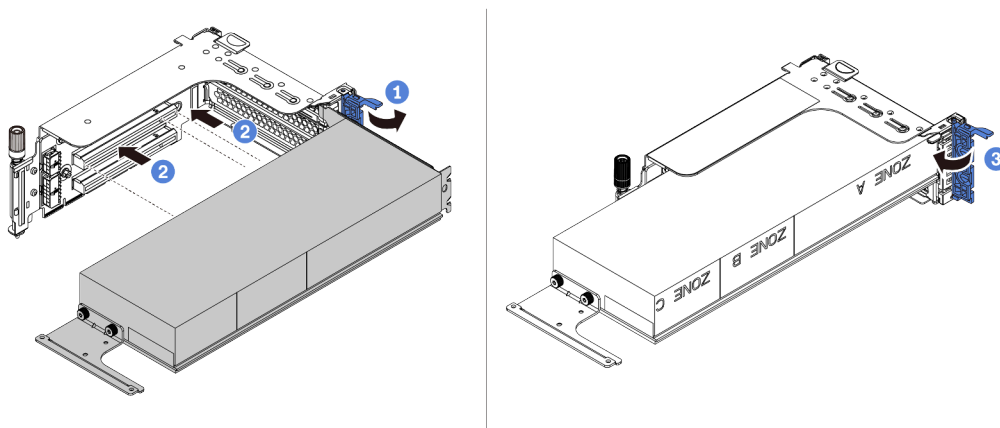


Figure 74. Installing the GPU adapter to the riser cage

Step 5. (Optional) Connect the power cable to the power connector on the GPU adapter. See [“GPUs” on page 81](#).

**Note:** If your GPU adapter TDP is equal to or lower than 75 watts, the adapter can be powered directly by the riser slot. An extra power cable is required for powering GPU adapters with TDP higher than 75 watts.

Step 6. Install the riser assembly to the system.

**Notes:** If a full-length GPU is installed in the riser cage, perform the following steps to ensure that the other end of the assembly is securely fixed to the GPU air baffle.

1. Align the slots and slightly put down the riser assembly.
2. Open the blue latch on the GPU air baffle and fix the end of the GPU adapter. Then, close the blue latch.
3. Tighten the riser cage screw.

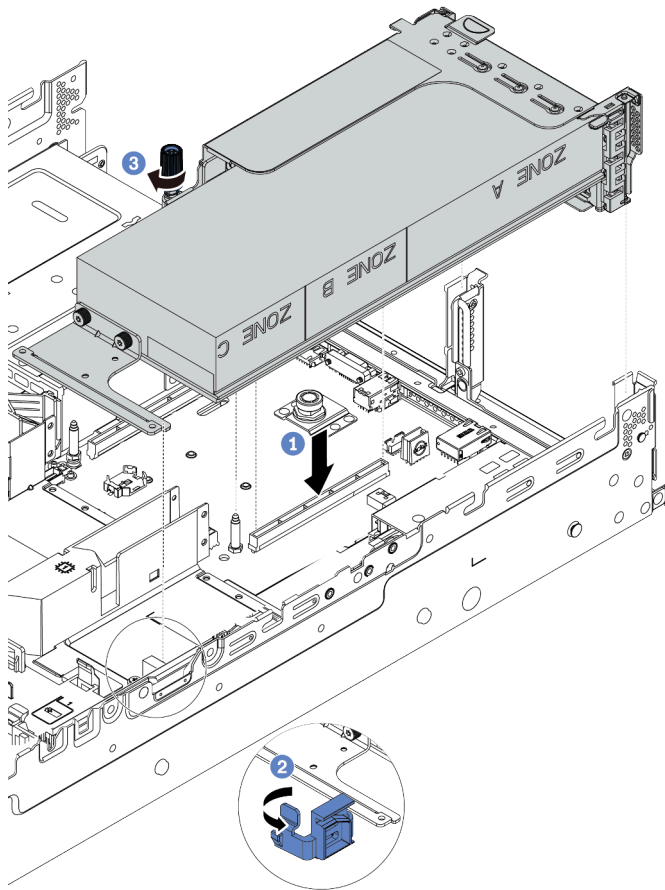
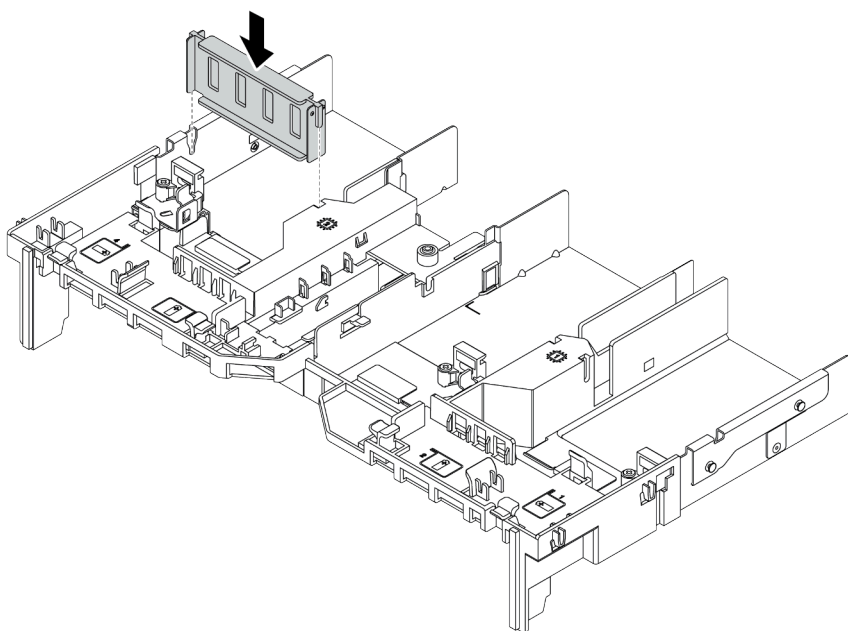


Figure 75. Installing the riser assembly

Step 7. If a certain slot is not installed with a GPU adapter, install a filler as shown.



*Figure 76. Installing the GPU filler*

## **After you finish**

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## 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. Ensure that you have all the cables and other equipment that are specified in the documentation that comes with the drive.
  - The electromagnetic interference (EMI) integrity and cooling of the server are protected by having all drive bays covered or occupied. The vacant bays are either covered by an EMI-protective panel or occupied by drive fillers. When installing a drive, save the removed drive filler in case that you later remove the drive and need the drive filler to cover the place.
  - 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” on page 184](#)
  - [“Install a hot-swap drive” on page 186](#)

## Remove a hot-swap drive

Use this information to remove a hot-swap drive.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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.

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, drive backplanes, or drive cables, back up all important data that is stored on the drives.
  - Before you remove any component of a RAID array, back up all RAID configuration information.
- 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). See the indications above the drive bays to determine the type of the drive to remove. If the drive bay numbers come with the term “NVMe”, it indicates the installed drives are NVMe drives.

## Procedure

- Step 1. If the security bezel is installed, remove it first. See [“Remove the security bezel” on page 361](#).
- Step 2. Slide the release latch to the left to open the drive tray handle.

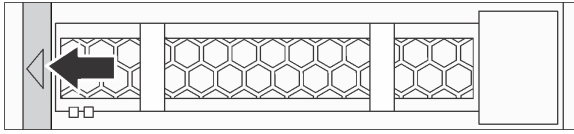


Figure 77. Opening the drive tray handle

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

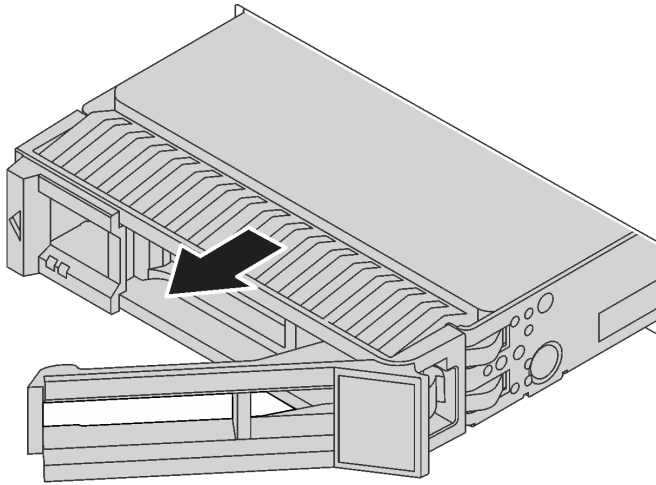


Figure 78. Hot-swap drive removal

## 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 186](#).
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 for a 2.5-inch hot-swap drive on YouTube](#)

[Watch the procedure for a 3.5-inch hot-swap drive 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 145](#) 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 18](#).

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

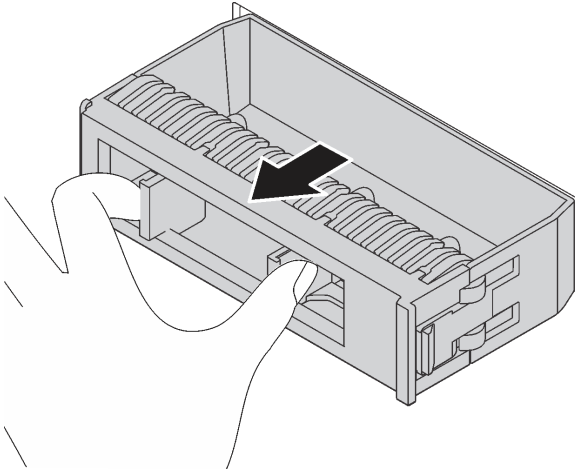


Figure 79. Drive filler removal

Step 3. Install the drive in the drive bay.

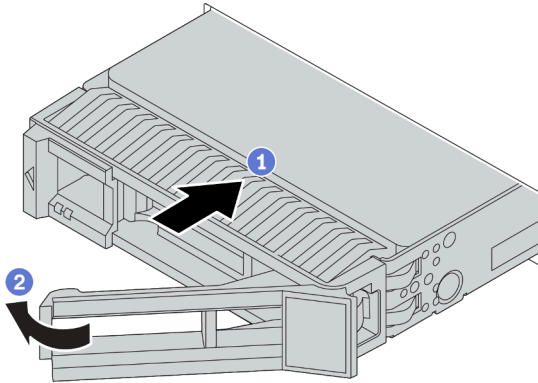


Figure 80. Hot-swap drive installation

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

Step 4. Check the drive status LED to verify that the drive is operating correctly.

- If the yellow drive status LED is lit continuously, that drive is faulty and must be replaced.
- If the green drive activity LED is flashing, the drive is being accessed.

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

## After you finish

- Reinstall the security bezel if you have removed it. See [“Install the security bezel” on page 364](#).

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](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 8-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 431.

### Demo video

[Watch the procedure for a 2.5-inch hot-swap drive on YouTube](#)

[Watch the procedure for a 3.5-inch hot-swap drive on YouTube](#)

## Hot-swap drive backplane replacement

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

Front drive backplane replacement:

- [“Remove the front 2.5-inch-drive backplane” on page 190](#)
- [“Install the front 2.5-inch-drive backplane” on page 193](#)
- [“Remove the front 3.5-inch-drive backplane” on page 203](#)
- [“Install the front 3.5-inch-drive backplane” on page 205](#)

Middle and rear drive backplane replacement:

- [“Remove the middle or rear 2.5-inch-drive backplane” on page 197](#)
- [“Install the middle or rear 2.5-inch-drive backplane” on page 200](#)
- [“Remove the middle or rear 3.5-inch-drive backplane” on page 208](#)
- [“Install the middle or rear 3.5-inch-drive backplane” on page 211](#)

## Remove the front 2.5-inch-drive backplane

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

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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.

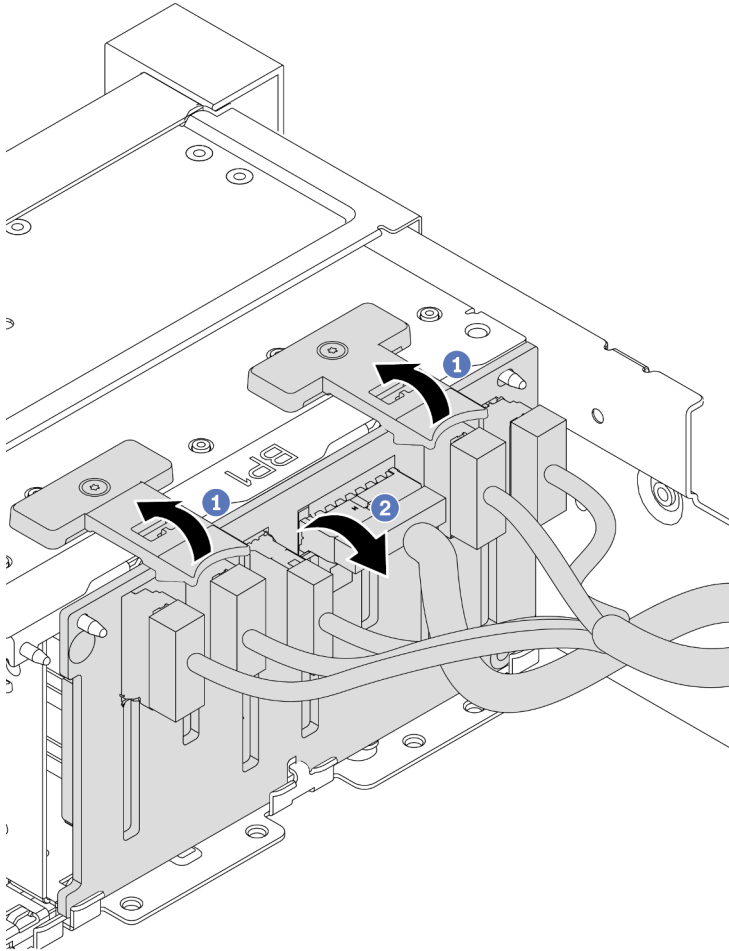
## Procedure

**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 378](#).
- b. Remove the system fan cage for easier operation. See [“Remove a system fan” on page 368](#).
- c. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 184](#).

Step 2. Remove the 2.5-inch-drive backplane.



*Figure 81. 2.5-inch-drive backplane removal*

- a. Lift the release tabs.
  - b. Rotate the backplane backward slightly to release it from the two pins on the chassis.
- 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 \(power\)” on page 90](#) and [“2.5-inch/3.5-inch drive backplane \(signal\)” on page 95](#).

## 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 front 2.5-inch-drive backplane.

### About this task

Your server supports two SATA/SAS 8-bay backplanes and one Anybay 8-bay backplane. The two SATA/SAS 8-bay backplanes should be installed to drive bays 0–7 and drive bays 8–15, and the Anybay 8-bay backplane should be installed to drive bays 16–23.

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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. Connect the cables to the backplane. See [“2.5-inch/3.5-inch drive backplane \(power\)” on page 90](#) and [“2.5-inch/3.5-inch drive backplane \(signal\)” on page 95](#).



Step 3. Install the 2.5-inch-drive front backplane.

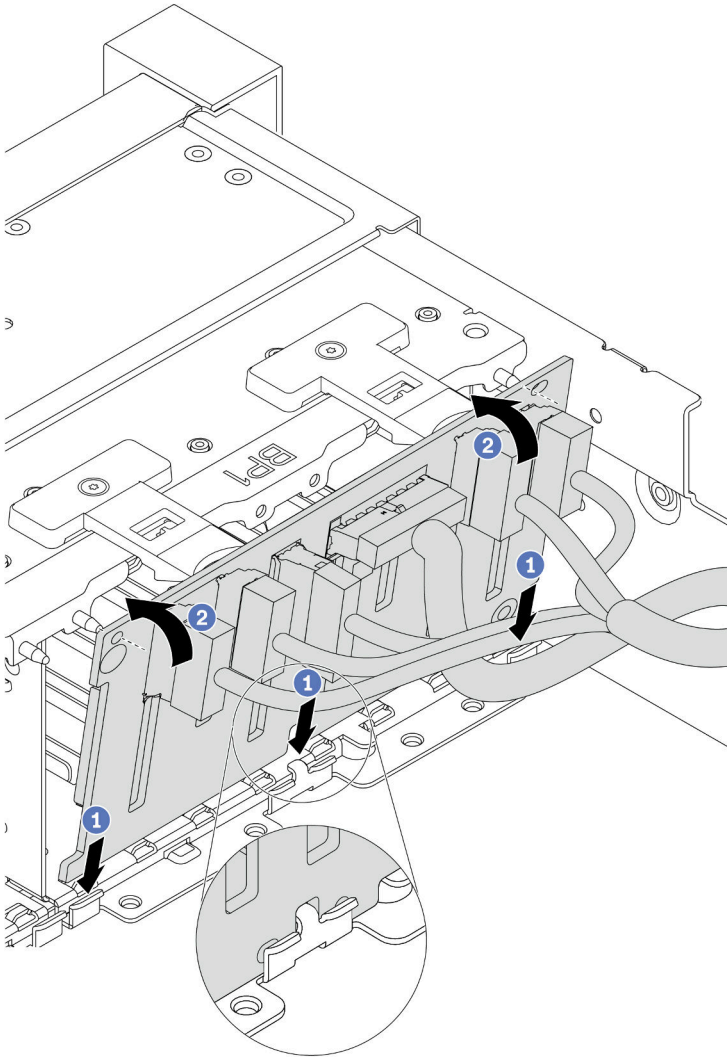


Figure 82. 2.5-inch-drive backplane installation

- a. Align the bottom of the backplane in the slots on the bottom of the chassis.
- b. Rotate the backplane to the vertical position and align the holes in the backplane with the pins on the chassis and press the backplane into position. The release tabs will secure the backplane in place.

Step 4. Connect the cables to the system board. See [“2.5-inch/3.5-inch drive backplane \(power\)” on page 90](#) and [“2.5-inch/3.5-inch drive backplane \(signal\)” on page 95](#).

## After you finish

1. Reinstall all the drives and fillers (if any) into the drive bays. See [“Install a hot-swap drive” on page 186](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).
3. If you have installed an Anybay 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 431](#).

## Demo video

[Watch the procedure on YouTube](#)

## Remove the middle or rear 2.5-inch-drive backplane

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

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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.
- Depending on the specific type, your backplane might look different from the illustration in this topic.

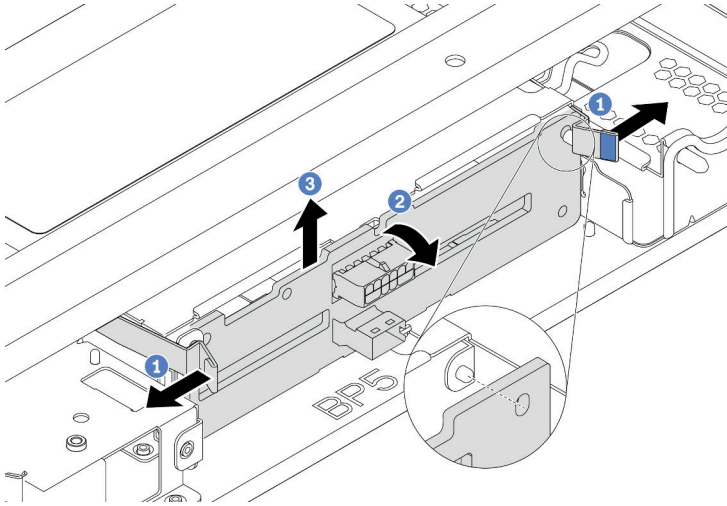
## Procedure

**Note:** The illustration shows removing the backplane from the rear drive cage. The procedure is the same for removing the backplane from the middle drive cage.

Step 1. Prepare your server.

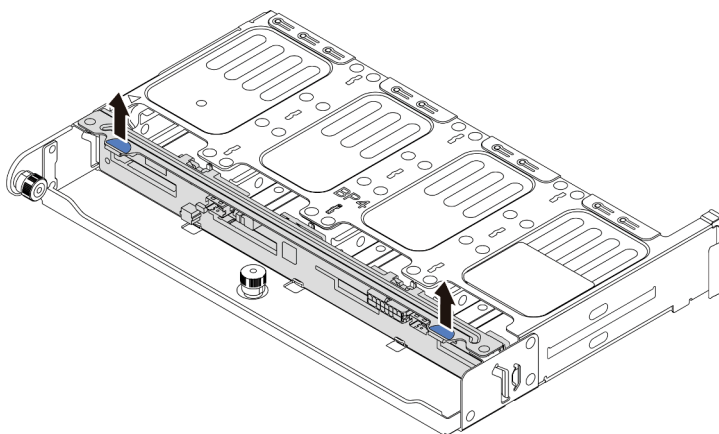
1. Remove the top cover. See [“Remove the top cover” on page 378](#).
2. If you are removing the middle backplane, remove the system fan cage for easier operation. See [“Remove the system fan cage” on page 373](#).
3. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 184](#).

Step 2. Remove the 2.5-inch-drive backplane.



*Figure 83. Removing the 4 x 2.5-inch-drive backplane*

1. Slightly pivot the release latches outwards in the direction as shown.
2. Pivot the backplane to release it from the two pins on the drive cage.
3. Carefully lift the backplane out of the drive cage.



*Figure 84. Removing the 8 x 2.5-inch-drive backplane*

Carefully lift the backplane out of the drive cage.

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 \(power\)” on page 90](#) and [“2.5-inch/3.5-inch drive backplane \(signal\)” on page 95](#).

#### **Demo video**

[Watch the procedure on YouTube](#)

## Install the middle or rear 2.5-inch-drive backplane

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

### About this task

Your server supports:

- Two types of middle 2.5-inch-drive backplane
  - 4 x 2.5-inch SAS/SATA backplane
  - 4 x 2.5-inch NVMe backplane
- Three types of rear 2.5-inch-drive backplane
  - 4 x 2.5-inch SAS/SATA backplane
  - 4 x 2.5-inch NVMe backplane
  - 8 x 2.5-inch SAS/SATA backplane

### Notes:

- The procedure shows the installation of the backplane on the rear drive cage. The procedure is the same for installing the backplane on the middle drive cage.

### Attention:

- Read [“Installation Guidelines” on page 145](#) 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 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. Connect the cables to the backplane. See [“2.5-inch/3.5-inch drive backplane \(power\)”](#) on page 90 and [“2.5-inch/3.5-inch drive backplane \(signal\)”](#) on page 95.
- Step 3. Align the bottom of the backplane with the studs at the bottom of the drive cage. Rotate the backplane to vertical position so that the holes in the backplane pass through the pins on the drive cage, and press the backplane into position. The release latches will secure the backplane in place.

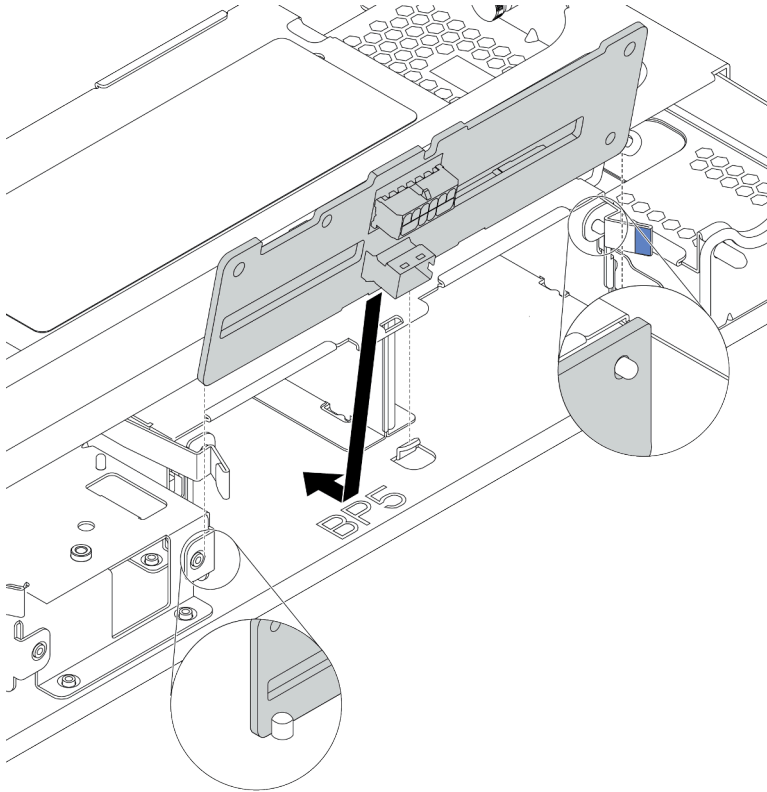
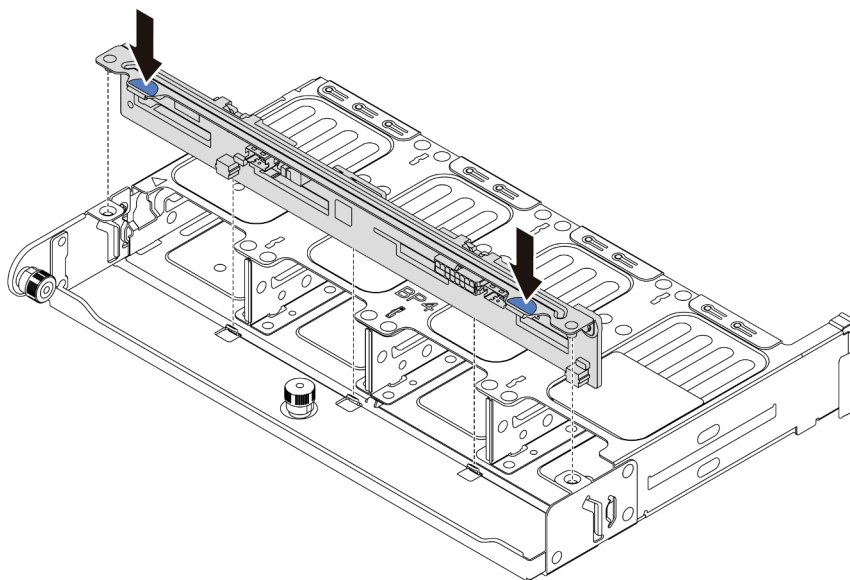


Figure 85. Installing the 4 x 2.5-inch-drive backplane



*Figure 86. Installing the 8 x 2.5-inch-drive backplane*

### **After you finish**

1. Reinstall all the drives and fillers (if any) into the drive bays. See [“Install a hot-swap drive” on page 186](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### **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 145](#) 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 378](#).
- b. Remove the system fan cage for easier operation. See [“Remove a system fan” on page 368](#).
- c. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 184](#).

Step 2. Lift the release tabs and rotate the backplane backward slightly to release it from the two pins on the chassis.

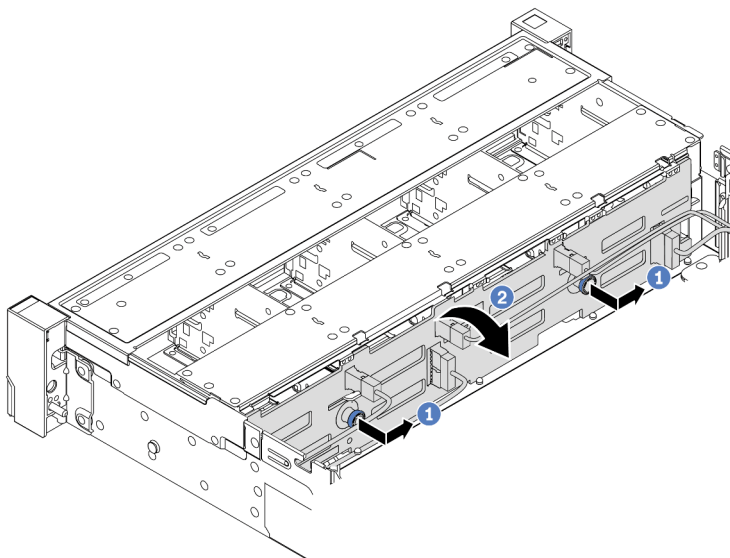


Figure 87. 3.5-inch-drive backplane removal

- a. Pull out the plungers and slightly slide the backplane to the side as shown.
- b. Rotate the backplane down to release it from the four hooks on the chassis. Then, carefully lift the backplane out of the chassis.

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 \(power\)” on page 90](#) and [“2.5-inch/3.5-inch drive backplane \(signal\)” on page 95](#).

## 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 front 3.5-inch-drive backplane.

### About this task

Your server supports one SAS/SATA 12-bay backplane.

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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. Connect the cables to the backplane. See [“2.5-inch/3.5-inch drive backplane \(power\)”](#) on page 90 and [“2.5-inch/3.5-inch drive backplane \(signal\)”](#) on page 95.
- Step 3. Install the 3.5-inch-drive backplane.

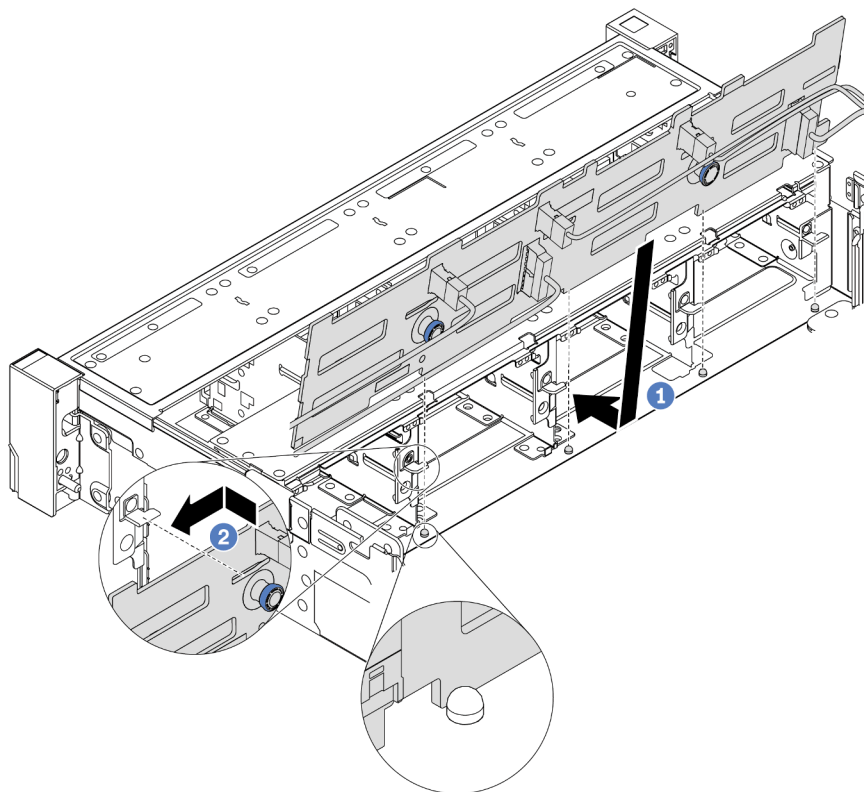


Figure 88. 3.5-inch-drive backplane installation

- a. Align the backplane with the chassis and lower it into the chassis. Then, put the backplane into place with it leaning backward slightly.
  - b. Rotate the backplane to vertical position to ensure that the four hooks on the chassis pass through the corresponding holes in the backplane. Then, slide the new backplane as shown until it is secured into place.
- Step 4. Connect the cables to the system board. See [“2.5-inch/3.5-inch drive backplane \(power\)”](#) on page 90 and [“2.5-inch/3.5-inch drive backplane \(signal\)”](#) on page 95.

## After you finish

1. Reinstall all the drives and fillers (if any) into the drive bays. See [“Install a hot-swap drive”](#) on page 186.
2. Complete the parts replacement. See [“Complete the parts replacement”](#) on page 383.

## Demo video

[Watch the procedure on YouTube](#)



## Remove the middle or rear 3.5-inch-drive backplane

Use this information to remove the middle or rear 3.5-inch-drive backplane.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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 illustration shows removing the backplane from the rear drive cage. The procedure is the same for removing the backplane from the middle drive cage.

Step 1. Prepare your server.

1. Remove the top cover. See [“Remove the top cover” on page 378](#).
2. If you are removing the middle backplane, remove the system fan cage for easier operation. See [“Remove the system fan cage” on page 373](#).
3. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 184](#).

Step 2. Remove the 3.5-inch-drive backplane.

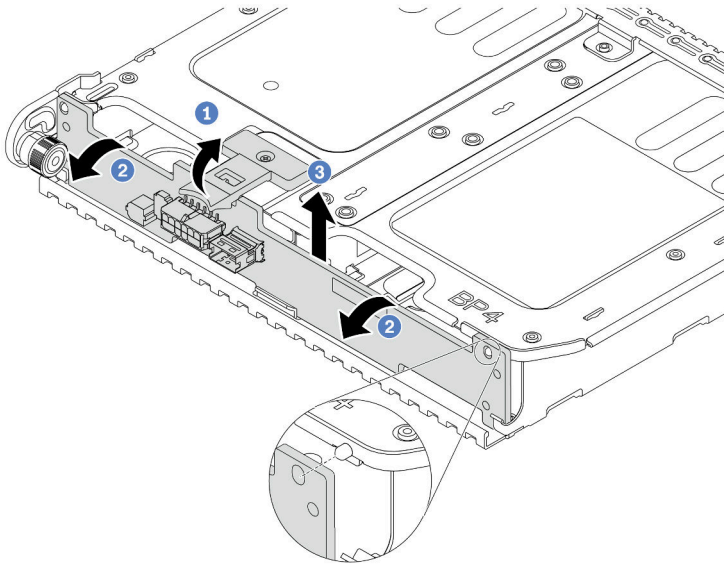


Figure 89. Removing the 2 x 3.5-inch-drive backplane

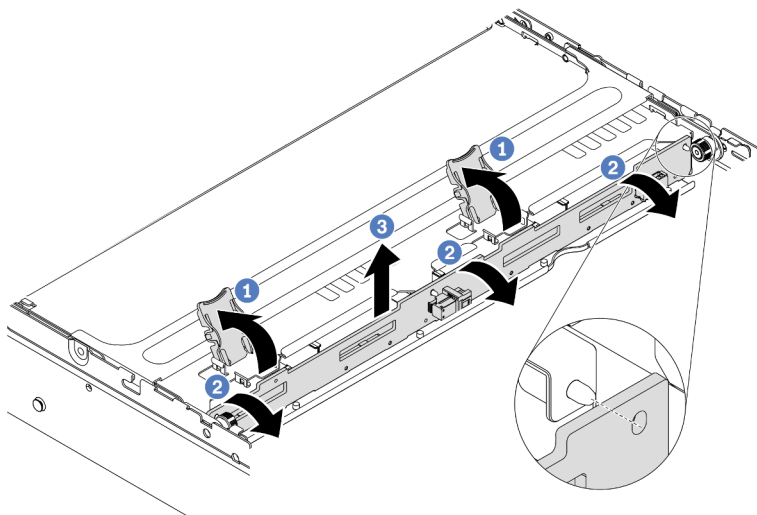


Figure 90. Removing the 4 x 3.5-inch-drive backplane

1. Slightly pivot the release latches outwards in the direction as shown.
2. Pivot the backplane to release it from the two pins on the drive cage.
3. Carefully lift the backplane out of the drive cage.

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 \(power\)”](#) on page 90 and [“2.5-inch/3.5-inch drive backplane \(signal\)”](#) on page 95.

#### Demo video

[Watch the procedure on YouTube](#)



## Install the middle or rear 3.5-inch-drive backplane

Use this information to install the middle or rear 3.5-inch-drive backplane.

