



# ThinkSystem SR650 Maintenance Manual



**Machine Types:** 7X05 and 7X06

## 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.

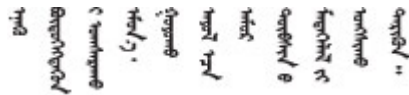
A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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་ཇུས་འདི་བདེ་སྤྱོད་མ་བྱས་གོང་། སྐྱར་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™ SR650 server is a 2U rack server designed for performance and expansion for various IT workloads. With the modular design, the server is flexible to be customized for maximum storage capacity or high storage density with selectable input/output options and tiered system management.

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

The server comes with a limited warranty. For details about the warranty, see:  
<https://support.lenovo.com/us/en/solutions/ht503310>

For details about your specific warranty, see:  
<http://datacentersupport.lenovo.com/warrantylookup>

### Identifying your server

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

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

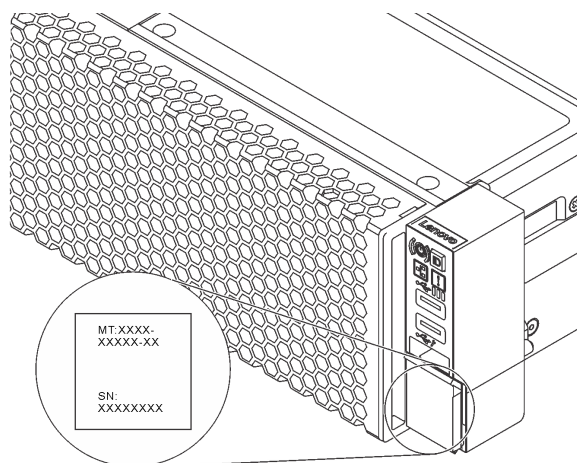


Figure 1. Location of the ID label

### XClarity Controller network access label

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

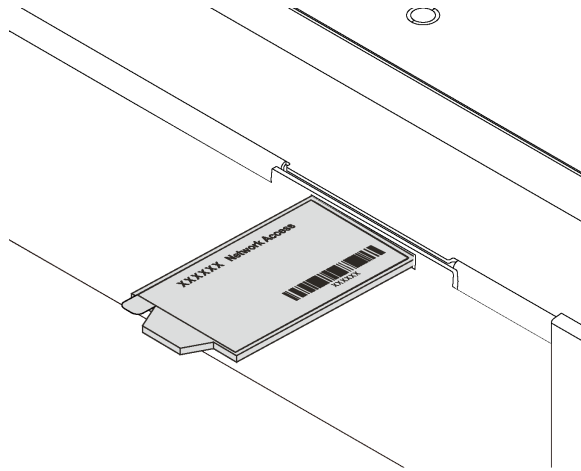


Figure 2. Location of the XClarity Controller network access label

### Quick response code

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

The following illustration shows the QR code: <https://support.lenovo.com/p/servers/sr650>



Figure 3. QR code

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## Specifications

The following information is a summary of the features and specifications of the server. Depending on the model, some features might not be available, or some specifications might not apply.

Table 1. Server specifications

Specification	Description
Dimension	<ul style="list-style-type: none"><li>• 2U</li><li>• Height: 86.5 mm (3.4 inches)</li><li>• Width:<ul style="list-style-type: none"><li>– With rack latches: 482.0 mm (19.0 inches)</li><li>– Without rack latches: 444.6 mm (17.5 inches)</li></ul></li><li>• Depth: 763.7 mm (30.1 inches)</li></ul> <p><b>Note:</b> The depth is measured with rack latches installed, but without the security bezel installed.</p>
Weight	Up to 32.0 kg (70.6 lb), depending on the server configuration

Table 1. Server specifications (continued)

Specification	Description
Processor (depending on the model)	<ul style="list-style-type: none"> <li>• Up to two Intel® Xeon® Scalable Processors               <ul style="list-style-type: none"> <li>– Designed for Land Grid Array (LGA) 3647 socket</li> <li>– Scalable up to 28 cores</li> <li>– Thermal Design Power (TDP): up to 205 watts</li> </ul> </li> </ul> <p>For a list of supported processors, see:</p> <p><a href="https://static.lenovo.com/us/en/serverproven/index.shtml">https://static.lenovo.com/us/en/serverproven/index.shtml</a></p> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>• Intel Xeon 6137, 6242R, 6246R, 6248R, 6250, 6256, or 6258R processor is supported only when the following requirements are met:               <ul style="list-style-type: none"> <li>– The server chassis is the twenty-four 2.5-inch-bay chassis.</li> <li>– The operating temperature is equal to or less than 30°C.</li> <li>– Up to eight drives are installed in the drive bays 8–15.</li> </ul> </li> <li>• Intel Xeon 6144, 6146, 8160T, 6126T, 6244, and 6240Y processor, or processors with TDP equal to 200 watts or 205 watts (excluding 6137, 6242R, 6246R, 6248R, 6250, 6256, or 6258R) are supported only when the following requirements are met:               <ul style="list-style-type: none"> <li>– The server chassis is the twenty-four 2.5-inch-bay chassis.</li> <li>– Up to eight drives are installed in the drive bays 8–15 if the operating temperature is equal to or less than 35°C, or up to sixteen drives are installed in the drive bays 0–15 if the operating temperature is equal to or less than 30°C.</li> </ul> </li> <li>• For server models with sixteen/twenty/twenty-four NVMe drives, two processors are needed, and the maximum supported processor TDP is 165 watts.</li> <li>• For server models with twenty-four 2.5-inch and twelve 3.5-inch-drive bays, if Intel Xeon 6144 and 6146 processors installed, the operating temperature is equal to or less than 27°C.</li> <li>• Intel Xeon 6154, 8168, 8180, and 8180M processors support the following server models: eight 3.5-inch-drive bays, eight 2.5-inch-drive bays, or sixteen 2.5-inch-drive bays. For server models with sixteen 2.5-inch and eight 3.5-inch drive bays, the operating temperature is equal to or less than 30°C.</li> <li>• Intel Xeon 6246, 6230T, and 6252N processors support the following server models: eight 3.5-inch-drive bays, eight 2.5-inch-drive bays, or sixteen 2.5-inch-drive bays.</li> <li>• If two TruDDR4 2933, 128 GB 3DS RDIMMs are installed in one channel, the operating temperature is equal to or less than 30°C.</li> </ul>
Memory	<p>For 1st Generation Intel Xeon Scalable Processor (Intel Xeon SP Gen 1):</p> <ul style="list-style-type: none"> <li>• Slots: 24 memory module slots</li> <li>• Minimum: 8 GB</li> <li>• Maximum:           <ul style="list-style-type: none"> <li>– 768 GB using registered DIMMs (RDIMMs)</li> <li>– 1.5 TB using load-reduced DIMMs (LRDIMMs)</li> <li>– 3 TB using three-dimensional stack registered DIMMs (3DS RDIMMs)</li> </ul> </li> <li>• Type (depending on the model):           <ul style="list-style-type: none"> <li>– TruDDR4 2666, single-rank or dual-rank, 8 GB/16 GB/32 GB RDIMM</li> <li>– TruDDR4 2666, quad-rank, 64 GB LRDIMM</li> <li>– TruDDR4 2666, octa-rank, 128 GB 3DS RDIMM</li> </ul> </li> </ul> <p>For 2nd Generation Intel Xeon Scalable Processor (Intel Xeon SP Gen 2):</p> <ul style="list-style-type: none"> <li>• Slots: 24 DIMM slots</li> <li>• Minimum: 8 GB</li> <li>• Maximum:</li> </ul>

Table 1. Server specifications (continued)

Specification	Description
	<ul style="list-style-type: none"> <li>- 1.5 TB using RDIMMs</li> <li>- 3 TB using 3DS RDIMMs</li> <li>- 6 TB using DC Persistent Memory Module (DCPMM) and RDIMMs/3DS RDIMMs in Memory Mode</li> <li>• Type (depending on the model):               <ul style="list-style-type: none"> <li>- TruDDR4 2666, single-rank or dual-rank, 16 GB/32 GB RDIMM</li> <li>- TruDDR4 2933, single-rank or dual-rank, 8 GB/16 GB/32 GB/64 GB RDIMM</li> <li>- TruDDR4 2933, single-rank or dual-rank, 16 GB/32 GB/64 GB Performance+ RDIMM</li> <li>- TruDDR4 2666, quad-rank, 64 GB 3DS RDIMM</li> <li>- TruDDR4 2933, quad-rank, 128 GB 3DS RDIMM</li> <li>- TruDDR4 2933, quad-rank, 128 GB Performance+ 3DS RDIMM</li> <li>- 128 GB/256 GB/512 GB DCPMM</li> </ul> </li> </ul> <p>DCPMM installation rules:</p> <ul style="list-style-type: none"> <li>• DCPMMs are not supported if any GPU is installed.</li> <li>• DCPMMs only support the following server models: eight 3.5-inch-drive bays, eight 2.5-inch-drive bays, or sixteen 2.5-inch-drive bays. The 256 GB and 512 GB DCPMMs only support server model with eight 2.5-inch-drive bays.</li> <li>• If the processors with TDP equal to 200 watts or 205 watts are installed, DCPMMs are supported only when the following requirements are met:               <ul style="list-style-type: none"> <li>- Two power supplies are installed.</li> <li>- For server models with sixteen 2.5-inch and eight 3.5-inch drive bays, the operating temperature is equal to or less than 30°C.</li> <li>- No Mellanox ConnectX-6, Innova-2 FPGA, or PCIe NVMe add-in-card (AIC) installed.</li> </ul> </li> </ul> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>• Memory dummy is required when any of the following hardware configuration requirement is met:               <ul style="list-style-type: none"> <li>- Processors with TDP more than 125 watts installed</li> <li>- Any of following processors installed: 5122, 8156, 6128, 6126, 4112, 5215, 5217, 5222, 8256, 6226, 4215, 4114T, 5119T, 5120T, 4109T, 4116T, 6126T, 6130T, 6138T, 5218T, 6238T</li> <li>- GPU installed</li> <li>- Server model: twenty-four 2.5-inch-drive bays, twelve 3.5-inch-drive bays (except for Chinese Mainland)</li> </ul> </li> <li>• For the server model with the processors with TDP less than 125 watts installed and without memory dummy installed, the memory performance might be degraded if one fan fails.</li> <li>• Operating speed and total memory capacity depend on the processor model and UEFI settings.</li> <li>• For a list of supported memory modules, see: <a href="https://static.lenovo.com/us/en/serverproven/index.shtml">https://static.lenovo.com/us/en/serverproven/index.shtml</a></li> </ul>
Operating systems	<p>Supported and certified operating systems:</p> <ul style="list-style-type: none"> <li>• Microsoft Windows Server</li> <li>• VMware ESXi</li> <li>• Red Hat Enterprise Linux</li> <li>• SUSE Linux Enterprise Server</li> </ul>

Table 1. Server specifications (continued)

Specification	Description
	<p>References:</p> <ul style="list-style-type: none"> <li>• Complete list of available operating systems: <a href="https://lenovopress.com/osig">https://lenovopress.com/osig</a>.</li> <li>• OS deployment instructions: See “Deploy the operating system” in <i>Setup Guide</i>..</li> </ul>
Internal drives	<p>The supported drives vary by models.</p> <ul style="list-style-type: none"> <li>• Up to eight 3.5-inch hot-swap SAS/SATA drives</li> <li>• Up to twelve 3.5-inch hot-swap SAS/SATA drives</li> <li>• Up to twelve 3.5-inch hot-swap SAS/SATA/NVMe drives (NVMe drives are supported only in drive bays 8–11)</li> <li>• Up to eight 2.5-inch hot-swap SAS/SATA drives</li> <li>• Up to eight 2.5-inch hot-swap SAS/SATA/NVMe drives (NVMe drives are supported only in drive bays 4–7)</li> <li>• Up to sixteen 2.5-inch hot-swap SAS/SATA drives</li> <li>• Up to sixteen 2.5-inch hot-swap SAS/SATA/NVMe drives (NVMe drives are supported in drive bays 4–7 and bays 12–15)</li> <li>• Up to sixteen 2.5-inch NVMe drives (NVMe drives are supported in drive bays 0–15)</li> <li>• Up to sixteen 2.5-inch NVMe drives with eight SAS/SATA drives (NVMe drives are supported in drive bays 0–15)</li> <li>• Up to twenty 2.5-inch NVMe drives (NVMe drives are supported in drive bays 0–19)</li> <li>• Up to twenty-four 2.5-inch hot-swap SAS/SATA drives</li> <li>• Up to twenty-four 2.5-inch hot-swap SAS/SATA/NVMe drives (NVMe drives are supported in drive bays 4–7, bays 12–15, and bays 20–23)</li> <li>• Up to twenty-four 2.5-inch NVMe drives (NVMe drives are supported in drive bays 0–23)</li> <li>• Up to two 3.5-inch hot-swap SAS/SATA drives in the rear</li> <li>• Up to two M.2 drives</li> </ul> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>• NVMe drives means Non-Volatile Memory express drives.</li> <li>• If the operating temperature is equal to or less than 30°C, the server models installed with Xeon 6137, 6154, 6242R, 6246R, 6248R, 6250, 6256, 6258R, 8168, 8180, and 8180M processor support no more than eight NVMe drives.</li> <li>• For server models with sixteen/twenty/twenty-four NVMe drives: <ul style="list-style-type: none"> <li>– The maximum power for installed PCIe card is 25 watts.</li> <li>– The SSD add-in-card (AID) is not supported.</li> <li>– The minimum power supplies should be 1100 watts.</li> </ul> </li> <li>• For server models with sixteen/twenty/twenty-four NVMe drives, the maximum memory module is 128 GB, and DCPMM is not supported.</li> </ul>
Expansion slots	<ul style="list-style-type: none"> <li>• One PCIe slot on the system board</li> <li>• One RAID adapter slot on the system board</li> <li>• Two riser card slots on the system board</li> <li>• Two or three PCIe slots on the riser card</li> </ul> <p>For detailed information, see “Rear view” on page 28.</p>

Table 1. Server specifications (continued)

Specification	Description
Input/Output (I/O) features	<ul style="list-style-type: none"> <li>• Front panel:               <ul style="list-style-type: none"> <li>– One VGA connector (available on some models)</li> <li>– One XClarity Controller USB connector</li> <li>– One USB 3.0 connector</li> </ul> </li> <li>• Rear panel:               <ul style="list-style-type: none"> <li>– One VGA connector</li> <li>– One XClarity Controller network connector</li> <li>– One serial port (available on some models)</li> <li>– Two USB 3.0 connectors</li> <li>– Two or four Ethernet connectors on the LOM adapter (available on some models)</li> </ul> </li> </ul>
Graphics processing unit (GPU)	<p>Your server supports the following GPUs or processing adapters:</p> <ul style="list-style-type: none"> <li>• Full-height, full-length, double-slot GPUs or processing adapters: AMD MI25, AMD V340, NVIDIA® M10, NVIDIA M60, NVIDIA P40, NVIDIA P100, NVIDIA P6000, NVIDIA RTX5000, NVIDIA RTX A6000, NVIDIA V100, NVIDIA V100S, NVIDIA A100, A16, and A30.</li> <li>• Full-height, full-length, single-slot GPU: NVIDIA P4000, NVIDIA RTX4000, and Cambricon MLU100-C3</li> <li>• Full-height, half-length, single-slot GPU: NVIDIA V100, NVIDIA A10</li> <li>• Half-height, half-length, single-slot GPU: NVIDIA A2</li> <li>• Low-profile, half-length, single-slot GPUs: NVIDIA P4, NVIDIA P600, and NVIDIA P620, NVIDIA T4, and Cambricon MLU270-S4</li> </ul> <p><b>Note:</b> The NVIDIA V100 GPU has two types of form factor: full-height full-length (FHFL) and full-height half-length (FHHL). Hereinafter the full-height full-length V100 GPU is called as the FHFL V100 GPU; the full-height half-length V100 GPU is called as the FHHL V100 GPU.</p> <p><b>GPU installation rules:</b></p> <ul style="list-style-type: none"> <li>• For Intel Xeon SP Gen 2 with the supported system board, you can install up to five NVIDIA A2, NVIDIA P4 or NVIDIA T4 GPUs in PCIe slots 1, 5, 6, 2 and 3.</li> <li>• For Cambricon MLU100-C3 processing adapters, you can only install two adapters in slots 5 and 6, or install four adapters in slots 1, 2, 5 and 6.</li> <li>• Before installing a GPU, ensure that the air baffle in your server is appropriate for the GPU. For more information about the air baffle, refer to <a href="#">“Important information about the air baffle and GPU” on page 14.</a></li> <li>• To install a full-height GPU, or the NVIDIA P4 GPU, you need to use the GPU thermal kit. For more information, see <a href="#">“GPU thermal kit installation procedure” on page 239.</a></li> <li>• For NVIDIA P600, NVIDIA P620, NVIDIA P4000, NVIDIA RTX4000, and FHHL V100 GPUs, you can install up to three GPUs in PCIe slots 1, 5, and 6. For the other supported GPUs, you can install up to two GPUs in PCIe slots 1 and 5.</li> <li>• NVIDIA A100 is only supported in the server models with the UEFI firmware (V2.80 or higher) and XCC firmware (V5.40 or higher). If NVIDIA A100 is installed, the operating temperature must be equal to or less than 35°C. If NVIDIA A100 is installed in the riser 2 assembly, use the ThinkSystem SR650 2FH Riser BKT NVFF5 bracket to fit with NVIDIA A100.</li> <li>• Up two NVIDIA A30 GPUs are supported and the operating temperature must be equal to or less than 35°C. If NVIDIA A30 is installed in the riser 2 assembly, use the ThinkSystem SR650 2FH Riser BKT NVFF5 bracket to fit with NVIDIA A30. If one fan fails, the GPU performance might be degraded.</li> <li>• If NVIDIA A16 is installed, the operating temperature must be equal to or less than 35°C.</li> </ul>

Table 1. Server specifications (continued)

Specification	Description
	<ul style="list-style-type: none"> <li>• If NVIDIA RTX A6000 is installed in the riser 2 assembly, use the ThinkSystem SR650 2FH Riser BKT NVFF5 bracket to fit with NVIDIA RTX A6000.</li> </ul> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>• If NVIDIA P4 is installed in PCIe slot 1, PCIe slot 5, or both slots, keep PCIe slot 2, PCIe slot 6, or both slots unoccupied.</li> <li>• For server models installed with three NVIDIA P4 can be installed in PCIe slot 1, PCIe slot 5, and PCIe slot 6 at the same time, the operating temperature must be equal to or less than 35°C.</li> <li>• If up to five NVIDIA P4 GPUs are installed, the server models support no more than eight 2.5-inch hot-swap SAS/SATA/NVMe drives and the operating temperature must be equal to or less than 35°C.</li> <li>• For server models installed with FHHL V100 GPU, NVIDIA T4 or Cambricon MLU270-S4 GPU, the operating temperature must be equal to or less than 30°C.</li> <li>• If one NVIDIA T4 or Cambricon MLU270-S4 GPU is installed, install in slot 1.</li> <li>• For server models installed with one CPU, if two NVIDIA T4 or Cambricon MLU270-S4 GPUs are installed, install in slot 1 and slot 2. For server models installed with two CPUs, if two NVIDIA T4 or Cambricon MLU270-S4 GPUs are installed, install in slot 1 and slot 5.</li> <li>• For server models installed with one CPU, if three NVIDIA T4 or Cambricon MLU270-S4 GPUs are installed, install in slot 1, slot 2 and slot 3. For server models installed with two CPUs, if three NVIDIA T4 or Cambricon MLU270-S4 GPUs are installed, install in slot 1, slot 5 and slot 6.</li> <li>• Four NVIDIA T4 or Cambricon MLU270-S4 GPUs are supported only for server models installed with two CPUs, and installed in slot 1, slot 2, slot 5, and slot 6.</li> <li>• Five NVIDIA T4 or Cambricon MLU270-S4 GPUs are supported only for server models installed with two CPUs, and installed in slot 1, slot 2, slot 3, slot 5, and slot 6.</li> <li>• NVIDIA T4 GPU cannot be mixed with NVIDIA A2 GPU.</li> <li>• If NVIDIA P600, NVIDIA P620, NVIDIA P4000, NVIDIA RTX4000, NVIDIA P6000, NVIDIA RTX A6000, or NVIDIA RTX5000 GPU is installed, the fan redundancy function is not supported. If one fan fails, power off the system immediately to prevent GPU overheat and replace the fan with a new one.</li> <li>• Cambricon MLU100-C3 processing adapter supports CentOS 7.6 when used in combination with Intel Xeon SP Gen 2, and supports CentOS 7.5 when used in combination with Intel Xeon SP Gen 1.</li> </ul> <p><b>GPU installation requirements:</b></p> <p>GPU is supported only when the following hardware configuration requirements are met at the same time:</p> <ul style="list-style-type: none"> <li>• Server model: eight 3.5-inch-drive bays, eight 2.5-inch-drive bays, or sixteen 2.5-inch-drive bays</li> <li>• Processor: High Tcase type; TDP less than or equal to 150 watts</li> </ul> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>– For server models with eight 2.5-inch-drive bays, if the server is installed with GPUs (except for GPU model NVIDIA P4, NVIDIA T4, NVIDIA V100 FHHL, NVIDIA P600, NVIDIA P620, NVIDIA P4000, NVIDIA RTX4000, NVIDIA P6000, NVIDIA RTX A6000, and NVIDIA RTX5000) and the operating temperature is equal to or less than 30°C, the TDP should be less than or equal to 165 watts.</li> </ul>



Table 1. Server specifications (continued)

Specification	Description
	<ul style="list-style-type: none"> <li>– For server models with eight 3.5-inch-drive bays or sixteen 2.5-inch-drive bays, if server is installed with NVIDIA T4 or Cambricon MLU270-S4 GPU, the TDP should be less than or equal to 150 watts.</li> <li>– For server models with eight 2.5-inch-drive bays, if the server is installed with up to four NVIDIA T4 or Cambricon MLU270-S4 GPUs, the TDP can be more than 150 watts, if the server is installed with five NVIDIA T4 or Cambricon MLU270-S4 GPUs, the TDP should be less than or equal to 150 watts.</li> <li>• Drive: no more than four NVMe drives installed, and no PCIe NVMe add-in-card (AIC) installed.</li> <li>• Power supply: for one GPU, 1100-watt or 1600-watt power supplies installed; for two or three GPUs, 1600-watt power supplies installed</li> </ul>
RAID adapters (depending on the model)	<ul style="list-style-type: none"> <li>• Onboard SATA ports with software RAID support (Intel VROC SATA RAID, formerly known as Intel RSTe)</li> </ul> <p><b>Note:</b> VROC is not supported with the VMware ESXi yet.</p> <ul style="list-style-type: none"> <li>• Onboard NVMe ports with software RAID support (Intel VROC NVMe RAID) <ul style="list-style-type: none"> <li>– VROC Intel-SSD-Only (also known as Intel VROC standard): supports RAID levels 0, 1, 5, and 10 with Intel NVMe drives only</li> <li>– VROC Premium: supports RAID levels 0, 1, 5, and 10 with non-Intel NVMe drives</li> </ul> </li> </ul> <p><b>Note:</b> VROC is not supported with the VMware ESXi yet.</p> <ul style="list-style-type: none"> <li>• An HBA 430-8e or 430-16e SAS/SATA adapter that support JBOD mode but does not support RAID</li> <li>• An HBA 430-8i or 430-16i SAS/SATA adapter that support JBOD mode but does not support RAID</li> <li>• An HBA 440-8e SAS/SATA adapter that support JBOD mode but does not support RAID</li> <li>• An HBA 440-8i or 440-16i SAS/SATA adapter that support JBOD mode but does not support RAID</li> <li>• An HBA 4350-8i or 4350-16i SAS/SATA adapter that support JBOD mode but does not support RAID</li> <li>• A RAID 530-8i SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, 5, 10, and 50</li> <li>• A RAID 530-16i SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, and 10</li> <li>• A RAID 540-8i or 540-16i SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, and 10</li> <li>• A RAID 730-8i 1GB Cache SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, 5, 10, and 50</li> <li>• A RAID 730-8i 2GB Cache SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, 5, 6, 10, 50, and 60</li> <li>• A RAID 730-8i 4GB Flash SAS/SATA adapter with CacheCade (for some models only) that supports JBOD mode and RAID levels 0, 1, 5, 6, 10, 50, and 60</li> <li>• A RAID 930-8e SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, 5, 6, 10, 50, and 60</li> <li>• A RAID 930-8i, 930-16i, or 930-24i SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, 5, 6, 10, 50, and 60</li> <li>• A RAID 940-8e 4GB SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, 5, 6, 10, 50, and 60</li> <li>• A RAID 940-8i, 940-16i, 940-32i, or 940-8e 4GB SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, 5, 6, 10, 50, and 60</li> <li>• A RAID 5350-8i SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, 5, and 10</li> <li>• A RAID 9350-8i 2GB or 9350-16i 4GB SAS/SATA adapter that supports JBOD mode and RAID levels 0, 1, 5, 6, 10, 50 and 60</li> </ul>

Table 1. Server specifications (continued)

Specification	Description
	<p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>• A RAID super capacitor module must be installed if the RAID 540–16i, 930-8e, 930-8i, 930-16i, 930-24i, 940-8e 4GB, 940-8i, 940-16i, or 940-32i SAS/SATA adapter is installed.</li> <li>• If 730-8i-2G Cache SAS/SATA adapter is installed, 730-8i-1G or 930-8i SAS/SATA adapter cannot be installed.</li> <li>• HBA 440-8i/440-16i SAS/SATA adapter and RAID 940-8i/940-16i/940-32i SAS/SATA adapter cannot be installed in the inner raid adapter slot.</li> <li>• RAID 540-8i/540-16i SAS/SATA adapter cannot be installed in the inner raid adapter slot 7.</li> <li>• HBA/RAID 4350-8i, 4350-16i, 5350-8i, 9350-8i or 9350-16i SAS/SATA adapter can only be installed in the PCIe slots 1 , 2 , 3 , 4, 5, and 6 in the server models with 2.5-inch drives , and can only be installed in the PCIe slots 4, 5, and 6 in the server models with 3.5-inch drives.</li> <li>• HBA/RAID 430-8i, 430-16i, 530-8i, 530-16i, 730-8i, 930-8e, 930-8i, or 930-16i SAS/SATA adapter can only be installed in the PCIe slots 1, 2, 3, 4, 5, 6, and 7 in the server models with 2.5-inch drives, and can only be installed in the PCIe slots 4, 5, 6 and 7 in the server models with 3.5-inch drives.</li> <li>• RAID 930-24i SAS/SATA adapter can only be installed in the PCIe slots 1, 2, 3, 5, and 6 in the server models with 2.5-inch drives.</li> <li>• HBA/RAID 940-8e 12GB SAS/SATA adapter can only be installed in the PCIe slots 1, 2, 3, 4, and 5.</li> </ul>
System fans	<ul style="list-style-type: none"> <li>• One processor: five hot-swap fans (including one redundant fan)</li> <li>• Two processors: six hot-swap fans (including one redundant fan)</li> </ul> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>• For server models installed with Intel Xeon 6137, 6144, 6146, 6154, 6242R, 6246R, 6248R, 6250, 6256, 6258R, 8168, 8180, and 8180M, if one fan fails, the server performance might be degraded.</li> <li>• If your server comes with only one processor, five system fans (fan 1 to fan 5) are adequate to provide proper cooling. However, you must keep the location for fan 6 occupied by a fan filler to ensure proper airflow.</li> <li>• For server models with sixteen/twenty/twenty-four NVMe drives, the maximum operating temperature is 30°C. The server performance might be degraded at 27° C or above 27°C if one fan fails.</li> </ul>
Power supplies (depending on the model)	<p>One or two hot-swap power supplies for redundancy support</p> <ul style="list-style-type: none"> <li>• 550-watt ac 80 PLUS Platinum</li> <li>• 750-watt ac 80 PLUS Platinum</li> <li>• 750-watt ac 80 PLUS Titanium</li> <li>• 1100-watt ac 80 PLUS Platinum</li> <li>• 1600-watt ac 80 PLUS Platinum</li> </ul>

Table 1. Server specifications (continued)

Specification	Description
Electrical input	<ul style="list-style-type: none"> <li>• Sine-wave input (50 Hz to 60 Hz) required</li> <li>• Input voltage low range:               <ul style="list-style-type: none"> <li>– Minimum: 100 V ac</li> <li>– Maximum: 127 V ac</li> </ul> </li> <li>• Input voltage high range:               <ul style="list-style-type: none"> <li>– Minimum: 200 V ac</li> <li>– Maximum: 240 V ac</li> </ul> </li> </ul> <p><b>Note:</b> For server models with 750-watt ac 80 PLUS Titanium or 1600-watt ac 80 PLUS Platinum power supplies, 100–127 V ac input voltage is not supported.</p> <p><b>CAUTION:</b></p> <ul style="list-style-type: none"> <li>• <b>240 V dc input (input range: 180-300 V dc) is supported in Chinese Mainland ONLY. Power supply with 240 V dc input cannot support hot plugging power cord function. Before removing the power supply with dc input, please turn off server or disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the power cord.</b></li> <li>• <b>In order for the ThinkSystem products to operate error free in both a DC or AC electrical environment, a TN-S earthing system which complies to 60364-1 IEC 2005 standard has to be present or installed.</b></li> </ul>
Minimal configuration for debugging	<ul style="list-style-type: none"> <li>• One processor in processor socket 1</li> <li>• One memory DIMM on slot 5</li> <li>• One power supply</li> <li>• one HDD or M.2 (If OS is needed for debugging)</li> <li>• Five system fans (fan 1 to fan 5)</li> </ul>

Table 1. Server specifications (continued)

Specification	Description
Acoustical noise emissions	<ul style="list-style-type: none"> <li>• Sound power levels, idle               <ul style="list-style-type: none"> <li>– 4.9 bels, minimum</li> <li>– 5.1 bels, typical</li> <li>– 6.1 bels, maximum</li> </ul> </li> <li>• Sound power levels, operating               <ul style="list-style-type: none"> <li>– 5.1 bels, minimum</li> <li>– 5.1 bels, typical</li> <li>– 6.2 bels, maximum</li> </ul> </li> </ul> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>• These sound power levels are measured in controlled acoustical environments according to procedures specified by ISO 7779 and are reported in accordance with ISO 9296.</li> <li>• The declared acoustic noise levels are based on specified configurations and they may change depending on configurations/conditions.</li> <li>• The declared acoustic noise levels may increase greatly, if high-power components are installed, for example, some high-power NICs, CPUs, and GPUs.</li> </ul>
Environment	<p>The server is supported in the following environment:</p> <p><b>Note:</b> This server is designed for standard data center environment and recommended to be placed in industrial data center.</p> <ul style="list-style-type: none"> <li>• Air temperature:           <ul style="list-style-type: none"> <li>– Operating:               <ul style="list-style-type: none"> <li>– ASHRAE class A2: 10–35°C (50–95°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 300 m (984 ft) of altitude increase.</li> <li>– ASHRAE class A3: 5–40°C (41–104°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 175 m (574 ft) of altitude increase.</li> <li>– ASHRAE class A4: 5–45°C (41–113°F); when the altitude exceeds 900 m (2953 ft), the maximum ambient temperature value decreases by 1°C (1.8°F) with every 125 m (410 ft) of altitude increase.</li> </ul> </li> <li>– Server off: 5–45°C (41–113°F)</li> <li>– Shipping or storage: -40–60°C (-40–140°F)</li> </ul> </li> <li>• Maximum altitude: 3050 m (10 000 ft)</li> <li>• Relative humidity (non-condensing):           <ul style="list-style-type: none"> <li>– Operating:               <ul style="list-style-type: none"> <li>– ASHRAE class A2: 8%–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> </li> <li>– Shipping or storage: 8%–90%</li> </ul> </li> <li>• Particulate contamination</li> </ul> <p><b>Attention:</b> Airborne particulates and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server. For information about the limits for particulates and gases, see <a href="#">“Particulate contamination” on page 15</a>.</p> <p><b>Note:</b> Your server complies with ASHRAE class A2 specifications. The server performance might be impacted when the operating temperature is outside the ASHRAE A2 specifications. Depending on the hardware configuration, some server models comply with ASHRAE class A3 and class A4 specifications. To comply with</p>

Table 1. Server specifications (continued)

Specification	Description
	<p>ASHRAE class A3 and class A4 specifications, the server models must meet the following hardware configuration requirements at the same time:</p> <ul style="list-style-type: none"> <li>• Two power supplies installed</li> <li>• NVMe drives not installed</li> <li>• PCIe flash adapter not installed</li> <li>• ThinkSystem QLogic QL41134 PCIe 10Gb 4-Port Base-T Ethernet Card not installed</li> <li>• Mellanox ConnectX-6 and Innova-2 FPGA not installed.</li> <li>• 240 GB or 480 GB M.2 drives not installed</li> <li>• GPU not installed</li> <li>• Certain processors not installed: <ul style="list-style-type: none"> <li>– Processors with TDP more than or equal to 150 watts not installed</li> <li>– For server models with twenty-four 2.5-inch drives or twelve 3.5-inch drives, the following frequency optimized processors not installed: Intel Xeon 4112, 4215, 5122, 5215, 5217, 5222, 6126, 6128, 6132, 6134, 6134M, 6137, 6226, 6242R, 6246R, 6248R, 6250, 6256, 6258R, 8156, and 8256 processors</li> </ul> </li> </ul>

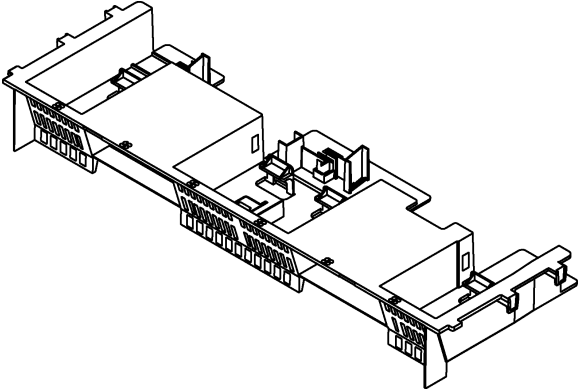
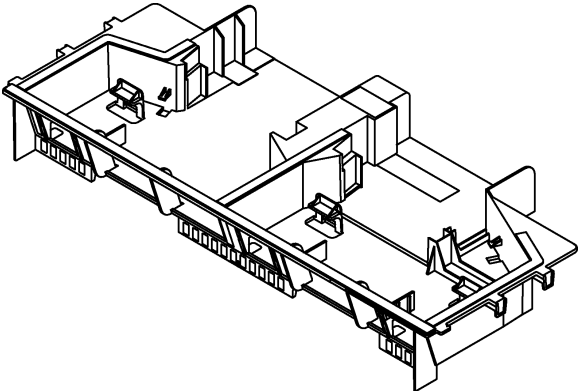
**Important information about EU ecodesign requirements**

To meet the EU ecodesign requirements for energy-related products (ErP) Lot 9, your server must meet the following requirements:

- Minimum memory: 16 GB
- If your server is configured with one processor, these processors are not supported: Intel Xeon 3104, 3106, 3204, 4108, 4109T, 4110, 4112, 5122, 5222, 8156, and 8256.

## Important information about the air baffle and GPU

There are two types of air baffle for your server. Depending on the GPU model, select the appropriate air baffle for your server.

Air baffle type	Supported GPU model
<p>Standard air baffle</p>  <p>The diagram shows a standard air baffle, which is a long, narrow metal component with several vertical fins and mounting brackets along its length. It is designed to fit into a server chassis to provide airflow for GPUs.</p>	<ul style="list-style-type: none"> <li>• NVIDIA A2</li> <li>• NVIDIA P600</li> <li>• NVIDIA P620</li> <li>• NVIDIA T4</li> <li>• Cambricon MLU270-S4</li> </ul>
<p>Large-size air baffle</p>  <p>The diagram shows a large-size air baffle, which is a wider and more complex metal component with multiple vertical fins and mounting brackets. It is designed to accommodate larger GPUs and provide enhanced airflow.</p>	<ul style="list-style-type: none"> <li>• AMD MI25</li> <li>• AMD V340</li> <li>• Cambricon MLU100-C3 processing adapter</li> <li>• NVIDIA A10</li> <li>• NVIDIA A16</li> <li>• NVIDIA A30</li> <li>• NVIDIA A100</li> <li>• NVIDIA M10</li> <li>• NVIDIA M60</li> <li>• NVIDIA P40</li> <li>• NVIDIA P100</li> <li>• NVIDIA P4000</li> <li>• NVIDIA P6000</li> <li>• NVIDIA RTX4000</li> <li>• NVIDIA RTX A6000</li> <li>• NVIDIA RTX5000</li> <li>• NVIDIA V100</li> <li>• NVIDIA V100S</li> <li>• NVIDIA P4</li> </ul> <p><b>Note:</b> If you are installing the NVIDIA P4 or the FHHL V100 GPU, install an additional air baffle first. If you are installing one NVIDIA A10 or installing two NVIDIA A10 GPUs on two riser adapter, install an additional air baffle first. If you are installing two NVIDIA A10 GPUs on one riser adapter, install the FHFL GPU holder first. For more information, see <a href="#">“Install a GPU” on page 239</a>.</p>

### Notes:

- For server models without GPU installed, select the standard air baffle.
- Before installing the large-size air baffle, ensure that the height of the installed heat sinks is 1U to leave adequate space for installing the large-size air baffle.

## 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}</math> weight gain).<sup>2</sup></li> <li>The silver reactivity level shall be less than 200 Angstroms per month (<math>\text{\AA}/\text{month} \approx 0.0035 \mu\text{g}/\text{cm}^2\text{-hour}</math> weight gain).<sup>3</sup></li> <li>The reactive monitoring of gaseous corrosivity must be conducted approximately 5 cm (2 in.) in front of the rack on the air inlet side at one-quarter and three-quarter frame height off the floor or where the air velocity is much higher.</li> </ul>
Airborne particulates	<p>Data centers must meet the cleanliness level of ISO 14644-1 class 8.</p> <p>For data centers without airside economizer, the ISO 14644-1 class 8 cleanliness might be met by choosing one of the following filtration methods:</p> <ul style="list-style-type: none"> <li>The room air might be continuously filtered with MERV 8 filters.</li> <li>Air entering a data center might be filtered with MERV 11 or preferably MERV 13 filters.</li> </ul> <p>For data centers with airside economizers, the choice of filters to achieve ISO class 8 cleanliness depends on the specific conditions present at that data center.</p> <ul style="list-style-type: none"> <li>The deliquescent relative humidity of the particulate contamination should be more than 60% RH.<sup>4</sup></li> <li>Data centers must be free of zinc whiskers.<sup>5</sup></li> </ul>

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

<sup>2</sup> The derivation of the equivalence between the rate of copper corrosion growth in the thickness of the corrosion product in  $\text{\AA}/\text{month}$  and the rate of weight gain assumes that  $\text{Cu}_2\text{S}$  and  $\text{Cu}_2\text{O}$  grow in equal proportions.

<sup>3</sup> The derivation of the equivalence between the rate of silver corrosion growth in the thickness of the corrosion product in  $\text{\AA}/\text{month}$  and the rate of weight gain assumes that  $\text{Ag}_2\text{S}$  is the only corrosion product.

<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.

<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.

## 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:

<http://datacentersupport.lenovo.com/products/servers/thinksystem/sr650/7X05/downloads>



## 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 Operating System executing on the server's operating system.
- **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.

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	√		
<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	√		√

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 Bootable Media Creator<sup>3</sup> (BOMC)</b>	In-band On-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	√		√
<b>Lenovo XClarity Integrator (LXCI) for Microsoft System Center Configuration Manager</b>	In-band On-Target	√	All I/O devices	√		√
<b>Notes:</b>						
1. For I/O firmware updates.						
2. For BMC and UEFI firmware updates.						

- **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 press F1. 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.

Additional information about using Lenovo XClarity Provisioning Manager to update firmware is available at:

[http://sysmgt.lenovofiles.com/help/topic/LXPM/platform\\_update.html](http://sysmgt.lenovofiles.com/help/topic/LXPM/platform_update.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.

Additional information about configuring Ethernet over USB is available at:

[http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/NN1ia\\_c\\_configuringUSB.html](http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/NN1ia_c_configuringUSB.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.

Specific details about updating firmware using Lenovo XClarity Controller are available at:

[http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/NN1ia\\_c\\_manageserverfirmware.html](http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/NN1ia_c_manageserverfirmware.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).

Specific details about updating firmware using Lenovo XClarity Essentials OneCLI is available at:

[http://sysmgt.lenovofiles.com/help/topic/toolsctr\\_cli\\_lenovo/onecli\\_c\\_update.html](http://sysmgt.lenovofiles.com/help/topic/toolsctr_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 applying firmware updates, running preboot diagnostics, and deploying Microsoft Windows operating systems.

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.

Specific details about updating firmware using Lenovo XClarity Administrator are available at:

[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.

Specific details about updating firmware using Lenovo XClarity Integrator offerings are available at:

[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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## Tech Tips

Lenovo continually updates the support Web site with the latest tips and techniques that you can use to solve issues that you might have with your server. These Tech Tips (also called retain tips or service bulletins) provide procedures to work around issues 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 **Knowledge Base & Guides** from the navigation pane.
3. Click **Documentation Type** → **Solution** from the drop-down menu.

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

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## Security advisories

Lenovo is committed to developing products and services that adhere to the highest security standards in order to protect our customers and their data. When potential vulnerabilities are reported, it is the responsibility of the Lenovo Product Security Incident Response Team (PSIRT) to investigate and provide information to our customers so they may put mitigation plans in place as we work toward providing solutions.

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

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

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## Turn on the server

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

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

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

For information about powering off the server, see “[Turn off the server](#)” on page 20.

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## Turn off the server

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

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

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

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

When in a standby state, the server can respond to remote power-on requests sent to the Lenovo XClarity Controller. For information about powering on the server, see [“Turn on the server” on page 20](#).



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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

The front view of the server varies by model.

The illustrations in this topic show the server front views based on the supported drive bays.

#### Notes:

- Your server might look different from the illustrations in this topic.
- The chassis for sixteen 2.5-inch-drive bays cannot be upgraded to the chassis for twenty-four 2.5-inch-drive bays.

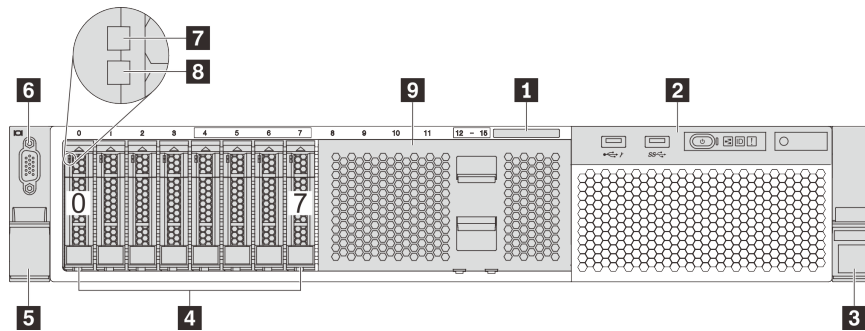


Figure 4. Front view of server models with eight 2.5-inch drive bays (0–7)

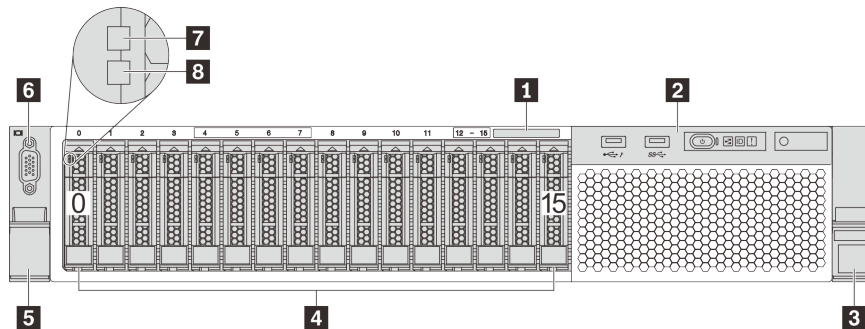


Figure 5. Front view of server models with sixteen 2.5-inch drive bays (0–15)

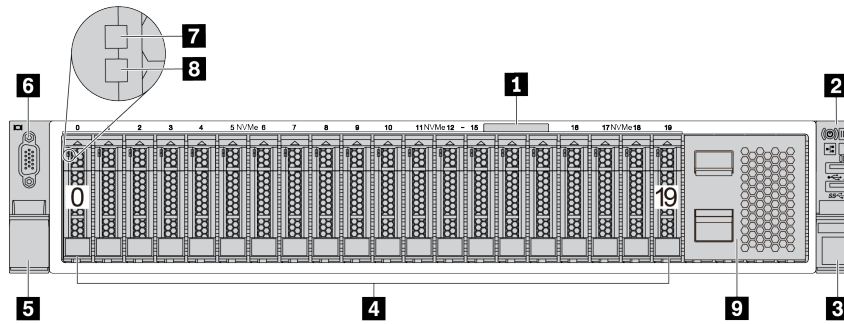


Figure 6. Front view of server models with twenty 2.5-inch drive bays (0–19)

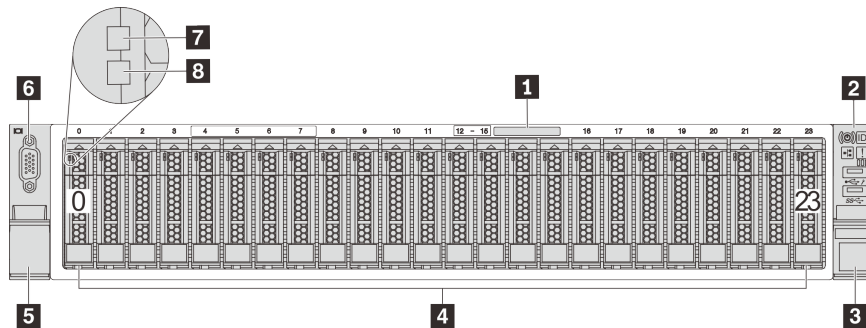


Figure 7. Front view of server models with twenty-four 2.5-inch drive bays (0–23)

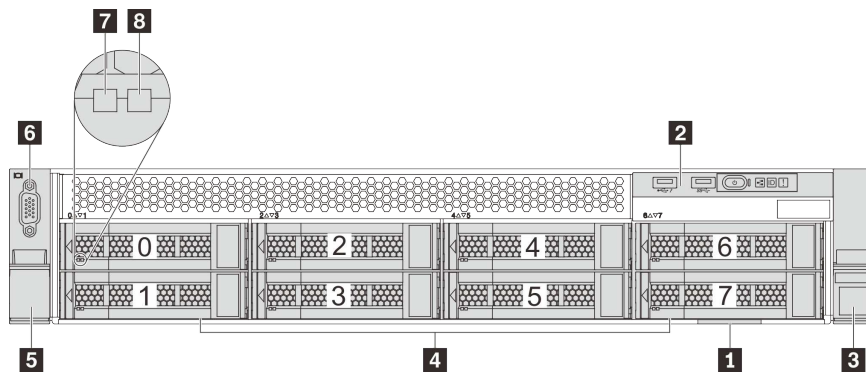


Figure 8. Front view of server models with eight 3.5-inch drive bays (0–7)

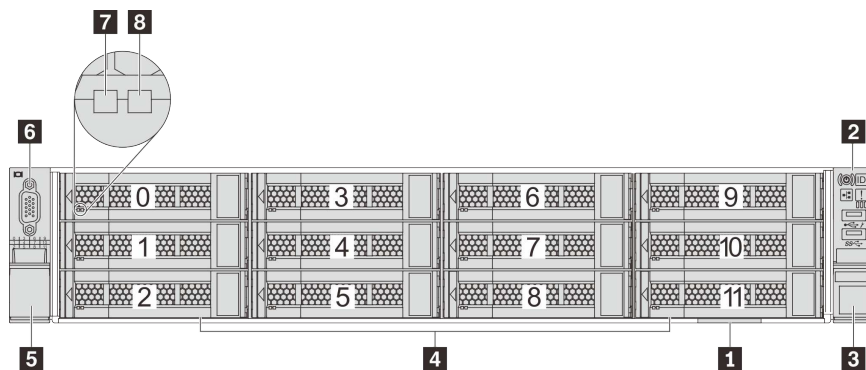


Figure 9. Front view of server models with twelve 3.5-inch drive bays (0–11)



Table 3. Components on the front of server models with 2.5-inch drives

Callout	Callout
<b>1</b> Pull-out information tab	<b>2</b> Front I/O assembly
<b>3</b> Rack latch (right)	<b>4</b> Drive bays
<b>5</b> Rack latch (left)	<b>6</b> VGA connector (available on some models)
<b>7</b> Drive activity LED	<b>8</b> Drive status LED
<b>9</b> Drive bay filler	

### **1 Pull-out information tab**

The XClarity Controller network access label is attached on the top side of the pull-out information tab.

### **2 Front I/O assembly**

For information about the controls, connectors, and status LEDs on the front I/O assembly, see [“Front I/O assembly” on page 26](#).

### **3 5 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.

### **4 Drive bays**

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. The vacant drive bays must be occupied by drive bay fillers or drive fillers.

### **6 VGA connector (available on some models)**

Used to attach a high-performance monitor, a direct-drive monitor, or other devices that use a VGA connector.

### **7 Drive activity LED**

### **8 Drive status LED**

Each hot-swap drive has two LEDs.

Drive LED	Status	Description
<b>7</b> Drive activity LED	Solid green	The drive is powered but not active.
	Blinking green	The drive is active.
<b>8</b> Drive status LED	Solid yellow	The drive has an error.
	Blinking yellow (blinking slowly, about one flash per second)	The drive is being rebuilt.

Drive LED	Status	Description
	Blinking yellow (blinking rapidly, about four flashes per second)	The RAID adapter is locating the drive.

## 9 Drive bay filler

The drive bay filler is used to cover vacant drive bays.

## Front I/O assembly

The front I/O assembly of the server provides controls, connectors, and LEDs. The front I/O assembly varies by model.

The following illustrations show the controls, connectors, and LEDs on the front I/O assembly of the server. To locate the front I/O assembly, see [“Front view” on page 23](#).

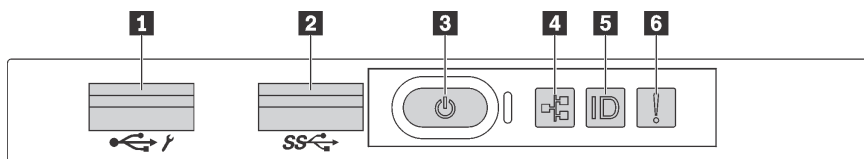


Figure 10. Front I/O assembly for server models with eight 3.5-inch-drive bays, eight 2.5-inch-drive bays, and sixteen 2.5-inch-drive bays

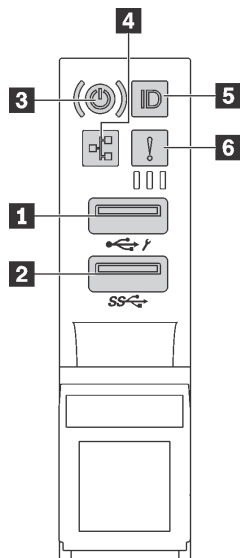


Figure 11. Front I/O assembly for server models with twelve 3.5-inch-drive bays and twenty-four 2.5-inch-drive bays

Table 4. Components on the front I/O assembly

Callout	Callout
<b>1</b> XClarity Controller USB connector	<b>2</b> USB 3.0 connector
<b>3</b> Power button with power status LED	<b>4</b> Network activity LED
<b>5</b> System ID button with system ID LED	<b>6</b> System error LED

### 1 XClarity Controller USB connector

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 3.0 connector

Used to attach a device that requires a USB 2.0 or 3.0 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 to 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

Compatibility of the NIC adapter and the network activity LED

NIC adapter	Network activity LED
LOM adapter	Support
ML2 NIC adapter	Support
PCIe NIC adapter	Not support

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.

## 5 System ID button with system ID LED

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

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

## 6 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	<p>An error has been detected on the server. Causes might include but not limited to the following errors:</p> <ul style="list-style-type: none"> <li>The temperature of the server reached the non-critical temperature threshold.</li> <li>The voltage of the server reached the non-critical voltage threshold.</li> <li>A fan has been detected to be running at low speed.</li> <li>A hot-swap fan has been removed.</li> <li>The power supply has a critical error.</li> <li>The power supply is not connected to the power.</li> </ul>	<p>Check the event log to determine the exact cause of the error.</p> <p>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 289</a>.</p>
Off	None	The server is off or the server is on and is working correctly.	None.

## Rear view

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

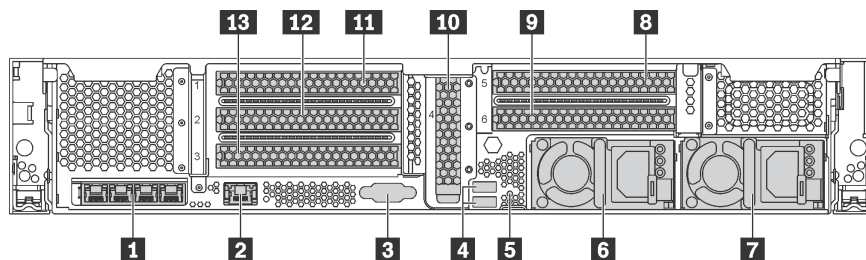


Figure 12. Rear view of server models with six PCIe slots

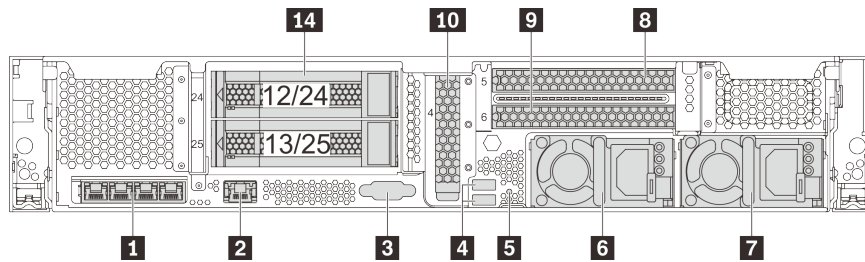


Figure 13. Rear view of server models with two rear 3.5-inch drive bays (12/13 or 24/25) and three PCIe slots

Table 5. Components on the rear of the server

Callout	Callout
<b>1</b> Ethernet connectors on the LOM adapter (available on some models)	<b>2</b> XClarity Controller network connector
<b>3</b> VGA connector	<b>4</b> USB 3.0 connectors (2)
<b>5</b> NMI button	<b>6</b> Power supply 1
<b>7</b> Power supply 2 (available on some models)	<b>8</b> PCIe slot 5 (on riser 2)
<b>9</b> PCIe slot 6 (on riser 2)	<b>10</b> PCIe slot 4 (with a serial port module installed on some models)
<b>11</b> PCIe slot 1 (on riser 1)	<b>12</b> PCIe slot 2 (on riser 1)
<b>13</b> PCIe slot 3 (on riser 1)	<b>14</b> Rear 3.5-inch drive bays (2)

#### **1 Ethernet connectors on the LOM adapter (available on some models)**

The LOM adapter provides two or four extra Ethernet connectors for network connections.

The leftmost Ethernet connector on the LOM adapter can be set as XClarity Controller network connector. To set the Ethernet connector as XClarity Controller network connector, start Setup utility, go to **BMC Settings** → **Network Settings** → **Network Interface Port** and select **Shared**. Then, go to **Shared NIC on** and select **PHY card**.

#### **2 XClarity Controller network connector**

Used to attach an Ethernet cable to manage the system using XClarity Controller.

#### **3 VGA connector**

Used to attach a high-performance monitor, a direct-drive monitor, or other devices that use a VGA connector.

#### **4 USB 3.0 connectors (2)**

Used to attach a device that requires a USB 2.0 or 3.0 connection, such as a keyboard, a mouse, or a USB storage device.

#### **5 NMI button**

Press this button to force a nonmaskable interrupt (NMI) to the processor. By this way, you can blue screen the server and take a memory dump. You might have to use a pen or the end of a straightened paper clip to press the button.

## **6 Power supply 1**

## **7 Power supply 2 (available on some models)**

The hot-swap redundant power supplies help 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 status LEDs, see [“Rear view LEDs” on page 31](#).

## **8 9 10 11 12 13 PCIe slots**

You can find the PCIe slot numbers on the rear of the chassis.

### **Notes:**

- Your server supports PCIe slot 5 and PCIe slot 6 when two processors are installed.
- Do not install PCIe adapters with small form factor (SFF) connectors in PCIe slot 6.
- Observe the following PCIe slot selection priority when installing an Ethernet card or a converged network adapter:

<b>Number of installed processors</b>	<b>PCIe slot selection priority</b>
One processor	4, 2, 3, 1
Two processors	4, 2, 6, 3, 5, 1

### **PCIe slots 1, 2, and 3 on riser 1:**

There are five different riser cards that can be installed in riser 1.

- Type 1
  - Slot 1: PCIe x16 (x8, x4, x1), full-height, half-length/full-height, full-length
  - Slot 2: PCIe x16 (x8, x4, x1), full-height, half-length/full-height, full-length
  - Slot 3: PCIe x16 (x8, x4, x1), full-height, half-length
- Type 2
  - Slot 1: PCIe x16 (x8, x4, x1), full-height, half-length/full-height, full-length
  - Slot 2: PCIe x16 (x8, x4, x1), full-height, half-length/full-height, full-length
  - Slot 3: ML2 x8 (x8, x4, x1), full-height, half-length
- Type 3
  - Slot 1: PCIe x16 (x16, x8, x4, x1), full-height, half-length/full-height, full-length
  - Slot 2: Not available
  - Slot 3: PCIe x16 (x8, x4, x1), full-height, half-length
- Type 4
  - Slot 1: PCIe x16 (x8, x4, x1), full-height, half-length/full-height, full-length
  - Slot 2: Not available
  - Slot 3: ML2 x16 (x16, x8, x4, x1), full-height, half-length
- Type 5
  - Slot 1: PCIe x16 (x16, x8, x4, x1), full-height, half-length/full-height, full-length

- Slot 2: PCIe x16 (x8, x4, x1), full-height, half-length/full-height, full-length
- Slot 3: PCIe x16 (x16, x8, x4, x1), full-height, half-length

**PCIe slot 4 on the system board:** PCIe x8 (x8, x1), low-profile

**PCIe slots 5 and 6 on riser 2:**

- Slot 5: PCIe x16 (x16, x8, x4, x1), full-height, half-length/full-height, full-length
- Slot 6: PCIe x16 (x16, x8, x4, x1), full-height, half-length/full-height, full-length

**14 Rear 3.5-inch drive bays (2)**

Used to install up to two 3.5-inch hot-swap drives on the rear of the server. The rear 3.5-inch drive bays are available on some models.

The number of the installed drives in your server varies by model. The EMI integrity and cooling of the server are protected by having all drive bays occupied. The vacant drive bays must be occupied by drive bay fillers or drive fillers.

**Rear view LEDs**

The illustration in this section shows the LEDs on the rear of the server.

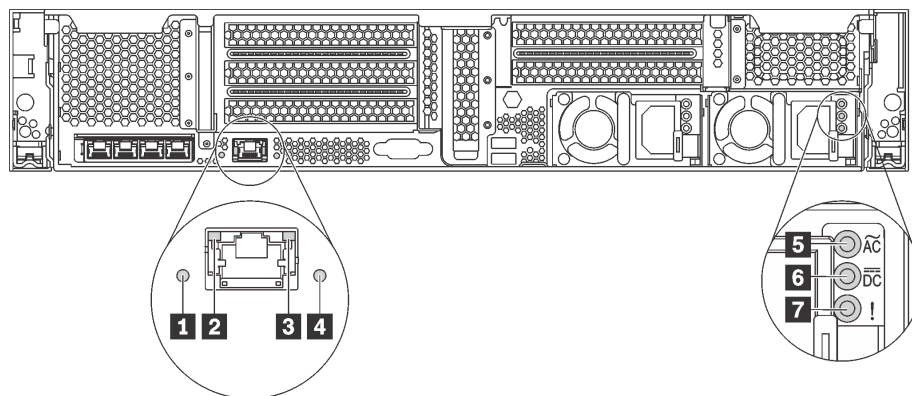


Figure 14. Rear view LEDs of the server

Table 6. 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 to visually locate the server. A system ID LED is also located on the front of the server. Each time you press the system ID button, the state of both the system ID LEDs changes. The LEDs can be changed to on, blinking, or off. You can also use the Lenovo XClarity Controller or a remote management program to change the state of the system ID LEDs to assist in visually locating the server among other servers.

## 2 3 Ethernet status LEDs

The XClarity Controller network connector has two status LEDs.

Ethernet status LED	Color	Status	Description
2 Ethernet link LED	Green	On	Network link is established.
	None	Off	Network link is disconnected.
3 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 [“Front I/O assembly” on page 26](#).

## 5 Power input LED

## 6 Power output LED

## 7 Power supply error LED

Each hot-swap power supply has three status LEDs.

LED	Description
5 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>
6 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, start the Setup utility, go to <b>System Settings</b> → <b>Power</b> → <b>Zero Output</b> and select <b>Disable</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>
7 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 components

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

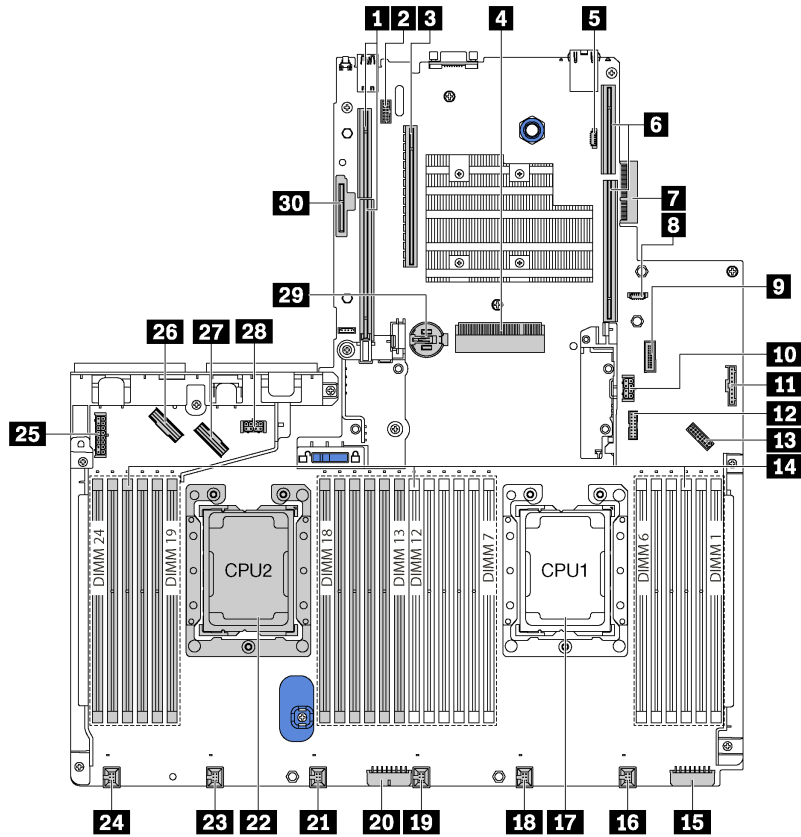


Figure 15. System board components

Table 7. Components on the system board

Callout	Callout
<b>1</b> Riser 2 slot	<b>2</b> Serial-port-module connector
<b>3</b> PCIe slot 4	<b>4</b> RAID adapter slot
<b>5</b> BIOS ROM programming connector	<b>6</b> Riser 1 slot
<b>7</b> LOM adapter connector	<b>8</b> XCC ROM programming connector
<b>9</b> Front USB connector	<b>10</b> GPU power connector 2
<b>11</b> Operator-information-panel connector	<b>12</b> TCM <sup>1</sup> /TPM <sup>2</sup> connector (for Chinese Mainland only)
<b>13</b> Front VGA connector	<b>14</b> memory module slots (24)
<b>15</b> Backplane power connector 3	<b>16</b> System fan 1 connector
<b>17</b> Processor 1 socket	<b>18</b> System fan 2 connector
<b>19</b> System fan 3 connector	<b>20</b> Backplane power connector 2
<b>21</b> System fan 4 connector	<b>22</b> Processor 2 socket

Table 7. Components on the system board (continued)

Callout	Callout
<b>23</b> System fan 5 connector	<b>24</b> System fan 6 connector
<b>25</b> Backplane power connector 1	<b>26</b> NVMe 2–3 connector
<b>27</b> NVMe 0–1 connector	<b>28</b> GPU power connector 1
<b>29</b> CMOS battery	<b>30</b> M.2 module slot (SATA / PCIe slot 8)

**Notes:**

- <sup>1</sup> Trusted Cryptography Module
- <sup>2</sup> Trusted Platform Module

## System board LEDs

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

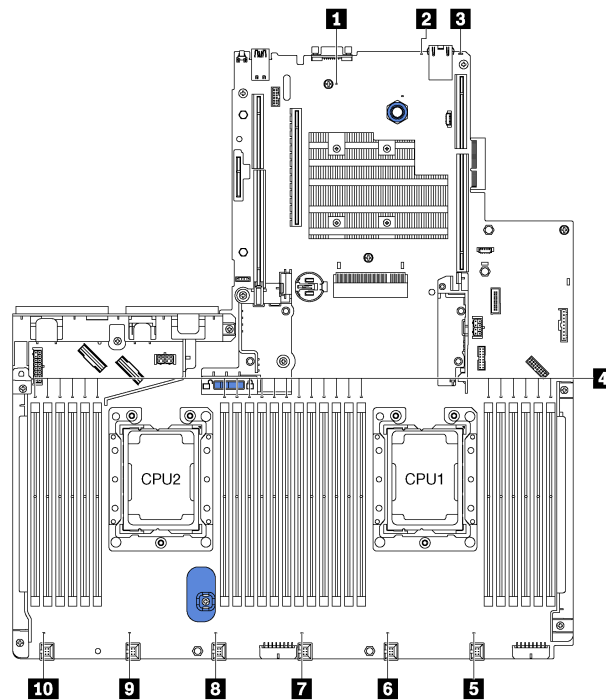


Figure 16. System board LEDs

Table 8. LEDs on the system board

Callout	Callout
<b>1</b> System power LED	<b>2</b> System ID LED
<b>3</b> System error LED	<b>4</b> memory module error LEDs (24)
<b>5</b> Fan 1 error LED	<b>6</b> Fan 2 error LED
<b>7</b> Fan 3 error LED	<b>8</b> Fan 4 error LED
<b>9</b> Fan 5 error LED	<b>10</b> Fan 6 error LED

## **1 System power LED**

When this LED is lit, it indicates that the server is powered on.

## **2 System ID LED**

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

## **3 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 [“Front I/O assembly” on page 26](#).

## **4 memory module error LEDs**

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

## **5 6 7 8 9 10 Fan error LEDs**

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

## System board jumpers

The following illustration shows the location of the jumpers on the system board of your server.

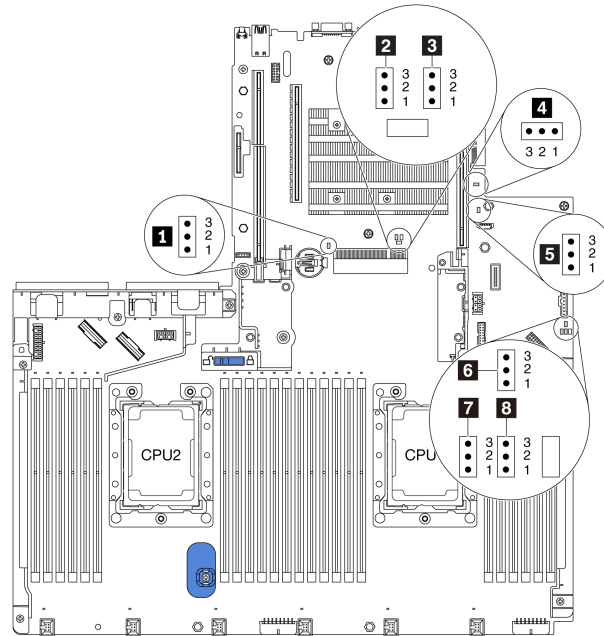


Figure 17. System board jumpers

Table 9. Jumper description

Jumper / Switch name	Jumper / Switch number	Jumper / Switch setting
<b>1</b> Clear CMOS jumper	J95	<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</b> Override power-on password jumper	J50	<ul style="list-style-type: none"> <li>Pins 1 and 2: The jumper is in default setting.</li> <li>Pins 2 and 3: Override the power-on password.</li> </ul>
<b>3</b> Boot backup XClarity Controller	J47	<ul style="list-style-type: none"> <li>Pins 1 and 2: The jumper is in default setting.</li> <li>Pins 2 and 3: The tower server will boot by using a backup of the XClarity Controller firmware.</li> </ul>
<b>4</b> TPM/TCM physical presence jumper	J46	<ul style="list-style-type: none"> <li>Pins 1 and 2: The jumper is in default setting.</li> <li>Pins 2 and 3: TPM/TCM physical presence is asserted.</li> </ul>
<b>5</b> ME firmware security override	J30	<ul style="list-style-type: none"> <li>Pins 1 and 2: The jumper is in default setting.</li> <li>Pins 2 and 3: Enable Flash security override.</li> </ul> <p><b>Note:</b> For debug only.</p>
<b>6</b> Force XCC update jumper	J45	<ul style="list-style-type: none"> <li>Pins 1 and 2: The jumper is in default setting.</li> <li>Pins 2 and 3: Force the Lenovo XClarity Controller to update to the latest version.</li> </ul>

Table 9. Jumper description (continued)

Jumper / Switch name	Jumper / Switch number	Jumper / Switch setting
<b>7</b> Force XCC reset jumper	J181	<ul style="list-style-type: none"> <li>• Pins 1 and 2: The jumper is in default setting.</li> <li>• Pins 2 and 3: Reset the Lenovo XClarity Controller.</li> </ul>
<b>8</b> Power permission	J49	<ul style="list-style-type: none"> <li>• Pins 1 and 2: The jumper is in default setting.</li> <li>• Pins 2 and 3: Enable Power On.</li> </ul>

**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 158
- Any system-board switch or jumper block that is not shown in the illustrations in this document are reserved.

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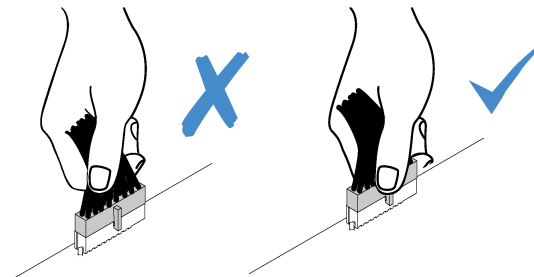
## Internal cable routing

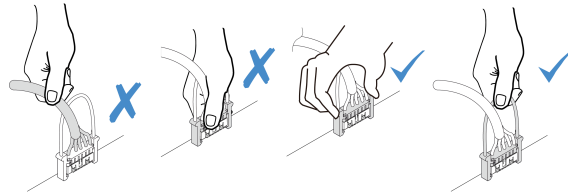
Some of the components in the server have internal cables and cable connectors.

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.





## VGA connector

Use the section to understand the cable routing for the VGA connector on the left rack latch.

**Note:** The VGA connector is available on some models.

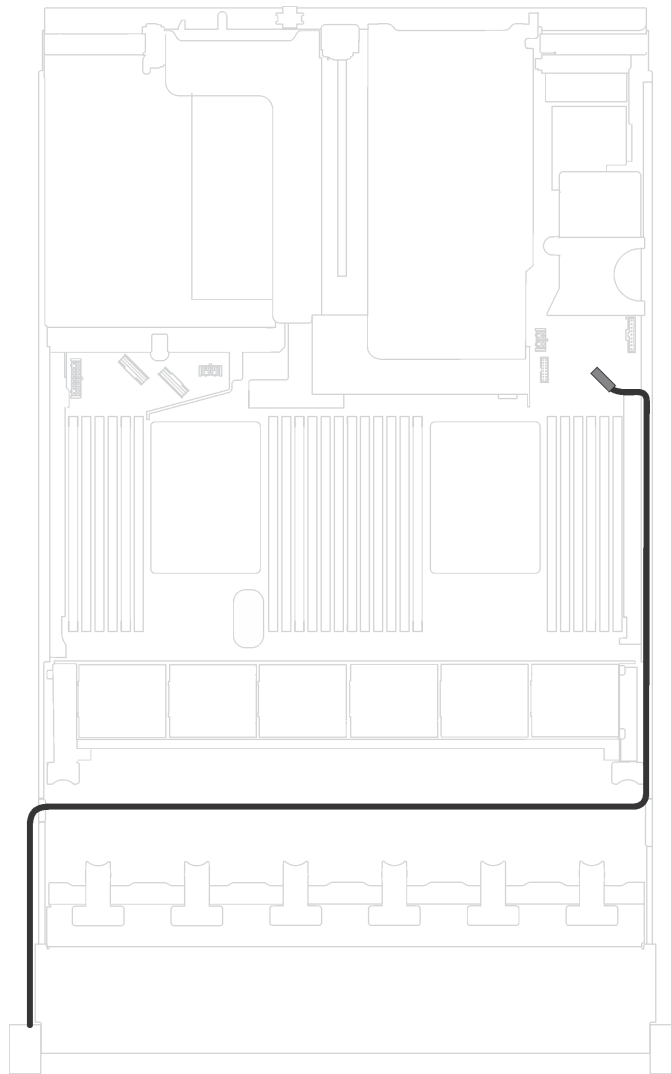


Figure 18. VGA connector cable routing

Cable	To
VGA cable on the left rack latch	Front VGA connector on the system board

## Front I/O assembly

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

### Front I/O assembly on the chassis

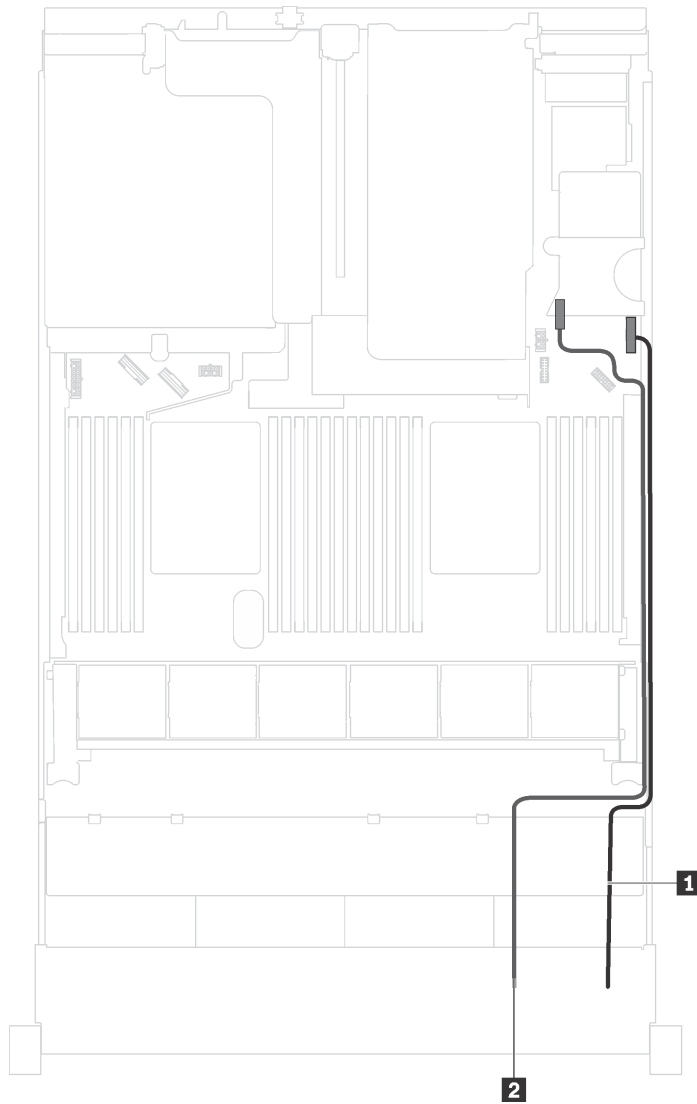


Figure 19. Cable routing for the front I/O assembly on the chassis

Cable	To
<b>1</b> Operator-information-panel cable	Operator-information-panel connector on the system board
<b>2</b> Front USB cable	Front USB connector on the system board

## Front I/O assembly on the right rack latch

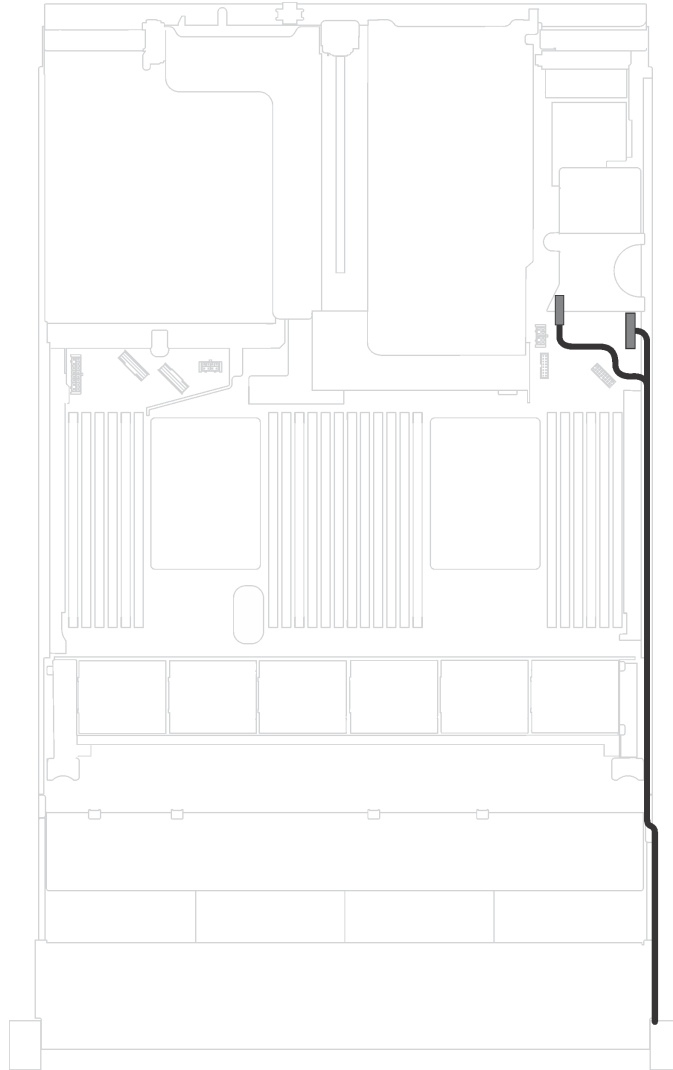


Figure 20. Cable routing for the front I/O assembly on the right rack latch

Cable	To
Front-I/O-assembly cable	Operator-information-panel connector and front USB connector on the system board

## GPU

Use the section to understand the cable routing for the GPUs.



## Server models with up to two GPUs

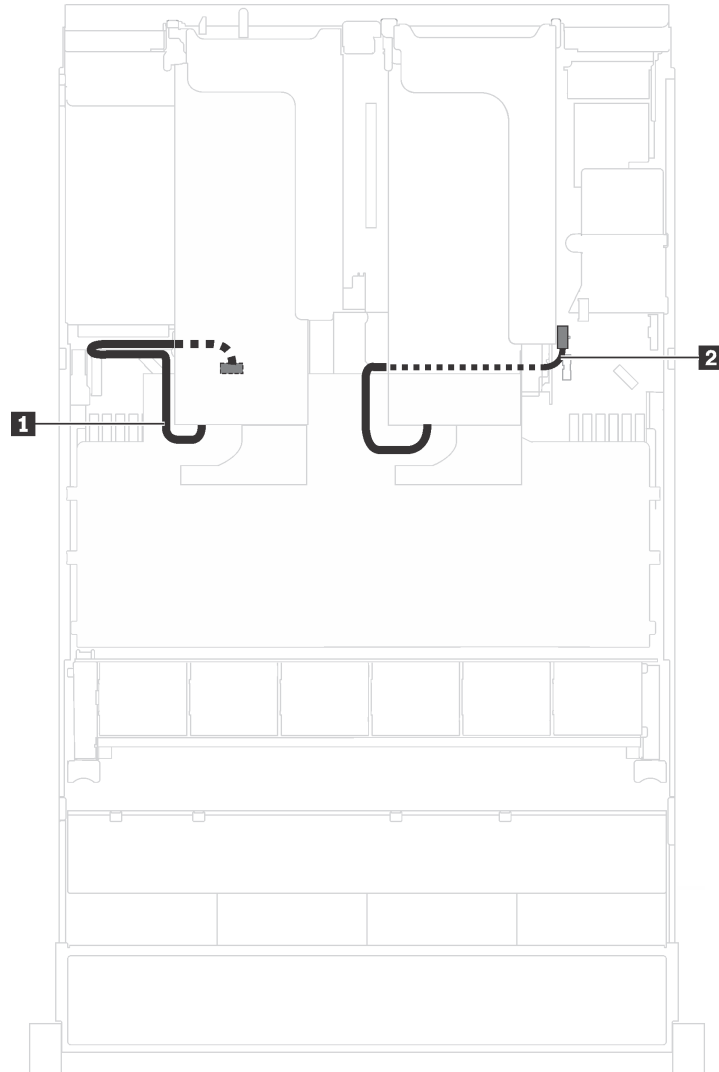


Figure 21. Cable routing for server models with up to two GPUs

Cable	From	To
<b>1</b> GPU power cable	Power connector on the GPU installed in PCIe slot 5	GPU power connector 1 on the system board
<b>2</b> GPU power cable	Power connector on the GPU installed in PCIe slot 1	GPU power connector 2 on the system board

## Server models with up to three GPUs

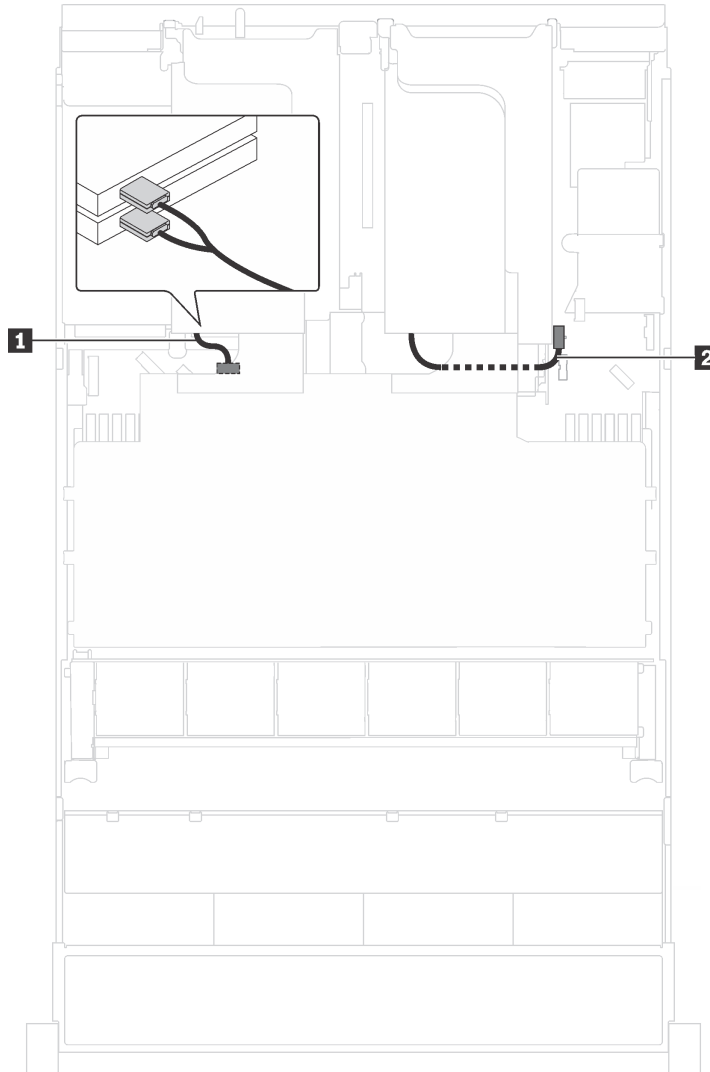


Figure 22. Cable routing for server models with up to three GPUs

Cable	From	To
<b>1</b> GPU power cable	Power connectors on the GPUs installed in PCIe slots 5 and 6	GPU power connector 1 on the system board
<b>2</b> GPU power cable	Power connector on the GPU installed in PCIe slot 1	GPU power connector 2 on the system board

## Server models with two Cambricon MLU100-C3 processing adapters

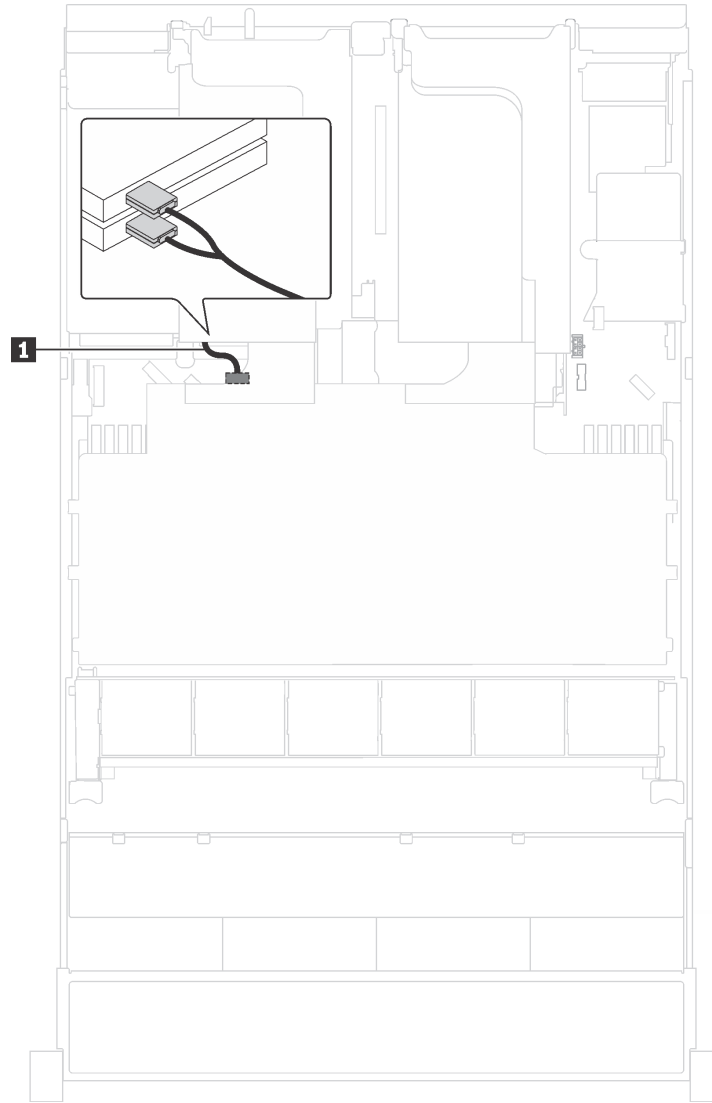


Figure 23. Cable routing for server models with two Cambricon MLU100-C3 processing adapters

Cable	From	To
<b>1</b> GPU power cable	Power connectors on the adapters installed in PCIe slots 5 and 6	GPU power connector 1 on the system board

## Server models with four Cambricon MLU100-C3 processing adapters

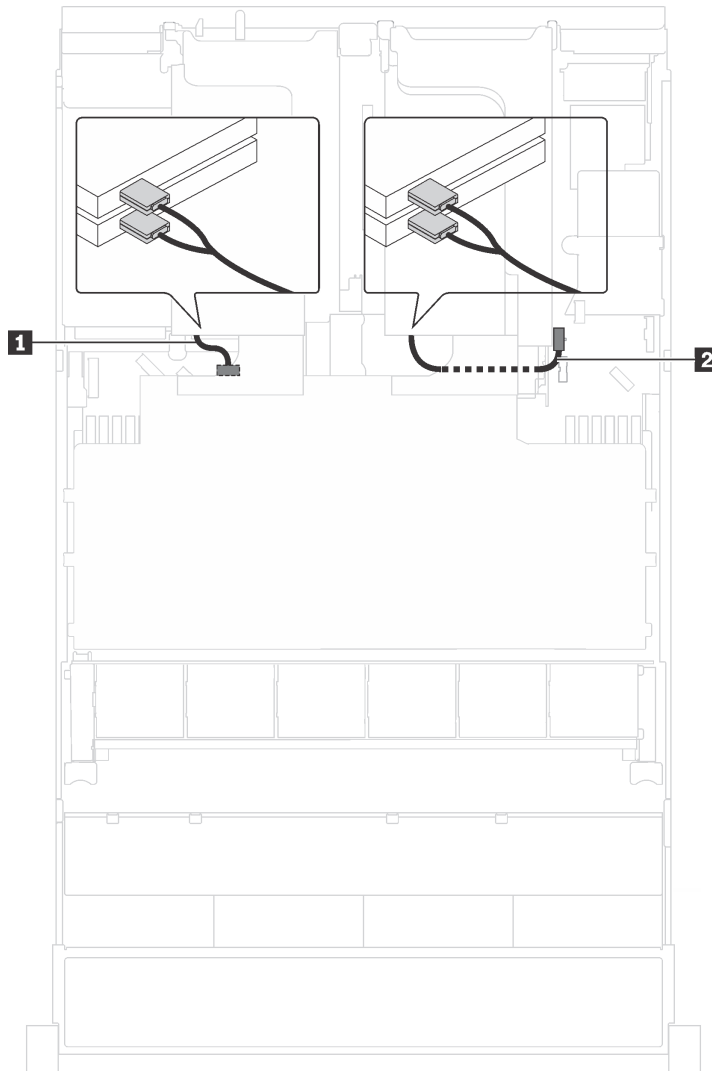


Figure 24. Cable routing for server models with four Cambricon MLU100-C3 processing adapters

Cable	From	To
<b>1</b> GPU power cable	Power connectors on the adapters installed in PCIe slots 5 and 6	GPU power connector 1 on the system board
<b>2</b> GPU power cable	Power connectors on the adapters installed in PCIe slots 1 and 2	GPU power connector 2 on the system board

## Backplane

Use the section to understand the cable routing for backplanes.

This topic contains the following information:

- [“Server models with eight 2.5-inch drives” on page 45](#)
- [“Server models with sixteen 2.5-inch drives” on page 61](#)
- [“Server models with twenty 2.5-inch drives” on page 86](#)

- “Server models with twenty-four 2.5-inch drives” on page 87
- “Server models with eight 3.5-inch drives” on page 137
- “Server models with twelve 3.5-inch drives” on page 140

Before you route cables for backplanes, observe the adapter priority and the PCIe slot selection priority when installing the NVMe switch adapter or a RAID adapter.

- Adapter priority: NVMe switch adapter, 24i RAID adapter, 8i HBA/RAID adapter, 16i HBA/RAID adapter
- PCIe slot selection priority when installing the NVMe switch adapter:

Number of installed processors	PCIe slot selection priority
One processor	1
Two processors	1, 5, 6

- For server models with sixteen/twenty/twenty-four NVMe drives (with two processors installed):

Server models	PCIe slot selection
Sixteen NVMe drives	1, 4, 6, 7
Twenty NVMe drives	1, 4, 5, 6, 7
Twenty-four NVMe drives	1, 2, 4, 6, 7

- PCIe slot selection priority when installing a 24i RAID adapter:

Number of installed processors	PCIe slot selection priority
One processor	1, 2, 3
Two processors	1, 2, 3, 5, 6

- PCIe slot selection priority when installing a 8i or 16i HBA/RAID adapter:

Number of installed processors	PCIe slot selection priority
One processor	7, 4, 2, 3, 1
Two processors	7, 4, 2, 3, 1, 5, 6

#### Notes:

- The PCIe slot 7 refers to the RAID adapter slot on the system board.
- If the rear hot-swap drive assembly is installed, PCIe slots 1, 2, and 3 will become unavailable because the space is occupied by the rear hot-swap drive assembly.
- The adapter priority of the 530-16i or 930-16i RAID adapter adapter can be higher than the 930-8i RAID adapter when both 16i RAID adapter and 8i RAID adapter are chosen.
- Oversubscription may exist in some configurations installed with NVMe 810-4P/1610-8P/1611-8P switch adapters. For details, see <https://lenovopress.lenovo.com/lp1050-thinksystem-sr650-server#controllers-for-internal-storage>.

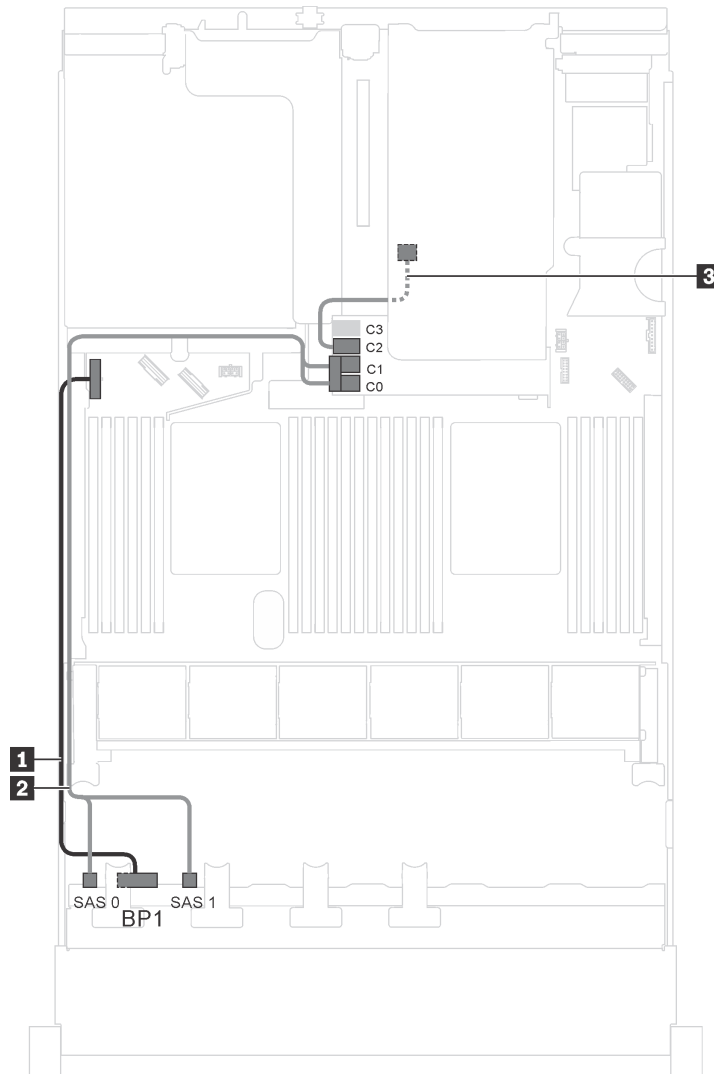
### Server models with eight 2.5-inch drives

Use this section to understand the cable routing for server models with eight 2.5-inch drives.

**Server model: eight 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 16i HBA/RAID adapter**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the cable **3** might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **3**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit



*Figure 25. Cable routing for server models with eight 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and one 16i HBA/RAID adapter*

Cable	From	To
<b>1</b> Power cable for front backplane	Power connector on front backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane*	SAS 0 and SAS 1 connectors on front backplane	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C2</li> <li>• Gen 4: C1</li> </ul>

**Server model: eight 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 24i RAID adapter**

**Note:** The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the cable **3** might not be available on your server.

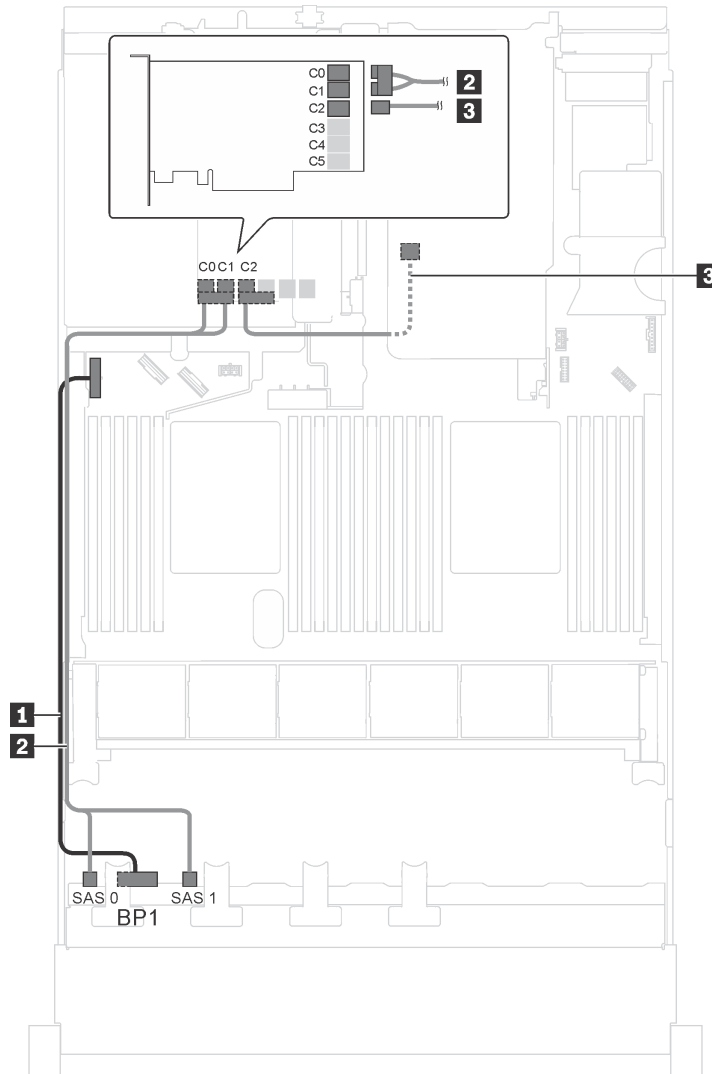


Figure 26. Cable routing for server models with eight 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and one 24i RAID adapter

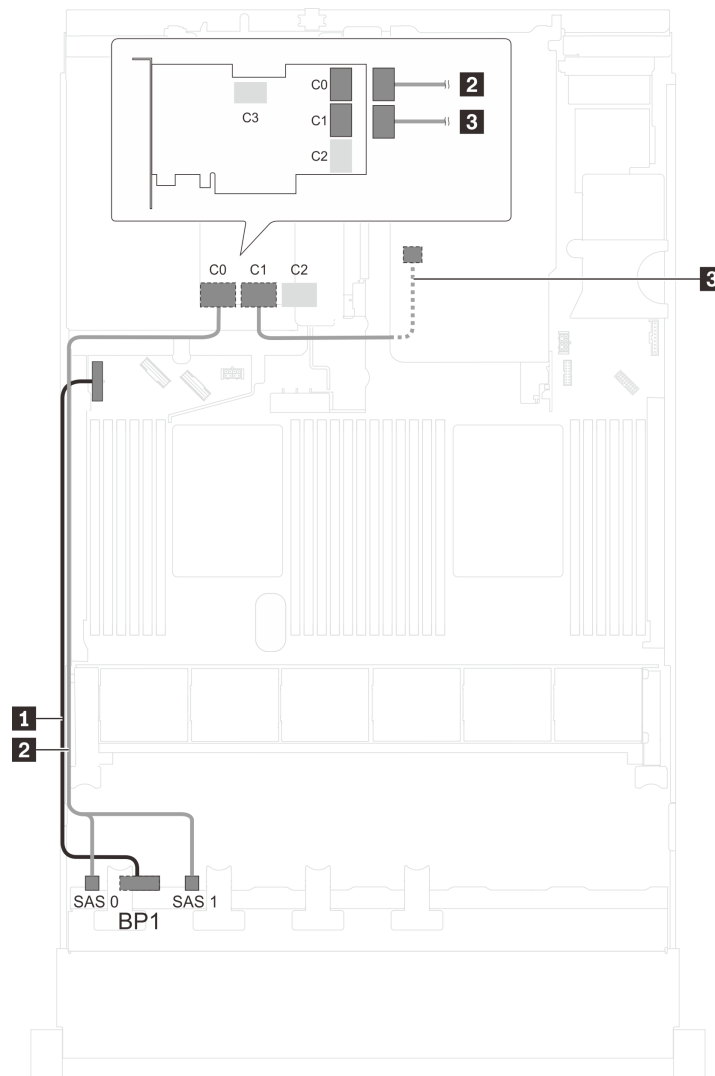
Cable	From	To
<b>1</b> Power cable for front backplane	Power connector on front backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane	SAS 0 and SAS 1 connectors on front backplane	C0 and C1 connectors on the 24i RAID adapter
<b>3</b> SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C2 connector on the 24i RAID adapter



**Server model: eight 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 32i RAID adapter**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the cable **3** might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*Ensure you use Gen 4 SAS signal cable:
  - Cable **2**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **3**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit



*Figure 27. Cable routing for server models with eight 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and one 32i RAID adapter*

Cable	From	To
<b>1</b> Power cable for front backplane	Power connector on front backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane*	SAS 0 and SAS 1 connectors on front backplane	C0 connector on the 32i RAID adapter
<b>3</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	C1 connector on the 32i RAID adapter

**Server model: eight 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, two 8i HBA/RAID adapters**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i HBA/RAID adapter in PCIe slot 4 might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **3**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

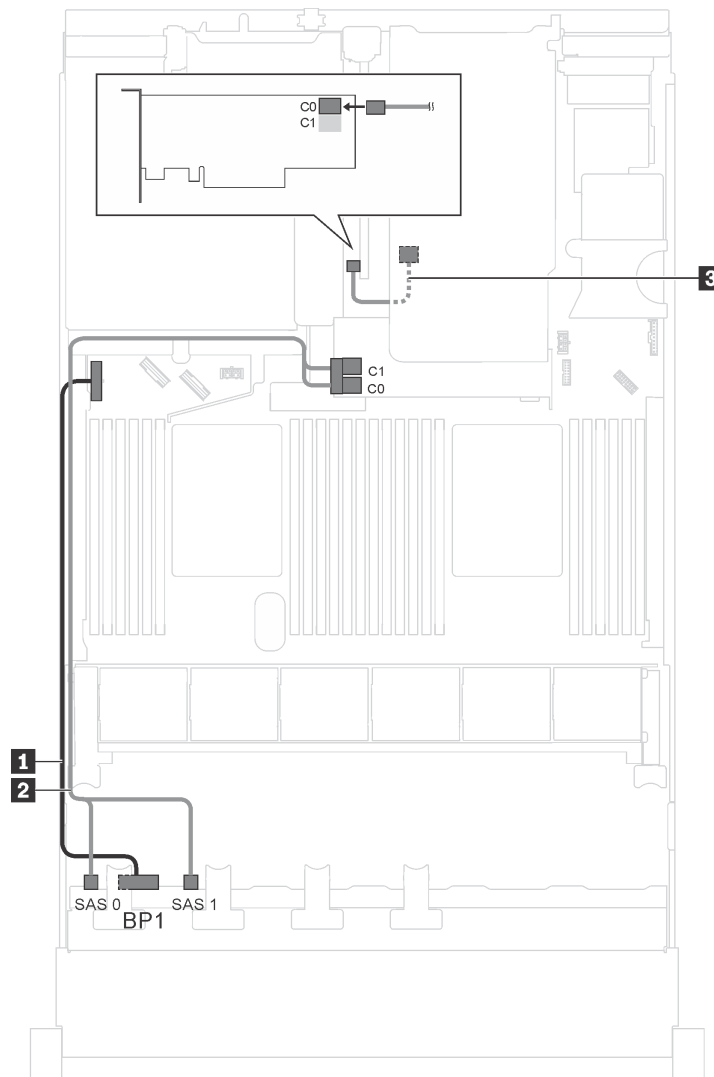


Figure 28. Cable routing for server models with eight 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and two 8i HBA/RAID adapters

Cable	From	To
<b>1</b> Power cable for front backplane	Power connector on front backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane*	SAS 0 and SAS 1 connectors on front backplane	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	8i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0</li> <li>• Gen 4: C0</li> </ul>

**Server model: eight 2.5-inch SAS/SATA drives, one 730-8i 4G Flash SAS/SATA RAID adapter with CacheCade**

**Note:** This configuration is available for some models only.

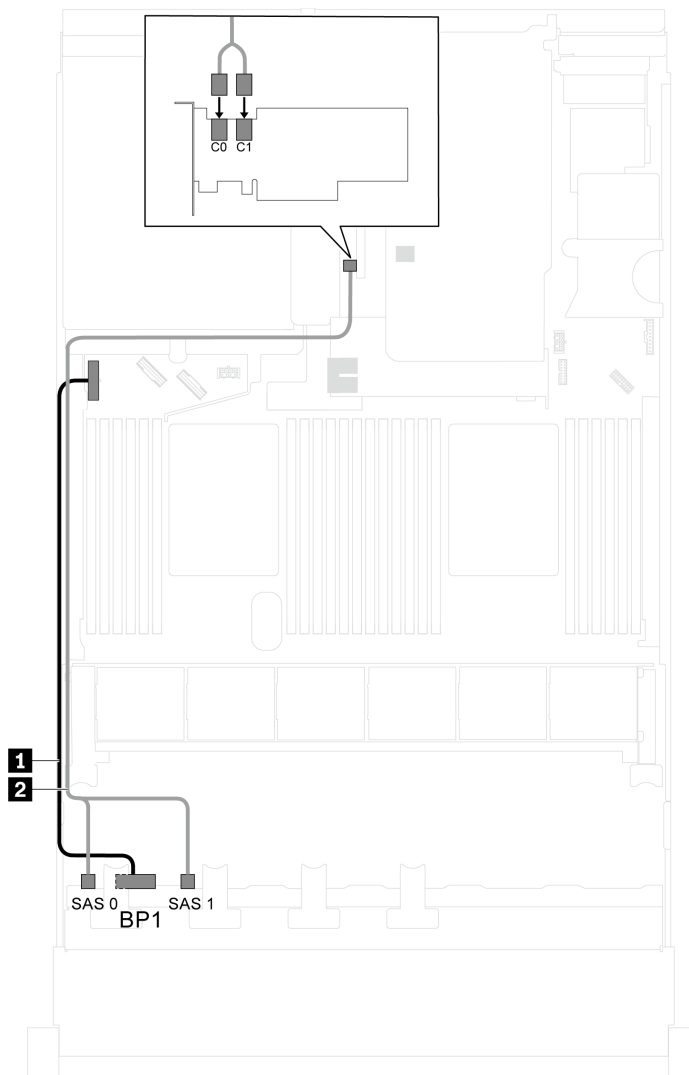


Figure 29. Cable routing for server models with eight 2.5-inch SAS/SATA drives, and one 730-8i 4G Flash SAS/SATA RAID adapter with CacheCache

Cable	From	To
<b>1</b> Power cable for front backplane	Power connector on front backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane	SAS 0 and SAS 1 connectors on front backplane	C0 and C1 connectors on the 8i HBA/RAID adapter installed in PCIe slot 4

**Server model: eight 2.5-inch SAS/SATA drives, Intel Xeon 6137, 6242R, 6246R, 6248R, 6250, 6256, or 6258R processors, one 8i HBA/RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

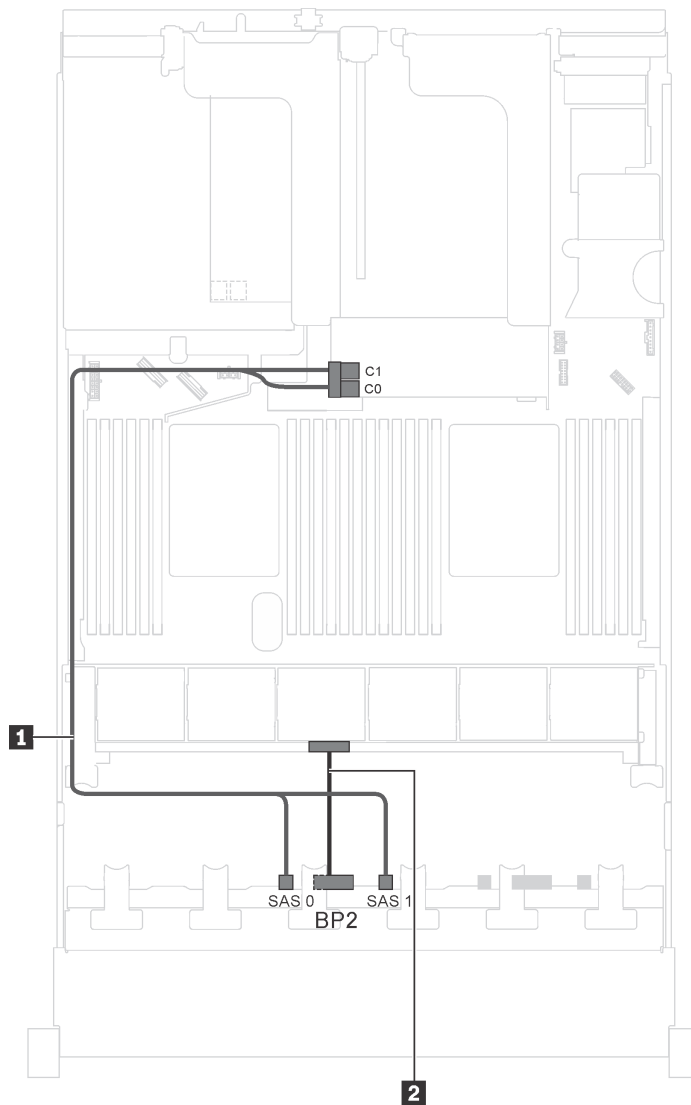


Figure 30. Cable routing for server models with eight 2.5-inch SAS/SATA drives, Intel Xeon 6137, 6242R, 6246R, 6248R, 6250, 6256, or 6258R processors, and one 8i HBA/RAID adapter

Cable	From	To
<b>1</b> SAS signal cable for front backplane*	SAS 0 and SAS 1 connectors on front backplane	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>Gen 3: C0C1</li> <li>Gen 4: C0</li> </ul>
<b>2</b> Power cable for front backplane	Power connector on front backplane	Backplane power connector 2 on the system board

**Server model: four 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, two 8i HBA/RAID adapters**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i HBA/RAID adapter in PCIe slot 4 might not be available on your server.

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **3**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

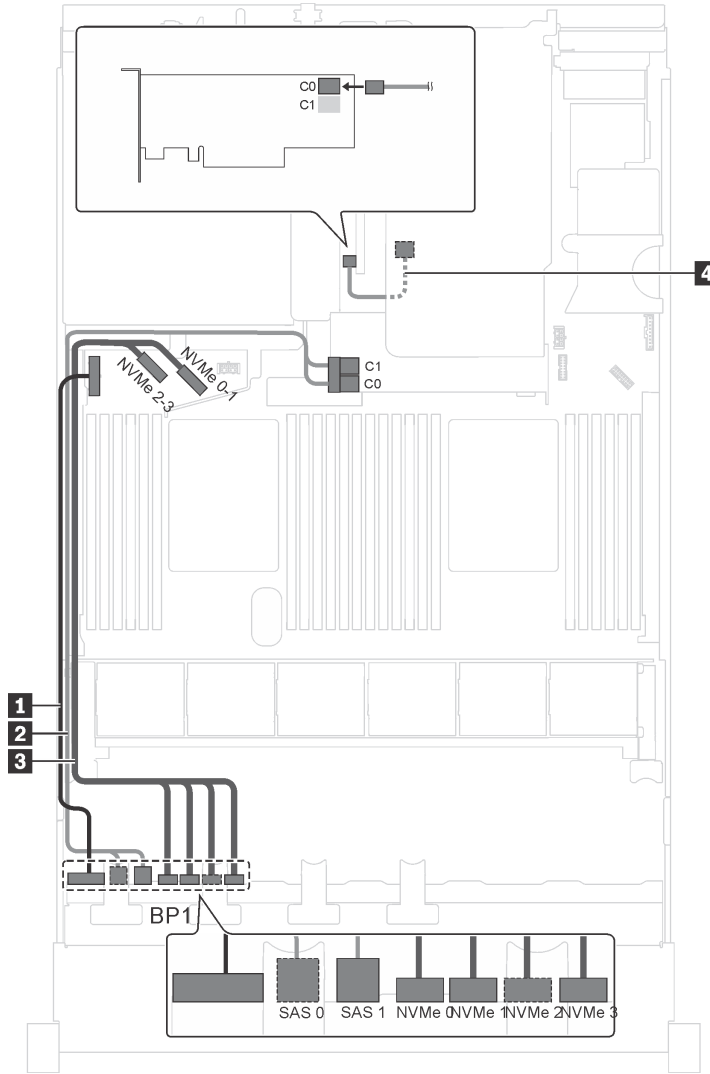


Figure 31. Cable routing for server models with four 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, and two 8i HBA/RAID adapters

Cable	From	To
<b>1</b> Power cable for front backplane	Power connector on front backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane*	SAS 0 and SAS 1 connectors on front backplane	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>

Cable	From	To
<b>3</b> NVMe signal cable for front backplane	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	8i HBA/RAID adapter installed in PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0</li> <li>• Gen 4: C0</li> </ul>

**Server model: four 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 16i HBA/RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **4**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

**Note:** The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the cable **4** might not be available on your server.

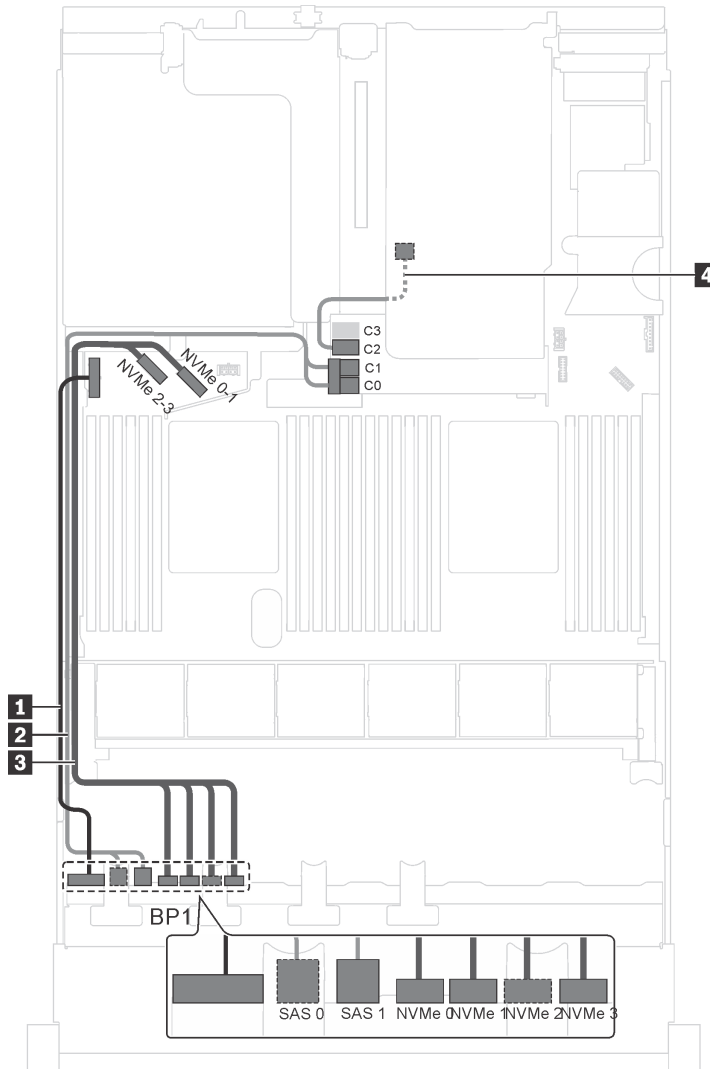


Figure 32. Cable routing for server models with four 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, and one 16i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane	Power connector on front backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane*	SAS 0 and SAS 1 connectors on front backplane	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>



Cable	From	To
<b>3</b> NVMe signal cable for front backplane	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C2</li> <li>• Gen 4: C1</li> </ul>

**Server model: four 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 24i RAID adapter**

**Note:** The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the cable **4** might not be available on your server.

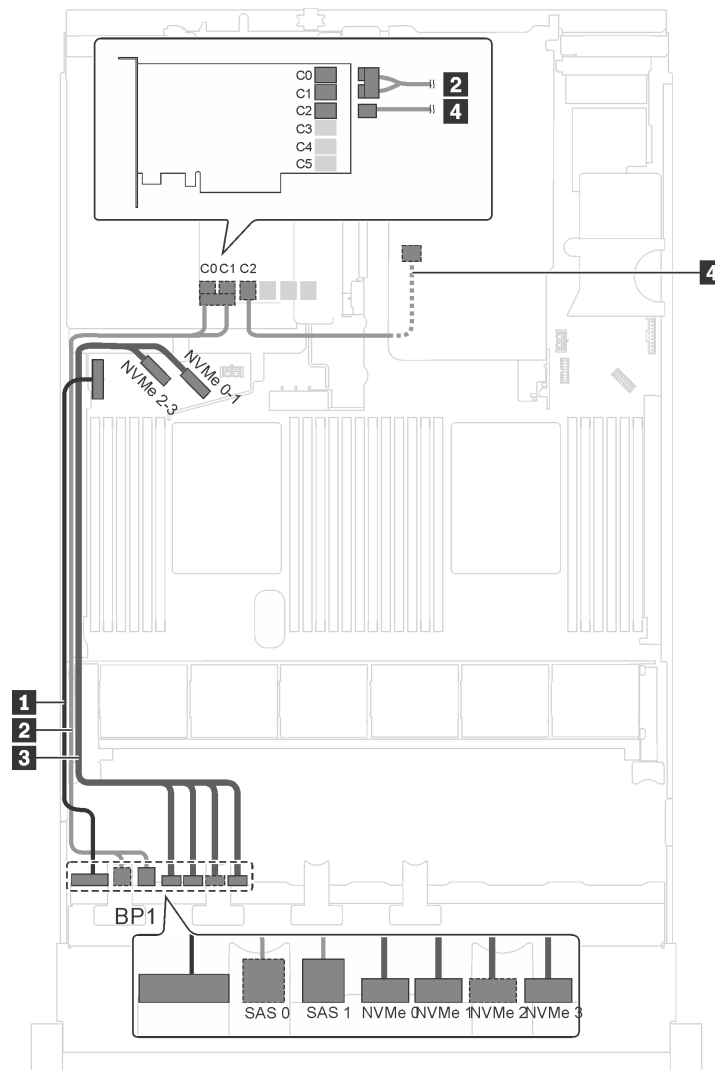


Figure 33. Cable routing for server models with four 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, and one 24i RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane	Power connector on front backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane	SAS 0 and SAS 1 connectors on front backplane	C0 and C1 connectors on the 24i RAID adapter installed in PCIe slot 5
<b>3</b> NVMe signal cable for front backplane	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C2 connector on the 24i RAID adapter installed in PCIe slot 5

**Server model: four 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 32i RAID adapter**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the cable **4** might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*Ensure you use Gen 4 SAS signal cable:
  - Cable **2**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **4**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

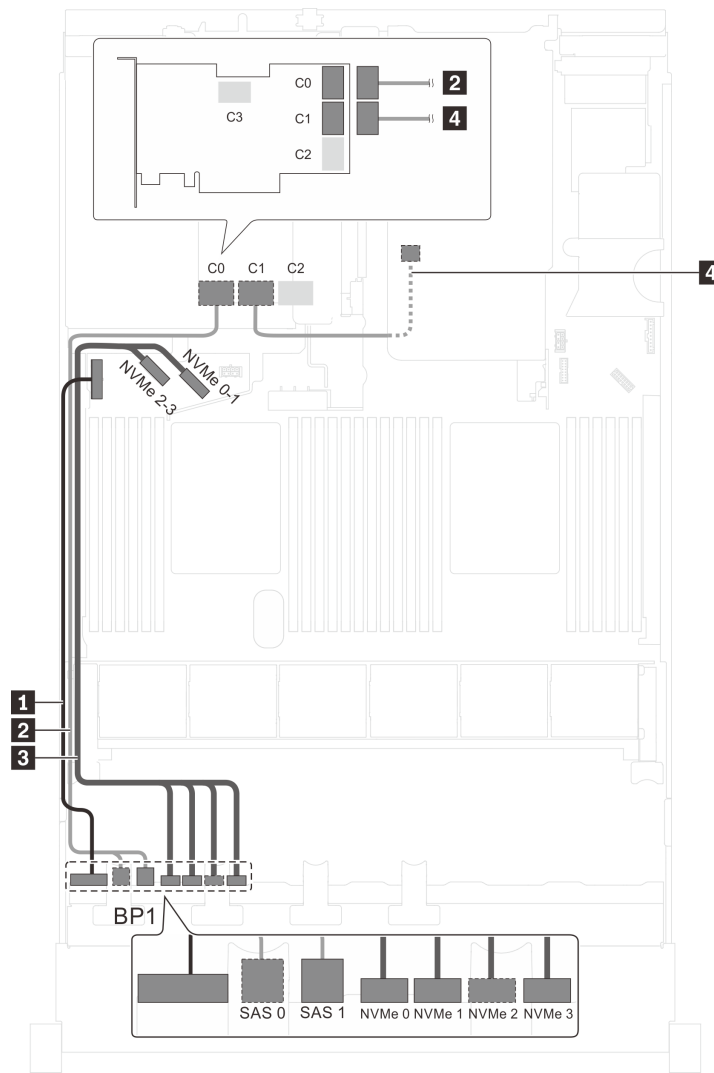


Figure 34. Cable routing for server models with four 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, and one 32i RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane	Power connector on front backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane*	SAS 0 and SAS 1 connectors on front backplane	C0 connector on the 32i RAID adapter on PCIe slot 5
<b>3</b> NVMe signal cable for front backplane	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	C1 connector on the 32i RAID adapter on PCIe slot 5

**Server model: four 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, Intel Xeon 6137, 6242R, 6246R, 6248R, 6250, 6256, or 6258R processors, one 8i HBA/RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.

- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

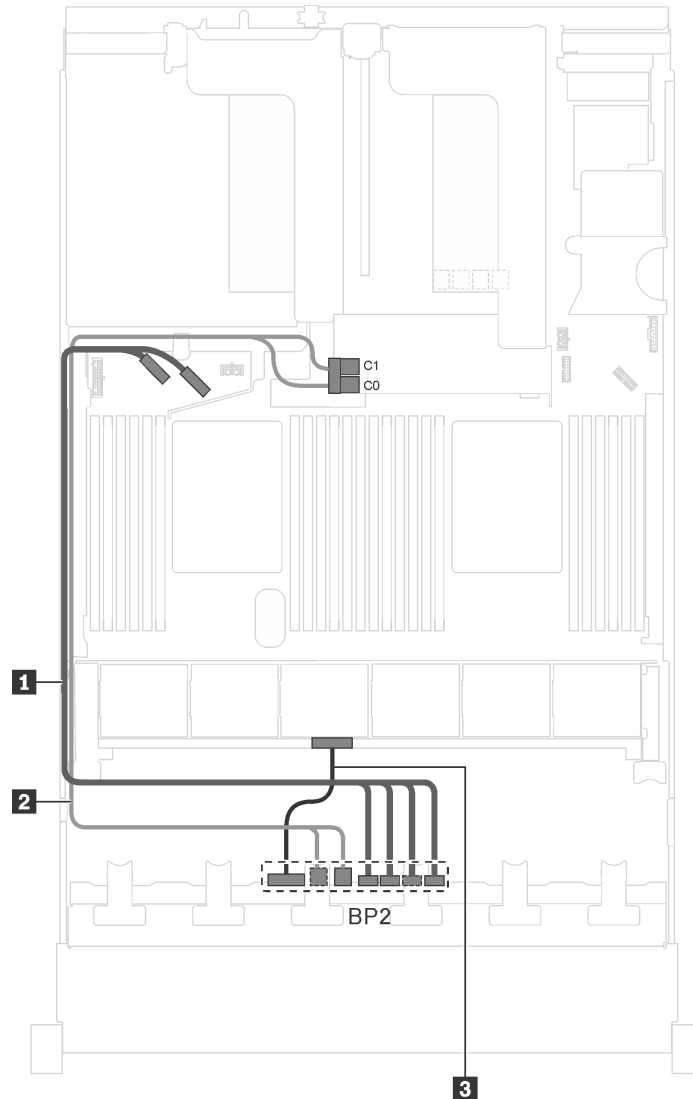


Figure 35. Cable routing for server models with four 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, Intel Xeon 6137, 6242R, 6246R, 6248R, 6250, 6256, or 6258R processors, and one 8i HBA/RAID adapter

Cable	From	To
<b>1</b> NVMe signal cable for front backplane	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>2</b> SAS signal cable for front backplane*	SAS 0 and SAS 1 connectors on front backplane	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> Power cable for front backplane	Power connector on front backplane	Backplane power connector 2 on the system board

## Server models with sixteen 2.5-inch drives

Use this section to understand the cable routing for server models with sixteen 2.5-inch drives.

### Server model: sixteen 2.5-inch SAS/SATA drives, one 16i HBA/RAID adapter

#### Notes:

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

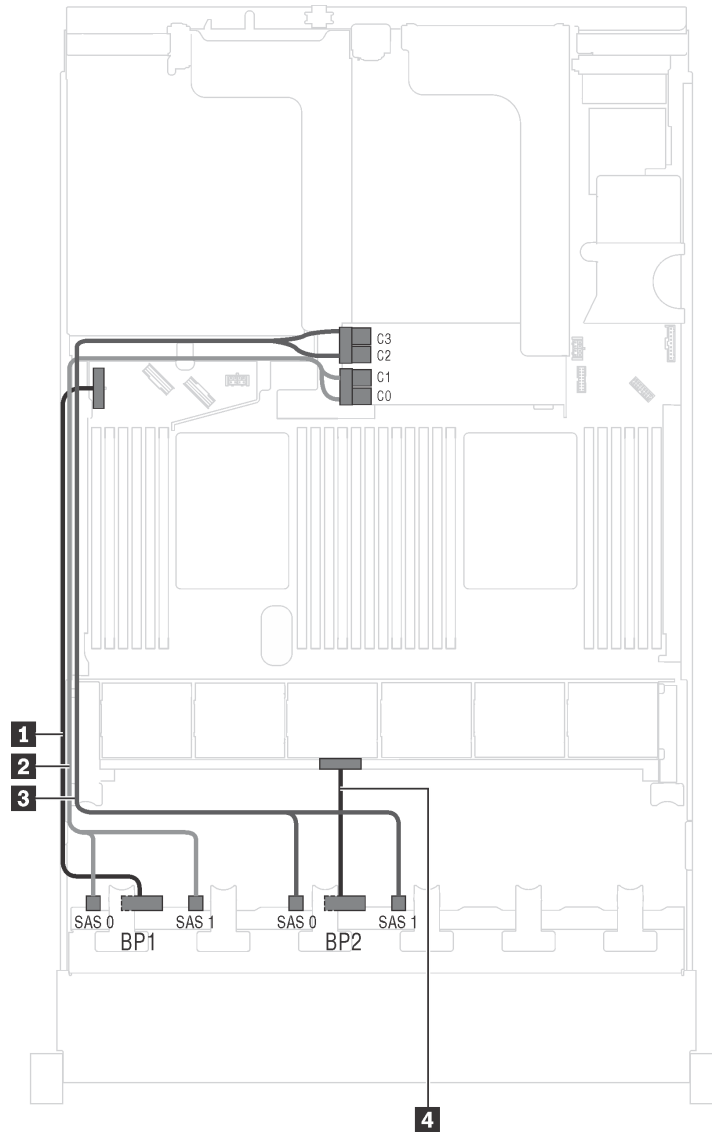
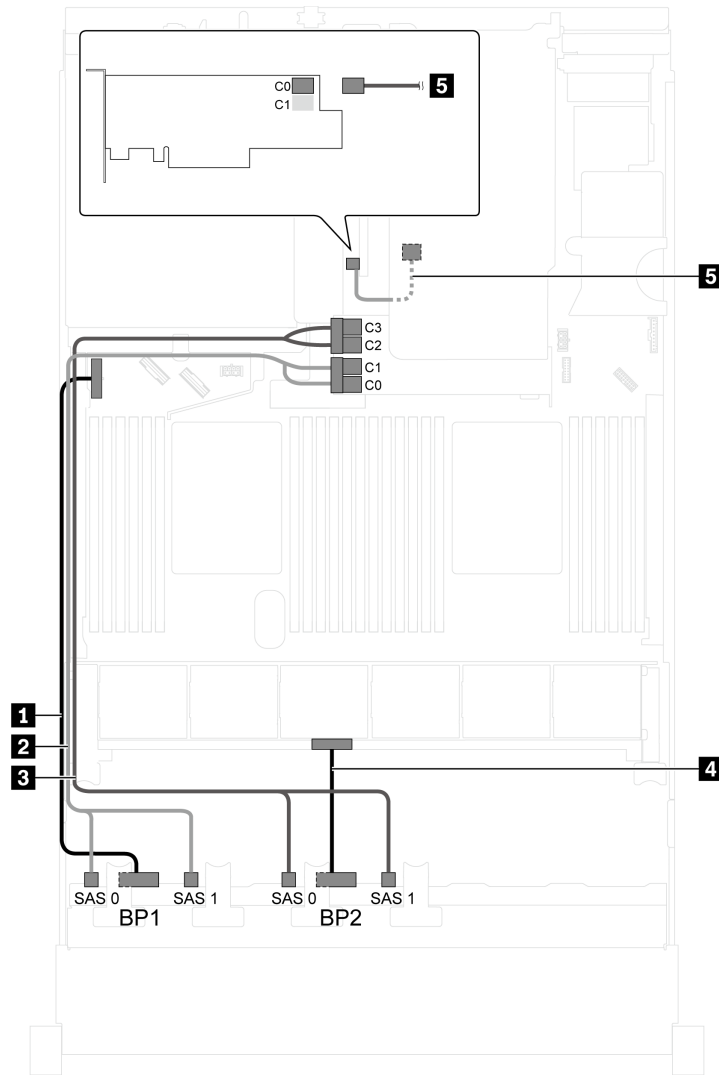


Figure 36. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives and one 16i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C2C3</li> <li>• Gen 4: C1</li> </ul>
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

**Server model: sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one Gen 3 8i HBA/RAID adapter, one Gen 3 16i HBA/RAID adapter**



*Figure 37. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one Gen 3 8i HBA/RAID adapter, and one Gen 3 16i HBA/RAID adapter*

<b>Cable</b>	<b>From</b>	<b>To</b>
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors of Gen 3 16i HBA/RAID adapter on the RAID adapter slot
<b>3</b> SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors of Gen 3 16i HBA/RAID adapter on the RAID adapter slot
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C0 connector of 8i HBA/RAID adapter on PCIe slot 4

**Server model: sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one Gen 4 8i HBA/RAID adapter, one Gen 4 16i HBA/RAID adapter**

**Notes:** When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:

- Cable **2/3**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
- Cable **5**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

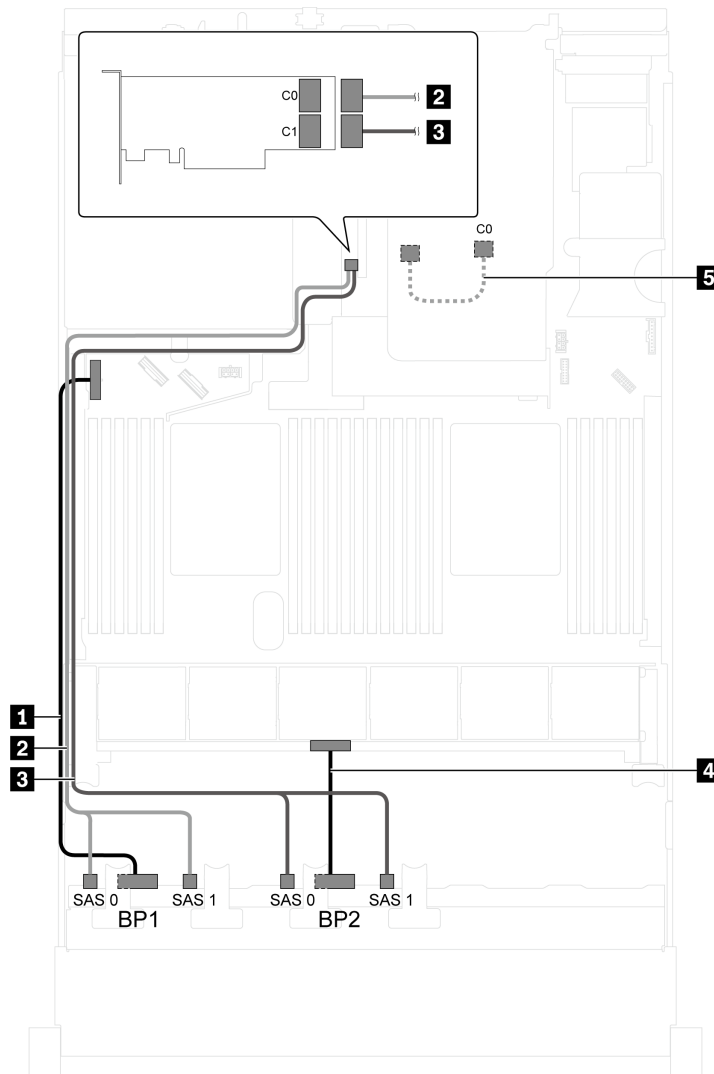


Figure 38. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one Gen 4 8i HBA/RAID adapter, and one Gen 4 16i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 connector of Gen 4 16i HBA/RAID adapter on PCIe slot 4
<b>3</b> SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C1 connector of Gen 4 16i HBA/RAID adapter on PCIe slot 4



Cable	From	To
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C0 connector of Gen 4 8i HBA/RAID adapter on PCIe slot 2

**Server model: sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 24i RAID adapter**

**Note:** The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the cable **5** might not be available on your server.

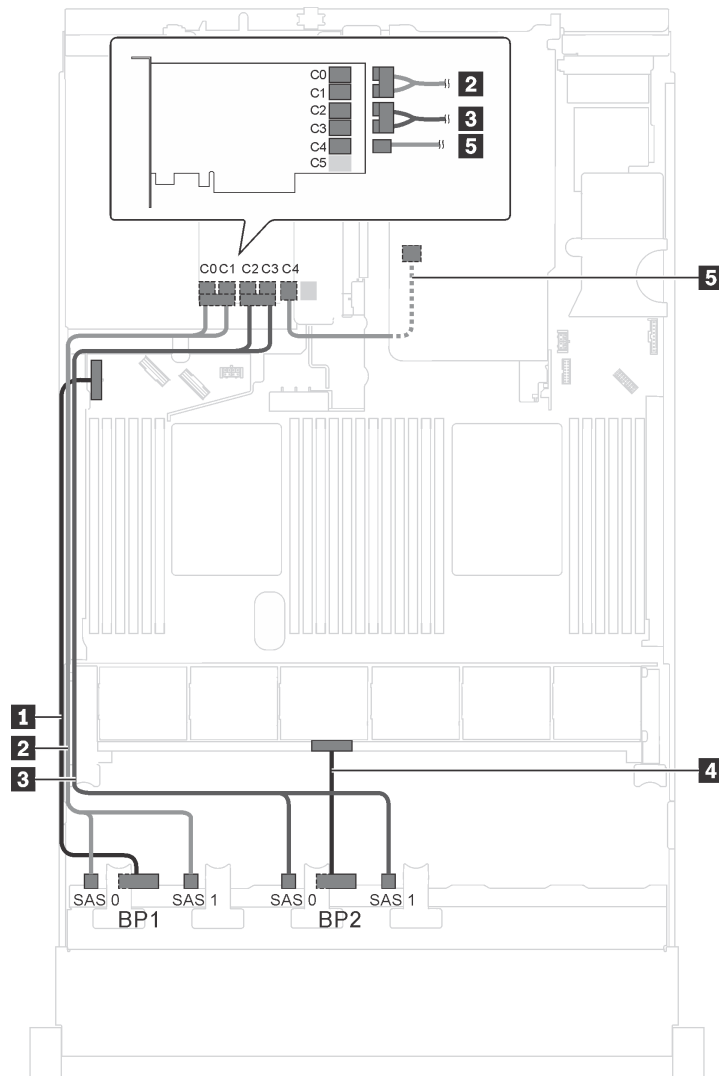


Figure 39. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and one 24i RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter installed in PCIe slot 5
<b>3</b> SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter installed in PCIe slot 5
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C4 connector on the 24i RAID adapter installed in PCIe slot 5

**Server model: sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 32i RAID adapter**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the cable **5** might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*Ensure you use Gen 4 SAS signal cable:
  - Cable **2/3**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **5**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

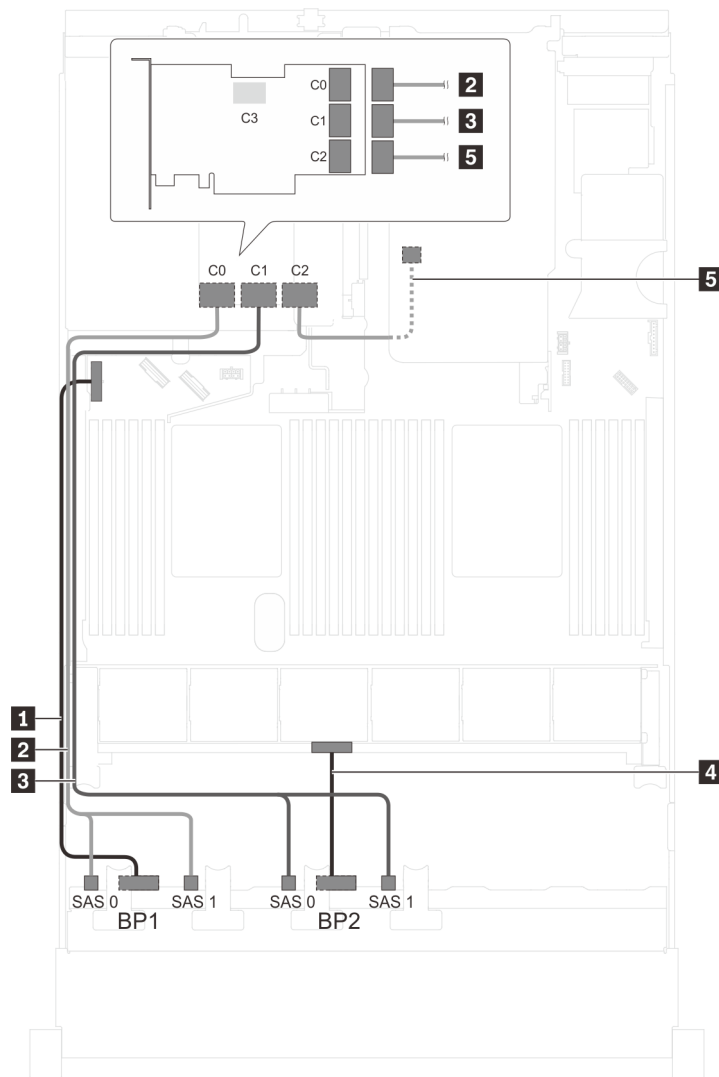


Figure 40. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and one 32i RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	C0 connector on the 32i RAID adapter on PCIe slot 5
<b>3</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	C1 connector on the 32i RAID adapter on PCIe slot 5
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	C2 connector on the 32i RAID adapter on PCIe slot 5

**Server model: sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, three 8i HBA/RAID adapters**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i HBA/RAID adapter in PCIe slot 5 might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2/3**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **5**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

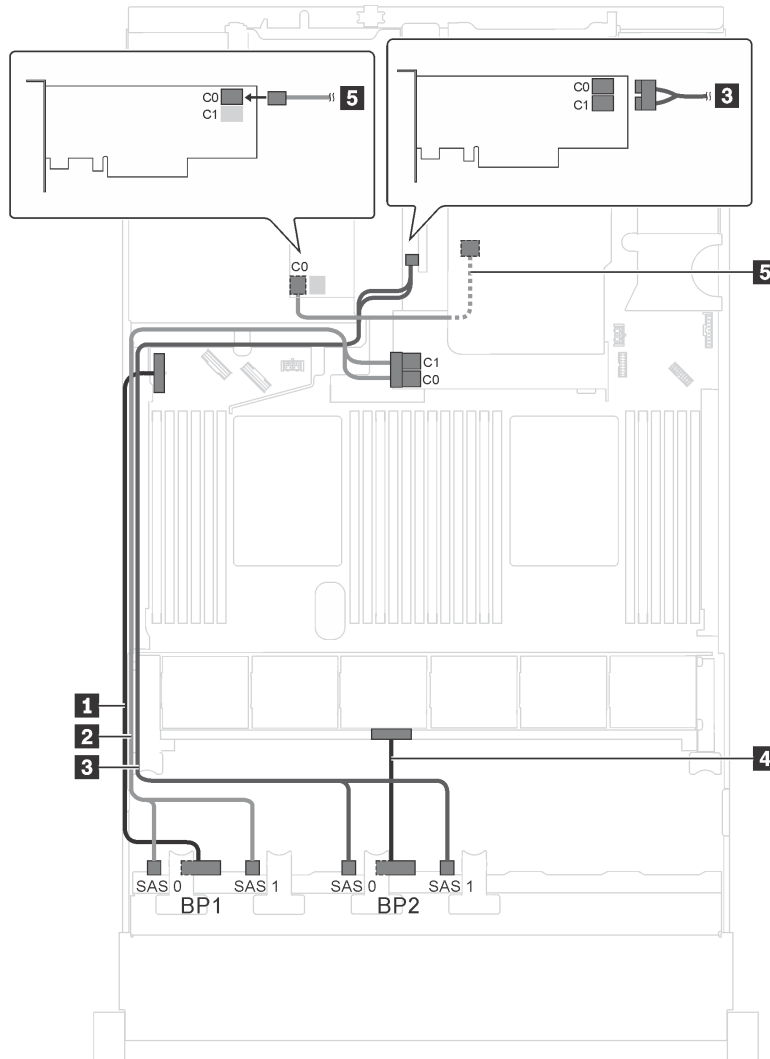


Figure 41. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and three 8i HBA/RAID adapters

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>

Cable	From	To
<b>3</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	8i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	8i HBA/RAID adapter installed in PCIe slot 5 <ul style="list-style-type: none"> <li>• Gen 3: C0</li> <li>• Gen 4: C0</li> </ul>

**Server model: twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, one 16i HBA/RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

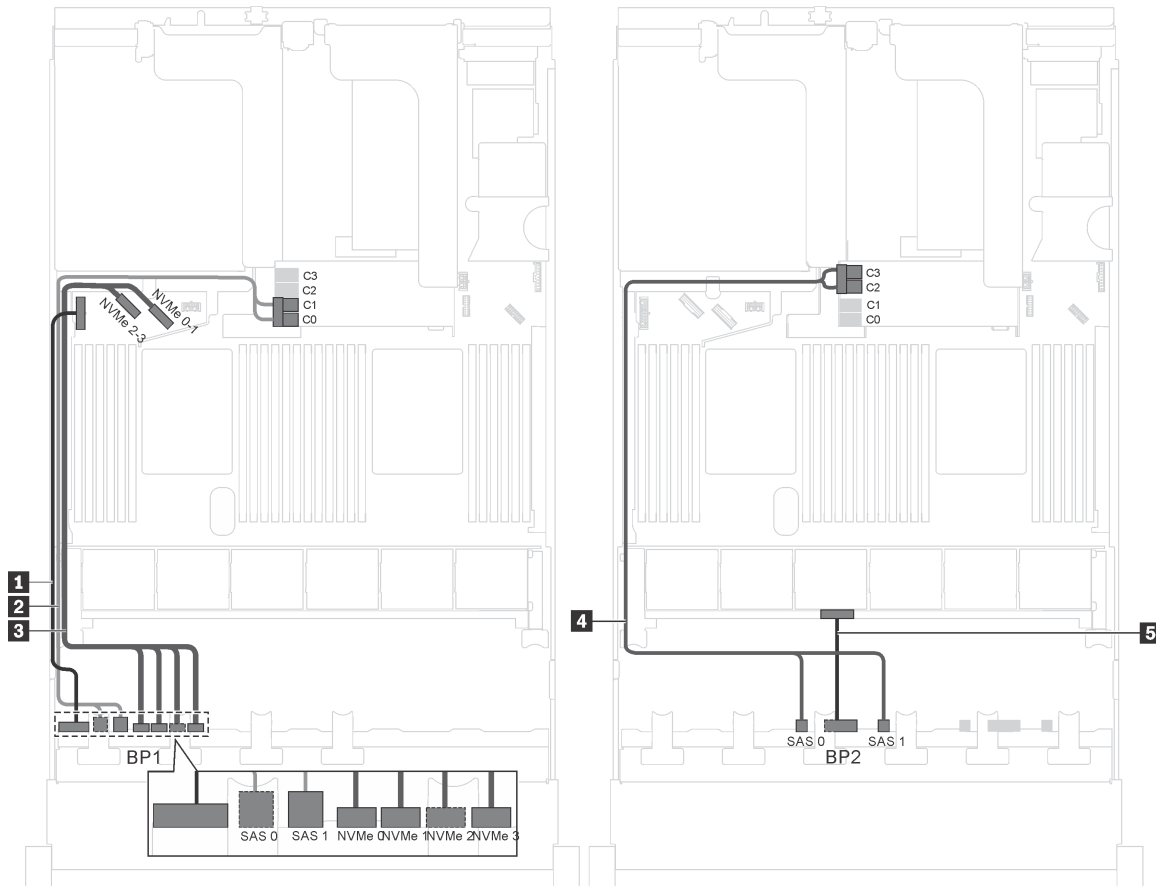


Figure 42. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, and one 16i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on backplane 1	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C2C3</li> <li>• Gen 4: C1</li> </ul>
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

**Server model: twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, one 24i RAID adapter**

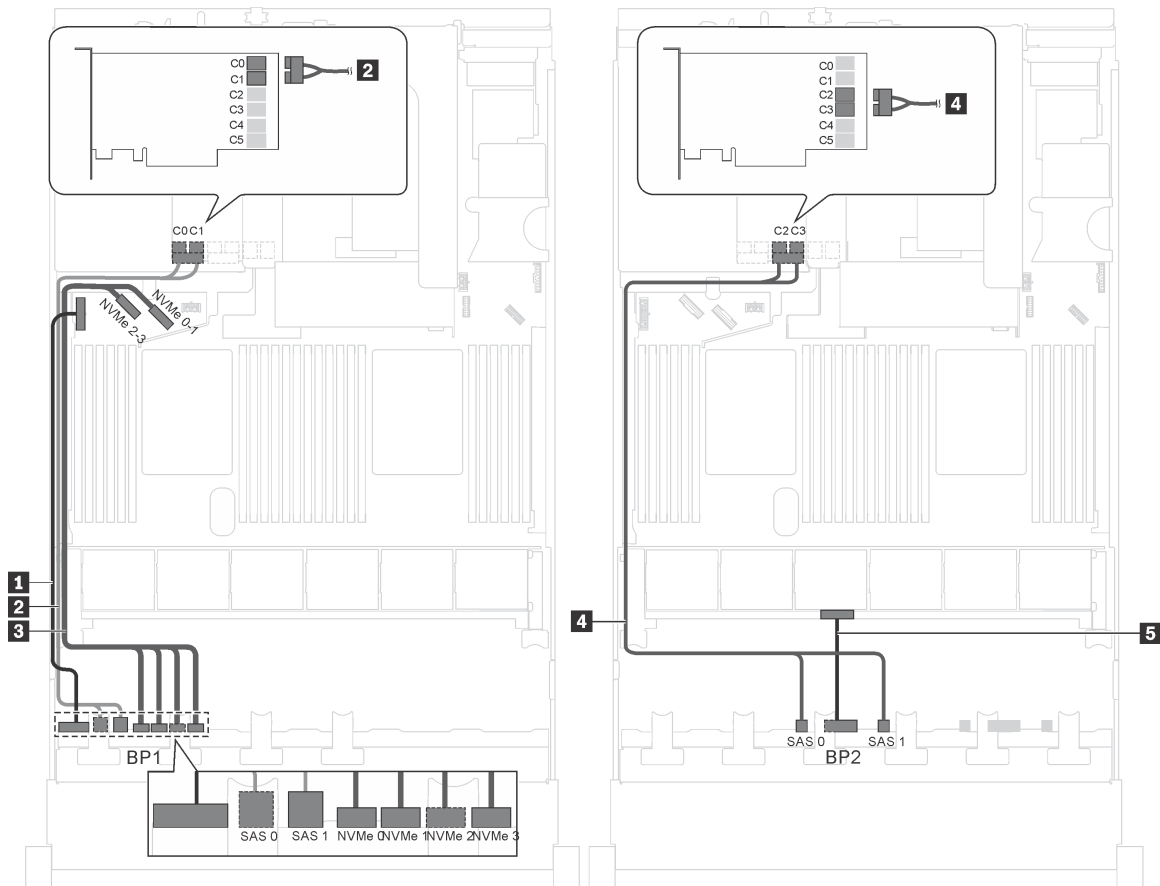


Figure 43. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, and one 24i RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on backplane 1	C0 and C1 connectors on the 24i RAID adapter on the riser assembly
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter on the riser assembly
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

**Note:** The 24i RAID adapter can be installed in riser assembly 1 or riser assembly 2.

**Server model: twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, one 32i RAID adapter**

**Notes:**

- The 32i RAID adapter can be installed in riser assembly 1 or riser assembly 2.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*Ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

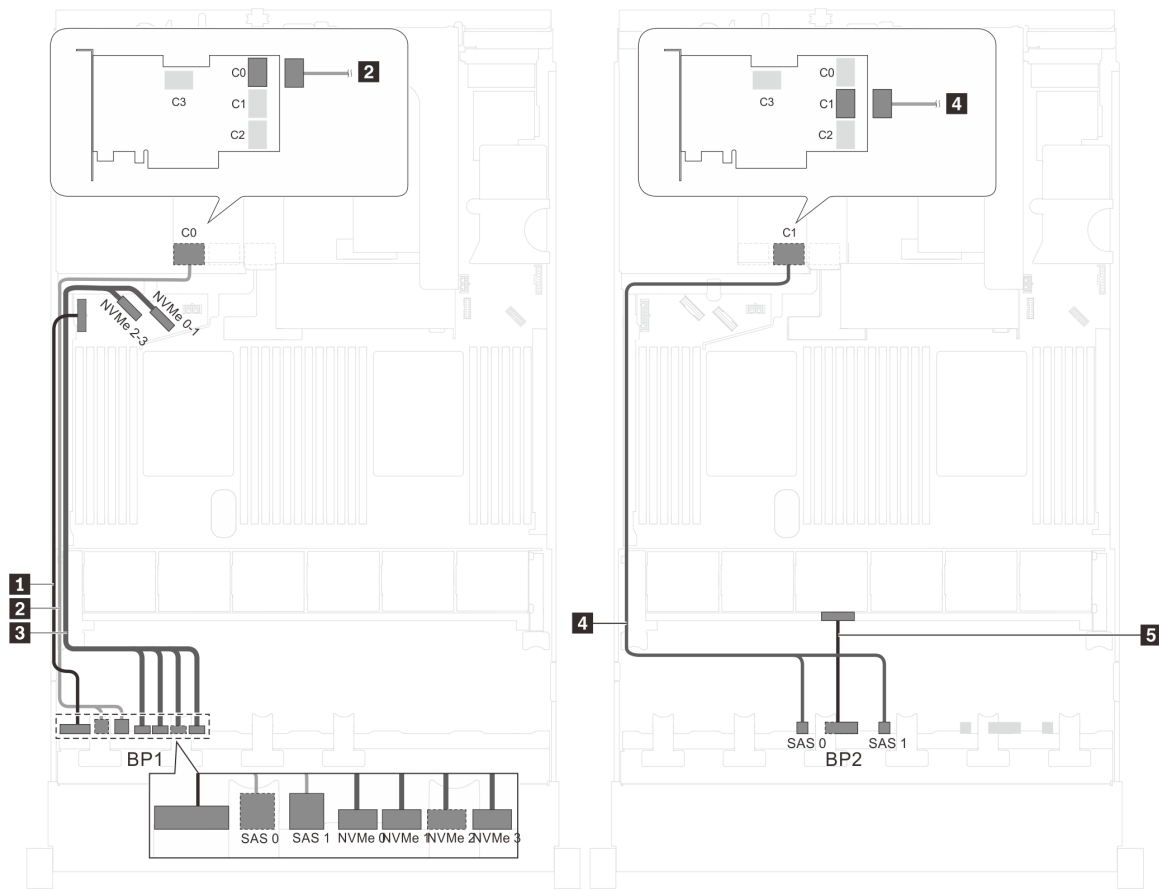


Figure 44. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, and one 32i RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on backplane 1	C0 connector on the 32i RAID adapter on the riser assembly
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	C1 connector on the 32i RAID adapter on the riser assembly
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