### About this task

Your server supports:

- One type of middle 3.5-inch-drive backplane
  - 4 x 3.5-inch SAS/SATA backplane
- Two types of rear 3.5-inch-drive backplane
  - 2 x 3.5-inch SAS/SATA backplane
  - 4 x 3.5-inch SAS/SATA backplane

### Notes:

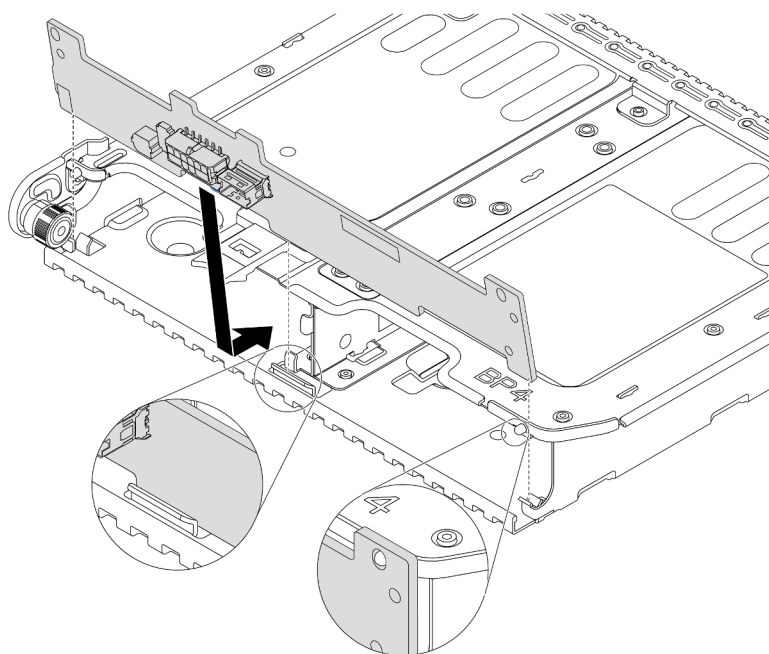
- The procedure shows the installation of the backplane on the rear drive cage. The procedure is the same for installing the backplane on the middle drive cage.

### Attention:

- Read [“Installation Guidelines” on page 145](#) 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 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. Connect the cables to the backplane. See [“2.5-inch/3.5-inch drive backplane \(power\)”](#) on page 90 and [“2.5-inch/3.5-inch drive backplane \(signal\)”](#) on page 95.
- Step 3. Align the bottom of the backplane with the studs at the bottom of the drive cage. Rotate the backplane to vertical position so that the holes in the backplane pass through the pins on the drive cage, and press the backplane into position. The release latches will secure the backplane in place.



*Figure 91. Installing the 2 x 3.5-inch-drive backplane*

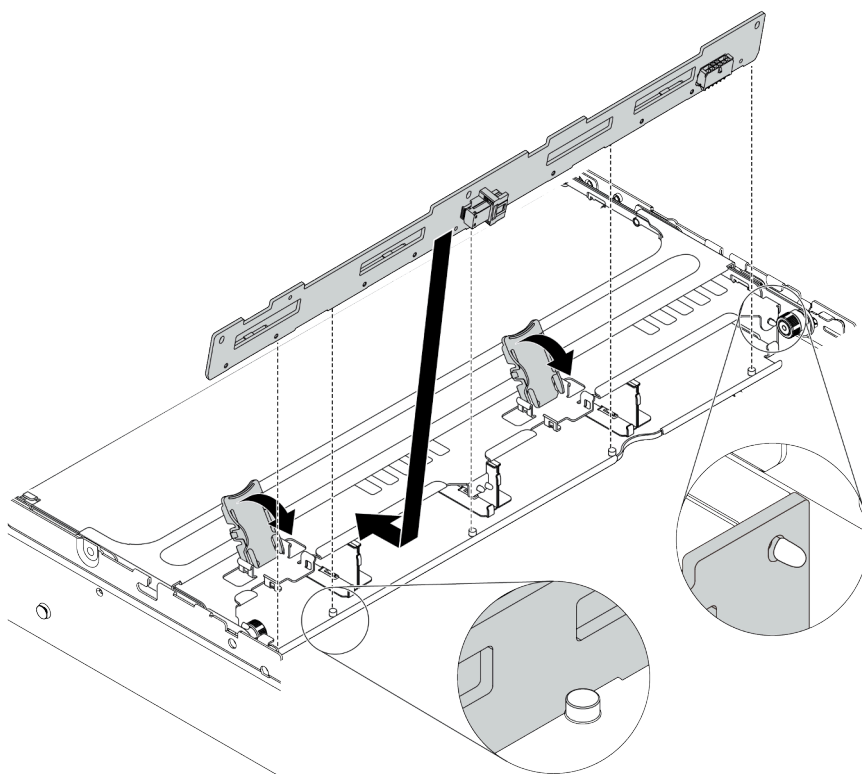


Figure 92. Installing the 4 x 3.5-inch-drive backplane

### After you finish

1. Reinstall all the drives and fillers (if any) into the drive bays. See [“Install a hot-swap drive” on page 186](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### Demo video

[Watch the procedure on YouTube](#)

### Remove the 7mm drive backplanes

Use this information to remove the 7mm drive backplanes.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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 378](#).

- b. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 184](#).
- 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 drives” on page 87](#).
- d. Remove the 7mm drive assembly from the rear chassis. See [“Remove the 7mm drive cage\(1-slot\)” on page 249](#) or [“Remove the 7mm drive cage\(3-slot\)” on page 245](#).

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

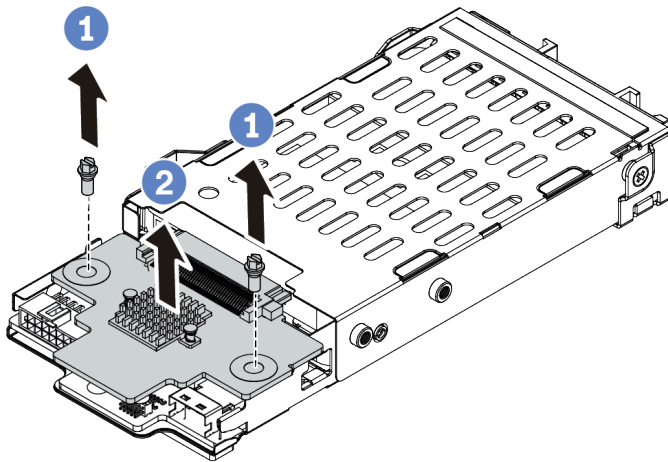


Figure 93. 7mm drive backplane removal (top)

- 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.

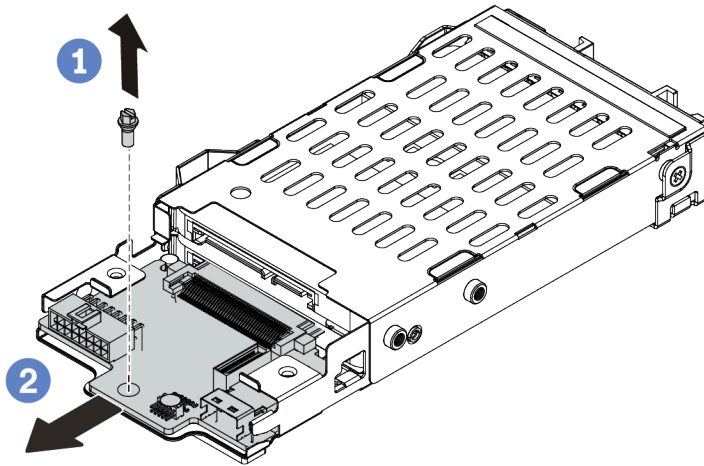


Figure 94. 7mm drive backplane removal (bottom)

- 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.

## Demo video

[Watch the procedure on YouTube](#)

## Install the 7mm drive backplanes

Use this information to install the 7mm drive backplanes.

## About this task

### Attention:

- Read [“Installation Guidelines” on page 145](#) 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. Take the new part out of the package and place it on a static-protective surface.

Step 2. Prepare your server.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).

3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 3. Connect the cables to the backplanes. See [“7mm drives” on page 87](#).

Step 4. Install the 7mm drive backplane at the bottom.

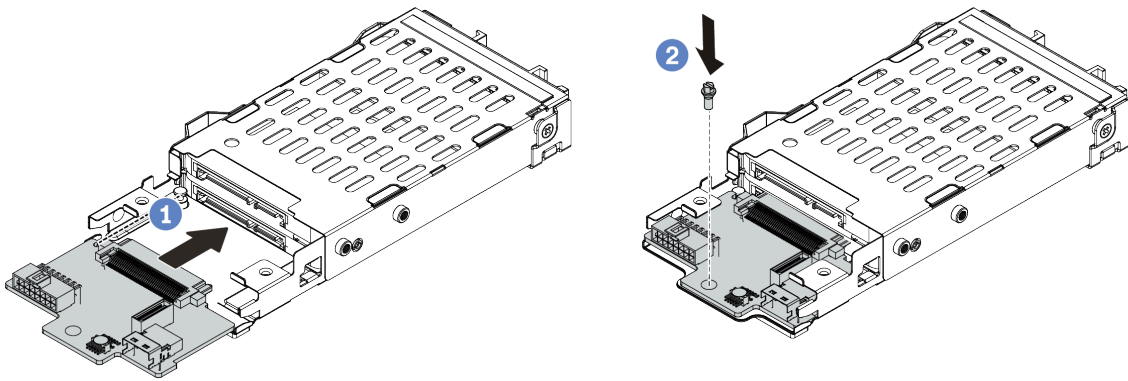


Figure 95. 7mm drive backplane installation (bottom)

- 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 5. Install the 7mm drive backplane on the top.

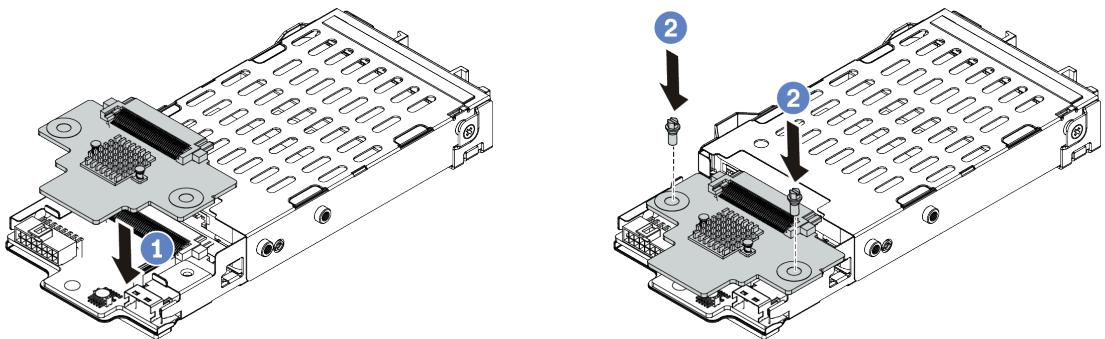


Figure 96. 7mm drive backplane installation (top)

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

Step 6. Connect the cables to the system board. See [“7mm drives” on page 87](#).

## After you finish

1. Reinstall all the drives and fillers (if any) into the drive bays. See [“Install a hot-swap drive” on page 186](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Hot-swap rear/middle drive cage replacement

Use this information to remove and install the 2.5-inch or 3.5-inch rear drive cage.

- [“Remove the 2.5-inch middle drive cage” on page 218](#)
- [“Install the 2.5-inch middle drive cage” on page 220](#)
- [“Remove the 3.5-inch middle drive cage” on page 222](#)
- [“Install the 3.5-inch middle drive cage” on page 225](#)
- [“Remove the 2 x 3.5-inch rear drive cage” on page 227](#)
- [“Install the 2 x 3.5-inch rear drive cage” on page 229](#)
- [“Remove the 4 x 3.5-inch rear drive cage” on page 231](#)
- [“Install the 4 x 3.5-inch rear drive cage” on page 233](#)
- [“Remove the 4 x 2.5-inch rear drive cage” on page 236](#)
- [“Install the 4 x 2.5-inch rear drive cage” on page 238](#)
- [“Remove the 8 x 2.5-inch rear drive cage” on page 240](#)
- [“Install the 8 x 2.5-inch rear drive cage” on page 242](#)
- [“Remove the 7mm drive cage\(3-slot\)” on page 245](#)
- [“Remove the 7mm drive cage\(1-slot\)” on page 249](#)
- [“Install the 7mm drive cage\(3-slot\)” on page 252](#)
- [“Install the 7mm drive cage\(1-slot\)” on page 257](#)

### Remove the 2.5-inch middle drive cage

Use this information to remove the middle 2.5-inch drive cage.

#### About this task

##### Attention:

- Read [“Installation Guidelines” on page 145](#) 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 378](#).
- b. Remove the system fan cage for easier operation. See [“Remove the system fan cage” on page 373](#).
- c. Disconnect cables from the middle drive cage.
- d. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 184](#).



Step 2. Rotate the handle to open it. Then remove the drives from the drive cage.

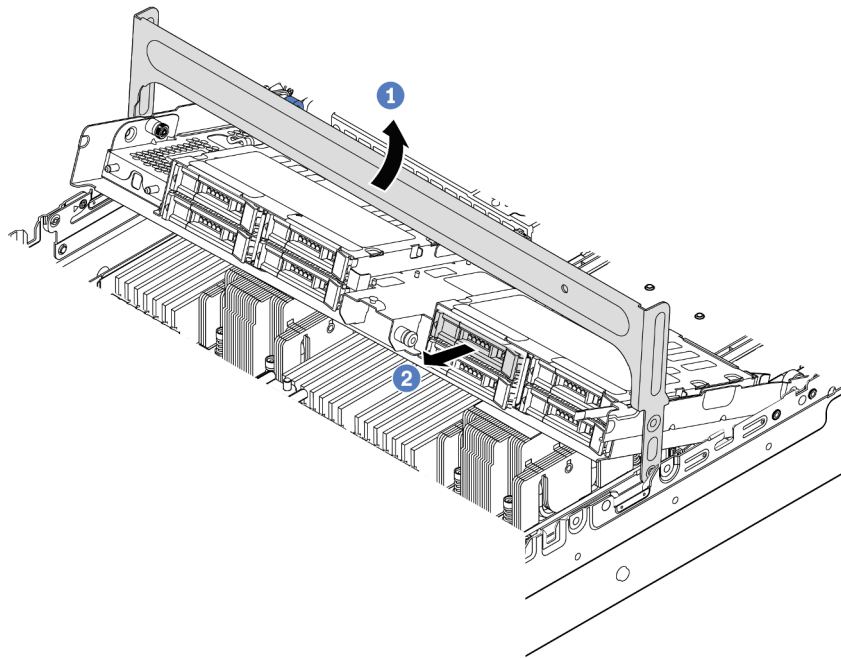


Figure 97. Opening the drive cage handle and removing the drives

Step 3. Pull and twist plunger pins and carefully lift the middle rear cage upward to release it from the chassis.

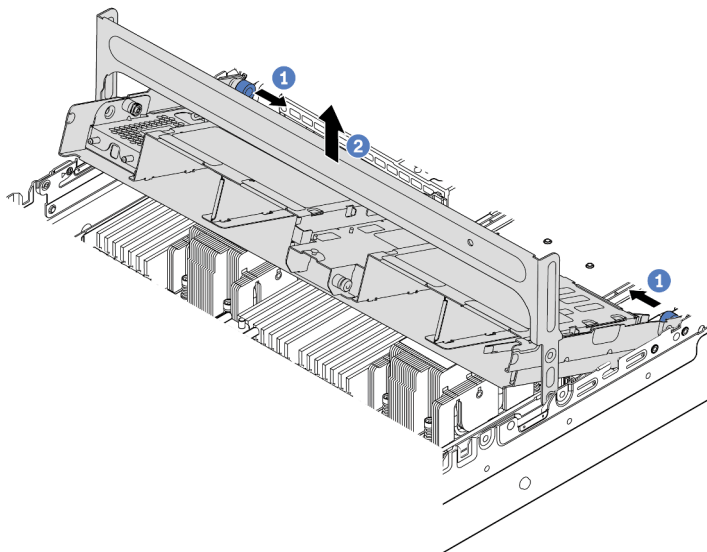


Figure 98. Removing the middle 2.5-inch drive cage

Step 4. Press the latch as shown and close the handle.

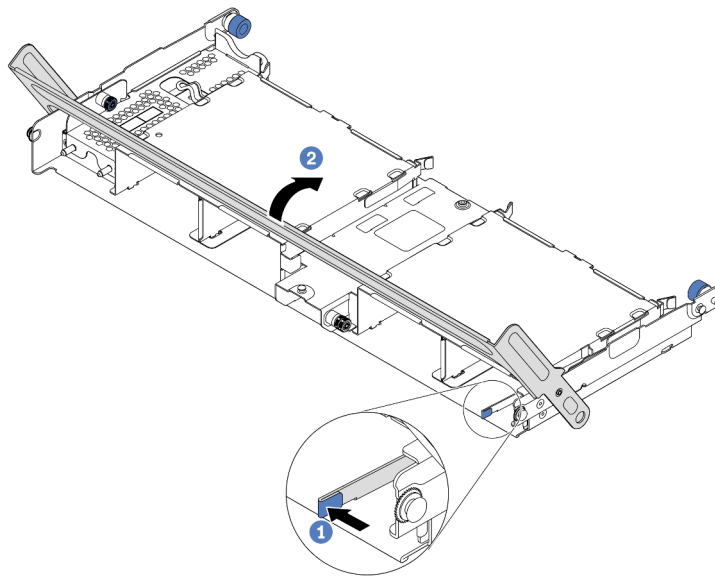


Figure 99. Closing the handle for the middle 2.5-inch drive cage

## After you finish

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

## Demo video

[Watch the procedure on YouTube](#)

## Install the 2.5-inch middle drive cage

Use this information to install the middle 2.5-inch drive cage.

## About this task

The middle drive cage is supported on some server models at certain conditions. For detailed information, see [“Technical rules” on page 18](#).

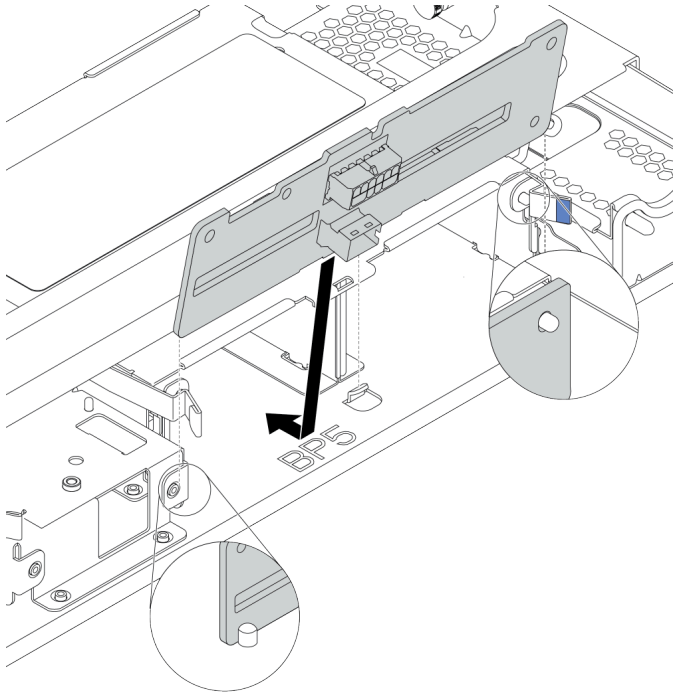
### Attention:

- Read [“Installation Guidelines” on page 145](#) 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. Connect cables to the backplane.

- Step 2. Align the bottom of the backplane with the studs at the bottom of the drive cage. Rotate the backplane to vertical position so that the holes in the backplane pass through the pins on the drive cage, and press the backplane into position. The release latches will secure the backplane in place.



*Figure 100. Installing the backplane*

Step 3. Install the middle drive cage onto chassis and drives into drive bays. Then close the handle.

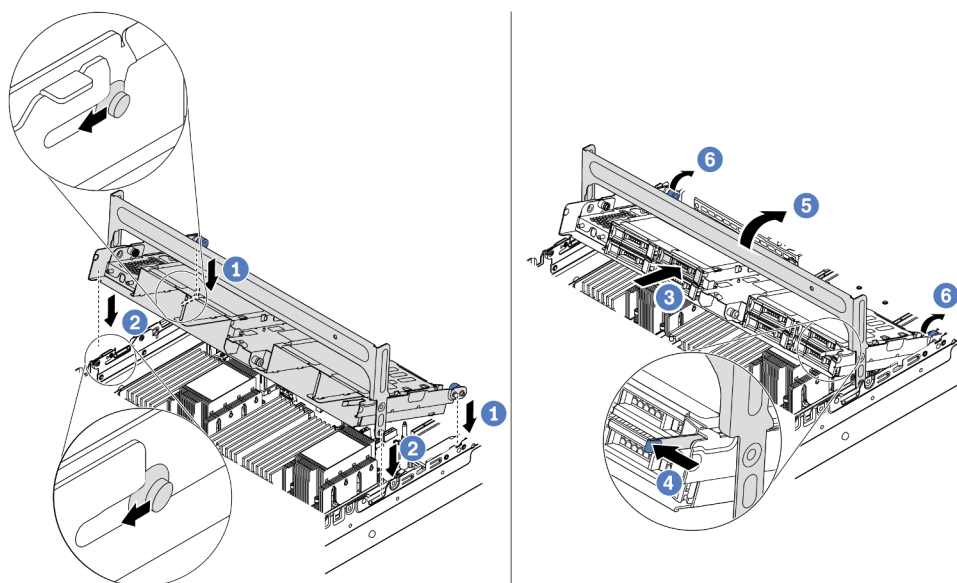


Figure 101. Installing the middle 2.5-inch drive cage and drives

1. Put the rear pins into the chassis slots.
2. Rotate the front of the drive cage down into place.
3. Install drives into the middle drive cage. See [“Install a hot-swap drive” on page 186](#).
4. Press the latch as shown.
5. Rotate the handle to close it.

Step 4. Connect cables from the backplanes to a RAID/HBA adapter. See [Chapter 3 “Internal cable routing” on page 79](#).

## After you finish

1. Connect cables from the backplanes to a RAID/HBA adapter. See [Chapter 3 “Internal cable routing” on page 79](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Remove the 3.5-inch middle drive cage

Use this information to remove the middle 3.5-inch drive cage.

## About this task

### Attention:

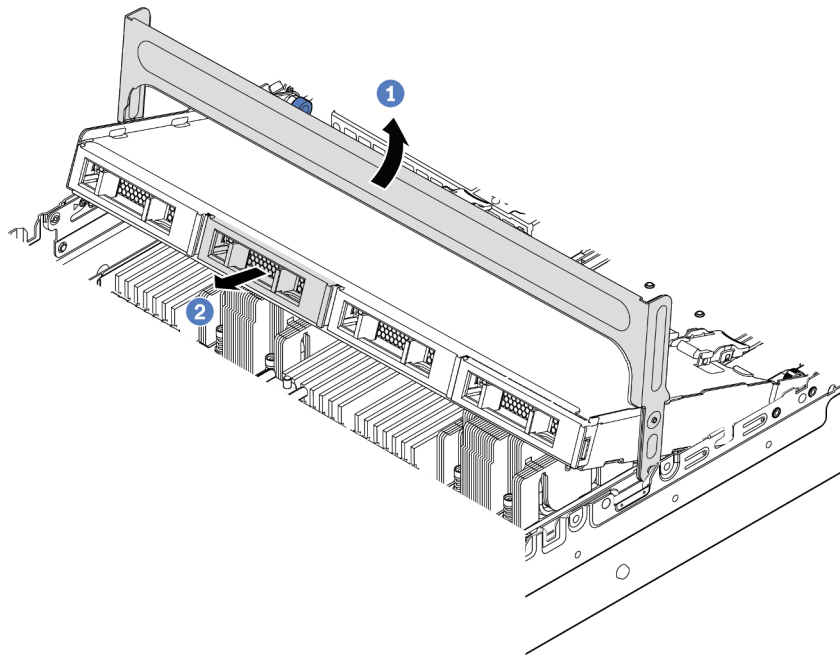
- Read [“Installation Guidelines” on page 145](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective 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 378](#).
- b. Remove the system fan cage for easier operation. See [“Remove the system fan cage” on page 373](#).
- c. Disconnect cables from the middle drive cage.
- d. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 184](#).

Step 2. Rotate the handle to open it. Then removing the drives from the drive cage.



*Figure 102. Opening the drive cage handle and removing the drives*

Step 3. Pull and twist plunger pins and carefully lift the middle rear cage upward to release it from the chassis.

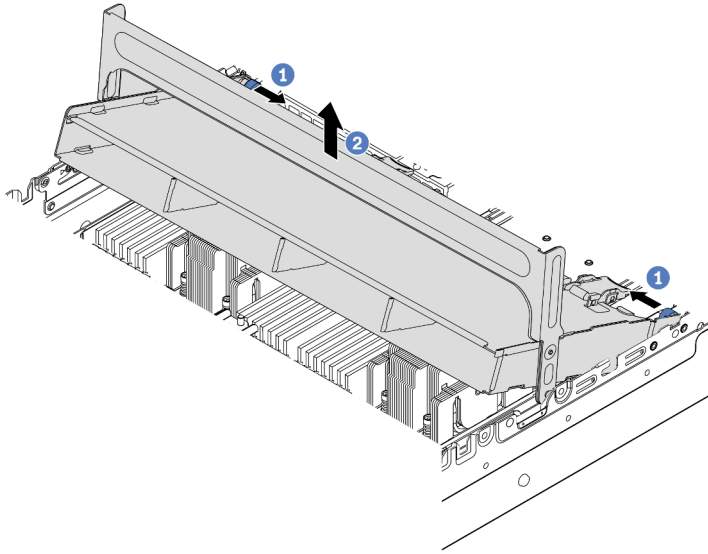


Figure 103. Removing the middle 3.5-inch drive cage

Step 4. Press the latch as shown and close the handle.

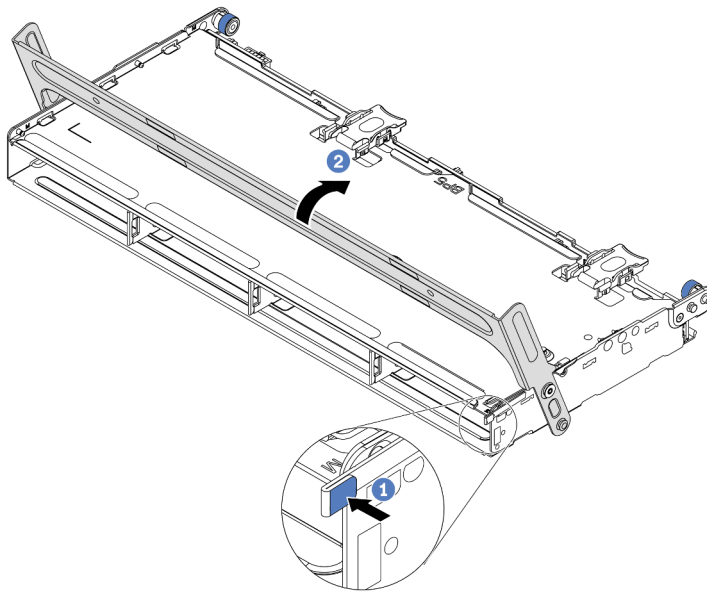


Figure 104. Closing the handle for the middle 3.5-inch drive cage

## After you finish

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

## Demo video

[Watch the procedure on YouTube](#)

## Install the 3.5-inch middle drive cage

Use this information to install the middle 3.5-inch drive cage.

### About this task

The middle drive cage is supported on some server models at certain conditions. For detailed information, see [“Technical rules” on page 18](#).

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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. Connect cables to the backplane.

Step 2. Align the bottom of the backplane with the studs at the bottom of the drive cage. Rotate the backplane to vertical position so that the holes in the backplane pass through the pins on the drive cage, and press the backplane into position. The release latches will secure the backplane in place.

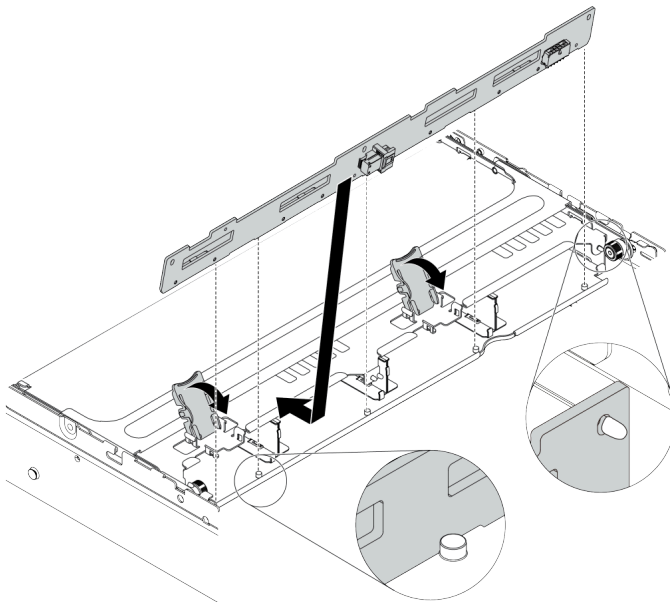


Figure 105. Installing the backplane

Step 3. Install the middle drive cage onto chassis and drives into the drive bays. Then close the handle.

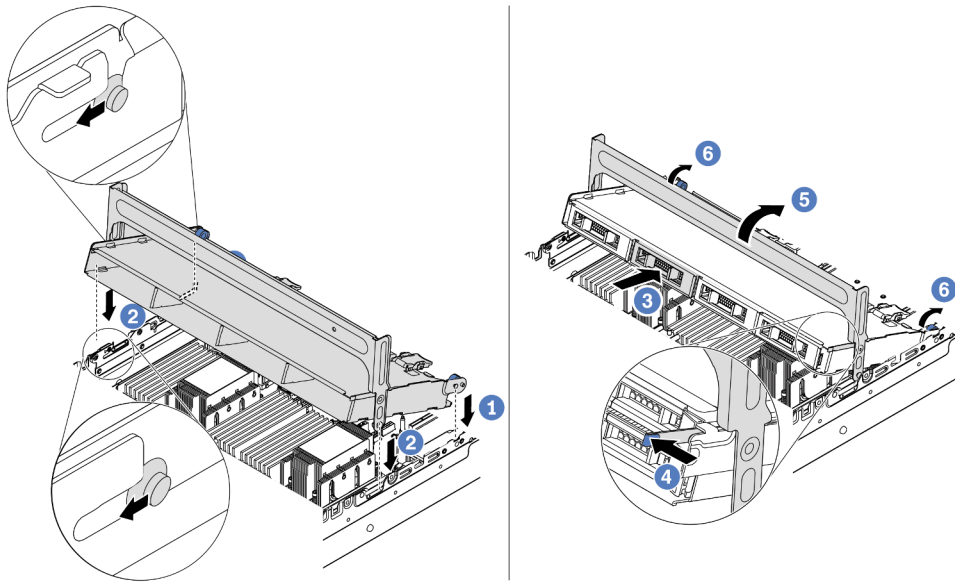


Figure 106. Installing the middle 3.5-inch drive cage and drives

1. Put the rear pins into the chassis slots.
2. Rotate the front of the drive cage down into place.
3. Install drives into the middle drive cage. See [“Install a hot-swap drive” on page 186](#).
4. Press the latch as shown.
5. Rotate the handle to close it.

## After you finish

1. Connect cables from the backplanes to a RAID/HBA adapter. See [Chapter 3 “Internal cable routing” on page 79](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)



## Remove the 2 x 3.5-inch rear drive cage

Use this information to remove the 2 x 3.5-inch rear drive cage.

### About this task

#### Attention:

1. Read [“Installation Guidelines” on page 145](#) to ensure that you work safely.
2. Power off the server and disconnect all power cords for this task.
3. 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.

1. Remove the top cover. See [“Remove the top cover” on page 378](#).
2. Disconnect the cables from the rear drive backplane. See [Chapter 3 “Internal cable routing” on page 79](#).
3. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 184](#).

Step 2. Remove the 2 x 3.5-inch rear drive cage.

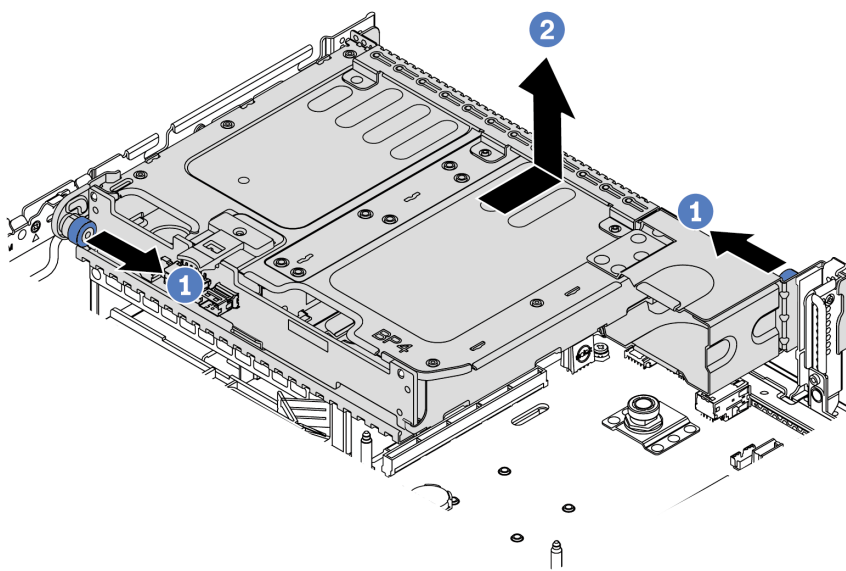


Figure 107. Removing the 2 x 3.5-inch rear drive cage

1. Twist and pull out the blue plungers.
2. Slide the drive cage towards the rear of the chassis to release it.

Step 3. If needed, remove the backplane from the drive cage. See [“Remove the middle or rear 3.5-inch-drive backplane” on page 208](#).

## After you finish

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

## Install the 2 x 3.5-inch rear drive cage

Use this information to install the 2 x 3.5-inch rear drive cage.

### About this task

The rear drive cage is supported on some server models at certain conditions. For detailed information, see [“Technical rules” on page 18](#).

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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. Prepare your server.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 2. Install the 2 x 3.5-inch rear drive cage.

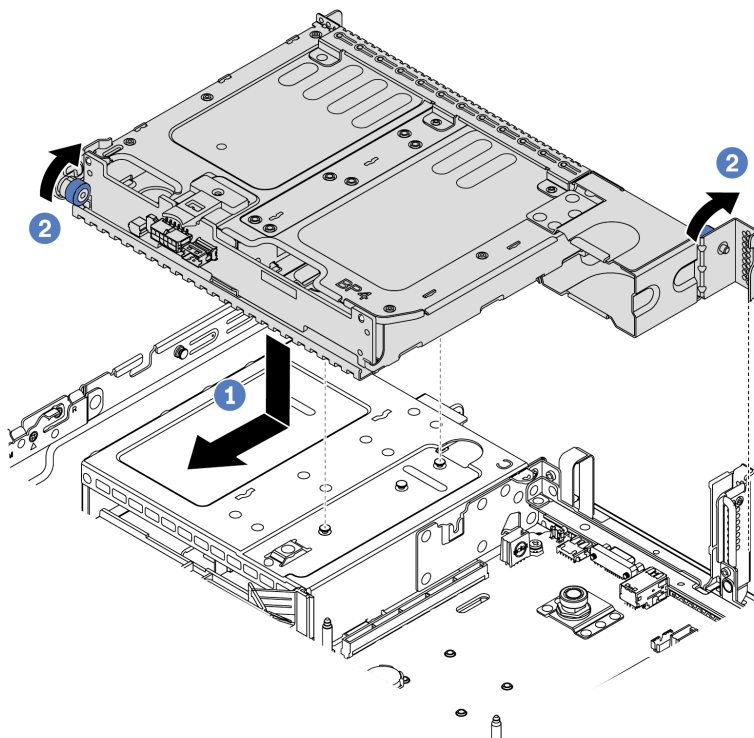


Figure 108. Installing the 2 x 3.5-inch rear drive cage

1. Align the rear drive cage with the chassis, and lower the drive cage into the chassis. Move the rear drive cage forward until it clicks into position.
2. Twist and release the blue plunger to secure the drive cage

Step 3. Check and ensure that the blue plungers are latched into place to secure the rear drive cage.