**Server model: twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, one 16i HBA/RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2/4**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit



- Cable **6**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

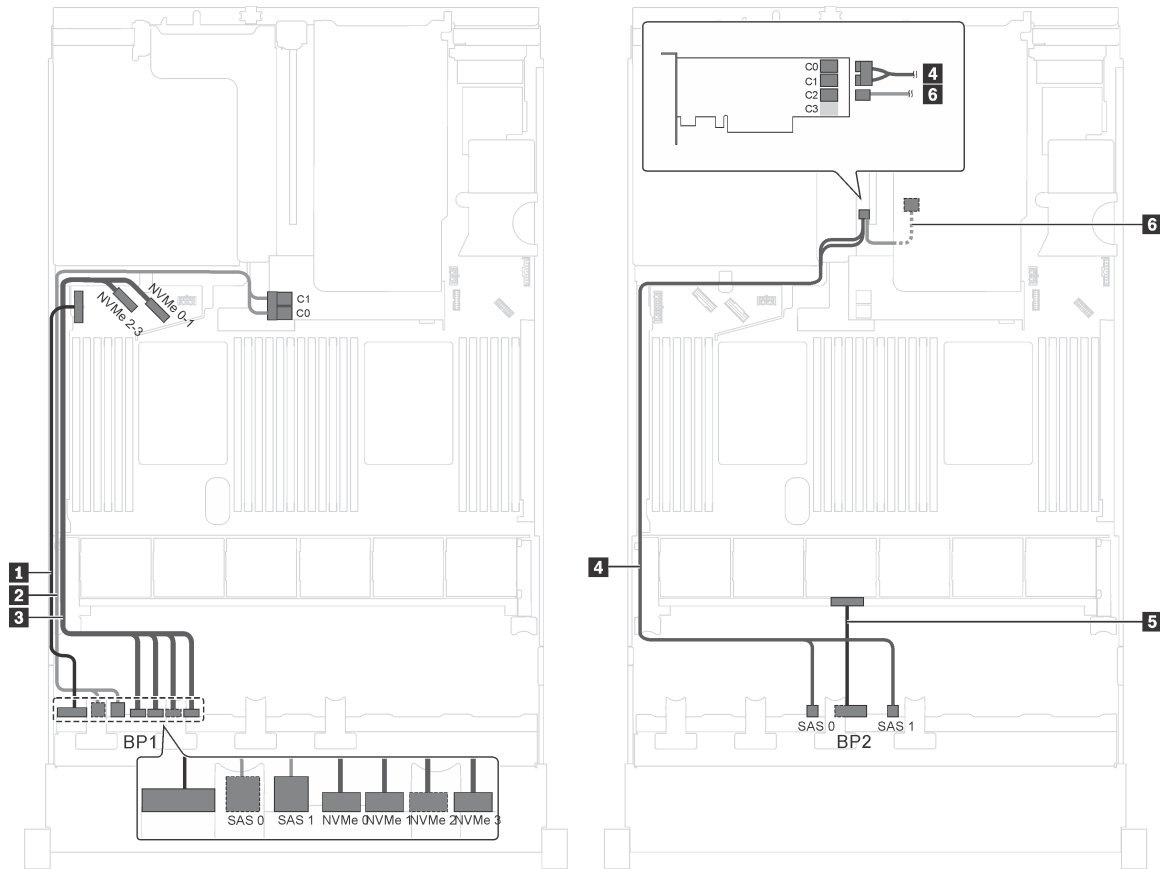


Figure 45. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, and one 16i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>6</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C2</li> <li>• Gen 4: C1</li> </ul>

**Server model: twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 24i RAID adapter**

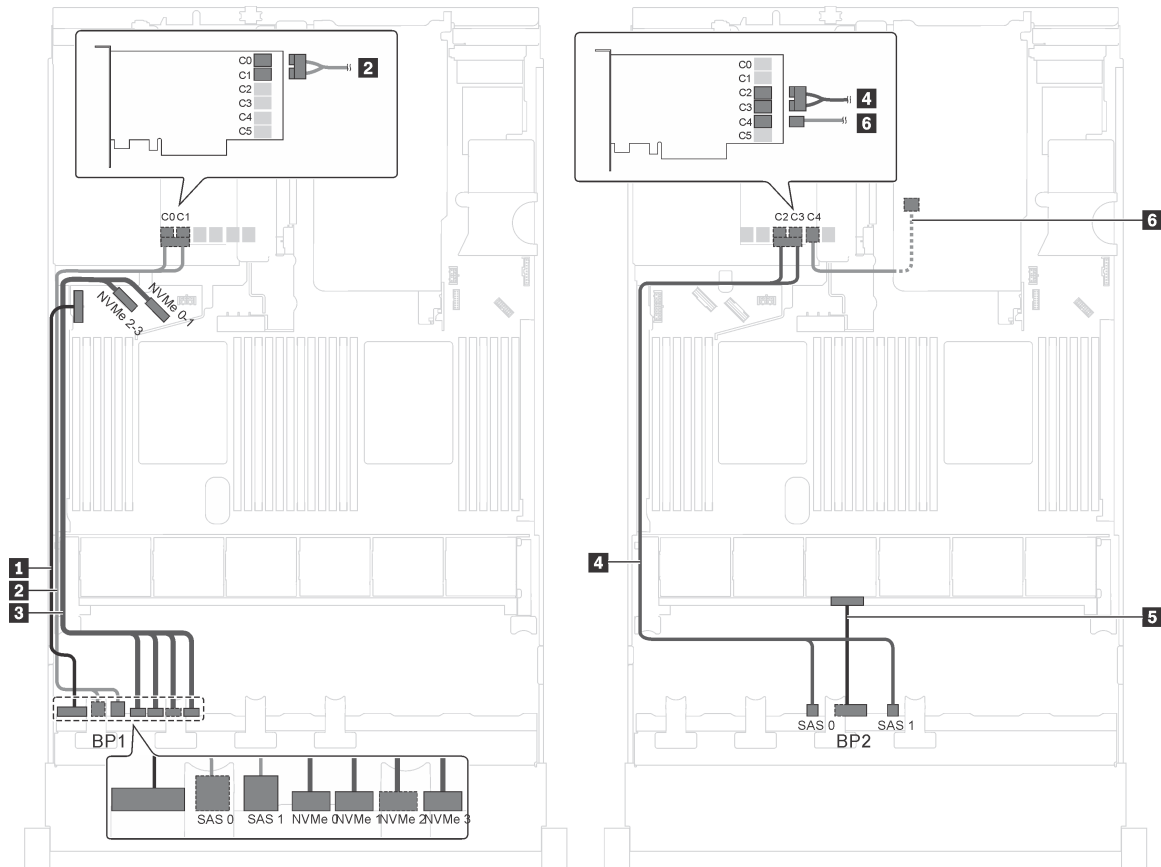


Figure 46. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, and one 24i RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter installed in PCIe slot 5
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter installed in PCIe slot 5
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>6</b> SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C4 connector on the 24i RAID adapter installed in PCIe slot 5

**Server model: twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 32i RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*Ensure you use Gen 4 SAS signal cable:
  - Cable **2/4**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **6**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

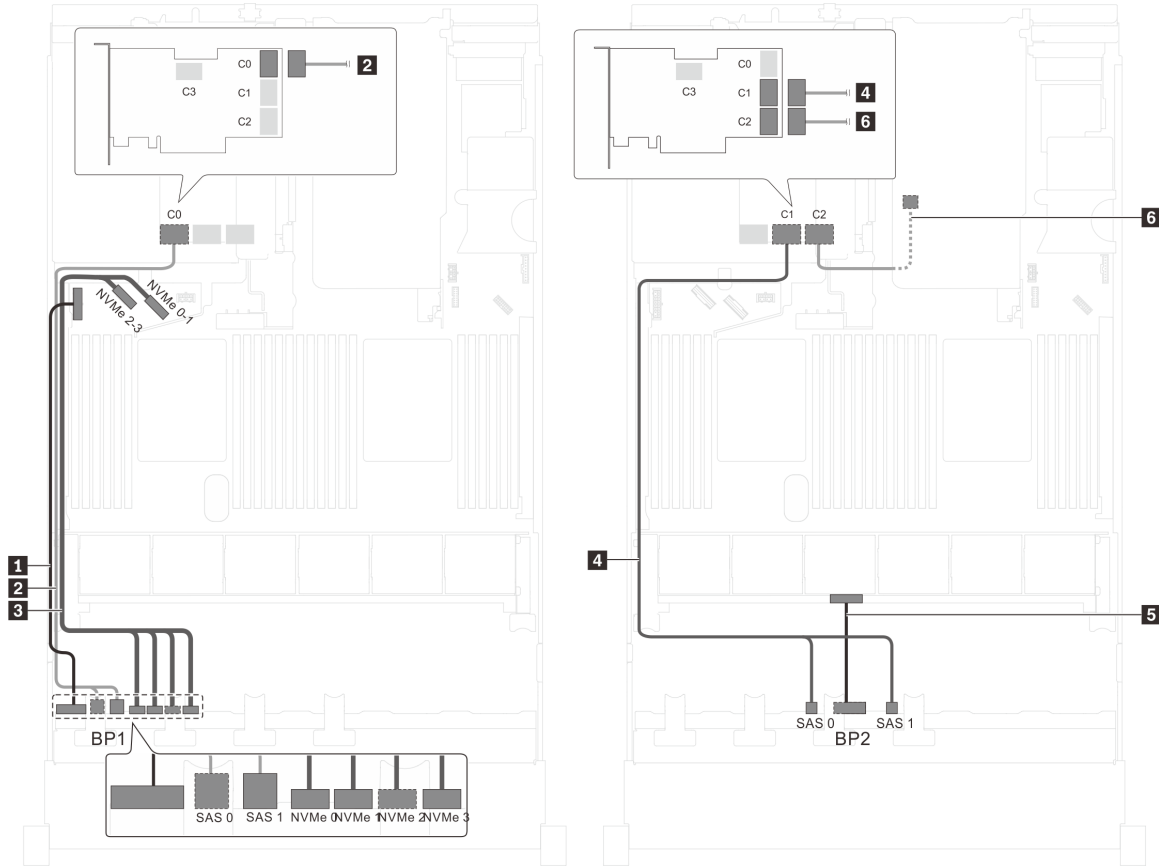


Figure 47. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, and one 32i RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	C0 connector on the 32i RAID adapter on PCIe slot 5
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0-1 and NVMe 2-3 connectors on the system board
<b>4</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	C1 connector on the 32i RAID adapter on PCIe slot 5
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>6</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	C2 connector on the 32i RAID adapter on PCIe slot 5

**Server model: eight 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, one 16i HBA/RAID adapter, one NVMe switch adapter**

**Notes:**

- The cable routing illustration is based on the scenario that the NVMe switch adapter is installed in PCIe slot 1. If the NVMe switch adapter is installed in PCIe slot 5 or PCIe slot 6, route the NVMe signal cable for front backplane 2 along the left side of the chassis.
- Gen 4 HBA/RAID adapter cannot be installed in the inner RAID adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

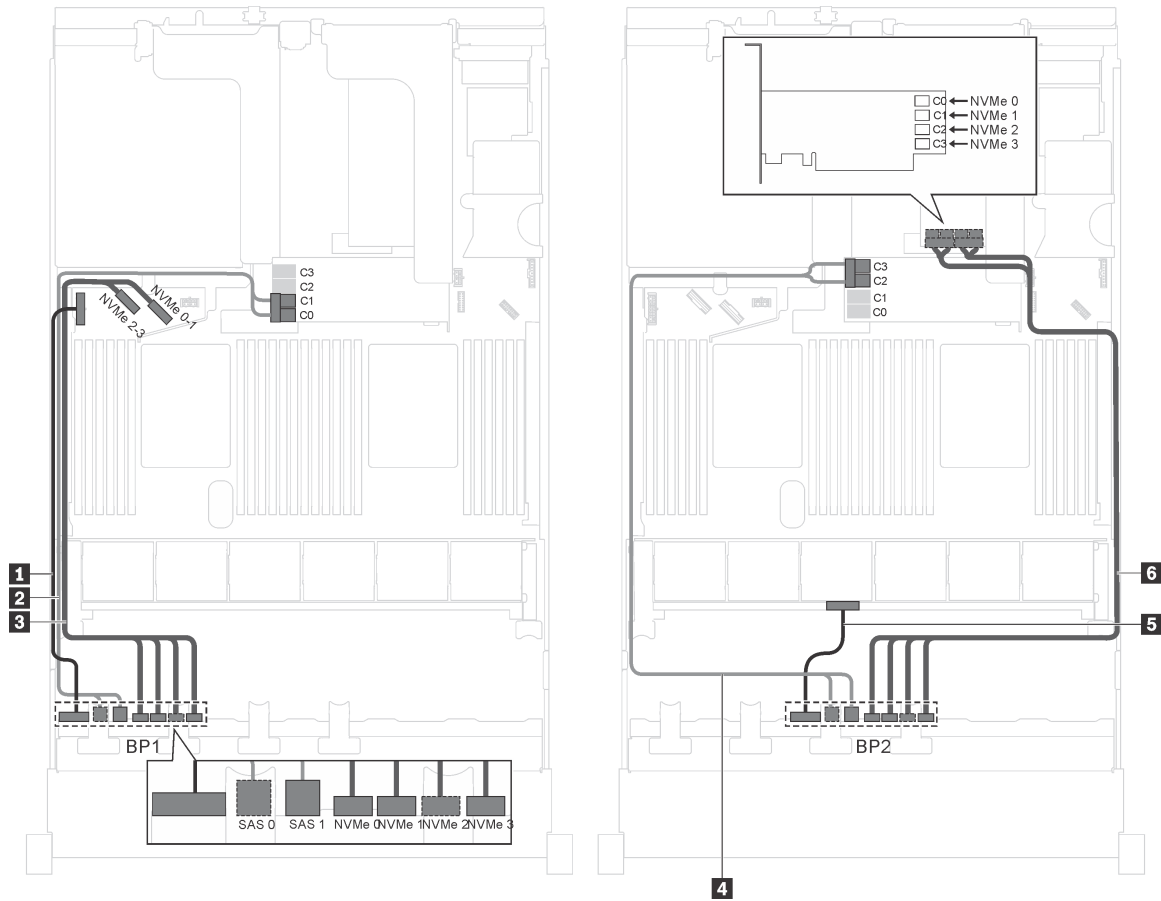


Figure 48. Cable routing for server models with eight 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, one 16i HBA/RAID adapter, and one NVMe switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board

Cable	From	To
<b>4</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C2C3</li> <li>• Gen 4: C1</li> </ul>
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>6</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 1

**Server model: eight 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, one 16i HBA/RAID adapter, one NVMe 1611-8P switch adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

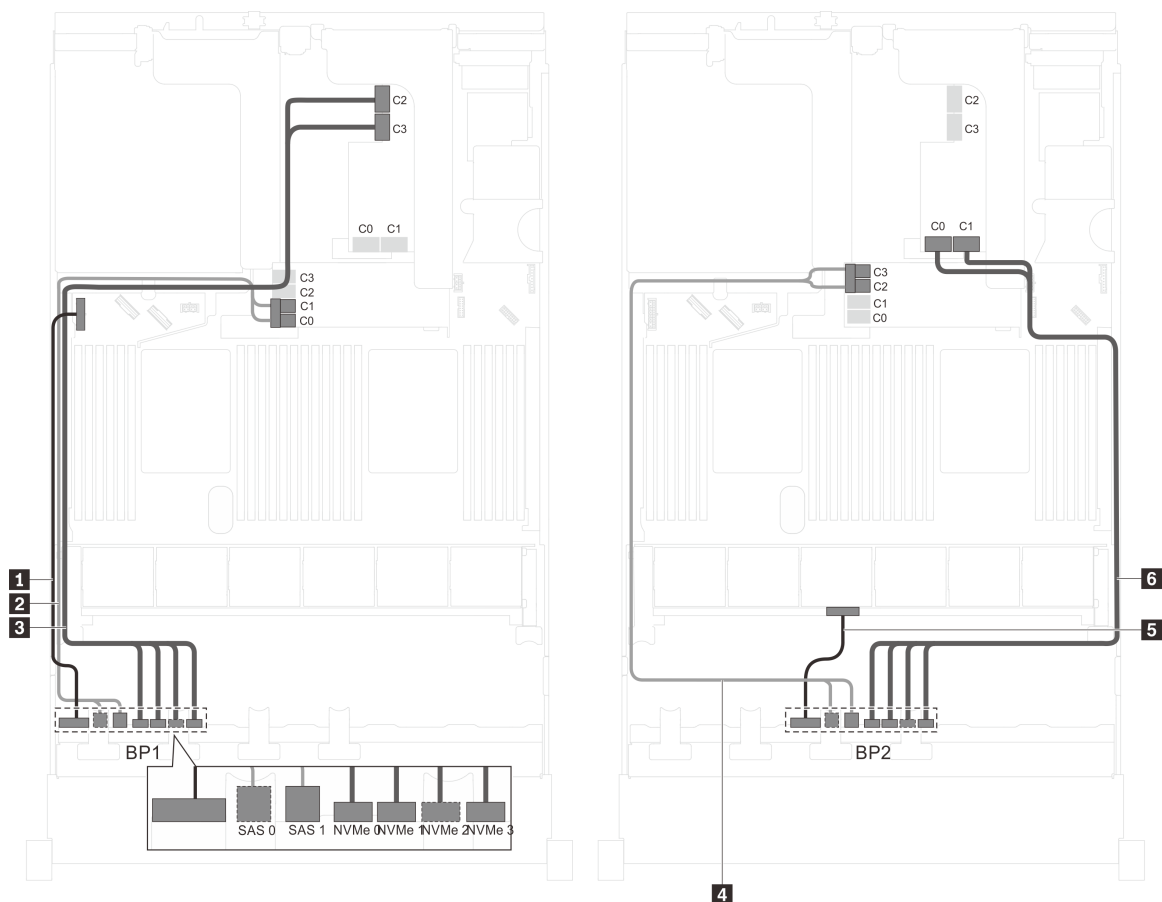


Figure 49. Cable routing for server models with eight 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, one 16i HBA/RAID adapter, and one NVMe 1611-8P switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on backplane 1	C2 and C3 connectors on the NVMe 1611–8P switch adapter installed in PCIe slot 1
<b>4</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C2C3</li> <li>• Gen 4: C1</li> </ul>
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>6</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0 and C1 connectors on the NVMe 1611–8P switch adapter installed in PCIe slot 1

**Server model: eight 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, one 16i HBA/RAID adapter, one NVMe switch adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).
  - Cable **2/5**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **7**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

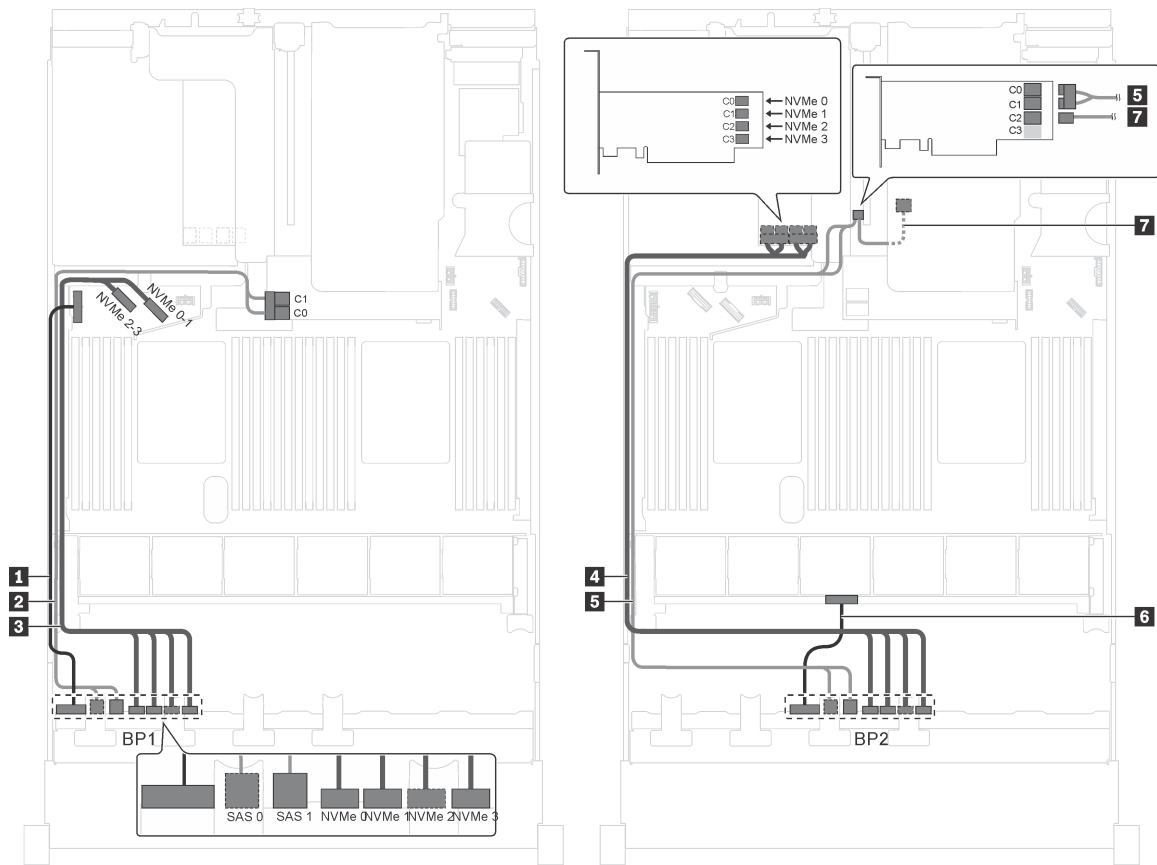


Figure 50. Cable routing for server models with eight 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, one 16i HBA/RAID adapter, and one NVMe switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 5
<b>5</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>

Cable	From	To
<b>6</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>7</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C2</li> <li>• Gen 4: C1</li> </ul>

**Server model: eight 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, three 8i HBA/RAID adapters, one NVMe switch adapter**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i HBA/RAID adapter in PCIe slot 6 might not be available on your server.
- Depending on the model, if the NVMe switch adapter is installed in PCIe slot 1, route the NVMe signal cable along the right side of the chassis.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2/5**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **7**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

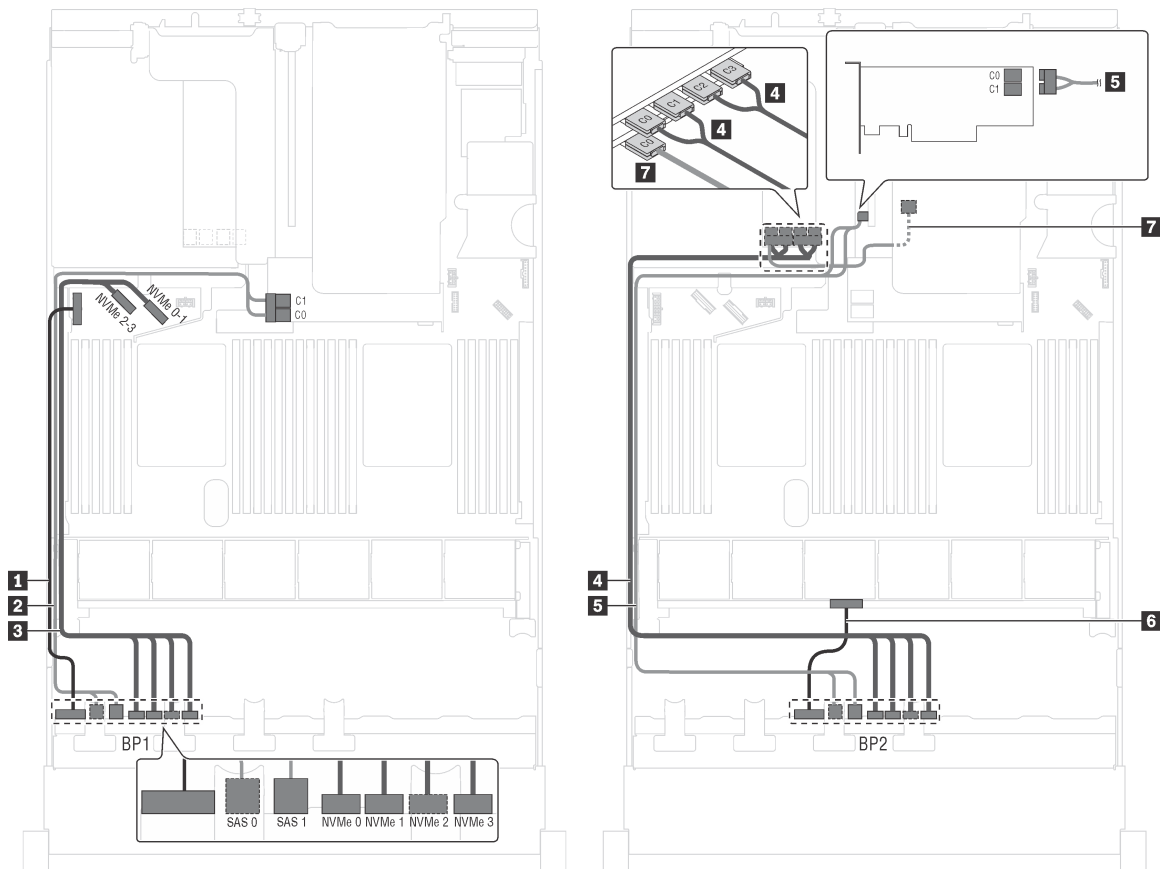


Figure 51. Cable routing for server models with eight 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, three 8i HBA/RAID adapters, and one NVMe switch adapter



<b>Cable</b>	<b>From</b>	<b>To</b>
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 5
<b>5</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	8i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>6</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>7</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	8i HBA/RAID adapter installed in PCIe slot 6 <ul style="list-style-type: none"> <li>• Gen 3: C0</li> <li>• Gen 4: C0</li> </ul>

**Server model: eight 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 24i RAID adapter, one NVMe switch adapter**

**Note:** The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the cable **7** might not be available on your server.

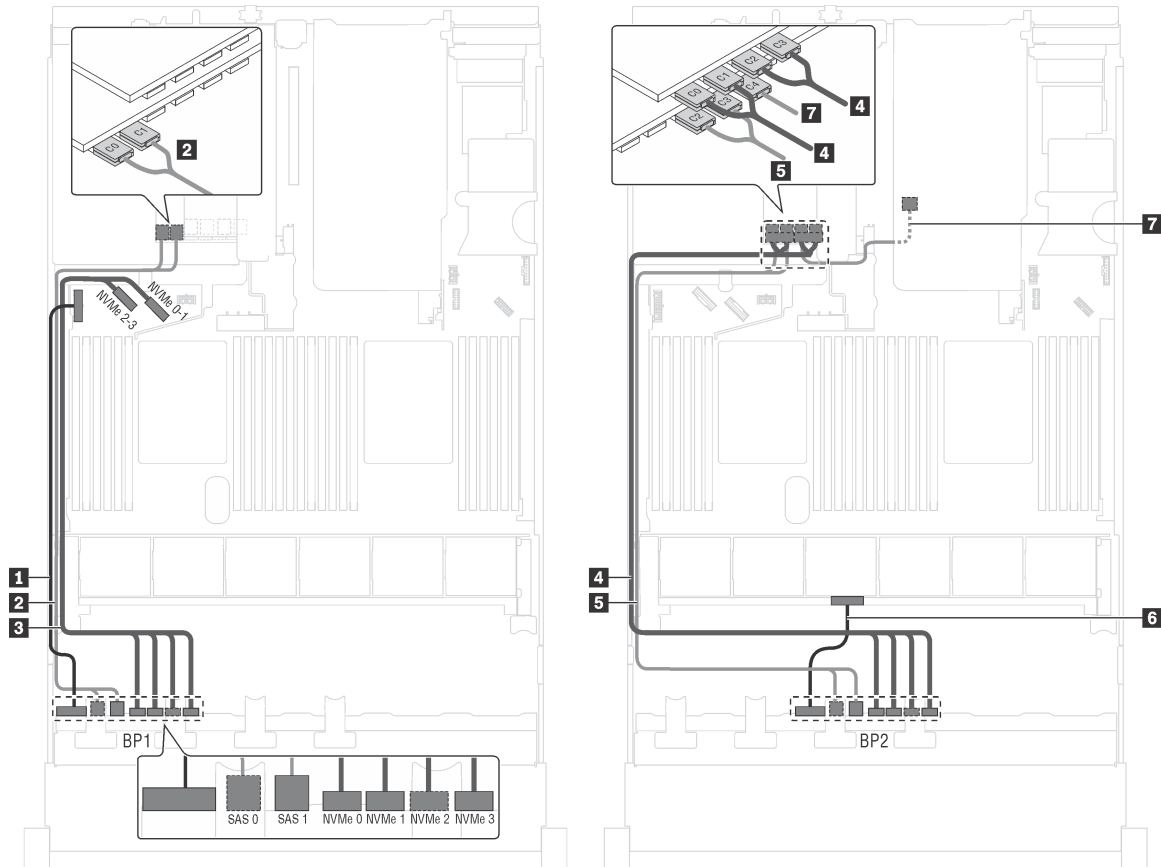


Figure 52. Cable routing for server models with eight 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 24i RAID adapter, and one NVMe switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter installed in PCIe slot 6
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 5
<b>5</b> SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter installed in PCIe slot 6

Cable	From	To
<b>6</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>7</b> SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C4 connector on the 24i RAID adapter installed in PCIe slot 6

**Server model: eight 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 32i RAID adapter, one NVMe switch adapter**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the cable **7** might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*Ensure you use Gen 4 SAS signal cable:
  - Cable **2/4**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **6**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

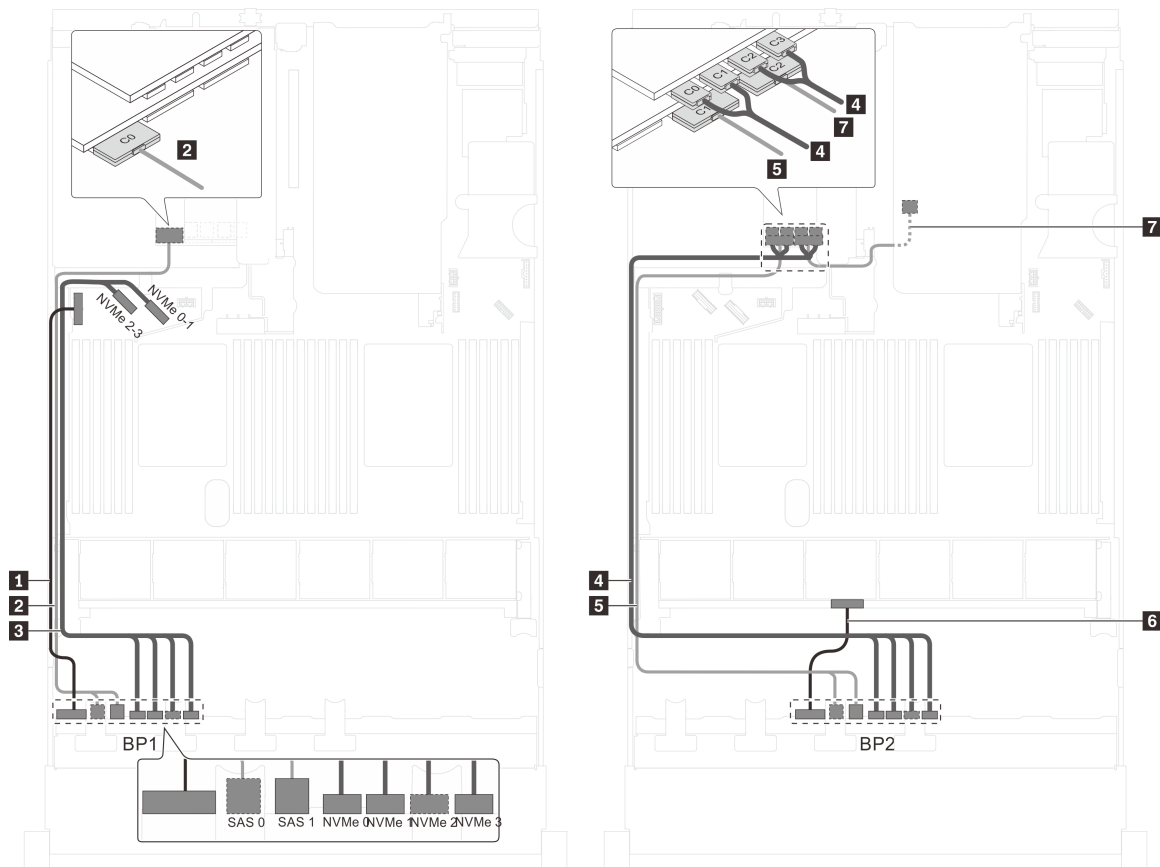


Figure 53. Cable routing for server models with eight 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 32i RAID adapter, and one NVMe switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	C0 connector on the 32i RAID adapter on PCIe slot 6
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 5
<b>5</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	C1 connector on the 32i RAID adapter on PCIe slot 6
<b>6</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>7</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	C2 connector on the 32i RAID adapter on PCIe slot 6

**Server model: sixteen 2.5-inch NVMe drives, two NVMe 810-4P switch adapters, two NVMe 1610-4P switch adapters**

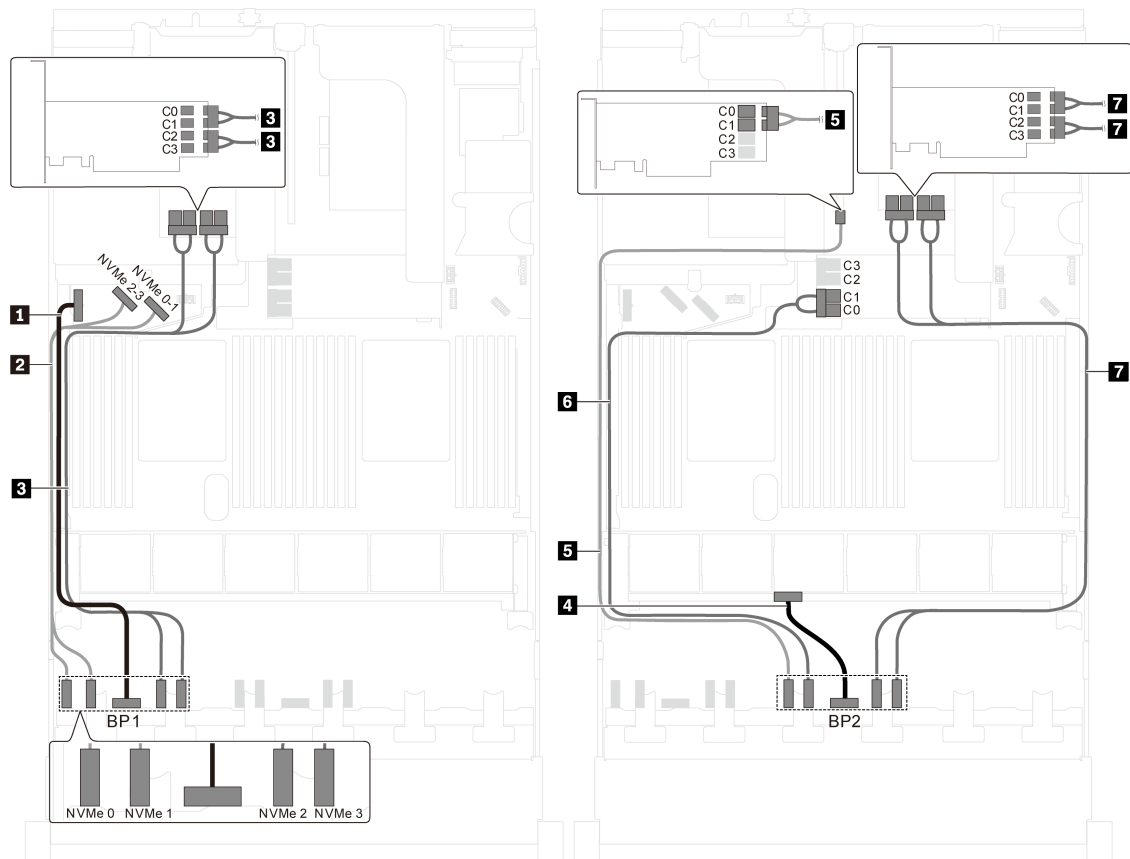


Figure 54. Cable routing for server models with sixteen 2.5-inch NVMe drives, two NVMe 810-4P switch adapters, and two NVMe 1610-4P switch adapters

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> NVMe signal cable for front backplane 1	NVMe 0 and NVMe 1 connectors on front backplane 1	NVMe 2–3 and NVMe 0–1 connectors on the system board
<b>3</b> NVMe signal cable for front backplane 1	NVMe 2 and NVMe 3 connectors on front backplane 1	C0, C1, C2, and C3 connectors on the NVMe 1610-4P switch adapter installed in PCIe slot 6
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> NVMe signal cable for front backplane 2	NVMe 0 connector on front backplane 2	C0 and C1 connector on the NVMe 810-4P switch adapter installed in PCIe slot 4
<b>6</b> NVMe signal cable for front backplane 2	NVMe 1 connector on front backplane 2	C0 and C1 connector on the NVMe 810-4P switch adapter installed in RAID adapter slot on the system board
<b>7</b> NVMe signal cable for front backplane 2	NVMe 2 and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe 1610-4P switch adapter installed in PCIe slot 1

**Server model: sixteen 2.5-inch NVMe drives, two NVMe 1611-8P switch adapters**

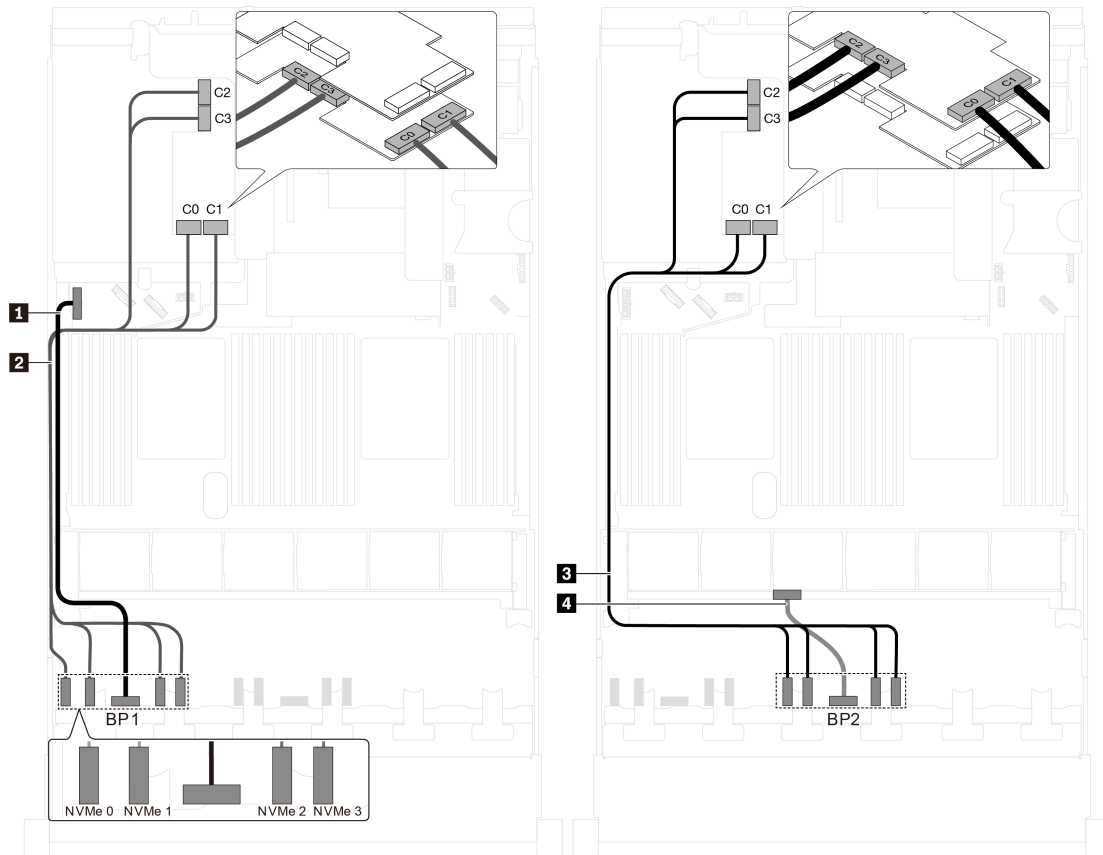


Figure 55. Cable routing for server models with sixteen 2.5-inch NVMe drives, and two NVMe 1611-8P switch adapters

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	C0, C1, C2, and C3 connectors on the NVMe 1611-8P switch adapter installed in PCIe slot 6
<b>3</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe 1611-8P switch adapter installed in PCIe slot 5
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

## Server models with twenty 2.5-inch drives

Use this section to understand the cable routing for server models with twenty 2.5-inch drives.

### Server model: twenty 2.5-inch NVMe drives, two NVMe 810-4P switch adapters, three NVMe 1610-4P switch adapters

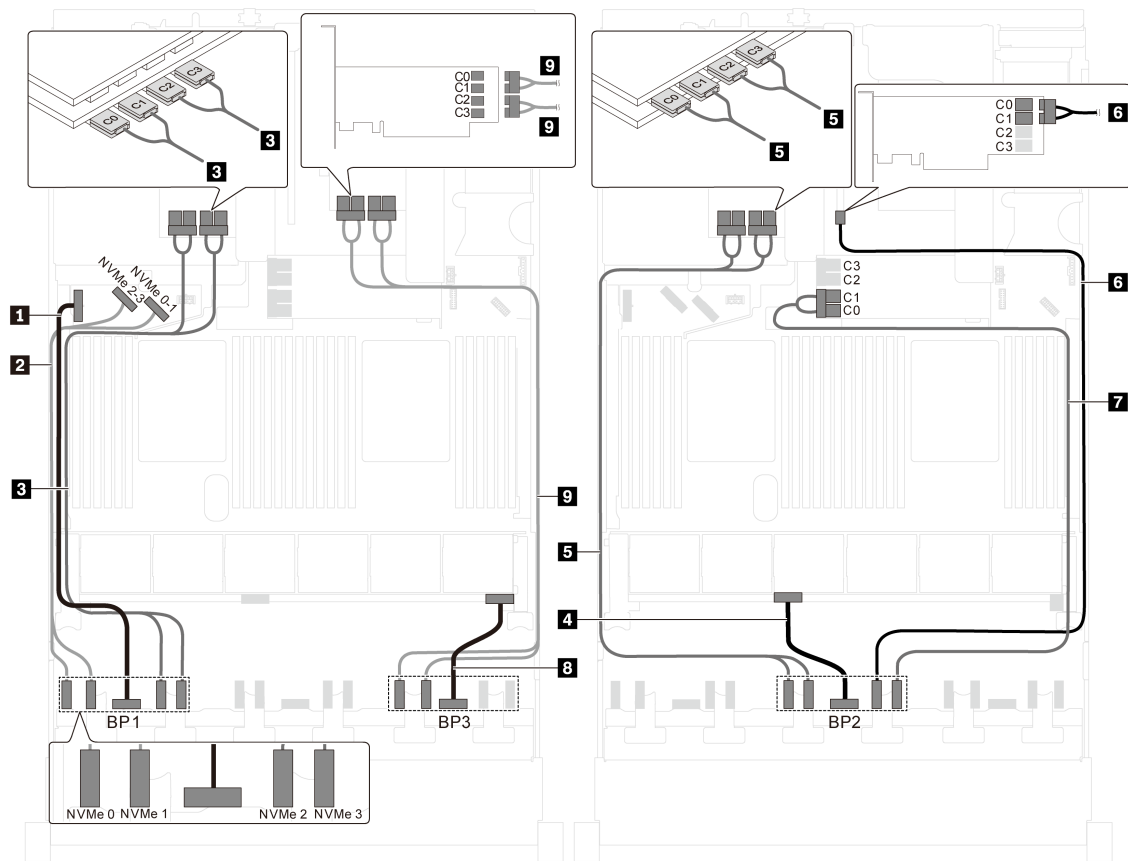


Figure 56. Cable routing for server models with twenty 2.5-inch NVMe drives, two NVMe 810-4P switch adapters, and three NVMe 1610-4P switch adapters

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> NVMe signal cable for front backplane 1	NVMe 0 and NVMe 1 connectors on front backplane 1	NVMe 2–3 and NVMe 0–1 connectors on the system board
<b>3</b> NVMe signal cable for front backplane 1	NVMe 2 and NVMe 3 connectors on front backplane 1	C0, C1, C2, and C3 connectors on the NVMe 1610-4P switch adapter installed in PCIe slot 6
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> NVMe signal cable for front backplane 2	NVMe 0 and NVMe 1 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe 1610-4P switch adapter installed in PCIe slot 5
<b>6</b> NVMe signal cable for front backplane 2	NVMe 2 connector on front backplane 2	C0 and C1 connectors on the NVMe 810-4P switch adapter installed in PCIe slot 4
<b>7</b> NVMe signal cable for front backplane 2	NVMe 3 connector on front backplane 2	C0 and C1 connectors on the NVMe 810-4P switch adapter installed in RAID adapter slot on the system board
<b>8</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>9</b> NVMe signal cable for front backplane 3	NVMe 0 and NVMe 1 connectors on front backplane 3	C0, C1, C2, and C3 connectors on the NVMe 1610-4P switch adapter installed in PCIe slot 1

## Server models with twenty-four 2.5-inch drives

Use this section to understand the cable routing for server models with twenty-four 2.5-inch drives.

### Server model: twenty-four 2.5-inch SAS/SATA drives, one 8i HBA/RAID adapter, one 16i HBA/RAID adapter

#### Notes:

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

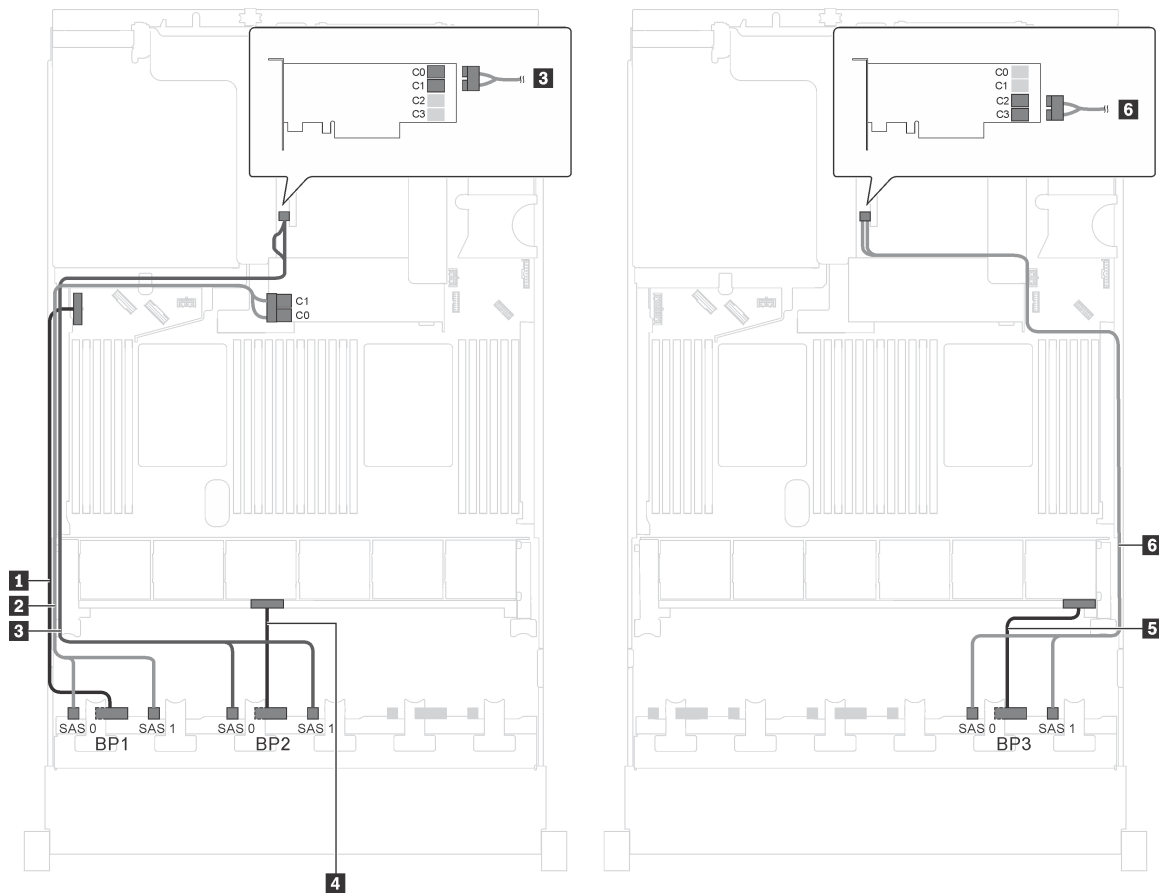


Figure 57. Cable routing for server models with twenty-four 2.5-inch SAS/SATA drives, one 8i HBA/RAID adapter, and one 16i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>Gen 3: C0C1</li> <li>Gen 4: C0</li> </ul>
<b>3</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>Gen 3: C0C1</li> <li>Gen 4: C0</li> </ul>
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>6</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>Gen 3: C2C3</li> <li>Gen 4: C1</li> </ul>



**Server model: twenty-four 2.5-inch SAS/SATA drives, one 24i RAID adapter**

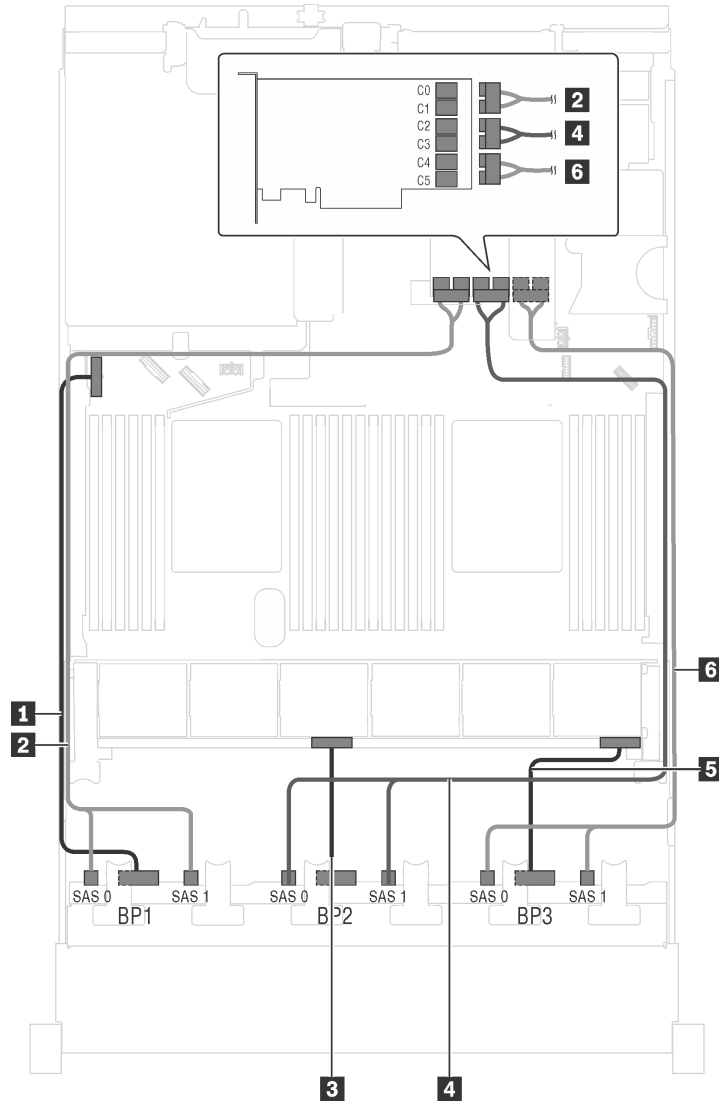


Figure 58. Cable routing for server models with twenty-four 2.5-inch SAS/SATA drives and one 24i RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter on riser 1 assembly
<b>3</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>4</b> SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter on riser 1 assembly
<b>5</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>6</b> SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C4 and C5 connectors on the 24i RAID adapter on riser 1 assembly

**Server model: twenty-four 2.5-inch SAS/SATA drives, one 32i RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner RAID adapter slot.
- \*Ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

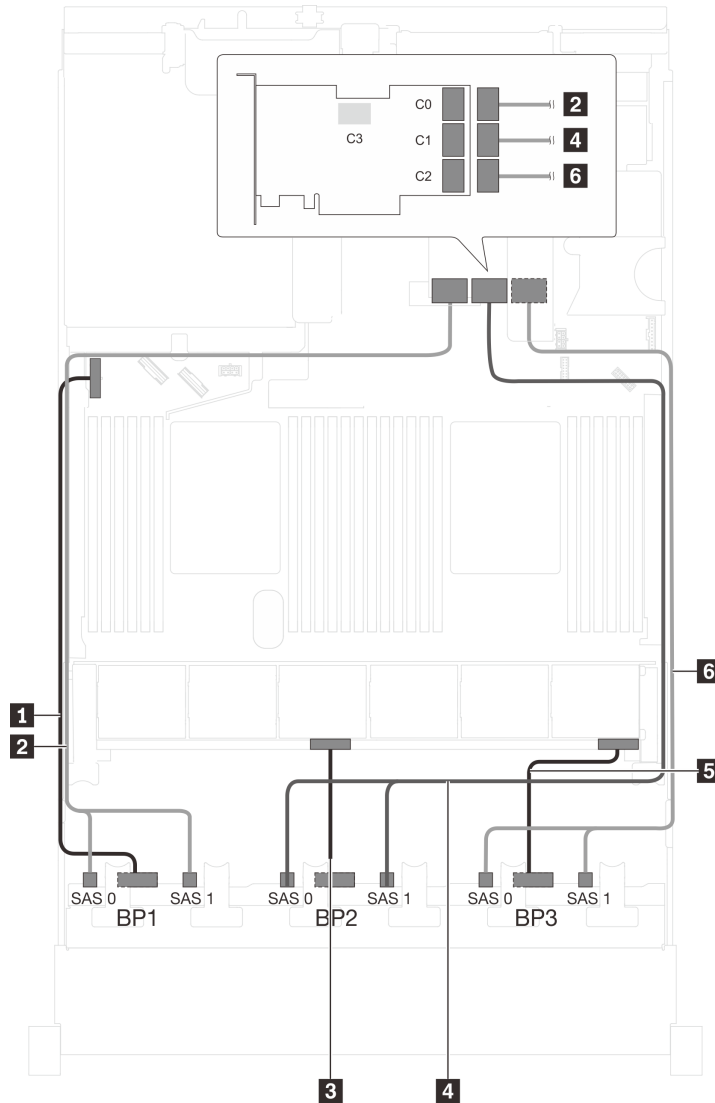


Figure 59. Cable routing for server models with twenty-four 2.5-inch SAS/SATA drives and one 32i RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	C0 connector on the 32i RAID adapter on riser 1 assembly
<b>3</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

Cable	From	To
<b>4</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	C1 connectors on the 32i RAID adapter on riser 1 assembly
<b>5</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>6</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	C2 connector on the 32i RAID adapter on riser 1 assembly

**Server model: twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, four 8i HBA/RAID adapters**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i HBA/RAID adapter in PCIe slot 6 might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **6**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **7**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

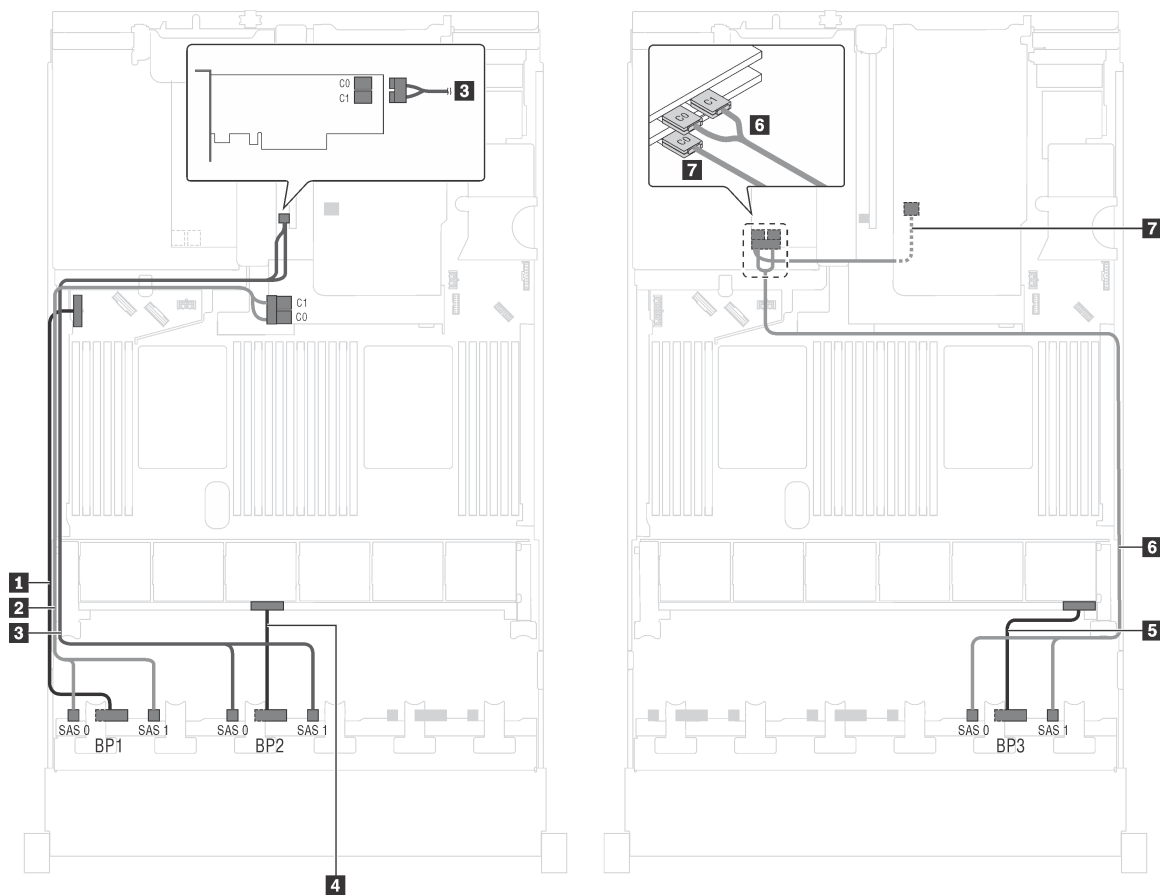


Figure 60. Cable routing for server models with twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and four 8i HBA/RAID adapters

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	8i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>6</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	8i HBA/RAID adapter on PCIe slot 5 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>7</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	8i HBA/RAID adapter installed in PCIe slot 6 <ul style="list-style-type: none"> <li>• Gen 3: C0</li> <li>• Gen 4: C0</li> </ul>

**Server model: twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, two 8i HBA/RAID adapters, one 16i HBA/RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2/3/6**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **7**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

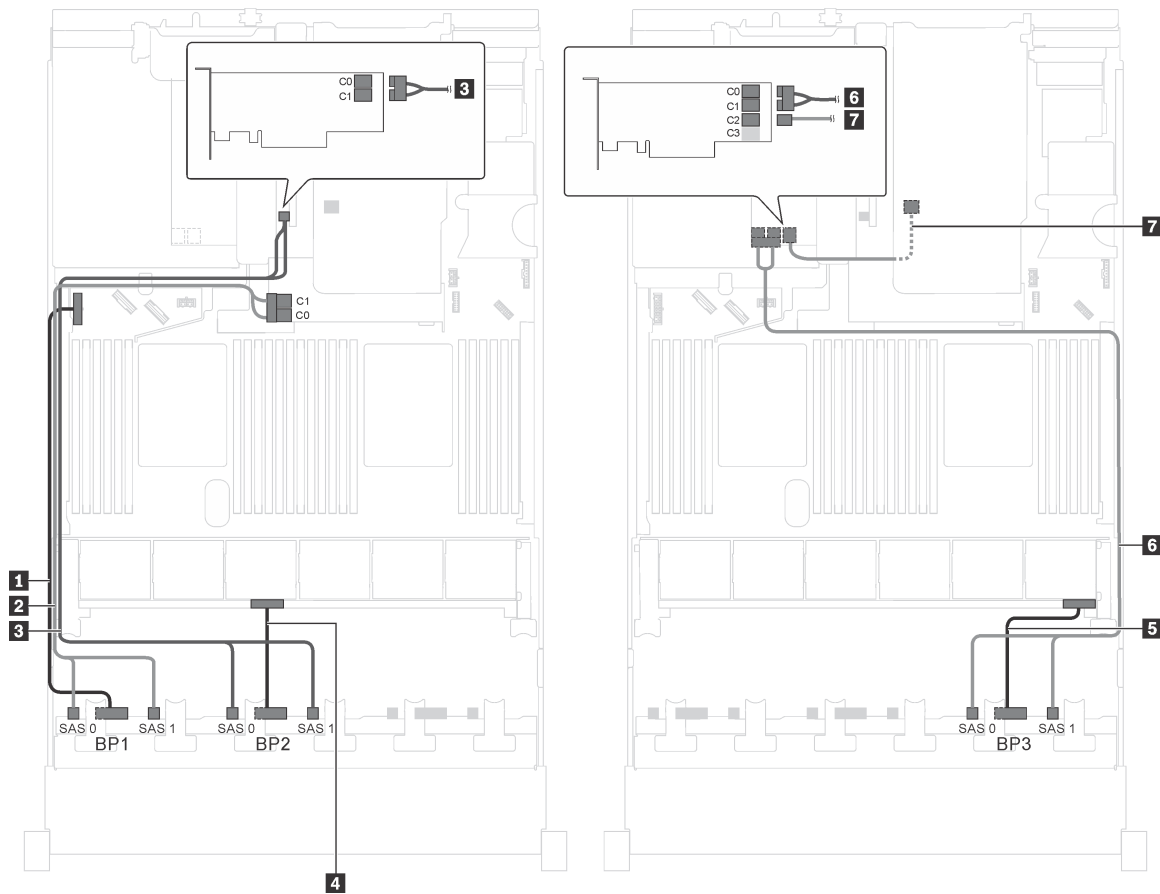


Figure 61. Cable routing for server models with twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, two 8i HBA/RAID adapters, and one 16i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	8i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board

Cable	From	To
<b>6</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	16i HBA/RAID adapter on PCIe slot 5 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>7</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	16i HBA/RAID adapter on PCIe slot 5 <ul style="list-style-type: none"> <li>• Gen 3: C2</li> <li>• Gen 4: C1</li> </ul>

**Server model: twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, one 24i RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit).

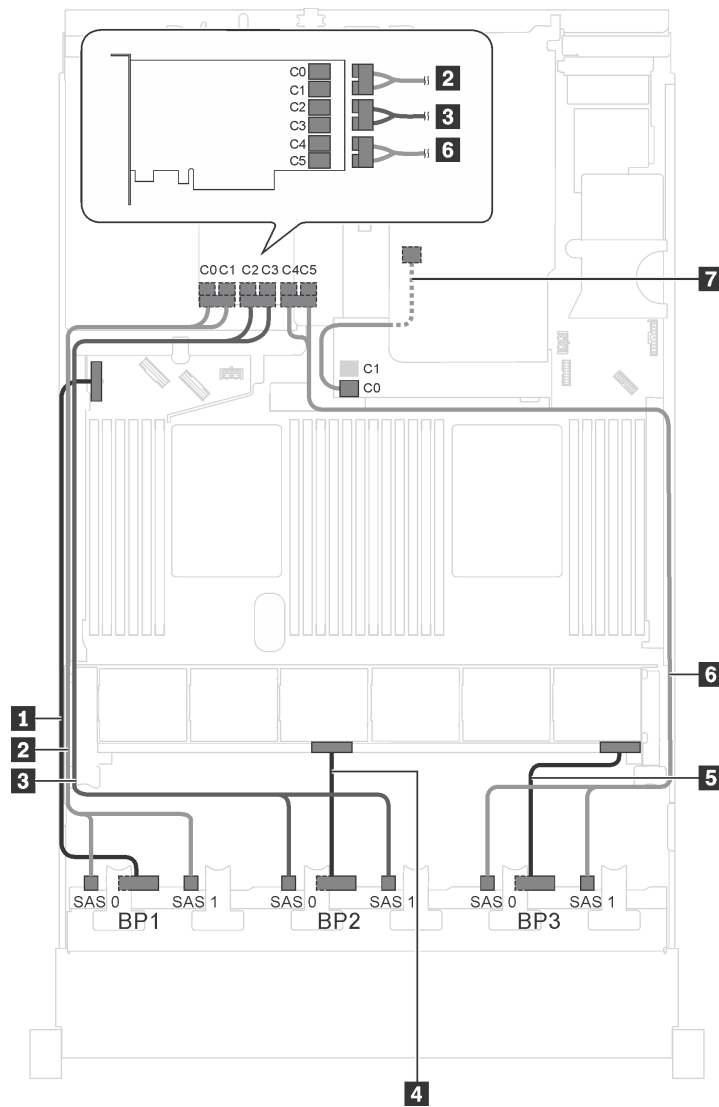


Figure 62. Cable routing for server models with twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, and one 24i RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter installed in PCIe slot 5
<b>3</b> SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter installed in PCIe slot 5
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board

Cable	From	To
<b>6</b> SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C4 and C5 connectors on the 24i RAID adapter installed in PCIe slot 5
<b>7</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0</li> <li>• Gen 4: C0</li> </ul>

**Server model: twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, one 32i RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2/3/6**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **7**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit



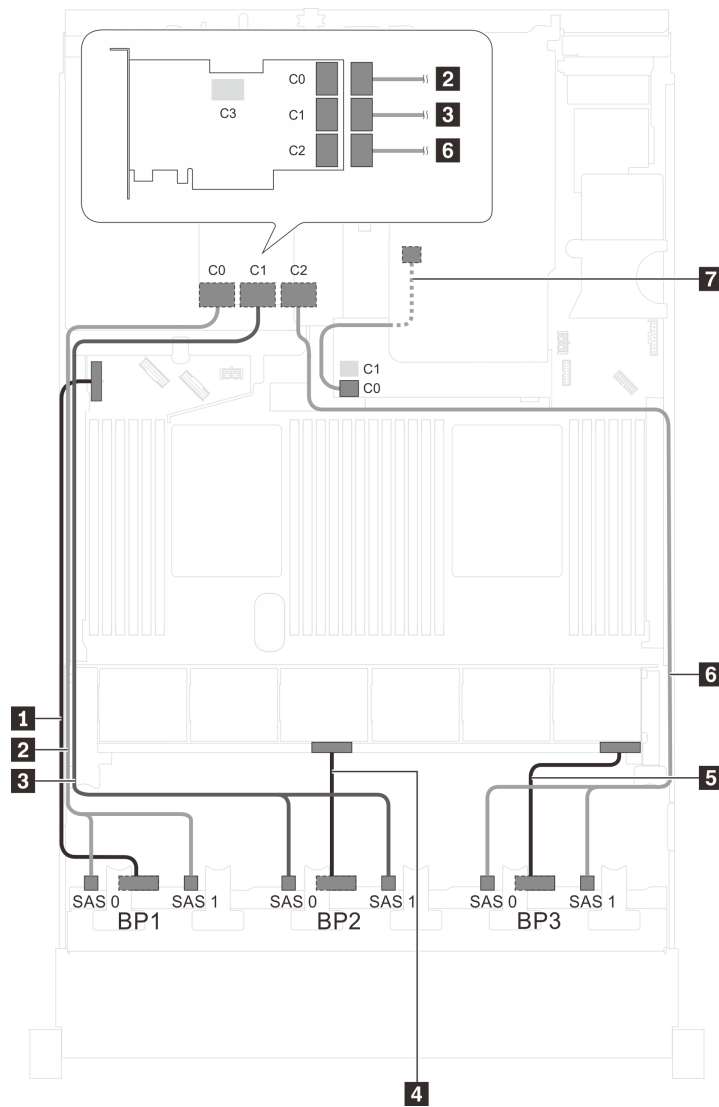


Figure 63. Cable routing for server models with twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, and one 32i RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	C0 connector on the 32i RAID adapter on PCIe slot 5
<b>3</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	C1 connector on the 32i RAID adapter on PCIe slot 5
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board

Cable	From	To
<b>6</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	C2 connector on the 32i RAID adapter on PCIe slot 5
<b>7</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0</li> <li>• Gen 4: C0</li> </ul>

**Server model: twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, two 16i HBA/RAID adapters**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2/3/6**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **7**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

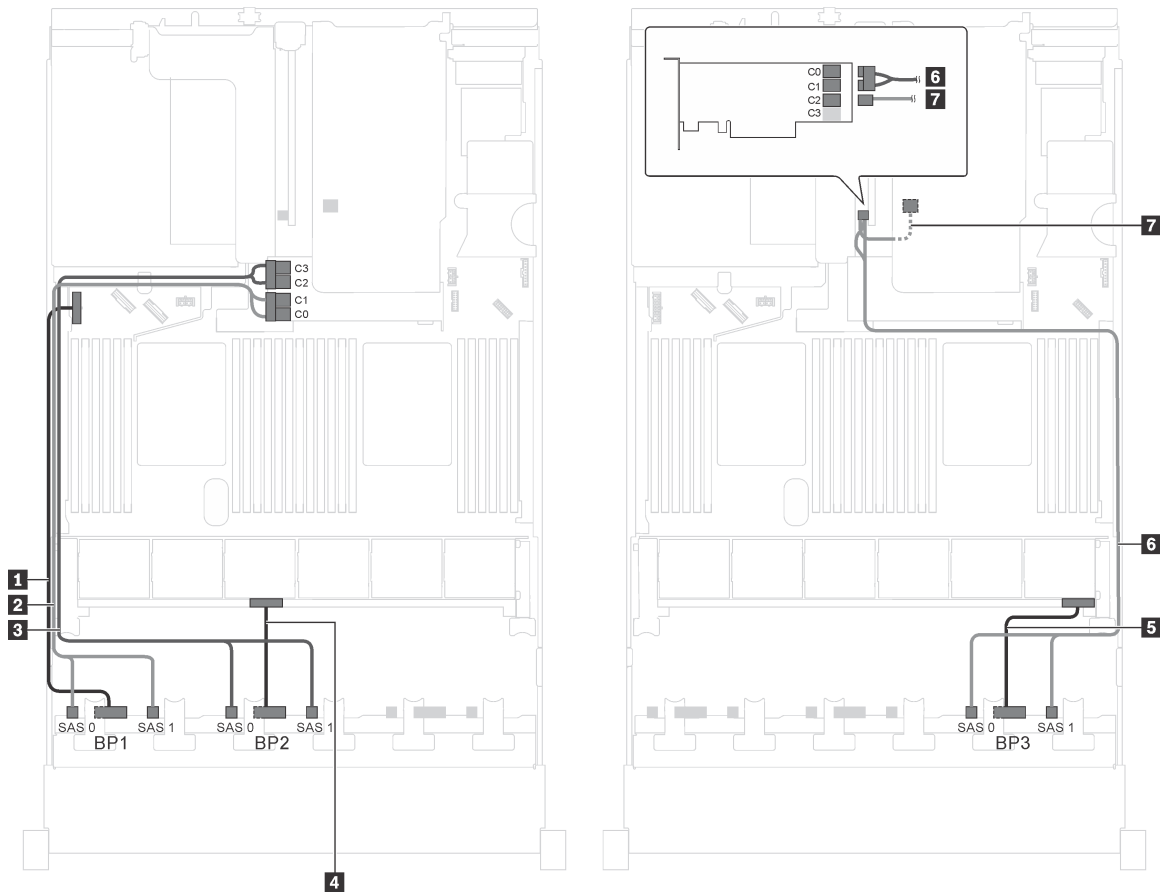


Figure 64. Cable routing for server models with twenty-four 2.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and two 16i HBA/RAID adapters

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C2C3</li> <li>• Gen 4: C1</li> </ul>
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>6</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>7</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C2</li> <li>• Gen 4: C1</li> </ul>

**Server model: twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, one 8i HBA/RAID adapter, one 16i HBA/RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

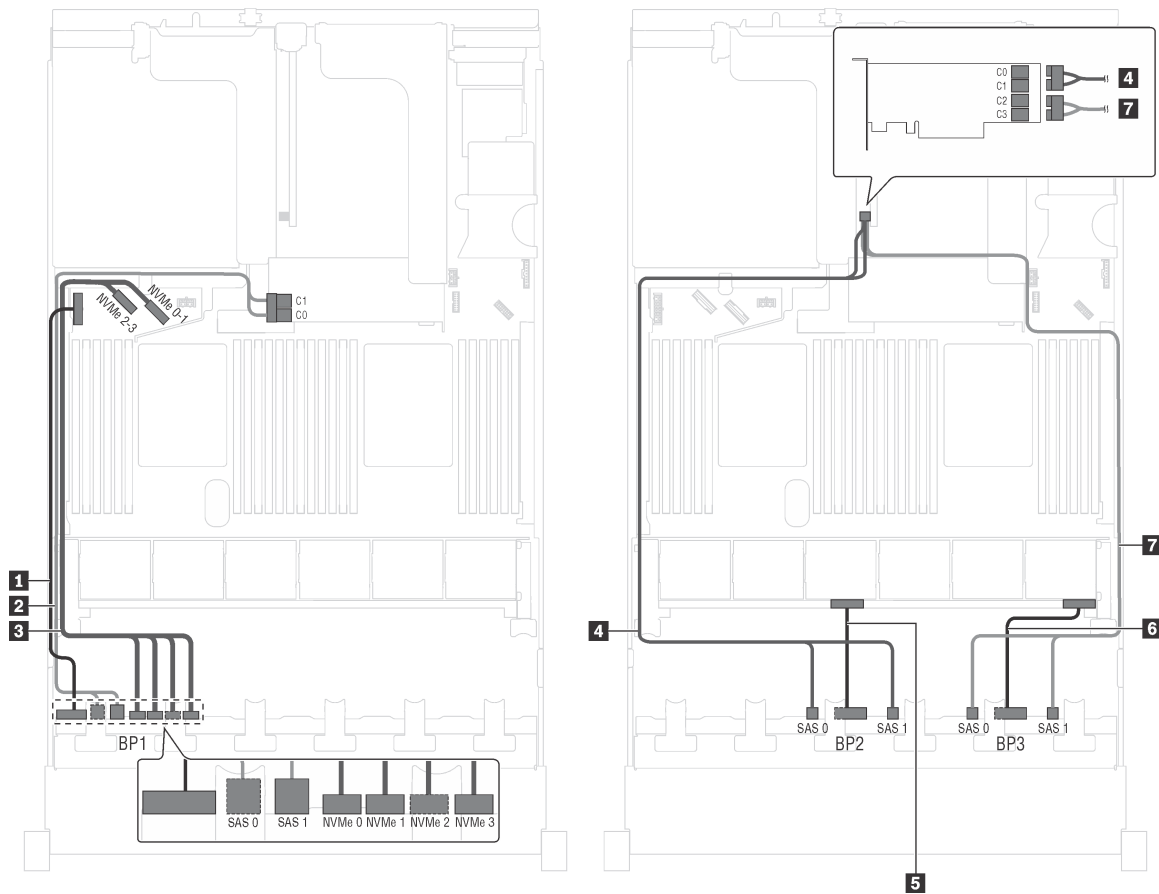


Figure 65. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, one 8i HBA/RAID adapter, and one 16i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>Gen 3: C0C1</li> <li>Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>Gen 3: C0C1</li> <li>Gen 4: C0</li> </ul>
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

Cable	From	To
<b>6</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>7</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C2C3</li> <li>• Gen 4: C1</li> </ul>