## After you finish

1. Reinstall the drives or drive fillers into the rear drive cage. See [“Install a hot-swap drive” on page 186](#).
2. Connect cables to the rear drive backplane. See [Chapter 3 “Internal cable routing” on page 79](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Remove the 4 x 3.5-inch rear drive cage

Use this information to remove the 4 x 3.5-inch rear drive cage.

### About this task

#### Attention:

1. Read [“Installation Guidelines” on page 145](#) to ensure that you work safely.
2. Power off the server and disconnect all power cords for this task.
3. 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.

1. Remove the top cover. See [“Remove the top cover” on page 378](#).
2. Disconnect the cables from the rear drive backplane. See [Chapter 3 “Internal cable routing” on page 79](#).
3. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 184](#).

Step 2. Remove the 4 x 3.5-inch rear drive cage.

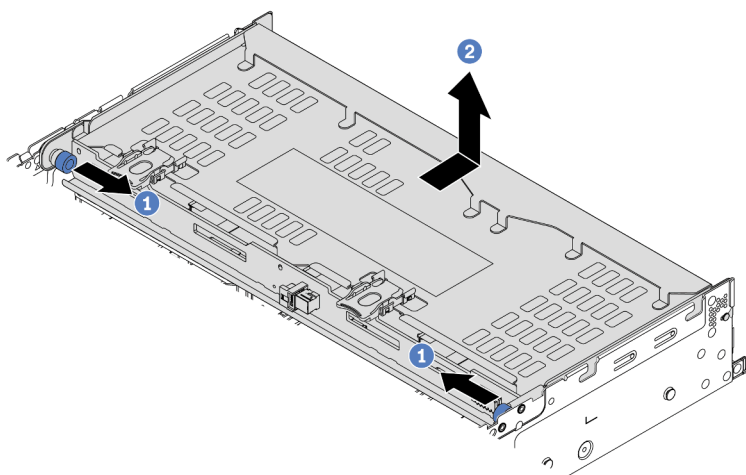


Figure 109. Removing the 4 x 3.5-inch rear drive cage

1. Twist and pull out the blue plungers.
2. Slide the drive cage towards the rear of the chassis to release it.

Step 3. If needed, remove the backplane from the drive cage. See [“Remove the middle or rear 3.5-inch-drive backplane” on page 208](#).

## After you finish

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

## Demo video

[Watch the procedure on YouTube](#)

## Install the 4 x 3.5-inch rear drive cage

Use this information to install the 4 x 3.5-inch rear drive cage.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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. Prepare your server.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 2. Align the rear drive cage with the chassis, and lower the drive cage into the chassis. Move the rear drive cage forward until it clicks into position.

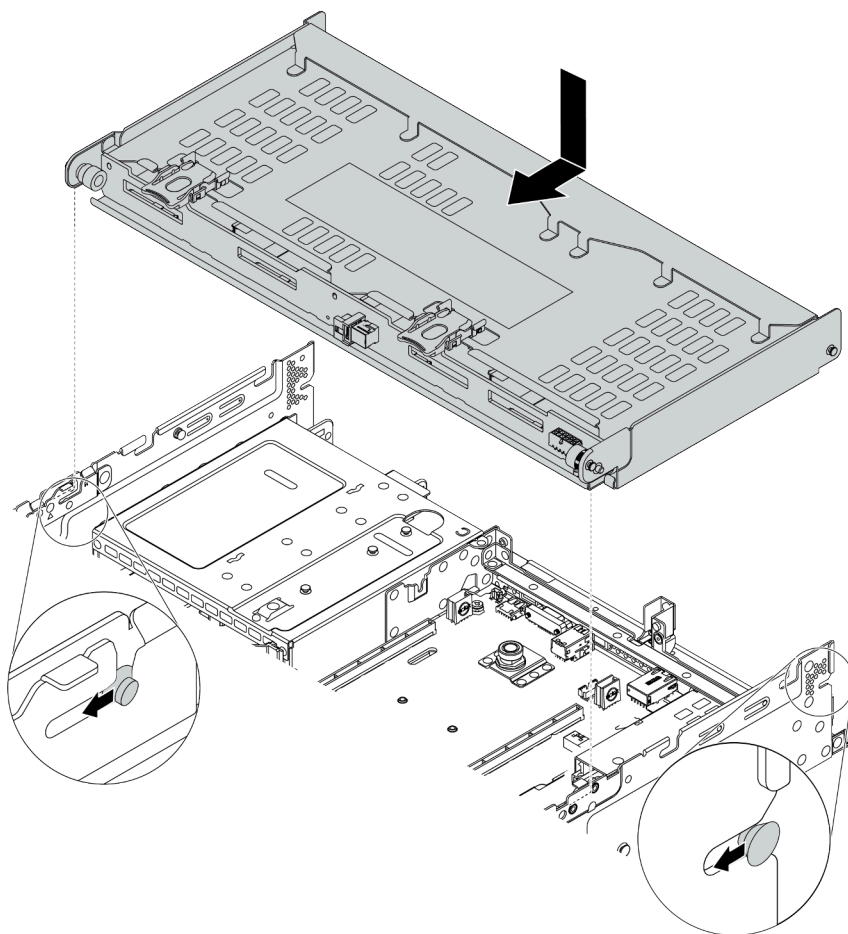
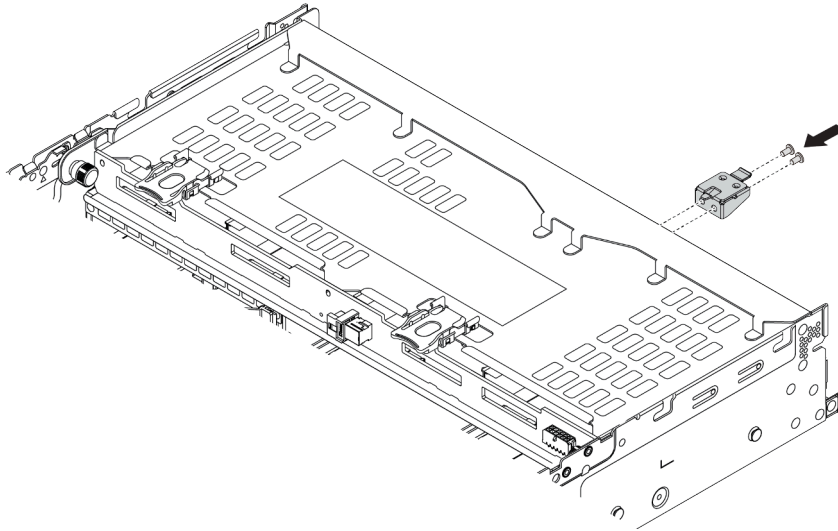


Figure 110. Installing the 4 x 3.5-inch rear drive cage

Step 3. Check and ensure that the blue plungers are latched into place to secure the rear drive cage.

Step 4. Install the top cover support bracket.





*Figure 111. Installing the top cover support bracket*

## **After you finish**

1. Reinstall the drives or drive fillers into the rear drive cage. See [“Install a hot-swap drive” on page 186](#).
2. Connect cables to the rear drive cage. See [Chapter 3 “Internal cable routing” on page 79](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## **Demo video**

[Watch the procedure on YouTube](#)

## Remove the 4 x 2.5-inch rear drive cage

Use this information to remove the 4 x 2.5-inch rear drive cage.

### About this task

#### Attention:

1. Read [“Installation Guidelines” on page 145](#) to ensure that you work safely.
2. Power off the server and disconnect all power cords for this task.
3. 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.

1. Remove the top cover. See [“Remove the top cover” on page 378](#).
2. Disconnect the cables from the rear drive cage.
3. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 184](#).

Step 2. Remove the 4 x 2.5-inch drive cage.

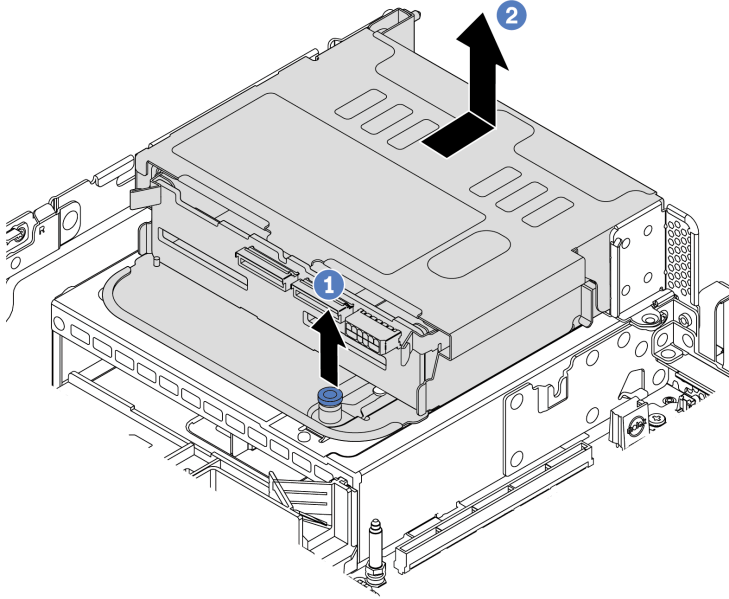


Figure 112. Removing the rear 4 x 2.5-inch drive cage

1. Twist and pull out the blue plunger.
  2. Slide the drive cage towards the rear of the chassis to release it.
- Step 3. If needed, remove the backplane from the drive cage. See [“Remove the middle or rear 2.5-inch-drive backplane” on page 197](#).

## After you finish

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

## Install the 4 x 2.5-inch rear drive cage

Use this information to install the 4 x 2.5-inch rear drive cage.

### About this task

The rear drive cage is supported on some server models at certain conditions. For detailed information, see [“Technical rules” on page 18](#).

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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. Prepare your server.

1. Install the required performance system fans. See [“System fan replacement” on page 367](#).
2. Install the required riser brackets. See [“PCIe adapter and riser assembly replacement” on page 346](#).
3. Install the backplane to the drive cage. See [“Install the middle or rear 2.5-inch-drive backplane” on page 200](#).
4. Remove irrelevant rearwall brackets and install the rearwall brackets required for installing the 4 x 2.5-inch rear drive cage. See [“Rearwall bracket replacement” on page 332](#)

Step 2. Install the 4 x 2.5-inch rear drive cage.

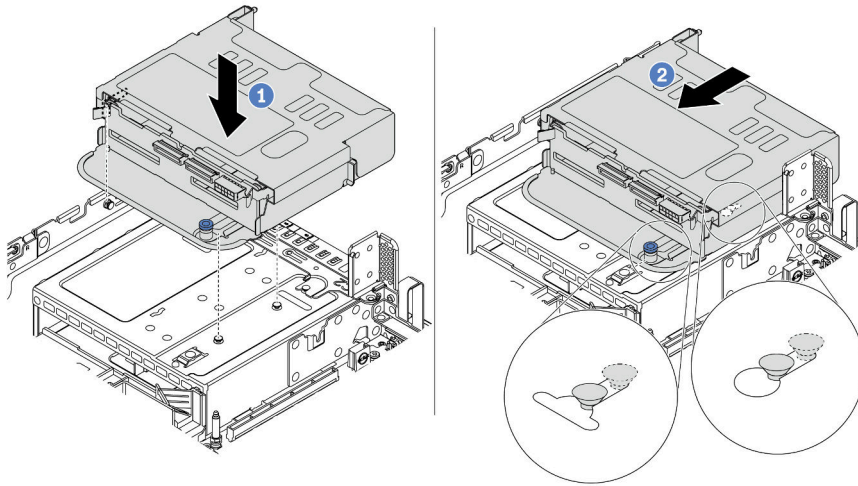


Figure 113. Installing the 4 x 2.5-inch rear drive cage

1. Align the rear drive cage with the chassis, and lower the drive cage into the chassis.
2. Move the rear drive cage forward until it clicks into position.

## After you finish

1. Reinstall the drives or drive fillers into the rear drive cage. See [“Install a hot-swap drive” on page 186](#).
2. Connect cables to the rear drive backplane. See [Chapter 3 “Internal cable routing” on page 79](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Remove the 8 x 2.5-inch rear drive cage

Use this information to remove the 8 x 2.5-inch rear drive cage.

### About this task

#### Attention:

1. Read [“Installation Guidelines” on page 145](#) to ensure that you work safely.
2. Power off the server and disconnect all power cords for this task.
3. 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.

1. Remove the top cover. See [“Remove the top cover” on page 378](#).
2. Disconnect the cables from the rear drive cage.
3. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 184](#).

Step 2. Remove the 8 x 2.5-inch rear drive cage.

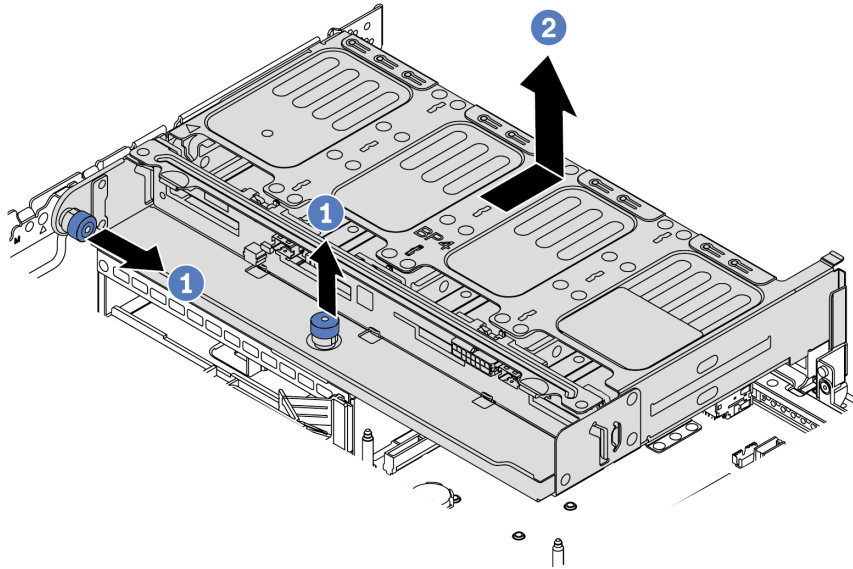


Figure 114. Removing the 8 x 2.5-inch rear drive cage

1. Twist and pull out the blue plunger.
2. Slide the drive cage towards the rear of the chassis to release it.

Step 3. If needed, remove the backplane from the drive cage. See [“Remove the middle or rear 2.5-inch-drive backplane” on page 197](#).

## After you finish

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

## Demo video

[Watch the procedure on YouTube](#)

## Install the 8 x 2.5-inch rear drive cage

Use this information to install the 8 x 2.5-inch rear drive cage.

### About this task

The rear drive cage is supported on some server models at certain conditions. For detailed information, see [“Technical rules” on page 18](#).

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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. Prepare your server.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 2. Install the 8 x 2.5-inch rear drive cage.

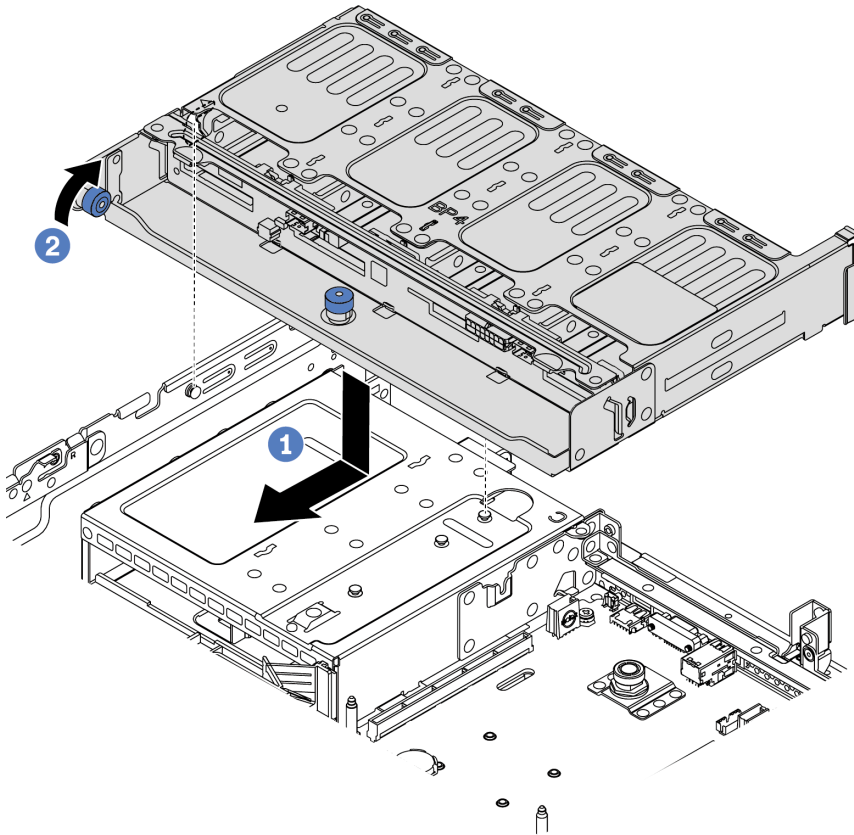


Figure 115. Installing the 8 x 2.5-inch rear drive cage

1. Align the rear drive cage with the chassis, and lower the drive cage into the chassis. Move the rear drive cage forward until it clicks into position.
2. Twist and put down the blue plunger.

## After you finish

1. Reinstall the drives or drive fillers into the rear drive cage. See [“Install a hot-swap drive” on page 186](#).
2. Connect cables to the rear drive cage. See [Chapter 3 “Internal cable routing” on page 79](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)



## Remove the 7mm drive cage(3–slot)

Use this information to remove the 7mm drive cage(two full-height slots + one 7mm cage).

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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.

1. Remove the top cover. See [“Remove the top cover” on page 378](#).
2. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 184](#).
3. Record the cable connections for 7mm drives and then disconnect all cables from the backplanes. See [“7mm drives” on page 87](#).

Step 2. Remove the riser 1 or riser 2 assembly from the system board.

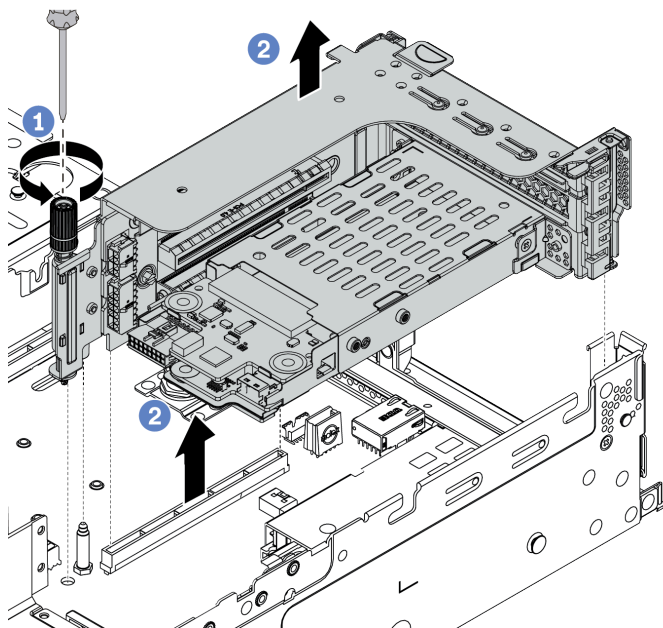


Figure 116. Riser assembly removal

Step 3. Remove the 7mm drive cage from the riser assembly

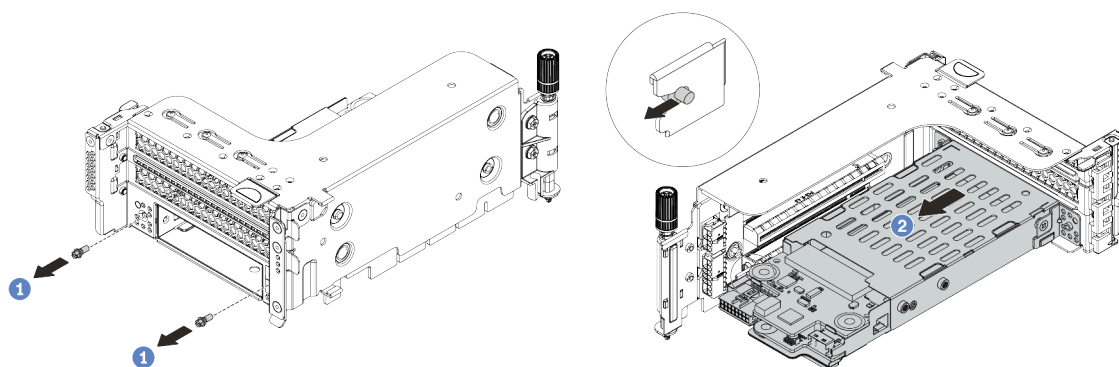
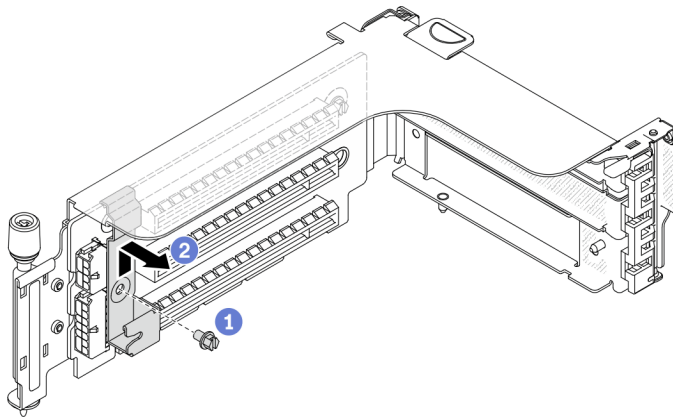


Figure 117. 7mm drive cage removal

1. Remove the two screws as shown.
2. Slightly and horizontally slide the cage out of the riser 2 cage.



- Step 4. Remove the two 7mm backplanes from the 7mm drive cage. See [“Remove the 7mm drive backplanes” on page 213](#).
- Step 5. Remove the 7mm drive cage securing clip as shown.



*Figure 118. 7mm drive cage securing clip removal*

## **After you finish**

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

## **Demo video**

[Watch the procedure on YouTube](#)

## Remove the 7mm drive cage(1–slot)

Use this information to remove the 7mm drive assembly(one 7mm cage).

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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.

1. Remove the top cover. See [“Remove the top cover” on page 378](#).
2. Remove all the installed drives and fillers (if any) from the drive bays. See [“Remove a hot-swap drive” on page 184](#).
3. Record the cable connections for 7mm drives and then disconnect all cables from the backplanes. See [“7mm drives” on page 87](#).

Step 2. Remove the riser 1 or riser 2 assembly from the system board.

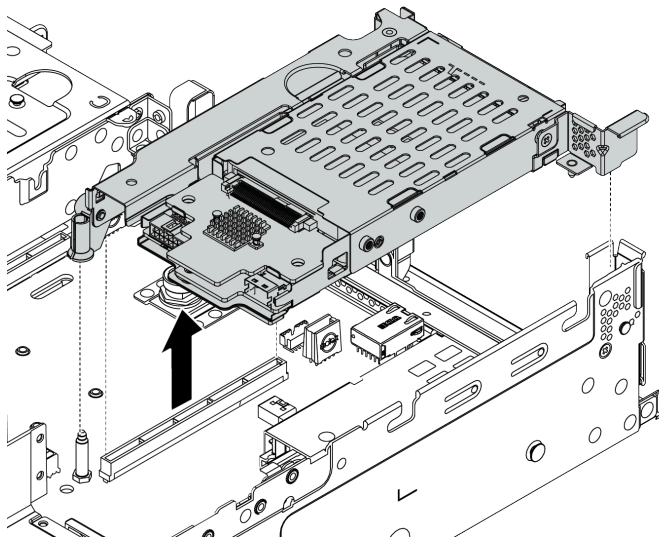


Figure 119. Riser assembly removal



Step 3. Remove the two 7mm backplanes from the 7mm drive cage. See [“Remove the 7mm drive backplanes” on page 213](#).

### **After you finish**

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

## Install the 7mm drive cage(3-slot)

Use this information to install the 7mm drive cage(two full-height slots + one 7mm cage).

### About this task

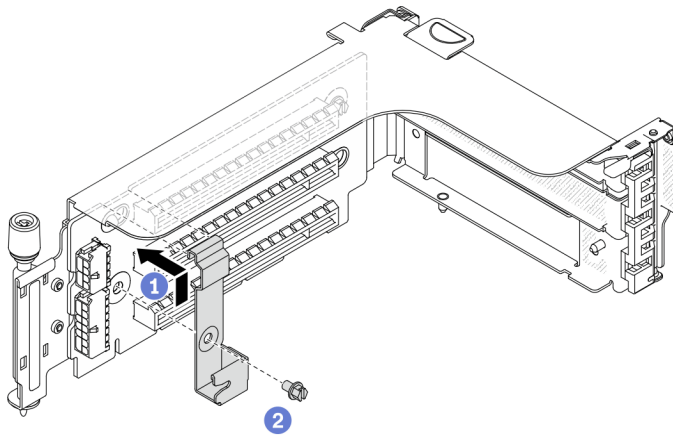
#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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. Take the new part out of the package and place it on a static-protective surface.
- Step 2. Prepare your server.
  - 1. Power off the server.
  - 2. Remove the top cover. See [“Remove the top cover” on page 378](#).
  - 3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
  - 4. Remove any components that are impeding the procedure.
  - 5. Install any components that are required before installing or removing the component(s).
- Step 3. Install the two 7mm backplanes to the 7mm drive cage.

Step 4. Hook the securing clip over the riser adapter on the riser cage.



*Figure 120. 7mm drive cage securing clip installation*

Step 5. Install the 7mm drive cage to the riser cage.

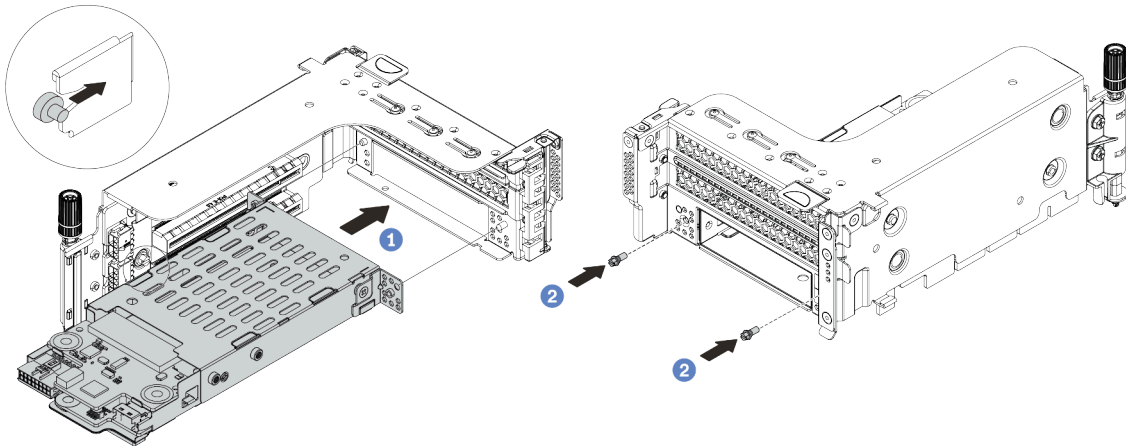


Figure 121. 7mm drive cage installation

- a. Align the left-side pin on the 7mm drive cage with the positioning slot on the securing clip, the two holes on the side brackets of the 7mm drive cage with the two holes on the front of the riser cage.
- b. Install the two screws to secure the 7mm drive cage in place.

Step 6. Install the 7mm drive assembly on the system board.

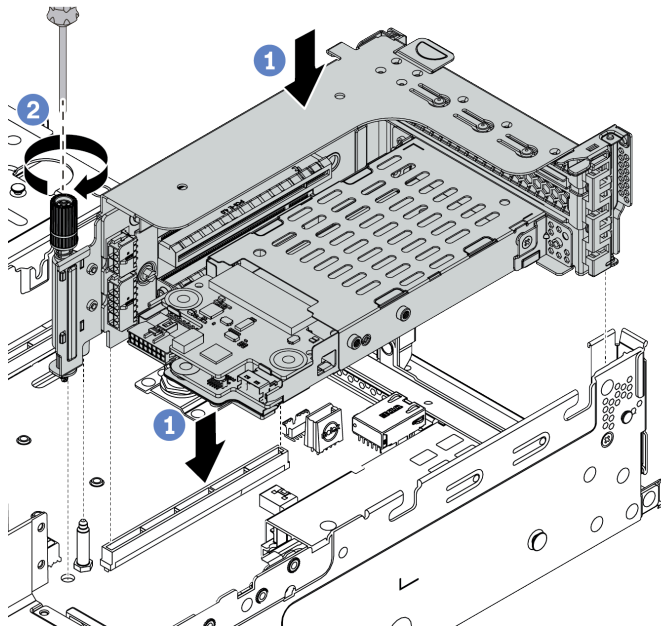


Figure 122. 7mm drive cage installation

Step 7. Connect any cables from the 7mm drive backplanes. See [“7mm drives” on page 87](#).

## After you finish

1. Reinstall all the drives and fillers (if any) into the drive bays. See [“Install a hot-swap drive” on page 186](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Install the 7mm drive cage(1–slot)

Use this information to install the 7mm drive cage(one 7mm cage).

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 145](#) 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. Take the new part out of the package and place it on a static-protective surface.
- Step 2. Prepare your server.
  - 1. Power off the server.
  - 2. Remove the top cover. See [“Remove the top cover” on page 378](#).
  - 3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
  - 4. Remove any components that are impeding the procedure.
  - 5. Install any components that are required before installing or removing the component(s).
- Step 3. Install the two 7mm backplanes to the 7mm drive cage.



Step 4. Install the 7mm drive assembly on the system board.

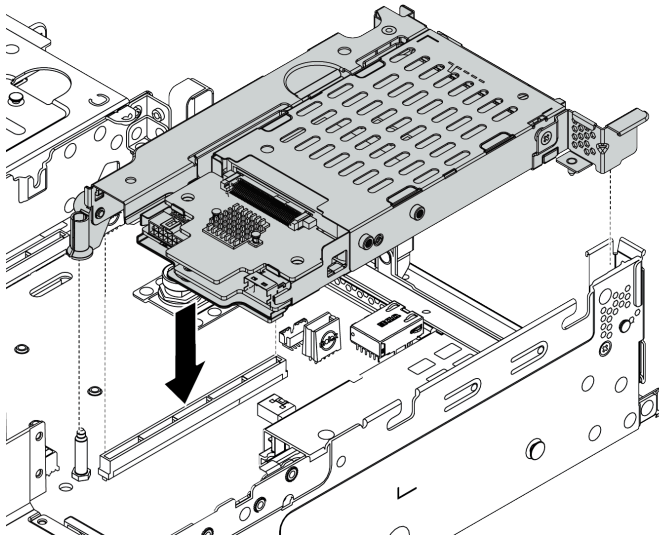


Figure 123. 7mm drive cage installation

Step 5. Connect any cables from the 7mm drive backplanes. See [“7mm drives” on page 87](#).

### After you finish

1. Reinstall all the drives and fillers (if any) into the drive bays. See [“Install a hot-swap drive” on page 186](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Hot-swap power supply unit replacement

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

- [“Remove a hot-swap power supply unit” on page 263](#)
- [“Install a hot-swap power supply unit” on page 266](#)

### Safety precautions

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

#### AC power supply units

##### S001



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

To avoid a shock hazard:

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

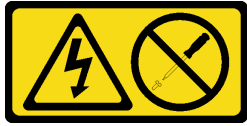
##### S002



#### 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:**

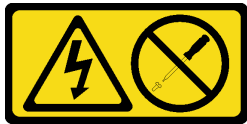


240 V DC input (input range: 180-300 V) is supported in Chinese Mainland ONLY.

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.



**For -48V dc power supply, electrical current from power cords is hazardous.**

**To avoid a shock hazard:**

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

**To Connect:**

1. Turn OFF subject dc power source(s) and equipment (s) that are attached to this product.
2. Install the power supply unit(s) into the system housing.
3. Attach dc power cord(s) to the product.
  - Ensure correct polarity of -48 V dc connections: RTN is + and -Vin (typical -48 V) dc is -. Earth ground should be connected very well.
4. Connect dc power cord(s) to subject power source (s).
5. Turn ON all the power source(s).

**To Disconnect:**

1. Disconnect or turn off the subject dc power source(s) (at the breaker panel) before removing the power supply unit(s).
2. Remove the subject dc cords(s) and make sure the wire terminal of power cord(s) is insulated.
3. Unplug the subject power supply unit(s) from the system housing.

## 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 145](#) 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.

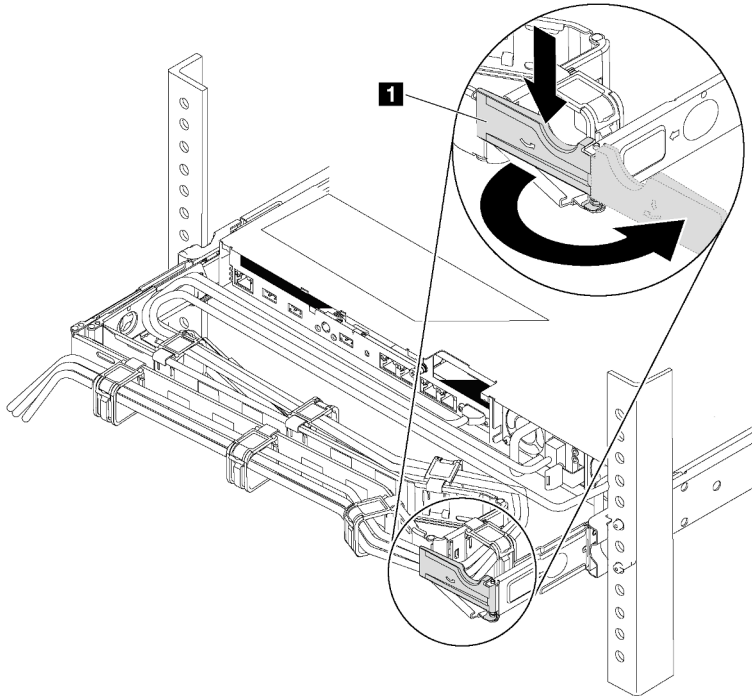


Figure 124. CMA adjustment

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 65](#).

- 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.