**Server model: twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, one 24i RAID adapter**

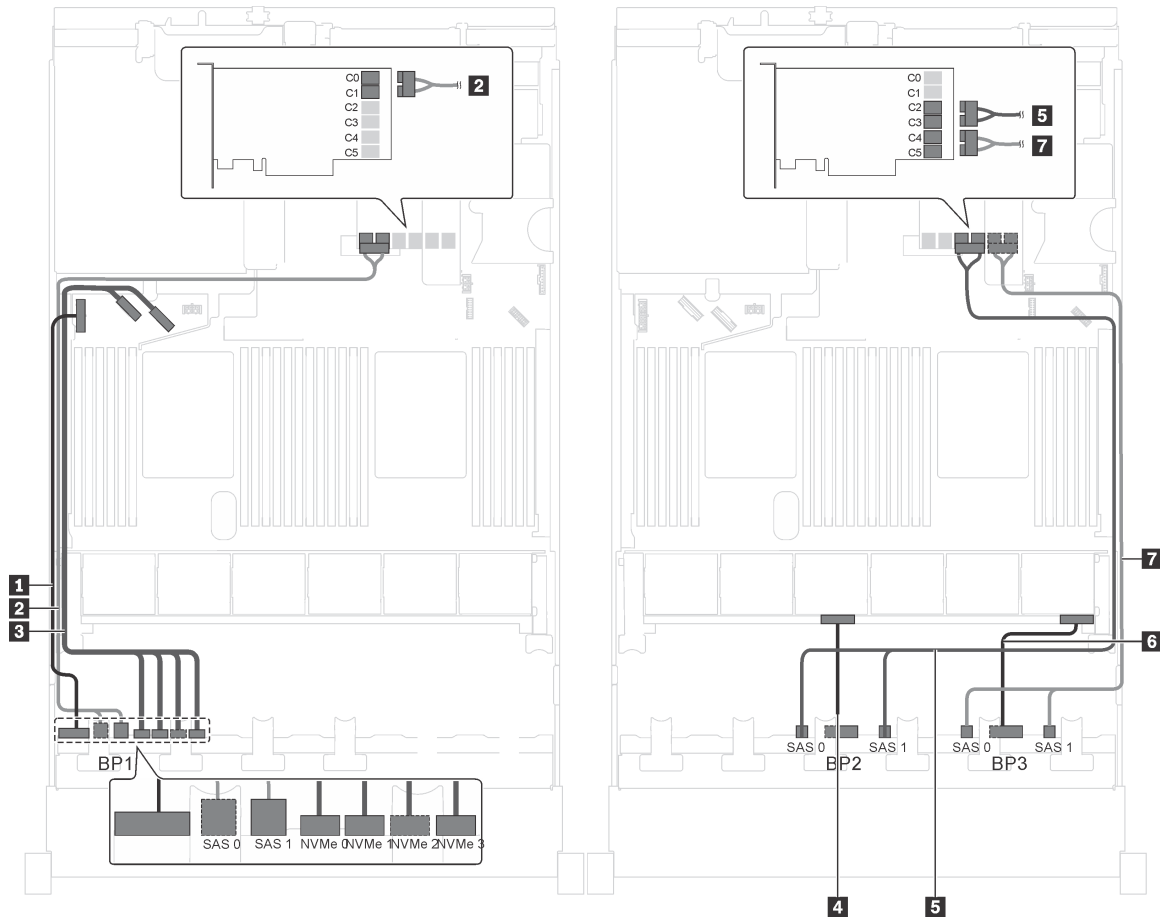


Figure 66. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, and one 24i RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter on riser 1 assembly
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board

Cable	From	To
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter on riser 1 assembly
<b>6</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>7</b> SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C4 and C5 connectors on the 24i RAID adapter on riser 1 assembly

**Server model: twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, one 32i RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*Ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

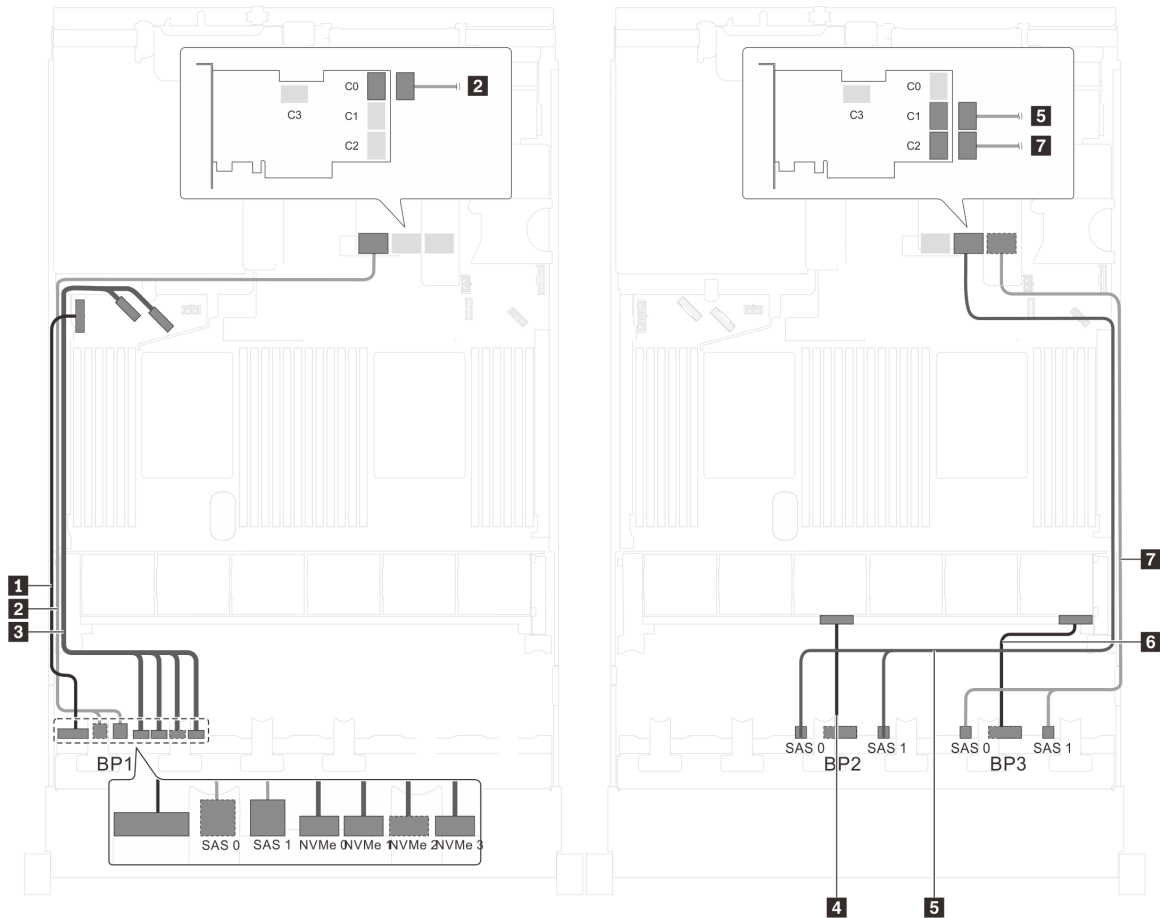


Figure 67. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, and one 32i RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	C0 connector on the 32i RAID adapter on riser 1 assembly
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	C1 connector on the 32i RAID adapter on riser 1 assembly
<b>6</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>7</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	C2 connector on the 32i RAID adapter on riser 1 assembly

**Server model: twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, four 8i HBA/RAID adapters**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i HBA/RAID adapter in PCIe slot 6 might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).
  - Cable **2** / Cable **4** / Cable **7**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **8**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

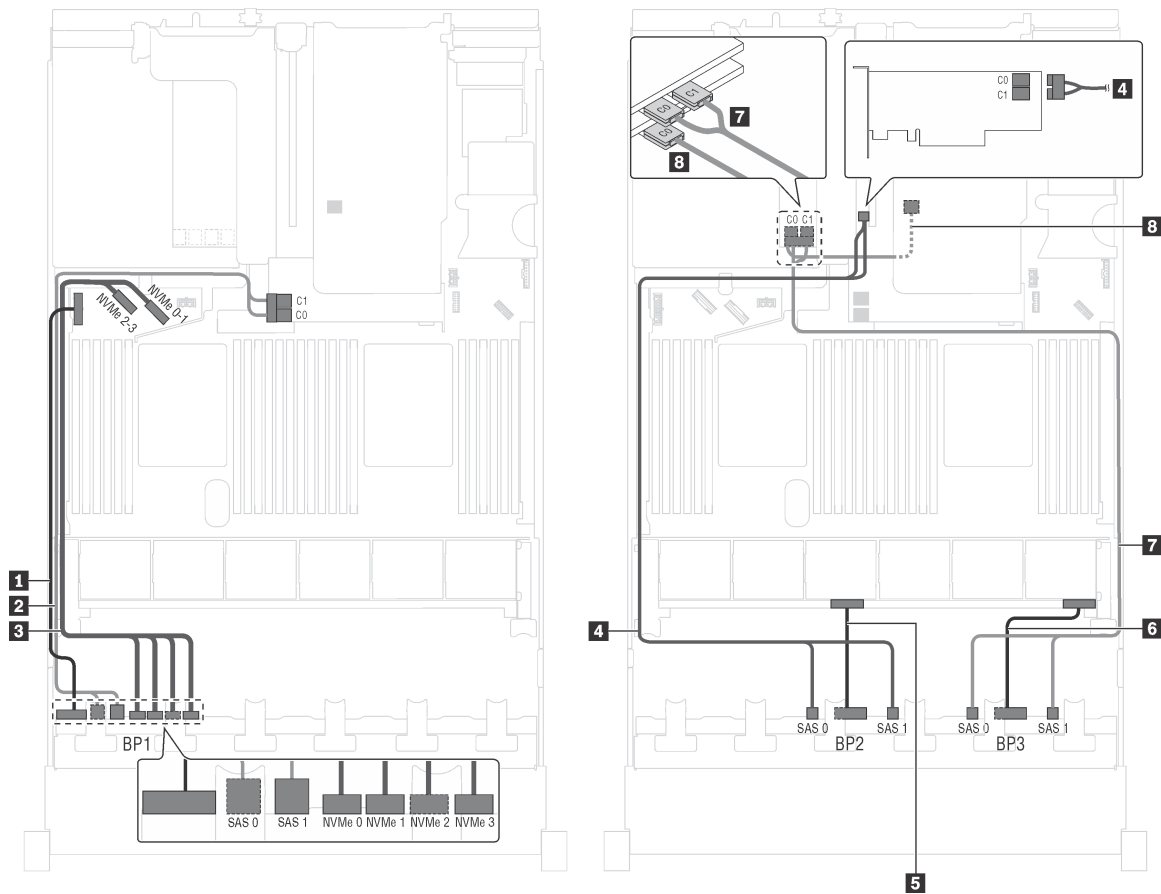


Figure 68. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, and four 8i HBA/RAID adapters

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>Gen 3: C0C1</li> <li>Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	8i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>Gen 3: C0C1</li> <li>Gen 4: C0</li> </ul>
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>6</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board



Cable	From	To
<b>7</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	8i HBA/RAID adapter on PCIe slot 5 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>8</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	8i HBA/RAID adapter installed in PCIe slot 6 <ul style="list-style-type: none"> <li>• Gen 3: C0</li> <li>• Gen 4: C0</li> </ul>

**Server model: twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, two 8i HBA/RAID adapters, one 16i HBA/RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2/4/7**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **8**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

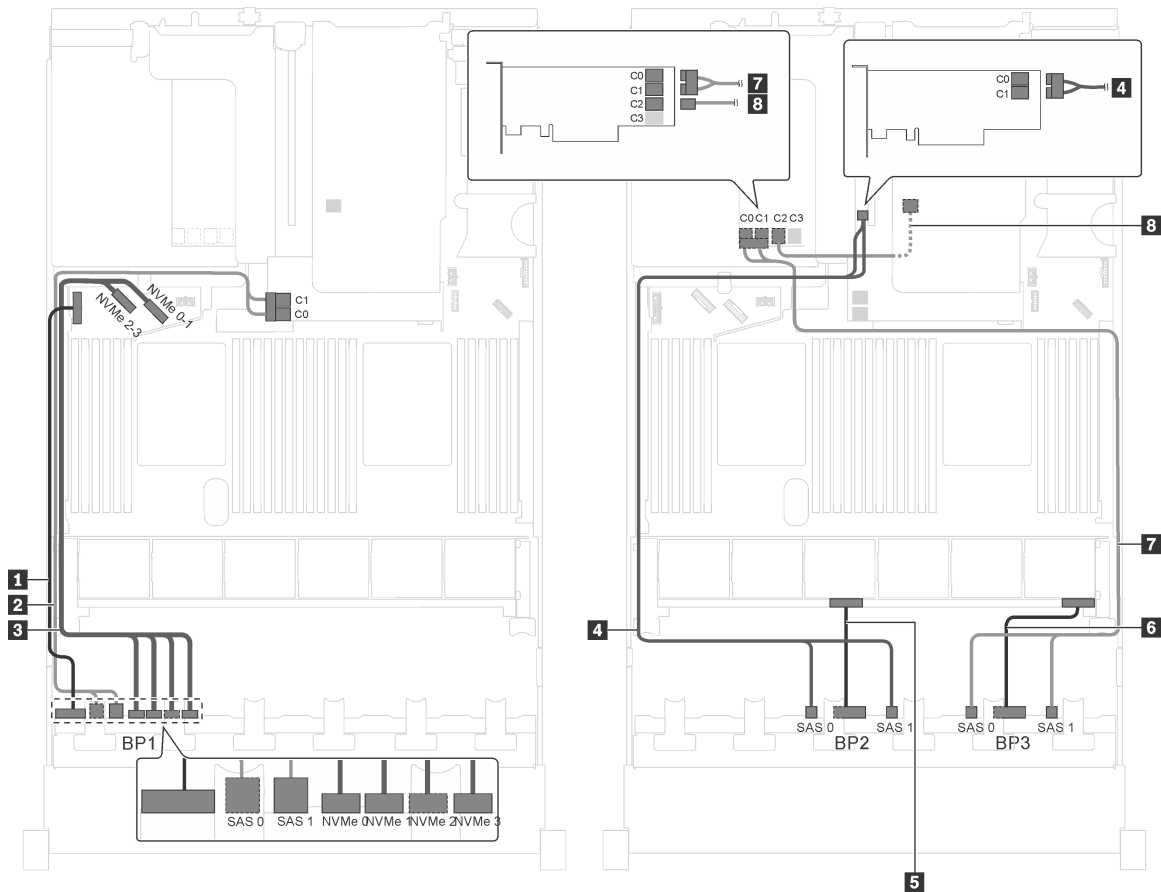


Figure 69. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, two 8i HBA/RAID adapters, and one 16i HBA/RAID adapter

<b>Cable</b>	<b>From</b>	<b>To</b>
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	8i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>6</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>7</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	16i HBA/RAID adapter on PCIe slot 5 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>8</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	16i HBA/RAID adapter on PCIe slot 5 <ul style="list-style-type: none"> <li>• Gen 3: C2</li> <li>• Gen 4: C1</li> </ul>

**Server model: twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, one 24i RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit).

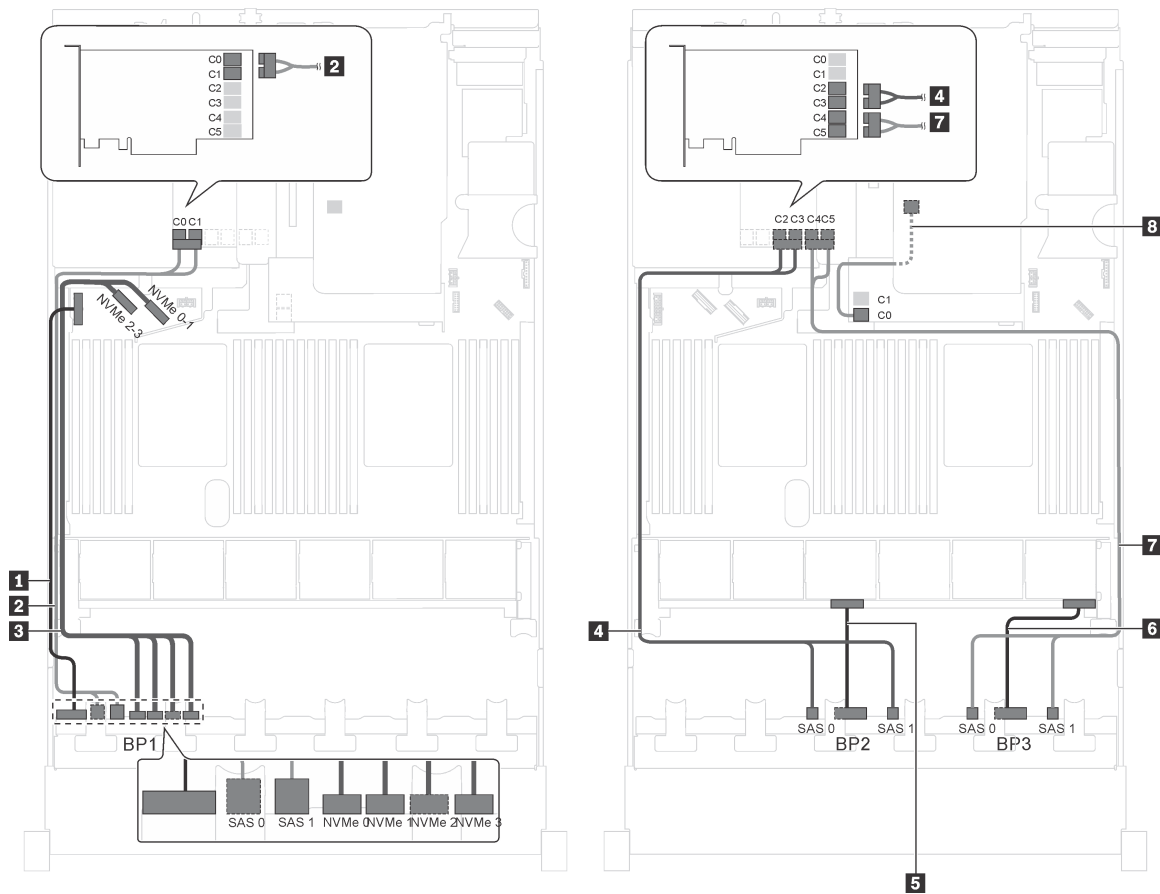


Figure 70. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, and one 24i RAID adapter

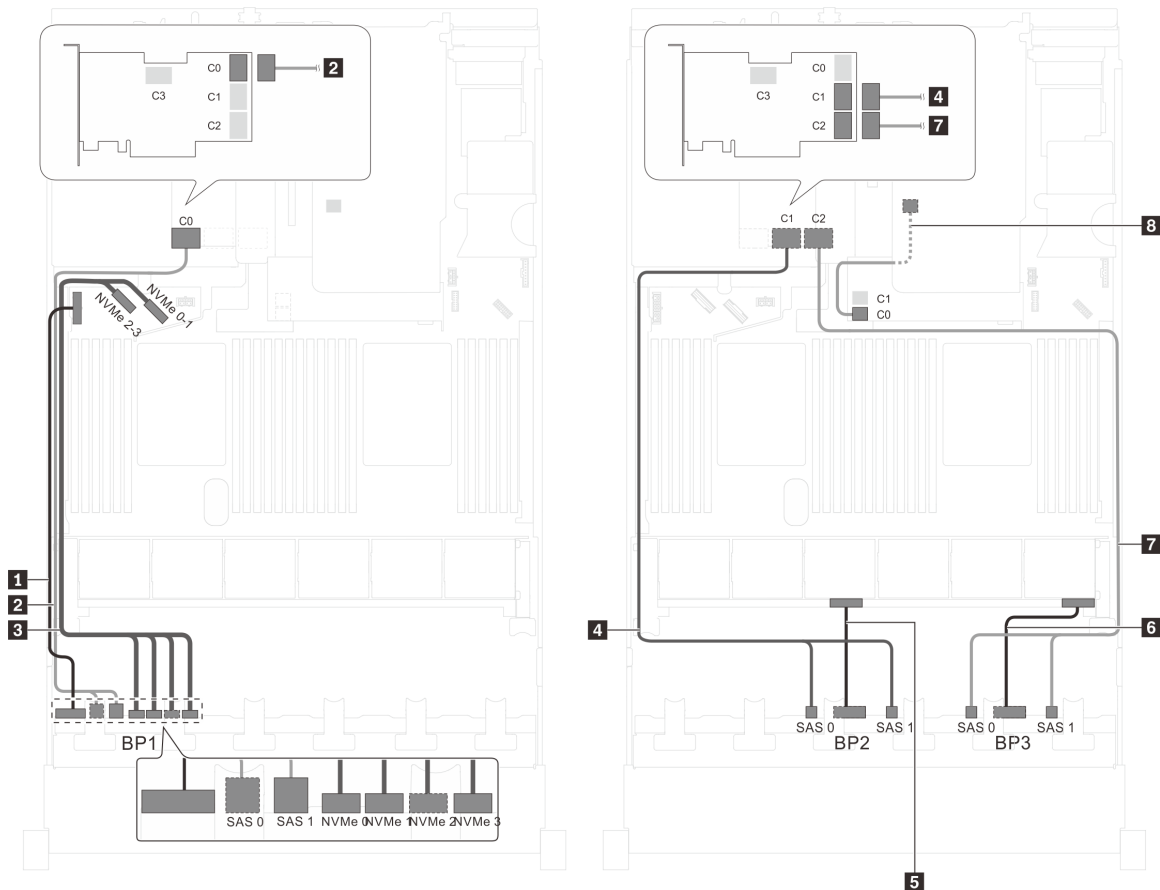
Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter installed in PCIe slot 5
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter installed in PCIe slot 5
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>6</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board

Cable	From	To
<b>7</b> SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C4 and C5 connectors on the 24i RAID adapter installed in PCIe slot 5
<b>8</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0</li> <li>• Gen 4: C0</li> </ul>

**Server model: twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, one 32i RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2/4/7**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **8**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit



*Figure 71. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, and one 32i RAID adapter*

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	C0 connector on the 32i RAID adapter on PCIe slot 5
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	C1 connectors on the 32i RAID adapter on PCIe slot 5
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>6</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>7</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	C2 connectors on the 32i RAID adapter on PCIe slot 5
<b>8</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0</li> <li>• Gen 4: C0</li> </ul>

**Server model: twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, two 16i HBA/RAID adapters**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2/4/7**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable 8: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

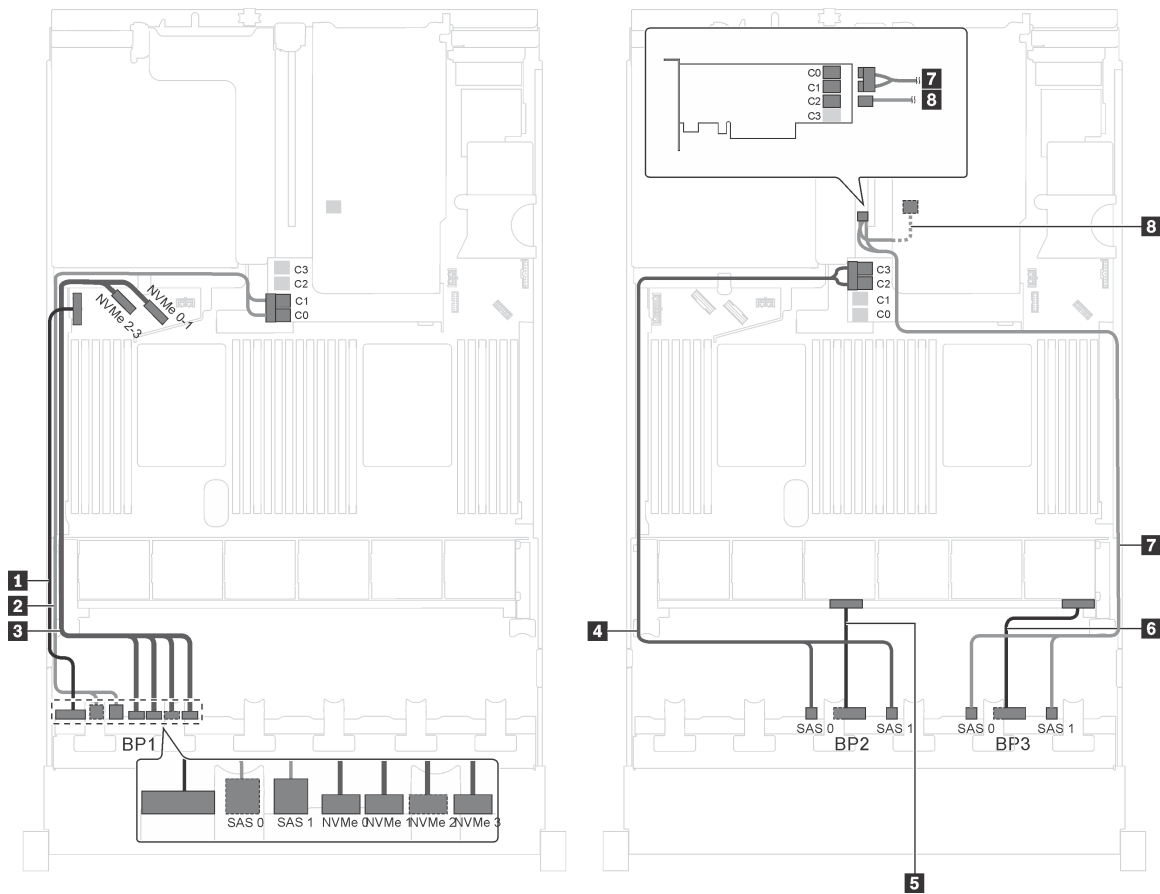


Figure 72. Cable routing for server models with twenty 2.5-inch SAS/SATA drives, four 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, and two 16i HBA/RAID adapters

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C2C3</li> <li>• Gen 4: C1</li> </ul>
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>6</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board

Cable	From	To
<b>7</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>8</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C2</li> <li>• Gen 4: C1</li> </ul>

**Server model: sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, one 24i RAID adapter, one NVMe switch adapter**

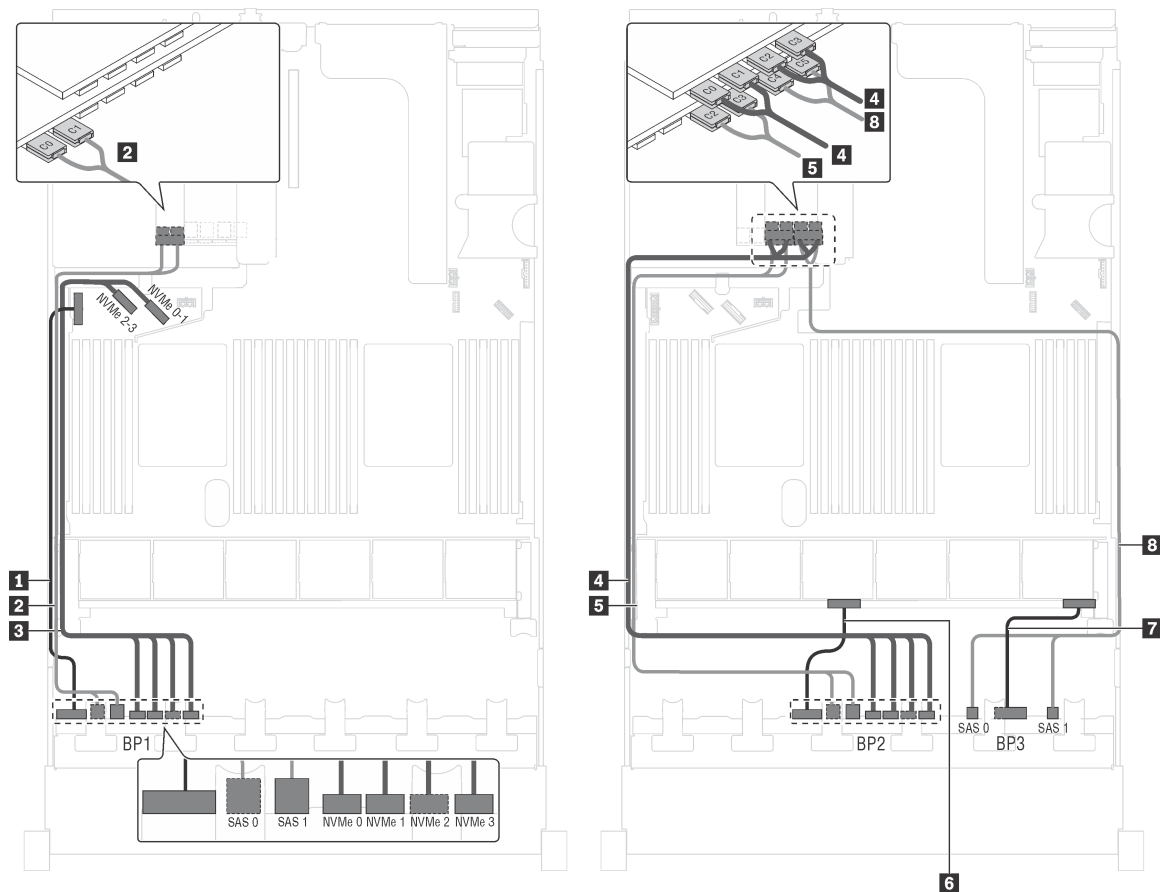


Figure 73. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, one 24i RAID adapter, and one NVMe switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter on an available PCIe slot
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board

<b>Cable</b>	<b>From</b>	<b>To</b>
<b>4</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter on an available PCIe slot
<b>5</b> SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter on an available PCIe slot
<b>6</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>7</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>8</b> SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C4 and C5 connectors on the 24i RAID adapter on an available PCIe slot

**Server model: sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, one 32i RAID adapter, one NVMe switch adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*Ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).



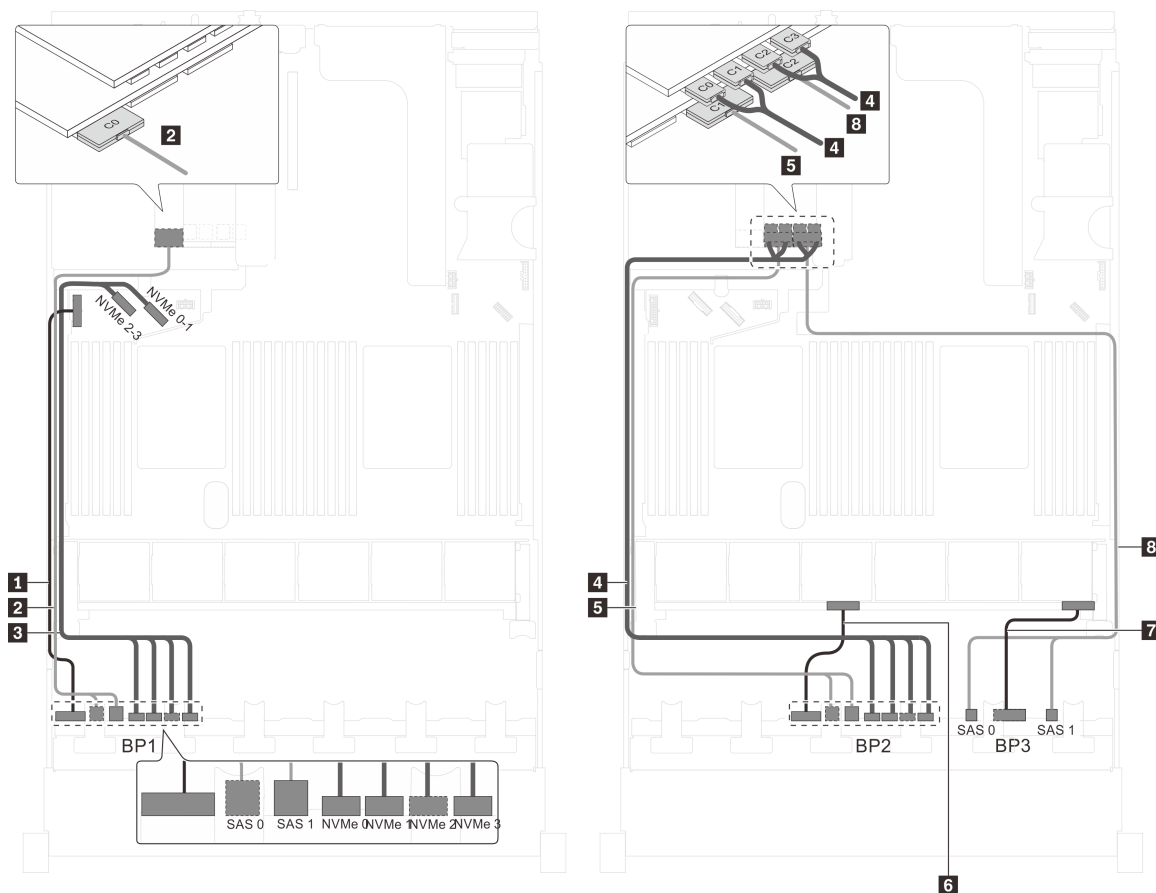


Figure 74. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, one 32i RAID adapter, and one NVMe switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	C0 connector on the 32i RAID adapter on an available PCIe slot
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter on an available PCIe slot
<b>5</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	C1 connector on the 32i RAID adapter on an available PCIe slot
<b>6</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>7</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>8</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	C2 connector on the 32i RAID adapter on an available PCIe slot

**Server model: sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, one 32i HBA/RAID adapter, one NVMe 1611-8P switch adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*Ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

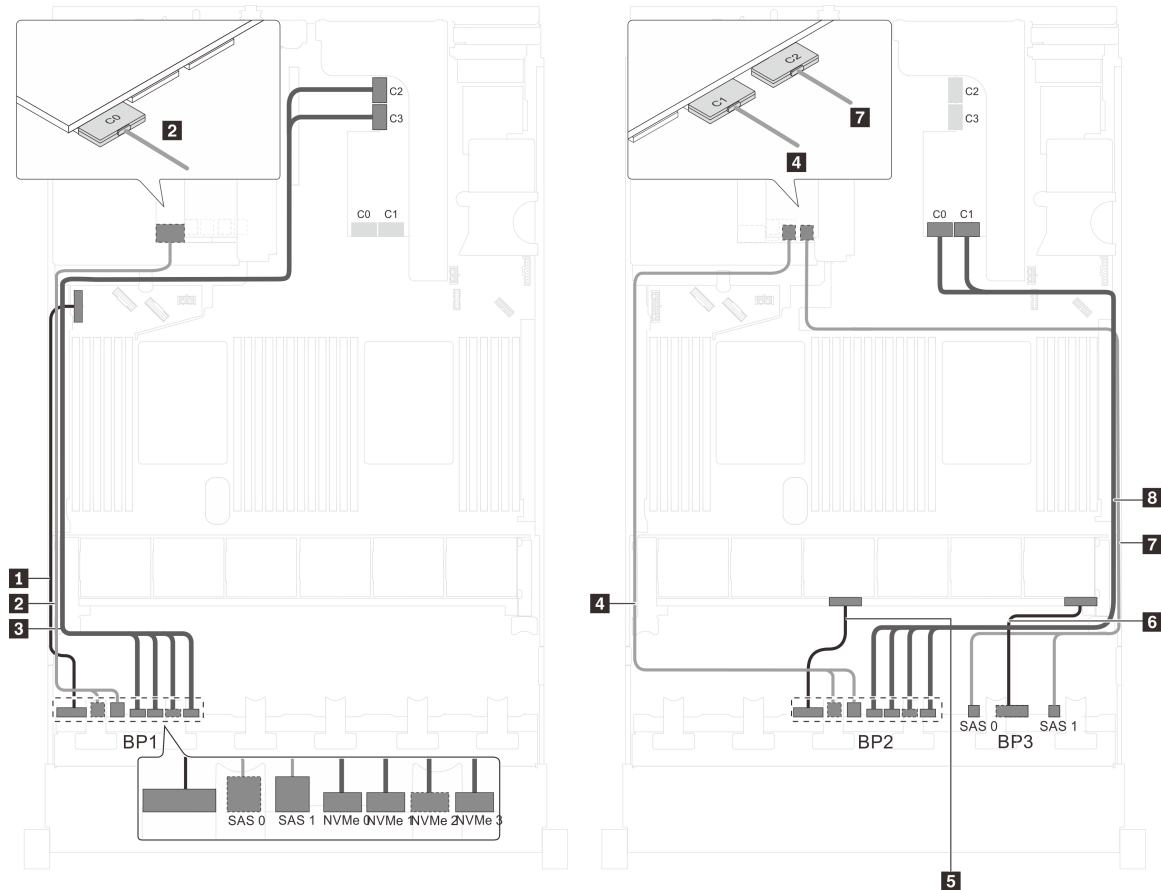


Figure 75. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, one 32i HBA/RAID adapter, and one NVMe 1611-8P switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	C0 connector on the 32i RAID adapter on an available PCIe slot
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	C2 and C3 connectors on the NVMe 1611-8P switch adapter installed in PCIe slot 1
<b>4</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	C1 connector on the 32i RAID adapter on an available PCIe slot
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

Cable	From	To
<b>6</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>7</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	C2 connector on the 32i RAID adapter on an available PCIe slot
<b>8</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0 and C1 connectors on the NVMe 1611-8P switch adapter installed in PCIe slot 1

**Server model: sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, one 24i RAID adapter, one NVMe switch adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit).

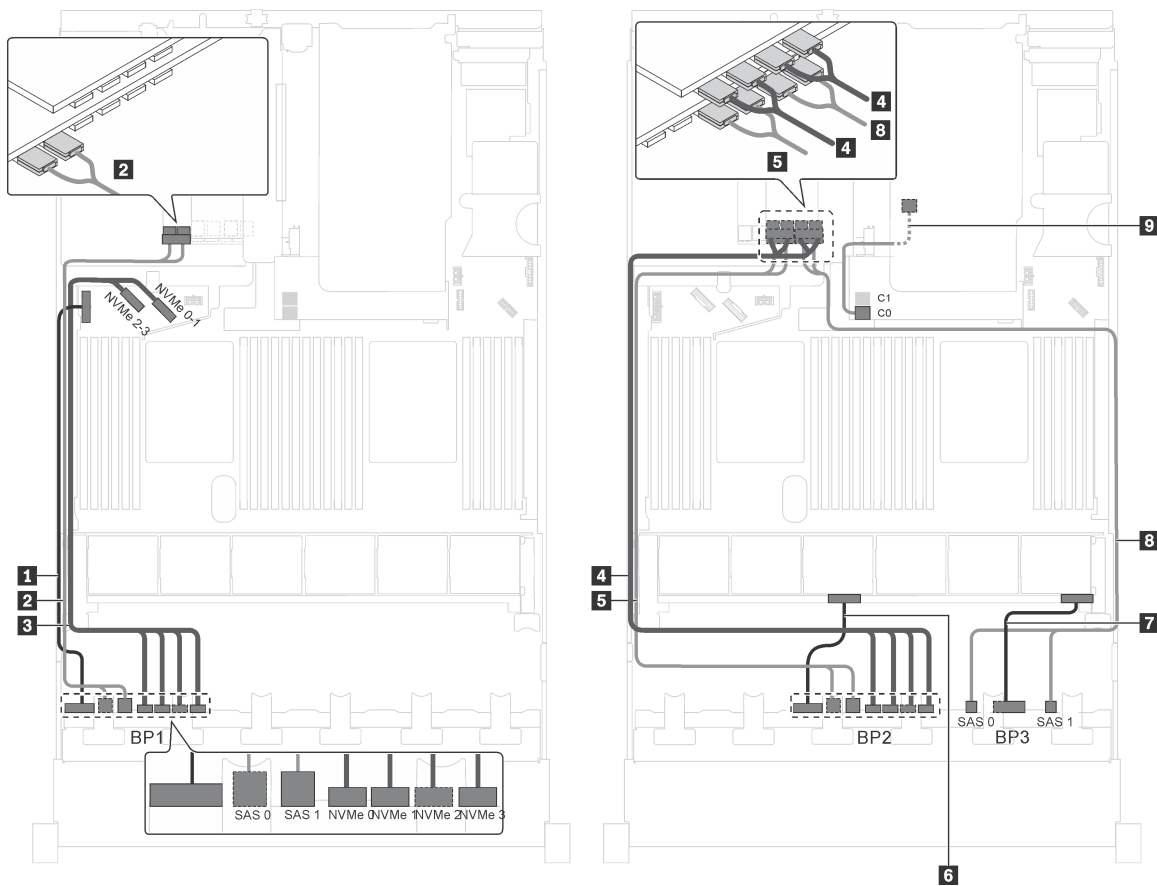


Figure 76. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, one 24i RAID adapter, and one NVMe switch adapter

<b>Cable</b>	<b>From</b>	<b>To</b>
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter installed in PCIe slot 6
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 5
<b>5</b> SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter installed in PCIe slot 6
<b>6</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>7</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>8</b> SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C4 and C5 connectors on the 24i RAID adapter installed in PCIe slot 6
<b>9</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0</li> <li>• Gen 4: C0</li> </ul>

**Server model: sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, one 8i HBA/RAID adapter, one 16i HBA/RAID adapter, one NVMe 1611-8P switch adapter**

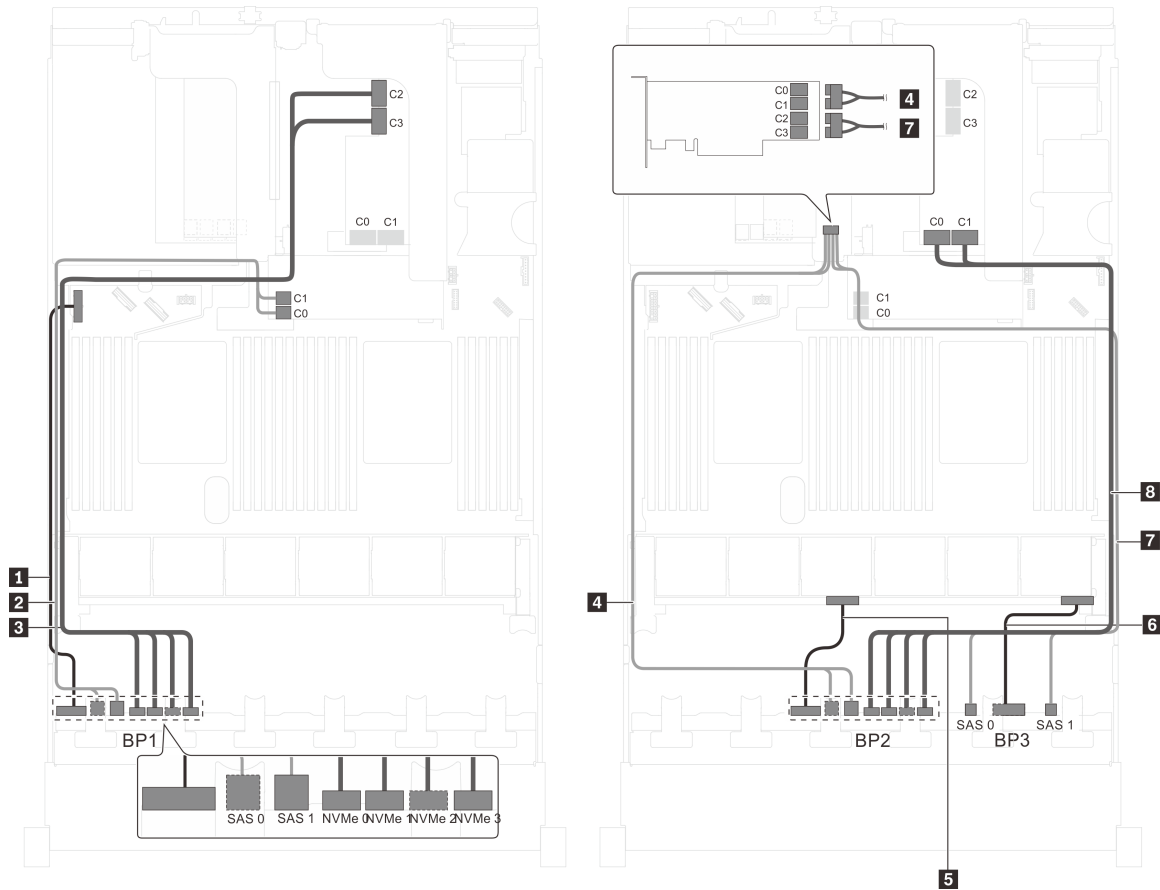


Figure 77. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, one 8i HBA/RAID adapter, one 16i HBA/RAID adapter, and one NVMe 1611-8P switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	C2 and C3 connectors on the NVMe 1611-8P switch adapter installed in PCIe slot 1
<b>4</b> SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	16i HBA/RAID adapter installed in PCIe slot 1 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

Cable	From	To
<b>6</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>7</b> SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	16i HBA/RAID adapter installed in PCIe slot 1 <ul style="list-style-type: none"> <li>• Gen 3: C2C3</li> <li>• Gen 4: C1</li> </ul>
<b>8</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0 and C1 connectors on the NVMe 1611-8P switch adapter installed in PCIe slot 1

**Server model: sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, one 32i RAID adapter, one NVMe switch adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2/5/8**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **9**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

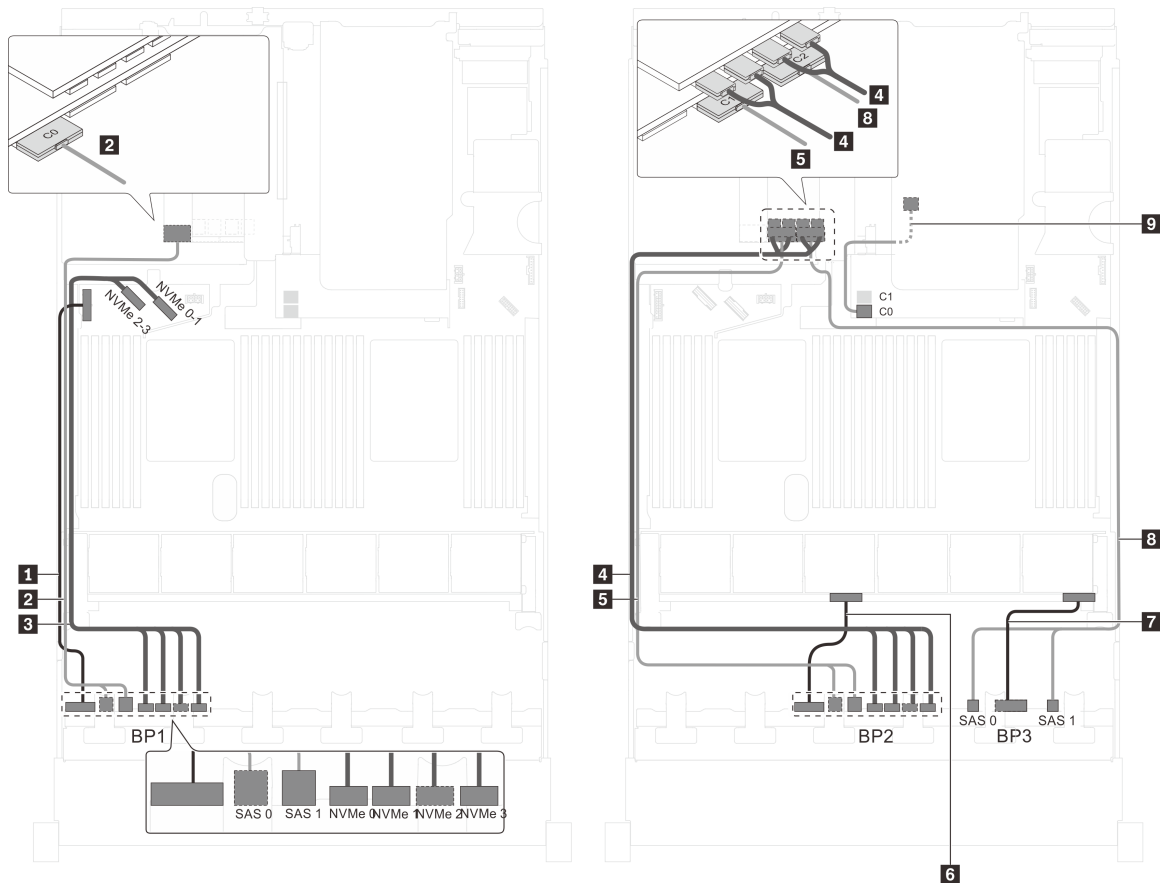


Figure 78. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, one 32i RAID adapter, and one NVMe switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	C0 connector on the 32i RAID adapter on PCIe slot 6
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 5
<b>5</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	C1 connector on the 32i RAID adapter on PCIe slot 6
<b>6</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>7</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>8</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	C2 connector on the 32i RAID adapter on PCIe slot 6
<b>9</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0</li> <li>• Gen 4: C0</li> </ul>

**Server model: sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, two 16i HBA/RAID adapters, one NVMe switch adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2/5/8**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **9**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

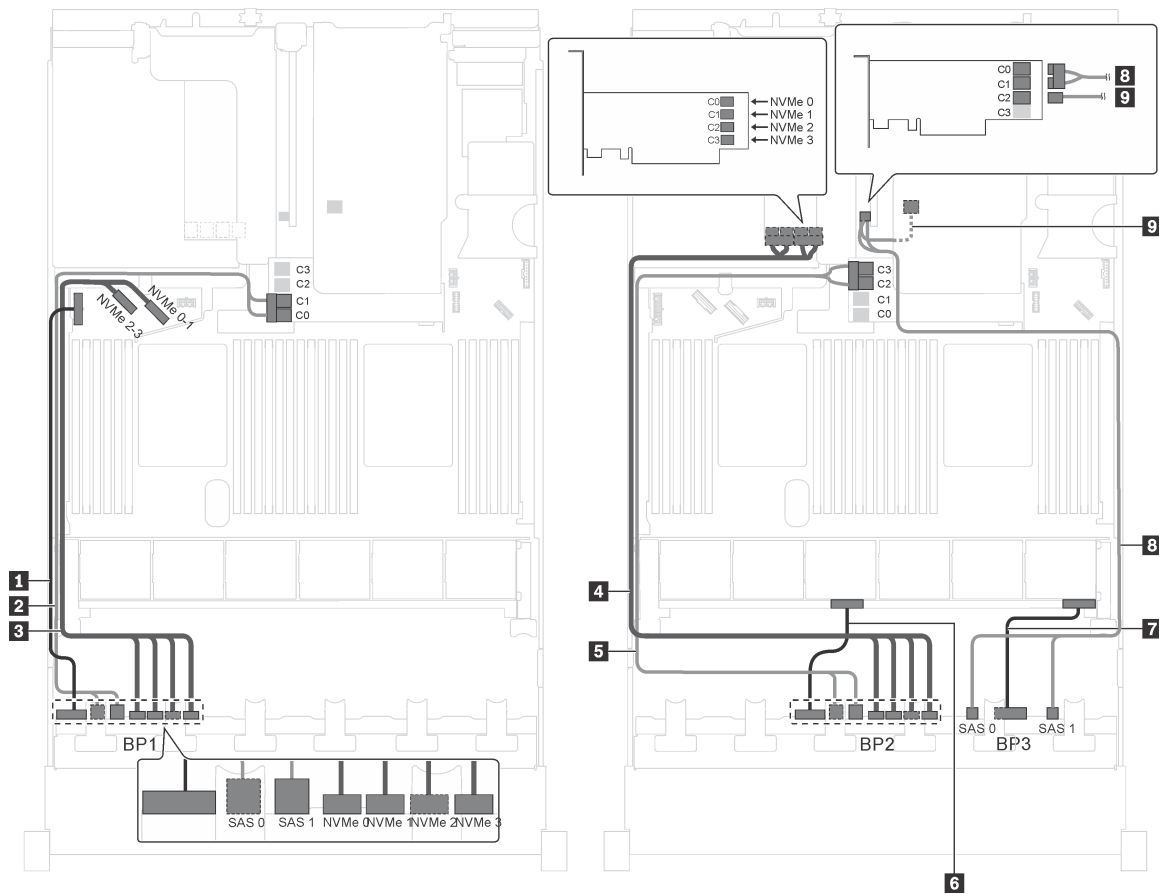


Figure 79. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, two 16i RAID adapters, and one NVMe switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 5
<b>5</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C2C3</li> <li>• Gen 4: C1</li> </ul>
<b>6</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board



Cable	From	To
<b>7</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>8</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>9</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C2</li> <li>• Gen 4: C1</li> </ul>

**Server model: sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, two 8i HBA/RAID adapters, one 16i HBA/RAID adapter, one NVMe switch adapter**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the cable **9** might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2/5/7**: ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit
  - Cable **6**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

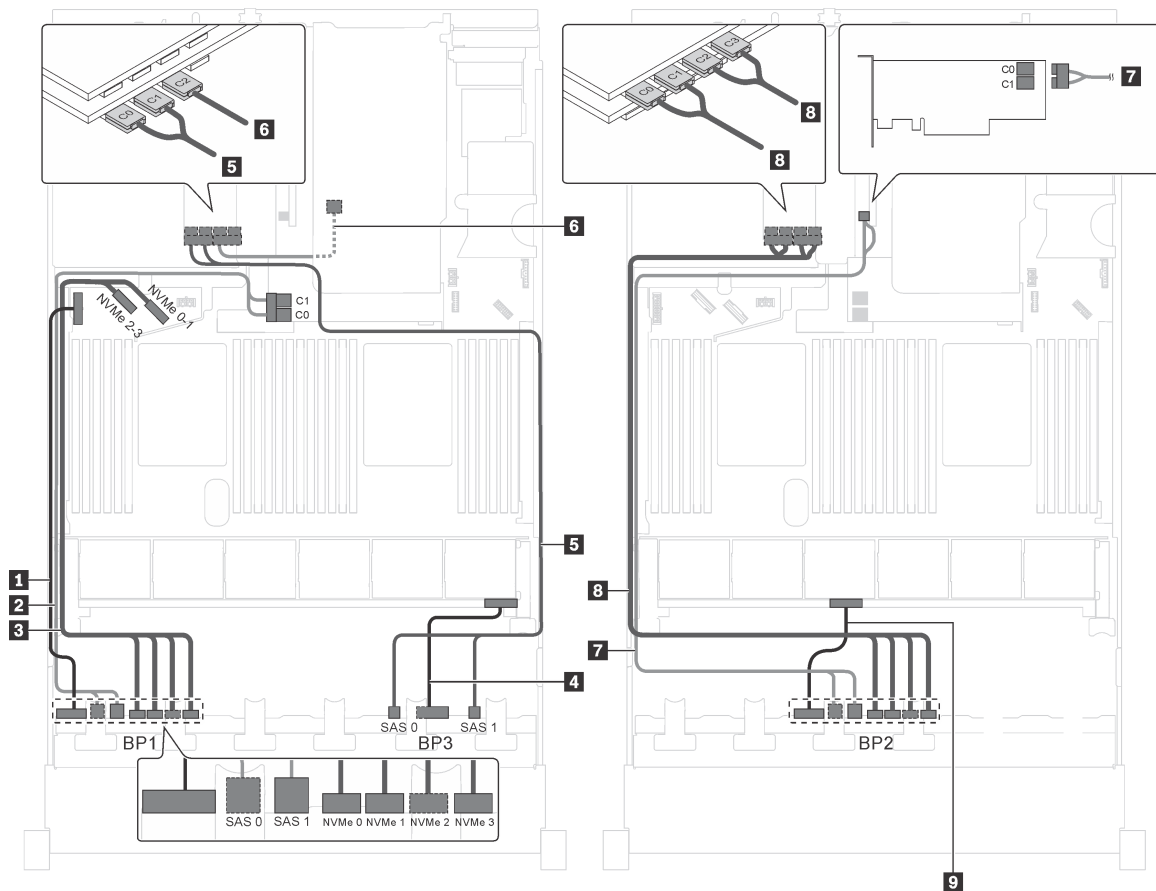


Figure 80. Cable routing for server models with sixteen 2.5-inch SAS/SATA drives, eight 2.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, two 8i HBA/RAID adapters, one 16i HBA/RAID adapter, and one NVMe switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>Gen 3: C0C1</li> <li>Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>5</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	16i HBA/RAID adapter on PCIe slot 6 <ul style="list-style-type: none"> <li>Gen 3: C0C1</li> <li>Gen 4: C0</li> </ul>
<b>6</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	16i HBA/RAID adapter on PCIe slot 6 <ul style="list-style-type: none"> <li>Gen 3: C2</li> <li>Gen 4: C1</li> </ul>

Cable	From	To
<b>7</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	8i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>8</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 5
<b>9</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

**Server model: twelve 2.5-inch SAS/SATA drives, twelve 2.5-inch SAS/SATA/NVMe drives, one 24i RAID adapter, two NVMe switch adapters**

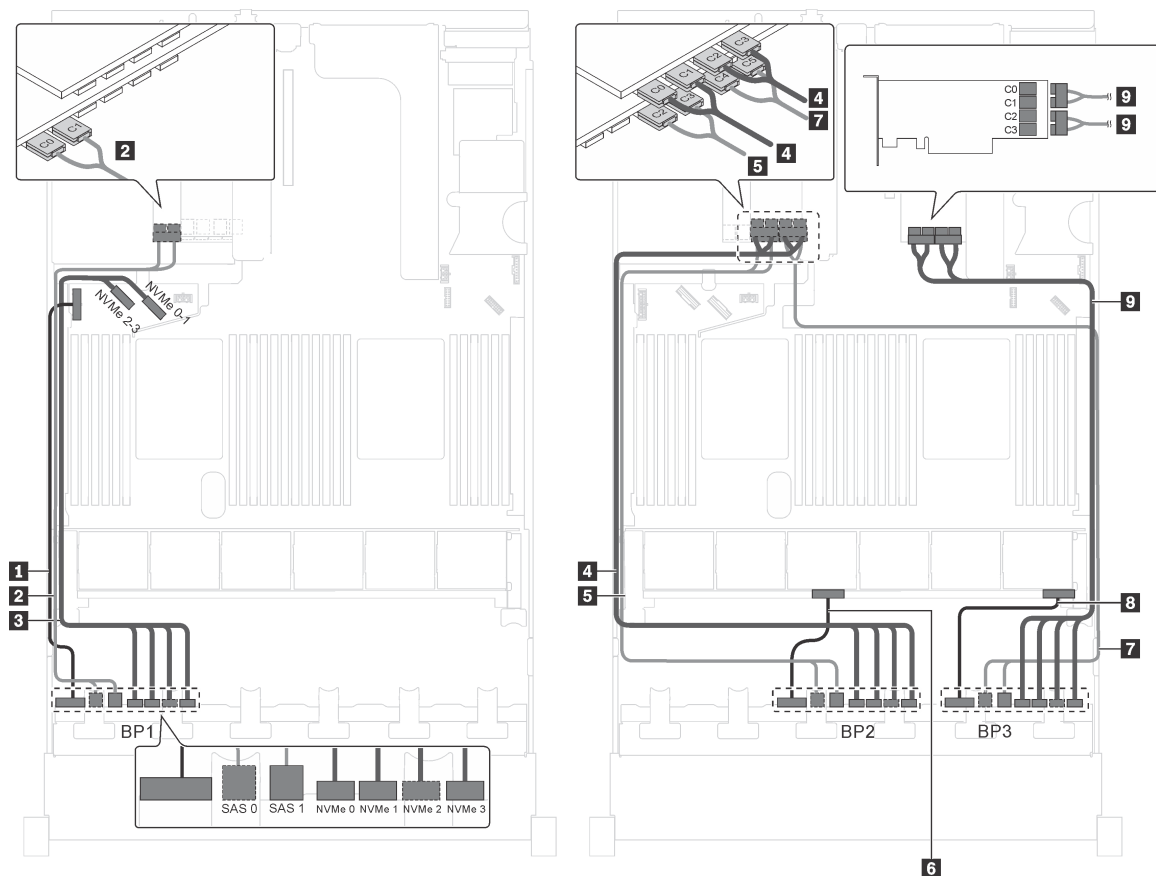


Figure 81. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, twelve 2.5-inch SAS/SATA/NVMe drives, one 24i RAID adapter, and two NVMe switch adapters

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1	SAS 0 and SAS 1 connectors on front backplane 1	C0 and C1 connectors on the 24i RAID adapter installed in PCIe slot 6
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board

<b>Cable</b>	<b>From</b>	<b>To</b>
<b>4</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 5
<b>5</b> SAS signal cable for front backplane 2	SAS 0 and SAS 1 connectors on front backplane 2	C2 and C3 connectors on the 24i RAID adapter installed in PCIe slot 6
<b>6</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>7</b> SAS signal cable for front backplane 3	SAS 0 and SAS 1 connectors on front backplane 3	C4 and C5 connectors on the 24i RAID adapter installed in PCIe slot 6
<b>8</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>9</b> NVMe signal cable for front backplane 3	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 3	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 1

**Server model: twelve 2.5-inch SAS/SATA drives, twelve 2.5-inch SAS/SATA/NVMe drives, one 32i RAID adapter, two NVMe switch adapters**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*Ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

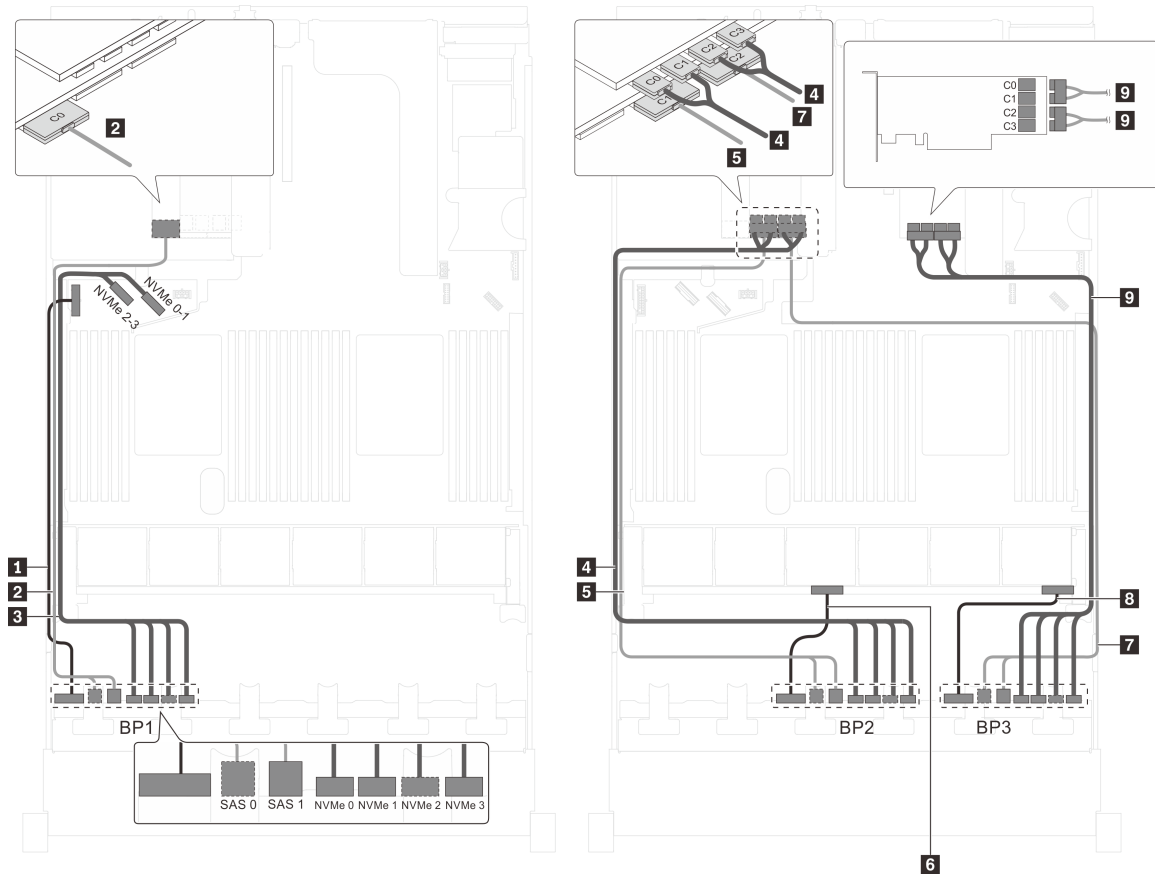


Figure 82. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, twelve 2.5-inch SAS/SATA/NVMe drives, one 32i RAID adapter, and two NVMe switch adapters

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	C0 connector on the 32i RAID adapter on PCIe slot 6
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 5
<b>5</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	C1 connector on the 32i RAID adapter on PCIe slot 6
<b>6</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>7</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	C2 connector on the 32i RAID adapter on PCIe slot 6

Cable	From	To
<b>8</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>9</b> NVMe signal cable for front backplane 3	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 3	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 1

**Server model: twelve 2.5-inch SAS/SATA drives, twelve 2.5-inch SAS/SATA/NVMe drives, one 32i HBA/RAID adapter, one NVMe 1611-8P switch adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*Ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

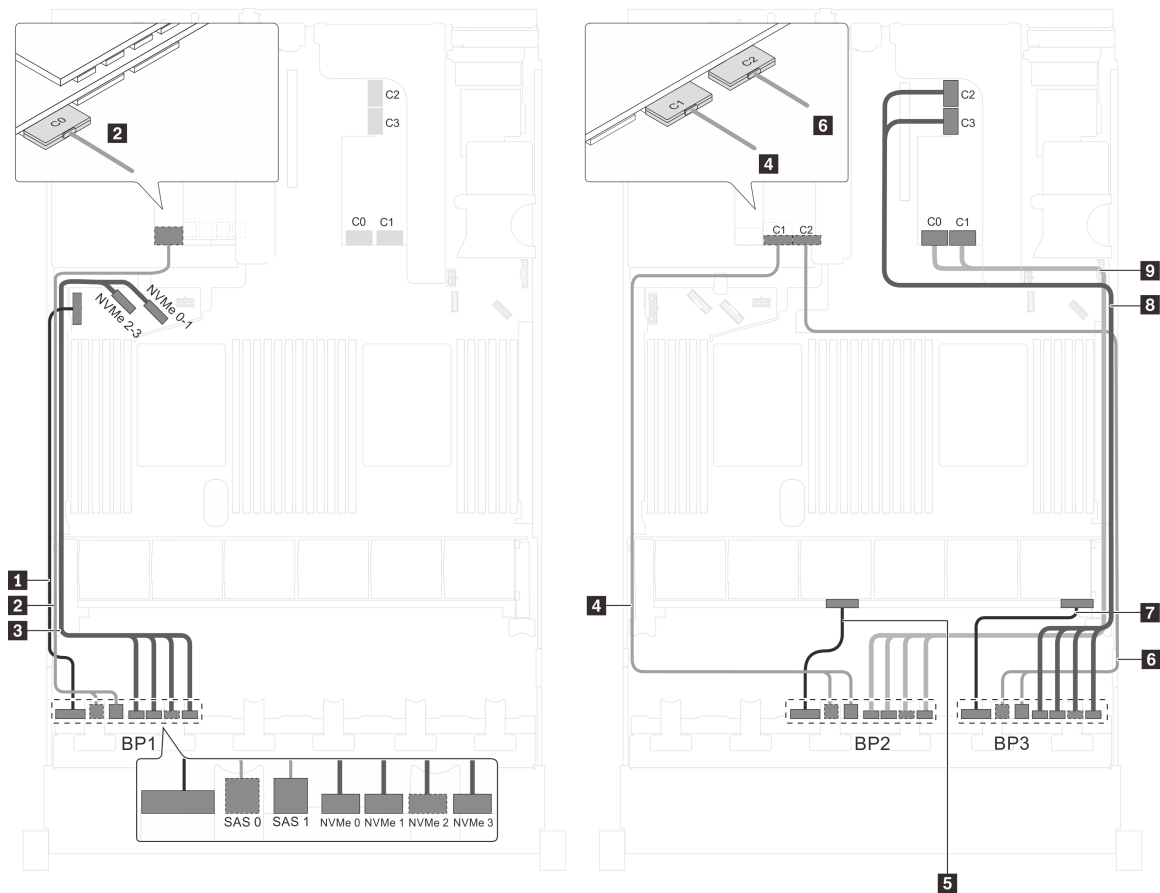


Figure 83. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, twelve 2.5-inch SAS/SATA/NVMe drives, one 32i HBA/RAID adapter, and one NVMe 1611-8P switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	C0 connector on the 32i RAID adapter on PCIe slot 6

<b>Cable</b>	<b>From</b>	<b>To</b>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	C1 connector on the 32i RAID adapter on PCIe slot 6
<b>5</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>6</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	C2 connector on the 32i RAID adapter on PCIe slot 6
<b>7</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>8</b> NVMe signal cable for front backplane 3	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 3	C2 and C3 connectors on the NVMe 1611–8P installed in PCIe slot 1
<b>9</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0 and C1 connectors on the NVMe 1611–8P installed in PCIe slot 1

**Server model: twelve 2.5-inch SAS/SATA drives, twelve 2.5-inch SAS/SATA/NVMe drives, three 8i HBA/RAID adapters, two NVMe switch adapters**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

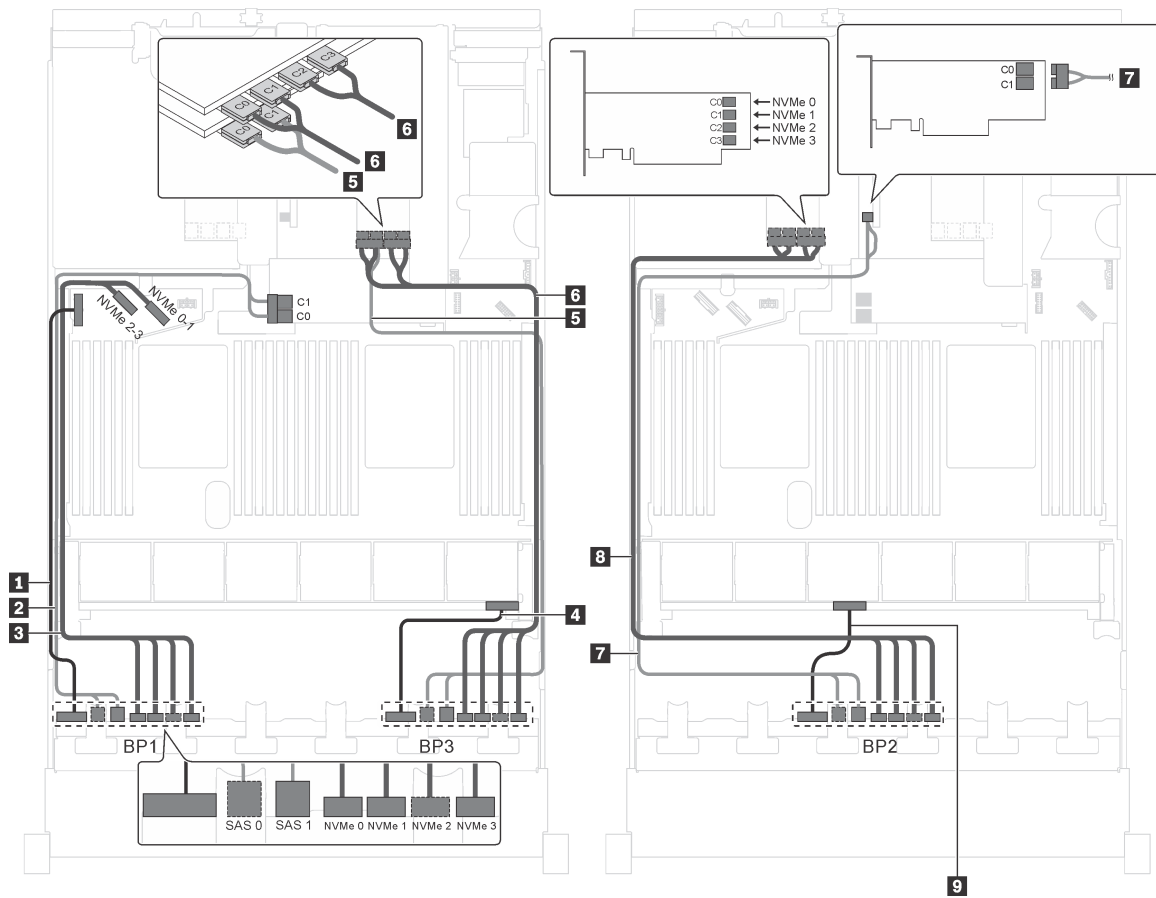


Figure 84. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, twelve 2.5-inch SAS/SATA/NVMe drives, three 8i HBA/RAID adapters, and two NVMe switch adapters

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>Gen 3: C0C1</li> <li>Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>5</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	8i HBA/RAID adapter on PCIe slot 2 <ul style="list-style-type: none"> <li>Gen 3: C0C1</li> <li>Gen 4: C0</li> </ul>
<b>6</b> NVMe signal cable for front backplane 3	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 3	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 1



Cable	From	To
<b>7</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	8i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>8</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 5
<b>9</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

**Server model: twelve 2.5-inch SAS/SATA drives, twelve 2.5-inch SAS/SATA/NVMe drives, one 8i HBA/RAID adapter, one 16i HBA/RAID adapters, two NVMe switch adapters**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

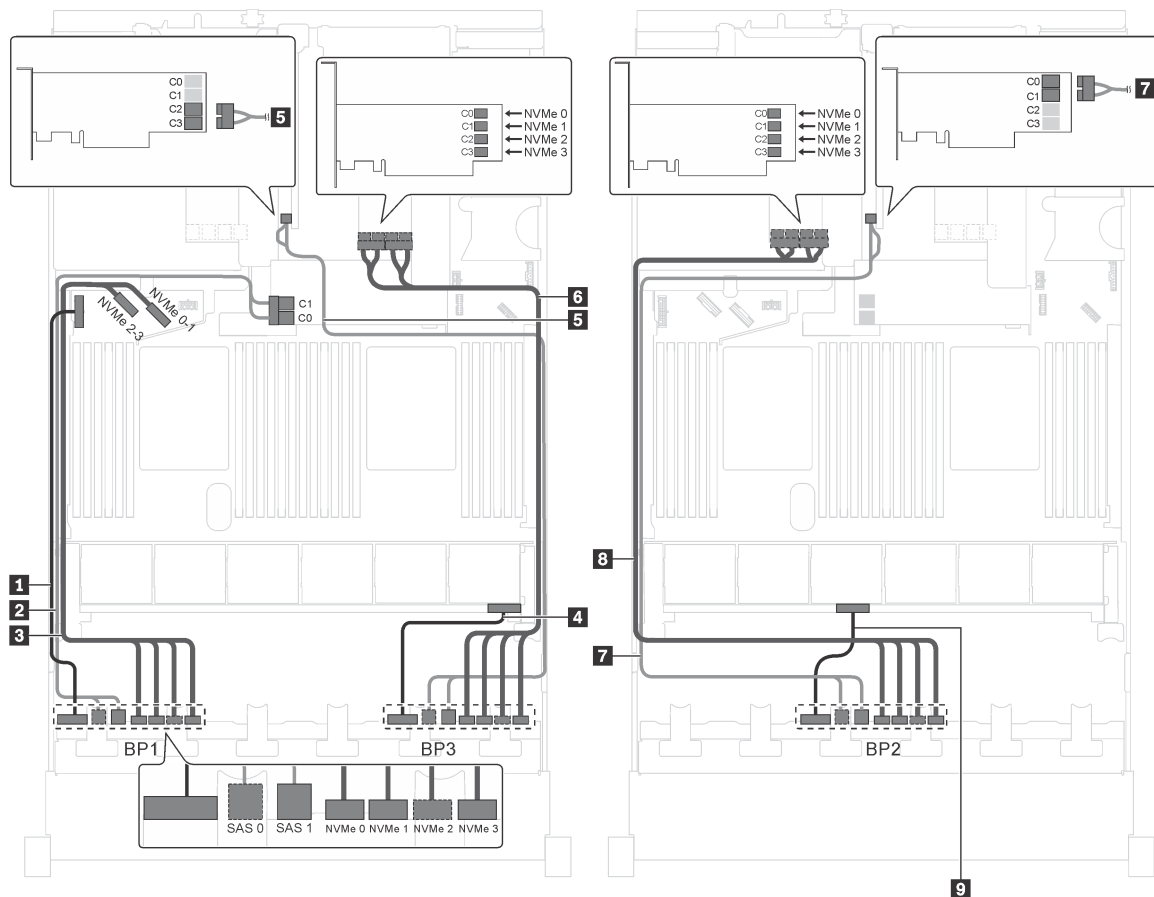


Figure 85. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, twelve 2.5-inch SAS/SATA/NVMe drives, one 8i HBA/RAID adapter, one 16i HBA/RAID adapters, and two NVMe switch adapters

<b>Cable</b>	<b>From</b>	<b>To</b>
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>4</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>5</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C2C3</li> <li>• Gen 4: C1</li> </ul>
<b>6</b> NVMe signal cable for front backplane 3	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 3	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 1
<b>7</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>8</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe switch adapter installed in PCIe slot 5
<b>9</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

**Server model: twelve 2.5-inch SAS/SATA drives, twelve 2.5-inch SAS/SATA/NVMe drives, one 8i HBA/RAID adapter, one 16i HBA/RAID adapter, one NVMe 1611-8P switch adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

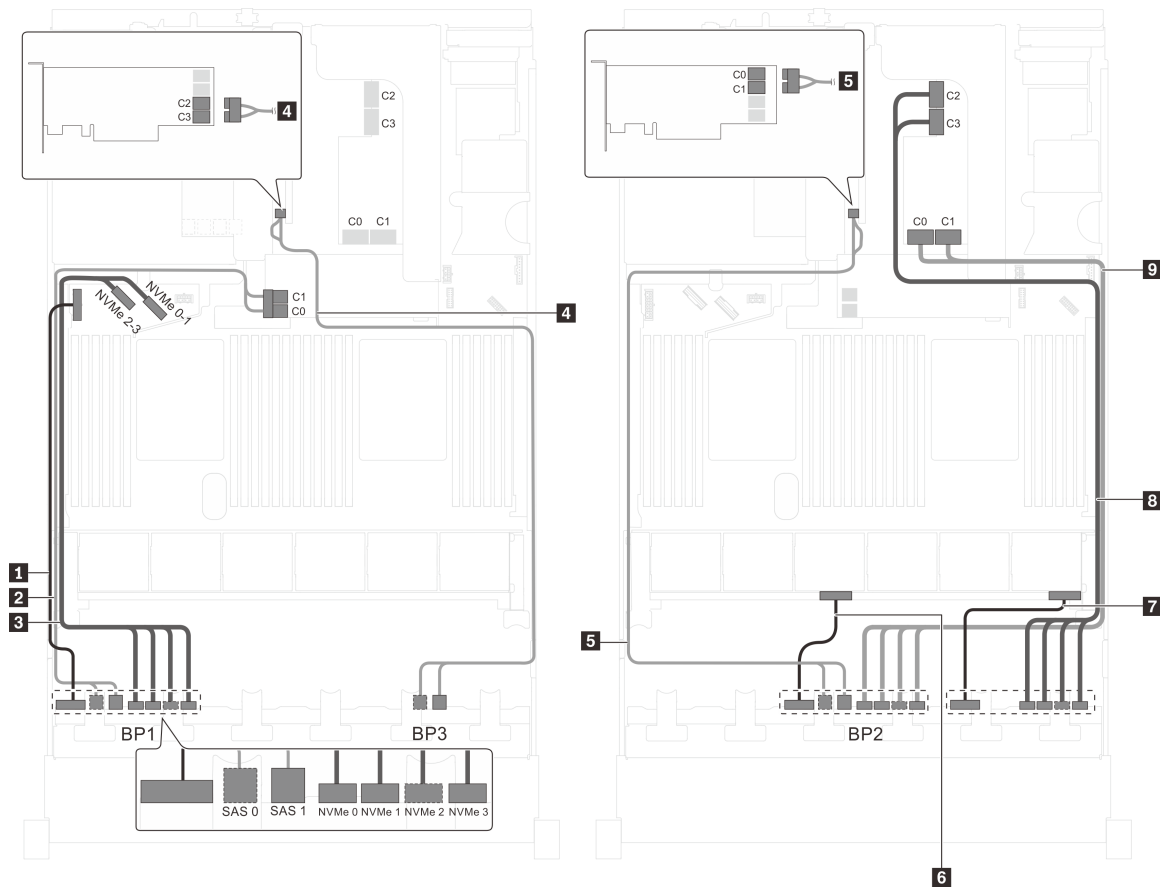


Figure 86. Cable routing for server models with twelve 2.5-inch SAS/SATA drives, twelve 2.5-inch SAS/SATA/NVMe drives, one 8i HBA/RAID adapter, one 16i HBA/RAID adapter, and one NVMe 1611-8P switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable for front backplane 1*	SAS 0 and SAS 1 connectors on front backplane 1	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>Gen 3: C0C1</li> <li>Gen 4: C0</li> </ul>
<b>3</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	NVMe 0-1 and NVMe 2-3 connectors on the system board
<b>4</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>Gen 3: C2C3</li> <li>Gen 4: C1</li> </ul>
<b>5</b> SAS signal cable for front backplane 2*	SAS 0 and SAS 1 connectors on front backplane 2	16i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>Gen 3: C0C1</li> <li>Gen 4: C0</li> </ul>
<b>6</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board

Cable	From	To
<b>7</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>8</b> NVMe signal cable for front backplane 3	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 3	C2 and C3 connectors on the NVMe 1611-8P switch adapter installed in PCIe slot 1
<b>9</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0 and C1 connectors on the NVMe 1611-8P switch adapter installed in PCIe slot 1

**Server model: sixteen 2.5-inch NVMe drives, eight SAS/SATA drives, two NVMe 810-4P switch adapters, two NVMe 1610-4P switch adapters, one 8i HBA/RAID adapter**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

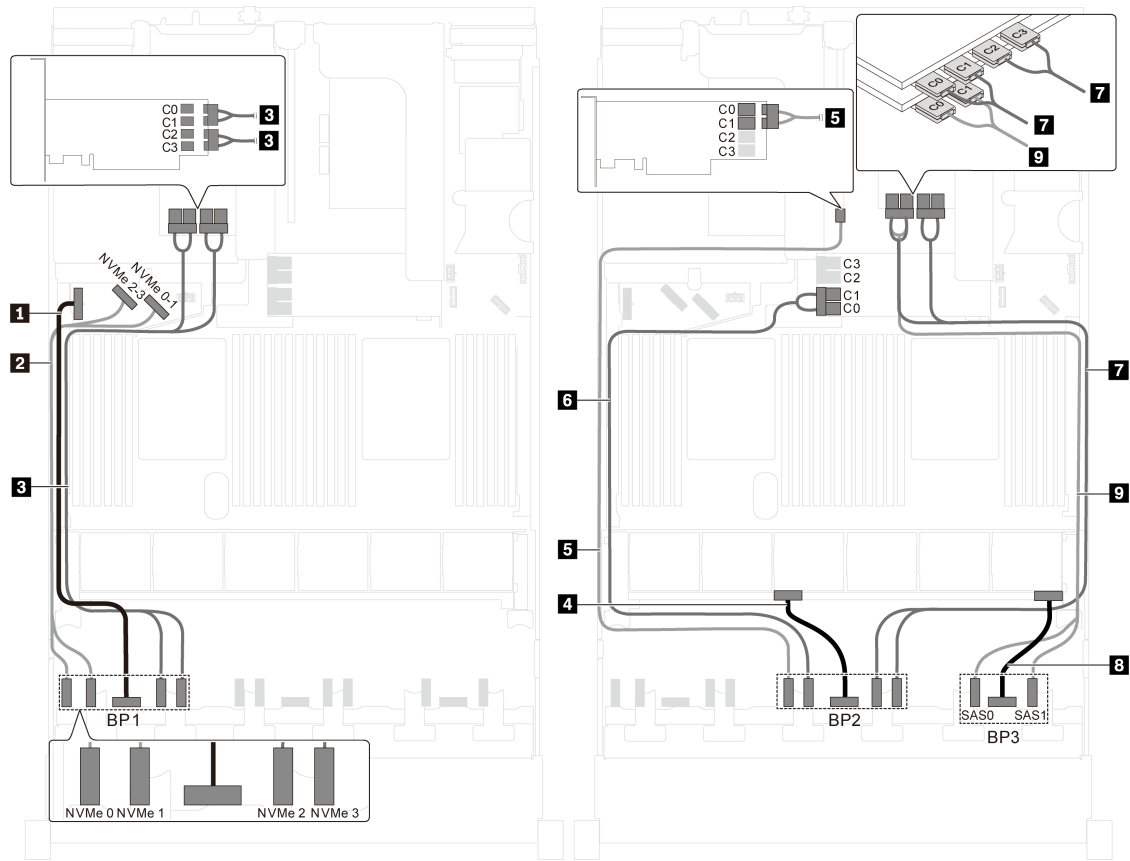


Figure 87. Cable routing for server models with sixteen 2.5-inch NVMe drives, eight SAS/SATA drives, two NVMe 810-4P switch adapters, two NVMe 1610-4P switch adapters and one 8i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> NVMe signal cable for front backplane 1	NVMe 0 and NVMe 1 connectors on front backplane 1	NVMe 2–3 and NVMe 0–1 connectors on the system board
<b>3</b> NVMe signal cable for front backplane 1	NVMe 2 and NVMe 3 connectors on front backplane 1	C0, C1, C2, and C3 connectors on the NVMe 1610-4P switch adapter installed in PCIe slot 6
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> NVMe signal cable for front backplane 2	NVMe 0 connector on front backplane 2	C0 and C1 connector on the NVMe 810-4P switch adapter installed in PCIe slot 4
<b>6</b> NVMe signal cable for front backplane 2	NVMe 1 connector on front backplane 2	C0 and C1 connector on the NVMe 810-4P switch adapter installed in RAID adapter slot on the system board
<b>7</b> NVMe signal cable for front backplane 2	NVMe 2 and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe 1610-4P switch adapter installed in PCIe slot 1
<b>8</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>9</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	8i HBA/RAID adapter on PCIe slot 3 <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>

**Server model: sixteen 2.5-inch NVMe drives, eight 2.5-inch SAS/SATA drives, one 8i HBA/RAID adapter, two NVMe 1611-8P switch adapters**

**Notes:**

- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 2.5" SAS/SATA/AnyBay 8-Bay X40 RAID Cable Kit).

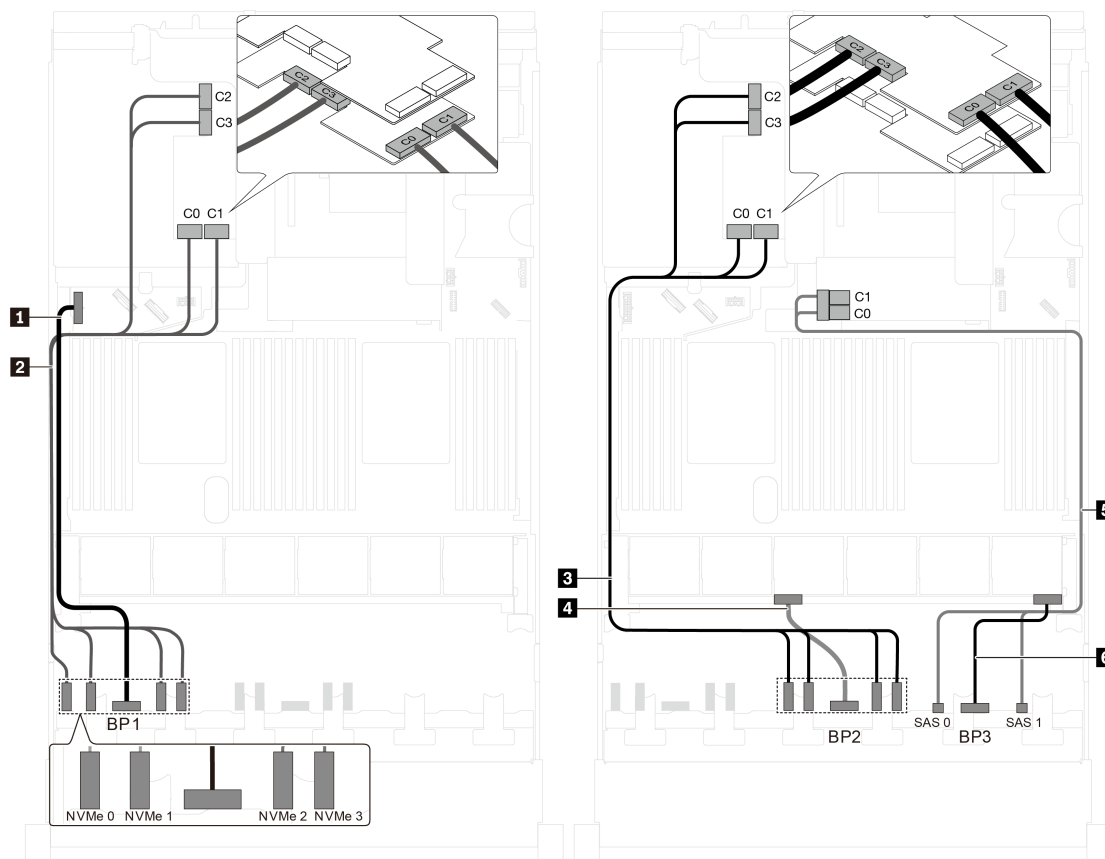


Figure 88. Cable routing for server models with sixteen 2.5-inch NVMe drives, eight 2.5-inch SAS/SATA drives, one 8i HBA/RAID adapter, and two NVMe 1611-8P switch adapters

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	C0, C1, C2, and C3 connectors on the NVMe 1611-8P switch adapter installed in PCIe slot 6
<b>3</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe 1611-8P switch adapter installed in PCIe slot 5
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> SAS signal cable for front backplane 3*	SAS 0 and SAS 1 connectors on front backplane 3	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>6</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board

**Server model: twenty-four 2.5-inch NVMe drives, four NVMe 810-4P switch adapters, one NVMe 1610-8P switch adapter**

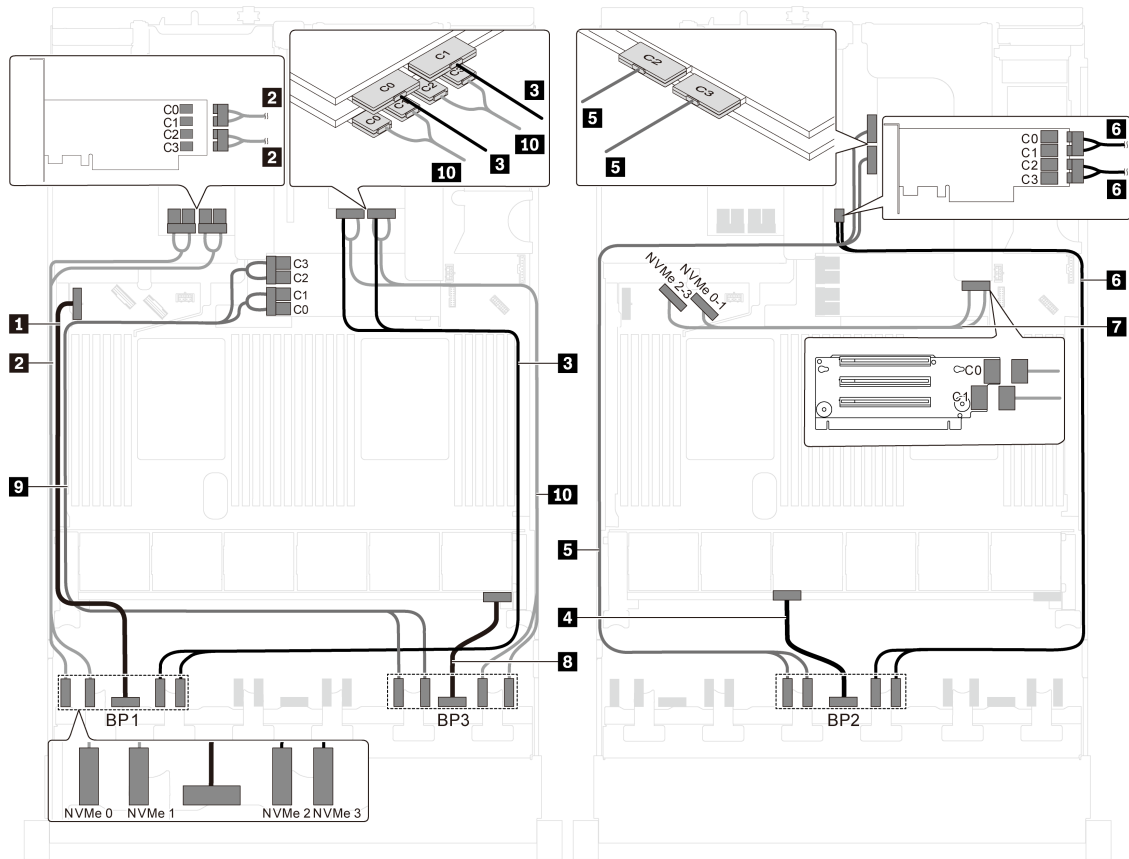


Figure 89. Cable routing for server models with twenty-four 2.5-inch NVMe drives, four NVMe 810-4P switch adapters, and one NVMe 1610-8P switch adapter

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> NVMe signal cable for front backplane 1	NVMe 0 and NVMe 1 connectors on front backplane 1	C0, C1, C2, and C3 connectors on the NVMe 810-4P switch adapter installed in PCIe slot 6
<b>3</b> NVMe signal cable for front backplane 1	NVMe 2 and NVMe 3 connectors on front backplane 1	C0 and C1 connectors on the NVMe 1610-8P switch adapter installed in PCIe slot 1
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> NVMe signal cable for front backplane 2	NVMe 0 and NVMe 1 connectors on front backplane 2	C2 and C3 connectors on the NVMe 1610-8P switch adapter installed in PCIe slot 1
<b>6</b> NVMe signal cable for front backplane 2	NVMe 2 and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe 810-4P switch adapter installed in PCIe slot 4
<b>7</b> NVMe signal cable for onboard NVMe connectors	NVMe 0–1 and NVMe 2–3 connectors on the system board	C0 and C1 connectors on the riser card 1

Cable	From	To
<b>8</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>9</b> NVMe signal cable for front backplane 3	NVMe 0 and NVMe 1 connectors on front backplane 3	C0, C1, C2, and C3 connectors on the NVMe 810-4P switch adapter installed in RAID adapter slot on the system board
<b>10</b> NVMe signal cable for front backplane 3	NVMe 2 and NVMe 3 connectors on front backplane 3	C0, C1, C2, and C3 connectors on the NVMe 810-4P switch adapter installed in PCIe slot 2

**Server model: twenty-four 2.5-inch NVMe drives, three NVMe 1611-8P switch adapters**

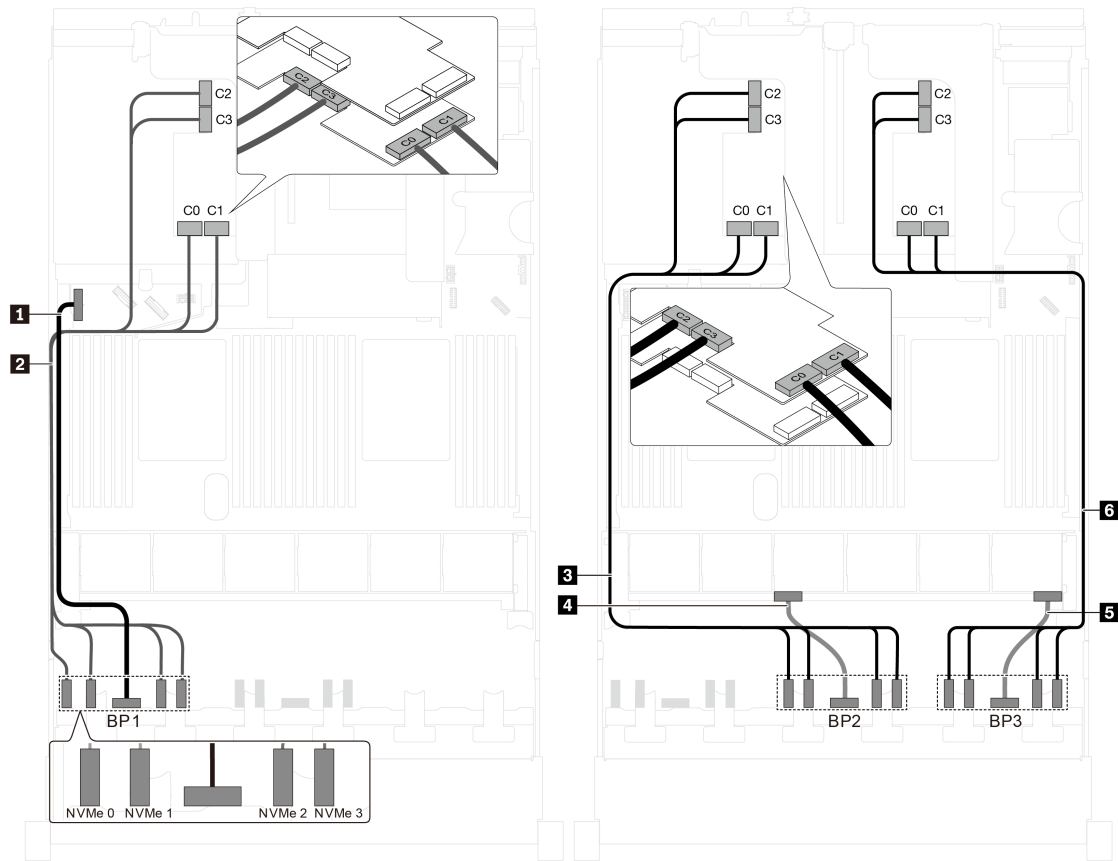


Figure 90. Cable routing for server models with twenty-four 2.5-inch NVMe drives and three NVMe 1611-8P switch adapters

Cable	From	To
<b>1</b> Power cable for front backplane 1	Power connector on front backplane 1	Backplane power connector 1 on the system board
<b>2</b> NVMe signal cable for front backplane 1	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 1	C0, C1, C2, and C3 connectors on the NVMe 1611-8P switch adapter installed in PCIe slot 6
<b>3</b> NVMe signal cable for front backplane 2	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 2	C0, C1, C2, and C3 connectors on the NVMe 1611-8P switch adapter installed in PCIe slot 5



Cable	From	To
<b>4</b> Power cable for front backplane 2	Power connector on front backplane 2	Backplane power connector 2 on the system board
<b>5</b> Power cable for front backplane 3	Power connector on front backplane 3	Backplane power connector 3 on the system board
<b>6</b> NVMe signal cable for front backplane 3	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on front backplane 3	C0, C1, C2, and C3 connectors on the NVMe 1611-8P switch adapter installed in PCIe slot 1

## Server models with eight 3.5-inch drives

Use this section to understand the cable routing for server models with eight 3.5-inch SAS/SATA drives.

### Server model: eight 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, two 8i HBA/RAID adapters

#### Notes:

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i HBA/RAID adapter in PCIe slot 4 might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2**: ThinkSystem SR550/SR590/SR650 3.5" SAS/SATA 8-Bay X40 RAID Cable Kit
  - Cable **3**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

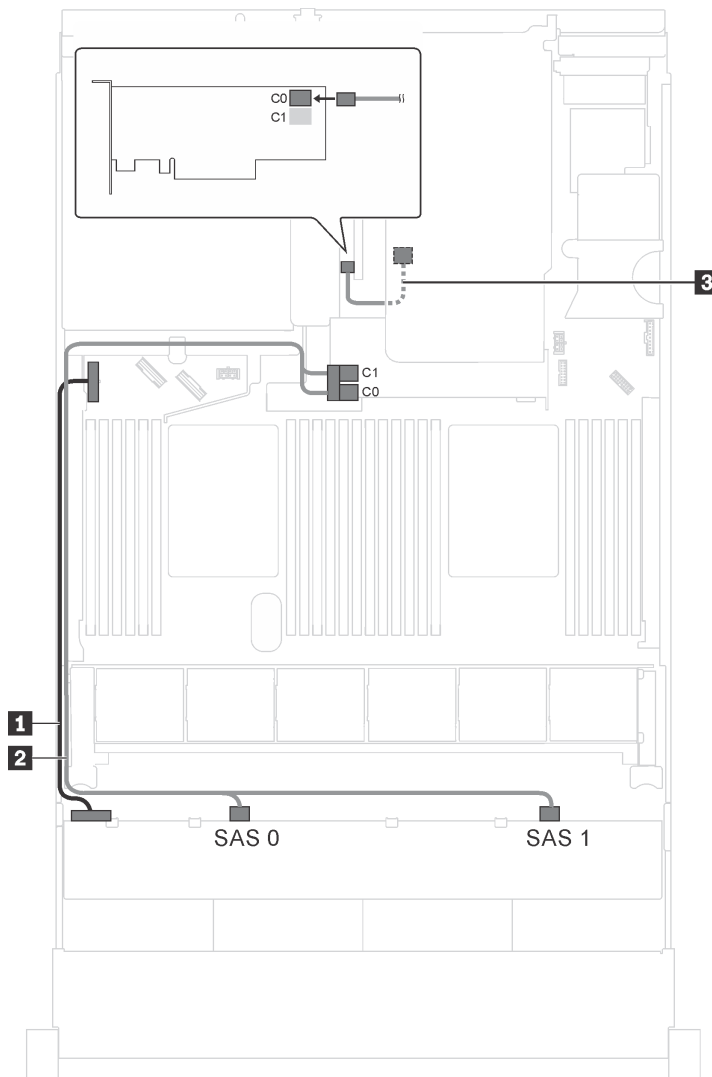


Figure 91. Cable routing for server models with eight 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and two 8i HBA/RAID adapters

Cable	From	To
<b>1</b> Power cable	Power connector on the backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable*	SAS 0 and SAS 1 connectors on the backplane	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	8i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0</li> <li>• Gen 4: C0</li> </ul>

**Server model: eight 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 16i HBA/RAID adapter**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and cable **3** might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2**: ThinkSystem SR550/SR590/SR650 3.5" SAS/SATA 8-Bay X40 RAID Cable Kit
  - Cable **3**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

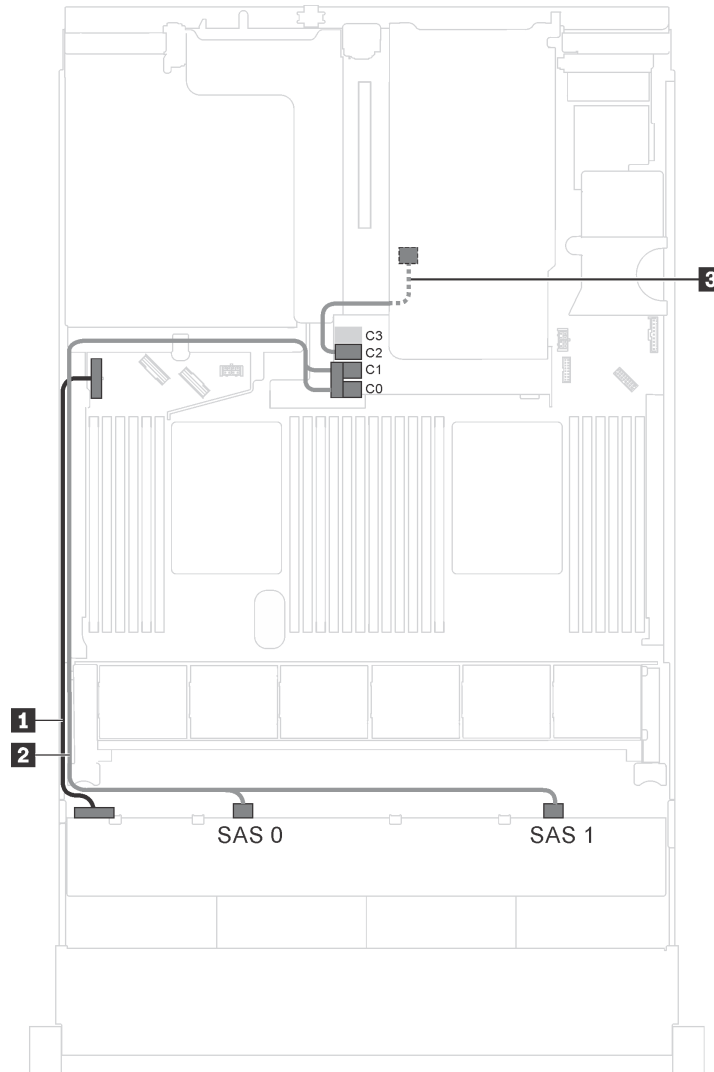


Figure 92. Cable routing for server models with eight 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and one 16i HBA/RAID adapter

<b>Cable</b>	<b>From</b>	<b>To</b>
<b>1</b> Power cable	Power connector on the backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable*	SAS 0 and SAS 1 connectors on the backplane	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C2</li> <li>• Gen 4: C1</li> </ul>

### Server models with twelve 3.5-inch drives

Use this section to understand the cable routing for server models with twelve 3.5-inch drives.

#### Server model: twelve 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one Gen 3 16i HBA/RAID adapter

**Note:** The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly might not be available on your server.

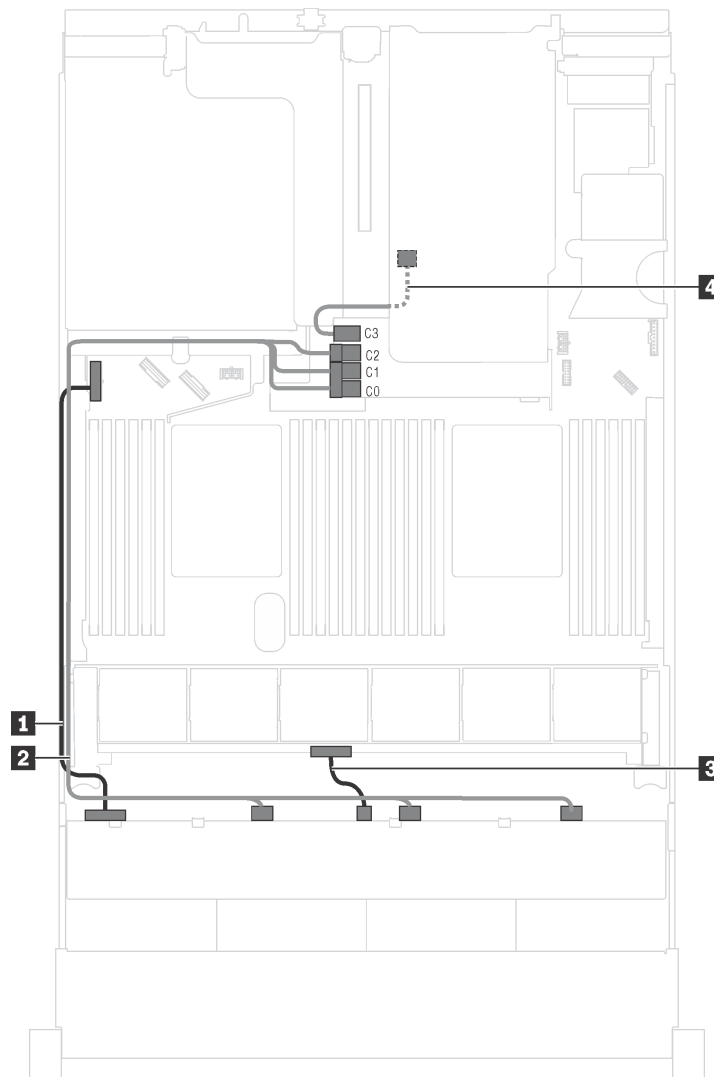


Figure 93. Cable routing for server models with twelve 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and one Gen 3 16i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable	Power 1 connector on the front backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable	SAS 0, SAS 1, and SAS 2 connectors on the backplane	C0, C1, and C2 connectors on the 16i HBA/RAID adapter on the RAID adapter slot
<b>3</b> Power cable	Power 2 connector on the front backplane	Backplane power connector 2 on the system board
<b>4</b> SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C3 connector on the 16i HBA/RAID adapter on the RAID adapter slot

**Server model: twelve 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one Gen 4 16i HBA/RAID adapter**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner RAID adapter slot.
- Ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 3.5" SAS/SATA 8-Bay X40 RAID Cable Kit).

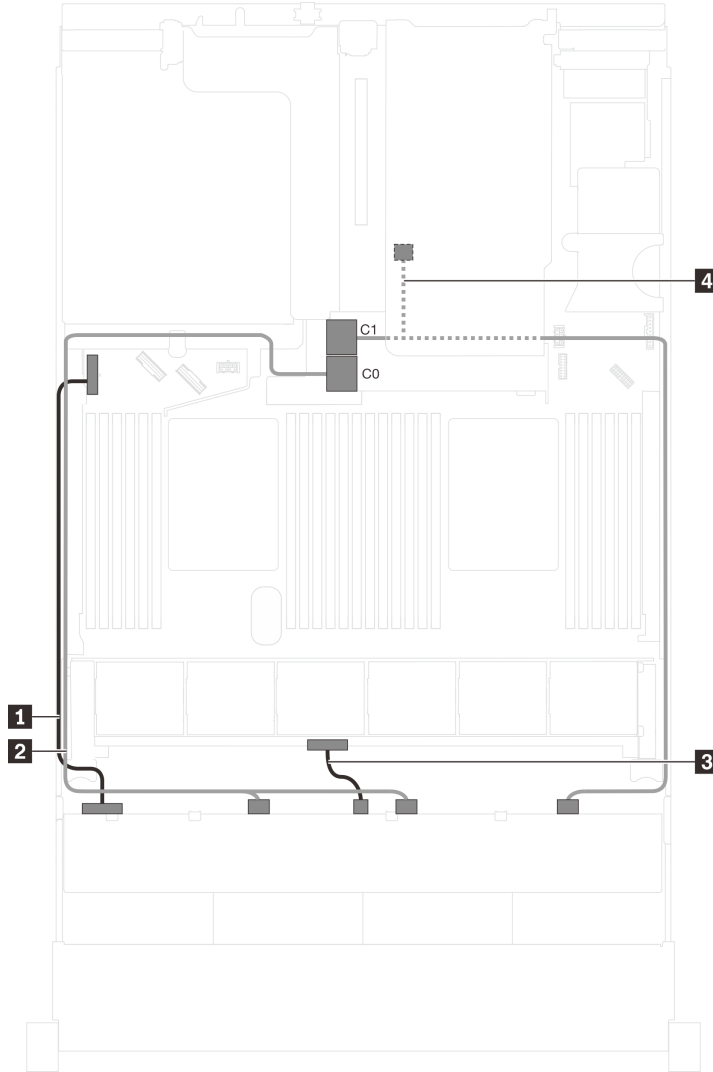


Figure 94. Cable routing for server models with twelve 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, and one Gen 4 16i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable	Power 1 connector on the front backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable	SAS 0 and SAS 1 connectors on the backplane	C0 connector on the 16i HBA/RAID adapter on the RAID adapter slot

Cable	From	To
<b>3</b> Power cable	Power 2 connector on the front backplane	Backplane power connector 2 on the system board
<b>4</b> SAS signal cable for the rear hot-swap drive assembly	SAS 2 connector on the backplane and signal connector on the rear hot-swap drive assembly	C1 connector on the 16i HBA/RAID adapter on the RAID adapter slot

**Server model: twelve 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, one 16i HBA/RAID adapter**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly and the 8i HBA/RAID adapter might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable:
  - Cable **2**: ThinkSystem SR590/SR650 3.5" SAS/SATA/AnyBay 12-Bay X40 RAID Cable Kit
  - Cable **4**: ThinkSystem SR590/SR650 3.5" SAS/SATA 2-Bay Rear BP X40 RAID Cable Kit

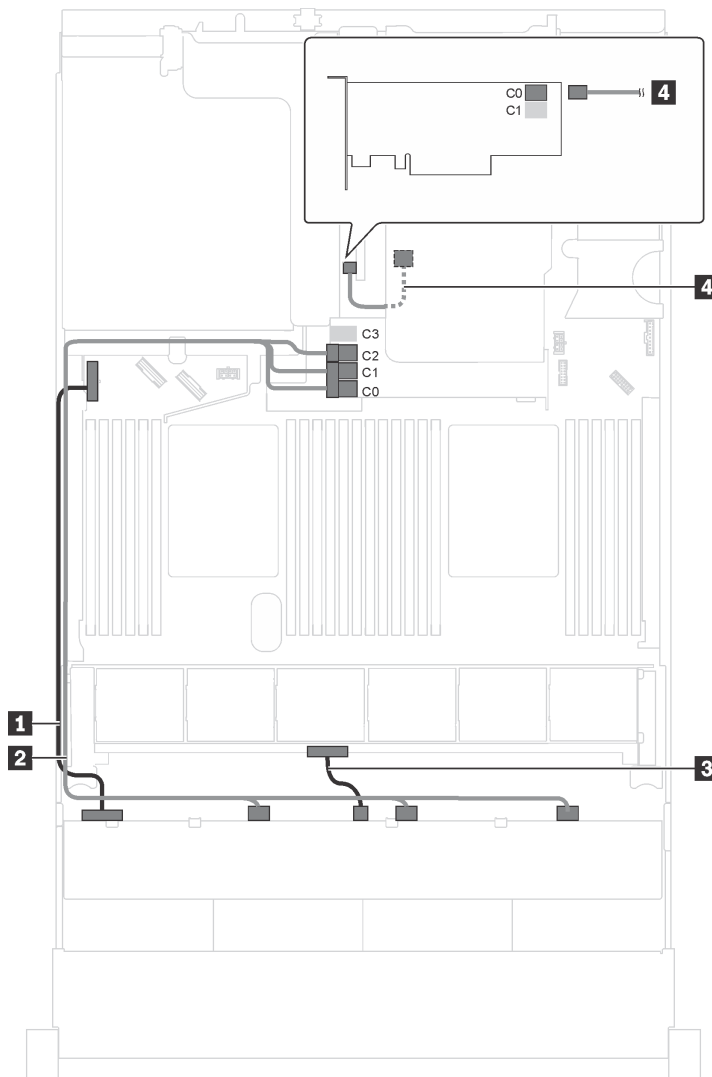


Figure 95. Cable routing for server models with twelve 3.5-inch SAS/SATA drives, the rear hot-swap drive assembly, one 8i HBA/RAID adapter, and one 16i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable	Power 1 connector on the front backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable*	SAS 0, SAS 1, and SAS 2 connectors on the backplane	16i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1C2</li> <li>• Gen 4: C0C1</li> </ul>
<b>3</b> Power cable	Power 2 connector on the front backplane	Backplane power connector 2 on the system board
<b>4</b> SAS signal cable for the rear hot-swap drive assembly*	Signal connector on the rear hot-swap drive assembly	8i HBA/RAID adapter on PCIe slot 4 <ul style="list-style-type: none"> <li>• Gen 3: C0</li> <li>• Gen 4: C0</li> </ul>



**Server model: eight 3.5-inch SAS/SATA drives, four 3.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one Gen 3 16i HBA/RAID adapter**

**Note:** The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly might not be available on your server.

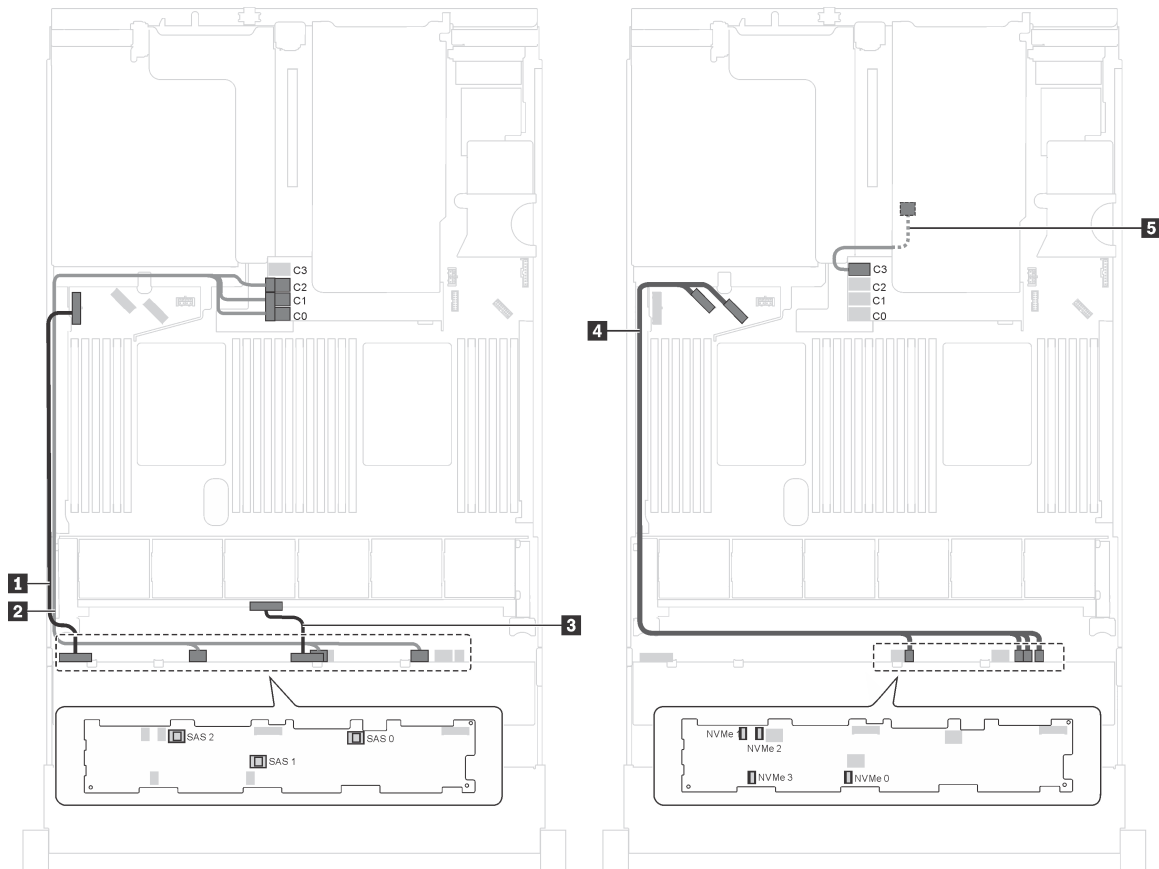


Figure 96. Cable routing for server models with eight 3.5-inch SAS/SATA drives, four 3.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, and one Gen 3 16i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable	Power 1 connector on the front backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable	SAS 0, SAS 1, and SAS 2 connectors on the backplane	C0, C1, and C2 connectors on the 16i HBA/RAID adapter on the RAID adapter slot
<b>3</b> Power cable	Power 2 connector on the front backplane	Backplane power connector 2 on the system board
<b>4</b> NVMe signal cable	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on the front backplane	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>5</b> SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C3 connector on the 16i HBA/RAID adapter on the RAID adapter slot

**Server model: eight 3.5-inch SAS/SATA drives, four 3.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, one Gen 4 16i HBA/RAID adapter**

**Notes:**

- The cable routing illustration is based on the scenario that the rear hot-swap drive assembly is installed. Depending on the model, the rear hot-swap drive assembly might not be available on your server.
- Gen 4 HBA/RAID adapter cannot be installed in the inner RAID adapter slot.
- Ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 3.5" SAS/SATA 8-Bay X40 RAID Cable Kit).

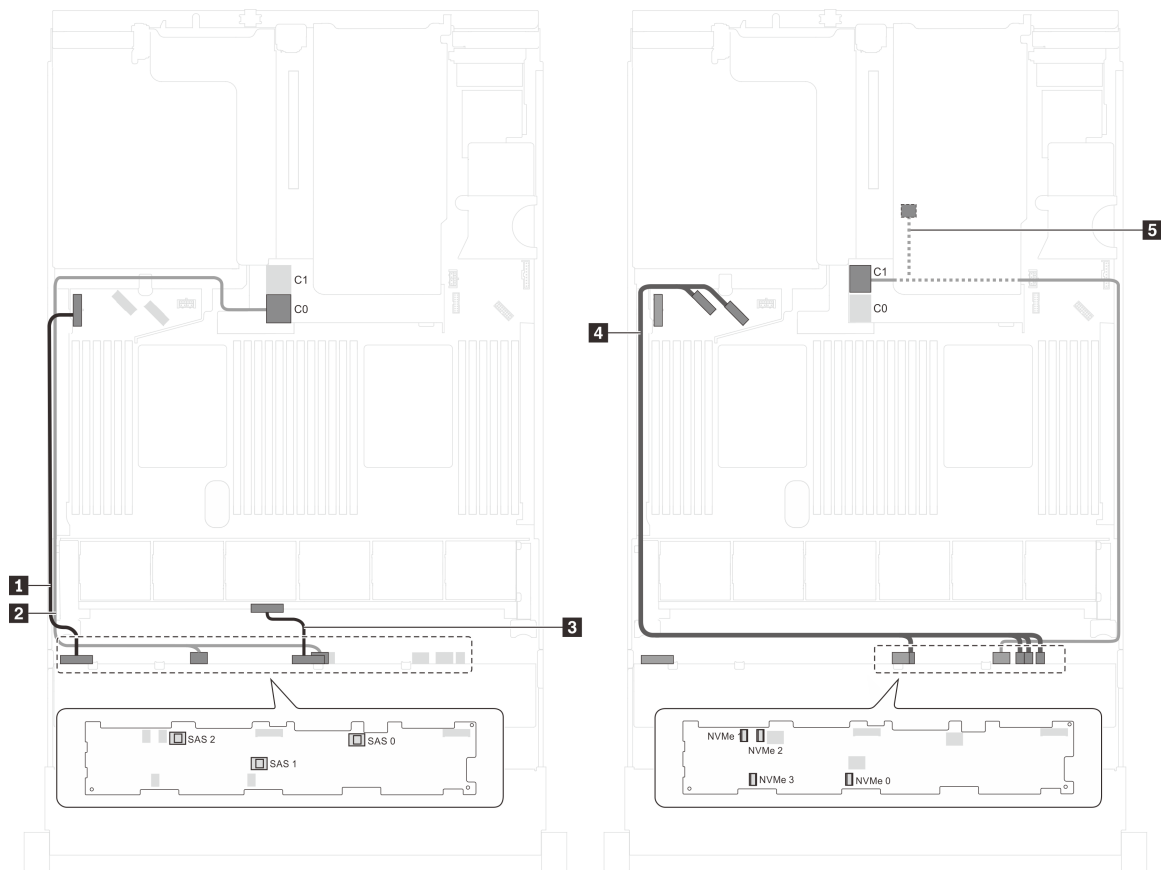


Figure 97. Cable routing for server models with eight 3.5-inch SAS/SATA drives, four 3.5-inch SAS/SATA/NVMe drives, the rear hot-swap drive assembly, and one Gen 4 16i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable	Power 1 connector on the front backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable	SAS 0 and SAS 1 connectors on the backplane	C0 connector on the 16i HBA/RAID adapter on the RAID adapter slot
<b>3</b> Power cable	Power 2 connector on the front backplane	Backplane power connector 2 on the system board

Cable	From	To
<b>4</b> NVMe signal cable	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on the front backplane	NVMe 0–1 and NVMe 2–3 connectors on the system board
<b>5</b> SAS signal cable for the rear hot-swap drive assembly	SAS 2 connector on the backplane and signal connector on the rear hot-swap drive assembly	C1 connector on the 16i HBA/RAID adapter on the RAID adapter slot

**Server model: eight 3.5-inch SAS/SATA drives, four 3.5-inch NVMe drives, one 8i HBA/RAID adapter**

**Notes:**

- Depending on the backplane type, the connector location of the backplanes may vary slightly.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- \*When Gen 4 HBA/RAID adapter is installed, ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 3.5" SAS/SATA 8-Bay X40 RAID Cable Kit).

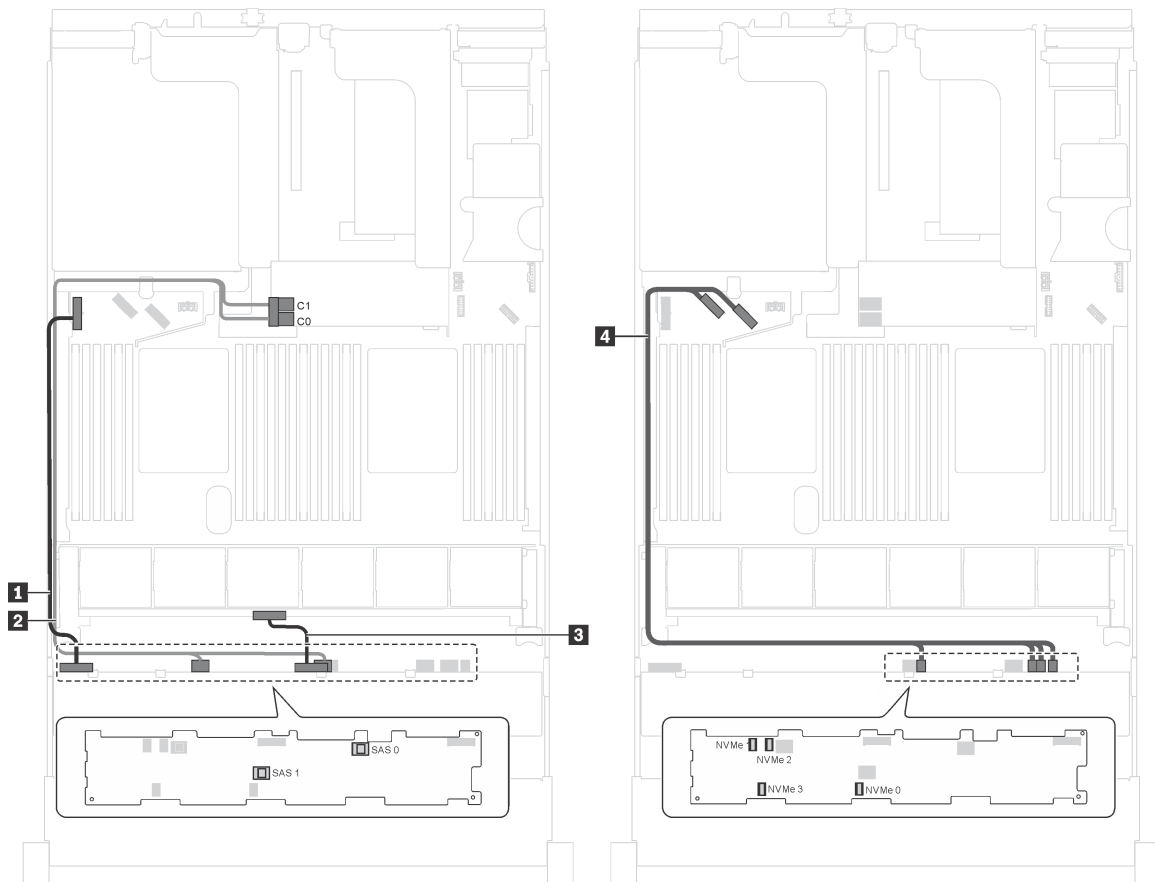


Figure 98. Cable routing for server models with eight 3.5-inch SAS/SATA drives, four 3.5-inch NVMe drives, and one 8i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable	Power 1 connector on the backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable*	SAS 0 and SAS 1 connectors on the backplane	8i HBA/RAID adapter on the RAID adapter slot <ul style="list-style-type: none"> <li>• Gen 3: C0C1</li> <li>• Gen 4: C0</li> </ul>
<b>3</b> Power cable	Power 2 connector on the backplane	Backplane power connector 2 on the system board
<b>4</b> NVMe signal cable	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on the backplane	NVMe 0–1 and NVMe 2–3 connectors on the system board

**Server model: eight 3.5-inch SAS/SATA drives, four 3.5-inch NVMe drives, the rear hot-swap drive assembly, one Gen 3 8i HBA/RAID adapter**

**Note:** This server model is supported in Chinese Mainland only.

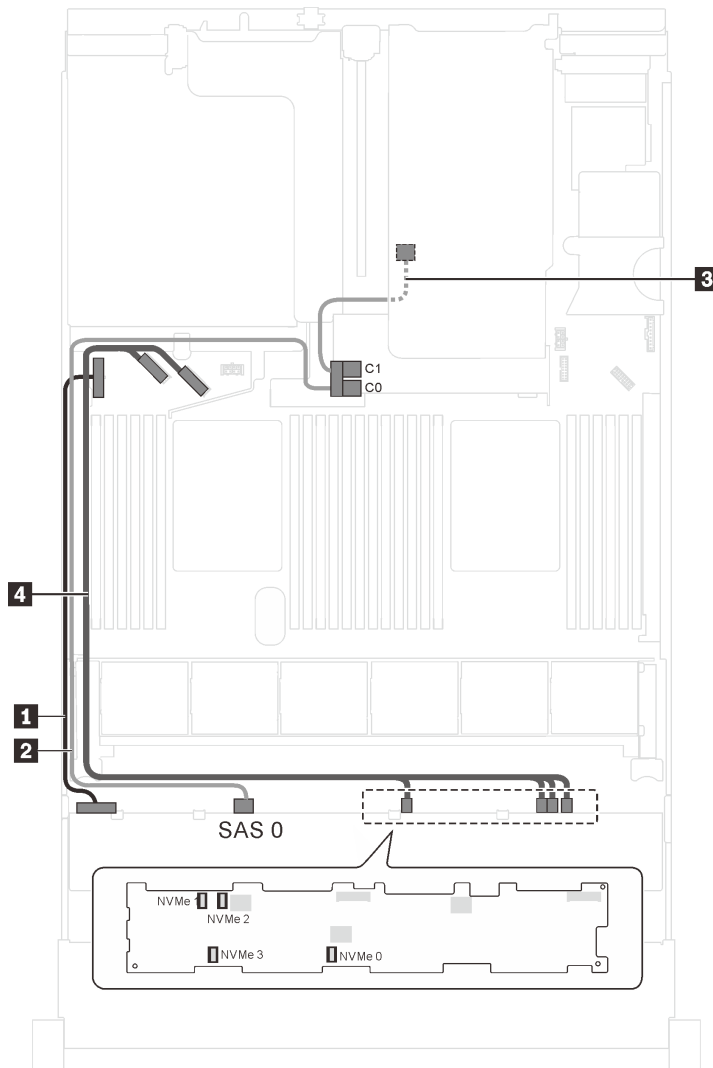


Figure 99. Cable routing for server models with eight 3.5-inch SAS/SATA drives, four 3.5-inch NVMe drives, the rear hot-swap drive assembly, and one Gen 3 8i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable	Power 1 connector on the backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable	SAS 0 connector on the backplane	C0 connector on the 8i HBA/RAID adapter on the RAID adapter slot
<b>3</b> SAS signal cable for the rear hot-swap drive assembly	Signal connector on the rear hot-swap drive assembly	C1 connector on the 8i HBA/RAID adapter on the RAID adapter slot
<b>4</b> NVMe signal cable	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on the backplane	NVMe 0–1 and NVMe 2–3 connectors on the system board

**Server model: eight 3.5-inch SAS/SATA drives, four 3.5-inch NVMe drives, the rear hot-swap drive assembly, one Gen 4 8i HBA/RAID adapter**

**Notes:**

- This server model is supported in Chinese Mainland only.
- Gen 4 HBA/RAID adapter cannot be installed in the inner raid adapter slot.
- Ensure you use Gen 4 SAS signal cable (ThinkSystem SR550/SR590/SR650 3.5" SAS/SATA 8-Bay X40 RAID Cable Kit).

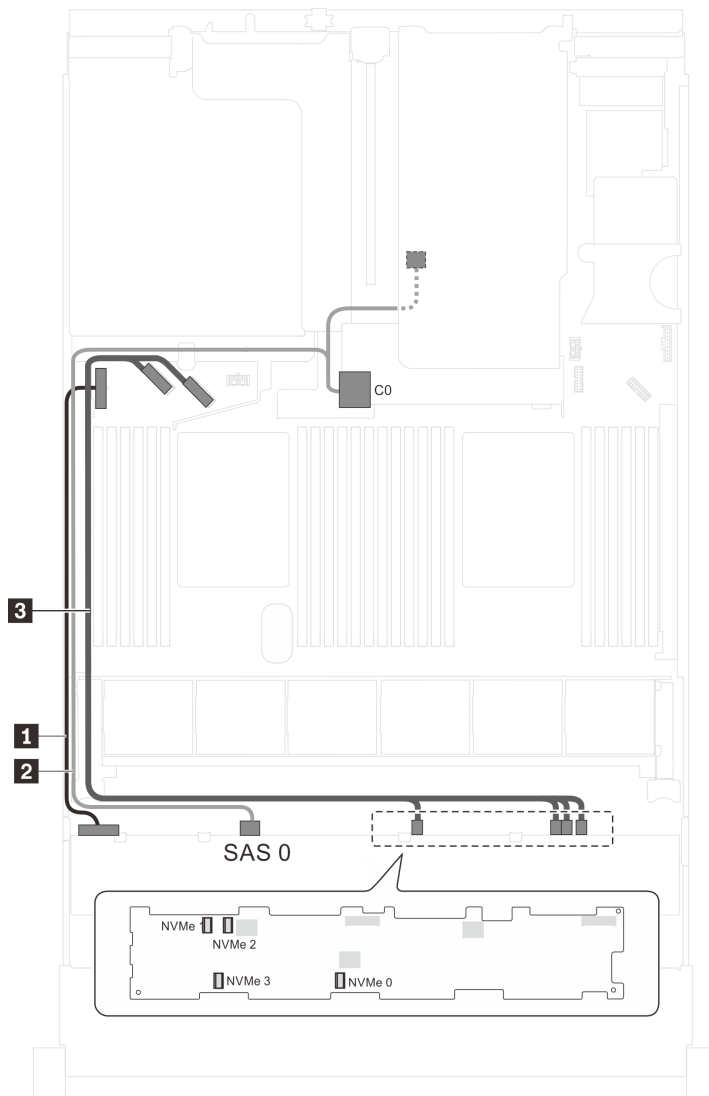


Figure 100. Cable routing for server models with eight 3.5-inch SAS/SATA drives, four 3.5-inch NVMe drives, the rear hot-swap drive assembly, and one Gen 4 8i HBA/RAID adapter

Cable	From	To
<b>1</b> Power cable	Power 1 connector on the backplane	Backplane power connector 1 on the system board
<b>2</b> SAS signal cable	SAS 0 connector on the backplane and signal connector on the rear hot-swap drive assembly	C0 connector on the 8i HBA/RAID adapter on the RAID adapter slot
<b>3</b> NVMe signal cable	NVMe 0, NVMe 1, NVMe 2, and NVMe 3 connectors on the backplane	NVMe 0–1 and NVMe 2–3 connectors on the system board

## Parts list

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

For more information about ordering the parts shown in [Figure 101 “Server components” on page 151](#):

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

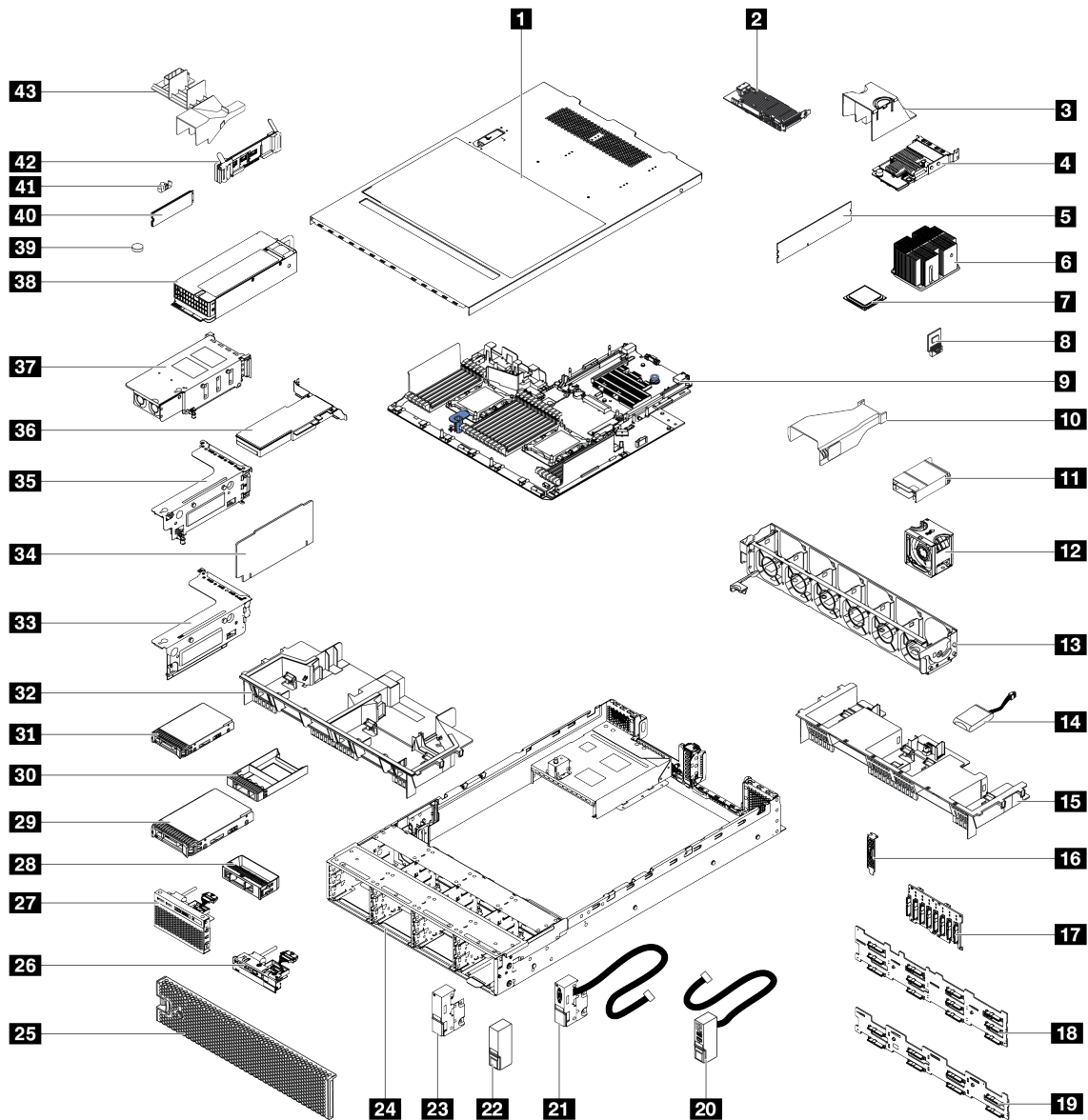


Figure 101. Server components

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

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

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

Table 10. Parts list

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and Structural parts
For more information about ordering the parts shown in Figure 101 “Server components” on page 151: <a href="http://datacentersupport.lenovo.com/us/en/products/servers/thinksystem/sr650/7x05/parts">http://datacentersupport.lenovo.com/us/en/products/servers/thinksystem/sr650/7x05/parts</a> It is highly recommended that you check the power summary data for your server using Lenovo Capacity Planner before purchasing any new parts.					
1	Top cover	√			
2	RAID adapter	√			
3	LOM-adapter air baffle				√
4	LOM adapter	√			
5	Memory module (DCPMM might look slightly different from the illustration)	√			
6	Heat sink			√	
7	Processor			√	
8	TCM/TPM adapter (for Chinese Mainland only)			√	
9	System board			√	
10	P4 GPU air baffle	√			
11	FHHL V100 GPU air baffle	√			
12	Fan	√			
13	Fan cage				√
14	RAID super capacitor module	√			
15	Standard air baffle				√
16	Serial port module	√			
17	Backplane, eight 2.5-inch hot-swap drives	√			
18	Backplane, twelve 3.5-inch hot-swap drives	√			
19	Backplane, eight 3.5-inch hot-swap drives	√			
20	Right rack latch, with front I/O assembly	√			
21	Left rack latch, with VGA connector	√			
22	Right rack latch, without front I/O assembly				√



Table 10. Parts list (continued)

Index	Description	Tier 1 CRU	Tier 2 CRU	FRU	Consumable and Structural parts
23	Left rack latch, without VGA connector				√
24	Chassis			√	
25	Security bezel	√			
26	Front I/O assembly, server models with eight 3.5-inch drive bays	√			
27	Front I/O assembly, server models with eight or sixteen 2.5-inch drive bays	√			
28	Filler, 3.5-inch drive				√
29	Storage drive, 3.5-inch, hot-swap	√			
30	Filler, 2.5-inch drive				√
31	Storage drive, 2.5-inch, hot-swap	√			
32	Large-size air baffle				√
33	Riser 2 bracket	√			
34	Riser card	√			
35	Riser 1 bracket	√			
36	PCIe adapter	√			
37	Rear hot-swap drive assembly	√			
38	Power supply	√			
39	CMOS battery (CR2032)				√
40	M.2 drive	√			
41	M.2 retainer	√			
42	M.2 backplane	√			
43	480 GB M.2 drive air baffle	√			

## 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. 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.

For more information about ordering parts:

<http://datacentersupport.lenovo.com/us/en/products/servers/thinksystem/sr650/7x05/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 16](#).

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### 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 that you work safely.
  - A complete list of safety information for all products is available at:  
[http://thinksystem.lenovofiles.com/help/topic/safety\\_documentation/pdf\\_files.html](http://thinksystem.lenovofiles.com/help/topic/safety_documentation/pdf_files.html)
  - The following guidelines are available as well: [“Handling static-sensitive devices” on page 158](#) and [“Working inside the server with the power on” on page 157](#).
- Make sure the components you are installing are supported by the server. For a list of supported optional components for the server, see <https://static.lenovo.com/us/en/serverproven/index.shtml>.
- 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 SR650 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 that the latest level of code is supported for the cluster solution 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.
- 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 since 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 about the display panel or to replace hot-swap components. Review these guidelines before doing so.

**Attention:** The server might stop and loss of data 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 long 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.

---

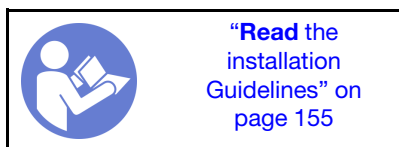
## Security bezel replacement

Use this information to remove and install the security bezel.

**Note:** The security bezel is available on some models.

### Remove the security bezel

Use this information to remove the security bezel.



To remove the security bezel, complete the following steps:

#### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

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

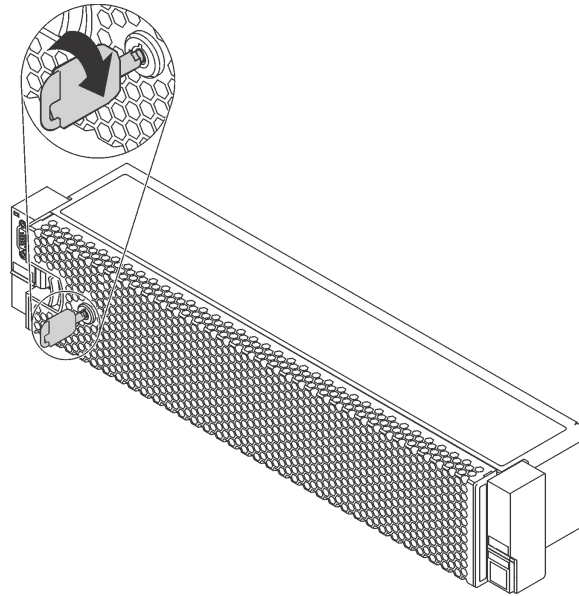


Figure 102. Unlocking the security bezel

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

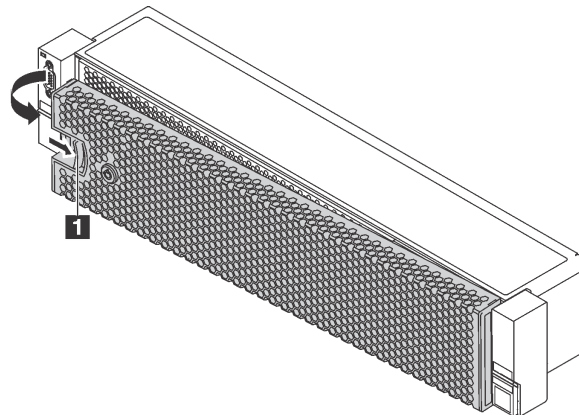
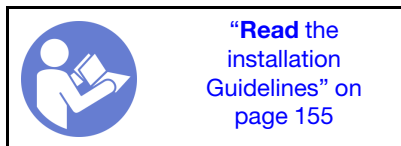


Figure 103. Security bezel removal

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

## Install the security bezel

Use this information to install the security bezel.



Before installing the security bezel, if you have removed the rack latches, reinstall them. See “[Install the rack latches](#)” on page 165.

To install the security bezel, complete the following steps:

**Watch the procedure**

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

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

Step 1. If the key is held inside the security bezel, remove it out of the security bezel.

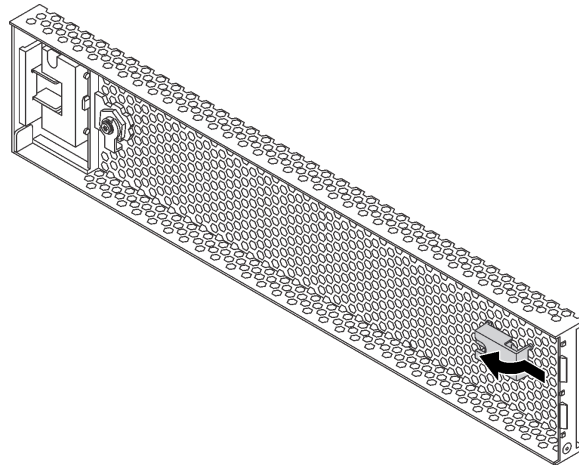


Figure 104. Key removal

Step 2. 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 pivot the security bezel inward until the other side clicks into place.

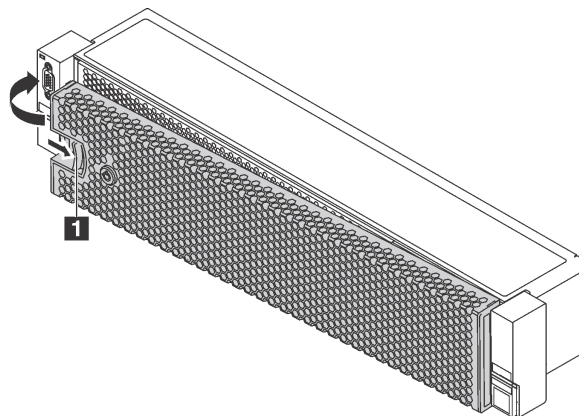


Figure 105. Security bezel installation



Step 3. Use the key to lock the security bezel to the closed position.

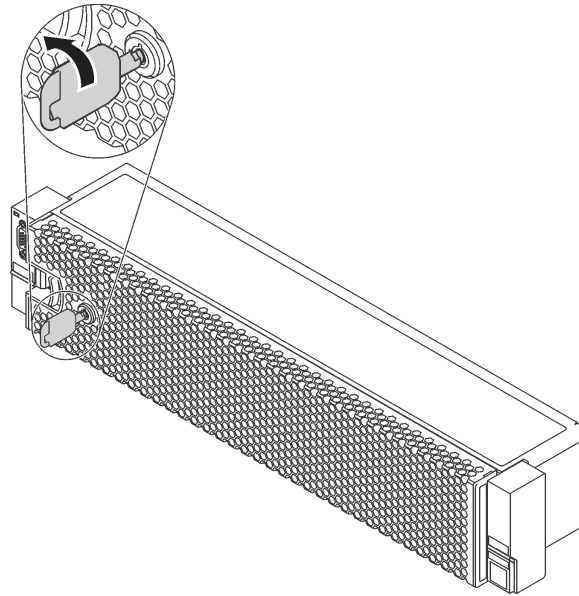


Figure 106. Locking the security bezel

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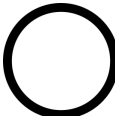

## Rack latches replacement

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

Use this information to remove the rack latches.

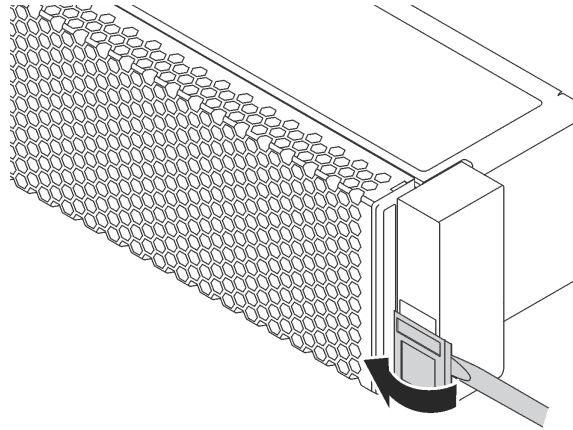
	<p><b>“Read the installation Guidelines”</b> on page 155</p>		<p><b>“Power off the server for this task”</b> on page 20</p>		<p><b>“ATTENTION: Static Sensitive Device</b> Ground package before opening” on page 158</p>
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**Note:** If the rack latches are not assembled with a VGA connector or the front I/O assembly, you can remove the rack latches without powering off the server.

Before removing the rack latches:

1. If the server is installed with the security bezel, remove it first. See [“Remove the security bezel”](#) on page 158.

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 107. ID label plate removal*

To remove the rack latches, complete the following steps:

**Watch the procedure**

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

Step 1. Do one of the following:

- If the rack latches are not assembled with a VGA connector or the front I/O assembly, go to the next step.
- If the rack latches are assembled with a VGA connector, the front I/O assembly, or both, complete the following steps:

1. Disconnect the VGA cable **1**, the front-I/O-assembly cable **2**, or both cables from the system board.

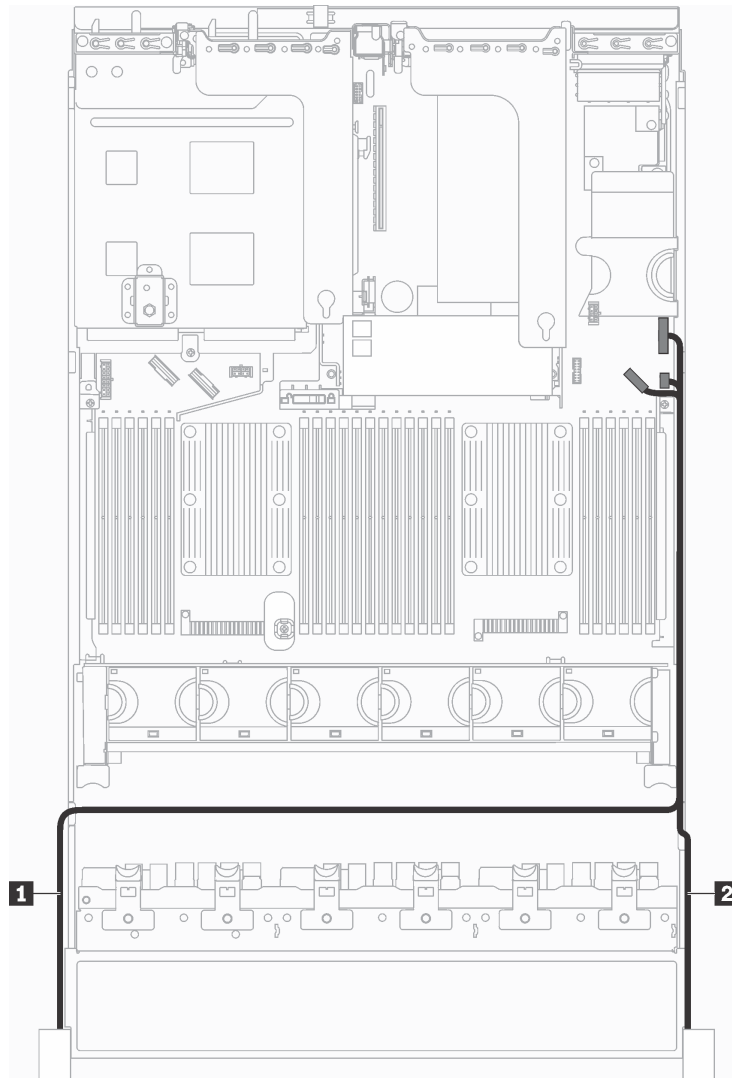
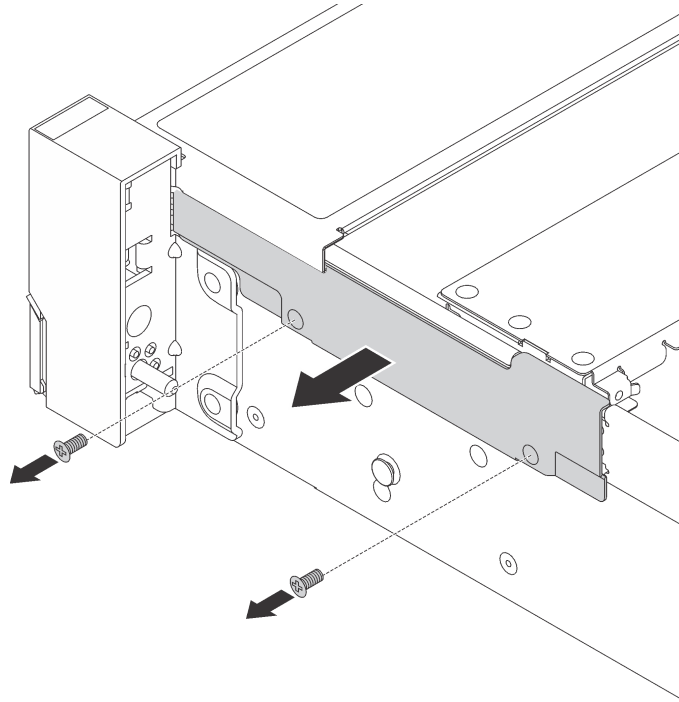


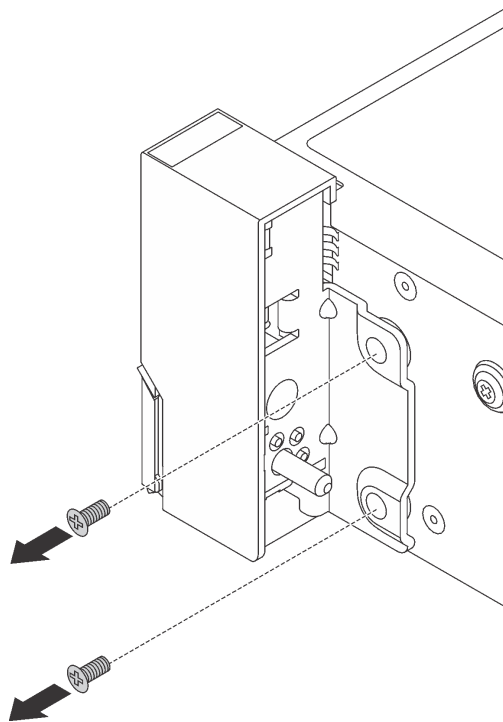
Figure 108. Cable routing for the VGA connector and the front I/O assembly on rack latches

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



*Figure 109. Cable retainer removal*

- Step 2. On each side of the server, remove the screws that secure the rack latch.