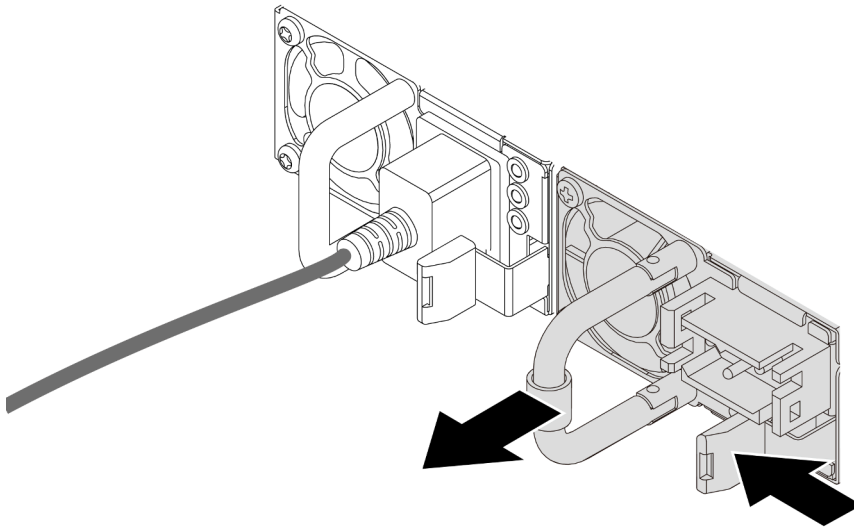


Figure 125. Hot-swap power supply removal

### 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 266](#).

**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 for 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 126. Example label

### Attention:

- Read “Installation Guidelines” on page 383 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.

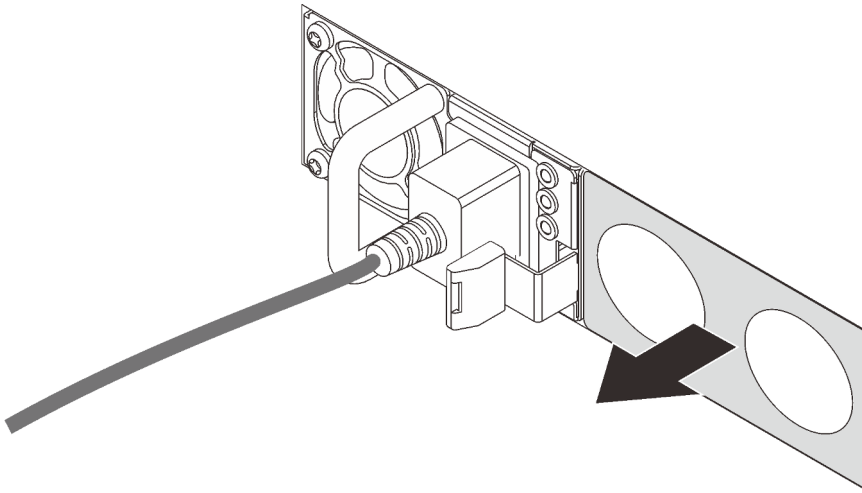


Figure 127. Hot-swap power supply filler removal

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

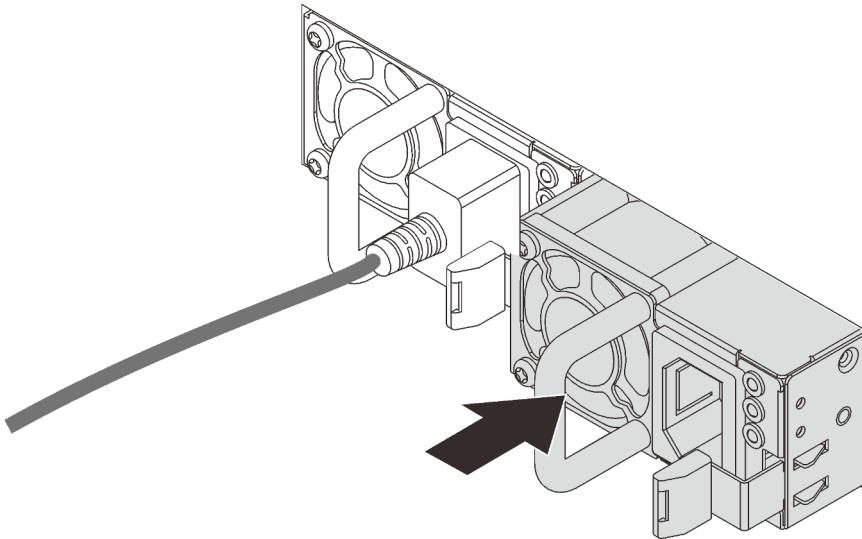



Figure 128. Hot-swap power supply installation

- Step 4. Connect the power cord(s).
- 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 adapter replacement

Use this information to remove and install the internal CFF RAID adapter, internal CFF HBA adapter, or internal CFF RAID expander adapter.

### Remove the internal CFF RAID/HBA/RAID expander adapter

Use this information to remove the internal CFF RAID adapter, internal CFF HBA adapter, or internal CFF RAID expander adapter.

#### About this task

##### Attention:

- Read [“Installation Guidelines” on page 383](#) 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.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 2. Lift the release pin, slightly slide the adapter as shown, and carefully lift it out of the chassis.

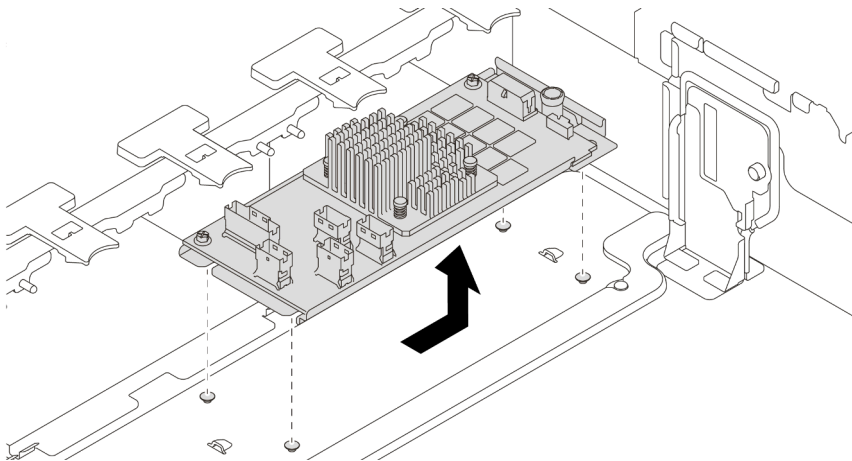


Figure 129. Internal CFF RAID/HBA/RAID expander adapter removal

#### After you finish

If you are instructed to return the old 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/RAID expander adapter

Use this information to install the internal CFF RAID adapter, internal CFF HBA adapter, or internal CFF RAID expander adapter.

### About this task

**Note:** The adapter is shipped with and preinstalled on a mounting bracket, check and ensure that the adapter is fixed in place. If there are any loosen screws, tighten the screws using a No.1 Phillips torque screwdriver. The maximum torque value is  $4.8 \pm 0.5$  inch-pounds.

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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. Take the new part out of the package and place it on a static-protective surface.

Step 2. Prepare your server.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 3. Align the notches on the mounting bracket with the pins on the chassis, place down the adapter, and slightly slide it as shown to secure it on the chassis.

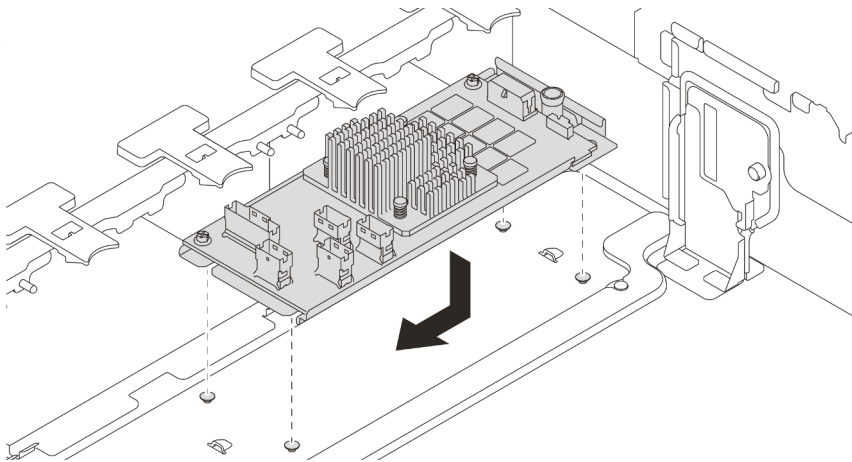


Figure 130. Internal CFF RAID/HBA adapter installation

Step 4. Connect cables to the adapter.

### After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Intrusion switch replacement

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

- [“Remove the intrusion switch” on page 273](#)
- [“Install the intrusion switch” on page 275](#)

### Remove the intrusion switch

Use this information to remove the intrusion switch.

#### About this task

- Read [“Installation Guidelines” on page 383](#) 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, extend the server from the rack.
- Step 2. Remove the top cover. See [“Remove the top cover” on page 378](#).
- Step 3. Remove the intrusion switch assembly from the fan cage as shown.

**Note:** The blowup in the illustration shows the fan cage upside down.

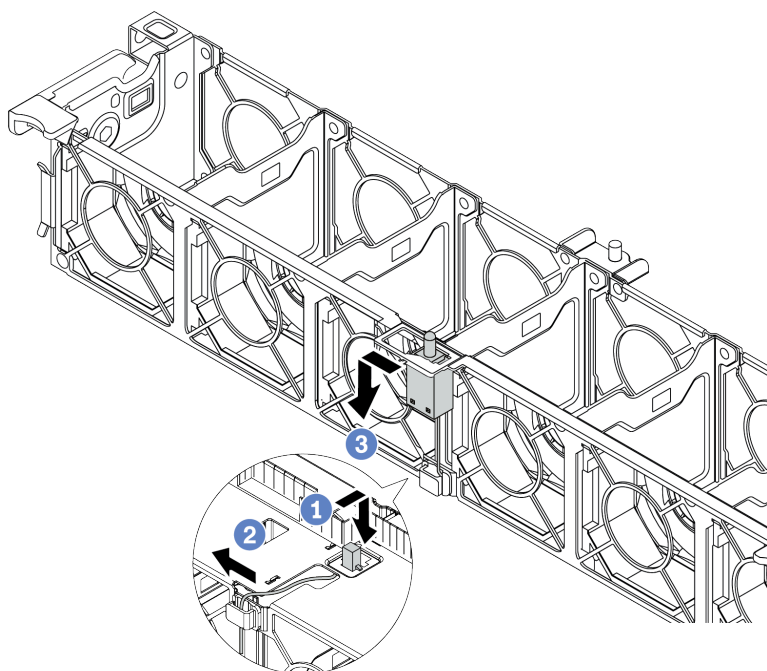


Figure 131. Intrusion switch removal

- a. Move the intrusion switch connector forward to disengage it from the keyhole.
- b. Release the intrusion switch cable from the cable clip.
- c. Slide and pull the intrusion switch to remove it from the holder.

## After you finish

- 1. Install a new intrusion switch. See [“Install the intrusion switch” on page 275](#).
- 2. If you are instructed to return the defective component, follow all packaging instructions and use any packaging materials that are provided.

## Demo video

[Watch the procedure on YouTube](#)



## Install the intrusion switch

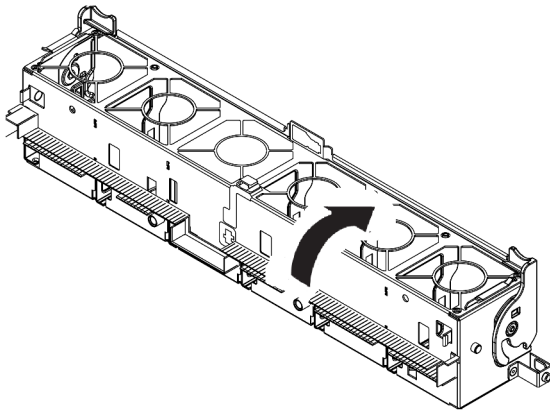
Use this information to install the intrusion switch.

### About this task

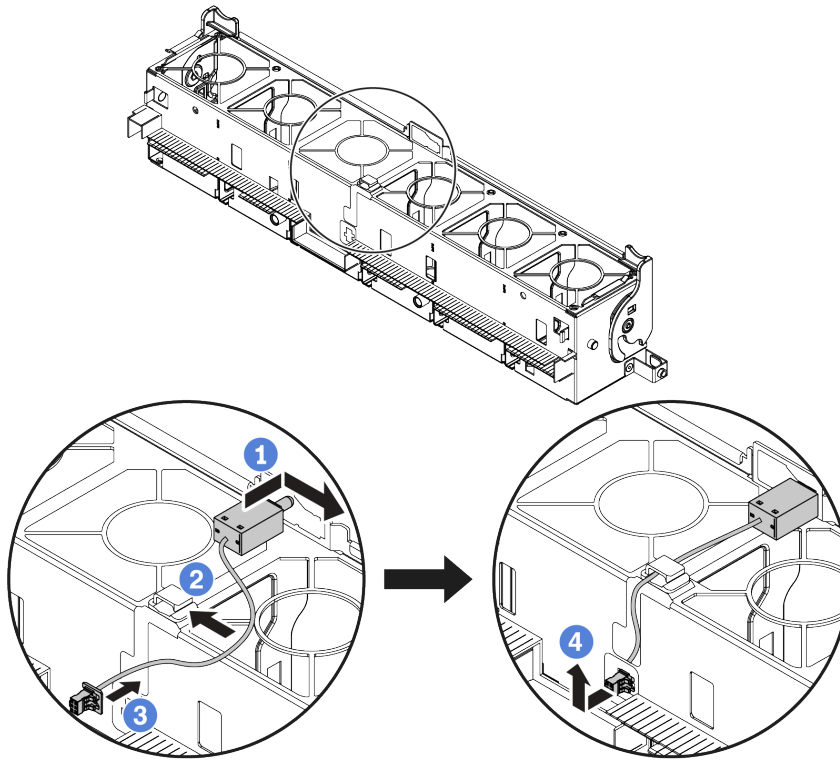
- Read [“Installation Guidelines” on page 383](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

## Procedure

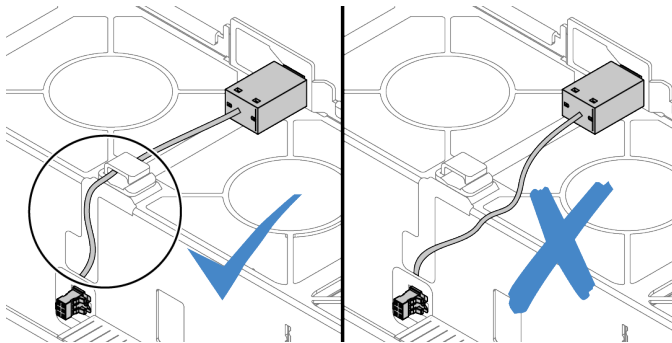
- Step 1. Touch the static-protective package that contains the new intrusion switch to any unpainted surface on the outside of the server. Then, take the new intrusion switch out of the package and place them on a static-protective surface.
- Step 2. Rotate the fan cage by 90 degrees in the direction shown in the picture.



Step 3. Install the intrusion switch onto the fan cage.



**Note:** Ensure that the intrusion switch cable is routed through the cable clip and the pre-cut slot. Otherwise, the cable may slide under the fan cage, the contact surface between the fan cage and the system board may get uneven, and the fan connection may get loose.



- Insert the intrusion switch onto the holder on the fan cage and push it in the direction as shown until it is fully seated.
- Fix the intrusion switch cable into the cable clip.
- Route the cable into the fan cage through the pre-cut slot on the fan cage bottom.
- Insert the intrusion switch connector into the connector keyhole, and move it in the shown direction until it is fully seated.

Step 4. Install the fan cage back into the chassis. See [“Install the system fan cage” on page 375](#).

Step 5. Install system fans into the fan cage. [“Install a system fan” on page 370](#)

## **After you finish**

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### **Demo video**

[Watch the procedure on YouTube](#)

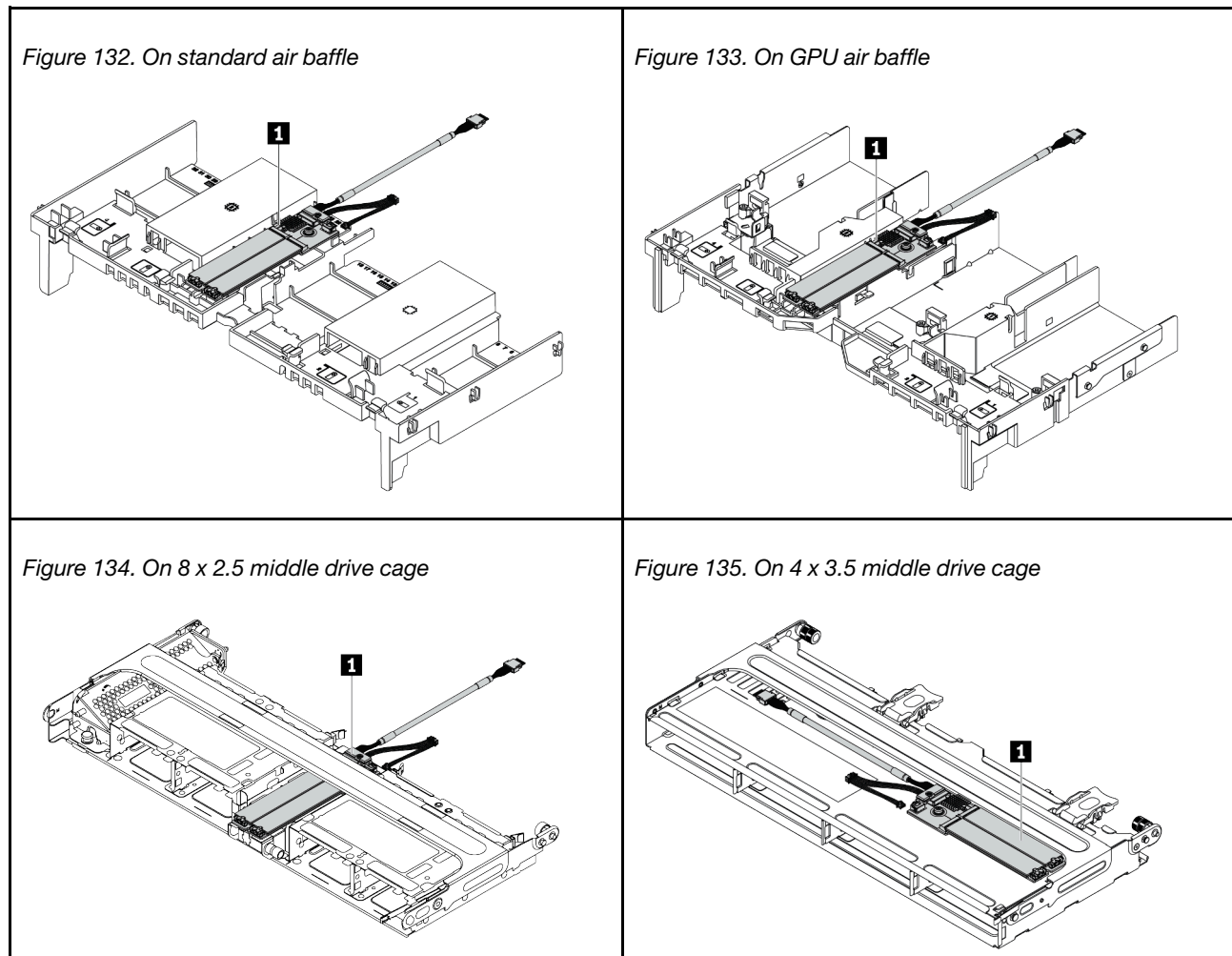
## M.2 adapter and M.2 drive replacement

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

- “Remove the M.2 adapter and M.2 drive” on page 280
- “Adjust the retainer on the M.2 adapter” on page 284
- “Install the M.2 adapter and M.2 drive” on page 286

The position of the M.2 module **1** vary by server hardware configuration. This topic uses the M.2 module on the standard air baffle as an example for replacement illustration. The replacement procedure is the same for the others.

Table 21. M.2 module position



## 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 383](#) 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 remove might be different from the following illustrations, but the removal method is the same.

Step 1. Remove the top cover. See [“Remove the top cover” on page 378](#).

Step 2. Disconnect the 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.

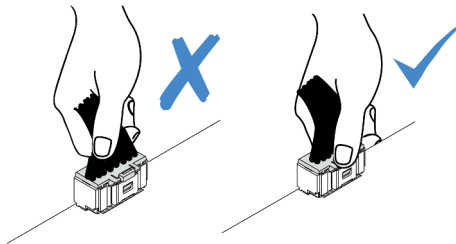


Figure 136. Disconnecting the M.2 cables

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

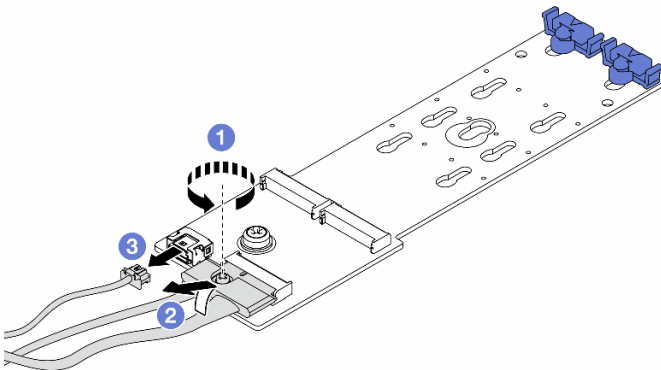


Figure 137. Disconnecting M.2 cables

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

Step 4. Remove the M.2 drive from the M.2 adapter.

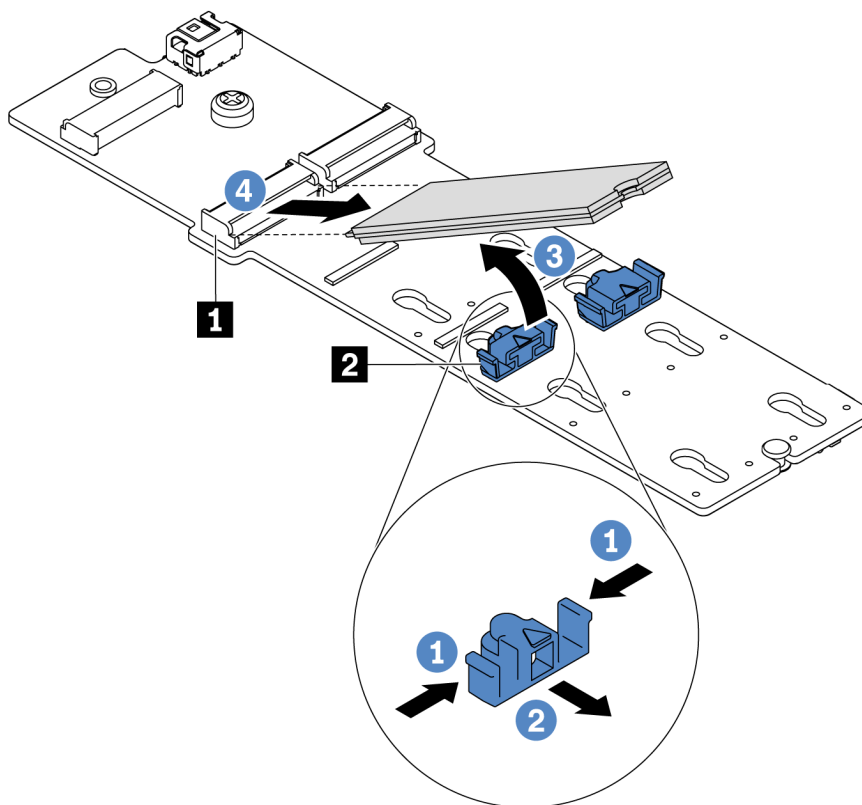
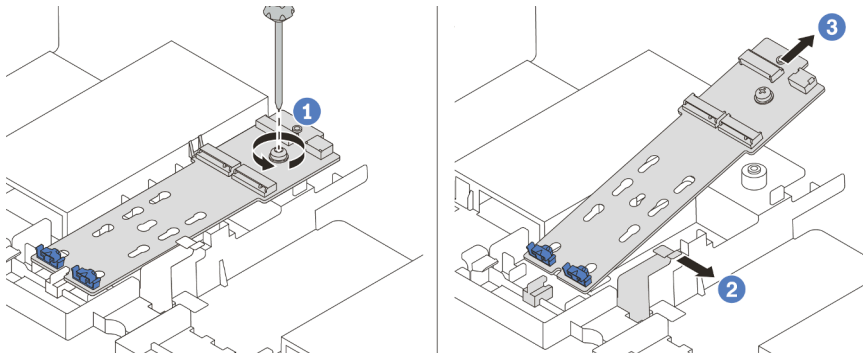


Figure 138. M.2 drive removal

- 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 **1** at an angle of approximately 30 degrees.



Step 5. Remove the M.2 adapter.



*Figure 139. M.2 adapter removal*

- a. Loosen the screw and remove the M.2 adapter from the bracket.
- b. Open the retainer clip on the air baffle.
- c. Remove the M.2 adapter from the air baffle.

#### **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.

### Attention:

- Read [“Installation Guidelines” on page 383](#) 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. Locate the correct keyhole that the retainer should be installed into to accommodate the particular size of the M.2 drive you wish to install.
- Step 2. Adjust the M.2 retainer.

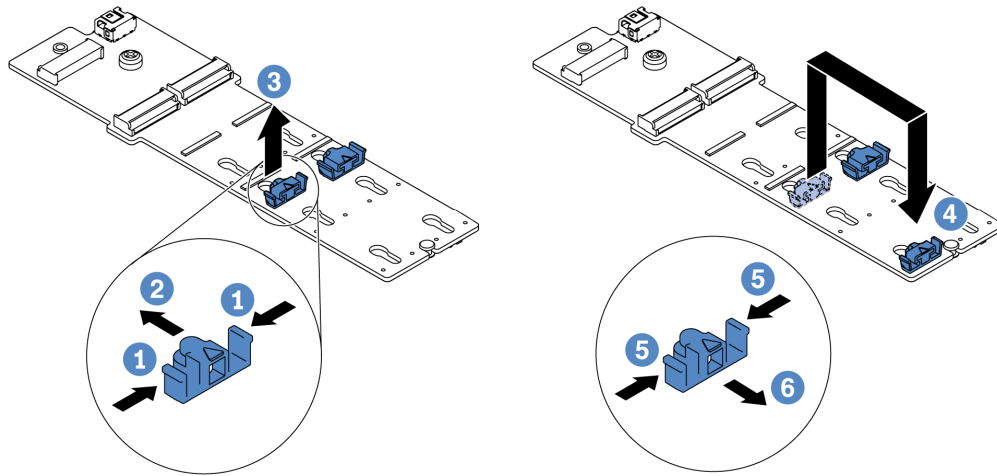


Figure 140. M.2 retainer adjustment

- a. Press both sides of the retainer.
- b. Move the retainer forward until it is in the large opening of the keyhole.
- c. Take the retainer out of the keyhole.
- d. Insert the retainer into the correct keyhole.
- e. Press both sides of the retainer.
- f. Slide the retainer backwards (toward the small opening of the keyhole) 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.

### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 M.2 adapter and M.2 drive to any unpainted surface on the outside of the server. Then, take the new M.2 adapter and M.2 drive out of the package and place them on a static-protective surface.

### Notes:

- The M.2 adapter 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 284](#).

Step 3. Locate the connector on the M.2 adapter.

**Note:** Some M.2 adapters support two identical M.2 drives. Install the M.2 drive in slot 0 first.

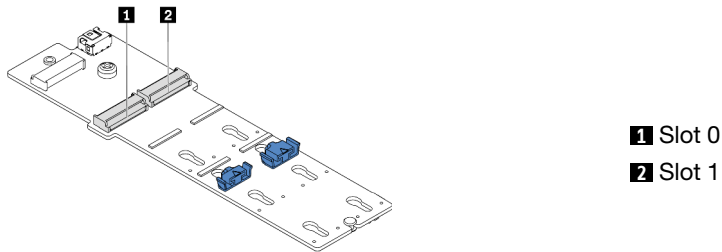


Figure 141. M.2 drive slot

Step 4. Install the M.2 adapter into the M.2 tray.

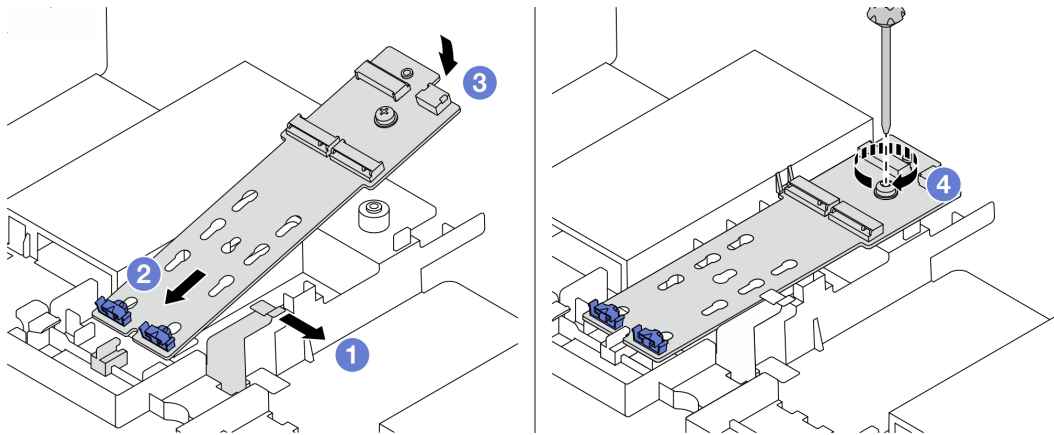


Figure 142. M.2 adapter installation

- Open the retention clip on the air baffle.
- Insert the M.2 adapter at an angle of approximately 30 degrees into the tray as shown.
- Rotate the M.2 adapter downward until it snaps into place.
- Tighten the screw to secure the M.2 adapter.

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

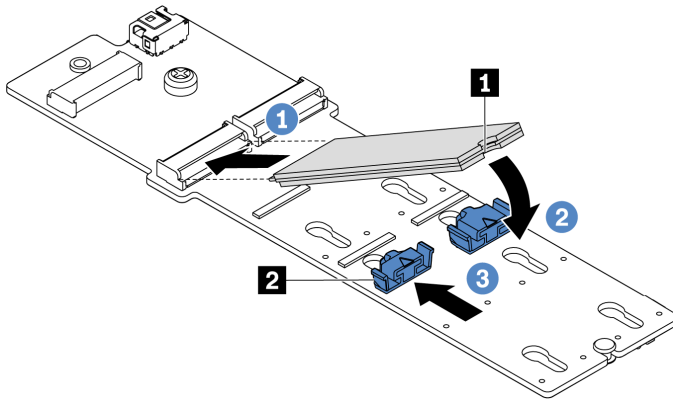


Figure 143. M.2 drive installation

- Insert the M.2 drive at an angle of approximately 30 degrees into the connector.
- Rotate the M.2 drive down until the notch **1** catches on the lip of the retainer **2**.
- 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 drives” on page 89.

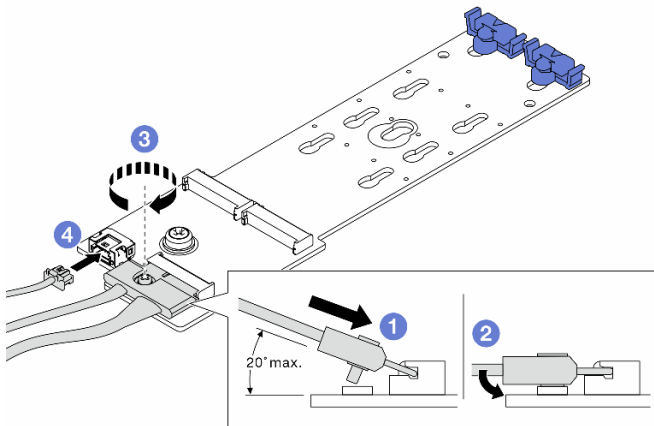


Figure 144. Connecting M.2 cables

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

## After you finish

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://sysmgt.lenovofiles.com/help/topic/lxpm\\_frontend/lxpm\\_product\\_page.html](https://sysmgt.lenovofiles.com/help/topic/lxpm_frontend/lxpm_product_page.html).

## Demo video

[Watch the procedure on YouTube](#)



## Memory module replacement

Use this information to remove and install a memory module.

- [“Remove a memory module” on page 292](#)
- [“Install a memory module” on page 293](#)

## Remove a memory module

Use this information to remove a memory module.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 388](#).
  - 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 378](#).
- Step 2. If your server comes with an air baffle, remove it. See [“Remove the air baffle” on page 151](#).
- Step 3. Remove the memory module from the slot.

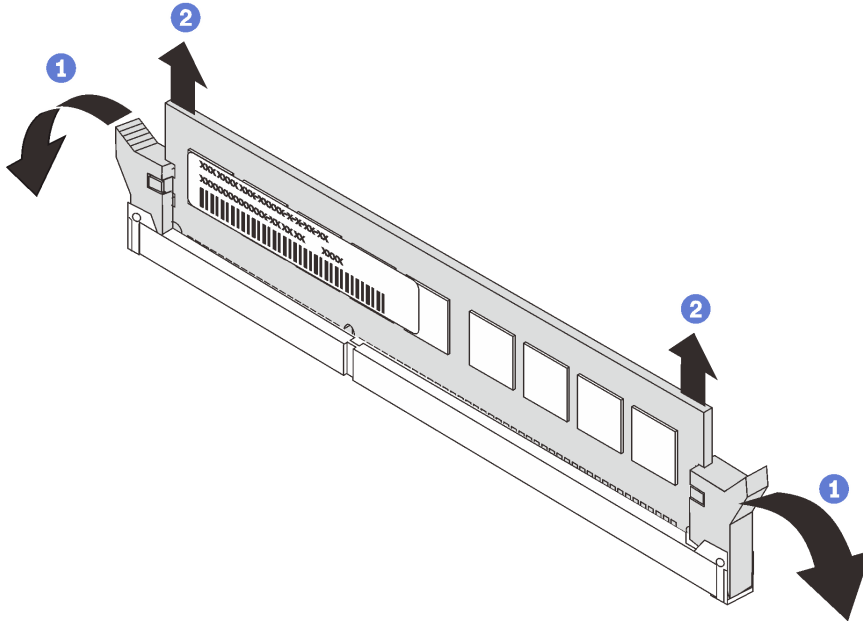


Figure 145. Memory module removal

- 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 293](#).
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 383](#) 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 388](#):
  - 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. Take the new part out of the package and place it on a static-protective surface.

Step 2. Prepare your server.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

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

**Note:** Ensure that you observe the installation rules and sequence in [“DIMM population rules” on page 20](#).

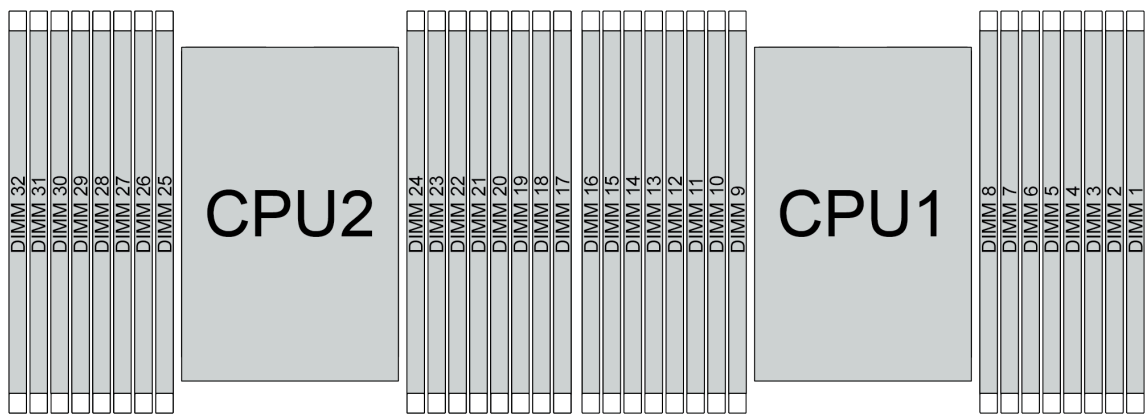


Figure 146. Memory module locations

Table 22. Memory slot and channel identification

Channel	D1	D0	C1	C0	B1	B0	A1	A0	E0	E1	F0	F1	G0	G1	H0	H1
Slot number	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Step 4. Install the memory module into the slot.

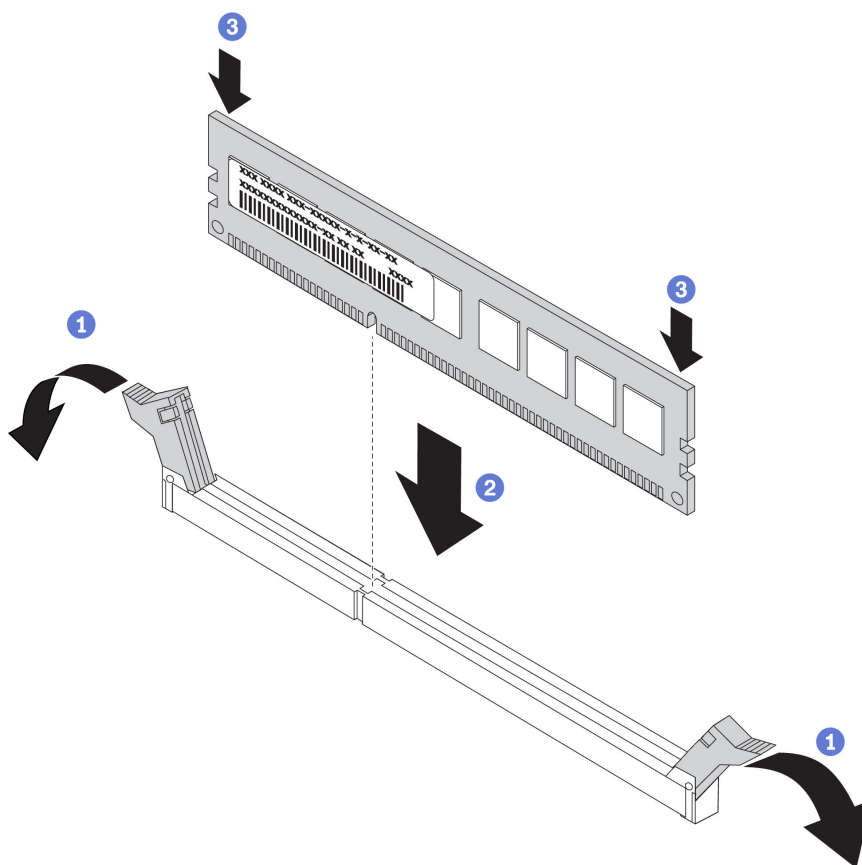


Figure 147. Memory module installation

- 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 383](#).

## 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.

- [“Remove the OCP 3.0 Ethernet adapter” on page 298](#)
- [“Install the OCP 3.0 Ethernet adapter” on page 300](#)

## Remove the OCP 3.0 Ethernet adapter

Use this information to remove the OCP 3.0 Ethernet adapter.

### About this task

#### CAUTION:

**Make sure that all server power cords are disconnected from their power sources before performing this procedure.**

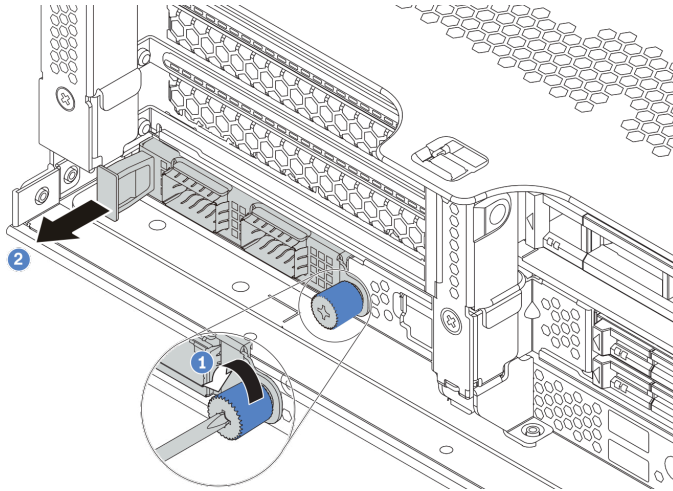
#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 OCP 3.0 Ethernet adapter.



*Figure 148. OCP 3.0 Ethernet adapter removal*

1. Loosen the thumbscrew that secures the card.
2. Pull out the OCP 3.0 Ethernet adapter.

## After you finish

Reinstall a new OCP 3.0 Ethernet adapter or a card filler.

## 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

#### CAUTION:

**Make sure that all server power cords are disconnected from their power sources before performing this procedure.**

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 OCP 3.0 Ethernet adapter to any unpainted surface on the outside of the server. Then, take the new OCP 3.0 Ethernet adapter out of the package and place it on a static-protective surface.
- Step 2. Remove the OCP 3.0 Ethernet adapter filler if there is.
- Step 3. 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.

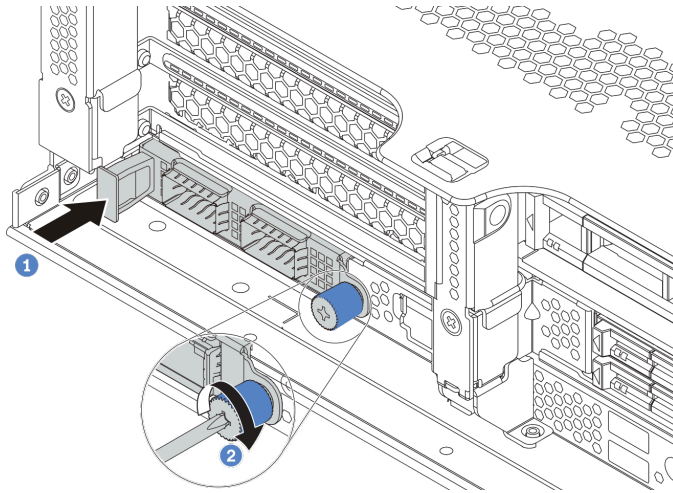


Figure 149. OCP 3.0 Ethernet adapter installation

- a. Push the OCP 3.0 Ethernet adapter as shown to insert it into the connector on the system board.
- b. Tighten the thumbscrew to secure the card.

- Step 4. Connect the cables to the OCP 3.0 Ethernet adapter.



Figure 150. OCP module (two connectors)

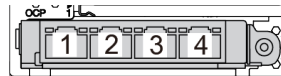


Figure 151. OCP module (four connectors)

### 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 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Rack latches replacement

Use this information to remove and install the rack latches.

**Note:** Depending on the model, the left rack latch might be assembled with a VGA connector and the right rack latch might be assembled with the front I/O assembly.

- [“Remove the rack latches” on page 304](#)
- [“Install the rack latches” on page 309](#)

## Remove the rack latches

Use this information to remove the rack latches.

### About this task

#### Attention:

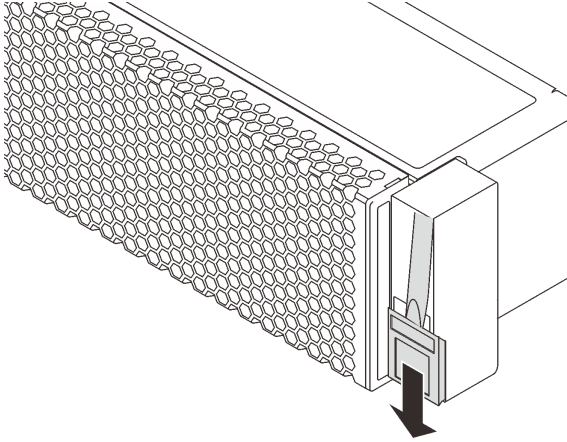
- Read [“Installation Guidelines” on page 383](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.

**Note:** If the rack latches are not assembled with a VGA connector or the front I/O assembly, you can remove the rack latches without powering off the server.

- 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 with the security bezel, remove it first. See [“Remove the security bezel” on page 361](#).
- 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 152. ID label plate removal*

- Step 3. Disconnect the VGA cable , the front-I/O-assembly cable, or both cables from the system board.
- Press the release tab to release the connector.
  - 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.

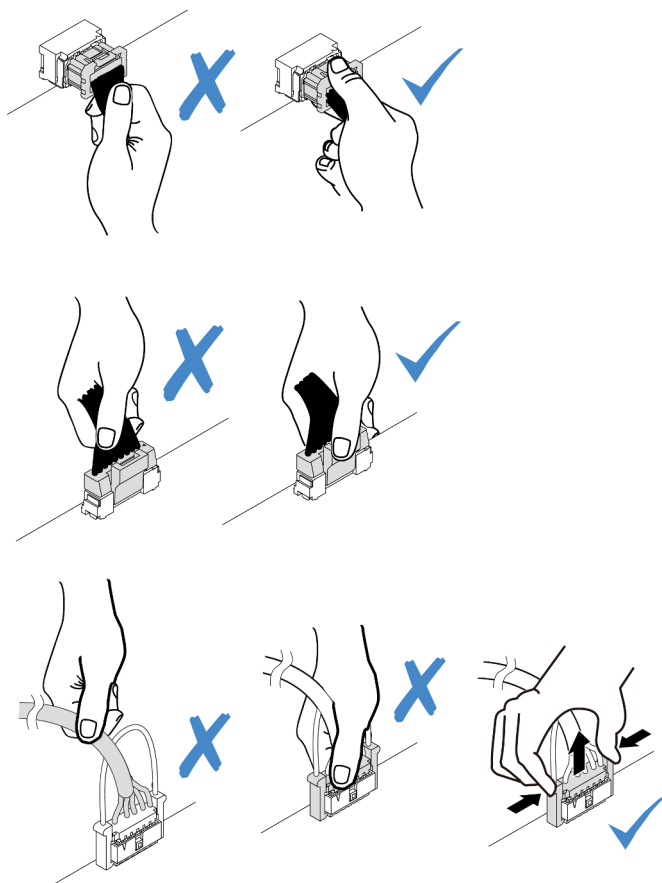
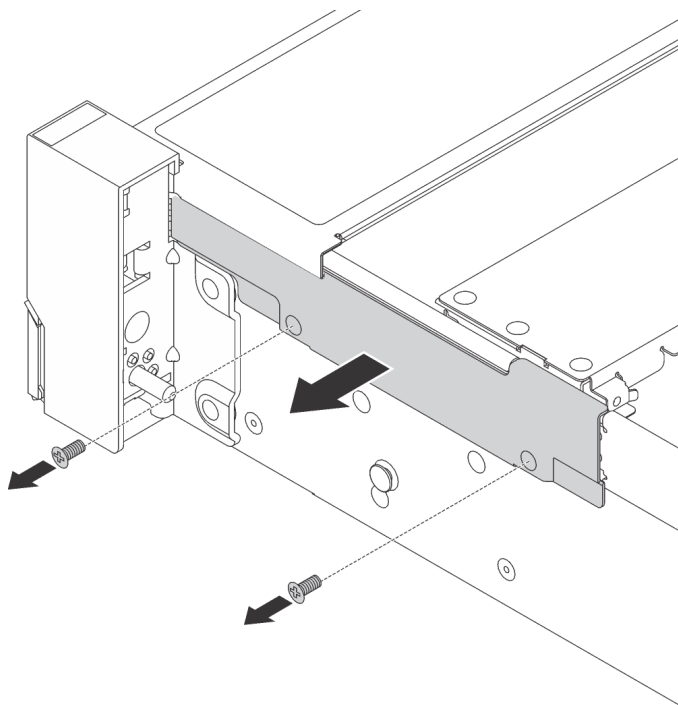


Figure 153. Disconnecting the VGA and front I/O assembly cables

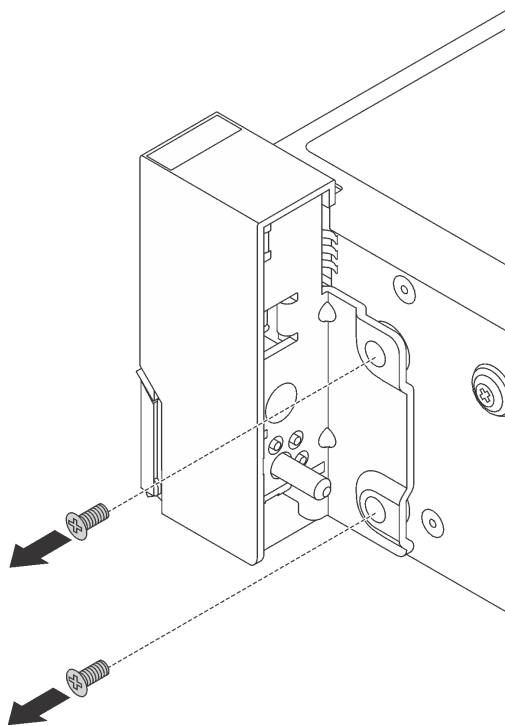
- Step 4. Remove the screws that secure the cable retainer on the side of the server. Then, remove the cable retainer from the chassis.





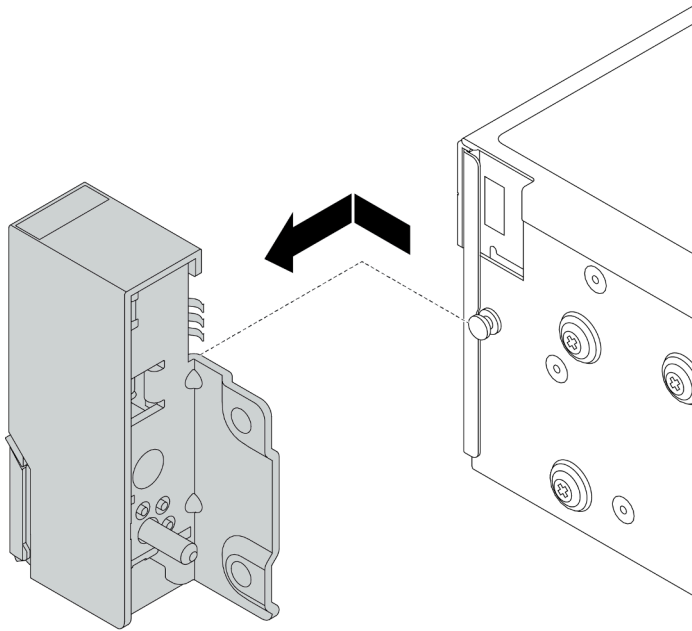
*Figure 154. Cable retainer removal*

Step 5. On each side of the server, remove the screws that secure the rack latch.



*Figure 155. Screws removal*

- Step 6. On each side of the server, slide the rack latch forward slightly and then remove the rack latch from the chassis.



*Figure 156. 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:

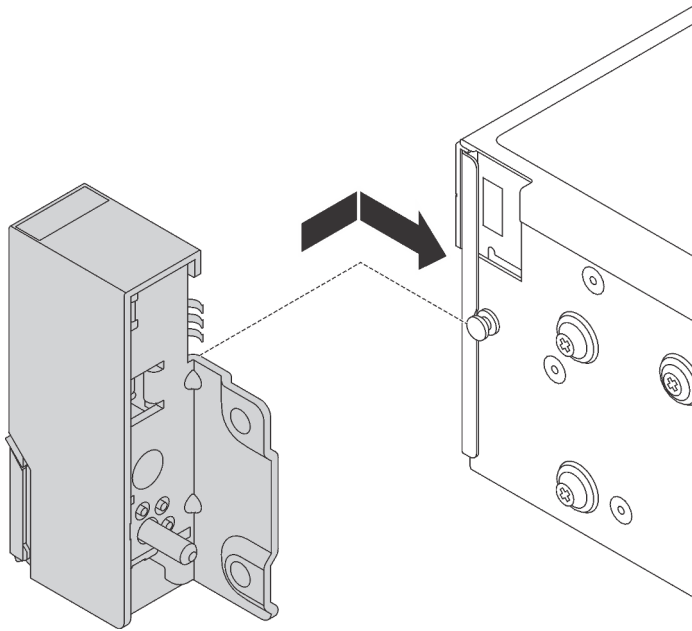
- Read [“Installation Guidelines” on page 383](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.

**Note:** If the rack latches are not assembled with a VGA connector or the front I/O assembly, you can install the rack latches without powering off the server.

- 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.

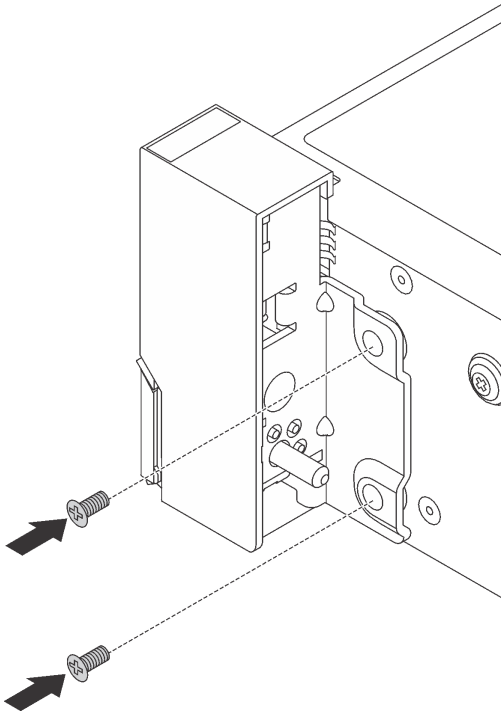
## Procedure

- Step 1. Touch the static-protective package that contains the new rack latches to any unpainted surface on the outside of the server. Then, take the new 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 backward.



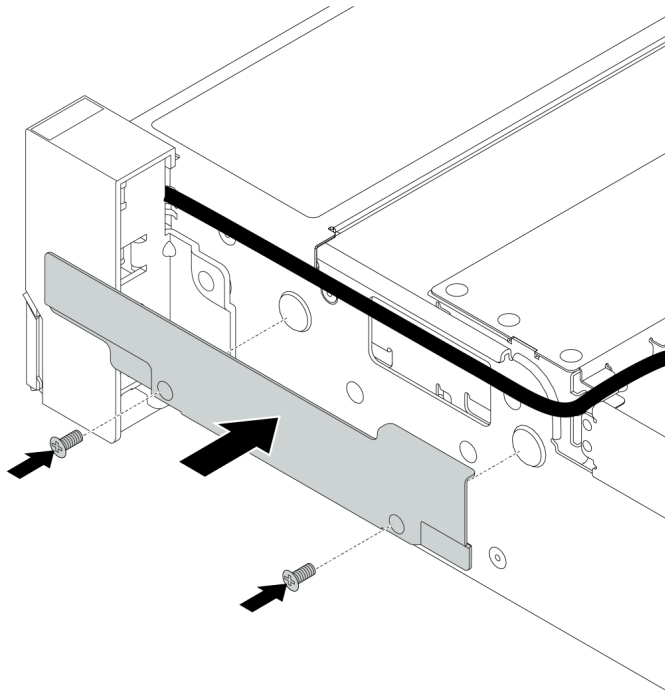
*Figure 157. Rack latch installation*

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



*Figure 158. Screws installation*

Step 4. Route the VGA cable as shown. Then, install the screws to secure the cable retainer.

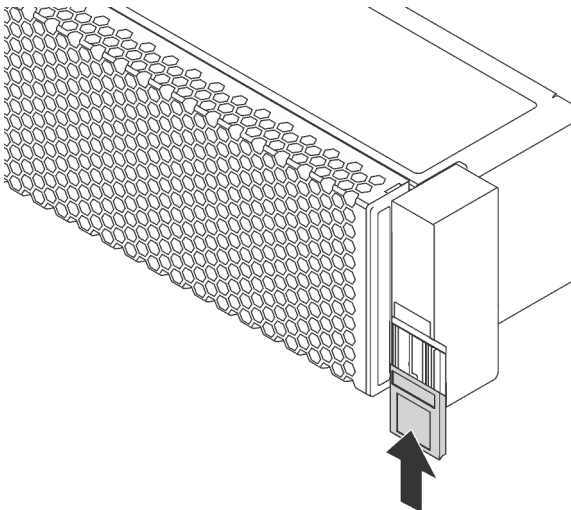


*Figure 159. Cable retainer installation*

Step 5. Connect the cables to the system board. See [Chapter 3 “Internal cable routing” on page 79](#).

## After you finish

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



*Figure 160. ID label plate installation*

2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

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

- [“Remove a super capacitor module from the air baffle” on page 316](#)
- [“Install a super capacitor module on the air baffle” on page 318](#)
- [“Remove a super capacitor module from the middle 2.5-inch drive cage” on page 320](#)
- [“Install a super capacitor module on the middle 2.5-inch drive cage” on page 323](#)
- [“Remove a super capacitor from the chassis” on page 326](#)
- [“Install a super capacitor on the chassis” on page 329](#)



Table 23. Super capacitor locations in the system

Figure 161. On the chassis

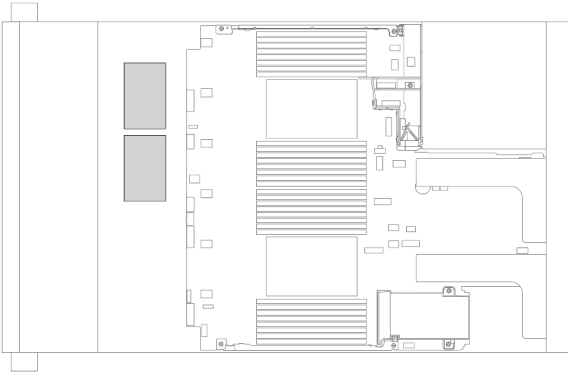


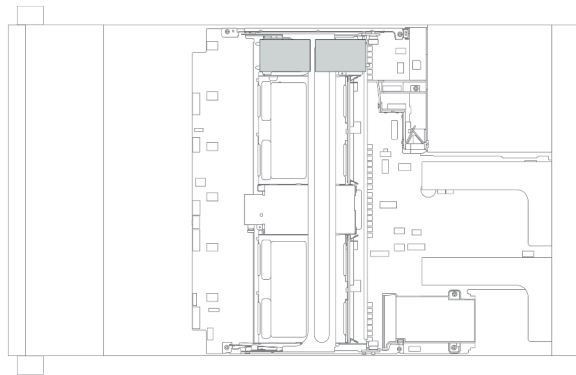
Figure 162. On standard air baffle



Figure 163. On GPU air baffle



Figure 164. On the 2.5-inch middle drive cage



## Remove a super capacitor module from the air baffle

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

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 378](#).
- Step 2. Disconnect the cable of the RAID super capacitor module.
- Step 3. Remove the super capacitor module from the air baffle.

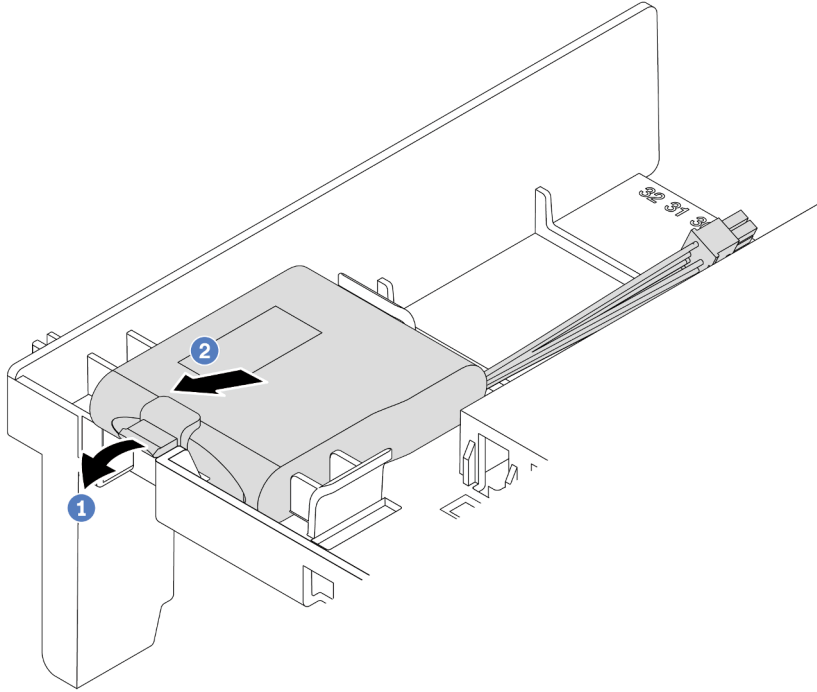


Figure 165. Super capacitor module removal

- a. Open the retention clip on the holder of the super capacitor module.
- b. Take the 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 a super capacitor module on the air baffle

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

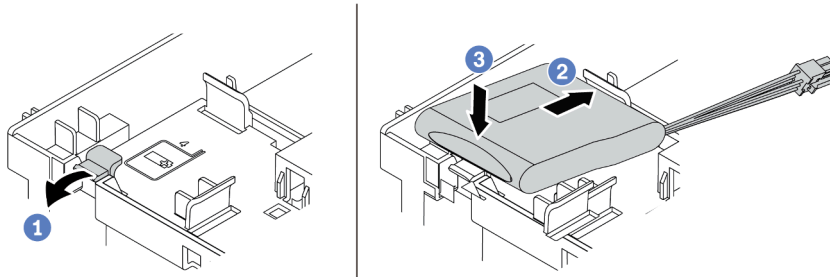
### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 new RAID super capacitor module to any unpainted surface on the outside of the server. Then, take the new RAID super capacitor module out of the package and place it on a static-protective surface.
- Step 2. Install the super capacitor module.



*Figure 166. Super capacitor installation on the air baffle*

1. Open the retention clip on a holder.
  2. Put a super capacitor module into the holder.
  3. Press it down to secure it into the holder.
- Step 3. Connect the super capacitor module to an adapter with the extension cable that comes with the super capacitor module. See [“RAID super capacitor modules” on page 85](#).

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### Demo video

[Watch the procedure on YouTube](#)

## Remove a super capacitor module from the middle 2.5-inch drive cage

Use this information to remove a super capacitor module from the middle 2.5-inch drive cage.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 378](#).
- Step 2. Disconnect the cable of the RAID super capacitor module.
- Step 3. Open the drive cage handle.

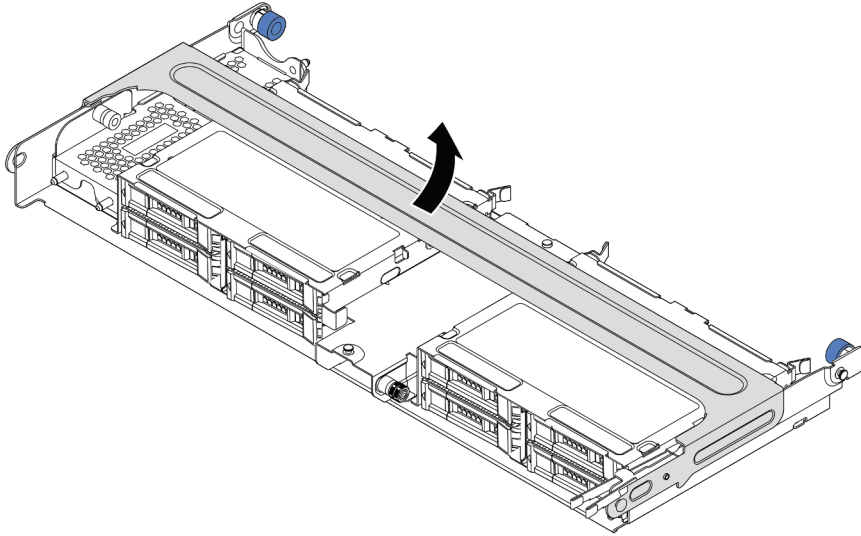


Figure 167. Opening the handle of the middle drive cage

- Step 4. Remove the super capacitor module.

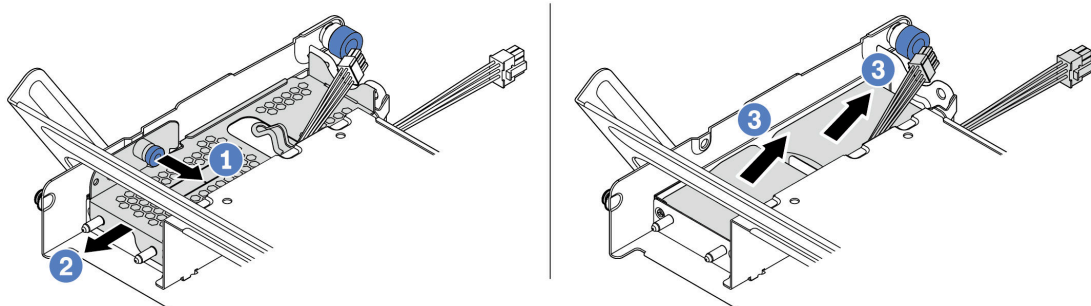


Figure 168. Removing the super capacitor module

- 1. Pull out the blue latch on the super capacitor cover.
- 2. Slide the cover out of the holder.
- 3. Take the 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 a super capacitor module on the middle 2.5-inch drive cage

Use this information to install a super capacitor module the middle 2.5-inch drive cage.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 new RAID super capacitor module to any unpainted surface on the outside of the server. Then, take the new RAID super capacitor module out of the package and place it on a static-protective surface.
- Step 2. Open the drive cage handle.

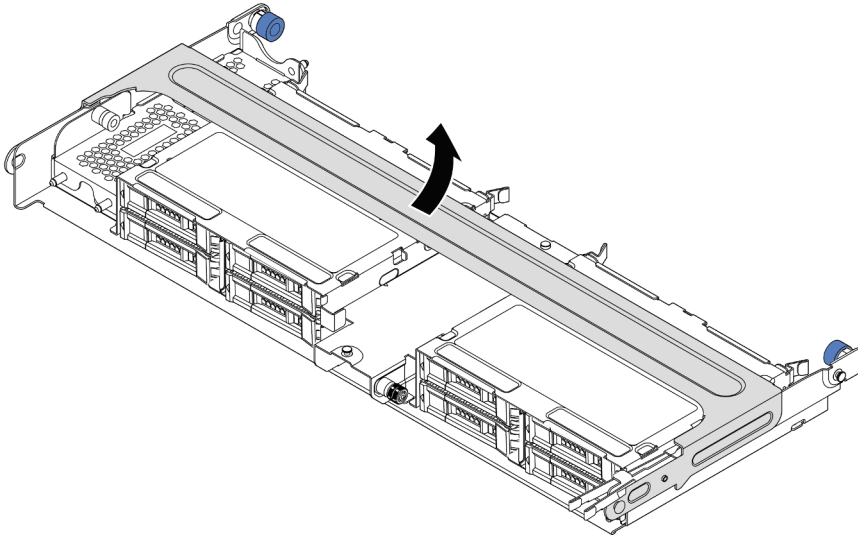


Figure 169. Opening the handle of the middle drive cage

1. Pull out the blue plunger.
  2. Slide the metal cover out of the drive cage.
- Step 3. Remove the metal cover.

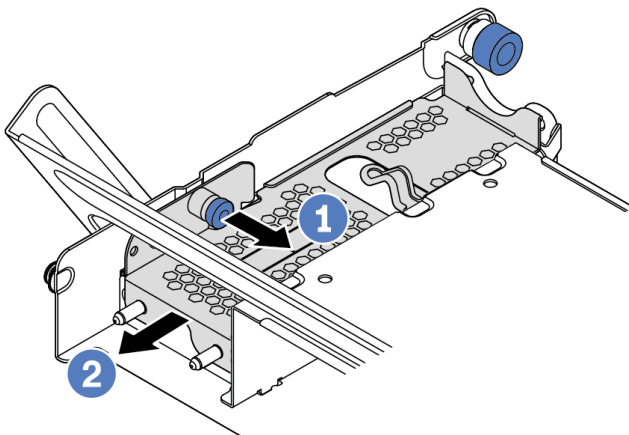


Figure 170. Removing the metal cover

1. Pull out the blue plunger.
2. Slide the metal cover out of the drive cage.

Step 4. Install the super capacitor module.

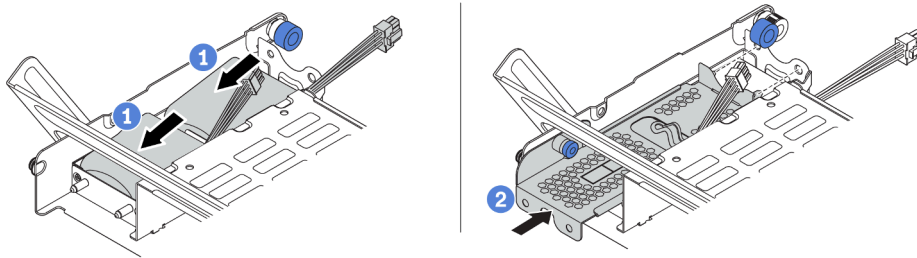


Figure 171. Installing the super capacitor module

1. Put a super capacitor module into the holder, and press it down to secure it into the holder.
2. Align the pins on the metal cover with the holes in the super capacitor holder, pull out the blue latch on the cover, and slide the cover into the holder until the pins pass through the holes. Then, release the blue latch to lock the cover into place.

Step 5. Connect the super capacitor module to an adapter with the extension cable that comes with the super capacitor module. See [“RAID super capacitor modules” on page 85](#).

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#)

### Demo video

[Watch the procedure on YouTube](#)

## Remove a super capacitor from the chassis

Use this information to remove a super capacitor module from the chassis.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 378](#).
- Step 2. Disconnect the cable of the super capacitor module.
- Step 3. Remove the super capacitor module.

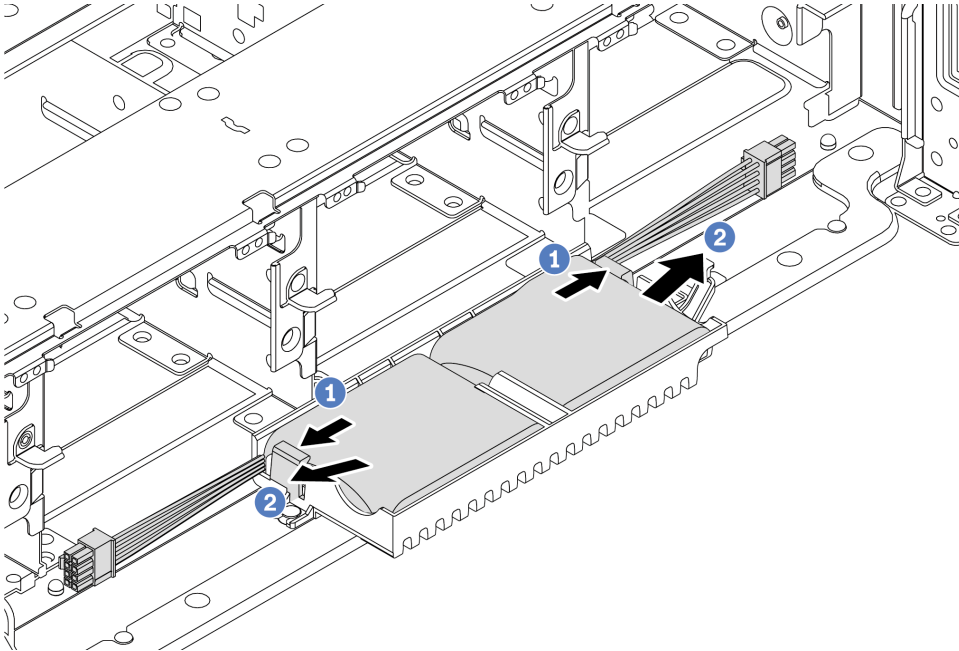


Figure 172. Super capacitor module removal

- 1. Open the retention clip on the super capacitor holder.
  - 2. Take the super capacitor module out of the holder.
- Step 4. Remove the super capacitor holder as shown if necessary.