*Figure 110. Screws removal*

Step 3. On each side of the server, slide the rack latch forward slightly and then remove the rack latch from the chassis.

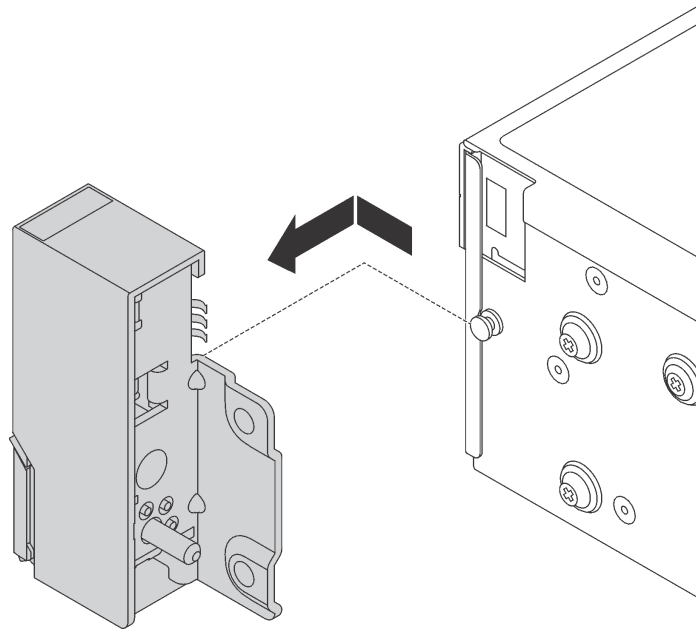





Figure 111. Rack latch removal

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

## Install the rack latches

Use this information to install the rack latches.

	<b>“Read the installation Guidelines”</b> on page 155		<b>“Power off the server for this task”</b> on page 20		<b>“ATTENTION: Static Sensitive Device</b> Ground package before opening” on page 158
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**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.

To install the rack latches, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

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.

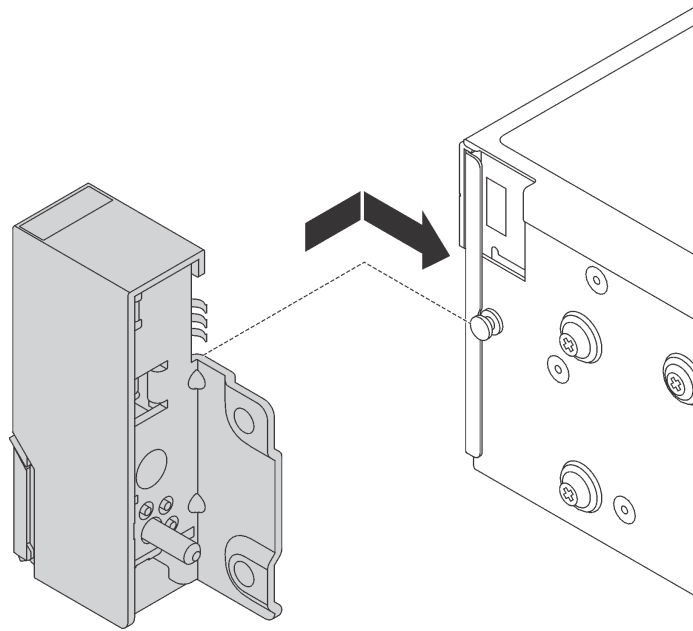


Figure 112. Rack latch installation

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

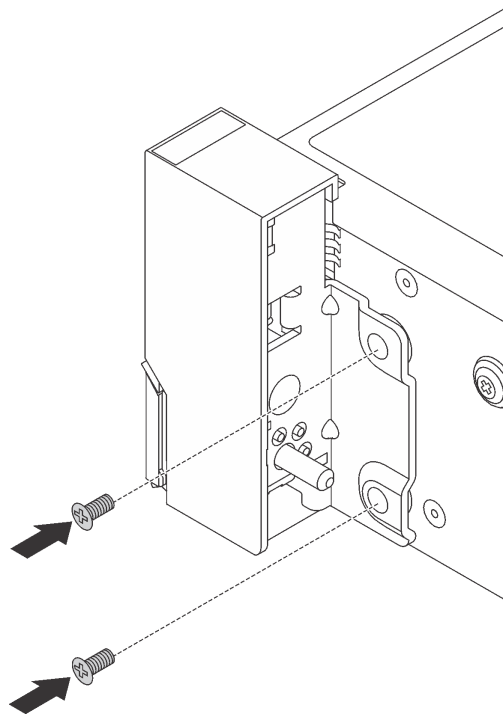
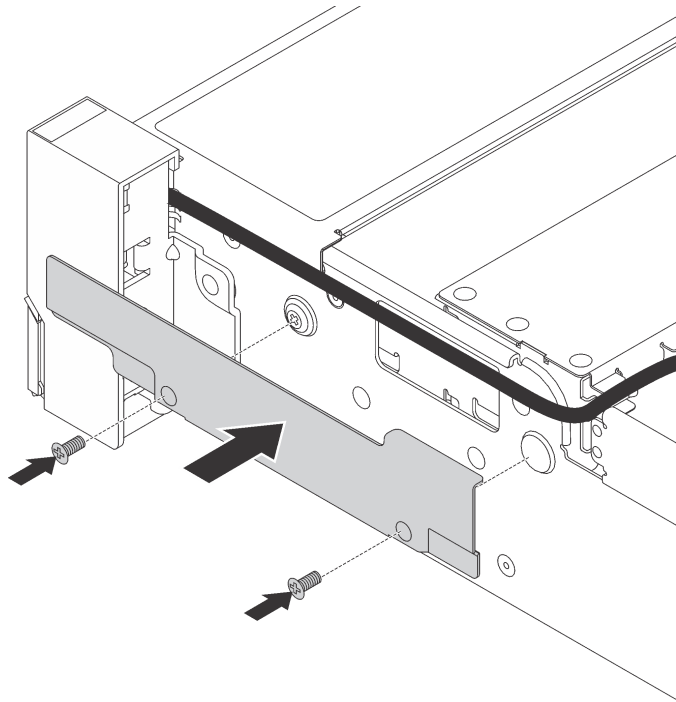


Figure 113. Screws installation

Step 4. If the rack latches are assembled with a VGA connector, the front I/O assembly, or both, complete the following steps:

1. Route the VGA cable, the front-I/O-assembly cable, or both cables across the notch on the chassis as shown. Then, install the screws to secure the cable retainer.



*Figure 114. Cable retainer installation*

2. Connect the VGA cable **1**, the front-I/O-assembly cable **2**, or both cables to the system board.

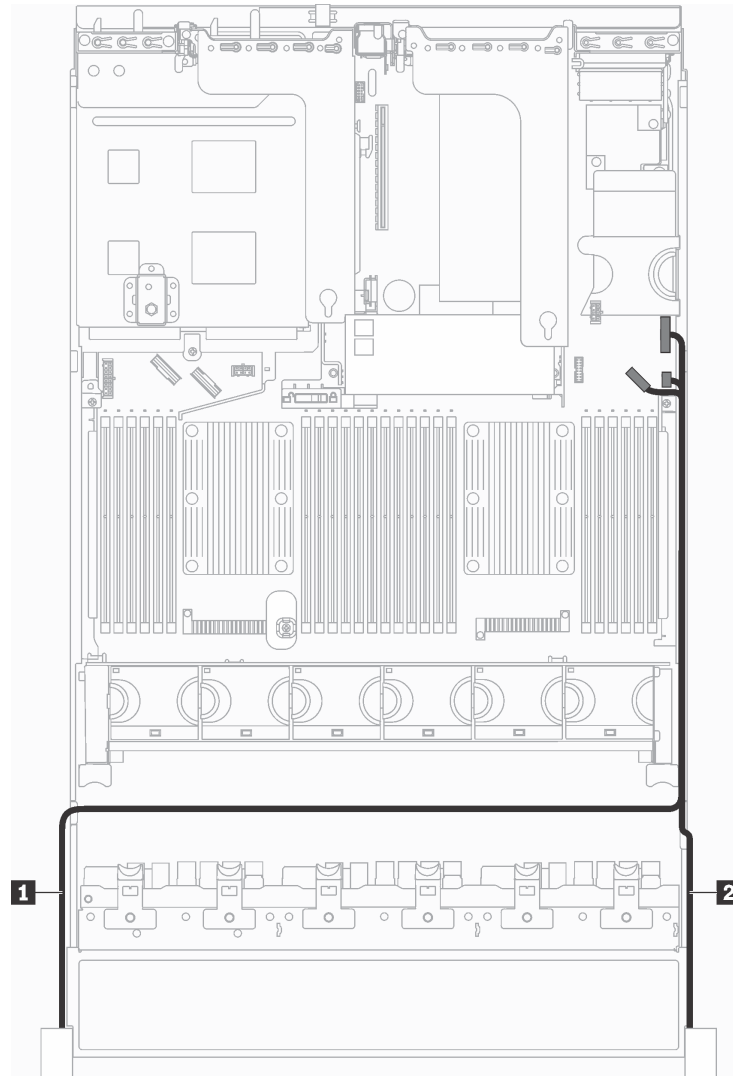


Figure 115. Cable routing for the VGA connector and the front I/O assembly on rack latches



After installing the rack latches:

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

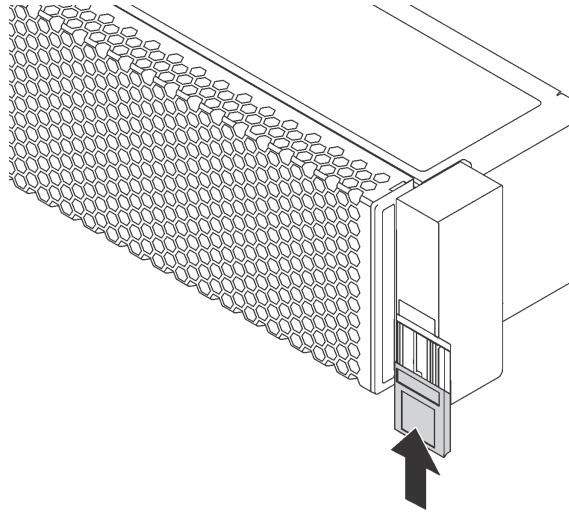


Figure 116. ID label plate installation

2. Complete the parts replacement. See [“Complete the parts replacement” on page 286](#).


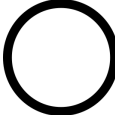

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## Top cover replacement

Use this information to remove and install the top cover.

### Remove the top cover

Use this information to remove the top cover.

	<p>“Read the installation Guidelines” on page 155</p>		<p>“Power off the server for this task” on page 20</p>		<p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 158</p>
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#### 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.**

**Note:** You can remove or install a hot-swap fan without powering off the server, which helps you avoid significant interruption to the operation of the system.

To remove the top cover, complete the following steps:

**Watch the procedure**

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

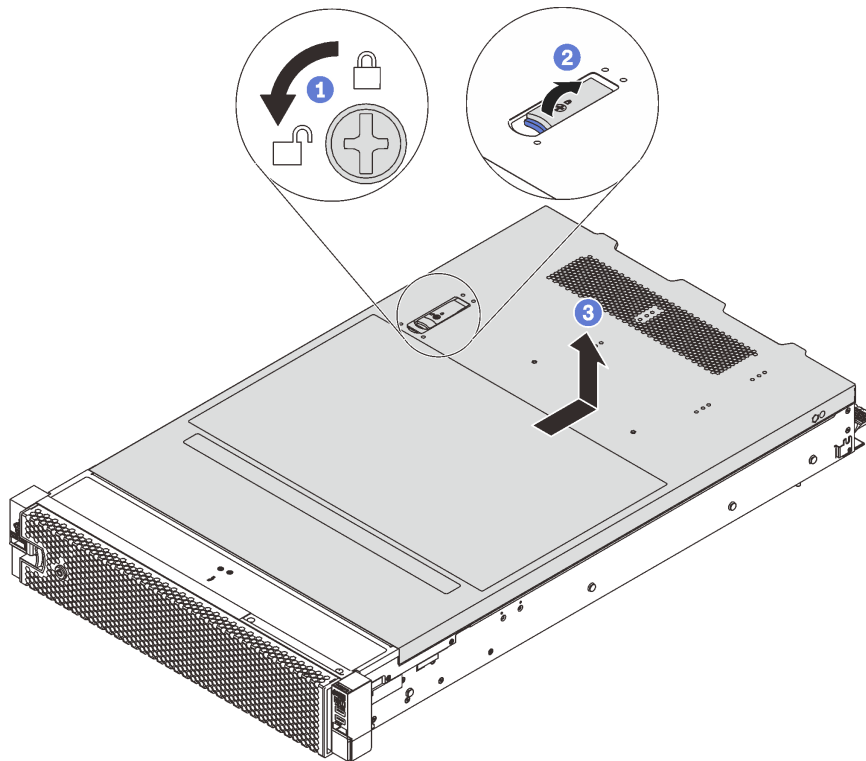


Figure 117. Top cover removal

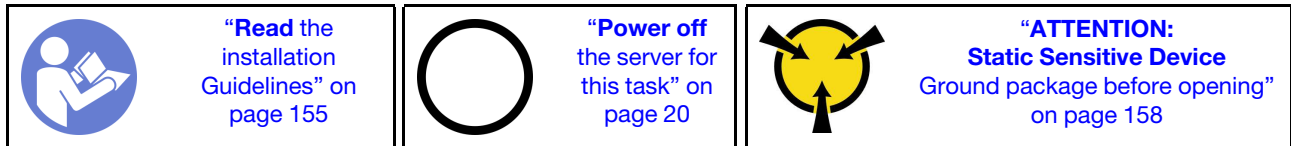
- Step 1. Use a screwdriver to turn the cover lock to the unlocked position as shown.
- Step 2. Press the release button on the cover latch and then fully open the cover latch.
- Step 3. Slide the top cover to the rear until it is disengaged from the chassis. Then, lift the top cover off the chassis and place the top cover on a flat clean surface.

**Attention:**

- Handle the top cover carefully. Dropping the top cover with the cover latch open might damage the cover latch.
- For proper cooling and airflow, install the top cover before you turn on the server. Operating the server with the top cover removed might damage server components.

**Install the top cover**

Use this information to install the top cover.



Before you install the top cover:

1. 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.
2. Ensure that all internal cables are connected and routed correctly. See [“Internal cable routing”](#) on page 37.
3. If you are installing a new top cover, attach the service label to the new top cover first if necessary.

**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. The service label is free of charge.

To install the top cover, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

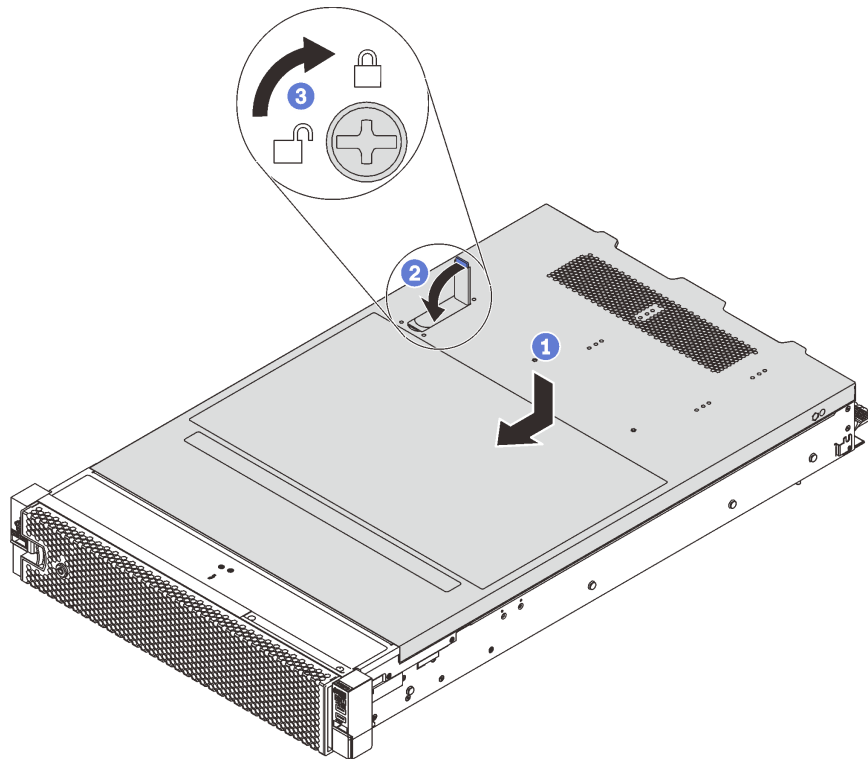


Figure 118. Top cover installation

**Note:** Before you slide the top cover forward, ensure that all the tabs on the top cover engage the chassis correctly. If the tabs do not engage the chassis correctly, it will be very difficult to remove the top cover later.

- Step 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.

- Step 2. Pivot the cover latch and slide the top cover to the front of the chassis at the same time until the top cover snaps into position. Ensure that the cover latch is closed.
- Step 3. Use a screwdriver to turn the cover lock to the locked position.

After installing the top cover, complete the parts replacement. See [“Complete the parts replacement” on page 286](#).

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## RAID super capacitor module replacement

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

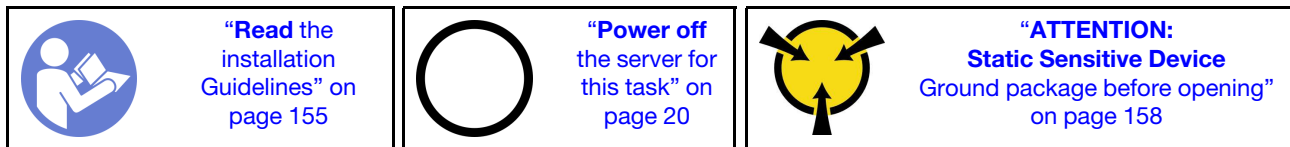
The RAID super capacitor module protects the cache memory on the installed RAID adapter. You can purchase a RAID super capacitor module from Lenovo.

For a list of supported options, see:

<https://static.lenovo.com/us/en/serverproven/index.shtml>

### Remove a RAID super capacitor module

Use this information to remove a RAID super capacitor module.



Before removing a RAID super capacitor module:

1. Remove the top cover. See [“Remove the top cover” on page 169](#).
2. Disconnect the cable of the RAID super capacitor module.

To remove a RAID super capacitor module, complete the following steps:

#### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

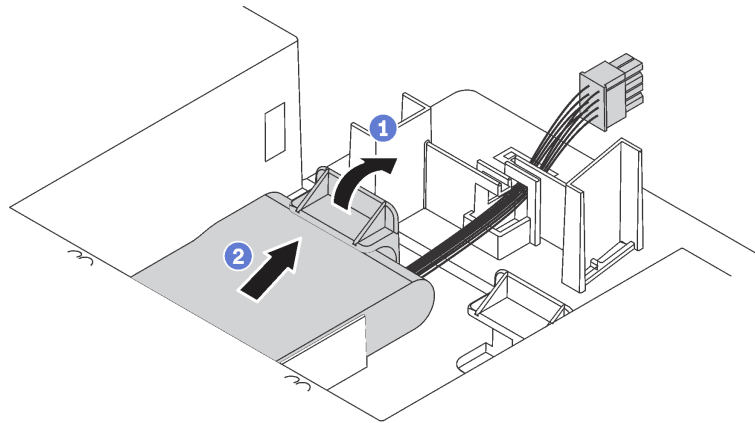



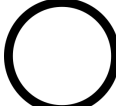

Figure 119. RAID super capacitor module removal

- Step 1. Gently press the tab on the air baffle as shown.
- Step 2. Remove the RAID super capacitor module from the air baffle.

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 RAID super capacitor module

Use this information to install a RAID super capacitor module.

 <p><b>“Read the installation Guidelines”</b> on page 155</p>	 <p><b>“Power off the server for this task”</b> on page 20</p>	 <p><b>“ATTENTION: Static Sensitive Device</b> Ground package before opening” on page 158</p>
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Before installing a RAID super capacitor module:

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.
2. Locate the holder for the RAID super capacitor module on the air baffle and note the orientation of the RAID super capacitor module.

To install a RAID super capacitor module, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

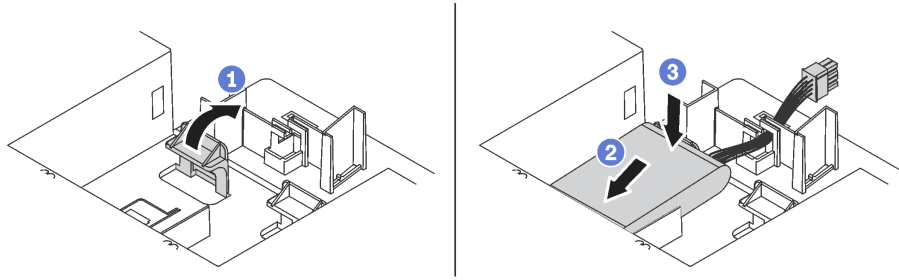


Figure 120. RAID super capacitor module installation

- Step 1. Gently press and hold the tab on the air baffle as shown.
- Step 2. Insert the RAID super capacitor module into the holder on the air baffle.
- Step 3. Press down the RAID super capacitor module to install it into the holder.

After installing the RAID super capacitor module:

- 1. Connect the RAID super capacitor module to a RAID adapter with the extension cable that comes with the RAID super capacitor module.
- 2. Complete the parts replacement. See [“Complete the parts replacement” on page 286](#).

---

## Air baffle replacement

Use this information to remove and install the air baffle.

### 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.**

## Remove the air baffle

Use this information to remove the air baffle.

	<p><b>“Read the installation Guidelines” on page 155</b></p>		<p><b>“Power off the server for this task” on page 20</b></p>
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Before removing the air baffle:

1. Remove the top cover. See “Remove the top cover” on page 169.
2. If there is a RAID super capacitor module installed on the air baffle, disconnect the RAID super capacitor module cable first.
3. If there is a GPU installed on the air baffle, remove the GPU first. See “Remove a GPU” on page 236.

To remove the air baffle, complete the following step:

#### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

Step 1. Grasp the air baffle and carefully lift it out of the server.

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

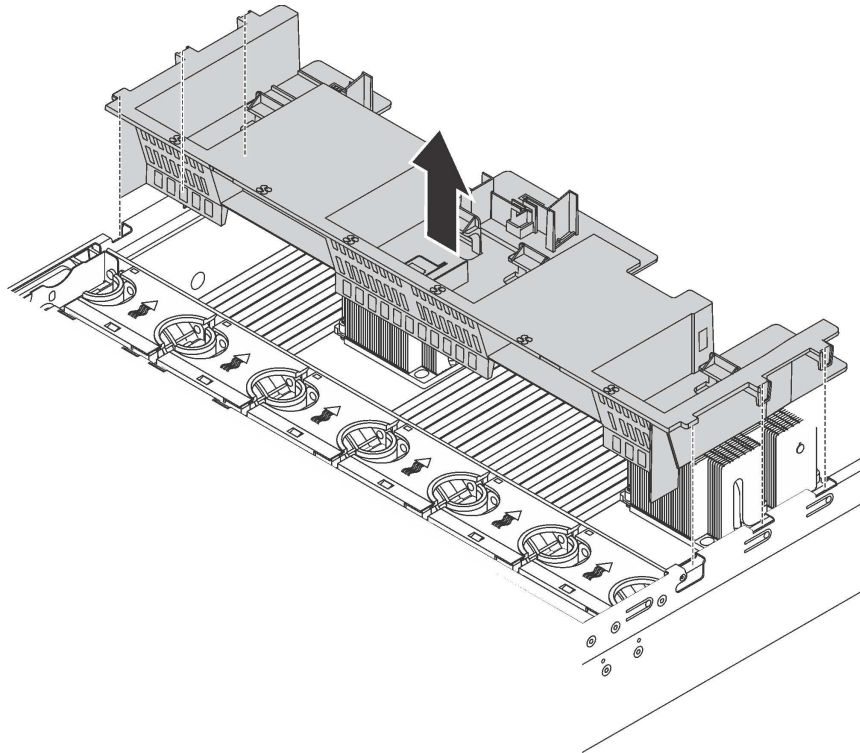


Figure 121. Removal of the standard air baffle

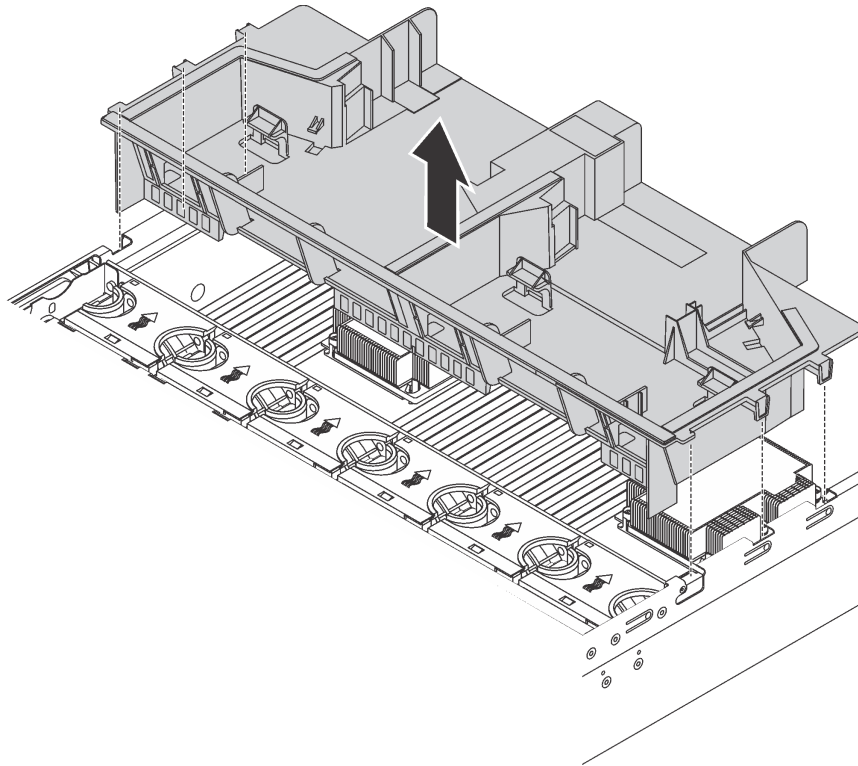


Figure 122. Removal of the large-size air baffle

After removing the standard air baffle, if there is a plastic filler installed in the air baffle, remove the plastic filler.

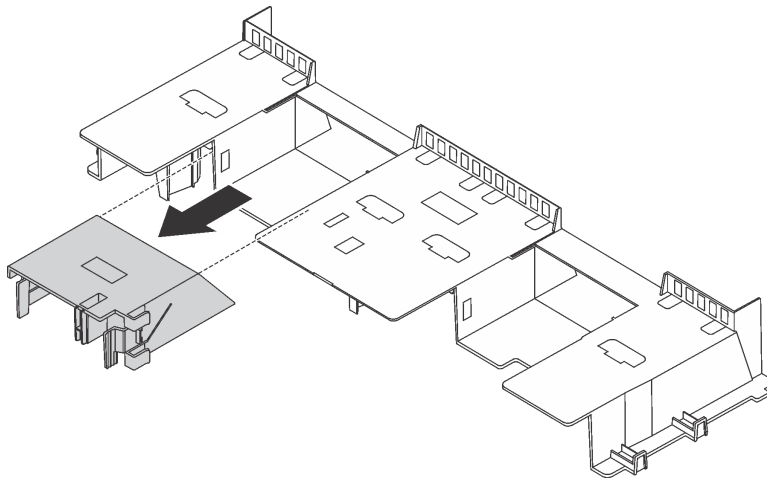
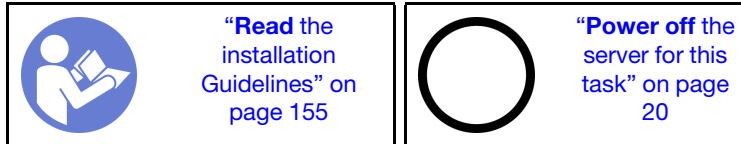


Figure 123. Plastic filler removal

## Install the air baffle

Use this information to install the air baffle.





Before installing the air baffle:

1. Ensure that no tools or loose screws are left inside your server.
2. Ensure that all components have been reassembled correctly.
3. Ensure that all cables inside the server have been properly routed and they will not interfere with installing the air baffle.
4. Select the appropriate air baffle for your server depending on the server model. See “[Important information about the air baffle and GPU](#)” on page 14.
5. If you are installing the standard air baffle, install the removed plastic filler to the air baffle if necessary.

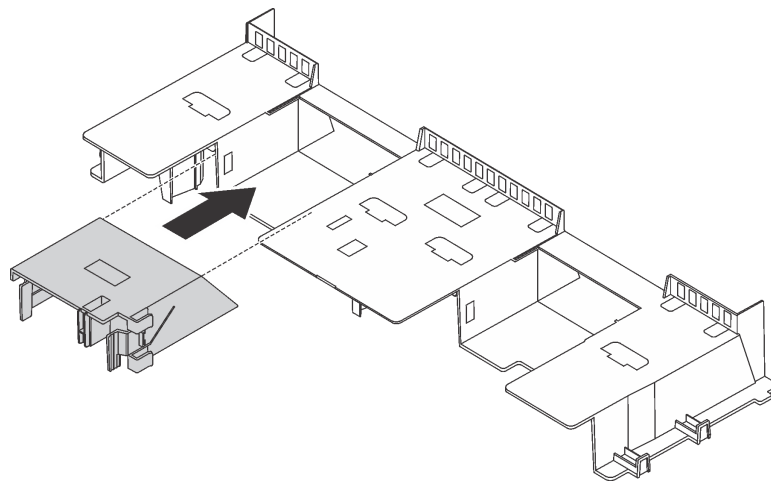


Figure 124. Plastic filler installation

To install the air baffle, complete the following steps:

#### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS_).

- Step 1. Note the orientation of the air baffle.
- Step 2. 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.

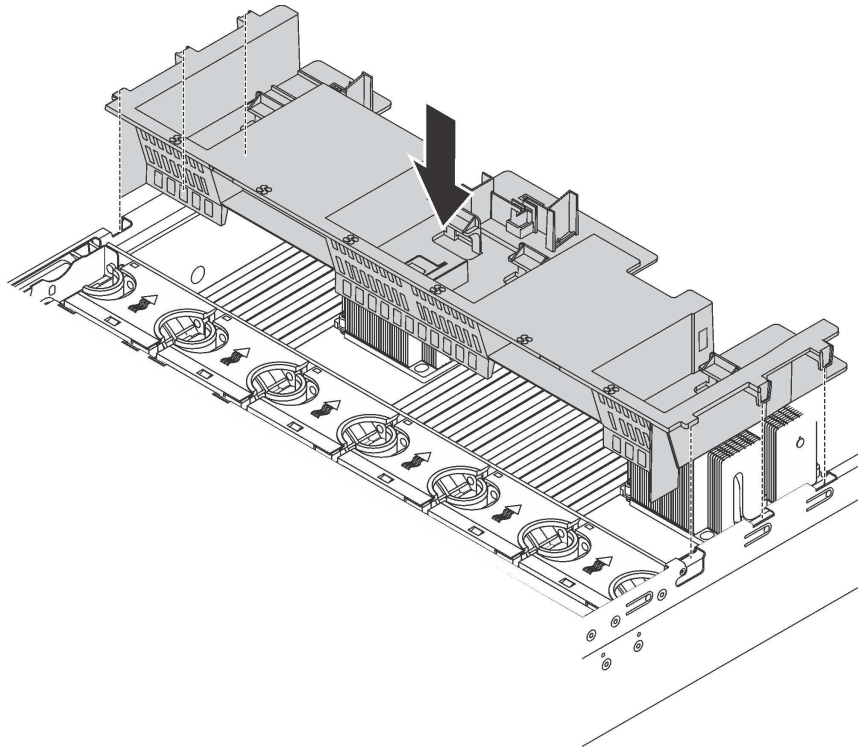


Figure 125. Installation of the standard air baffle

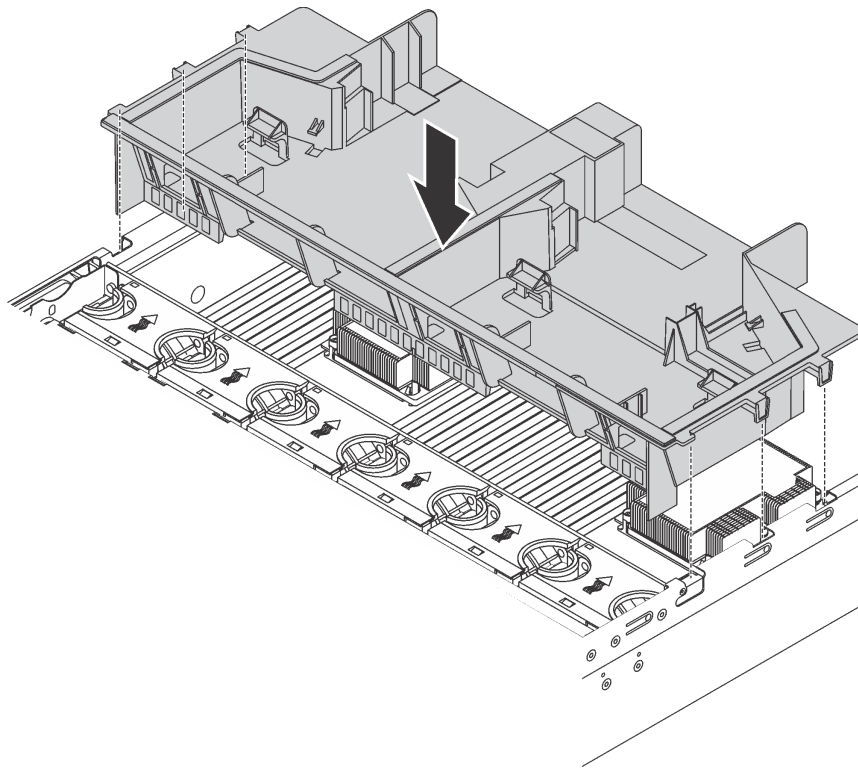


Figure 126. Installation of the large-size air baffle

After installing the air baffle:

1. If you have removed a RAID super capacitor module, reinstall it and connect it to the RAID adapter with the extension cable. [“Install a RAID super capacitor module” on page 173.](#)
2. If you have removed a GPU, reinstall it. See [“Install a GPU” on page 239.](#)
3. Complete the parts replacement. See [“Complete the parts replacement” on page 286.](#)

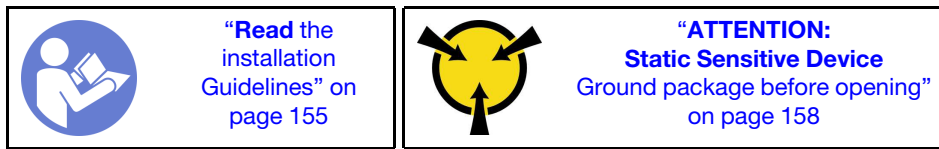
---

## System fan replacement

Use this information to remove and install a system fan.

### Remove a system fan

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



#### 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:** When removing a system fan without powering off the server, do not touch the system fan cage.

Before removing a system fan:

1. Remove the top cover. See [“Remove the top cover” on page 169.](#)

2. View the fan error LEDs **1** to locate the failing system fan.

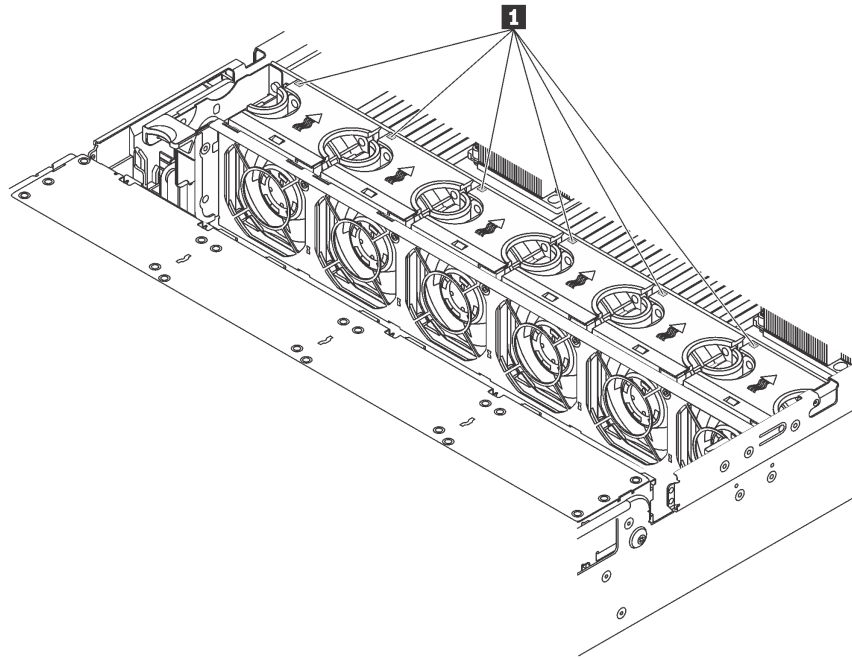


Figure 127. Viewing the fan error LEDs from the top of the system fans

To remove a system fan, complete the following steps:

**Watch the procedure**

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

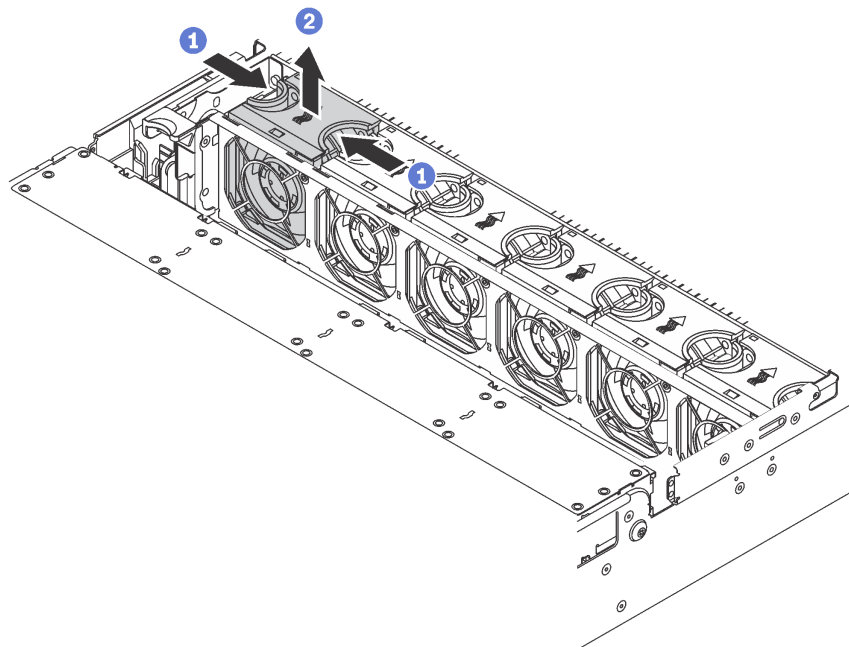


Figure 128. System fan removal

Step 1. Grasp the top of the system fan with your fingers.

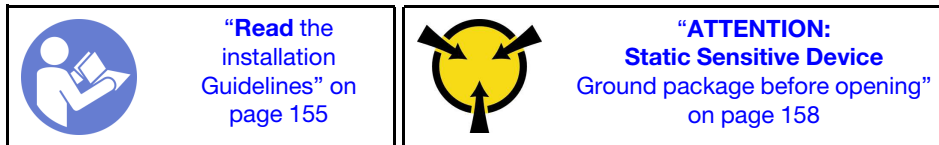
Step 2. Lift the system fan out of the server.

After removing the system fan:

1. Install a new system fan or install a fan filler to cover the place. See “Install a system fan” on page 181.
2. If you are instructed to return the old system fan, follow all packaging instructions and use any packaging materials that are provided.

## Install a system fan

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



### 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:** When installing a system fan without powering off the server, do not touch the system fan cage.

To install a system fan, complete the following steps:

#### **Watch the procedure**

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

- 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.

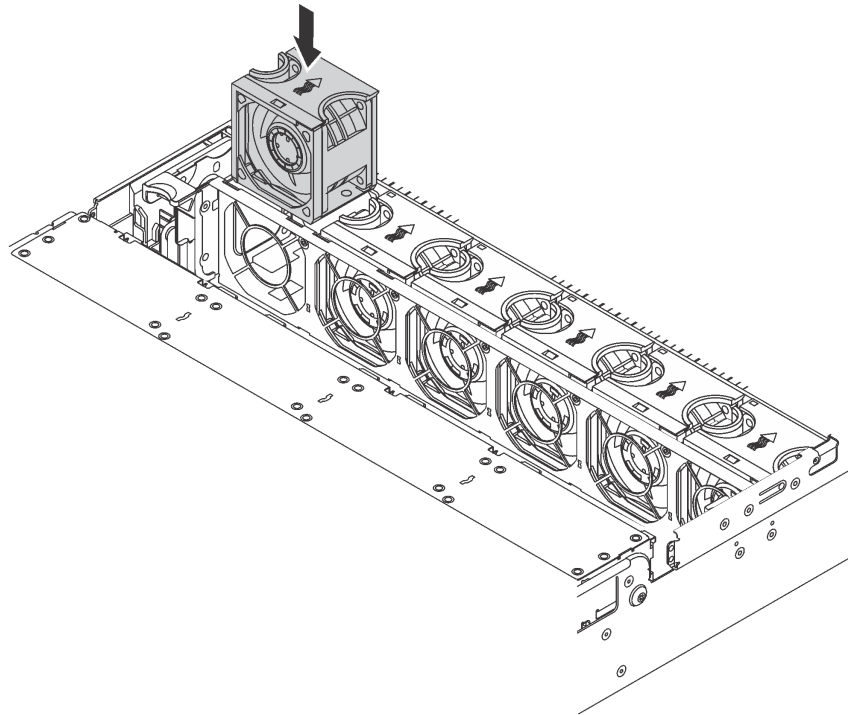


Figure 129. System fan installation

After installing the system fan, complete the parts replacement. See [“Complete the parts replacement” on page 286](#).


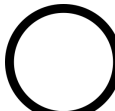

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## System fan cage replacement

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

### Remove the system fan cage

Use this information to remove the system fan cage.

	<b>“Read the installation Guidelines” on page 155</b>		<b>“Power off the server for this task” on page 20</b>		<b>“ATTENTION: Static Sensitive Device</b> Ground package before opening” on page 158
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Before removing the system fan cage:

1. Remove the top cover. See [“Remove the top cover” on page 169](#).
2. If you are replacing the system fan cage, remove all system fans first. See [“Remove a system fan” on page 179](#). If you are removing the system fan cage to access other components, you can remove it with the system fans installed.

To remove the system fan cage, complete the following steps:

## Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

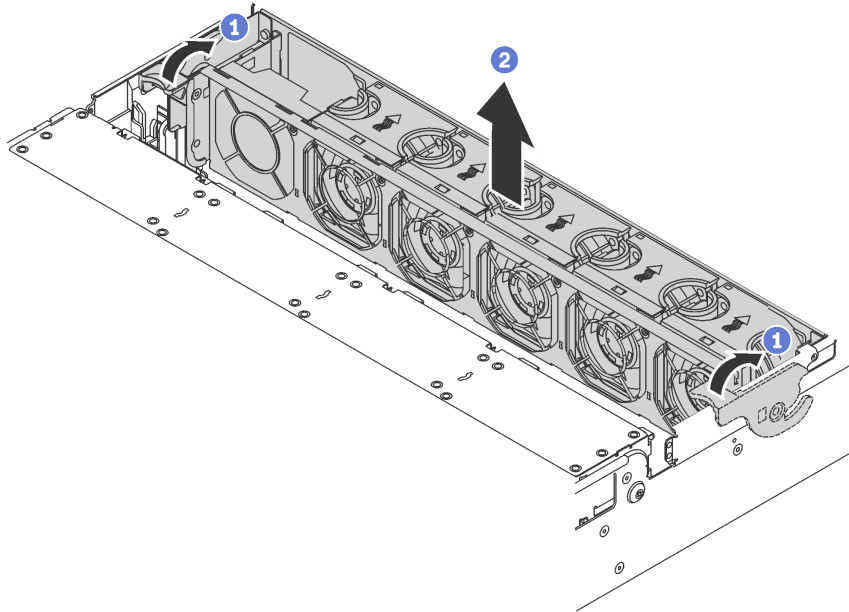



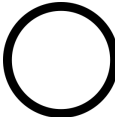

Figure 130. System fan cage removal

Step 1. Rotate the levers of the system fan cage to the rear of the server.

Step 2. Lift the system fan cage straight up and out of the chassis.

## Install the system fan cage

Use this information to install the system fan cage.

	<p>“Read the installation Guidelines” on page 155</p>		<p>“Power off the server for this task” on page 20</p>		<p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 158</p>
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To install the system fan cage, complete the following steps:

## Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

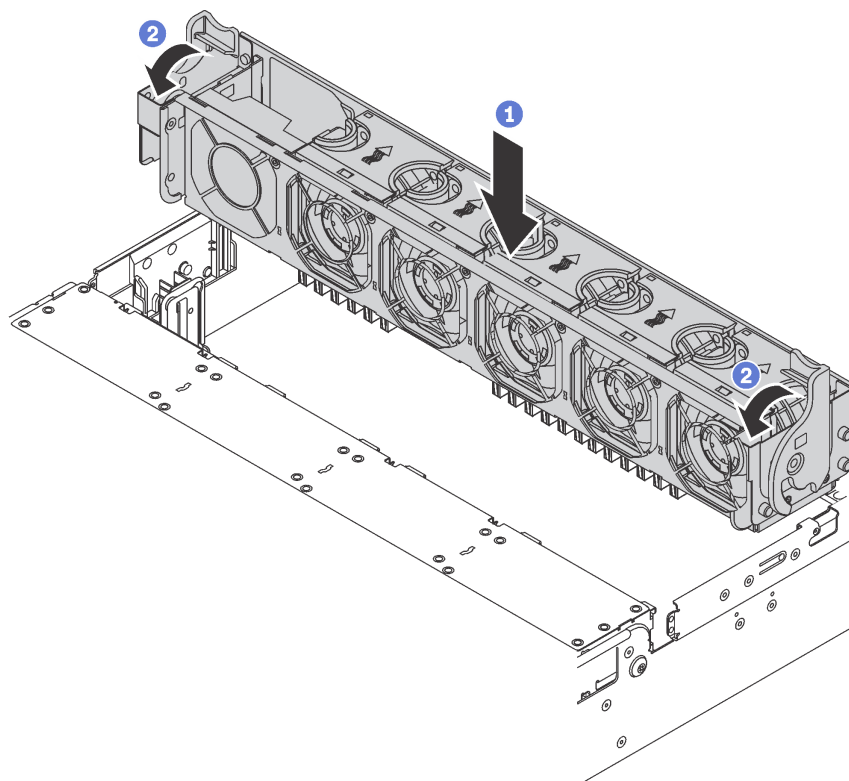


Figure 131. System fan cage installation

Step 1. Align both sides of the system fan cage with the corresponding mounting posts in the chassis. Then, press the system fan cage straight down into the chassis.

**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.

Step 2. Rotate the levers of the system fan cage to the front of the server to secure the system fan cage.

After installing the system fan cage:

1. If you have removed the system fans, reinstall them. See [“Install a system fan” on page 181](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 286](#).

## Front I/O assembly replacement

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

**Note:** Depending on the model, your server and the front I/O assembly might look different from the illustrations in this topic.

### Remove the front I/O assembly

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

	<p><b>“Read the installation Guidelines” on page 155</b></p>	<p><b>“Power off the server for this task” on page 20</b></p>	<p><b>“ATTENTION: Static Sensitive Device Ground package before opening” on page 158</b></p>
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**Note:** The following procedure is based on the scenario that you are removing the front I/O assembly for server models with eight 3.5-inch drive bays. The removal procedure is similar for the front I/O assembly for server models with eight or sixteen 2.5-inch drive bays. For server models with twelve 3.5-inch drive bays or twenty-four 2.5-inch drive bays, the front I/O assembly is assembled with the right rack latch. See “[Remove the rack latches](#)” on [page 161](#) for the removal procedures.

Before removing the front I/O assembly:

1. Remove the top cover. See “[Remove the top cover](#)” on [page 169](#).
2. If the security bezel is installed, remove it. See “[Remove the security bezel](#)” on [page 158](#).
3. Disconnect the cables of the front I/O assembly from the system board. See “[Front I/O assembly](#)” on [page 39](#).

To remove the front I/O assembly, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

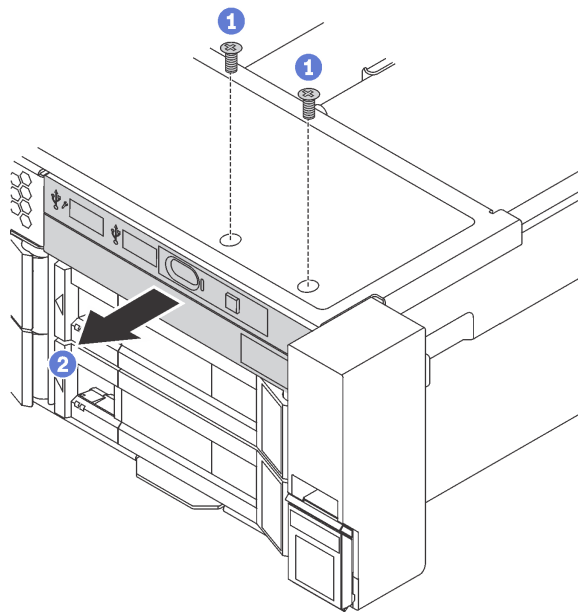


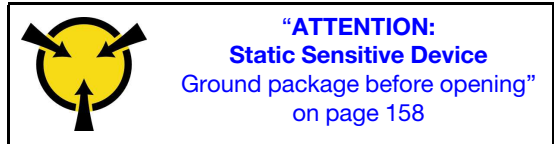
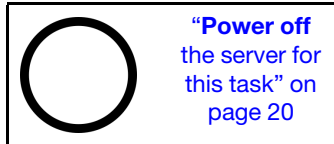
Figure 132. Front I/O assembly removal

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

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

## Install the front I/O assembly

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



**Note:** The following procedure is based on the scenario that you are installing the front I/O assembly for server models with eight 3.5-inch drive bays. The installation procedure is similar for the front I/O assembly for server models with eight or sixteen 2.5-inch drive bays. For server models with twelve 3.5-inch drive bays or twenty-four 2.5-inch drive bays, the front I/O assembly is assembled with the right rack latch. See [“Install the rack latches” on page 165](#) for the installation procedures.

Before installing the front I/O assembly, touch the static-protective package that contains the new front I/O assembly to any unpainted surface on the outside of the server. Then, take the new front I/O assembly out of the package and place it on a static-protective surface.

To install the front I/O assembly, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

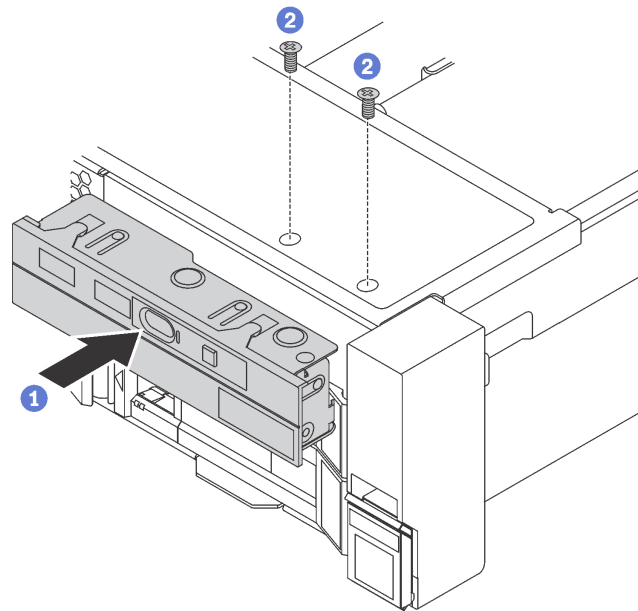


Figure 133. Front I/O assembly installation

Step 1. Insert the front I/O assembly into the assembly bay.

Step 2. Install the screws to secure the front I/O assembly in place.

After installing the front I/O assembly:

1. Connect the cables of the front I/O assembly to the system board. See [“Front I/O assembly” on page 39](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 286](#).

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## Hot-swap drive replacement

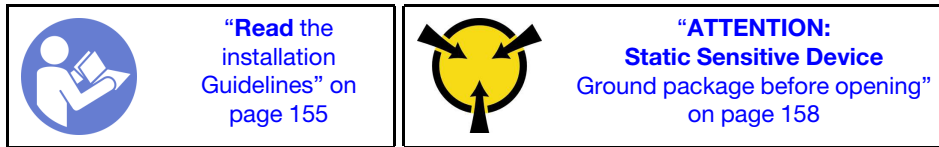
Use this information to remove and install a hot-swap drive. You can remove or install a hot-swap drive without powering off the server, which helps you avoid significant interruption to the operation of the system.

### 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

Use this information to remove a hot-swap drive.



Before removing a hot-swap drive:

1. Ensure that you have back 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.
2. 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 labels 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 that the installed drives are NVMe drives.
3. If the security bezel is installed, remove it. See “Remove the security bezel” on page 158.

**Attention:** 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.

To remove a hot-swap drive, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS_).

Step 1. Slide the release latch to open the drive tray handle.

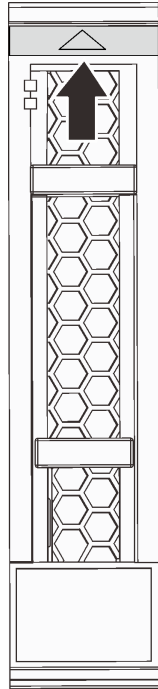


Figure 134. Opening the drive tray handle of a 2.5-inch hot-swap drive

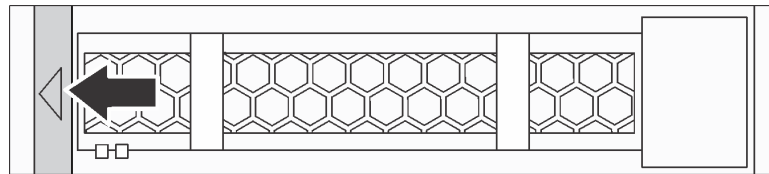
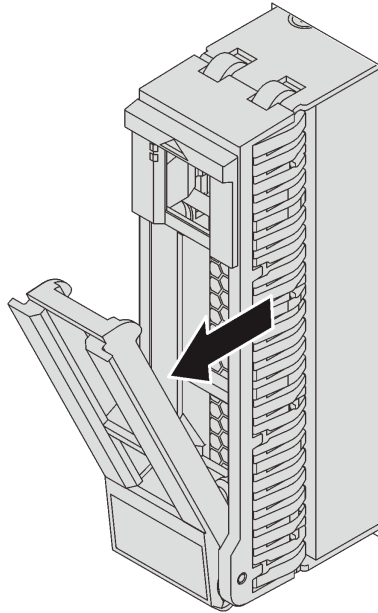
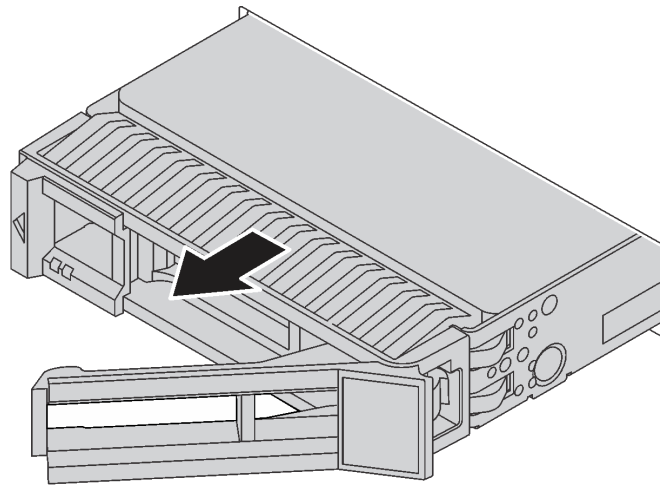


Figure 135. Opening the drive tray handle of a 3.5-inch hot-swap drive

Step 2. Grasp the handle and slide the drive out of the drive bay.



*Figure 136. 2.5-inch hot-swap drive removal*



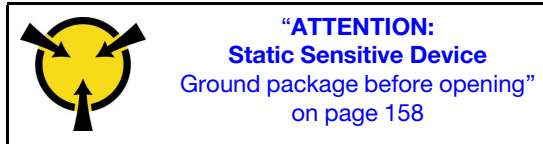
*Figure 137. 3.5-inch hot-swap drive removal*

After removing a hot-swap drive:

1. Install the drive filler or a new drive to cover the drive bay. See [“Install a hot-swap drive” on page 189](#).
2. If you are instructed to return the old hot-swap drive, follow all packaging instructions and use any packaging materials that are provided.

## **Install a hot-swap drive**

Use this information to install a hot-swap drive.



The following notes describe the type of drives that your server supports and other information that you must consider when you install a drive.

- Depending on your server models, your server supports the following drive types:
  - NVMe SSD
  - SAS/SATA SSD
  - SAS/SATA HDD

For a list of supported drives, see:

<https://static.lenovo.com/us/en/serverproven/index.shtml>

- The drive bays are numbered to indicate the installation order (starting from number “0”). Follow the installation order when you install a drive. See **“Front view” on page 23**.
- You can mix drives of different types, different sizes, and different capacities in one system, but not in one RAID array. The following order is recommended when installing the drives:
  - Drive type priority: NVMe SSD, SAS SSD, SATA SSD, SAS HDD, SATA HDD
  - Drive size priority: 2.5 inch, 3.5 inch
  - Drive capacity priority: the lowest capacity first
- The drives in a single RAID array must be the same type, same size, and same capacity.
- Some server models support NVMe drives and the bays for installing NVMe drives vary by model:

<b>Server models</b>	<b>Bays for installing NVMe drives</b>
Eight-2.5-inch-drive-bay models that support NVMe drives	Up to four NVMe drives in the bays 4–7
Sixteen-2.5-inch-drive-bay models that support NVMe drives	Up to sixteen NVMe drives in the bays 0–15
Twenty-2.5-inch-drive-bay models that support NVMe drives	Up to sixteen NVMe drives in the bays 0–19
Twenty-four-2.5-inch-drive-bay models that support NVMe drives	Up to twenty-four NVMe drives in the bays 0–23
Twelve-3.5-inch-drive-bay model that supports NVMe drives	Up to four NVMe drives in the bays 8–11

Before installing a hot-swap drive:

1. If the drive bay has a drive filler installed, pinch the two tabs to remove the drive filler. Keep the drive filler in a safe place.

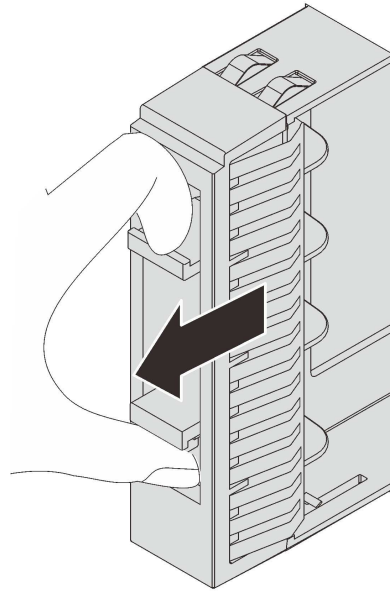


Figure 138. 2.5-inch drive filler removal

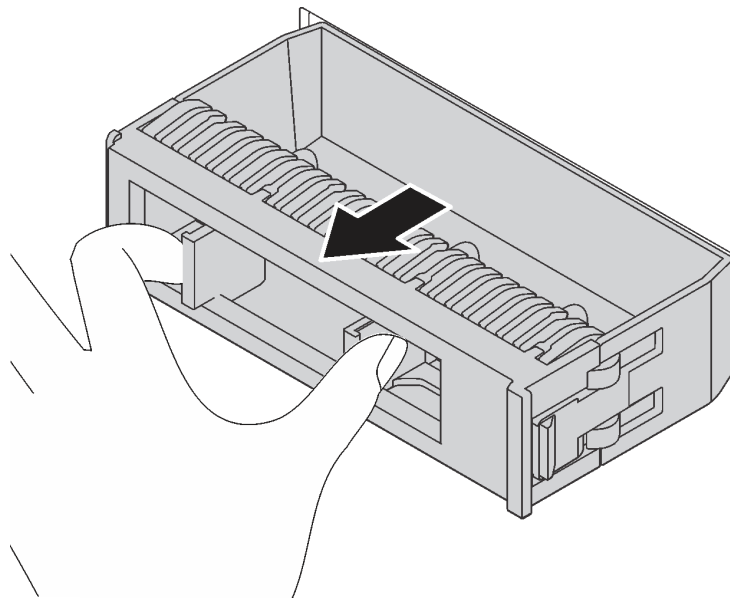


Figure 139. 3.5-inch drive filler removal

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

To install a hot-swap drive, complete the following steps:

**Watch the procedure**

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

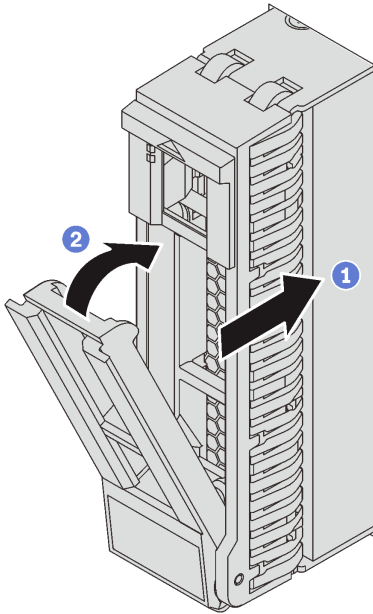


Figure 140. 2.5-inch hot-swap drive installation

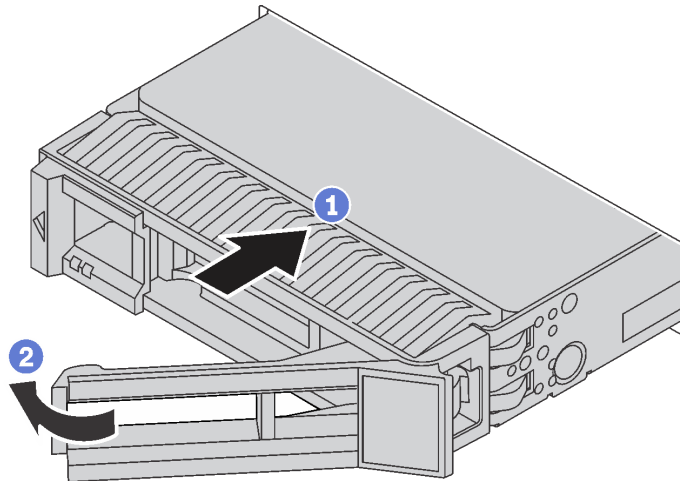


Figure 141. 3.5-inch hot-swap drive installation

- Step 1. Ensure that the drive tray handle is in the open position. Slide the drive into the drive bay until it snaps into position.
- Step 2. Close the drive tray handle to lock the drive in place.
- Step 3. 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 4. Continue to install additional hot-swap drives if necessary.



After installing all hot-swap drives:

1. If you have removed the security bezel, reinstall it. See “[Install the security bezel](#)” on page 159.
2. Use the Lenovo XClarity Provisioning Manager to configure the RAID if necessary. For more information, see:  
[http://sysmgmt.lenovofiles.com/help/topic/LXPM/RAID\\_setup.html](http://sysmgmt.lenovofiles.com/help/topic/LXPM/RAID_setup.html)

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## Backplane replacement

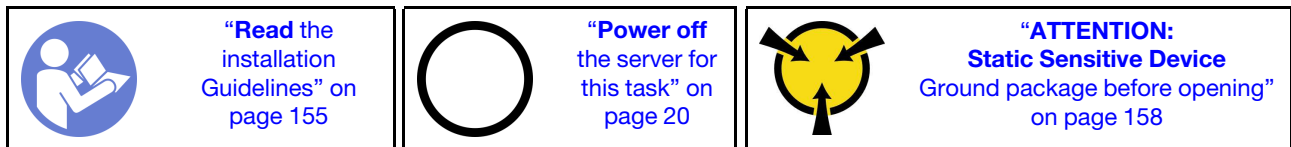
Use this information to remove and install a hot-swap-drive backplane.

This topic contains the following information:

- “[Remove the 2.5-inch-drive backplane](#)” on page 193
- “[Install the 2.5-inch-drive backplane](#)” on page 194
- “[Remove the 3.5-inch-drive backplane](#)” on page 196
- “[Install the 3.5-inch-drive backplane](#)” on page 197

### Remove the 2.5-inch-drive backplane

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



Before removing the 2.5-inch-drive backplane:

1. Remove the top cover. See “[Remove the top cover](#)” on page 169.
2. Remove the system fan cage for easier operation. See “[Remove the system fan cage](#)” on page 182.
3. Remove all the installed drives and fillers (if any) from the drive bays. See “[Remove a hot-swap drive](#)” on page 187.

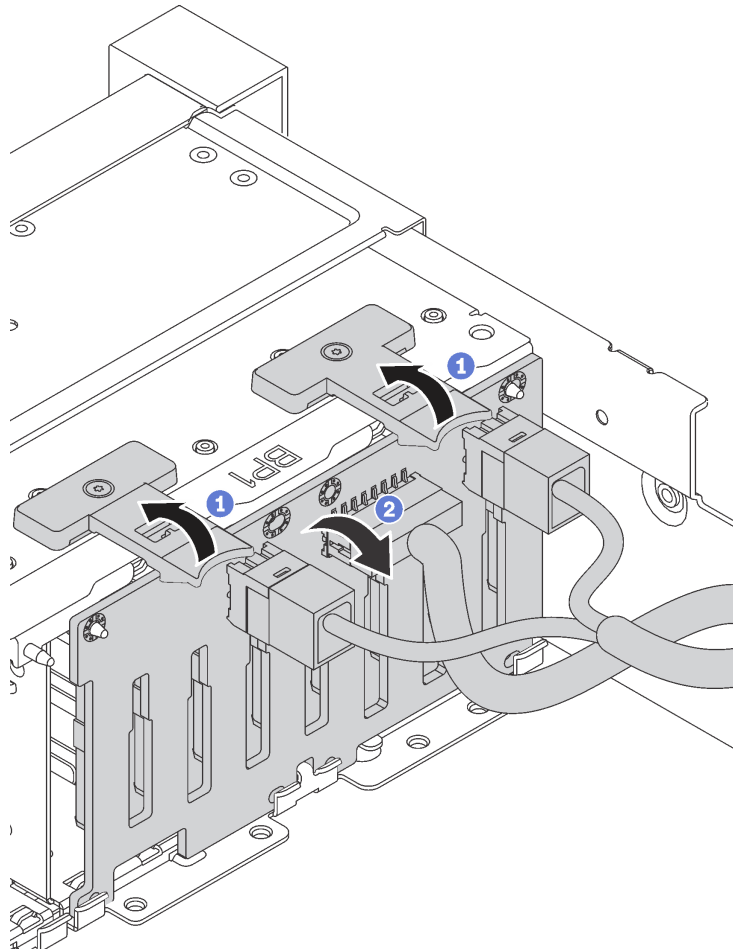
To remove the 2.5-inch-drive backplane, complete the following steps:

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

#### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS_).

Step 1. Lift the release tabs and rotate the backplane backward slightly to release it from the two pins on the chassis.


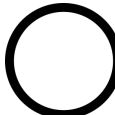



Step 2. Record the cable connections on the backplane and then disconnect all cables from the backplane. For information about the backplane cable routing, see [“Backplane” on page 44](#).

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

## Install the 2.5-inch-drive backplane

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

	<p><b>“Read the installation Guidelines” on page 155</b></p>		<p><b>“Power off the server for this task” on page 20</b></p>		<p><b>“ATTENTION: Static Sensitive Device Ground package before opening” on page 158</b></p>
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### Note:

Your server supports three types of 2.5-inch-drive backplanes: SATA/SAS 8-bay backplane (eight SATA/SAS drive bays), AnyBay 8-bay backplane (four SATA/SAS drive bays and four NVMe drive bays), and NVMe 8-bay backplane. Depending on the backplane type and quantity, the installation location of the backplanes varies.

- One backplane

Always install either the 8-bay backplane or the AnyBay backplane to drive bays 0–7.

- Two backplanes

- Two 8-bay backplanes, two AnyBay backplanes or two NVMe 8-bay backplanes: install the two backplanes to drive bays 0–7 and drive bays 8–15
- One 8-bay backplane and one AnyBay backplane: install the AnyBay backplane to drive bays 0–7; install the 8-bay backplane to drive bays 8–15

- Three backplanes

- Three 8-bay backplanes, three AnyBay backplanes or three NVMe 8-bay backplanes: install the three backplanes to drive bays 0–7, drive bays 8–15, and drive bays 16–23
- Two 8-bay backplanes and one AnyBay backplane: install the AnyBay backplane to drive bays 0–7; install the two 8-bay backplanes to drive bays 8–15 and drive bays 16–23
- Two AnyBay backplanes and one 8-bay backplane: install the two AnyBay backplanes to drive bays 0–7 and drive bays 8–15; install the 8-bay backplanes to drive bays 16–23
- Two NVMe 8-bay backplanes and one SATA/SAS 8-bay backplane: install the two NVMe 8-bay backplanes to drive bays 0–7 and drive bays 8–15; install the SATA/SAS 8-bay backplanes to drive bays 16–23

Before installing the 2.5-inch-drive backplane, 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.

To install the 2.5-inch-drive backplane, complete the following steps:

#### **Watch the procedure**

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS_).

Step 1. Connect the cables to the backplane.

Step 2. Align the bottom of the backplane in the slots on the bottom of the chassis. Then, rotate the backplane to 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.

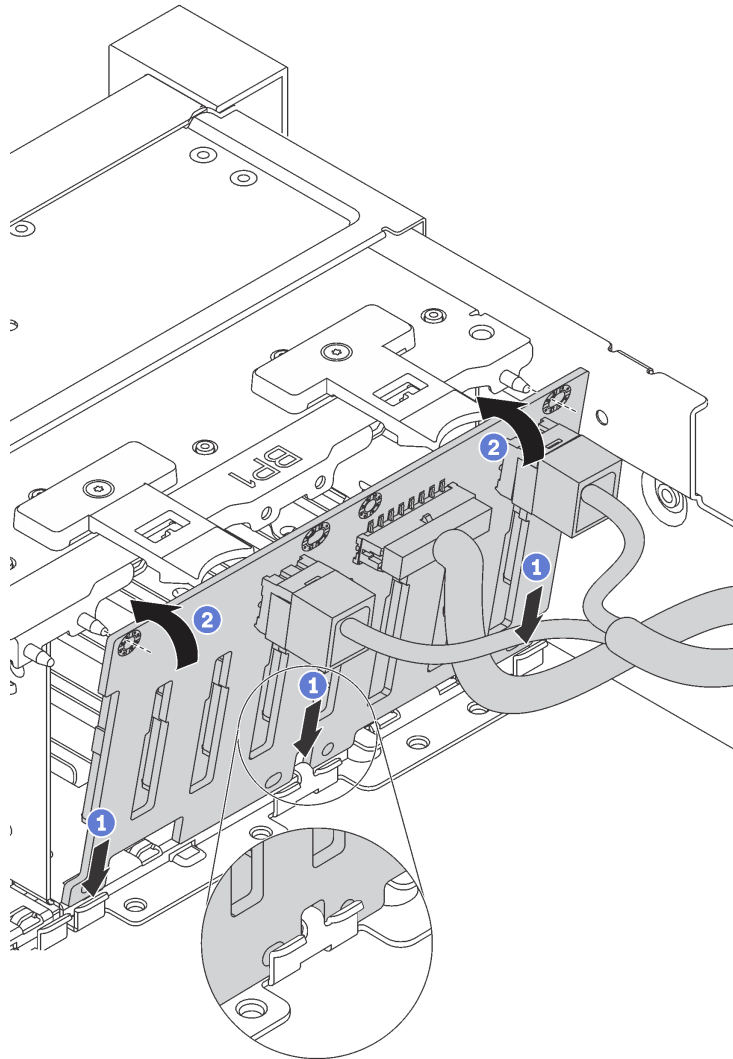



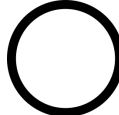

Figure 142. 2.5-inch-drive backplane installation

After installing the 2.5-inch-drive backplane:

1. Reinstall all the drives and fillers (if any) into the drive bays. See [“Install a hot-swap drive” on page 189](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 286](#).

## Remove the 3.5-inch-drive backplane

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

	<b>“Read the installation Guidelines” on page 155</b>		<b>“Power off the server for this task” on page 20</b>		<b>“ATTENTION: Static Sensitive Device</b> Ground package before opening” on page 158
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**Note:** The procedure is based on the scenario that you want to remove the backplane for up to twelve 3.5-inch drives. The procedure is similar for the backplane for up to eight 3.5-inch drives.

Before removing the 3.5-inch-drive backplane:

1. Remove the top cover. See “[Remove the top cover](#)” on page 169.
2. Remove the system fan cage for easier operation. See “[Remove the system fan cage](#)” on page 182.
3. Remove all the installed drives and fillers (if any) from the drive bays. See “[Remove a hot-swap drive](#)” on page 187.

To remove the 3.5-inch-drive backplane, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS_).