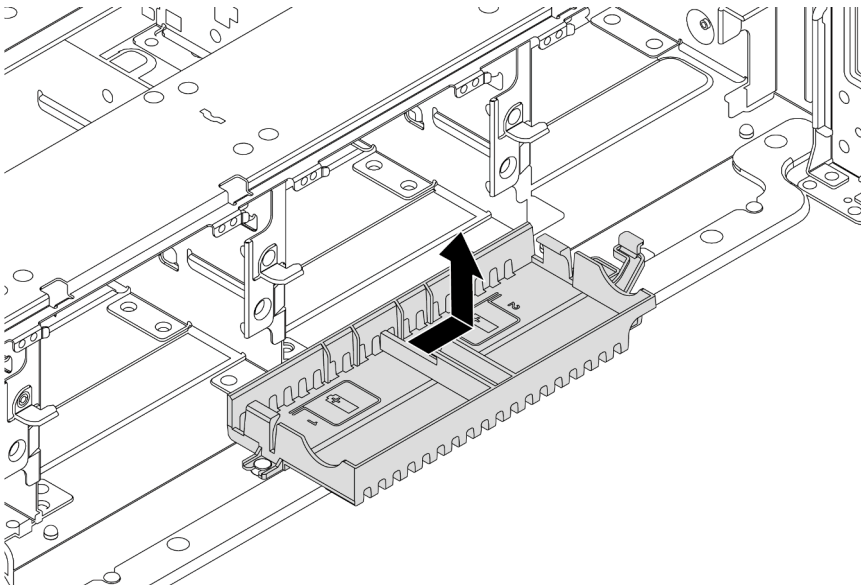


Figure 173. Super capacitor holder removal

## **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.

## Install a super capacitor on the chassis

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

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 new RAID super capacitor module to any unpainted surface on the outside of the server. Then, take the new RAID super capacitor module out of the package and place it on a static-protective surface.
- Step 2. Install the super capacitor holder.

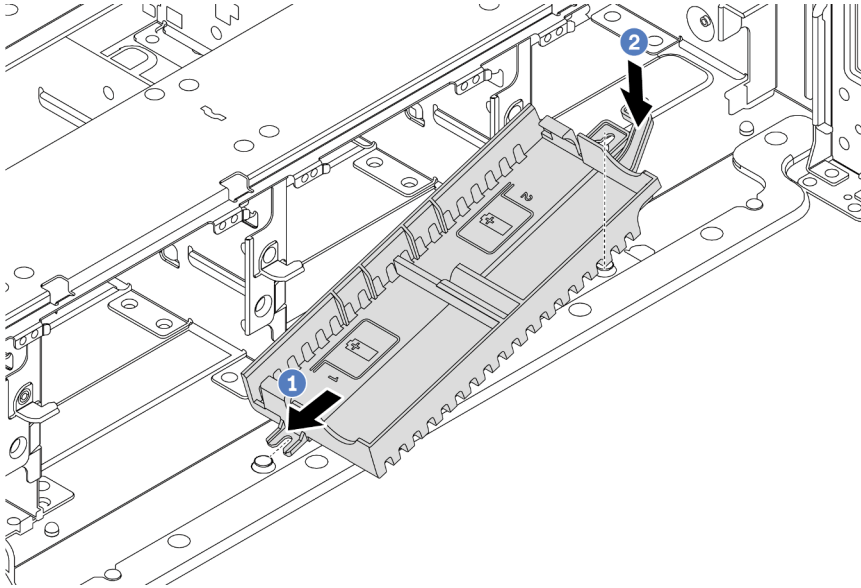


Figure 174. Super capacitor box installation

1. Align the notch on the super capacitor holder with the pin on the chassis as shown.
2. Pivot the super capacitor holder inward until the other side clicks into place.



Step 3. Install the super capacitor module.

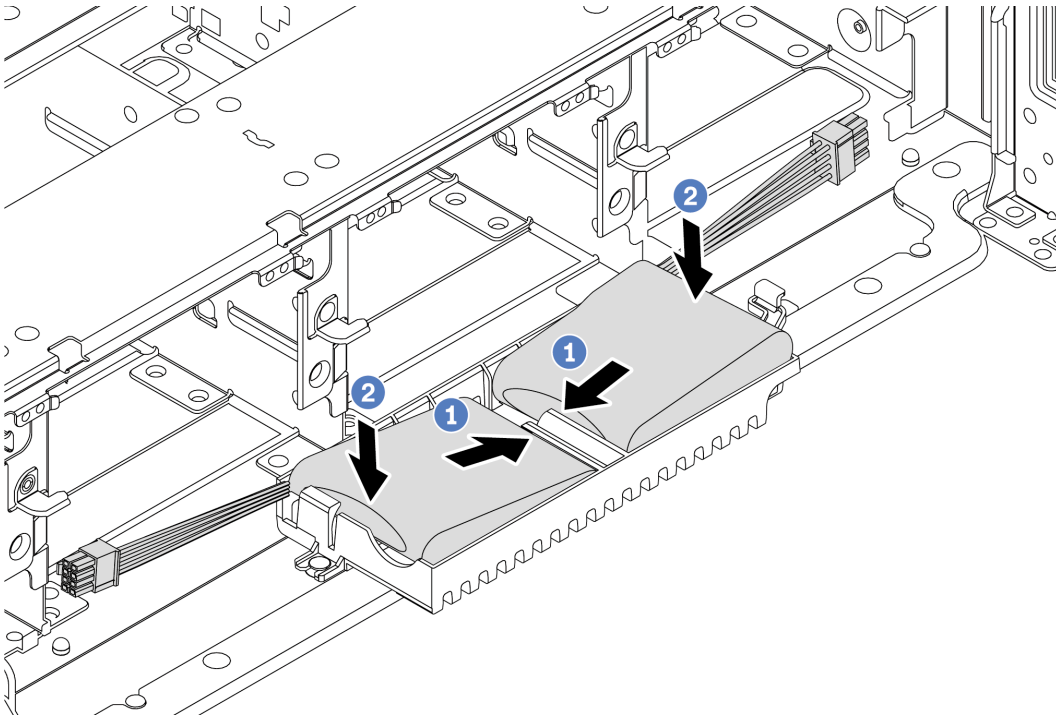


Figure 175. Super capacitor module installation

1. Insert the RAID super capacitor module into the retaining clip at one side as shown.
  2. Press the RAID super capacitor module down on the other side until it snaps into place.
- Step 4. Connect the super capacitor module to an adapter with the extension cable that comes with the super capacitor module. See [“RAID super capacitor modules” on page 85](#).

## After you finish

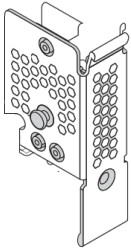
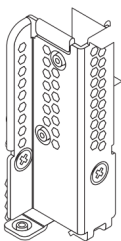
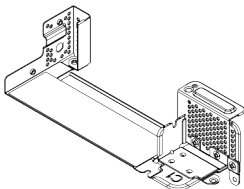
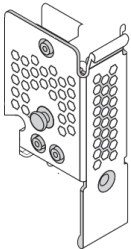
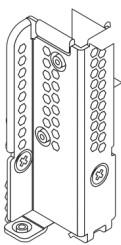
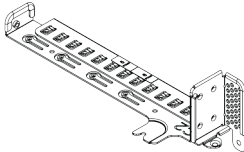
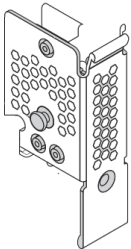
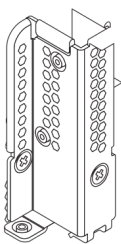
Complete the parts replacement. See [“Complete the parts replacement” on page 383](#)

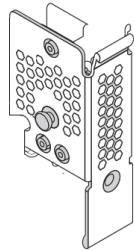
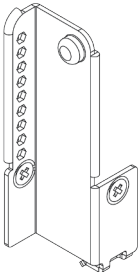
## Rearwall bracket replacement

Use this information to remove and install a rearwall bracket.

- “Remove an A1 rearwall bracket (left)” on page 334
- “Install an A1 rearwall bracket (left)” on page 336
- “Remove a B1/B2 rearwall bracket (middle)” on page 338
- “Install a B1/B2 rearwall bracket (middle)” on page 340
- “Remove a C1/C2 rearwall bracket (right)” on page 342
- “Install a C1/C2 rearwall bracket (right)” on page 344

### Rearwall bracket matrix

Server model	Required rearwall brackets		
Server model with 8 PCIe slots	The server requires 3 rearwall brackets:		
	A1 	B1 	C1 
Server model with 4 x 2.5-inch rear drives	The server requires 3 rearwall brackets:		
	A1 	B1 	C2 
Server model with 2 x 3.5-inch rear drives	The server requires 2 rearwall brackets:		
	A1 	B1 	
Server model with 8 x 2.5-inch rear drives	The server requires 2 rearwall bracket:		

Server model	Required rearwall brackets
	<div>A1</div>  <div>B2</div> 
Server model with 4 x 3.5-inch rear drives	The server requires no rearwall brackets

## Remove an A1 rearwall bracket (left)

Use this information to remove an A1 rearwall on the left of the rear chassis.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 new riser card to any unpainted surface on the outside of the server. Then, take the new riser card out of the package and place it on a static-protective surface.
- Step 2. Remove an A1 rearwall bracket.

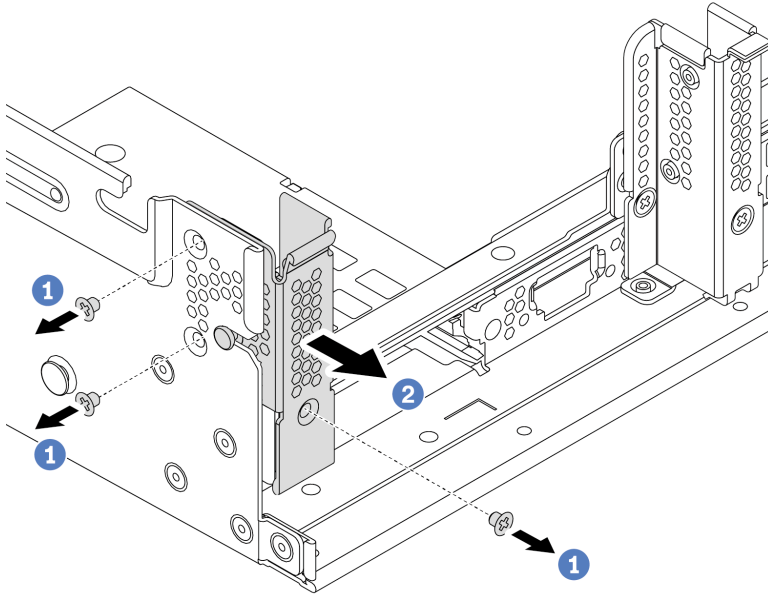


Figure 176. A1 rearwall bracket installation

- a. Remove the three screws as shown.
- b. Remove the bracket from the chassis as shown.

## After you finish

1. Remove or install a rear drive cage or riser assemblies. See
  - [“PCIe adapter and riser assembly replacement” on page 346](#)
  - [“Hot-swap rear/middle drive cage replacement” on page 218](#)
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## **Install an A1 rearwall bracket (left)**

Use this information to install an A1 rearwall on the left of the rear chassis.

### **About this task**

#### **Attention:**

- Read [“Installation Guidelines” on page 383](#) 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. Prepare your server.
1. Power off the server.
  2. Remove the top cover. See [“Remove the top cover” on page 378](#).
  3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
  4. Remove any components that are impeding the procedure.
  5. Install any components that are required before installing or removing the component(s).
- Step 3. Install an A1 rearwall bracket.

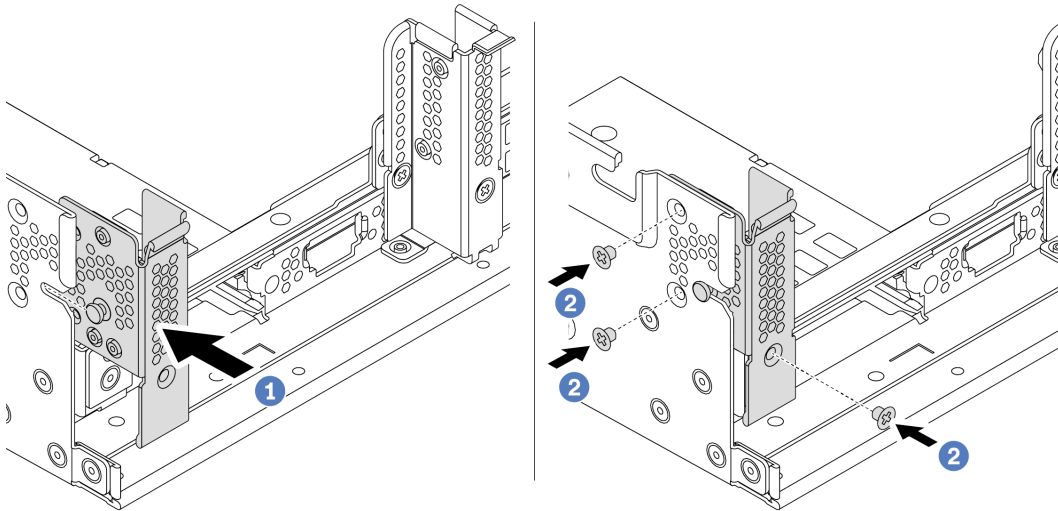


Figure 177. A1 rearwall bracket installation

- a. Align the pin on the rearwall bracket and the pin slot on the left side of the rear chassis. Install the bracket to the chassis as shown.
- b. Install the three screws to secure the rearwall bracket.

## After you finish

1. Install a rear drive cage or riser assemblies.
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Remove a B1/B2 rearwall bracket (middle)

Use this information to remove a B1 or B2 rearwall on the middle of the rear chassis.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 new riser card to any unpainted surface on the outside of the server. Then, take the new riser card out of the package and place it on a static-protective surface.
- Step 2. Remove a B1 or B2 rearwall bracket.

**Note:** The illustration shows only the removal of B1 rearwall bracket, the B2 rearwall bracket can be removed in the same way.

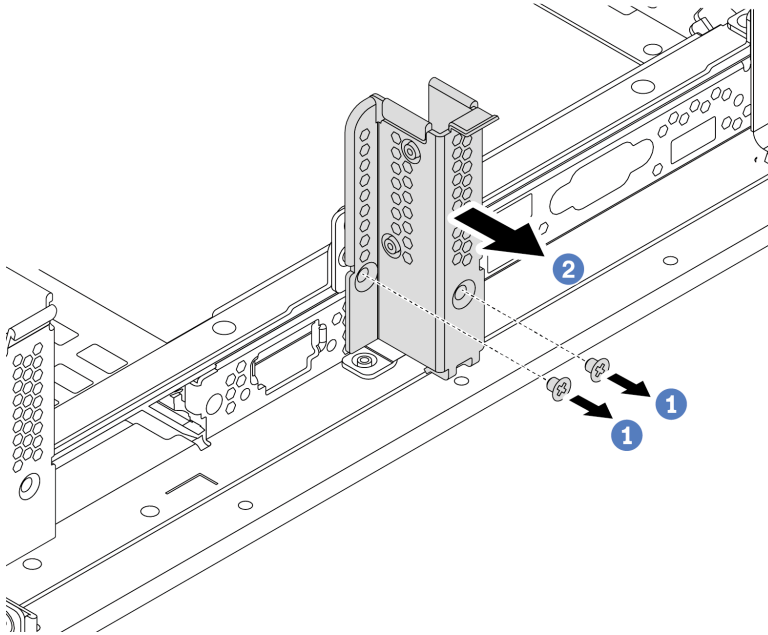


Figure 178. B1 rearwall bracket removal

- a. Remove the two screws.
- b. Remove the bracket from the chassis in the direction as shown.

## After you finish

1. Remove or install a rear drive cage or riser assemblies. See
  - [“PCIe adapter and riser assembly replacement” on page 346](#)
  - [“Hot-swap rear/middle drive cage replacement” on page 218](#)
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## **Install a B1/B2 rearwall bracket (middle)**

Use this information to install a B1 or B2 rearwall on the middle of the rear chassis.

### **About this task**

#### **Attention:**

- Read [“Installation Guidelines” on page 383](#) 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. Prepare your server.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 3. Install a B1 rearwall bracket.

**Note:** The figure illustrates only the installation of B1 rearwall bracket, the B2 rearwall bracket can be installed in the same way.

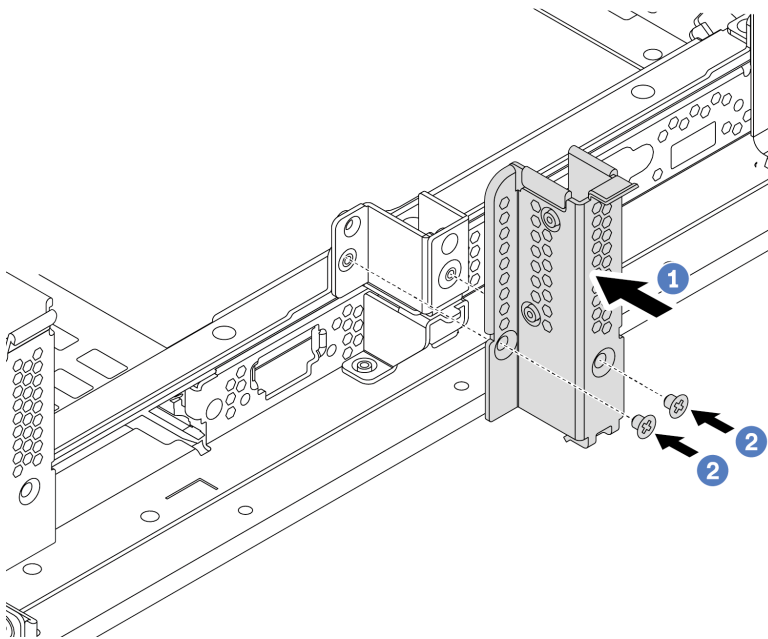


Figure 179. B1 rearwall bracket installation

- a. Align the holes on the rearwall bracket and the chassis. Install the bracket to the chassis as shown.
- b. Install the two screws to secure the rearwall bracket.

## After you finish

1. Install a rear drive cage or riser assemblies. See
  - [“Install the 4 x 2.5-inch rear drive cage” on page 238](#)
  - [“Install the 2 x 3.5-inch rear drive cage” on page 229](#)
  - [“Install a PCIe adapter and riser assembly” on page 352](#)
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Remove a C1/C2 rearwall bracket (right)

Use this information to remove a C1/C2 rearwall on the right of the rear chassis.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 new riser card to any unpainted surface on the outside of the server. Then, take the new riser card out of the package and place it on a static-protective surface.
- Step 2. Remove a C1 rearwall bracket.

**Note:** The illustration shows removing a C1 rearwall bracket. The procedure is the same for removing the C2 rearwall bracket.

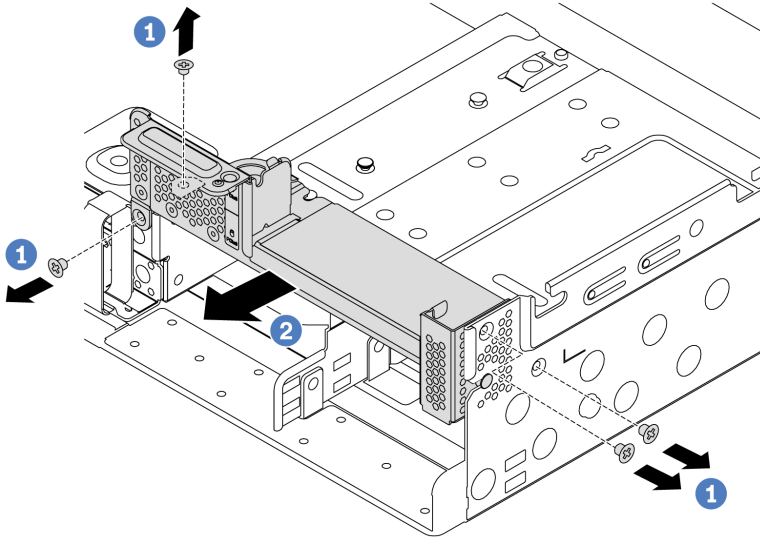


Figure 180. C1 rearwall bracket removal

- a. Remove the four screws.
- b. Remove the bracket from the chassis in the direction as shown.

## After you finish

1. Remove or install a rear drive cage or riser assemblies. See
  - [“PCIe adapter and riser assembly replacement” on page 346](#)
  - [“Hot-swap rear/middle drive cage replacement” on page 218](#)
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## **Install a C1/C2 rearwall bracket (right)**

Use this information to install a C1/C2 rearwall on the right of the rear chassis.

### **About this task**

#### **Attention:**

- Read [“Installation Guidelines” on page 383](#) 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. Prepare your server.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 3. Install a C1 rearwall bracket.

**Note:** The figure illustrates only the installation of C1 rearwall bracket, the C2 rearwall bracket can be installed in the same way.

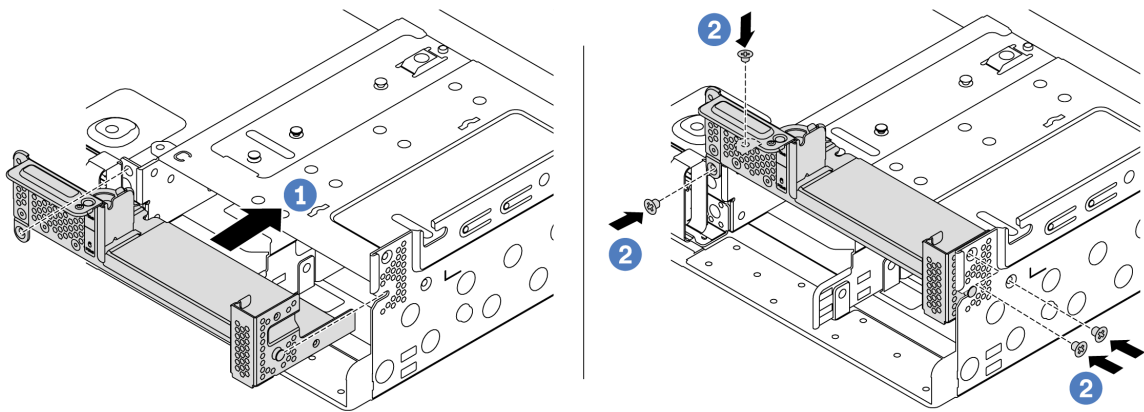


Figure 181. C1 rearwall bracket installation

- a. Align the pin on the rearwall bracket and the pin slot on the right side of the rear chassis. Install the bracket to the chassis as shown.
- b. Install the four screws to secure the rearwall bracket.

## After you finish

1. Install a rear drive cage or riser assemblies. See
  - [“Install the 4 x 2.5-inch rear drive cage” on page 238](#)
  - [“Install a PCIe adapter and riser assembly” on page 352](#)
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

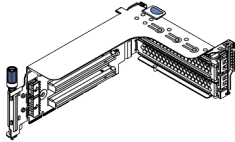
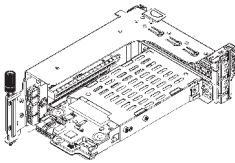
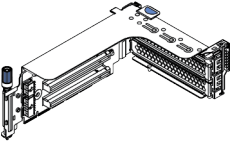
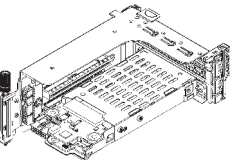
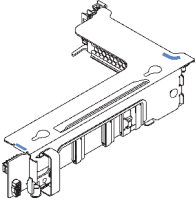
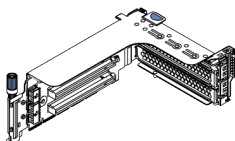
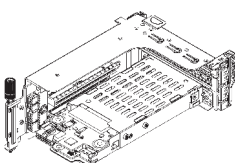
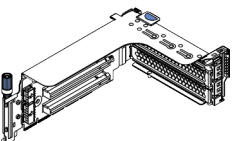
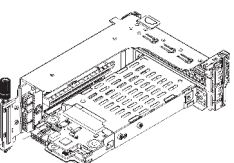
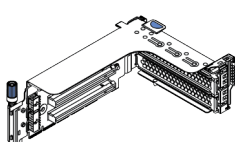
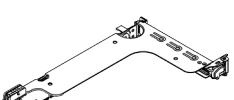
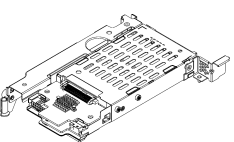
## PCIe adapter and riser assembly replacement

Use this information to remove and install a riser card.

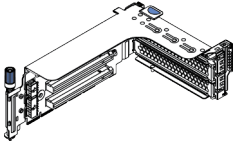
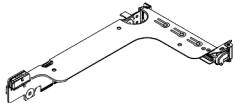
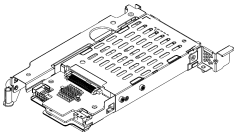
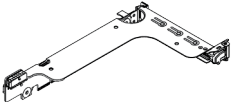
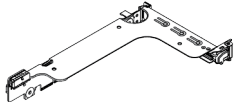
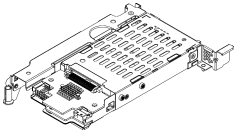
Depending on your configuration, refer to the specific topics to remove or install a riser assembly:

- [“Remove a PCIe adapter and riser assembly” on page 348](#)
- [“Install a PCIe adapter and riser assembly” on page 352](#)

Your server supports the following rear configurations:

Server rear configuration	Riser 1 cage	Riser 2 cage	Riser 3 cage
Configuration with 8 PCIe slots	<ul style="list-style-type: none"> <li>• Type 1: 3FH riser cage</li> </ul>  <ul style="list-style-type: none"> <li>• Type 2: 2FH + 7mm riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>• Type 1: 3FH riser cage</li> </ul>  <ul style="list-style-type: none"> <li>• Type 2: 2FH + 7mm riser cage</li> </ul> 	Type 3: 2FH riser cage 
Configuration with 4 x 2.5-inch rear drives	<ul style="list-style-type: none"> <li>• Type 1: 3FH riser cage</li> </ul>  <ul style="list-style-type: none"> <li>• Type 2: 2FH + 7mm riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>• Type 1: 3FH riser cage</li> </ul>  <ul style="list-style-type: none"> <li>• Type 2: 2FH + 7mm riser cage</li> </ul> 	
Configuration with 8 x 2.5-inch rear drives	<ul style="list-style-type: none"> <li>• Type 1: 3FH riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>• Type 3: 1FH riser cage</li> </ul>  <ul style="list-style-type: none"> <li>• Type 4: 7mm riser cage</li> </ul> 	



Server rear configuration	Riser 1 cage	Riser 2 cage	Riser 3 cage
Configuration with 2 x 3.5-inch rear drives	<ul style="list-style-type: none"> <li>Type 1: 3FH riser cage</li> </ul> 	<ul style="list-style-type: none"> <li>Type 3: 1FH riser cage</li> <li>Type 4: 7mm riser cage</li> </ul>  	
Configuration with 4 x 3.5-inch rear drives	Type 3: 1FH riser cage 	<ul style="list-style-type: none"> <li>Type 3: 1FH riser cage</li> <li>Type 4: 7mm riser cage</li> </ul>  	

## Remove a PCIe adapter and riser assembly

Use this information to remove a PCIe adapter and riser assembly.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 new riser card to any unpainted surface on the outside of the server. Then, take the new riser card out of the package and place it on a static-protective surface.
- Step 2. Remove the top cover. See [“Remove the top cover” on page 378](#).
- Step 3. If there is any PCIe adapter installed on the riser card, record the cable connections first. Then, disconnect all cables from the PCIe adapter.
- Step 4. Remove a riser assembly.

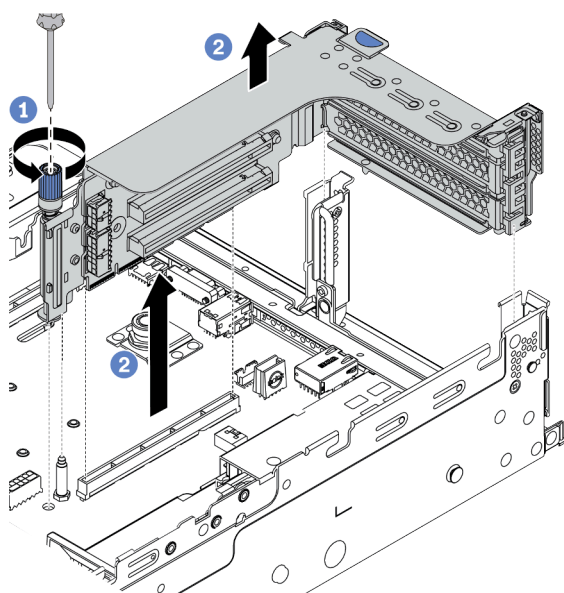


Figure 182. Riser 1/2 assembly removal (three-slot bracket)

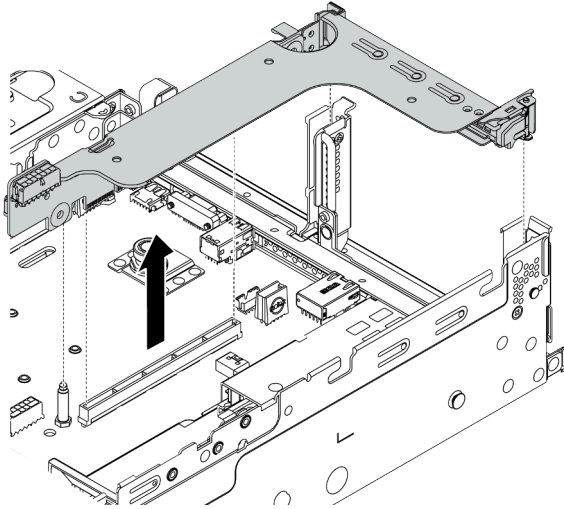


Figure 183. Riser 1/2 assembly removal (one-slot riser bracket)

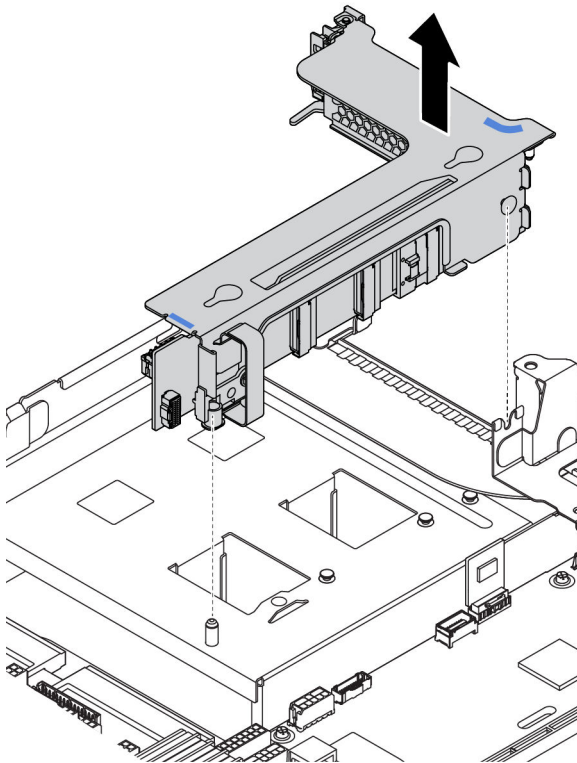


Figure 184. Riser 3 assembly removal (two-slot riser bracket)

1. (Optional) Loosen the screw that secures the riser assembly.
  2. Grasp the riser assembly by its edges and carefully lift it straight up and off the chassis.
- Step 5. Remove any PCIe adapters from the riser assembly. The illustration shows how to remove a PCIe adapter from a riser 1/2 assembly, the method is the same for removing other PCIe adapters.

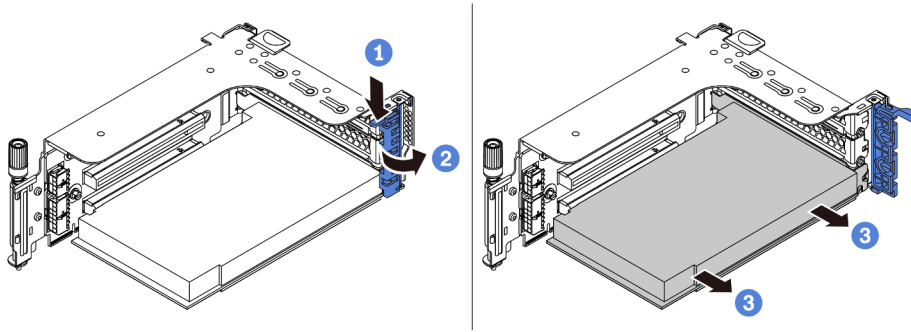


Figure 185. PCIe adapter removal

1. Press the retainer clip downward.
2. Rotate the PCIe adapter retention latch to the open position.
3. Grasp the PCIe adapter by its edges and carefully pull it out of the PCIe slot.

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

Step 6. Remove a riser card in a riser cage.

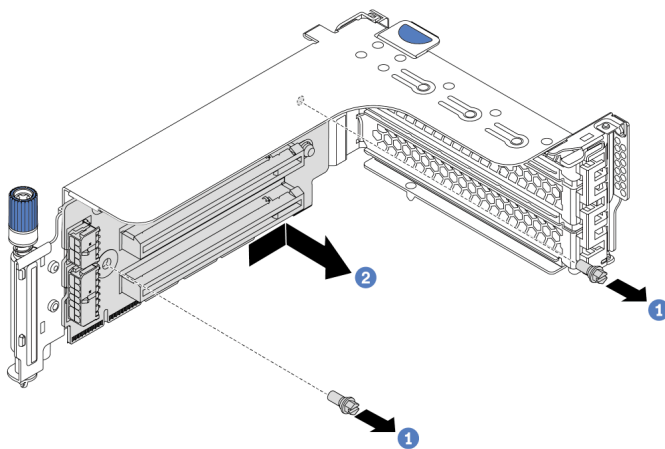


Figure 186. Riser card removal (three-slot riser bracket)

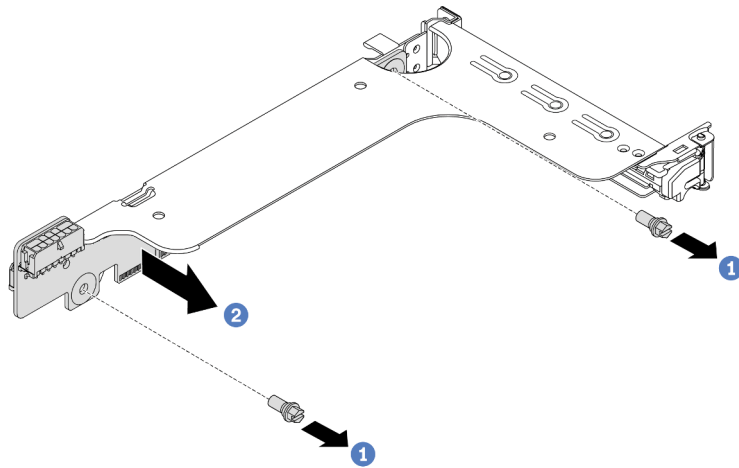


Figure 187. Riser card removal (one-slot or two-slot riser bracket)

1. Remove the two screws.
2. Remove the riser card from the bracket in the direction as shown.

### After you finish

1. Refer to [Chapter 3 “Internal cable routing” on page 79](#) if you need reconnect any cables to the removed PCIe adapters or riser cards.
2. Reinstall the PCIe adapters and riser assembly. See [“Install a PCIe adapter and riser assembly” on page 352](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### Demo video

[Watch the procedure on YouTube](#)

## Install a PCIe adapter and riser assembly

Use this information to install a PCIe adapter and riser assembly.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 new riser card to any unpainted surface on the outside of the server. Then, take the new riser card out of the package and place it on a static-protective surface.
- Step 2. Install a riser card in a riser cage.

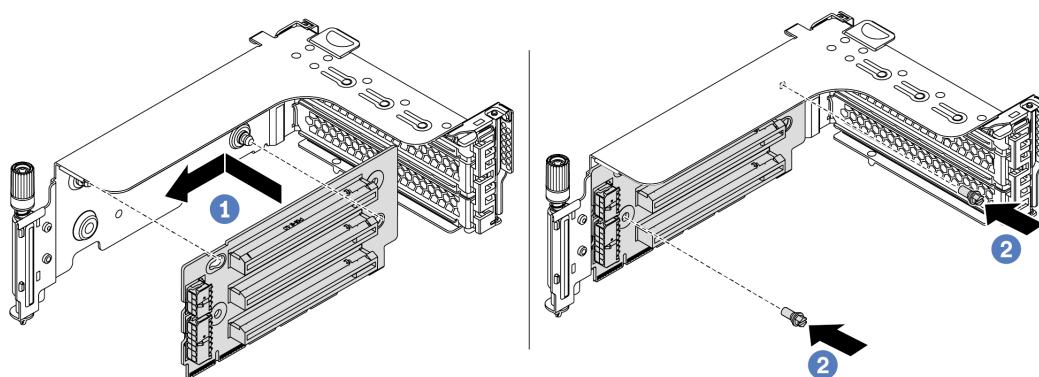


Figure 188. Riser card installation (three-slot riser bracket)

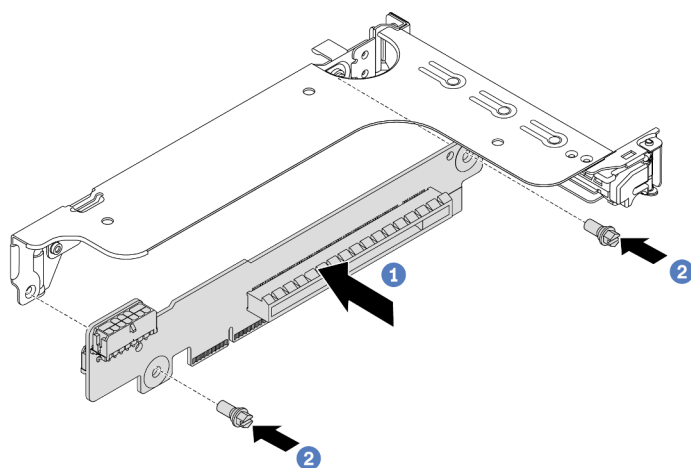


Figure 189. Riser card installation (one-slot or two-slot riser bracket)

1. Align the holes in the riser card with the mounting studs on the bracket. Install the riser card to the bracket in the direction as shown.
2. Install the two screws to secure the riser card to the bracket.

Step 3. Install PCIe adapters. For information about supported PCIe adapters and PCIe slots, see [“PCIe slots and configurations” on page 25](#).

**Note:** Carefully handle the PCIe adapter by its edges.

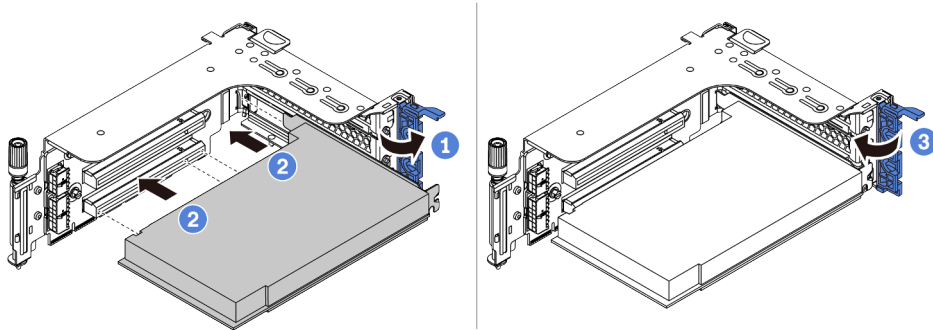


Figure 190. PCIe adapter installation

1. Align the PCIe adapter with the PCIe slot on the riser card. Carefully press the PCIe adapter straight into the slot until it is securely seated and its bracket also is secured.
2. Rotate the PCIe adapter retention latch to the closed position.

Step 4. Check the rearwall matrix and decide which rearwall brackets need to be installed or removed for installing your riser assemblies. See [“Rearwall bracket replacement” on page 332](#)

Step 5. Install a riser assembly.

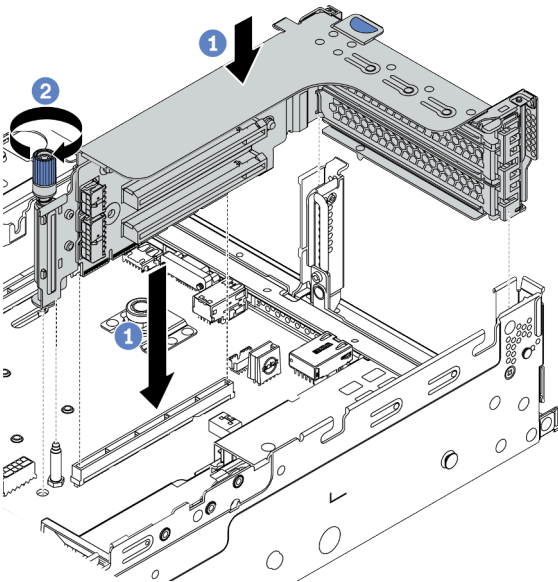


Figure 191. Riser 1/2 assembly installation (three-slot riser bracket)

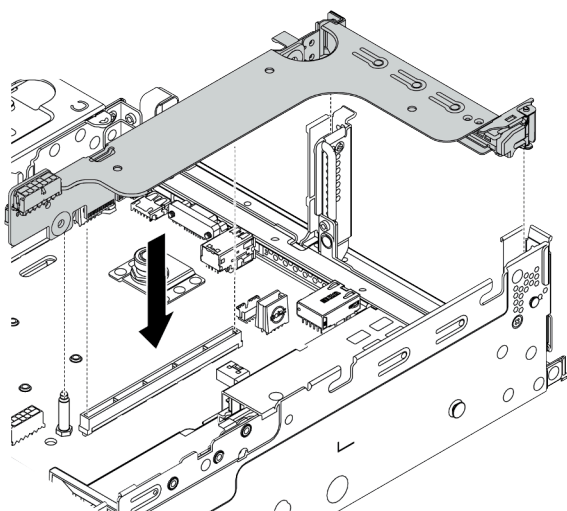


Figure 192. Riser 1/2 assembly installation (one-slot riser bracket)

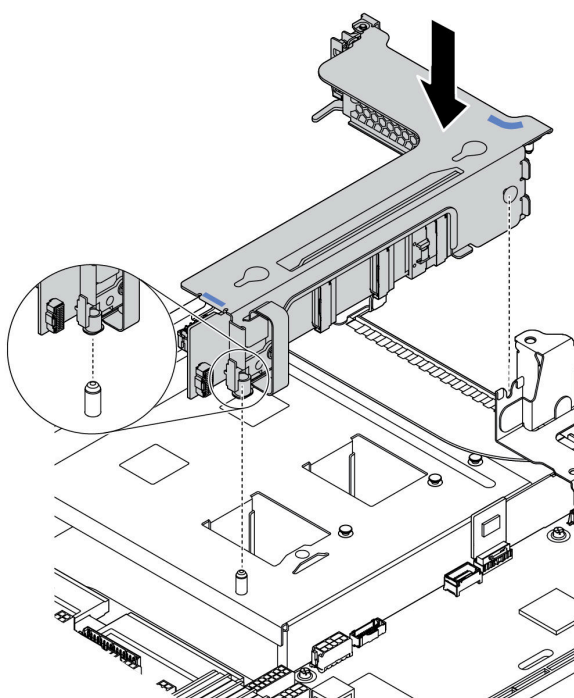


Figure 193. Riser 3 assembly installation

1. Align the riser adapter in the riser cage with the riser slot on the system board. Carefully press the riser card straight into the slot until it is securely seated.
2. (Optional) If there is one screw on the riser cage, tighten the screw.

### After you finish

1. Refer to [Chapter 3 “Internal cable routing” on page 79](#) to connect any cables to the PCIe adapters.
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### Demo video



[Watch the procedure on YouTube](#)

## Serial port module replacement

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

### Remove a serial port module

Use this information to remove a serial port module.

#### About this task

##### Attention:

- Read [“Installation Guidelines” on page 383](#) 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 378](#).
- Step 2. Disconnect the cable of the serial port module 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.

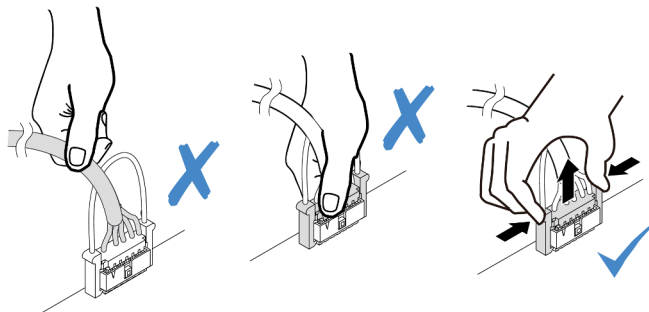


Figure 194. Disconnecting the serial port cable

- Step 3. Remove the riser assembly from the system. See [“PCIe adapter and riser assembly replacement” on page 346](#).
- 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.

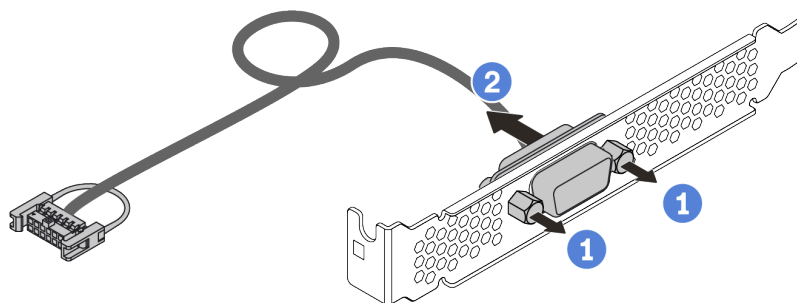


Figure 195. Serial port module disassembling

### After you finish

1. Install a new serial port module, a PCIe adapter, or a PCIe slot bracket to cover the place. See [“Install a serial port module” on page 358](#) and [“Install a PCIe adapter and riser assembly” on page 352](#).
2. If you are instructed to return the defective component, follow all packaging instructions and use any packaging materials that are provided.

## Install a serial port module

Use this information to install a serial port module.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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.
- Read the [“PCIe slots and configurations” on page 25](#) for the PCIe slots to ensure that you install the serial port module to a correct PCIe slot.

### Procedure

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

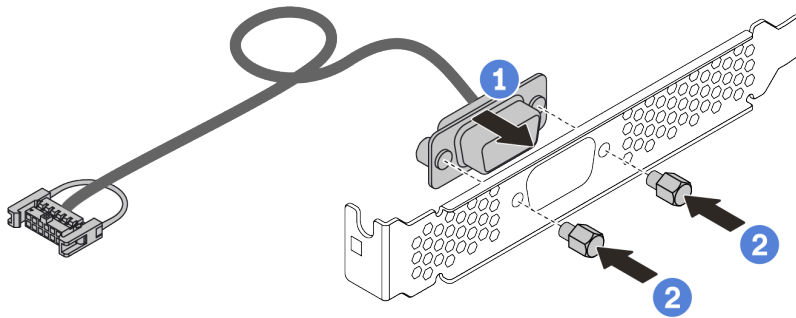


Figure 196. Serial port module assembling

- Step 3. Install the serial port module to the riser bracket.
- Step 4. Install the riser assembly back to the server.
- Step 5. 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 68](#).

### After you finish

1. Complete the parts replacement.
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.

## 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” on page 361](#)
- [“Install the security bezel” on page 364](#)

## Remove the security bezel

Use this information to remove the security bezel.

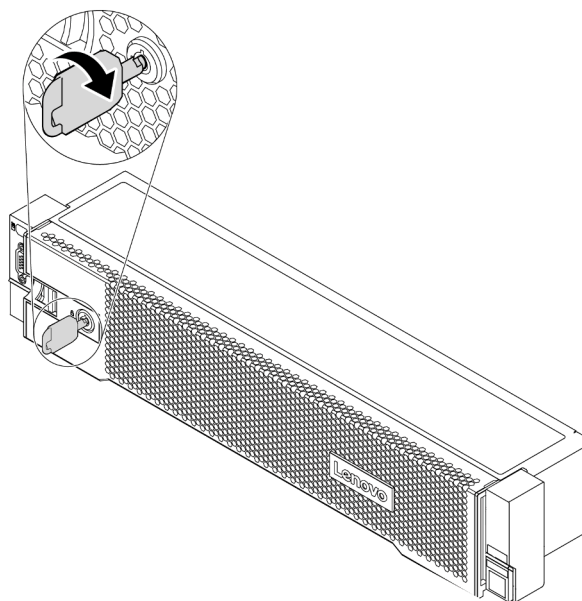
### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) to ensure that you work safely.
- Before you ship the rack with the server installed, reinstall and lock the security bezel into place.

## Procedure

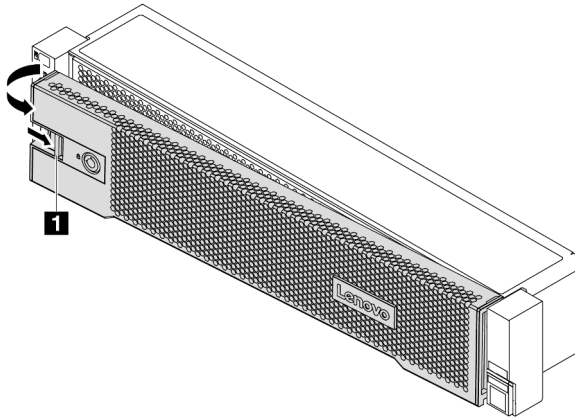
Step 1. Use the key to unlock the security bezel.



*Figure 197. Unlocking the security bezel*



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



*Figure 198. Security bezel removal*

### **After you finish**

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

### **Demo video**

[Watch the procedure on YouTube](#)

## **Install the security bezel**

Use this information to install the security bezel.

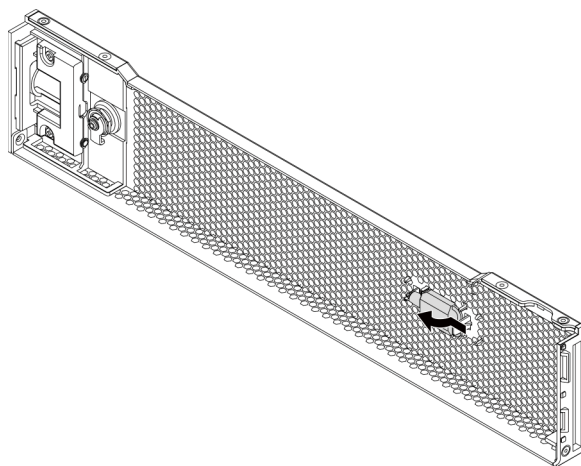
### **About this task**

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

**Attention:** Read [“Installation Guidelines” on page 383](#) to ensure that you work safely.

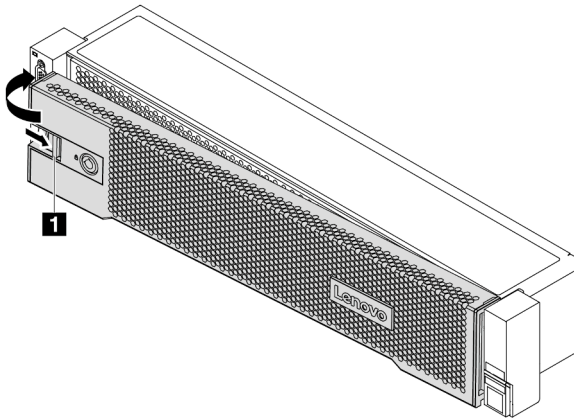
## Procedure

- Step 1. If you have removed the rack latches, reinstall them. See [“Install the rack latches” on page 309](#).
- Step 2. If the key is held inside the security bezel, remove it out of the security bezel.



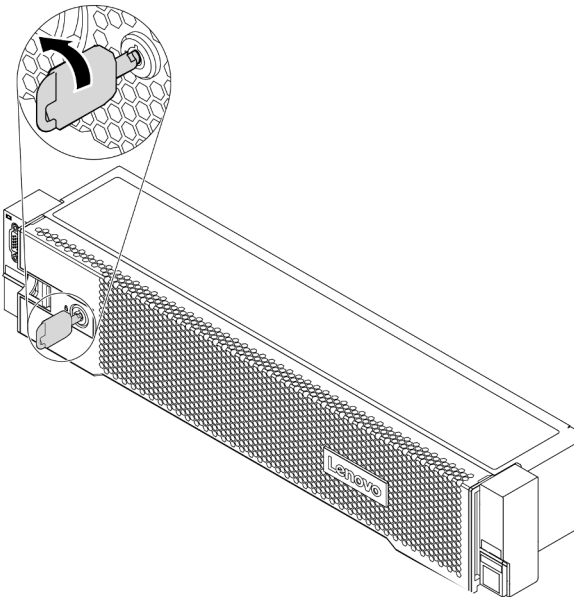
*Figure 199. Key removal*

Step 3. Carefully insert the tabs on the security bezel into the slots on the right rack latch. Then, press and hold the release latch **1** and rotate the security bezel inward until the other side clicks into place.



*Figure 200. Security bezel installation*

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



*Figure 201. Locking the security bezel*

### Demo video

[Watch the procedure on YouTube](#)

## System fan replacement

Use this information to remove and install a system fan.

- [“Remove a system fan” on page 368](#)
- [“Install a system fan” on page 370](#)

## Remove a system fan

Use this information to remove a system fan.

### 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 383](#) 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.
- You can remove a hot-swap fan without powering off the server, which helps you avoid significant interruption to the operation of the system.

**Note:** When removing a system fan without powering off the server, do not touch the system fan cage.

## Procedure

Step 1. Remove the top cover. See [“Remove the top cover” on page 378](#).

Step 2. Remove the system fan.

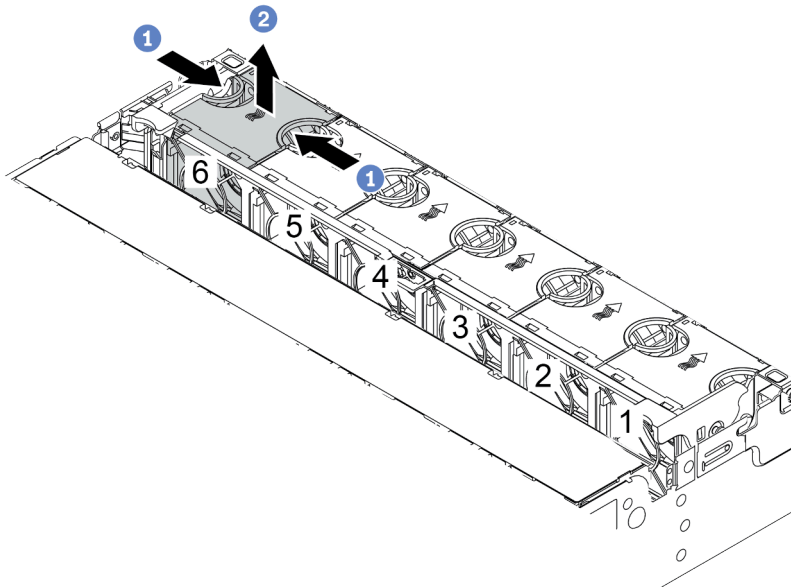


Figure 202. System fan removal

- a. Grasp the top of the system fan with your fingers.
- b. Lift the system fan out of the server.

## 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 370](#).
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.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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.

#### 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.**



## Procedure

- Step 1. Touch the static-protective package that contains the new system fan to any unpainted surface on the outside of the server. Then, take the new system fan out of the package and place it on a static-protective surface.
- Step 2. Position the system fan above the system fan cage. The system fan connector on the bottom of the system fan should face the rear of the chassis. Press the system fan straight down until it is seated into place.

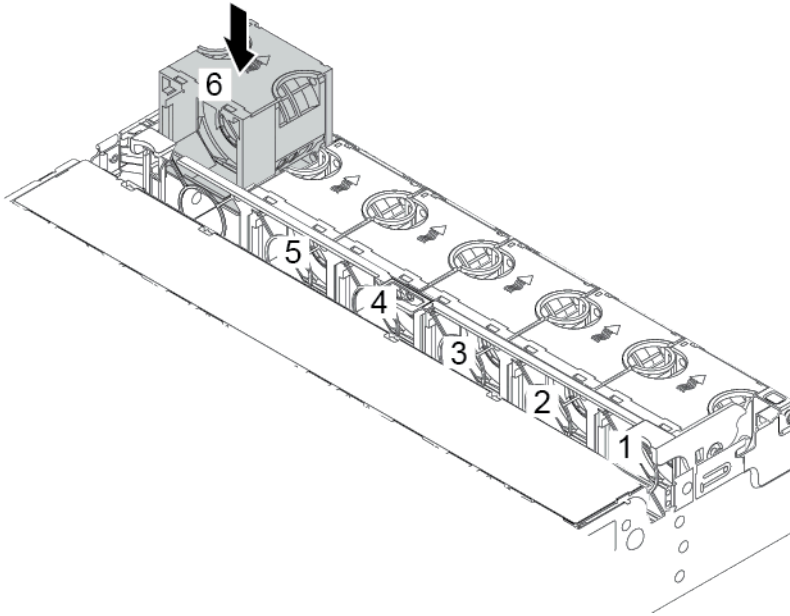


Figure 203. System fan installation

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## System fan cage replacement

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

- [“Remove the system fan cage” on page 373](#)
- [“Install the system fan cage” on page 375](#)

## Remove the system fan cage

Use this information to remove the system fan cage.

### About this task

#### Attention:

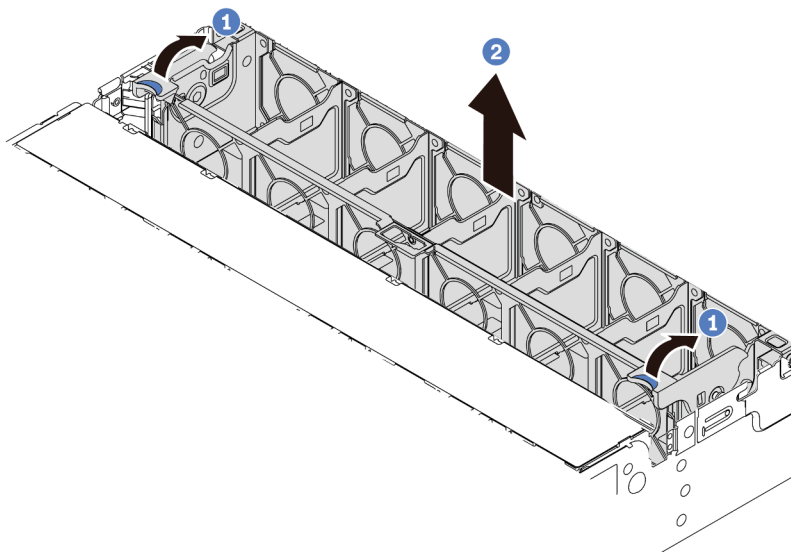
- Read [“Installation Guidelines” on page 383](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.
- Prevent exposure to static electricity, which might lead to system halt and loss of data, by keeping static-sensitive components in their static-protective packages until installation, and handling these devices with an electrostatic-discharge wrist strap or other grounding system.

## Procedure

Step 1. Prepare your server.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 2. Remove the system fan cage.



*Figure 204. System fan cage removal*

- a. Rotate the levers of the system fan cage to the rear of the server.
- b. Lift the system fan cage straight up and out of the chassis.

## Demo video

[Watch the procedure on YouTube](#)

## Install the system fan cage

Use this information to install the system fan cage.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 2. Align both sides of the system fan cage with the corresponding mounting posts in the chassis, press the system fan cage straight down into the chassis. Then, rotate the levers of the system fan cage to the front of the server to secure the system fan cage.

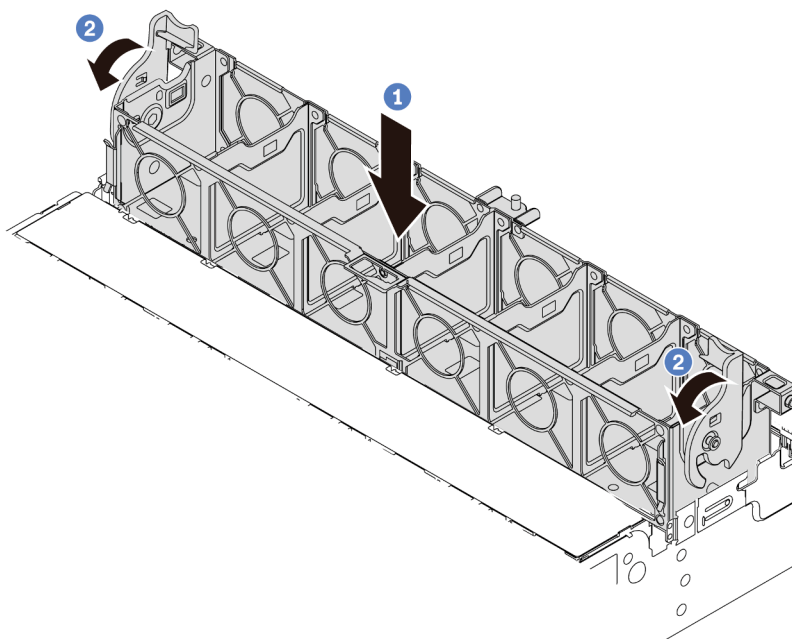


Figure 205. System fan cage installation

**Note:** If there are system fans installed in the system fan cage, ensure that the system fans are correctly connected to the system fan connectors on the system board.

## After you finish

1. If you have removed the system fans, reinstall them. See [“Install a system fan” on page 370](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## Demo video

[Watch the procedure on YouTube](#)

## Top cover replacement

Use this information to remove and install the top cover.

- [“Remove the top cover” on page 378](#)
- [“Install the top cover” on page 380](#)

## 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 383](#) to ensure that you work safely.
- Power off the server and disconnect all power cords for this task.



## 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.

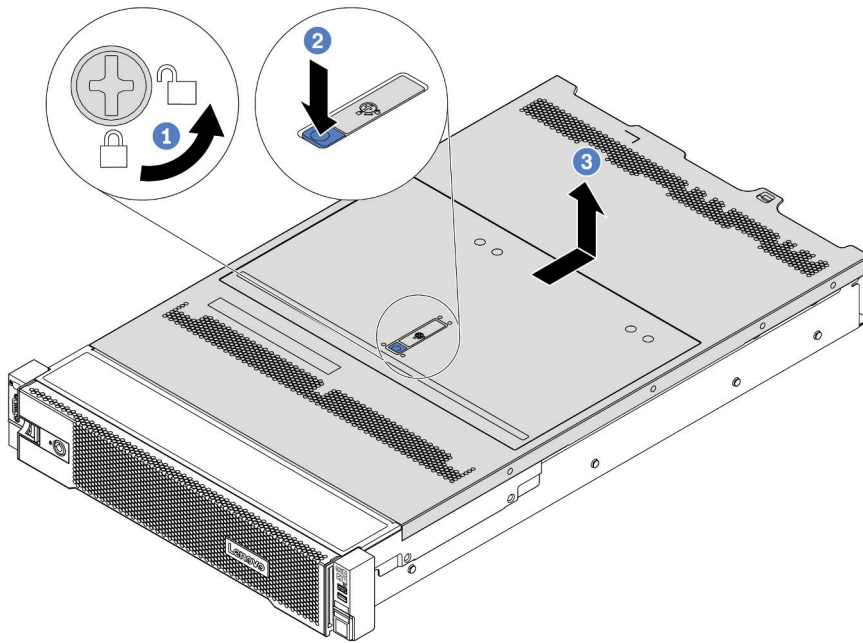


Figure 206. Top cover removal

- a. Use a screwdriver to turn the cover lock to the unlocked position as shown.
- b. Press the release button on the cover latch and then fully open the cover latch.
- c. 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.

## 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.**

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.

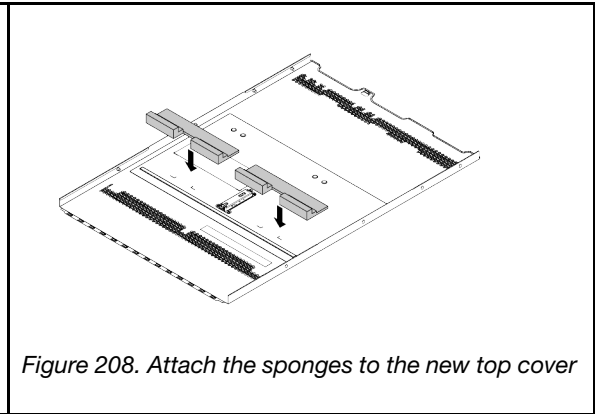
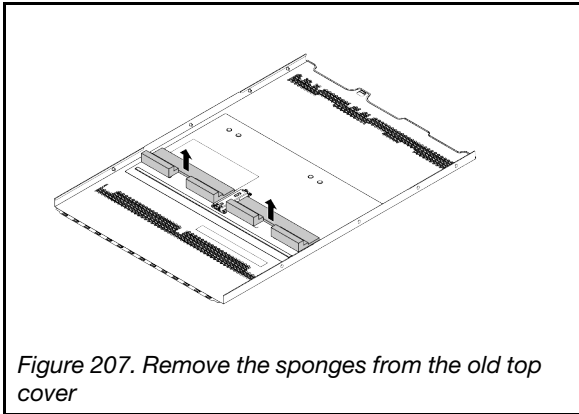
**Note:** A new top cover comes without a service label attached. If you need a service label, order it together with the new top cover and attach the service label to the new top cover first.

## 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 79](#).

Step 2. A new top cover comes without sponges by default. If the old top cover is installed with sponges, remove the sponges from the old top cover and attach them to the new top cover.



Step 3. 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.

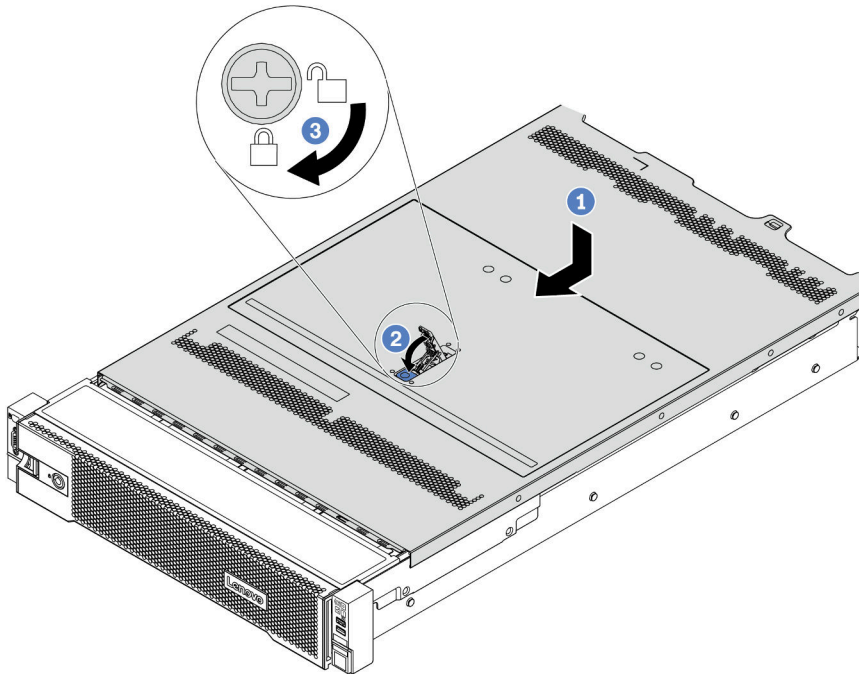


Figure 209. Top cover installation

1. 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.

2. Rotate the cover latch until the top cover snaps into position. Ensure that the cover latch is completely closed.
3. Use a screwdriver to turn the cover lock to the locked position.

## After you finish

Complete the parts replacement. See [“Complete the parts replacement” on page 383](#).

## 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 the cable connecting and routing information for each component.
3. If you have removed the top cover, reinstall it. See [“Install the top cover” on page 380](#).
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 29](#).
  - 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/ixpm\\_frontend/ixpm\\_product\\_page.html](https://sysmgt.lenovofiles.com/help/topic/ixpm_frontend/ixpm_product_page.html).

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## 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 29](#).

## 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](http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html)
- Make sure the components you are installing are supported by the server. For a list of supported optional components for the server, see <https://serverproven.lenovo.com/>.
- 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 SR665 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, or 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. Click **Preconfigured Model** or **Configure to order**.
- c. Enter the machine type and model for your server to display the configurator page.

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

## System reliability guidelines

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

Make sure the following requirements are met:

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



## Working inside the server with the power on

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

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

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

## Handling static-sensitive devices

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

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

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



## Processor and heat sink replacement

Use this information to remove and install a processor and heat sink.

The server supports three types of heat sinks. Depending on the specific type, the heat sink on your server might be different from that shown in the illustrations. For detailed information on heat sink selection, see [“Technical rules” on page 18](#).

### **CAUTION:**

**Make sure that all server power cords are disconnected from their power sources before performing this procedure.**

### **Attention:**

- Before reusing a processor or heat sink, make sure you use Lenovo proven alcohol cleaning pad and thermal grease.
  - Each processor socket must always contain a cover or a processor and heat sink. When removing or installing a processor and heat sink, protect empty processor sockets with a cover.
  - Do not touch the processor socket or processor contacts. Processor-socket contacts are very fragile and easily damaged. Contaminants on the processor contacts, such as oil from your skin, can cause connection failures.
  - Do not allow the thermal grease on the processor or heat sink to come in contact with anything. Contact with any surface can compromise the thermal grease, rendering it ineffective. Thermal grease can damage components, such as electrical connectors in the processor socket. Do not remove the grease cover from a heat sink until you are instructed to do so.
- 
- [“Remove a heat sink” on page 391](#)
  - [“Remove a processor” on page 394](#)
  - [“Install a processor” on page 396](#)
  - [“Install a heat sink” on page 398](#)

## Remove a heat sink

Use this information to remove a heat sink.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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

### 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.

Step 1. Prepare your server.