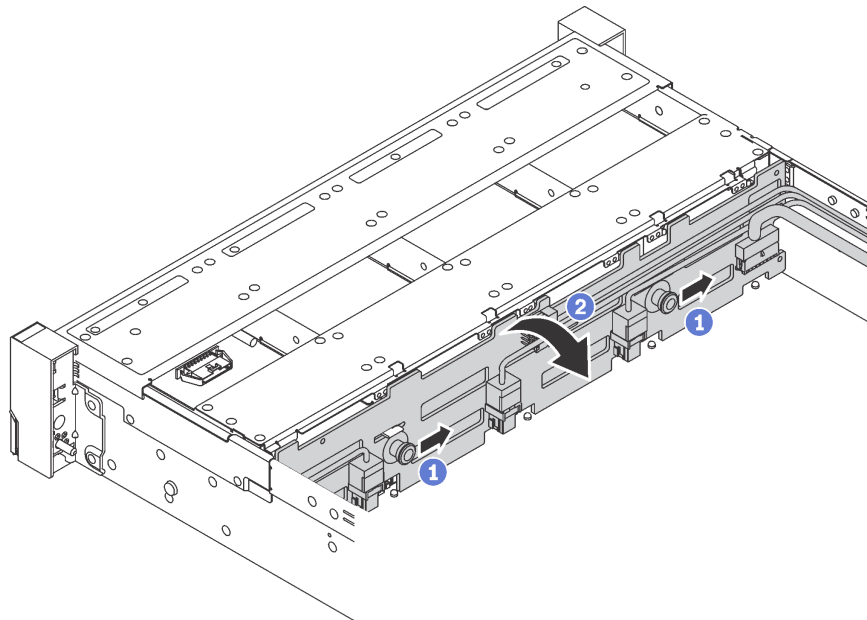


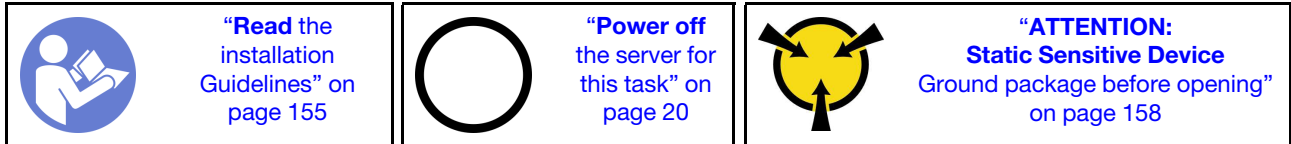
Figure 143. 3.5-inch-drive backplane removal

- Step 1. Pull the release pins and slightly slide the backplane in the direction as shown.
- Step 2. Pivot the backplane backward slightly 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. For information about the backplane cable routing, see “[Backplane](#)” on page 44.

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

## Install the 3.5-inch-drive backplane

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



**Notes:**

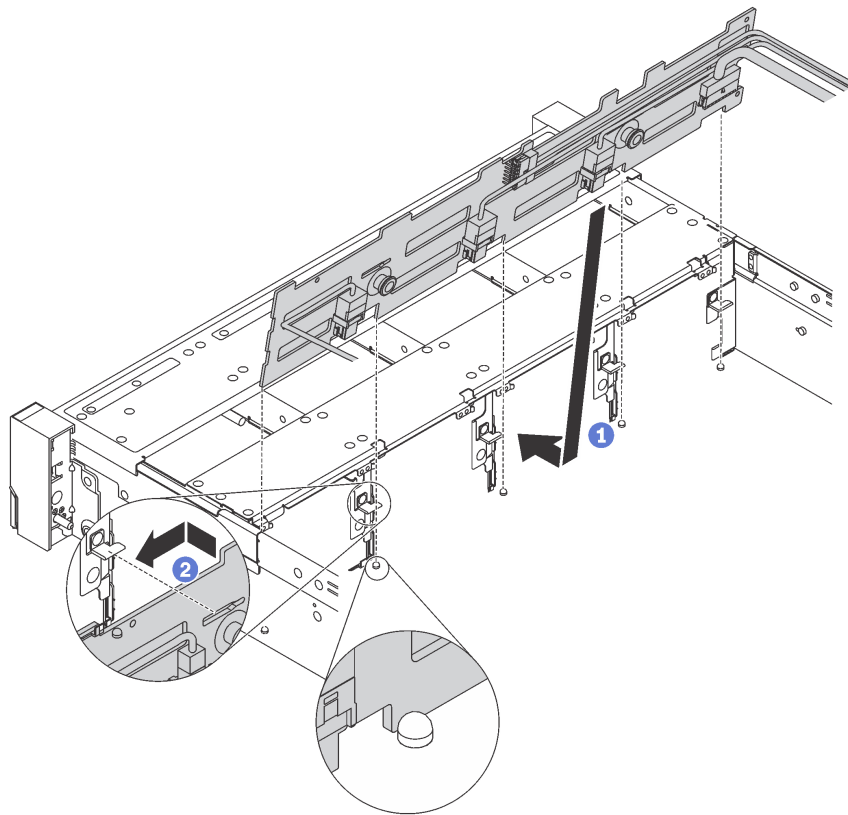
- The procedure is based on the scenario that you want to install the backplane for up to twelve 3.5-inch drives. The procedure is similar for the backplane for up to eight 3.5-inch drives.
- If you are installing the 3.5-inch-drive backplane with expander and the 8i HBA/RAID adapter for the server models with twelve 3.5-inch-drive bays, GPU is not supported, the maximum supported processor TDP is 165 watts, and you need to create the RAID volume to avoid the disorder of the HDD sequence. Besides, if the rear hot-swap drive is installed, the server performance might be degraded.

Before installing the 3.5-inch-drive backplane, 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.

To install the 3.5-inch-drive backplane, complete the following steps:

**Watch the procedure**

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).



*Figure 144. 3.5-inch-drive backplane installation*

Step 1. Connect the cables to the backplane.

- Step 2. Align the backplane with the chassis and lower it into the chassis. Then, put the backplane into place with it leaning backward slightly.
- Step 3. 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.

After installing the 3.5-inch-drive backplane:

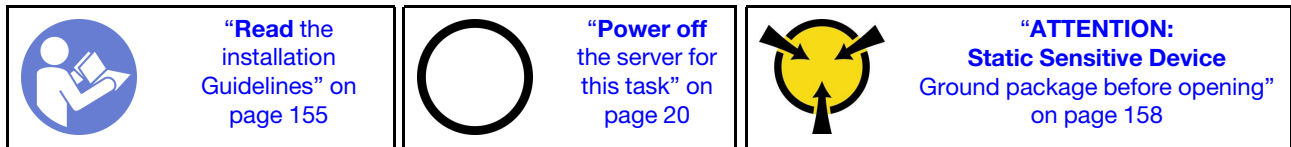
1. Reinstall all the drives and fillers (if any) into the drive bays. See [“Install a hot-swap drive” on page 189](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 286](#).

## Memory module replacement

Use this information to remove and install a memory module.

### Remove a memory module

Use this information to remove a memory module.



#### Attention:

- Disconnect all power cords for this task.
- If you are removing a DCPMM in App Direct or Mixed Memory Mode, make sure to back up the stored data, and delete any created namespace.
- memory modules are sensitive to static discharge and require special handling. In addition to the standard guidelines for [“Handling static-sensitive devices” on page 158](#):
  - 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.

Before removing a memory module:

1. Remove the top cover. See [“Remove the top cover” on page 169](#).
2. Remove the air baffle. See [“Remove the air baffle” on page 174](#).

If you are removing a DCPMM in App Direct or Mixed Memory Mode, make sure to:

1. Back up the stored data.
2. If the App Direct capacity is interleaved:

- a. Delete all the created namespaces and filesystems in the operating system.
- b. Perform secure erase on all the DCPMMs that are installed. Go to **Intel Optane DCPMMs → Security → Press to Secure Erase** to perform secure erase.

**Note:** If one or more DCPMMs are secured with passphrase, make sure security of every unit is disabled before performing secure erase. In case the passphrase is lost or forgotten, contact Lenovo service.

If the App Direct capacity is not interleaved:

- a. Delete the namespace and filesystem of the DCPMM unit to be replaced in the operating system.
- b. Perform secure erase on the DCPMM unit that is to be replaced. Go to **Intel Optane DCPMMs → Security → Press to Secure Erase** to perform secure erase.

To remove a memory module, complete the following steps:

**Note:** A DCPMM module looks slightly different from a DRAM DIMM in the illustration, but the removal method is the same.

#### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

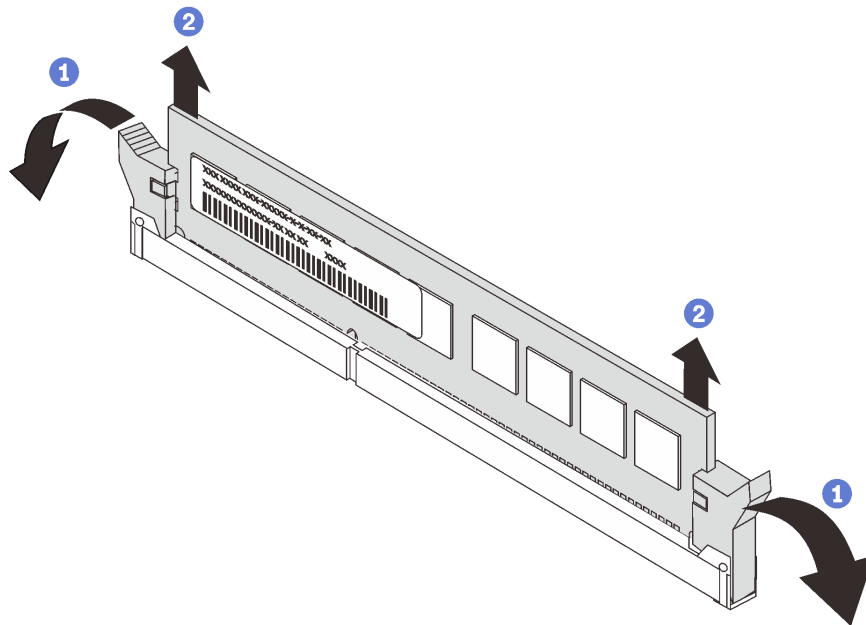


Figure 145. memory module removal

Step 1. Open the retaining clips 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.

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



After removing a memory module:

1. Install a memory module filler or a new memory module to cover the slot. See [“Install a memory module” on page 214](#).
2. If you are instructed to return the old memory module, follow all packaging instructions and use any packaging materials that are provided.

## Memory module installation rules

Memory modules must be installed in a specific order based on the memory configuration that you implement on your server.

Your server has 24 memory module slots. It supports up to 12 memory modules when one processor is installed, and up to 24 memory modules when two processors are installed. It has the following features:

For Intel Xeon SP Gen 1:

- Supporting memory module type is as follows:
  - TruDDR4 2666, single-rank or dual-rank, 8 GB/16 GB/32 GB RDIMM
  - TruDDR4 2666, quad-rank, 64 GB LRDIMM
  - TruDDR4 2666, octa-rank, 128 GB 3DS RDIMM
- The minimum system memory is 8 GB.
- The maximum system memory is as follows:
  - 768 GB using RDIMMs
  - 1.5 TB using LRDIMMs
  - 3 TB using 3DS RDIMMs

For Intel Xeon SP Gen 2:

- Supporting memory module type is as follows:
  - TruDDR4 2666, single-rank or dual-rank, 16 GB/32 GB RDIMM
  - TruDDR4 2933, single-rank or dual-rank, 8 GB/16 GB/32 GB/64 GB RDIMM
  - TruDDR4 2933, single-rank or dual-rank, 16 GB/32 GB/64 GB Performance+ RDIMM
  - TruDDR4 2666, quad-rank, 64 GB 3DS RDIMM
  - TruDDR4 2933, quad-rank, 128 GB 3DS RDIMM
  - TruDDR4 2933, quad-rank, 128 GB Performance+ 3DS RDIMM
  - 128 GB/256 GB/512 GB DCPMM
- The minimum system memory is 8 GB.
- The maximum system memory is as follows:
  - 1.5 TB using RDIMMs
  - 3 TB using 3DS RDIMMs
  - 6 TB using DCPMM and RDIMMs/3DS RDIMMs in Memory Mode

For a list of supported memory options, see: <https://static.lenovo.com/us/en/serverproven/index.shtml>

Depending on the memory modules installed, refer to below topics for detailed installation rules:

- [“DRAM DIMM installation rules” on page 202](#)

- “DCPMM and DRAM DIMM installation order” on page 206

## DRAM DIMM installation rules

For RDIMMs or LRDIMMs, the following memory modes are available:

- “Independent mode” on page 202
- “Mirroring mode” on page 204
- “Rank sparing mode” on page 205

The following illustration helps you to locate the memory module slots on the system board.

**Note:** It is recommended to install memory modules with the same rank in each channel.

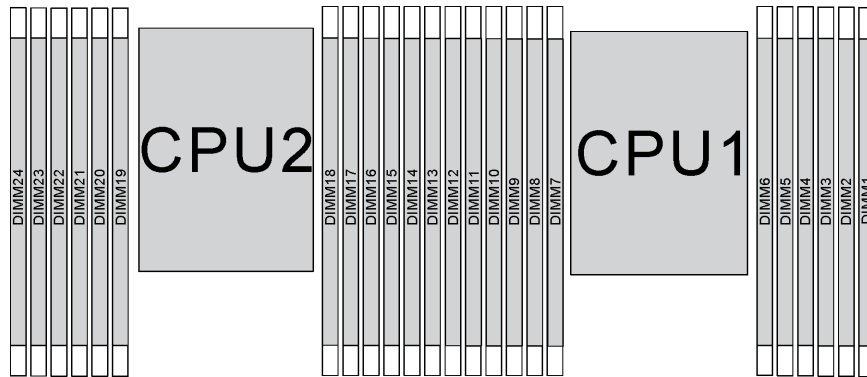


Figure 146. memory module slots on the system board

### Independent mode

Independent mode provides high performance memory capability. You can populate all channels with no matching requirements. Individual channels can run at different memory module timings, but all channels must run at the same interface frequency.

#### Notes:

- All memory modules to be installed must be the same type.
- All Performance+ DIMMs in the server must be of the same type, rank, and capacity (the same Lenovo part number) to operate at 2933 MHz in the configurations with two DIMMs per channel. Performance+ DIMMs cannot be mixed with other DIMMs.
- When you install memory modules with same rank and different capacity, install the memory module that has the highest capacity first.

The following table shows the memory module population sequence for independent mode when only one processor (Processor 1) is installed.

#### Notes:

- If there are three identical memory modules to be installed for Processor 1, and the three memory modules have the same Lenovo part number, move the memory module to be installed in slot 8 to slot 1.
- If there are ten identical memory modules to be installed for Processor 1, and the ten memory modules have the same Lenovo part number, move the memory module to be installed in slot 6 to slot 12.

Table 11. Independent mode with one processor

Total DIMMs	Processor 1												Total DIMMs
	12	11	10	9	8	7	6	5	4	3	2	1	
1								5					1
2					8			5					2
3					8			5		3			3
4			10		8			5		3			4
5			10		8			5		3		1	5
6	12		10		8			5		3		1	6
7	12		10		8		6	5	4	3			7
8			10	9	8	7	6	5	4	3			8
9	12		10		8		6	5	4	3	2	1	9
10			10	9	8	7	6	5	4	3	2	1	10
11	12		10	9	8	7	6	5	4	3	2	1	11
12	12	11	10	9	8	7	6	5	4	3	2	1	12

The following table shows the memory module population sequence for independent mode when two processors (Processor 1 and Processor 2) are installed.

**Notes:**

- If there are three identical memory modules to be installed for Processor 1, and the three memory modules have the same Lenovo part number, move the memory module to be installed in slot 8 to slot 1.
- If there are three identical memory modules to be installed for Processor 2, and the three memory modules have the same Lenovo part number, move the memory module to be installed in slot 20 to slot 13.
- If there are ten identical memory modules to be installed for Processor 1, and the ten memory modules have the same Lenovo part number, move the memory module to be installed in slot 2 to slot 12.
- If there are ten identical memory modules to be installed for Processor 2, and the ten memory modules have the same Lenovo part number, move the memory module to be installed in slot 14 to slot 24.

Table 12. Independent mode with two processors

Total DIMMs	Processor 2												Processor 1												Total DIMMs
	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
2								17												5					2
3								17								8				5					3
4					20			17								8				5					4
5					20			17								8				5		3			5
6					20			17	15							8				5		3			6
7					20			17	15						10	8				5		3			7
8			22		20			17	15						10	8				5		3			8
9			22		20			17	15						10	8				5		3		1	9
10			22		20			17	15		13				10	8				5		3		1	10

Table 12. Independent mode with two processors (continued)

Total DIMMs	Processor 2												Processor 1										Total DIMMs		
	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3		2	1
11			22		20			17		15		13	12		10		8			5		3		1	11
12	24		22		20			17		15		13	12		10		8			5		3		1	12
13	24		22		20			17		15		13	12		10		8		6	5	4	3			13
14	24		22		20		18	17	16	15			12		10		8		6	5	4	3			14
15	24		22		20		18	17	16	15					10	9	8	7	6	5	4	3			15
16			22	21	20	19	18	17	16	15					10	9	8	7	6	5	4	3			16
17			22	21	20	19	18	17	16	15			12		10		8		6	5	4	3	2	1	17
18	24		22		20		18	17	16	15	14	13	12		10		8		6	5	4	3	2	1	18
19	24		22		20		18	17	16	15	14	13			10	9	8	7	6	5	4	3	2	1	19
20			22	21	20	19	18	17	16	15	14	13			10	9	8	7	6	5	4	3	2	1	20
21	24		22		20		18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	21
22	24		22	21	20	19	18	17	16	15	14	13	12		10	9	8	7	6	5	4	3	2	1	22
23	24		22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	23
24	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	24

### Mirroring mode

In mirroring mode, each memory module in a pair must be identical in size and architecture. The channels are grouped in pairs with each channel receiving the same data. One channel is used as a backup of the other, which provides redundancy.

#### Notes:

- All memory modules to be installed must be the same type with the same capacity, frequency, voltage, and ranks.
- All Performance+ DIMMs in the server must be of the same type, rank, and capacity (the same Lenovo part number) to operate at 2933 MHz in the configurations with two DIMMs per channel. Performance+ DIMMs cannot be mixed with other DIMMs.

The following table shows the memory module population sequence for mirroring mode when only one processor (Processor 1) is installed.

Table 13. Mirroring mode with one processor

Total DIMMs	Processor 1												Total DIMMs
	12	11	10	9	8	7	6	5	4	3	2	1	
2								5		3			2
3								5		3		1	3
4			10		8			5		3			4
6	12		10		8			5		3		1	6
8			10	9	8	7	6	5	4	3			8
9	12		10		8		6	5	4	3	2	1	9
12	12	11	10	9	8	7	6	5	4	3	2	1	12

The following table shows the memory module population sequence for mirroring mode when two processors (Processor 1 and Processor 2) are installed.

Table 14. Mirroring mode with two processors

Total	Processor 2												Processor 1										Total		
DIMMs	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	DIMMs
4								17		15									5		3			4	
5								17		15									5		3		1	5	
6								17		15		13							5		3		1	6	
7								17		15		13			10		8			5		3			7
8			22		20			17		15					10		8			5		3			8
9								17		15		13	12		10		8			5		3		1	9
10			22		20			17		15			12		10		8			5		3		1	10
12	24		22		20			17		15		13	12		10		8			5		3		1	12
13			22		20			17		15			12		10		8		6	5	4	3	2	1	13
14			22	21	20	19	18	17	16	15			12		10		8			5		3		1	14
15	24		22		20			17		15		13	12		10		8		6	5	4	3	2	1	15
16			22	21	20	19	18	17	16	15					10	9	8	7	6	5	4	3			16
17			22	21	20	19	18	17	16	15			12		10		8		6	5	4	3	2	1	17
18	24		22		20		18	17	16	15	14	13	12		10		8		6	5	4	3	2	1	18
20			22	21	20	19	18	17	16	15			12	11	10	9	8	7	6	5	4	3	2	1	20
21	24		22		20		18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	21
24	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	24

### Rank sparing mode

In rank sparing mode, one rank of a memory module works as the spare rank for the other ranks on the same channel. The spare rank is not available as system memory.

#### Notes:

- All memory modules to be installed must be the same type with the same capacity, frequency, voltage, and ranks.
- All Performance+ DIMMs in the server must be of the same type, rank, and capacity (the same Lenovo part number) to operate at 2933 MHz in the configurations with two DIMMs per channel. Performance+ DIMMs cannot be mixed with other DIMMs.
- If the rank of installed memory modules is one rank, follow the installation rules listed in the following tables. If the rank of installed memory modules is more than one rank, follow the installation rules of independent mode.

The following table shows the memory module population sequence for rank sparing mode when only one processor (Processor 1) is installed.

Table 15. Rank sparing mode with one processor

Total DIMMs	Processor 1												Total DIMMs
	12	11	10	9	8	7	6	5	4	3	2	1	
2							6	5					2
4					8	7	6	5					4
6					8	7	6	5	4	3			6
8			10	9	8	7	6	5	4	3			8
10			10	9	8	7	6	5	4	3	2	1	10
12	12	11	10	9	8	7	6	5	4	3	2	1	12

The following table shows the memory module population sequence for rank sparing mode when two processors (Processor 1 and Processor 2) are installed.

Table 16. Rank sparing mode with two processors

Total DIMMs	Processor 2												Processor 1												Total DIMMs
	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
4							18	17											6	5					4
6							18	17									8	7	6	5					6
8					20	19	18	17									8	7	6	5					8
10					20	19	18	17									8	7	6	5	4	3			10
12					20	19	18	17	16	15							8	7	6	5	4	3			12
14					20	19	18	17	16	15					10	9	8	7	6	5	4	3			14
16			22	21	20	19	18	17	16	15					10	9	8	7	6	5	4	3			16
18			22	21	20	19	18	17	16	15					10	9	8	7	6	5	4	3	2	1	18
20			22	21	20	19	18	17	16	15	14	13			10	9	8	7	6	5	4	3	2	1	20
22			22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	22
24	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	24

## DCPMM and DRAM DIMM installation order

For DCPMM, the following memory modes are available:

- [“App Direct Mode” on page 207](#)
- [“Memory Mode” on page 210](#)
- [“Mixed Memory Mode” on page 212](#)

### Notes:

- Before installing DCPMMs and DRAM DIMMs, refer to and make sure to meet all the requirements.
- To verify if the presently installed processors support DCPMMs, examine the four digits in the processor description. Only the processor with description meeting *both* of the following requirements support DCPMMs.
  - The first digit is **5** or a larger number.
  - The second digit is **2**.

Example: *Intel Xeon 5215L* and *Intel Xeon Platinum 8280M*

**Note:** The only exception to this rule is *Intel Xeon Silver 4215*, which also supports DCPMM.

- DCPMMs are supported only by Intel Xeon SP Gen 2. For a list of supported processors and memory modules, see <http://www.lenovo.com/us/en/serverproven/>
- When you install two or more DCPMMs, all DCPMMs must have the same Lenovo part number.
- All DRAM memory modules installed must have the same Lenovo part number.
- 16 GB RDIMM has two different types: 16 GB 1Rx4 and 16 GB 2Rx8. The part number of the two types are different.
- Supported memory capacity range varies with the following types of DCPMMs.
  - **Large memory tier (L):** The processors with **L** after the four digits (for example: *Intel Xeon 5215 L*)
  - **Medium memory tier (M):** The processors with **M** after the four digits (for example: *Intel Xeon Platinum 8280 M*)
  - **Other:** Other processors that support DCPMMs (for example: *Intel Xeon Gold 5222*)

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

[http://1config.lenovo.com/#/memory\\_configuration](http://1config.lenovo.com/#/memory_configuration)

The following illustration helps you to locate the memory module slots on the system board.

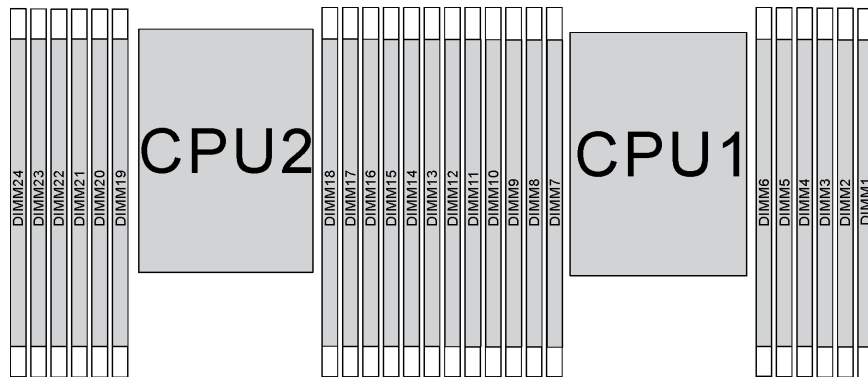


Figure 147. memory module slots on the system board

### App Direct Mode

In this mode, DCPMMs act as independent and persistent memory resources directly accessible by specific applications, and DRAM DIMMs act as system memory.

#### App Direct Mode with one processor

**Note:** When adding one or more DCPMMs and DIMMs during a memory upgrade, you might need to move other DIMMs that are already installed to new locations.

Table 17. App Direct Mode with one processor

<b>D:</b> All supported DDR4 DIMM except 8GB 1Rx8 RDIMM												
<b>P:</b> Only Data Center Persistent Memory Module (DCPMM) can be installed on the corresponding DIMM slots.												
Configuration	Processor 1											
	12	11	10	9	8	7	6	5	4	3	2	1
1 DCPMM and 6 DIMMs	D		D		D	P		D		D		D
2 DCPMMs and 4 DIMMs	P		D		D			D		D		P

Table 17. App Direct Mode with one processor (continued)

2 DCPMMs and 6 DIMMs	D		D		D	P	P	D		D		D
2 DCPMMs and 8 DIMMs	P		D	D	D	D	D	D	D	D		P
4 DCPMMs and 6 DIMMs	D		D	P	D	P	P	D	P	D		D
6 DCPMMs and 6 DIMMs	D	P	D	P	D	P	P	D	P	D	P	D

Table 18. Supported DCPMM capacity in App Direct Mode with one processor

Total DCPMMs	Total DIMMs	Processor Family	128 GB DCPMM	256 GB DCPMM	512 GB DCPMM
1	6	L	√	√	√
		M	√	√	√
		Other	√	√	√ <sup>2</sup>
2	4	L	√	√	√
		M	√	√	√
		Other	√	√	
2	6	L	√	√	√
		M	√	√	√
		Other	√	√ <sup>2</sup>	
2	8	L	√	√	√
		M	√	√	√
		Other	√ <sup>2</sup>	√ <sup>2</sup>	
4	6	L	√	√	√
		M	√	√	
		Other	√ <sup>2</sup>		
6	6	L	√	√	√
		M	√	√ <sup>2</sup>	
		Other	√ <sup>1</sup>		

**Notes:**

1. Supported DIMM capacity is up to 32 GB.
2. Supported DIMM capacity is up to 64 GB.

**App Direct Mode with two processors**

**Note:** When adding one or more DCPMMs and DIMMs during a memory upgrade, you might need to move other DCPMMs and DIMMs that are already installed to new locations.



Table 19. App Direct Mode with two processors

<b>D:</b> All supported DDR4 DIMM except 8GB 1Rx8 RDIMM																								
<b>P:</b> Only Data Center Persistent Memory Module (DCPMM) can be installed on the corresponding DIMM slots.																								
Configuration	Processor 2												Processor 1											
	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1 DCPMM and 12 DIMMs	D		D		D			D		D		D	D		D		D		P	D		D		D
2 DCPMMs and 12 DIMMs	D		D		D		P	D		D		D	D		D		D		P	D		D		D
4 DCPMMs and 8 DIMMs	P		D		D			D		D		P	P		D		D			D		D		P
4 DCPMMs and 12 DIMMs	D		D		D	P	P	D		D		D	D		D	P			P	D		D		D
4 DCPMMs and 16 DIMMs	P		D	D	D	D	D	D	D		P	P		D	D	D	D		D	D	D	D		P
8 DCPMMs and 12 DIMMs	D		D	P	D	P	P	D	P	D		D	D		D	P	D	P	P	D	P	D		D
12 DCPMMs and 12 DIMMs	D	P	D	P	D	P	P	D	P	D	P	D	D	P	D	P	D	P	P	D	P	D	P	D

Table 20. Supported DCPMM capacity in App Direct Mode with two processors

Total DCPMMs	Total DIMMs	Processor Family	128 GB DCPMM	256 GB DCPMM	512 GB DCPMM
1	12	L	√	√	√
		M	√	√	√
		Other	√	√	√ <sup>2</sup>
2	12	L	√	√	√
		M	√	√	√
		Other	√	√	√ <sup>2</sup>
4	8	L	√	√	√
		M	√	√	√
		Other	√	√	
4	12	L	√	√	√
		M	√	√	√
		Other	√	√ <sup>2</sup>	
4	16	L	√	√	√
		M	√	√	√
		Other	√ <sup>2</sup>	√ <sup>2</sup>	
8	12	L	√	√	√
		M	√	√	

Table 20. Supported DCPMM capacity in App Direct Mode with two processors (continued)

		<b>Other</b>	√ <sup>2</sup>		
12	12	<b>L</b>	√	√	√
		<b>M</b>	√	√ <sup>2</sup>	
		<b>Other</b>	√ <sup>1</sup>		

**Notes:**

1. Supported DIMM capacity is up to 32 GB.
2. Supported DIMM capacity is up to 64 GB.

**Memory Mode**

In this mode, DCPMMs act as volatile system memory, while DRAM DIMMs act as cache. Ensure that the ratio of DRAM DIMM capacity to DCPMM capacity is between 1:2 and 1:16.

**Memory Mode with one processor**

Table 21. Memory Mode with one processor

<b>D:</b> All supported DDR4 DIMM except 8GB 1Rx8 RDIMM												
<b>P:</b> Only Data Center Persistent Memory Module (DCPMM) can be installed on the corresponding DIMM slots.												
Configuration	Processor 1											
	12	11	10	9	8	7	6	5	4	3	2	1
2 DCPMMs and 4 DIMMs	P		D		D			D		D		P
2 DCPMMs and 6 DIMMs	D		D		D	P	P	D		D		D
4 DCPMMs and 6 DIMMs	D		D	P	D	P	P	D	P	D		D
6 DCPMMs and 6 DIMMs	D	P	D	P	D	P	P	D	P	D	P	D

Table 22. Supported DCPMM capacity in Memory Mode with one processor

Total DCPMMs	Total DIMMs	Processor Family	128 GB DCPMM	256 GB DCPMM	512 GB DCPMM
2	4	<b>L</b>	√ <sup>1</sup>	√ <sup>2</sup>	√ <sup>3</sup>
		<b>M</b>	√ <sup>1</sup>	√ <sup>2</sup>	√ <sup>3</sup>
		<b>Other</b>	√ <sup>1</sup>	√ <sup>2</sup>	
2	6	<b>L</b>		√ <sup>1</sup>	√ <sup>2</sup>
		<b>M</b>		√ <sup>1</sup>	√ <sup>2</sup>
		<b>Other</b>		√ <sup>1</sup>	
4	6	<b>L</b>	√ <sup>1</sup>	√ <sup>2</sup>	√ <sup>4</sup>
		<b>M</b>	√ <sup>1</sup>	√ <sup>2</sup>	
		<b>Other</b>	√ <sup>1</sup>		

Table 22. Supported DCPMM capacity in Memory Mode with one processor (continued)

6	6	L	$\sqrt{2}$	$\sqrt{3}$	$\sqrt{5}$
		M	$\sqrt{2}$	$\sqrt{3}$	
		Other	$\sqrt{2}$		

**Notes:**

1. Supported DIMM capacity is 16 GB.
2. Supported DIMM capacity is 16 to 32 GB.
3. Supported DIMM capacity is 16 GB to 64 GB.
4. Supported DIMM capacity is 32 GB to 64 GB.
5. Supported DIMM capacity is 32 GB to 128 GB.

**Memory Mode with two processors**

Table 23. Memory Mode with two processors

<b>D:</b> All supported DDR4 DIMM except 8GB 1Rx8 RDIMM																								
<b>P:</b> Only Data Center Persistent Memory Module (DCPMM) can be installed on the corresponding DIMM slots.																								
Configuration	Processor 2												Processor 1											
	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
4 DCPMMs and 8 DIMMs	P		D		D			D		D		P	P		D		D			D		D		P
4 DCPMMs and 12 DIMMs	D		D		D	P	P	D		D		D	D		D		D	P	P	D		D		D
8 DCPMMs and 12 DIMMs	D		D	P	D	P	P	D	P	D		D	D		D	P	D	P	P	D	P	D		D
12 DCPMMs and 12 DIMMs	D	P	D	P	D	P	P	D	P	D	P	D	D	P	D	P	D	P	P	D	P	D	P	D

Table 24. Supported DCPMM capacity in Memory Mode with two processors

Total DCPMMs	Total DIMMs	Processor Family	128 GB DCPMM	256 GB DCPMM	512 GB DCPMM
4	8	L	$\sqrt{1}$	$\sqrt{2}$	$\sqrt{3}$
		M	$\sqrt{1}$	$\sqrt{2}$	$\sqrt{3}$
		Other	$\sqrt{1}$	$\sqrt{2}$	
4	12	L		$\sqrt{1}$	$\sqrt{2}$
		M		$\sqrt{1}$	$\sqrt{2}$
		Other		$\sqrt{1}$	
8	12	L	$\sqrt{1}$	$\sqrt{2}$	$\sqrt{4}$
		M	$\sqrt{1}$	$\sqrt{2}$	
		Other	$\sqrt{1}$		
12	12	L	$\sqrt{2}$	$\sqrt{3}$	$\sqrt{5}$

Table 24. Supported DCPMM capacity in Memory Mode with two processors (continued)

		<b>M</b>	$\sqrt{2}$	$\sqrt{3}$	
		<b>Other</b>	$\sqrt{2}$		

**Notes:**

1. Supported DIMM capacity is 16 GB.
2. Supported DIMM capacity is 16 to 32 GB.
3. Supported DIMM capacity is 16 GB to 64 GB.
4. Supported DIMM capacity is 32 GB to 64 GB.
5. Supported DIMM capacity is 32 GB to 128 GB.

**Mixed Memory Mode**

In this mode, some percentage of DCPMM capacity is directly accessible to specific applications (App Direct), while the rest serves as system memory. The App Direct part of DCPMM is displayed as persistent memory, while the rest of DCPMM capacity is displayed as system memory. DRAM DIMMs act as cache in this mode.

**Mixed Memory Mode with one processor**

**Note:** When adding one or more DCPMMs and DIMMs during a memory upgrade, you might need to move other DIMMs that are already installed to new locations.

Table 25. Mixed Memory Mode with one processor

<b>D:</b> All supported DDR4 DIMM except 8GB 1Rx8 RDIMM												
<b>P:</b> Only Data Center Persistent Memory Module (DCPMM) can be installed on the corresponding DIMM slots.												
Configuration	Processor 1											
	12	11	10	9	8	7	6	5	4	3	2	1
2 DCPMMs and 4 DIMMs	P		D		D			D		D		P
2 DCPMMs and 6 DIMMs	D		D		D	P	P	D		D		D
4 DCPMMs and 6 DIMMs	D		D	P	D	P	P	D	P	D		D
6 DCPMMs and 6 DIMMs	D	P	D	P	D	P	P	D	P	D	P	D

Table 26. Supported DCPMM capacity in Mixed Memory Mode with one processor

Total DCPMMs	Total DIMMs	Processor Family	128 GB DCPMM	256 GB DCPMM	512 GB DCPMM
2	4	L		$\sqrt{1}$	$\sqrt{2}$
		M		$\sqrt{1}$	$\sqrt{2}$
		Other		$\sqrt{1}$	
2	6	L		$\sqrt{1}$	$\sqrt{2}$
		M		$\sqrt{1}$	$\sqrt{2}$
		Other		$\sqrt{1}$	

Table 26. Supported DCPMM capacity in Mixed Memory Mode with one processor (continued)

4	6	L	√ <sup>1</sup>	√ <sup>2</sup>	√ <sup>3</sup>
		M	√ <sup>1</sup>	√ <sup>2</sup>	
		Other	√ <sup>1</sup>		
6	6	L	√ <sup>1</sup>	√ <sup>2</sup>	√ <sup>3</sup>
		M	√ <sup>1</sup>	√ <sup>2</sup>	
		Other	√ <sup>1</sup>		

**Notes:**

1. Supported DIMM capacity is 16 GB.
2. Supported DIMM capacity is 16 to 32 GB.
3. Supported DIMM capacity is 16 to 64 GB.

**Mixed Memory Mode with two processors**

Table 27. Mixed Memory Mode with two processors

<b>D:</b> All supported DDR4 DIMM except 8GB 1Rx8 RDIMM																								
<b>P:</b> Only Data Center Persistent Memory Module (DCPMM) can be installed on the corresponding DIMM slots.																								
Configuration	Processor 2												Processor 1											
	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
4 DCPMMs and 8 DIMMs	P		D		D			D		D		P	P		D		D			D		D		P
4 DCPMMs and 12 DIMMs	D		D		D	P	P	D		D		D	D		D	P	P	D		D		D		D
8 DCPMMs and 12 DIMMs	D		D	P	D	P	P	D	P	D		D	D		D	P	D	P	P	D	P	D		D
12 DCPMMs and 12 DIMMs	D	P	D	P	D	P	P	D	P	D	P	D	D	P	D	P	D	P	P	D	P	D	P	D

Table 28. Supported DCPMM capacity in Mixed Memory Mode with two processors

Total DCPMMs	Total DIMMs	Processor Family	128 GB DCPMM	256 GB DCPMM	512 GB DCPMM
4	8	L		√ <sup>1</sup>	√ <sup>2</sup>
		M		√ <sup>1</sup>	√ <sup>2</sup>
		Other		√ <sup>1</sup>	
4	12	L		√ <sup>1</sup>	√ <sup>2</sup>
		M		√ <sup>1</sup>	√ <sup>2</sup>
		Other		√ <sup>1</sup>	
8	12	L	√ <sup>1</sup>	√ <sup>2</sup>	√ <sup>3</sup>
		M	√ <sup>1</sup>	√ <sup>2</sup>	
		Other	√ <sup>1</sup>		

Table 28. Supported DCPMM capacity in Mixed Memory Mode with two processors (continued)


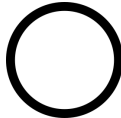

12	12	L	$\sqrt{1}$	$\sqrt{2}$	$\sqrt{3}$
		M	$\sqrt{1}$	$\sqrt{2}$	
		Other	$\sqrt{1}$		

**Notes:**

1. Supported DIMM capacity is 16 GB.
2. Supported DIMM capacity is 16 to 32 GB.
3. Supported DIMM capacity is 16 to 64 GB.

## Install a memory module

Use this information to install a memory module.

	<p><b>“Read the installation Guidelines” on page 155</b></p>		<p><b>“Power off the server for this task” on page 20</b></p>		<p><b>“ATTENTION: Static Sensitive Device Ground package before opening” on page 158</b></p>
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**Attention:**

- Disconnect all power cords for this task.
- memory modules are sensitive to static discharge and require special handling. In addition to the standard guidelines for [“Handling static-sensitive devices” on page 158](#):
  - 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.

Before installing a memory module:

1. Touch the static-protective package that contains the new memory module to any unpainted surface on the outside of the server. Then, take the new memory module out of the package and place it on a static-protective surface.
2. Locate the required memory module slot on the system board.

**Note:** Ensure that you observe the installation rules and sequence in [“Memory module installation rules” on page 201](#).

3. If you are going to install a DCPMM for the first time, refer to “DC Persistent Memory Module (DCPMM) setup” in *Setup Guide*.

**Note:** A DCPMM module looks slightly different from a DRAM DIMM in the illustration, but the installation method is the same.

To install a memory module, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS_).

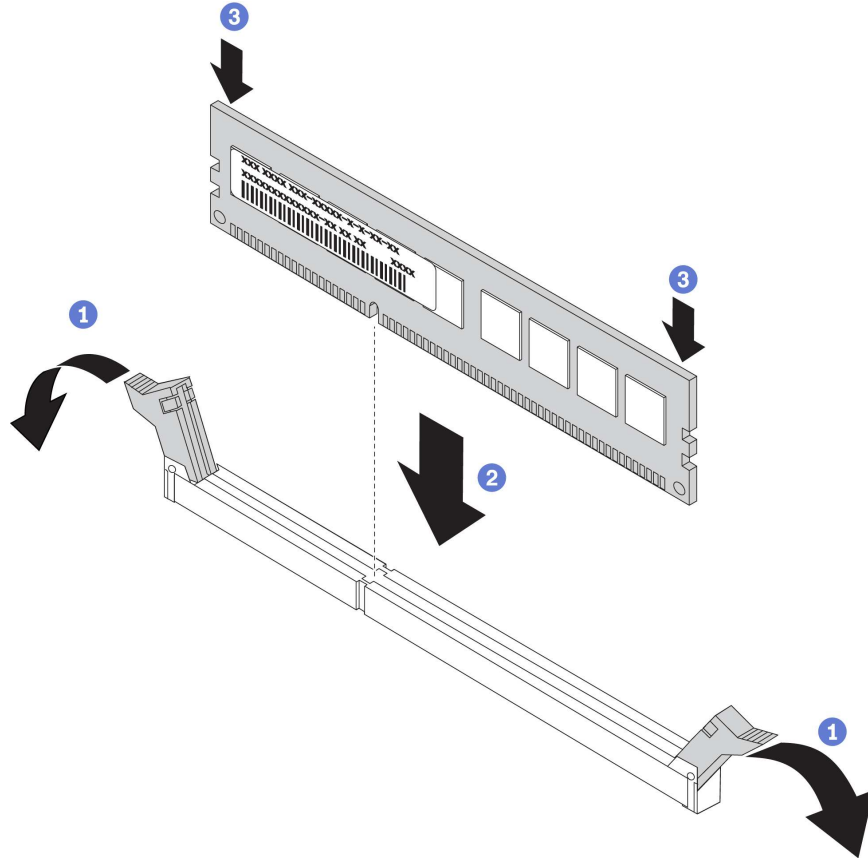


Figure 148. memory module installation

Step 1. Open the retaining clips 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.

Step 2. Align the memory module with the slot, and gently place the memory module on the slot with both hands.

Step 3. 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.

If you have installed a DRAM DIMM, complete the parts replacement. See [“Complete the parts replacement” on page 286](#).

If you have installed a DCPMM:

1. Make sure the DCPMM firmware is the latest version. If not, update it to the latest version (see [https://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/update\\_fw.html](https://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/update_fw.html)).
2. Configure DCPMMs and DRAM DIMMs (see “Configuring Intel Optane DC Persistent Memory (DCPMM)” in *Setup Guide*).
3. Restore the data that has been backed up if necessary.

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## RAID adapter replacement

Use this information to remove and install the RAID adapter on the system board.

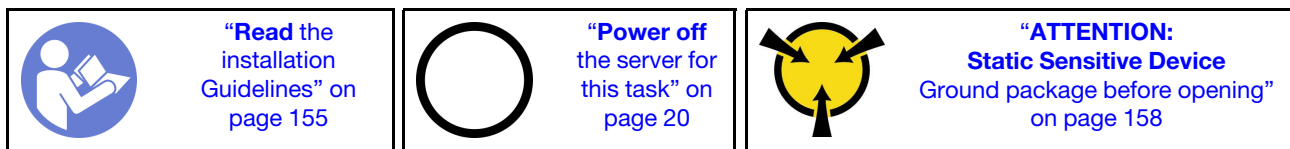
### Notes:

- For a list of the supported RAID adapters, see: <https://static.lenovo.com/us/en/serverproven/index.shtml>
- Depending on the specific type, your RAID adapter might look different from the illustrations in this topic.
- Depending on the specific server model, a NVMe switch adapter might be installed in the RAID adapter slot. The NVMe switch adapter might be different from the RAID adapter illustration in this topic, but the installation and removal procedures are the same.

**Attention:** Replacing the RAID adapter might impact your RAID configurations. Back up your data before you begin to avoid any data loss due to a RAID configuration change.

## Remove the RAID adapter

Use this information to remove the RAID adapter from the RAID adapter slot on the system board.



**Note:** The following procedure is based on the scenario that the RAID adapter is installed in the RAID adapter slot on the system board. For the procedure about removing the RAID adapter from the PCIe slot, see “Remove a PCIe adapter” on page 228.

Before removing the RAID adapter:

1. Remove the top cover. See “Remove the top cover” on page 169.
2. Remove any parts and disconnect any cables that might impede your access to the RAID adapter.
3. Record the cable connections on the RAID adapter and then disconnect all cables from the RAID adapter. For information about the cable routing, see “Internal cable routing” on page 37.

To remove the RAID adapter from the RAID adapter slot on the system board, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).



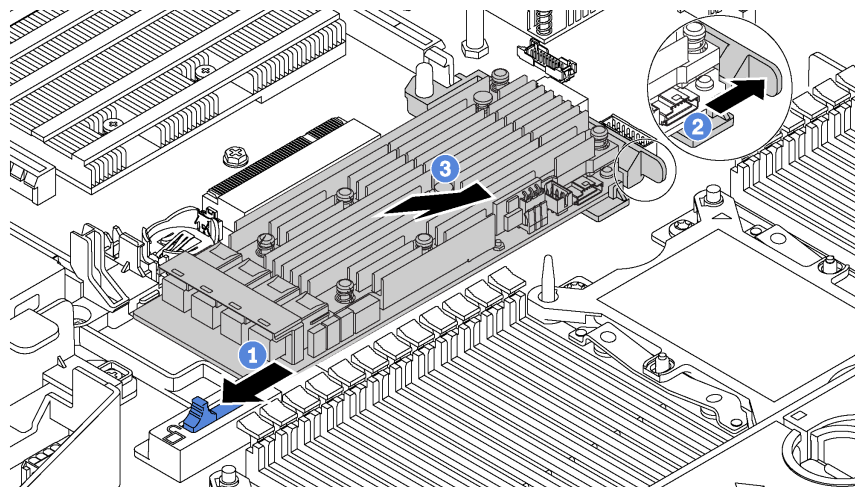



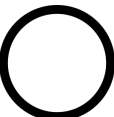

Figure 149. RAID adapter removal

- Step 1. Slide the left-side latch to the unlocked position.
- Step 2. Push and hold the right-side latch in the direction as shown.
- Step 3. Grasp the RAID adapter by its edges and carefully remove it from the RAID adapter slot on the system board.

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

## Install the RAID adapter

Use this information to install the RAID adapter in the RAID adapter slot on the system board.

 <p><b>“Read the installation Guidelines”</b> on page 155</p>	 <p><b>“Power off the server for this task”</b> on page 20</p>	 <p><b>“ATTENTION: Static Sensitive Device</b> Ground package before opening” on page 158</p>
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Ensure that you follow the installation order if you install more than one RAID adapter:

- The RAID adapter slot on the system board
- The PCIe slot 4 on the system board if the serial port module is not installed
- A PCIe slot on the riser card

**Note:** The following procedure is based on the scenario that the RAID adapter will be installed in the RAID adapter slot on the system board. For the procedure about installing the RAID adapter in PCIe slot 4 or a PCIe slot on the riser assembly, see [“Install a PCIe adapter” on page 231](#).

Before installing the RAID adapter:

1. Touch the static-protective package that contains the new RAID adapter to any unpainted surface on the outside of the server. Then, take the new RAID adapter out of the package and place it on a static-protective surface.
2. If the RAID adapter is installed with a bracket, remove the bracket.

To install the RAID adapter in the RAID adapter slot on the system board, complete the following steps:

## Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

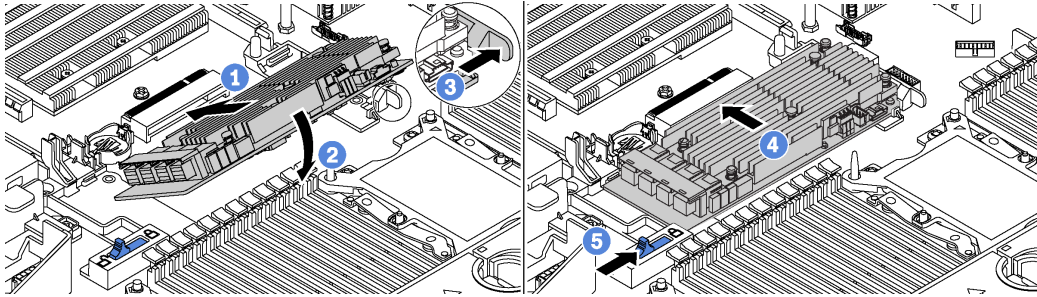


Figure 150. RAID adapter installation

- Step 1. Place the RAID adapter into the slot at an angle.
- Step 2. Rotate the RAID adapter down.
- Step 3. Push the right-side latch open.
- Step 4. Push the RAID adapter to the fully horizontal position and insert it into the RAID adapter slot.
- Step 5. Slide the left-side latch to the locked position.

After installing the RAID adapter:

1. Connect cables to the new RAID adapter. See “Internal cable routing” on page 37.
2. Complete the part replacement. See “Complete the parts replacement” on page 286.

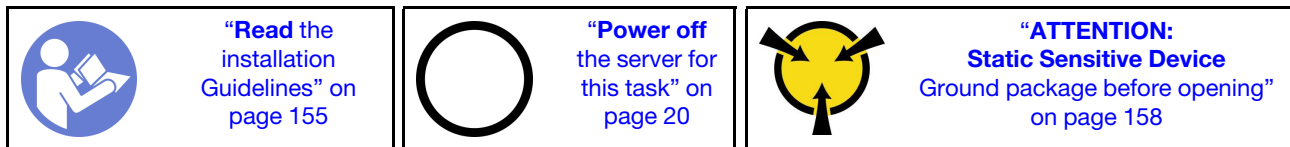
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## CMOS battery replacement

Use this information to remove and install the CMOS battery.

### Remove the CMOS battery

Use this information to remove the CMOS battery.



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

- Lenovo has designed this product with your safety in mind. The lithium CMOS battery must be handled correctly to avoid possible danger. If you replace the CMOS battery, you must adhere to the following instructions.

**Note:** In the U.S., call 1-800-IBM-4333 for information about 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.

- To order replacement batteries, call 1-800-IBM-SERV within the U.S., and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your support center or business partner.

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

#### **S004**



#### **CAUTION:**

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

*Do not:*

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

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

#### **S002**



#### **CAUTION:**

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

Before removing the CMOS battery:

1. Remove the top cover. See [“Remove the top cover”](#) on page 169.
2. Remove any parts and disconnect any cables that might impede your access to the CMOS battery.

To remove the CMOS battery, complete the following steps:

#### **Watch the procedure**

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

Step 1. Locate the CMOS battery. See [“System board components”](#) on page 33.

Step 2. 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.

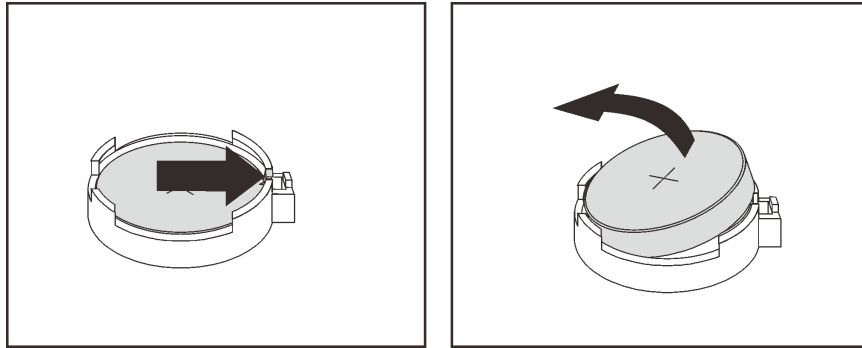



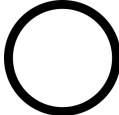

Figure 151. CMOS battery removal

After removing the CMOS battery:

1. Install a new CMOS battery. See [“Install the CMOS battery” on page 220](#).
2. Dispose of the CMOS battery as required by local ordinances or regulations.

## Install the CMOS battery

Use this information to install the CMOS battery.

 <p><b>“Read the installation Guidelines” on page 155</b></p>	 <p><b>“Power off the server for this task” on page 20</b></p>	 <p><b>“ATTENTION: Static Sensitive Device Ground package before opening” on page 158</b></p>
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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 install the CMOS battery, you must adhere to the following instructions.

**Note:** In the U. S., call 1-800-IBM-4333 for information about 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.
- To order replacement batteries, call 1-800-IBM-SERV within the U.S., and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your support center or business partner.

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

### S004



**CAUTION:**

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

*Do not:*

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

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

**S002**



**CAUTION:**

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

To install the CMOS battery, complete the following steps:

**Watch the procedure**

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

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

Step 2. Install the new CMOS battery as shown. Ensure that the CMOS battery socket holds the battery securely.

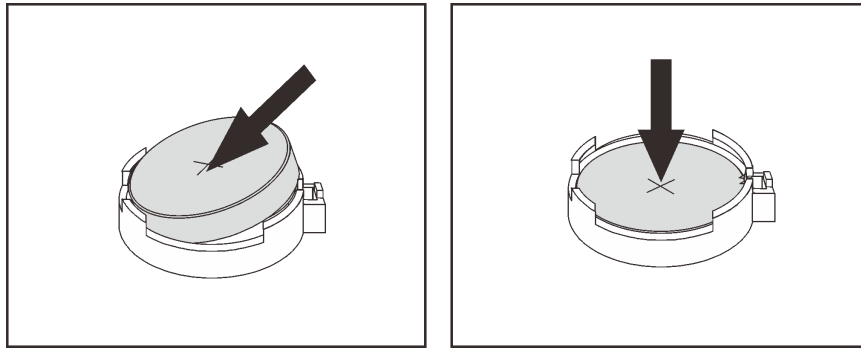


Figure 152. CMOS battery installation

After installing the CMOS battery:

1. Complete the parts replacement. See “[Complete the parts replacement](#)” on page 286.
2. Use the Setup utility to set the date, time, and any passwords.

---


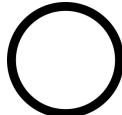

## Riser card replacement

Use this information to remove and install a riser card.

**Note:** Depending on the specific type, your riser card might look different from the illustrations in this topic.

### Remove a riser card

Use this information to remove a riser card.

	<b>“Read the installation Guidelines”</b> on page 155		<b>“Power off the server for this task”</b> on page 20		<b>“ATTENTION: Static Sensitive Device</b> Ground package before opening” on page 158
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Before removing a riser card:

1. Remove the top cover. See “[Remove the top cover](#)” on page 169.
2. If there is any PCIe adapter installed on the riser card, record the cable connections first. Then, disconnect all cables from the PCIe adapter.

To remove a riser card, complete the following steps:

#### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

Step 1. Grasp the riser assembly by its edges and carefully lift it straight up and off the chassis.

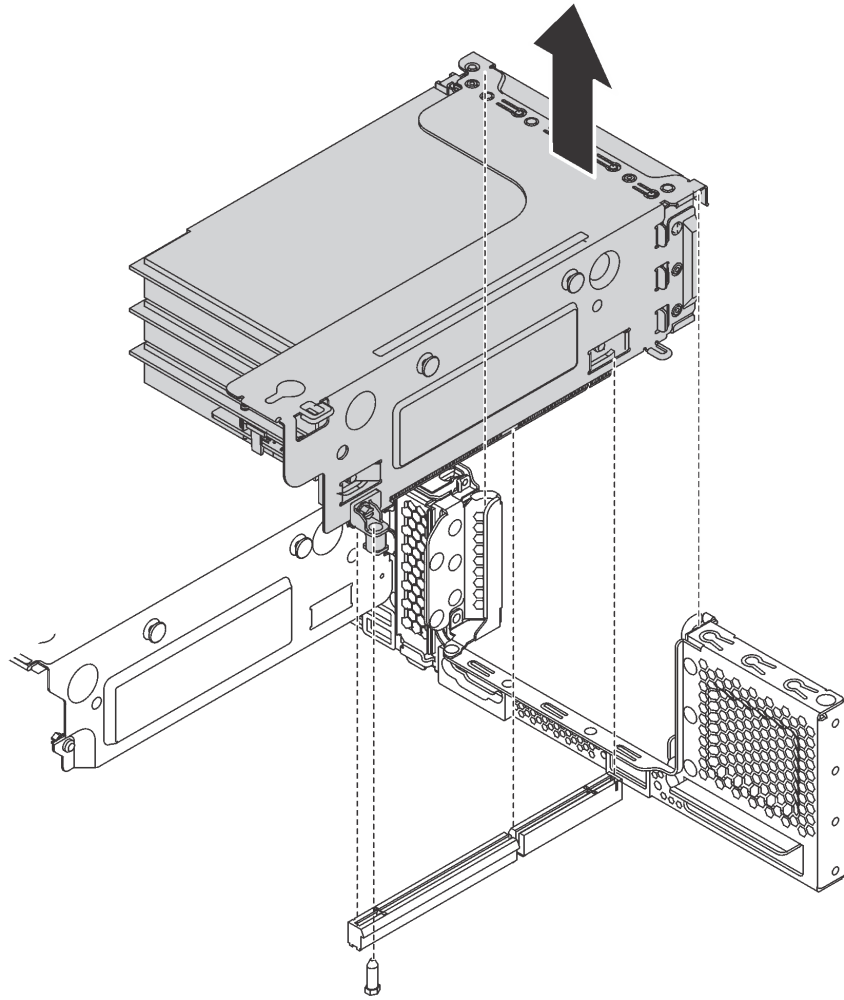


Figure 153. Riser 1 assembly removal

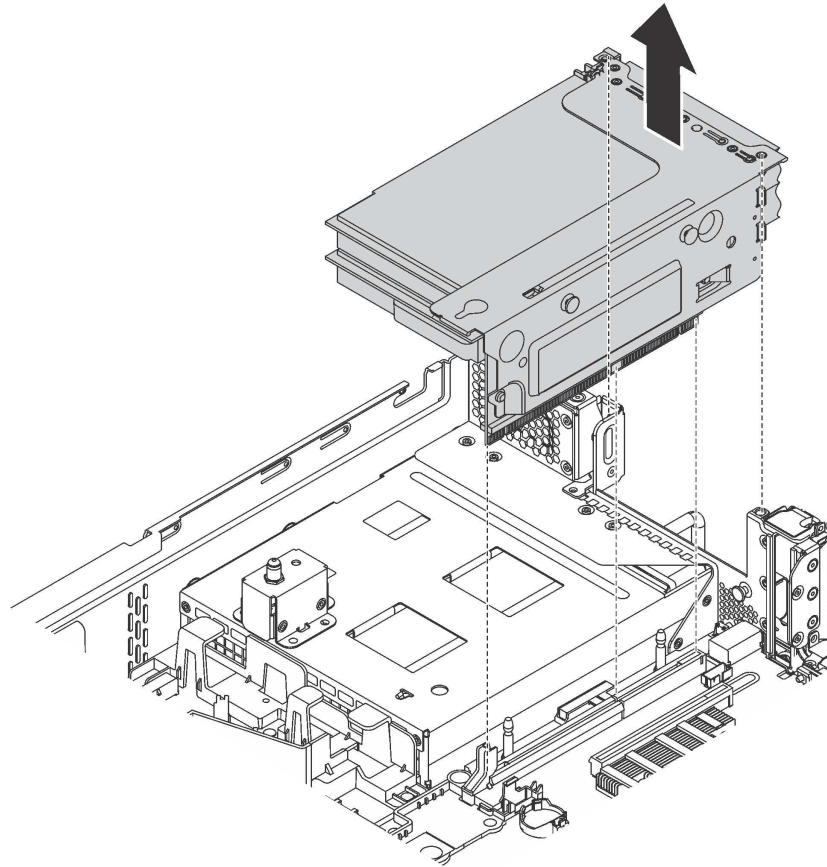


Figure 154. Riser 2 assembly removal

- Step 2. Remove the PCIe adapters that are installed on the riser card. See [“Remove a PCIe adapter from the riser assembly”](#) on page 229.
- Step 3. Remove the two screws that secure the failing riser card. Then, remove the failing riser card from the bracket.

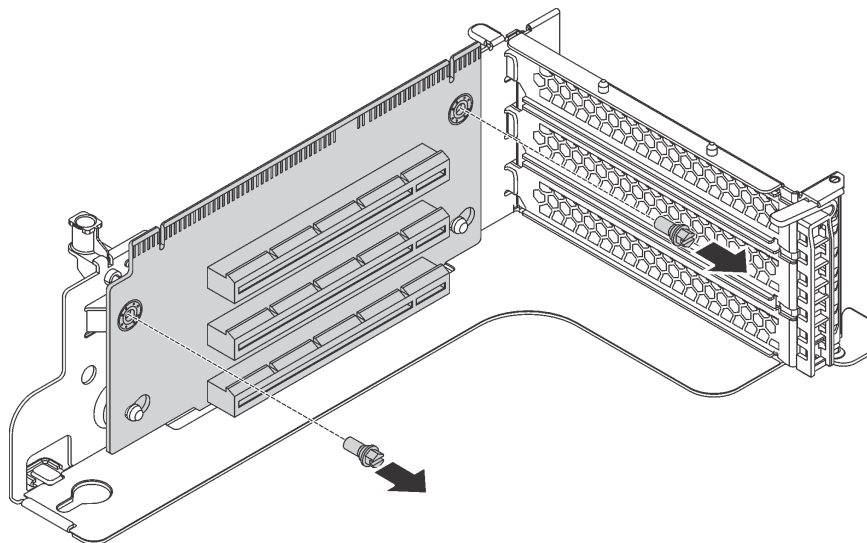


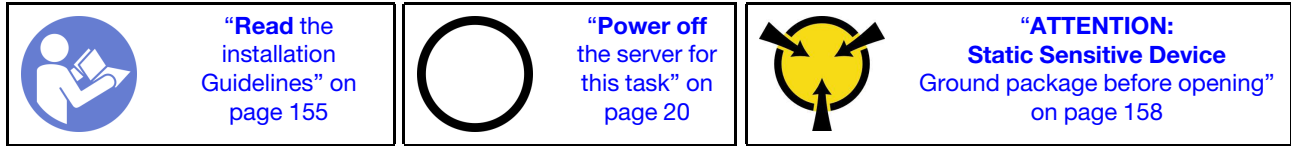
Figure 155. Riser card removal



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

## Install a riser card

Use this information to install a riser card.



Before installing a riser card, 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.

To install a riser card, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

- Step 1. Align the holes in the riser card with the mounting studs on the bracket. Then, install the riser card to the bracket in the direction as shown. Ensure that the screw holes in the riser card align with the corresponding holes in the bracket.

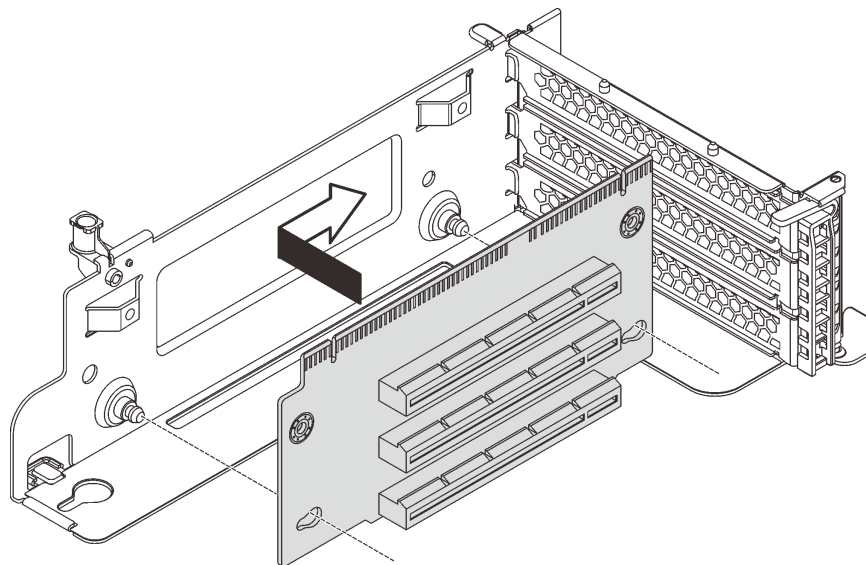


Figure 156. Riser card installation

Step 2. Install the two screws to secure the riser card to the bracket.

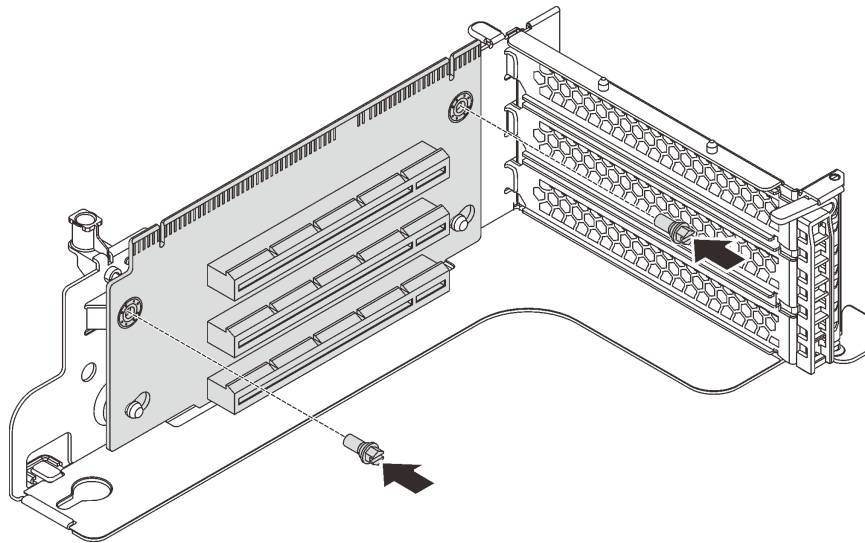


Figure 157. Installing the screws to secure the riser card

After installing the riser card:

1. Refer to your note to reconnect any cables to the removed PCIe adapters.
2. Reinstall the PCIe adapters on the new riser card. See [“Install a PCIe adapter on the riser assembly” on page 231](#).
3. Install the riser assembly by doing the following:

- To install the riser 1 assembly, align the mounting stud on the system board with the corresponding hole in the riser bracket. Meanwhile, align the rear of the riser 1 assembly with the corresponding rail guides in the rear of the chassis. Then, carefully press the riser 1 assembly straight down into the chassis until it is fully seated.

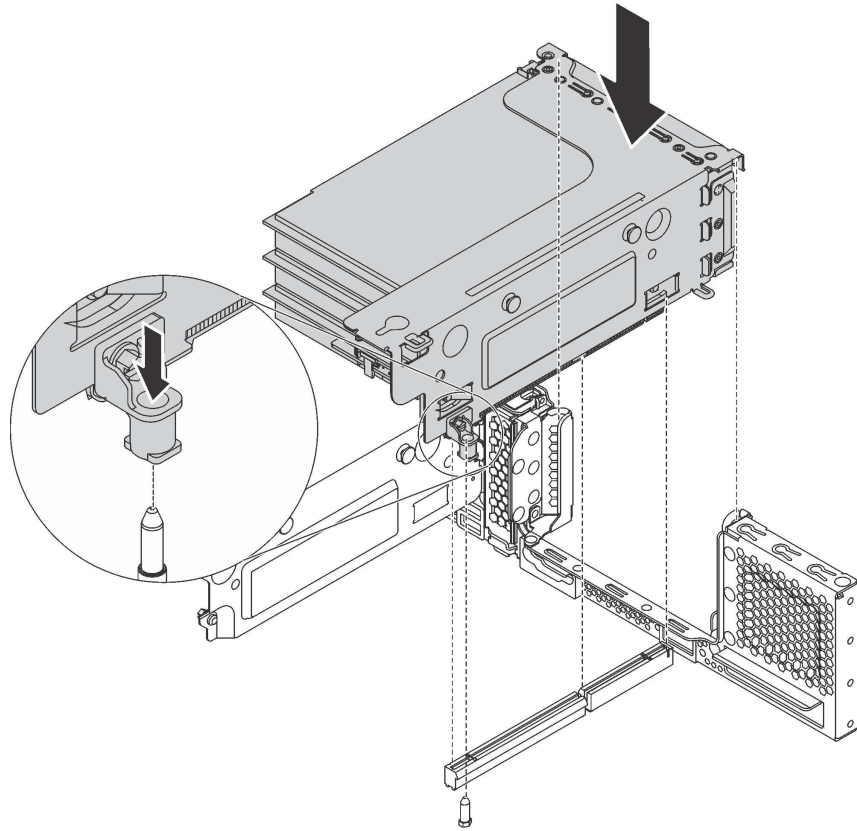


Figure 158. Riser 1 assembly installation

- To install the riser 2 assembly, align the rear of the riser 2 assembly with the corresponding rail guides in the rear of the chassis. Then, carefully press the riser 2 assembly straight down into the chassis until it is fully seated.

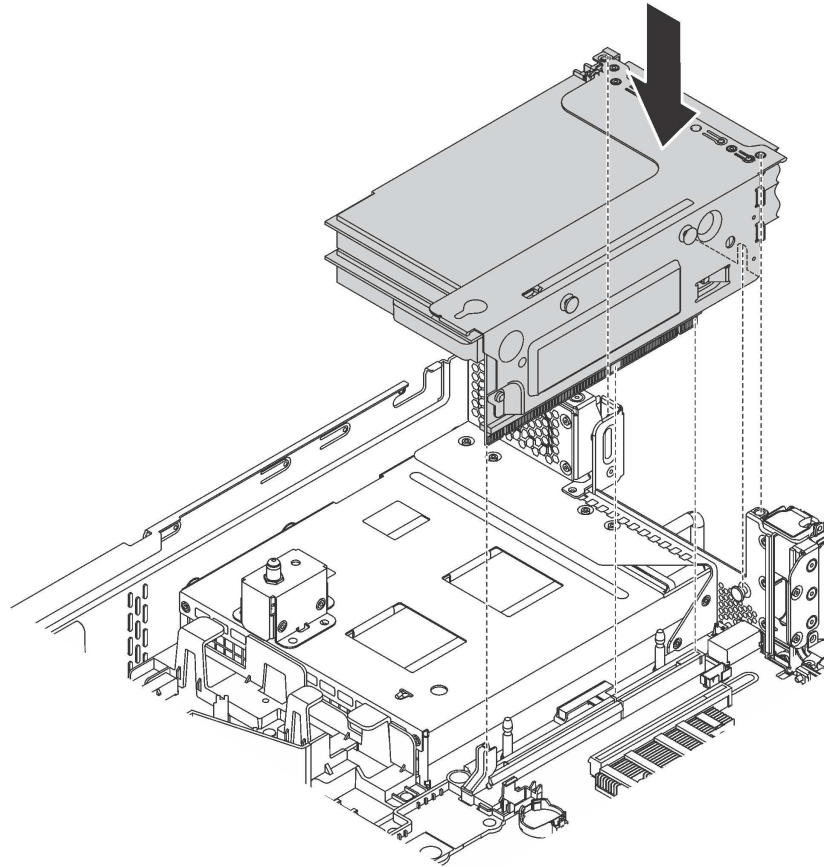


Figure 159. Riser 2 assembly installation

4. Complete the parts replacement. See “[Complete the parts replacement](#)” on page 286.

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## PCIe adapter replacement

Use this information to remove and install a PCIe adapter.

The PCIe adapter can be an Ethernet card, a host bus adapter, a RAID adapter, a PCIe solid-state drive, or any other supported PCIe adapters. PCIe adapters vary by type, but the installation and removal procedures are the same.

**Note:** For a list of the supported PCIe adapters, see:  
<https://static.lenovo.com/us/en/serverproven/index.shtml>

### Remove a PCIe adapter

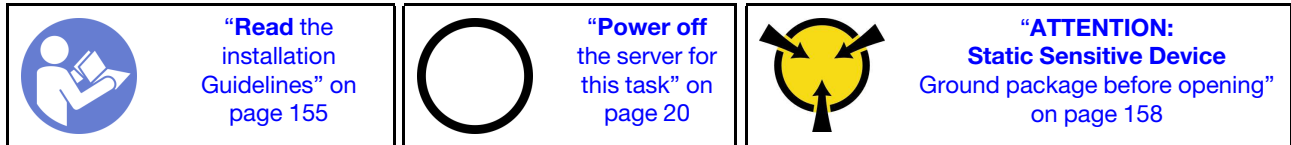
Use this information to remove a PCIe adapter.

This topic contains the following information:

- “Remove a PCIe adapter from the riser assembly” on page 229
- “Remove a PCIe adapter from the system board” on page 230

## Remove a PCIe adapter from the riser assembly

Use this information to remove a PCIe adapter from the riser assembly.



### Notes:

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

Before removing a PCIe adapter from the riser assembly:

1. Remove the top cover. See “Remove the top cover” on page 169.
2. Record the cable connections on the PCIe adapter and then disconnect all cables from the PCIe adapter.
3. Remove the riser assembly and lay it upside down on a flat, clean, and static-protective surface. See “Remove a riser card” on page 222.

To remove a PCIe adapter from the riser assembly, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

Step 1. Press the tab to pivot the PCIe adapter retention latch to the open position.

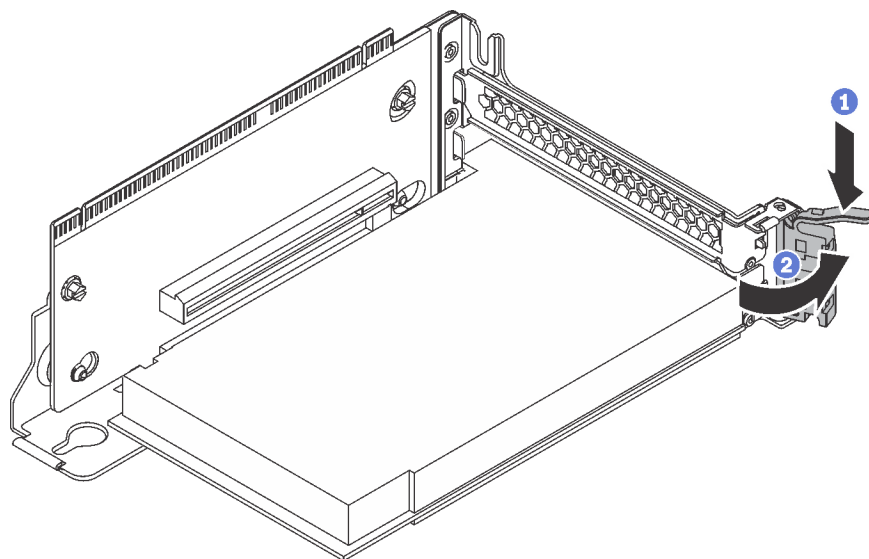


Figure 160. Opening the PCIe adapter retention latch

Step 2. Grasp the PCIe adapter by its edges and carefully pull it out of the PCIe slot.

**Notes:**

- 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.

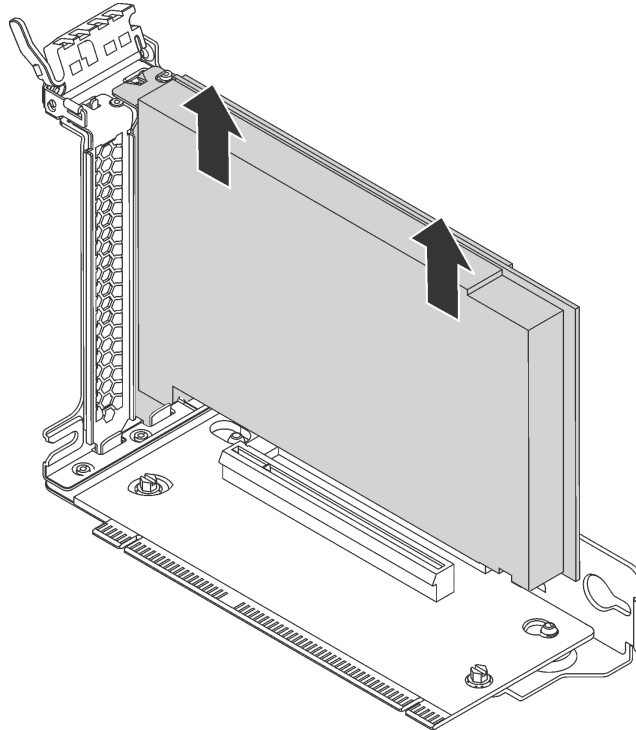

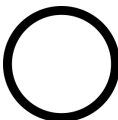



Figure 161. Removing a PCIe adapter from the riser assembly

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

## Remove a PCIe adapter from the system board

Use this information to remove a PCIe adapter from the system board.

 <p><b>“Read the installation Guidelines” on page 155</b></p>	 <p><b>“Power off the server for this task” on page 20</b></p>	 <p><b>“ATTENTION: Static Sensitive Device Ground package before opening” on page 158</b></p>
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**Notes:**

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

Before removing a PCIe adapter from the system board:

1. Remove the top cover. See [“Remove the top cover” on page 169](#).
2. Record the cable connections on the PCIe adapter and then disconnect all cables from the PCIe adapter.