1. Remove the top cover. See [“Remove the top cover” on page 378](#).
2. Remove the air baffle. See [“Remove the air baffle” on page 151](#).
3. Remove the fan cage (only for removing the performance heat sink). See [“Remove the system fan cage” on page 373](#).
4. Remove any parts and disconnect any cables that might impede your access to the heat sink and processor.

Step 2. 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. Then, slightly lift the heat sink away from the system.

**Note:** The suggested tightening torque value is  $14.0 \pm 0.5$  inch-pounds (1.525 – 1.638 newton meters).

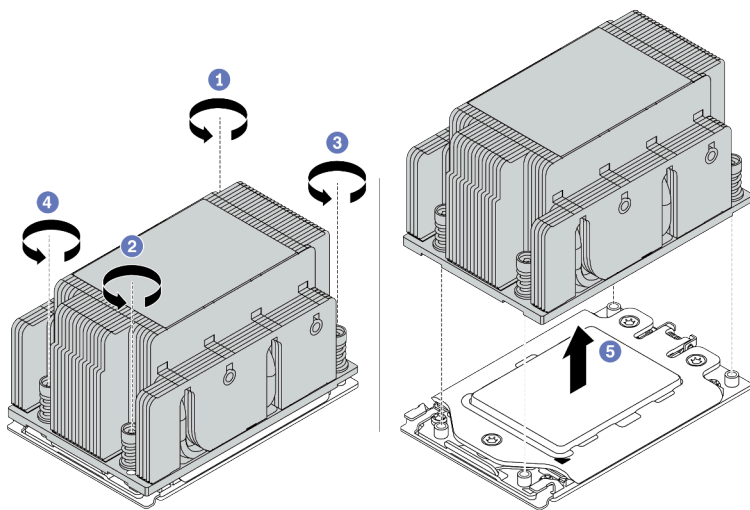


Figure 210. Removing a standard heat sink

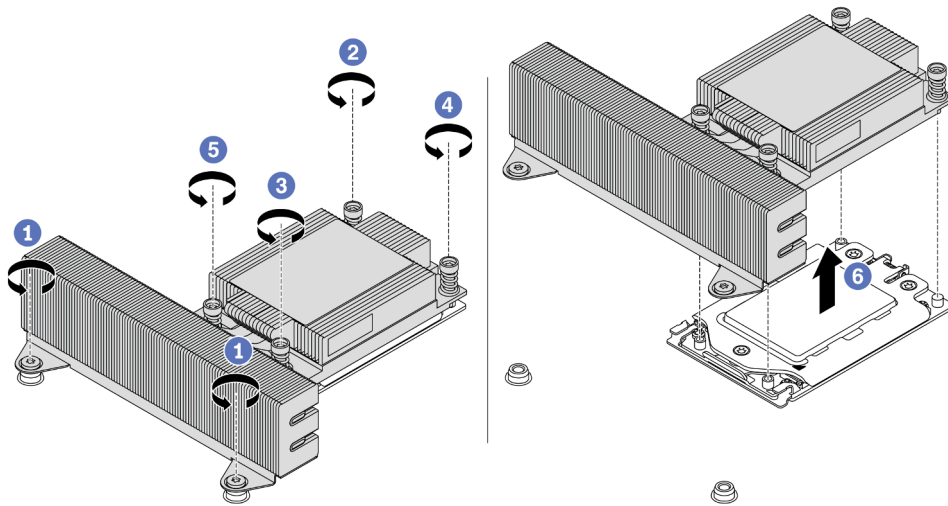


Figure 211. Removing a performance heat sink

### After you finish

- If you are replacing a heat sink, install a new heat sink. See [“Install a heat sink” on page 398](#).
- If you are replacing a processor, remove the processor. See [“Remove a processor” on page 394](#).

### 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 383](#) 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

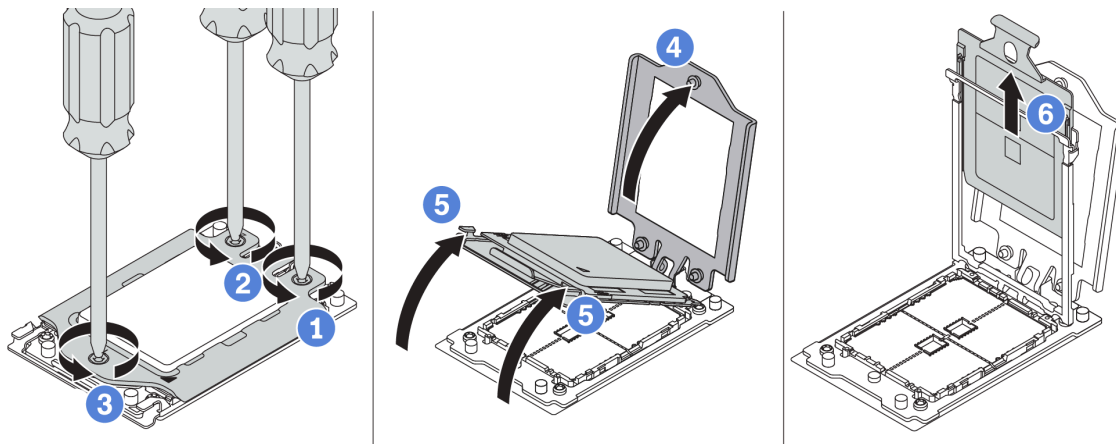


Figure 212. Processor removal

Step 1. Use a Torx #T20 screwdriver to loosen the captive screws in the *removal sequence* shown on the force frame.

**Note:** Use an ESD safe screwdriver and set the maximum torque value to  $14.0 \pm 0.5$  inch-pounds.

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 396](#).

## 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 383](#) 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 29](#).
- Optional devices available for your system might have specific processor requirements. See [“Technical rules” on page 18](#).

## Procedure

Step 1. Take the new part out of the package and place it on a static-protective surface.

Step 2. Prepare your server.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 3. Install the processors.

- a. Slide the processor carrier into the rail frame.
- b. Push the rail frame down until the blue latches lock into place.
- c. Close the force frame.
- d. 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  $14.0 \pm 0.5$  inch-pounds.

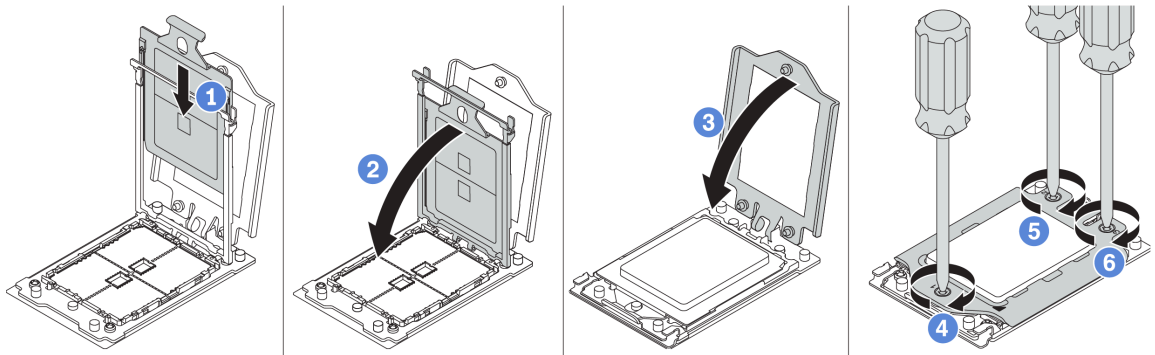


Figure 213. Processor installation

## After you finish

Install the heat sink. See [“Install a heat sink” on page 398](#).

## Demo video

[Watch the procedure on YouTube](#)

## Install a heat sink

This task has instructions for installing a heat sink.

### About this task

#### Attention:

- Read [“Installation Guidelines” on page 383](#) 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. Take the new part out of the package and place it on a static-protective surface.
- Step 2. Prepare your server.
1. Power off the server.
  2. Remove the top cover. See [“Remove the top cover” on page 378](#).
  3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
  4. Remove any components that are impeding the procedure.
  5. Install any components that are required before installing or removing the component(s).
- Step 3. 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.

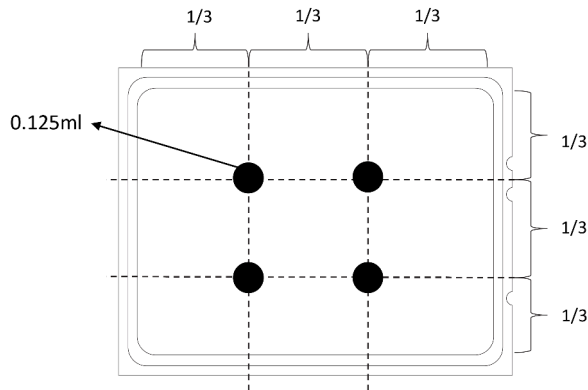


Figure 214. Applying thermal grease

Step 4. Install the standard or performance heat sink.

**Note:** For a new heat sink, the thermal grease is pre-applied to the heat sink. Remove the protective cover and install the heat sink.

**Note:** Use an ESD safe screwdriver and set the maximum torque value to  $14.0 \pm 0.5$  inch-pounds.

- 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.
- Tighten all the captive screws in the *installation sequence* shown on the heat-sink label.
- (Optional) Tighten the two screws located in the front of the performance heat sink.

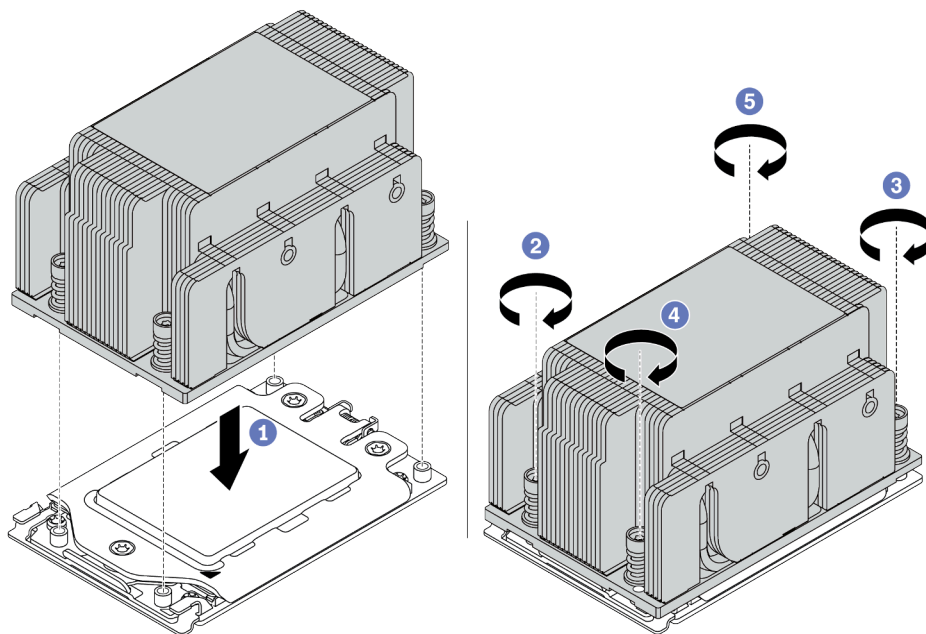


Figure 215. Installing a standard heat sink

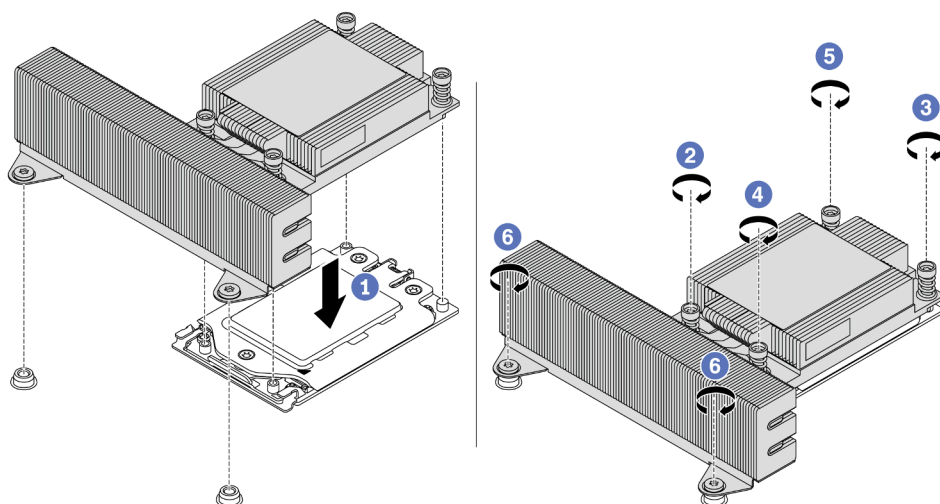


Figure 216. Installing a performance heat sink

## After you finish

1. Install the air baffle. See [“Install the air baffle”](#) on page 155.
2. Install any parts that you have removed.
3. Complete the parts replacement. See [“Complete the parts replacement”](#) on page 383.

## Demo video

[Watch the procedure on YouTube](#)

## System board replacement

Use this information to remove and install the system board.

- “Remove the system board” on page 403
- “Install the system board” on page 405
- “Update the Vital Product Data (VPD)” on page 407
- “Configure security settings” on page 409

### 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 383](#) 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. Take the new part out of the package and place it on a static-protective surface.

Step 2. Prepare your server.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 3. Remove the system board.

- a. Lift the two release pins at the same time.
- b. Slide the system board towards the front of the chassis until it stops.
- c. Tilt and lift the system board out of the chassis.

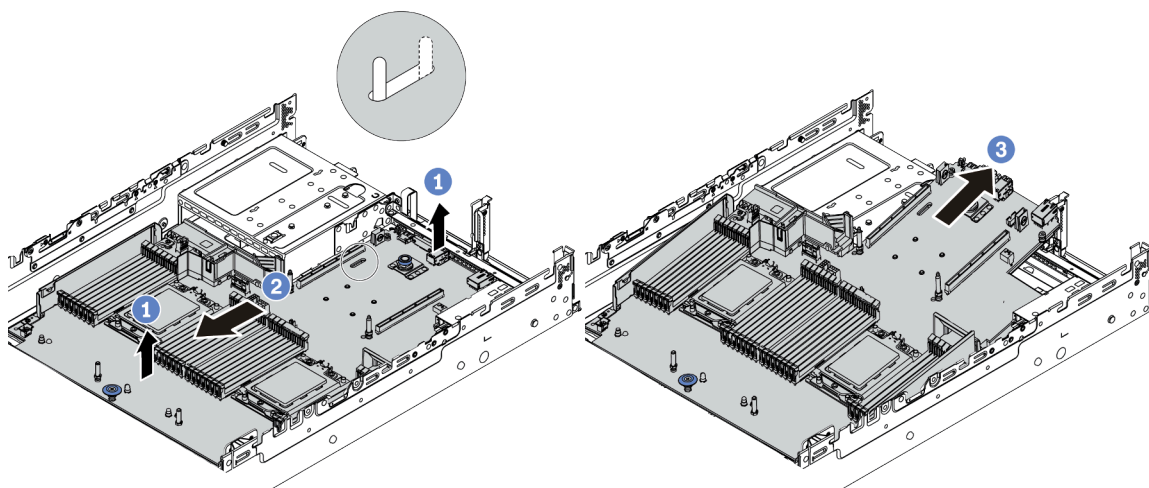


Figure 217. System board removal

## 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 [“Disassembling the system board for recycle” on page 447](#) 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 383](#) 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. Take the new part out of the package and place it on a static-protective surface.

Step 2. Prepare your server.

1. Power off the server.
2. Remove the top cover. See [“Remove the top cover” on page 378](#).
3. Record and disconnect any cables. See [Chapter 3 “Internal cable routing” on page 79](#).
4. Remove any components that are impeding the procedure.
5. Install any components that are required before installing or removing the component(s).

Step 3. Install the new system board to the server.

- a. Pivot the front end of the system board towards the chassis.
- b. Lower the other end down.
- c. Slide the system board towards the rear of the chassis until the mounting stud is moved to the rear end of the slot.

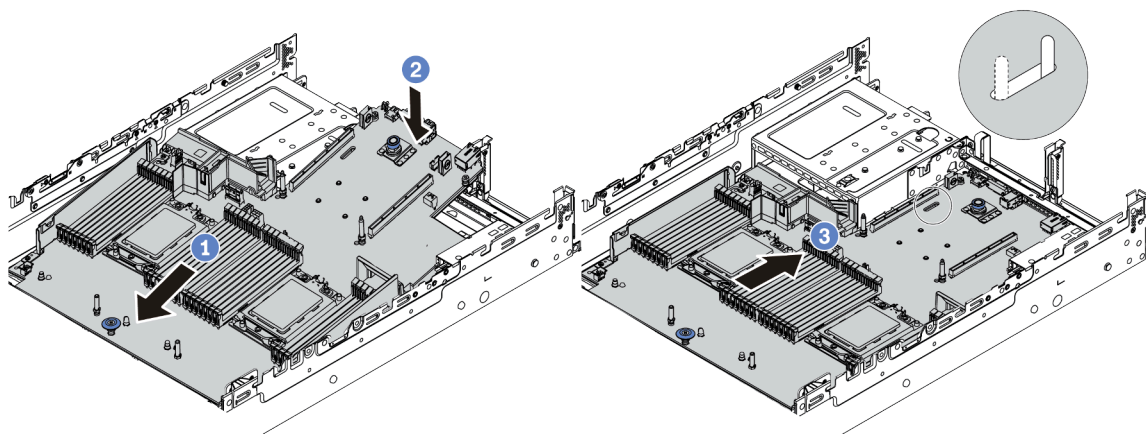


Figure 218. System board installation

Step 4. A new system board comes with half-height cable holders by default. If the old system board is installed with full-height cable holders, remove them from the old system board and install them to the new system board. See [“Cable holder replacement” on page 158](#).

## After you finish

1. Install any components that you have removed from the failing system board.
2. Properly route and secure the cables in the server. Refer to the cable connecting and routing information for each component.
3. Install the air baffle if you have removed it. See [“Install the air baffle” on page 155](#).
4. Install the top cover. See [“Install the top cover” on page 380](#).
5. Push the power supplies into the bays until they click into place.
6. Connect power cords to the server and turn on the server.
7. Update the VPD. See [“Update the Vital Product Data \(VPD\)” on page 407](#).
  - (Required) Machine type
  - (Required) Serial number
  - (Optional) Asset tag
  - (Optional) UUID
8. Configure the security settings. See [“Configure security settings” on page 409](#).
  - (Optional) Assert Physical Presence
  - (Required) Set the TPM policy
  - (Required) Lock the TPM policy
  - (Optional) Toggle 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**, 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
<code>&lt;m/t_model&gt;</code>	<p>The server machine type and model number.</p> <p>Type xxxxyyy, where xxxx is the machine type and yyy is the server model number.</p>
<code>&lt;s/n&gt;</code>	<p>The serial number on the server.</p> <p>Type zzzzzzz, where zzzzzzz is the serial number.</p>
<code>&lt;asset_tag&gt;</code>	<p>The server asset tag number.</p> <p>Type aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa, where aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa is the asset tag number.</p>
<code>[access_method]</code>	<p>The access method that you select to access the target server.</p> <ul style="list-style-type: none"> <li>Online KCS (unauthenticated and user restricted): You can directly delete <code>[access_method]</code> from the command.</li> <li>Online authenticated LAN: In this case, specify below LAN account information at the end of the OneCLI command: --bmc-username <code>&lt;user_id&gt;</code> --bmc-password <code>&lt;password&gt;</code></li> <li>Remote WAN/LAN: In this case, specify below XCC account information and IP address at the end of the OneCLI command: --bmc <code>&lt;bmc_user_id&gt;:&lt;bmc_password&gt;@&lt;bmc_external_IP&gt;</code></li> </ul> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li><code>&lt;bmc_user_id&gt;</code> The BMC account name (1 of 12 accounts). The default value is USERID.</li> <li><code>&lt;bmc_password&gt;</code> The BMC account password (1 of 12 accounts).</li> </ul>

## 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 <sup>1</sup>		Required <sup>1</sup>	
TPM policy setting & locking	Required	Required	Required	Required
TPM version toggling	Optional <sup>2</sup>	Optional <sup>2</sup>		
<div>1. Required only when certain UEFI firmware versions and processors are installed. For details, see <a href="#">“(Optional) Assert physical presence” on page 409</a>.</div> <div>2. Optional versions for toggling vary when different processors and UEFI firmware versions are installed. For details, see <a href="#">“(Optional) Toggle the TPM version” on page 416</a>.</div>				

- [“\(Optional\) Assert physical presence” on page 409](#)
- [“\(Required\) Set the TPM policy” on page 411](#)
- [“\(Optional\) Toggle the TPM version” on page 416](#)
- [“\(Optional\) Enable UEFI Secure Boot” on page 418](#)

### (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/ixcc\\_frontend/ixcc\\_overview.html](https://sysmgmt.lenovofiles.com/help/topic/ixcc_frontend/ixcc_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 73](#).



**(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 412](#)
- [“Using Lenovo XClarity Essentials OneCLI” on page 414](#)

### 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](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
<b>Undefined</b>	The default setting and must be changed to one of the other 3 policies.
<b>NationZ TPM 2.0 enabled - China only</b>	Customers in Chinese Mainland that intend to enable TPM should select this TPM policy.
<b>TPM enabled - ROW</b>	Customers outside Chinese Mainland that intend to enable TPM should select this TPM policy.
<b>Permanently disabled</b>	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) <sup>1</sup>	TPM 2.0 upgrade (7.2.1.0->7.2.2.0)
Before v2.0.2	7002 series	√ <sup>2</sup>	
v2.0.2 and later	7002 series		√ <sup>3</sup>
v2.0.2 and later	7003 series		√ <sup>3</sup>
<b>Notes:</b> 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. <ul style="list-style-type: none"><li>• UEFI firmware before v2.02 installed.</li><li>• 7002 series processors installed.</li><li>• Original TPM firmware version is either 7.4.0.0 or 7.2.1.0.</li></ul> 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 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://sysmgt.lenovofiles.com/help/topic/lxpm\\_frontend/lxpm\\_product\\_page.html](https://sysmgt.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.

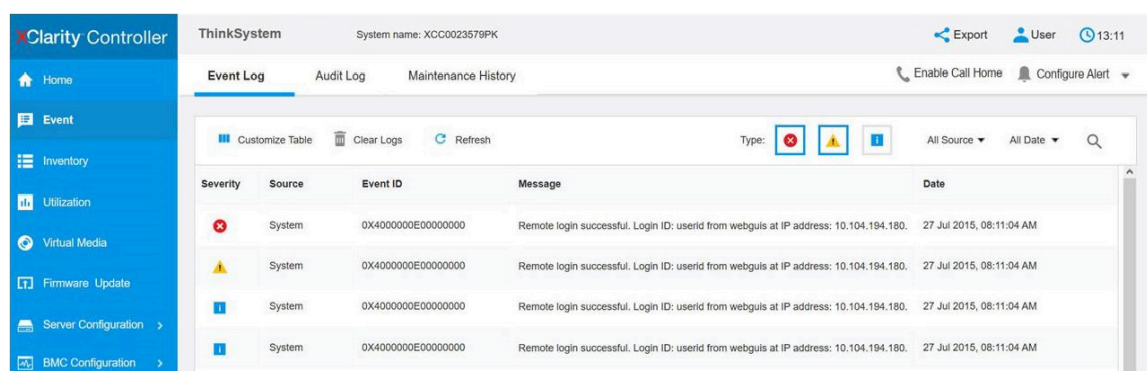
## Event logs

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: [http://thinksystem.lenovofiles.com/help/topic/7d2w/pdf\\_files.html](http://thinksystem.lenovofiles.com/help/topic/7d2w/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 system management software and to system administrators and users to enable remote management and control of a server.



Severity	Source	Event ID	Message	Date
Success	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
Success	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
Success	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
Success	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM

Figure 219. 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/lxccc\\_frontend/lxccc\\_overview.html](https://sysmgt.lenovofiles.com/help/topic/lxccc_frontend/lxccc_overview.html).

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## 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 37](#)
- [“Diagnostics panel” on page 49](#)
- [“LCD diagnostics panel/handset” on page 52](#)
- [“Rear view LEDs” on page 65](#)
- [“System board LEDs” on page 70](#)

---

## General problem determination procedures

Use the information in this section to resolve problems if the event log does not contain specific errors or the server is inoperative.

If you are not sure about the cause of a problem and the power supplies are working correctly, complete the following steps to attempt to resolve the problem:

1. Power off the server.
2. Make sure that the server is cabled correctly.
3. Remove or disconnect the following devices if applicable, one at a time, until you find the failure. Power on and configure the server each time you remove or disconnect a device.
  - Any external devices.
  - Surge-suppressor device (on the server).
  - Printer, mouse, and non-Lenovo devices.
  - Each adapter.
  - Hard disk drives.
  - Memory modules until you reach the minimum configuration that is supported for the server.

See [“Minimum configuration for debugging” on page 10](#) to determine the minimum configuration for your server.

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.

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.
- If you set the Ethernet controller to operate at 100 Mbps or 1000 Mbps, you must use Category 5 cabling.

Step 3. Determine whether a hub is installed in the network environment. If yes, use direct connection from a server adapter port to a laptop to clarify the network issue. If the network environment is for unique fiber channel connectors (such as SFP+ and QSFP), use another known good server for direct connection to clarify the issue first.

Step 4. Check the Ethernet controller LEDs on the rear panel of the server. These LEDs indicate whether there is a problem with the connector, cable, or hub.

- The Ethernet link status LED is lit when the Ethernet controller receives a link pulse from the hub. If the LED is off, there might be a defective connector or cable or a problem with the hub.
- The Ethernet transmit/receive activity LED is lit when the Ethernet controller sends or receives data over the Ethernet network. If the Ethernet transmit/receive activity is off, make sure that the hub and network are operating and that the correct device drivers are installed.

Step 5. Check the 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 420](#)

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 451](#)).

## 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 425
- “The power button does not work (server does not start)” on page 426
- “Server does not power on” on page 427

### 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://sysmgt.lenovofiles.com/help/topic/lxcc\\_frontend/lxcc\\_overview.html](https://sysmgt.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 1a and 1b.
    - 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, reseat all the power supplies and make sure AC LED on PSU rear side are lit on.
4. If you have just installed an optional device, remove it, and restart the server.
5. If the issue is still observed or without power button LED lit on, implement the minimum configuration to check whether any specific components lock the power permission. Replace the each power supply and check the power button function after installing the each one.
6. If everything is still done and the issue cannot be resolved, collect the failure information with system logs captured to Lenovo support.



## **Server does not power on**

Complete the following steps until the problem is resolved:

1. Check the event log for any events related to the server not powering on.
2. Check for any LEDs that are flashing amber.
3. Check the power LED on the system board.
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 each power supply and check the power button function after installing 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 428](#)
- [“Multiple rows of DIMMs in a branch identified as failing” on page 429](#)
- [“DIMM PFA issue” on page 429](#)

### 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, reseat the DIMM; then, run the Setup utility and enable the DIMM.
5. Reseat the DIMM.
6. Restart the server.

### Multiple rows of DIMMs in a branch identified as failing

1. Reseat the DIMMs; then, restart the server.
2. Remove the lowest-numbered DIMM pair of those that are identified and replace it with an identical known good DIMM; then, restart the server. Repeat as necessary. If the failures continue after all identified DIMMs are replaced, go to step 4.
3. Return the removed DIMMs, one at a time, to their original connectors, restarting the server after each DIMM, until a DIMM fails. Replace each failing DIMM with an identical known good DIMM, restarting the server after each DIMM replacement. Repeat step 3 until you have tested all removed DIMMs.
4. Replace the lowest-numbered DIMM of those identified; then, restart the server. Repeat as necessary.
5. Reverse the DIMMs between the channels (of the same processor), and then restart the server. If the problem is related to a DIMM, replace the failing DIMM.
6. 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 429
- “Multiple hard drives fail” on page 430
- “One or two 7mm drives identified as failing” on page 430
- “Multiple hard drives are offline” on page 430
- “A replacement hard disk drive does not rebuild” on page 430
- “Green hard disk drive activity LED does not represent actual state of associated drive” on page 431
- “U.3 NVMe drive can be detected in NVMe connection, but cannot be detected in Tri-mode” on page 431

### 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/ixpm\\_frontend/ixpm\\_product\\_page.html](https://sysmgt.lenovofiles.com/help/topic/ixpm_frontend/ixpm_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](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://sysmgt.lenovofiles.com/help/topic/ixpm\\_frontend/ixpm\\_product\\_page.html](https://sysmgt.lenovofiles.com/help/topic/ixpm_frontend/ixpm_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 433](#)
- [“Screen is blank” on page 433](#)
- [“Screen goes blank when you start some application programs” on page 434](#)
- [“The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted” on page 434](#)
- [“The wrong characters appear on the screen” on page 434](#)

### 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 29](#).

### 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 29](#).
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 29](#).



## 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 436](#)
- [“Mouse does not work” on page 436](#)
- [“KVM switch problems” on page 437](#)
- [“USB-device does not work” on page 437](#)

**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 437
- “PCIe adapter is not recognized or is not functioning” on page 437
- “A Lenovo optional device that worked previously does not work now” on page 438
- “A Lenovo optional device that was just installed does not work.” on page 438
- “A Lenovo optional device that worked previously does not work now” on page 438

### 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 damage, 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 439](#)
- [“Serial device does not work” on page 440](#)

### **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 440
- “Intermittent KVM problems” on page 440
- “Intermittent unexpected reboots” on page 441

### 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://sysmgt.lenovofiles.com/help/topic/lxpm\\_frontend/lxpm\\_product\\_page.html](https://sysmgt.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://sysmgt.lenovofiles.com/help/topic/lxpm\\_frontend/lxpm\\_product\\_page.html](https://sysmgt.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 420](#) 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 443
- “Could not log in using LDAP account with SSL enabled” on page 443

### 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 TSM system event log, 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 443
- “The server immediately displays the POST Event Viewer when it is turned on” on page 444
- “Server is unresponsive (POST is complete and operating system is running)” on page 444
- “Server is unresponsive (POST failed and cannot start System Setup)” on page 444
- “Voltage planar fault is displayed in the event log” on page 445
- “Unusual smell” on page 445
- “Server seems to be running hot” on page 445
- “Cannot enter legacy mode after installing a new adapter” on page 445
- “Cracked parts or cracked chassis” on page 445

### 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 [“Technical specifications” on page 3](#) for the minimally required number of processors and DIMMs.
2. Restart the system.
  - If the system restarts, add each of the 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 [“Technical specifications” on page 3](#)).
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. Hardware disassembling 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.

#### **About this task**

Refer to local environmental, waste or disposal regulations to ensure compliance.

#### **Procedure**

Step 1. Remove the system board from the server (see [“Remove the system board” on page 403](#)).

Step 2. Disassemble the system board.

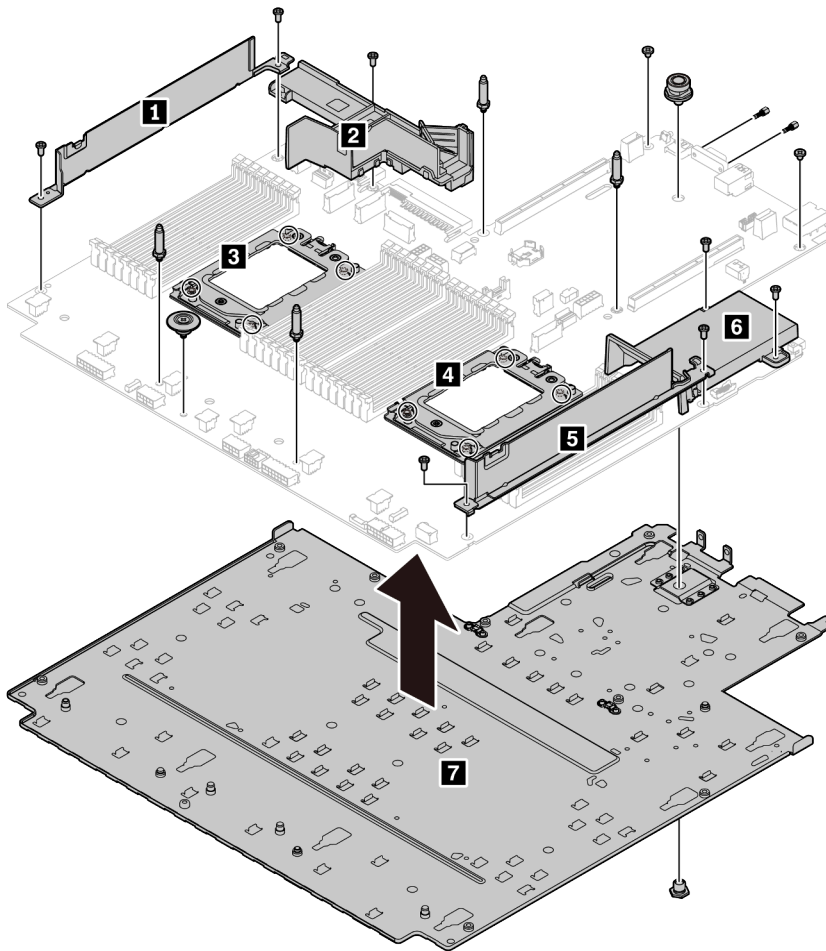


Figure 220. Disassembling the system board

1. Remove the following screws as illustrated:
  - Nine slotted screws (with PH2 screwdriver)
  - Four guiding pin standoffs (with 6 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 VGA and COM (RS232) connectors (with 5 mm wrench)
2. Separate the components **1 2 3 4 5 6 7** from the system board.

## After you finish

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](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](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/ixcc\\_frontend/ixcc\\_overview.html](https://sysmgt.lenovofiles.com/help/topic/ixcc_frontend/ixcc_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](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](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/toolctr\\_cli\\_lenovo/onecli\\_r\\_getinfor\\_command.html](http://sysmgt.lenovofiles.com/help/topic/toolctr_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/supportphonenumberlist> for your region support details.



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## Appendix C. Notices

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Morrisville, NC 27560  
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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.

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Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

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## 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.

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## Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

Additional electronic emissions notices are available at:

<http://thinksystem.lenovofiles.com/help/index.jsp>

## Taiwan Region BSMI RoHS declaration

單元 Unit	限用物質及其化學符號 Restricted substances and its chemical symbols					
	鉛Lead (PB)	汞Mercury (Hg)	鎘Cadmium (Cd)	六價鉻 Hexavalent chromium (Cr <sup>6+</sup> )	多溴聯苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
機架	○	○	○	○	○	○
外部蓋板	○	○	○	○	○	○
機械組零件	—	○	○	○	○	○
空氣傳動設備	—	○	○	○	○	○
冷卻組零件	—	○	○	○	○	○
內存模組	—	○	○	○	○	○
處理器模組	—	○	○	○	○	○
電纜組零件	—	○	○	○	○	○
電源供應器	—	○	○	○	○	○
儲備設備	—	○	○	○	○	○
電路卡	—	○	○	○	○	○
光碟機	—	○	○	○	○	○
<p>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.</p> <p>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.</p> <p>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.</p>						

## 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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