To remove a PCIe adapter from the system board, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

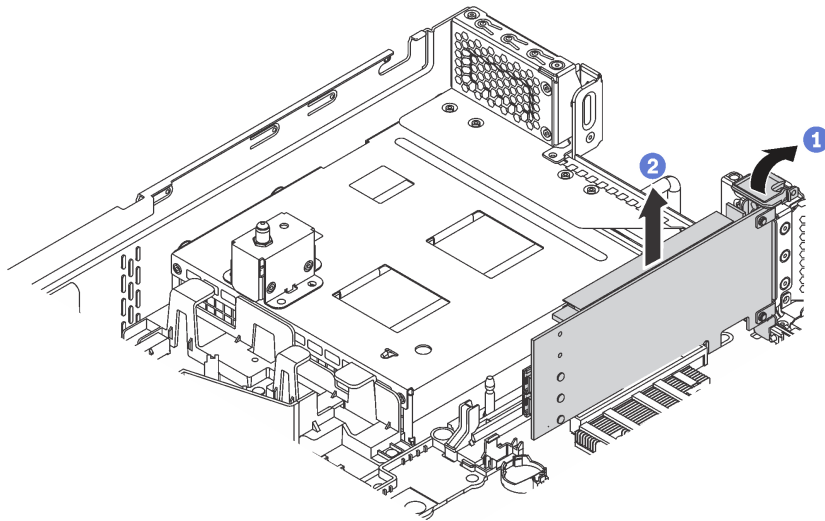


Figure 162. Removing a PCIe adapter from the system board

Step 1. Locate the PCIe slot 4. Then, pivot the PCIe adapter retention latch to the open position.

Step 2. 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.

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

## Install a PCIe adapter


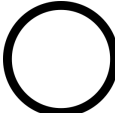

Use this information to install a PCIe adapter on the riser assembly or on the system board.

This topic contains the following information:

- “Install a PCIe adapter on the riser assembly” on page 231
- “Install a PCIe adapter on the system board” on page 235

### Install a PCIe adapter on the riser assembly

Use the following information to install a PCIe adapter on the riser assembly.

	<b>“Read the installation Guidelines”</b> on page 155		<b>“Power off the server for this task”</b> on page 20		<b>“ATTENTION: Static Sensitive Device</b> Ground package before opening” on page 158
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Observe the following PCIe slot selection priority when installing a PCIe adapter:

- For NVMe switch adapter:

Number of installed processors	PCIe slot selection priority
One processor	1
Two processors	1, 5, 6

- For server models with sixteen/twenty/twenty-four NVMe drives (with two processors installed):

Server models	PCIe slot selection
Sixteen NVMe drives	1, 4, 6, 7
Twenty NVMe drives	1, 4, 5, 6, 7
Twenty-four NVMe drives	1, 2, 4, 6, 7

- For 24i RAID adapter:

Number of installed processors	PCIe slot selection priority
One processor	1, 2, 3
Two processors	1, 2, 3, 5, 6

- For 8i or 16i HBA/RAID adapter:

Number of installed processors	PCIe slot selection priority
One processor	7, 4, 2, 3, 1
Two processors	7, 4, 2, 3, 1, 5, 6

- For 440-8e or 440-16e HBA/RAID adapter:

Number of installed processors	PCIe slot selection priority
One processor	4, 2, 3, 1
Two processors	4, 2, 3, 1, 5

- For an Ethernet card or a converged network adapter:

Number of installed processors	PCIe slot selection priority
One processor	4, 2, 3, 1
Two processors	4, 2, 6, 3, 5, 1

#### Notes:

- Depending on the specific type, your PCIe adapter and riser card for the riser assembly might look different from the illustration in this topic.
- Use any documentation that comes with the PCIe adapter and follow those instructions in addition to the instructions in this topic.
- Do not install PCIe adapters with small form factor (SFF) connectors in PCIe slot 6.
- ThinkSystem Xilinx Alveo U50 Data Center Accelerator Adapter is supported only when the following requirements are met:



- For server models installed with one CPU, only one adapter is supported and must be installed in PCIe slot 1.
- For server models installed with two CPUs, up to two adapters are supported and must be installed in PCIe slot 1 and slot 5.
- The maximum supported processor TDP is 165 watts and the ThinkSystem SR630/530/650(GPU) CPU Performance Heatsink must be installed.
- The maximum operating temperature is 35°C.
- No fan fails.
- The P4 GPU air baffle and the large-size air baffle must be installed.
- No VMware and Windows preload.
- ThinkSystem Mellanox ConnectX-6 HDR100 QSFP56 1-port PCIe InfiniBand adapter or ThinkSystem Mellanox ConnectX-6 HDR100 QSFP56 2-port PCIe InfiniBand adapter is supported only when the following requirements are met:
  - The server chassis is the eight 3.5-inch-drive bays chassis, eight 2.5-inch-drive bays chassis, sixteen 2.5-inch-drive bays chassis, or twenty 2.5-inch-drive bays chassis.
  - The operating temperature is equal to or less than 35°C.
- ThinkSystem Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe adapter is supported only when the following requirements are met:
  - The server chassis is the eight 3.5-inch-drive bays chassis, eight 2.5-inch-drive bays chassis, sixteen 2.5-inch-drive bays chassis, or twenty 2.5-inch-drive bays chassis.
  - The operating temperature is equal to or less than 35°C.
  - Two processors installed.
  - The PCIe adapter can only be installed in PCIe slot 1, and the auxiliary connection card can only be installed in PCIe slot 5 or PCIe slot 6.
- For information about installing a Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe adapter with the ThinkSystem Mellanox HDR/200GbE 2x PCIe Aux Kit on the riser assembly, refer to the most up-to-date documentation at [https://thinksystem.lenovofiles.com/help/index.jsp?topic=%2Fthinksystem\\_mellanox\\_hdr\\_200gbe\\_2x\\_pcie\\_aux\\_kit%2FThinkSystem\\_Mellanox\\_HDR200GbE\\_2xPCIe\\_Aux\\_Kit.html&cp=7\\_9\\_4](https://thinksystem.lenovofiles.com/help/index.jsp?topic=%2Fthinksystem_mellanox_hdr_200gbe_2x_pcie_aux_kit%2FThinkSystem_Mellanox_HDR200GbE_2xPCIe_Aux_Kit.html&cp=7_9_4).

Before installing a PCIe adapter on the riser assembly:

1. Touch the static-protective package that contains the new PCIe adapter to any unpainted surface on the outside of the server. Then, take the new PCIe adapter out of the package and place it on a static-protective surface.
2. Locate an appropriate PCIe slot. See “Rear view” on page 28 to identify the PCIe slots of your server.

To install a PCIe adapter on the riser assembly, complete the following steps:

#### **Watch the procedure**

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS_).

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

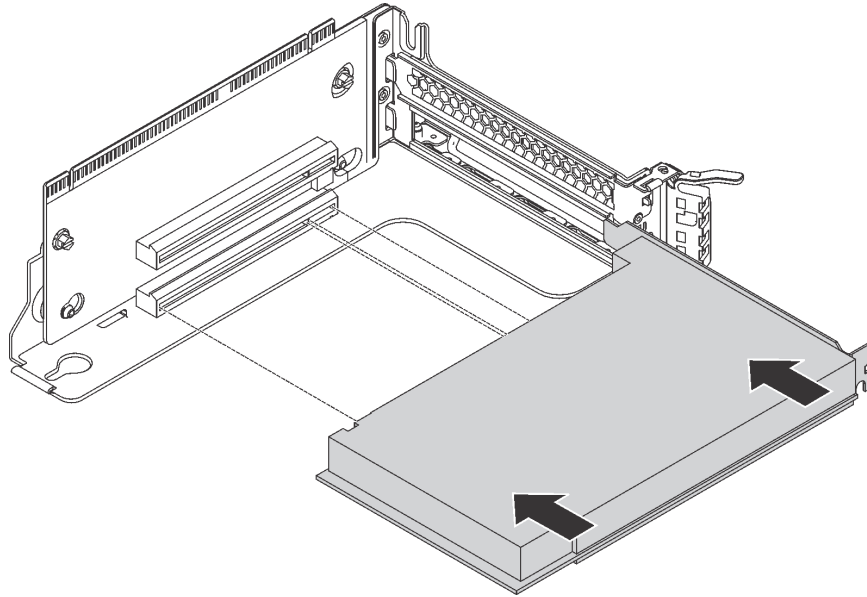


Figure 163. PCIe adapter installation

**Note:** Carefully handle the PCIe adapter by its edges.

Step 2. Pivot the PCIe adapter retention latch to the closed position.

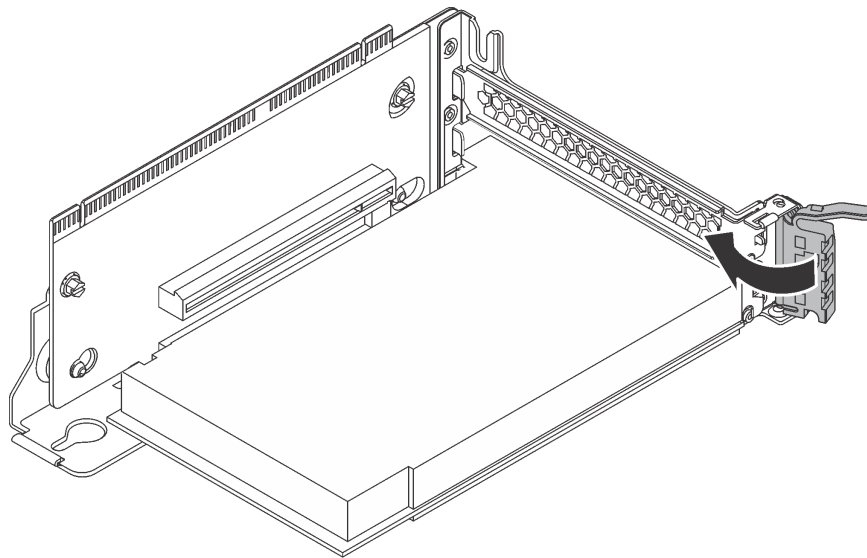


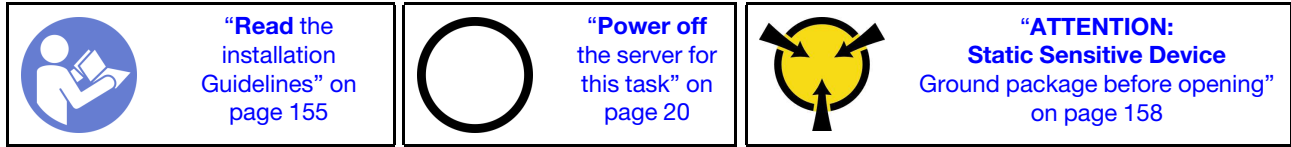
Figure 164. Closing the PCIe adapter retention latch

After installing the PCIe adapter on the riser assembly:

1. Refer to your record to reconnect the cables.
2. Reinstall the riser assembly. See [“Install a riser card” on page 225](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 286](#).

## Install a PCIe adapter on the system board

Use this information to install a PCIe adapter on the system board.



### Notes:

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

Before installing the PCIe adapter on the system board:

1. Touch the static-protective package that contains the new PCIe adapter to any unpainted surface on the outside of the server. Then, take the new PCIe adapter out of the package and place it on a static-protective surface.
2. If the new PCIe adapter is installed with a full-height bracket, replace the full-height bracket with the low-profile bracket by doing the following:
  - a. Carefully remove the screws that secure the PCIe adapter and then remove the full-height bracket from the PCIe adapter.
  - b. Note the orientation and align the screw holes in the low-profile bracket with the corresponding holes in the PCIe adapter. Then, install the screws to secure the bracket to the PCIe adapter.

To install a PCIe adapter on the system board, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS_).

Step 1. Position the PCIe adapter near the PCIe slot. Then, carefully press the PCIe adapter straight into the slot until it is securely seated and its bracket also is secured by the chassis.

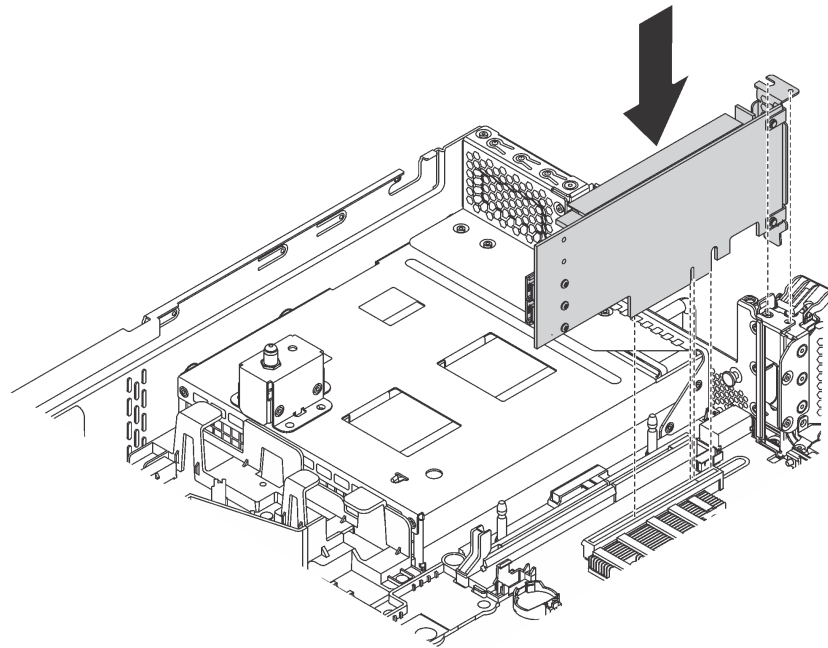


Figure 165. Installing a PCIe adapter on the system board

Step 2. Pivot the PCIe adapter retention latch to the closed position to secure the PCIe adapter in position.

After installing the PCIe adapter on the system board:

1. Refer to your record to reconnect the cables.
2. Complete the parts replacement. See [“Complete the parts replacement” on page 286](#).

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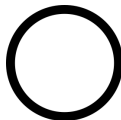

## GPU replacement

Use this information to remove and install the GPU.

This topic applies only to the full-height GPUs and the NVIDIA P4/T4 GPU. About the replacement procedure for low-profile GPUs, refer to [“PCIe adapter replacement” on page 228](#).

### Remove a GPU

Use this information to remove a GPU.

	<b>“Read the installation Guidelines” on page 155</b>		<b>“Power off the server for this task” on page 20</b>		<b>“ATTENTION: Static Sensitive Device Ground package before opening” on page 158</b>
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#### Notes:

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

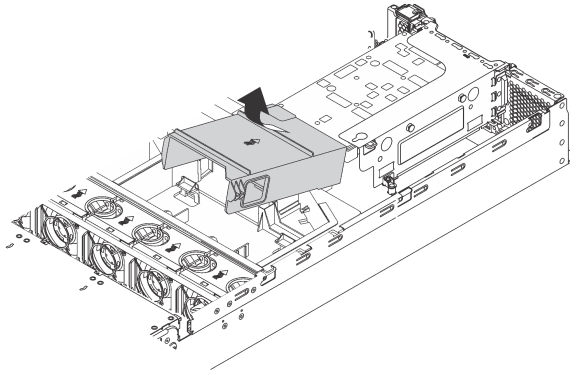
Before removing a GPU:

1. Remove the top cover. See [“Remove the top cover” on page 169](#).
2. Remove the riser assembly that has the GPU installed. For instructions on how to remove the riser assembly, see [“Remove a riser card” on page 222](#).

To remove a GPU, complete the following steps:

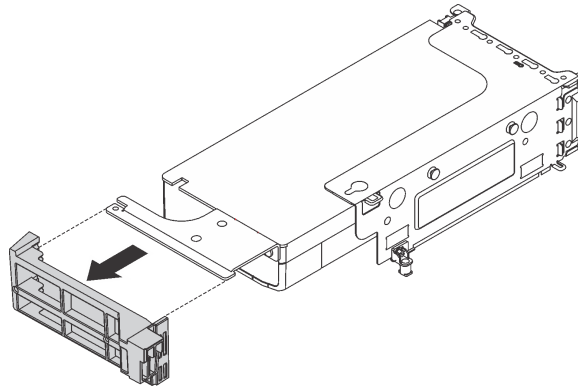
Step 1. Depending on the GPU type, do one of the following:

- For NVIDIA FHHL V100 GPU, remove the V100 GPU air baffle first.



*Figure 166. V100 GPU air baffle removal*

- For full-height full-length GPUs, remove the GPU holder from the GPU assembly.



*Figure 167. GPU holder removal*

- For NVIDIA P4 GPU, remove the P4 GPU air baffle (also called the P4 GPU air baffle).

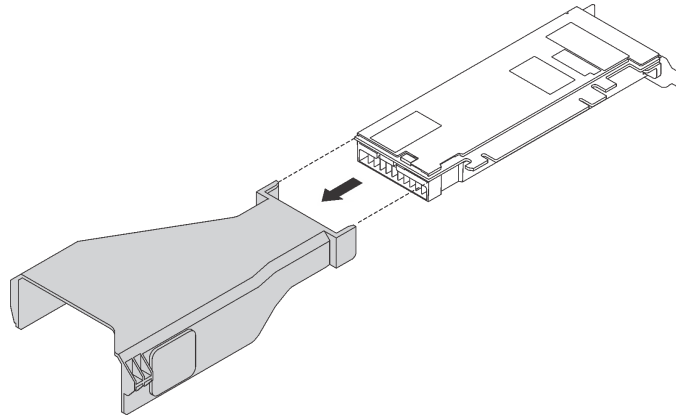


Figure 168. P4 GPU air baffle removal

- For NVIDIA A10 GPU, if you are removing one A10 GPU on one riser assembly, remove the riser assembly first, and then remove the A10 GPU air baffle.

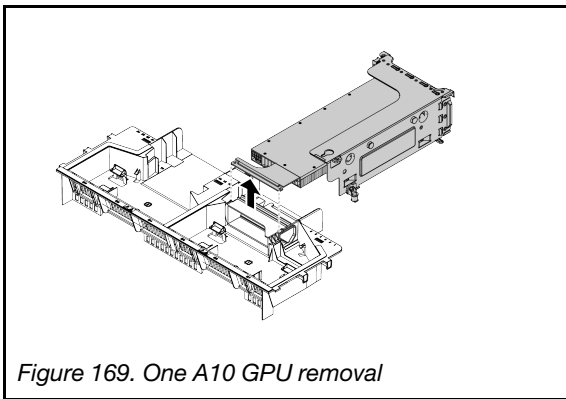


Figure 169. One A10 GPU removal

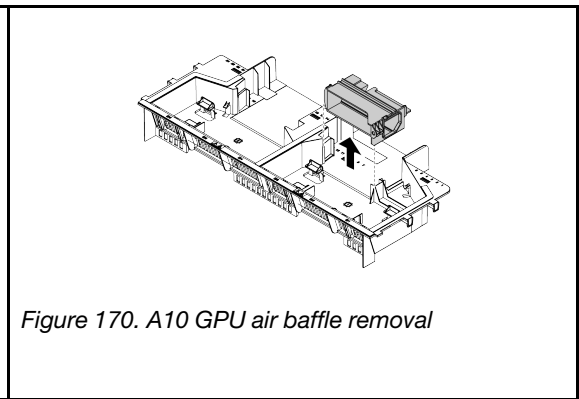


Figure 170. A10 GPU air baffle removal

- For NVIDIA A10 GPU, if you are removing two NVIDIA A10 GPUs on one riser assembly, remove both the riser assembly and the FHFL GPU holder together first, and then remove the FHFL GPU holder.

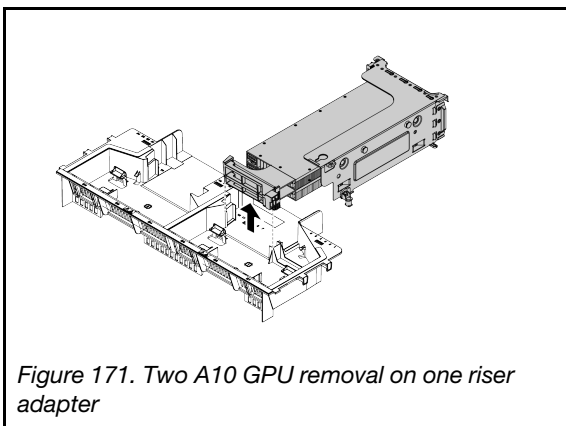


Figure 171. Two A10 GPU removal on one riser adapter

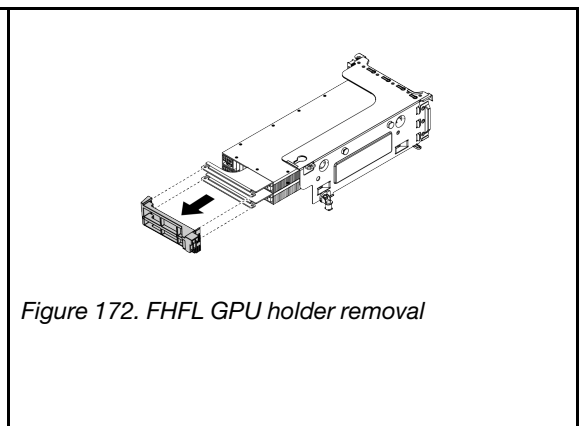


Figure 172. FHFL GPU holder removal

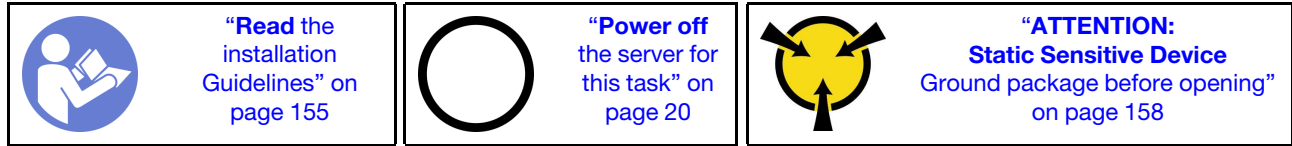
Step 2. Disconnect the power cable from the GPU assembly.

Step 3. Remove the GPU from the riser assembly. See [“Remove a PCIe adapter from the riser assembly” on page 229.](#)

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

## Install a GPU

Use this information to install a GPU.



### Notes:

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

Before installing a GPU:

1. Touch the static-protective package that contains the new GPU to any unpainted surface on the outside of the server. Then, take the new GPU out of the package and place it on a static-protective surface.
2. Ensure that your server has the appropriate air baffle installed. For more information, refer to [“Important information for the air baffle and GPU” on page 3](#).
3. Depending on the GPU type, do one of the following:
  - For full-height full-length (FHFL) GPUs, if the GPU does not have a bracket installed on it, install the screws to secure the GPU bracket **1** to the GPU. Then, install the FHFL GPU holder **2** to the GPU.

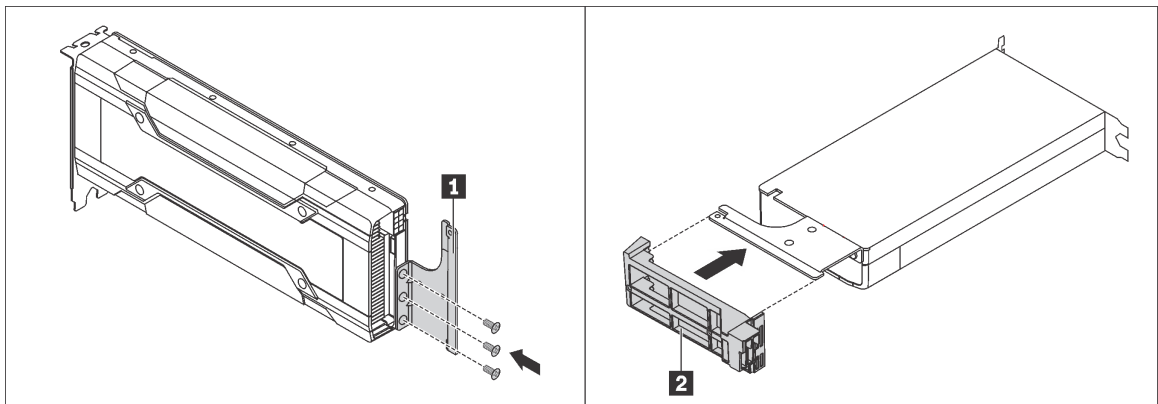


Figure 173. GPU bracket and holder installation

- For NVIDIA P4 GPU, install the P4 GPU air baffle (also called the P4 GPU air duct).

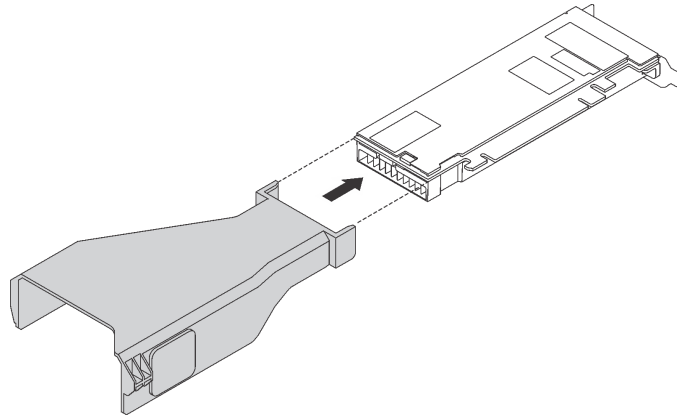


Figure 174. P4 GPU air baffle installation

- For NVIDIA A10 GPU, if you are installing one NVIDIA A10 on the one riser assembly, install a A10 GPU air baffle on the large-size air baffle first.

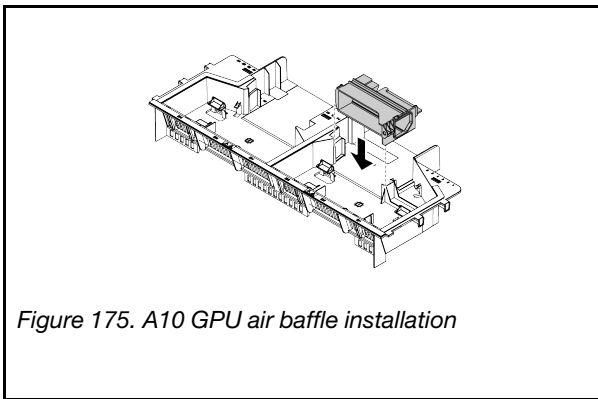


Figure 175. A10 GPU air baffle installation

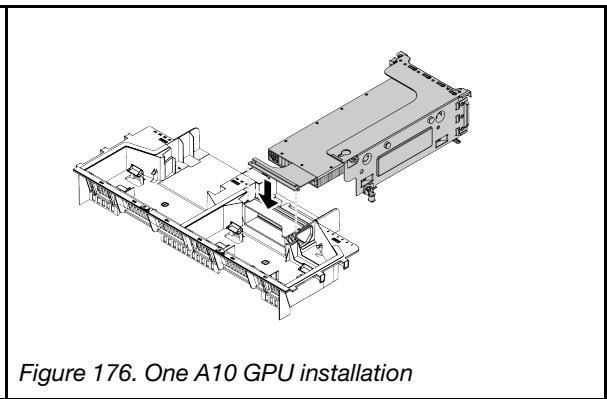


Figure 176. One A10 GPU installation

- For NVIDIA A10 GPU, if you are installing two NVIDIA A10 GPUs on one riser assembly, install the FHFL GPU holder on the riser assembly first.

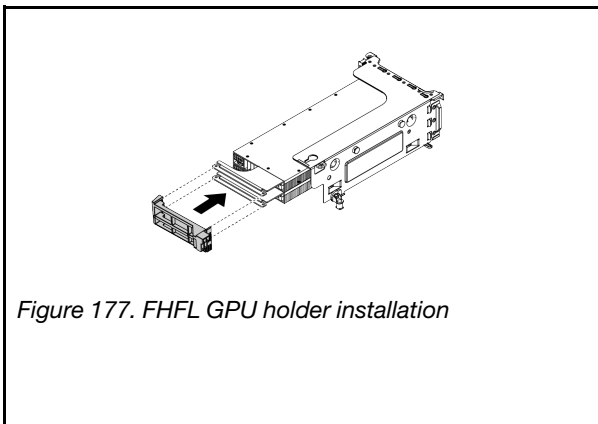


Figure 177. FHFL GPU holder installation

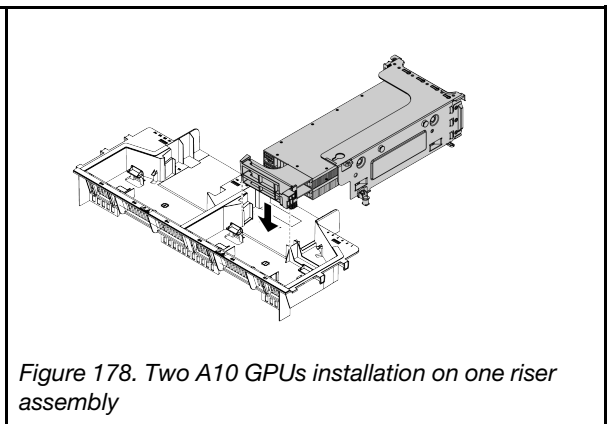


Figure 178. Two A10 GPUs installation on one riser assembly

To install a GPU, complete the following steps:

Step 1. Locate the appropriate PCIe slot for the GPU.



**Note:** For server models with one processor, you can install one GPU in PCIe slot 1. For server models with two processors, you can install up to two GPUs in PCIe slot 1 and PCIe slot 5, or up to five GPUs in PCIe slots 1, 5, 6, 2, and 3. For more information, see [“GPU specifications” on page 3](#).

- Step 2. Align the GPU with the PCIe slot on the riser card. Then, carefully press the GPU straight into the slot until it is securely seated. See [“Install a PCIe adapter on the riser assembly” on page 231](#).
- Step 3. Connect the power cable to the power connector on the GPU.
- Step 4. Reinstall the riser assembly. See [“Install a riser card” on page 225](#).

After installing the GPU:

1. If you are installing a NVIDIA FHHL V100 GPU, do the following:
  - a. One V100 GPU air baffle supports up to two FHHL V100 GPUs installed. If you are installing two FHHL V100 GPUs, remove the middle plate from the V100 GPU air baffle. If you are installing one FHHL V100 GPU, go to the next step.

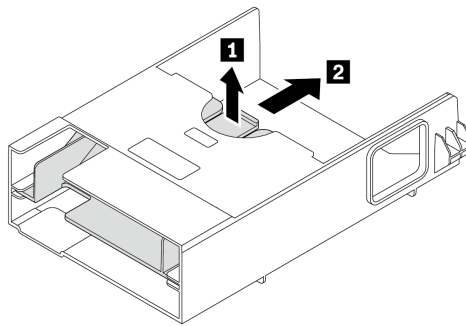


Figure 179. Middle plate removal

- b. Install the V100 GPU air baffle.

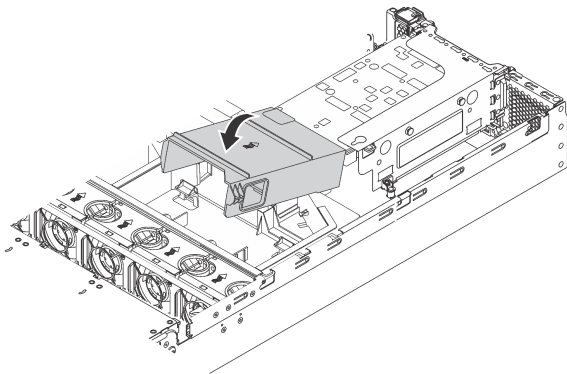


Figure 180. V100 GPU air baffle installation

2. Complete the parts replacement. See [“Complete the parts replacement” on page 286](#).

---

## Rear hot-swap drive assembly replacement

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

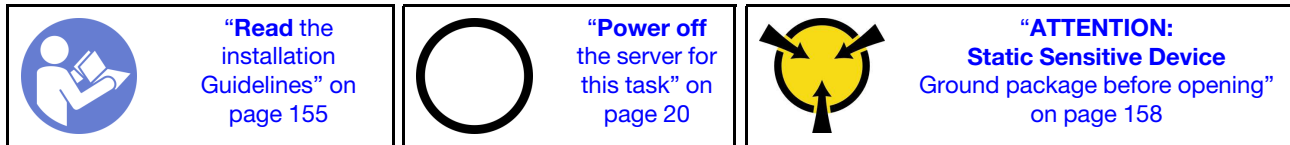
The rear hot-swap drive assembly enables you to install up to two 3.5-inch hot-swap drives in the rear of the server.

## Notes:

- The term “hot-swap drive” refers to all the supported types of 3.5-inch hot-swap hard disk drives and hot-swap solid-state drives.
- The rear hot-swap drive assembly is available on some models.

## Remove the rear hot-swap drive assembly

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



Before removing the rear hot-swap drive assembly:

1. Remove the top cover. See [“Remove the top cover”](#) on page 169.
2. Remove the drives or drive fillers installed in the rear hot-swap drive assembly. See [“Remove a hot-swap drive”](#) on page 187.

To remove the rear hot-swap drive assembly, complete the following steps:

- Step 1. Disconnect the signal cable from the rear hot-swap drive assembly. See [“Internal cable routing”](#) on page 37.
- Step 2. Grasp the rear hot-swap drive assembly by its edges and carefully lift it straight up and off the chassis.

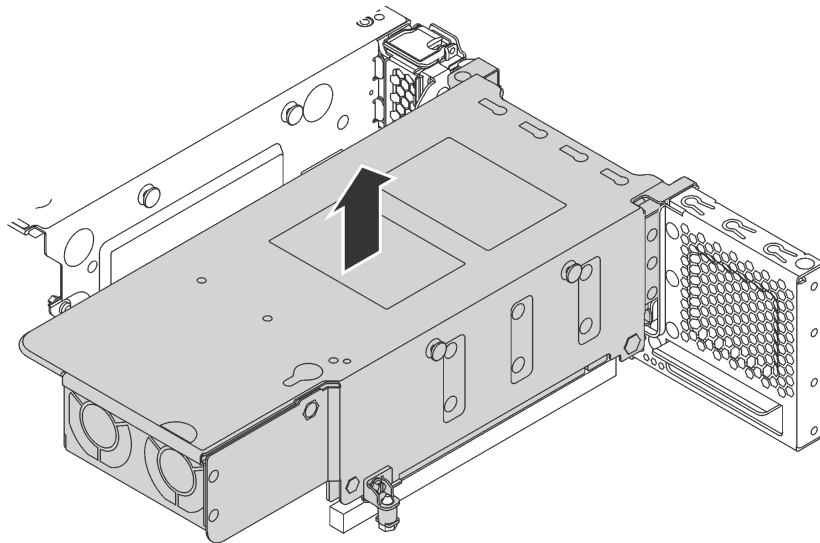
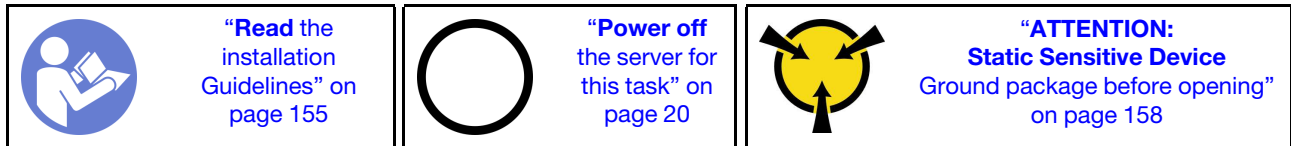


Figure 181. Rear hot-swap drive assembly removal

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

## Install the rear hot-swap drive assembly

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



Before installing the rear hot-swap drive assembly, touch the static-protective package that contains the new rear hot-swap drive assembly to any unpainted surface on the outside of the server. Then, take the new rear hot-swap drive assembly out of the package and place it on a static-protective surface.

**Note:** If you are installing the ThinkSystem SR650 Rear 3.5 HDD kit Without Fan (provided for Chinese Mainland only), the maximum supported processor TDP is 125 watts.

To install the rear hot-swap drive assembly, complete the following steps:

- Step 1. Align the mounting stud on the system board with the corresponding hole in the rear hot-swap drive assembly. Meanwhile, align the rear of the rear hot-swap drive assembly with the corresponding rail guides in the rear of the chassis. Then, carefully press the rear hot-swap drive assembly straight down into the chassis until it is fully seated.

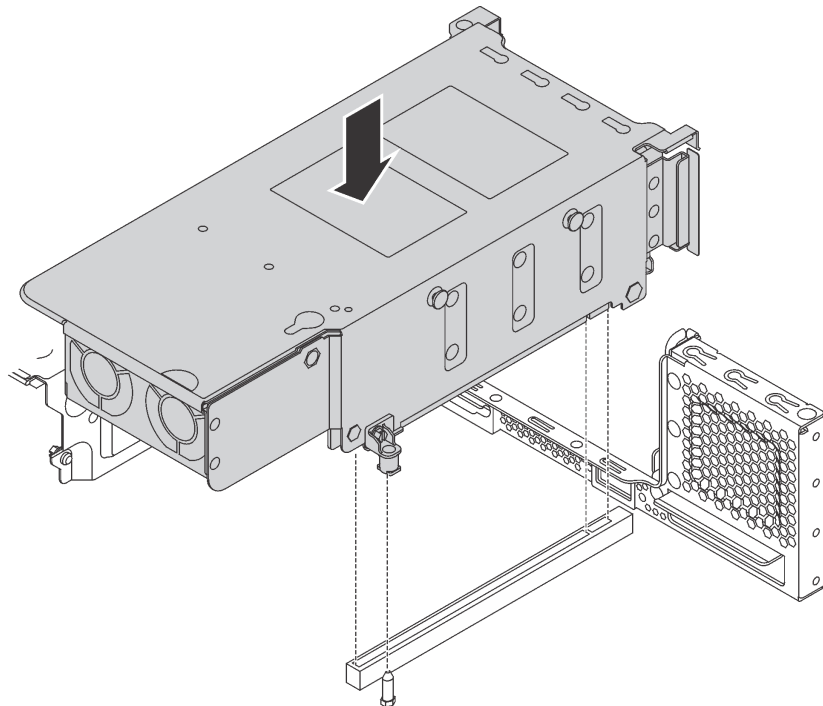


Figure 182. Rear hot-swap drive assembly installation

- Step 2. Connect the signal cable to the rear hot-swap drive assembly. See [“Internal cable routing” on page 37](#).

After installing the rear hot-swap drive assembly:

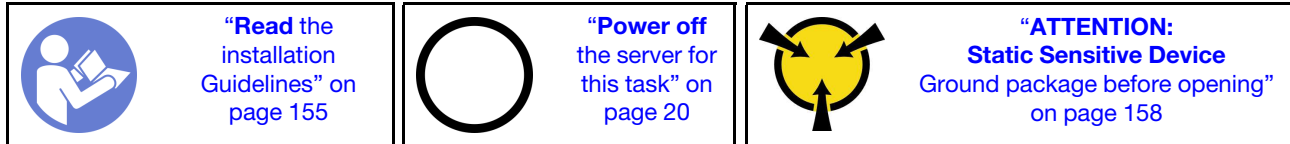
1. Reinstall the drives or drive fillers into the rear hot-swap drive assembly. See [“Install a hot-swap drive” on page 189](#).
2. Complete the parts replacement. See [“Complete the parts replacement” on page 286](#).

## LOM adapter replacement

Use this information to remove and install the LOM adapter.

### Remove the LOM adapter

Use this information to remove the LOM adapter.



Before removing the LOM adapter, remove the top cover. See “Remove the top cover” on page 169.

To remove the LOM adapter, complete the following steps:

#### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

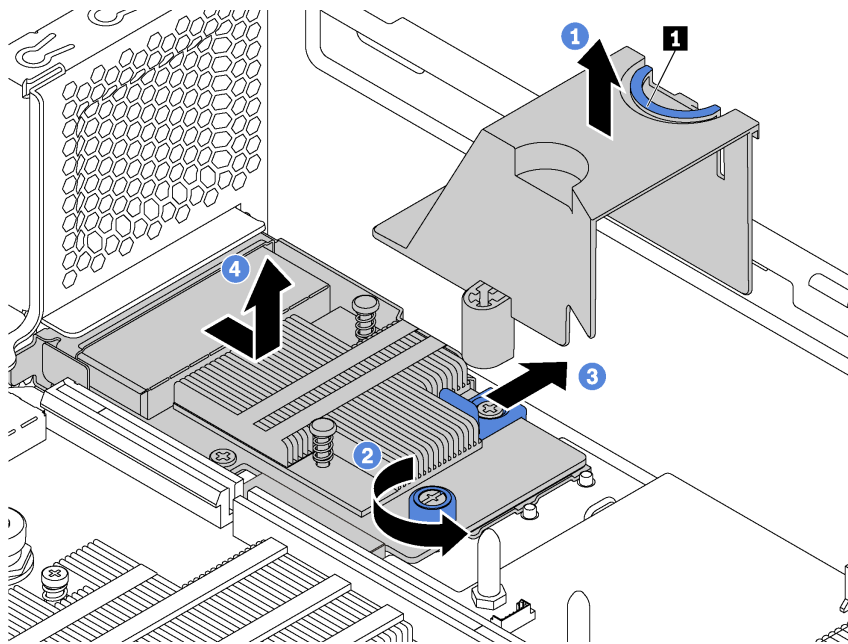


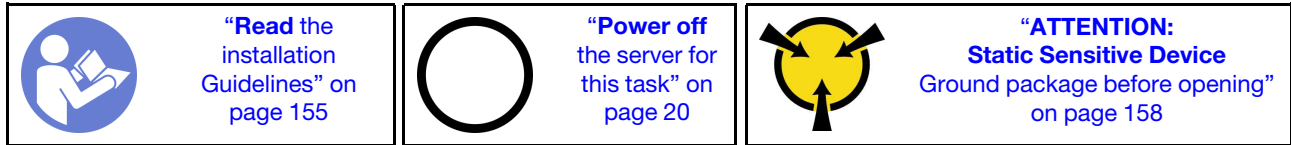
Figure 183. LOM adapter removal

- Step 1. Remove the LOM-adapter air baffle by pinching the tab **1** and then lifting the air baffle out of the server.
- Step 2. Loosen the thumbscrew that secures the LOM adapter.
- Step 3. Push the LOM adapter out of the connector on the system board.
- Step 4. Lift the LOM adapter off the server as shown.

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

## Install the LOM adapter

Use this information to install the LOM adapter.



Before installing the LOM adapter:

1. If the server comes with a LOM adapter slot bracket, remove it with a tool first. Store the bracket in case that you later remove the LOM adapter and need the bracket to cover the place.

### CAUTION:

**Use a tool to remove the LOM adapter slot bracket to avoid injury.**

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

To install the LOM adapter, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

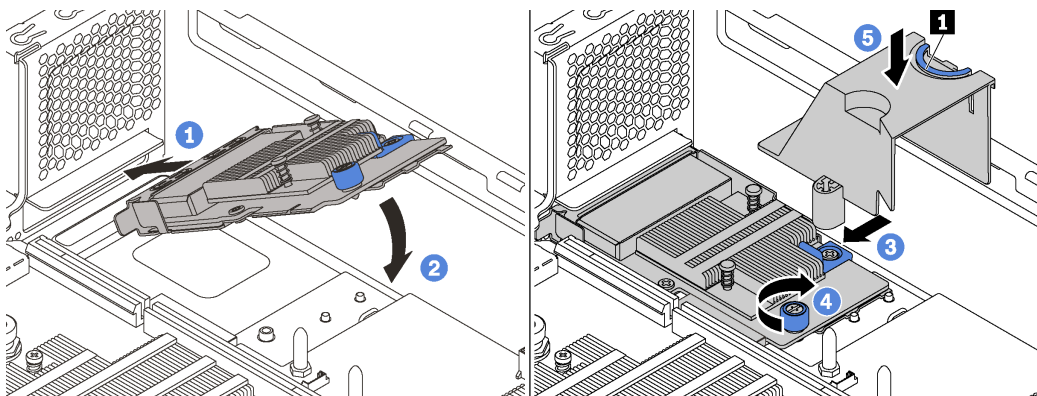


Figure 184. LOM adapter installation

- Step 1. Place the LOM adapter into the connector at an angle.
- Step 2. Rotate the LOM adapter down.
- Step 3. Push the LOM adapter as shown to insert it into the connector on the system board.
- Step 4. Tighten the thumbscrew to secure the LOM adapter.
- Step 5. Align the mounting stud on the chassis with the hole in the LOM-adapter air baffle. Then, pinch the tab **1** and lower the LOM-adapter air baffle onto the LOM adapter.

After installing the LOM adapter, complete the parts replacement. See “[Complete the parts replacement](#)” on page 286.

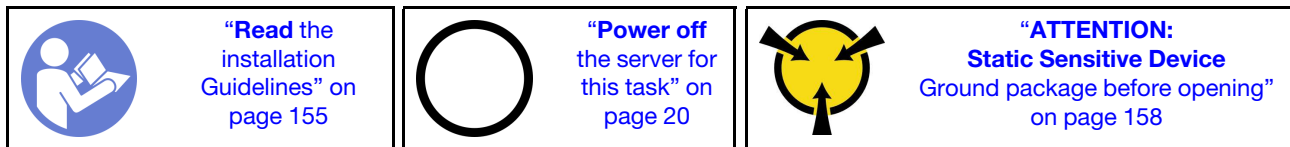
## Serial port module replacement

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

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

### Remove the serial port module

Use this information to remove the serial port module.



Before removing the serial port module, remove the top cover. See “Remove the top cover” on page 169.

To remove the serial port module, complete the following steps:

#### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

Step 1. Disconnect the cable of the serial port module from the system board.

Step 2. Open the retention latch and remove the serial port module from the chassis.

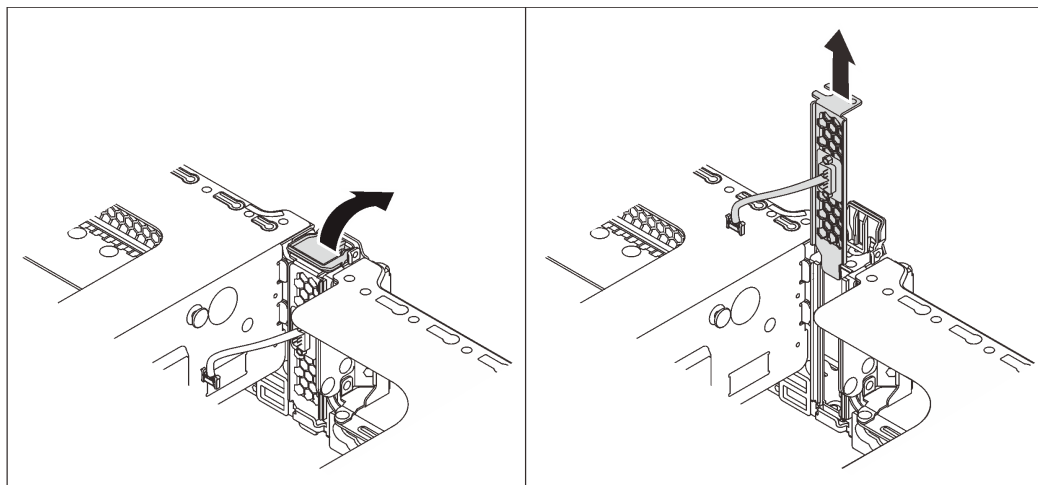


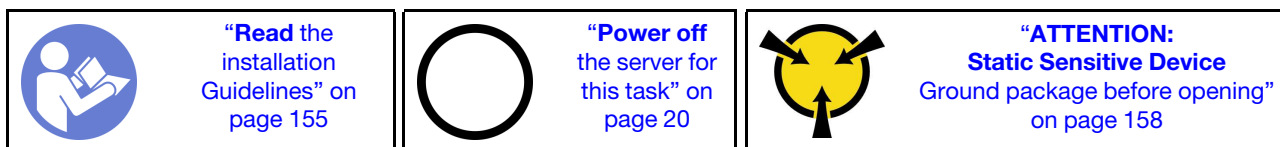
Figure 185. Serial port module removal

After removing the serial port module:

1. Install a new serial port module, a PCIe adapter, or a PCIe slot bracket to cover the place.
2. If you are instructed to return the old serial port module, follow all of the packaging instructions and use any packaging materials that are provided.

### Install the serial port module

Use this information to install the serial port module.



Before installing the serial port module:

1. If the slot is covered with a slot bracket, open the retention latch and remove the slot bracket from the chassis. Store the bracket in case that you later remove the serial port module and need the bracket to cover the place.
2. Touch the static-protective package that contains the new serial port module to any unpainted surface on the outside of the server. Then, take the new serial port module out of the package and place it on a static-protective surface.

To install the serial port module, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

Step 1. Install the serial port module into the chassis and close the retention latch to secure it in position.

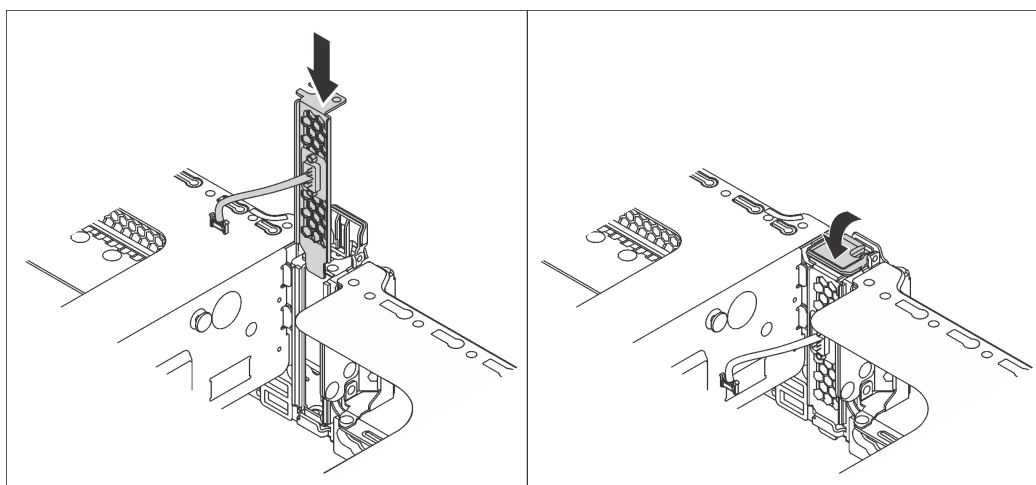


Figure 186. Serial port module installation

Step 2. 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 components” on page 33](#).

After installing the serial port module:

1. Complete the parts replacement. See [“Complete the parts replacement” on page 286](#).
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:
 


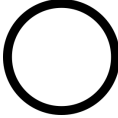

```
Bcdedit /ems no
```
  - c. Restart the server to ensure that the EMS setting takes effect.

## M.2 backplane and M.2 drive replacement

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

### Remove the M.2 backplane and M.2 drive

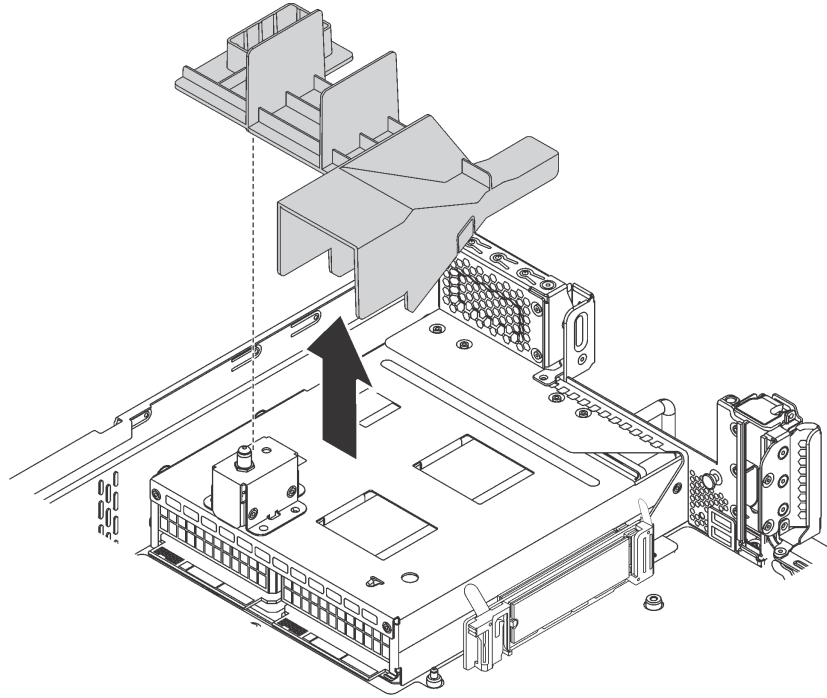
Use this information to remove the M.2 backplane and M.2 drive.

 <p><b>“Read the installation Guidelines”</b> on page 155</p>	 <p><b>“Power off the server for this task”</b> on page 20</p>	 <p><b>“ATTENTION: Static Sensitive Device</b> Ground package before opening” on page 158</p>
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Before removing the M.2 backplane and M.2 drive:

1. Remove the top cover. See [“Remove the top cover”](#) on page 169.
2. For easier operation, remove the riser 2 assembly. See [“Remove a riser card”](#) on page 222.
3. If your server has a M.2 drive air baffle installed, remove the M.2 drive air baffle first.



*Figure 187. M.2 drive air baffle removal*

To remove the M.2 backplane and M.2 drive, complete the following steps:

Step 1. Grasp the M.2 backplane at both ends and pull it straight up to remove it from the system board.

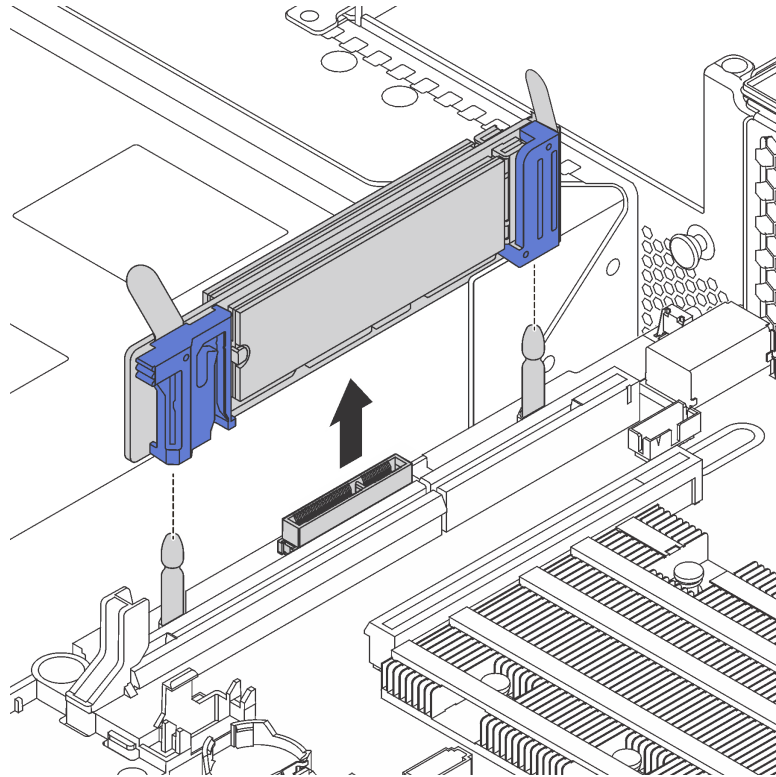


Figure 188. M.2 backplane removal

Step 2. Remove the M.2 drive from the M.2 backplane by doing the following:

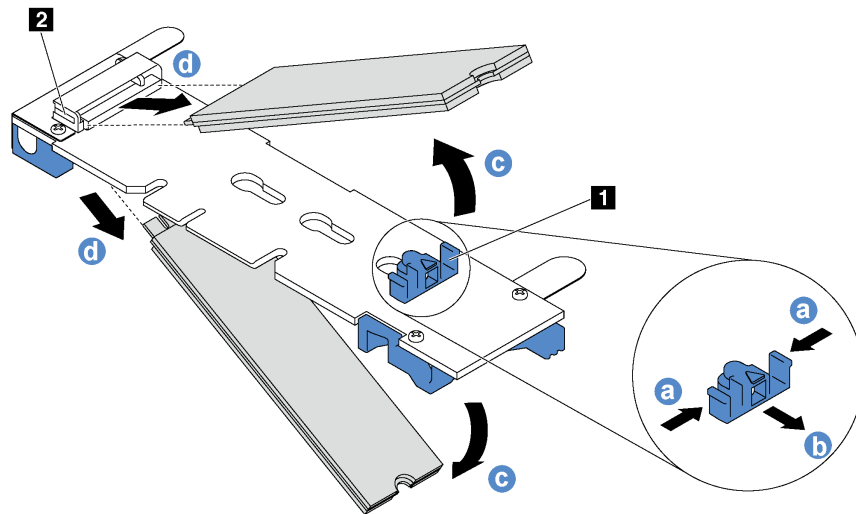


Figure 189. M.2 drive removal

- Press both sides of the retainer **1**.
- Slide the retainer backward to loosen the M.2 drive from the M.2 backplane.


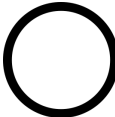

**Note:** If the M.2 backplane has two M.2 drives, they will both release outward when you slide the retainer backward.

- Rotate the M.2 drive away from the M.2 backplane.
- Pull it away from the connector **2** at an angle of approximately 30 degrees.

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

## Adjust the retainer on the M.2 backplane

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

	<p>“Read the installation Guidelines” on page 155</p>		<p>“Power off the server for this task” on page 20</p>		<p>“ATTENTION: Static Sensitive Device Ground package before opening” on page 158</p>
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Before adjusting the retainer on the M.2 backplane, 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.

To adjust the retainer on the M.2 backplane, complete the following steps:

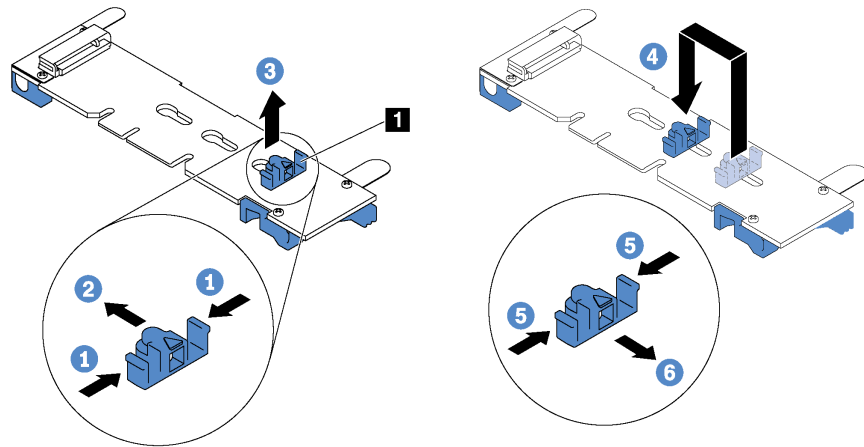


Figure 190. M.2 retainer adjustment

- Step 1. Press both sides of the retainer **1**.
- Step 2. Move the retainer forward until it is in the large opening of the keyhole.
- Step 3. Take the retainer out of the keyhole.
- Step 4. Insert the retainer into the correct keyhole.
- Step 5. Press both sides of the retainer.
- Step 6. Slide the retainer backwards until it is seated in place.

## Install the M.2 backplane and M.2 drive

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

	<p><b>“Read the installation Guidelines”</b> on page 155</p>		<p><b>“Power off the server for this task”</b> on page 20</p>		<p><b>“ATTENTION: Static Sensitive Device</b> Ground package before opening” on page 158</p>
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Before installing the M.2 backplane and M.2 drive:

1. Touch the static-protective package that contains the new M.2 backplane and M.2 drive to any unpainted surface on the outside of the server. Then, take the new M.2 backplane and M.2 drive out of the package and place them on a static-protective surface.
2. Adjust the retainer on the M.2 backplane to accommodate the particular size of the M.2 drive you wish to install. See [“Adjust the retainer on the M.2 backplane”](#) on page 251.
3. Locate the connector on each side of the M.2 backplane.

**Notes:**

- Some M.2 backplanes support two identical M.2 drives. When two M.2 drives are installed, align and support both M.2 drives when sliding the retainer forward to secure the M.2 drives.
- Install the M.2 drive in slot 0 first.

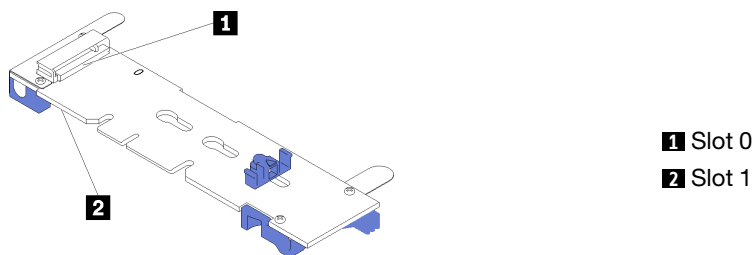


Figure 191. M.2 drive slot

To install the M.2 backplane and M.2 drive, complete the following steps:

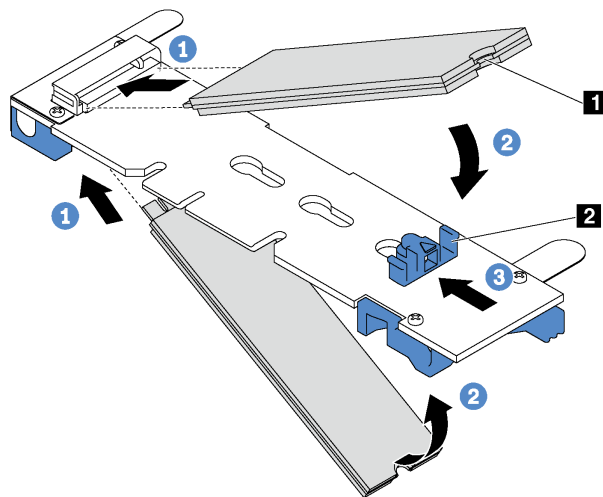


Figure 192. M.2 drive installation

Step 1. Insert the M.2 drive at an angle of approximately 30 degrees into the connector.

**Note:** If your M.2 backplane supports two M.2 drives, insert the M.2 drives into the connectors at both sides.

Step 2. Rotate the M.2 drive down until the notch **1** catches on the lip of the retainer **2**.

Step 3. Slide the retainer forward (toward the connector) to secure the M.2 drive into place.

**Attention:** When sliding the retainer forward, ensure that the two nubs **3** on the retainer enter the small holes **4** on the M.2 backplane. Once they enter the holes, you will hear a soft “click” sound.

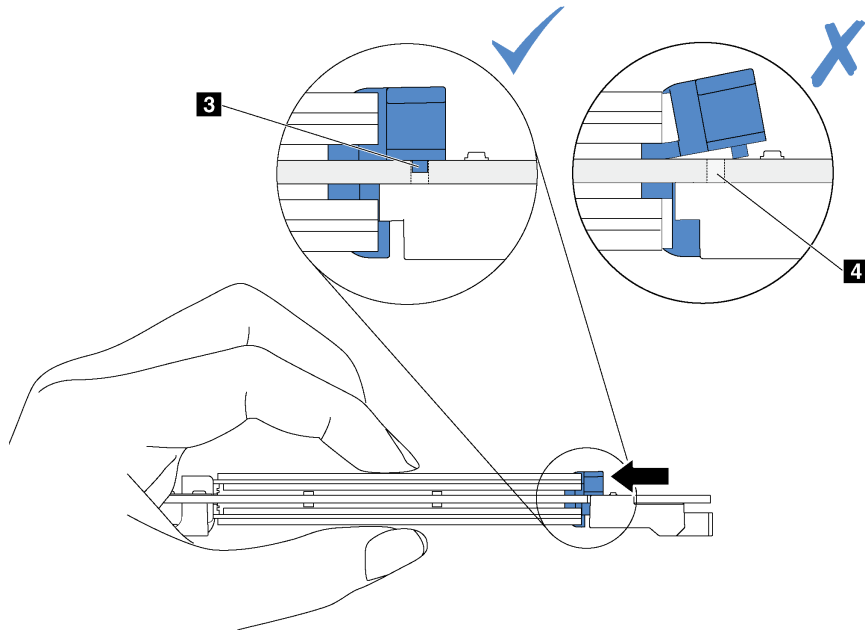
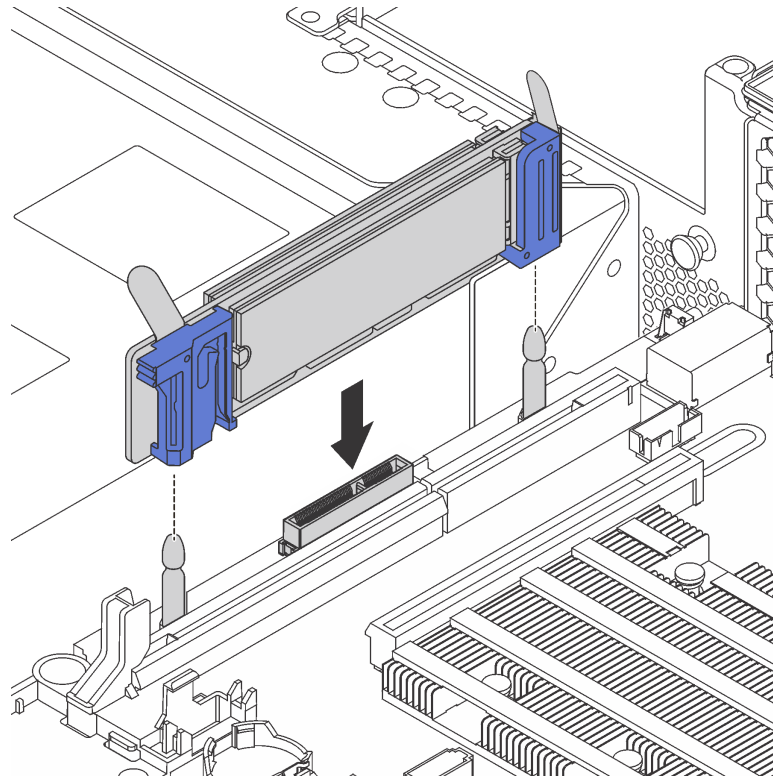


Figure 193. Instruction for sliding the retainer

Step 4. Align the blue plastic supports at each end of the M.2 backplane with the guide pins on the system board. Then, insert the M.2 backplane into the M.2 slot on the system board and press it down to fully seat it.



*Figure 194. M.2 backplane installation*

After installing the M.2 drive and M.2 backplane:

1. If you are installing the 240 GB or 480 GB M.2 drives and there is no PCIe adapter installed on PCIe slot 6, install the M.2 drive air baffle for proper airflow.

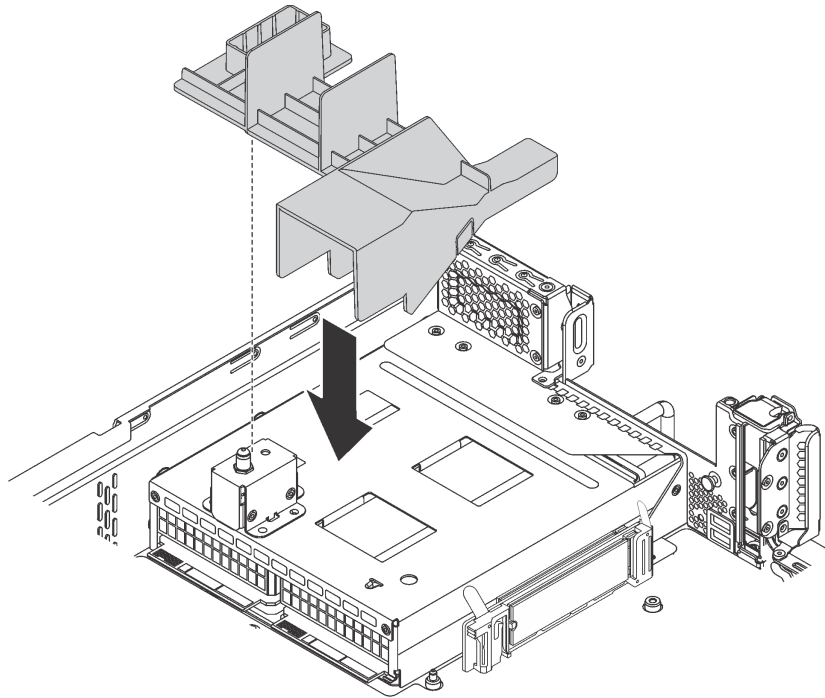


Figure 195. M.2 drive air baffle installation

2. If you have removed the riser 2 assembly, reinstall it. See [“Install a riser card” on page 225](#).
3. Complete the parts replacement. See [“Complete the parts replacement” on page 286](#).
4. Use the Lenovo XClarity Provisioning Manager to configure the RAID. For more information, see: [http://sysmgmt.lenovofiles.com/help/topic/LXPM/RAID\\_setup.html](http://sysmgmt.lenovofiles.com/help/topic/LXPM/RAID_setup.html)



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## Hot-swap power supply replacement

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

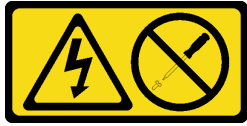
### Remove a hot-swap power supply

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

 <p><b>“Read the installation Guidelines” on page 155</b></p>	 <p><b>“ATTENTION: Static Sensitive Device</b> Ground package before opening” on page 158</p>
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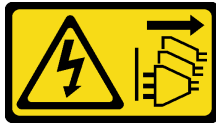
### S035



#### CAUTION:

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

### S002



#### CAUTION:

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

### S001



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.



Figure 196. Hot-swap power supply label on the cover

**Attention:** This type of power supply is hot-swap only when two power supplies are installed for redundancy. If only one power supply is installed, you must turn off the server first before removing the power supply.

The following tips describe the information that you must consider when you remove a power supply with dc input.

**CAUTION:**

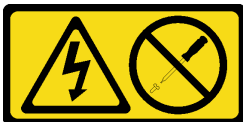
- **240 V dc input (input range: 180-300 V dc) is supported in Chinese Mainland ONLY. Power supply with 240 V dc input cannot support hot plugging power cord function. Before removing the power supply with dc input, please turn off server or disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the power cord.**
- **In order for the ThinkSystem products to operate error free in both a DC or AC electrical environment, a TN-S earthing system which complies to 60364-1 IEC 2005 standard has to be present or installed.**



在直流输入状态下，若电源供应器插座不支持热插拔功能，请务必不要对设备电源线进行热插拔，此操作可能导致设备损坏及数据丢失。因错误执行热插拔导致的设备故障或损坏，不属于保修范围。

NEVER CONNECT AND DISCONNECT THE POWER SUPPLY CABLE AND EQUIPMENT WHILE YOUR EQUIPMENT IS POWERED ON WITH DC SUPPLY (hot-plugging). Otherwise you may damage the equipment and result in data loss, the damages and losses result from incorrect operation of the equipment will not be covered by the manufacturers' warranty.

**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.

To remove a hot-swap power supply, complete the following steps:

**Watch the procedure**

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS_).

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

If you have installed the 2U CMA Upgrade Kit for Toolless Slide Rail or Toolless Slide Rail Kit with 2U CMA, do the following:

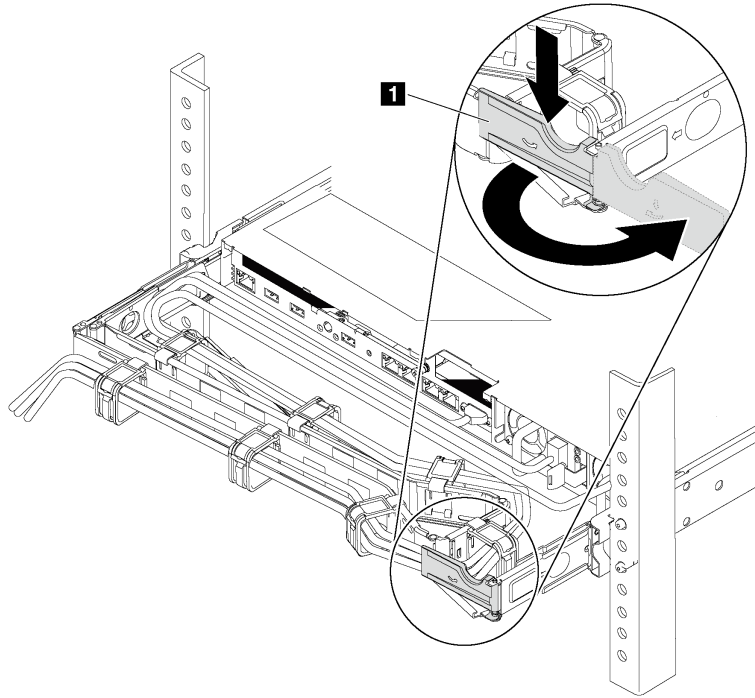


Figure 197. CMA adjustment

- a. Press down the stop bracket **1** and rotate it to the open position.
- b. 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.

**Note:** If you are replacing two power supplies, do the power supply replacement 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 31.

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.

**Note:**

Slightly pull the power supply upwards when sliding the power supply out of the chassis, if you have installed one of the following CMA kits:

- 2U CMA Upgrade Kit for Toolless Slide Rail
- Toolless Slide Rail Kit with 2U CMA

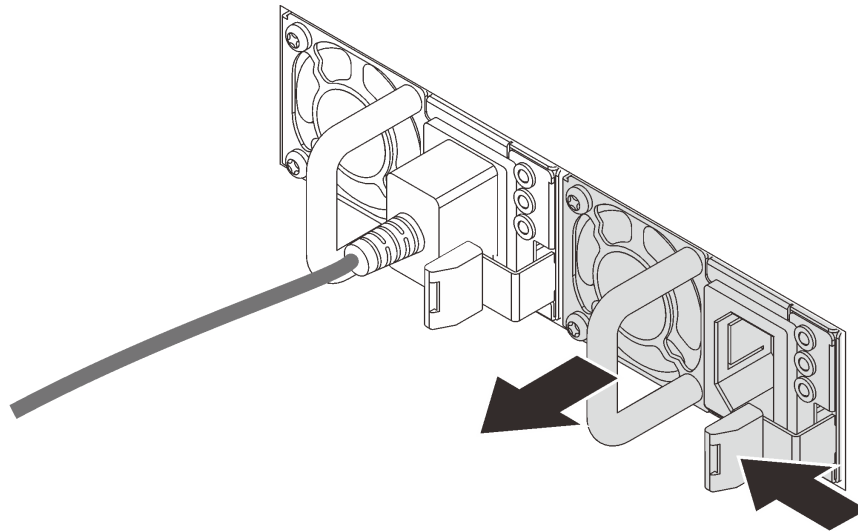


Figure 198. Hot-swap power supply removal

After removing the hot-swap power supply:



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”](#) on page 260.

**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.

## Install a hot-swap power supply

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

 <p>“Read the installation Guidelines” on page 155</p>	 <p>“ATTENTION: Static Sensitive Device” Ground package before opening” on page 158</p>
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The following tips describe the type of power supply that the server supports and other information that you must consider when you install a power supply:

- The standard shipping has only one power supply installed in the server. For redundancy and hot-swap support, you must install an additional hot-swap power supply. Certain customized models might be shipped with two power supplies installed.
- Ensure that the devices that you are installing are supported. For a list of supported optional devices for the server, go to:  
<https://static.lenovo.com/us/en/serverproven/index.shtml>

**Notes:**

- Ensure that the two power supplies installed on the server have the same wattage.
- If you are replacing the existing power supply with a new power supply of different wattage, attach the power information label that comes with this option onto the existing label near the power supply.



Figure 199. Hot-swap power supply label on the cover

**S035**



**CAUTION:**

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

**S002**



**CAUTION:**

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

**S001**





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.

The following tips describe the information that you must consider when you install a power supply with dc input.

**CAUTION:**

- 240 V dc input (input range: 180-300 V dc) is supported in Chinese Mainland ONLY. Power supply with 240 V dc input cannot support hot plugging power cord function. Before removing the power supply with dc input, please turn off server or disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the power cord.
- In order for the ThinkSystem products to operate error free in both a DC or AC electrical environment, a TN-S earthing system which complies to 60364-1 IEC 2005 standard has to be present or installed.



在直流输入状态下，若电源供应器插座不支持热插拔功能，请务必不要对设备电源线进行热插拔，此操作可能导致设备损坏及数据丢失。因错误执行热插拔导致的设备故障或损坏，不属于保修范围。

NEVER CONNECT AND DISCONNECT THE POWER SUPPLY CABLE AND EQUIPMENT WHILE YOUR EQUIPMENT IS POWERED ON WITH DC SUPPLY (hot-plugging). Otherwise you may damage the equipment and result in data loss, the damages and losses result from incorrect operation of the equipment will not be covered by the manufacturers' warranty.

**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.**

Before installing a hot-swap power supply, touch the static-protective package that contains the new hot-swap power supply to any unpainted surface on the outside of the server. Then, take the new hot-swap power supply out of the package and place it on a static-protective surface.

To install a hot-swap power supply, complete the following steps:

### **Watch the procedure**

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS_).

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

If you have installed the 2U CMA Upgrade Kit for Toolless Slide Rail or Toolless Slide Rail Kit with 2U CMA, do the following:

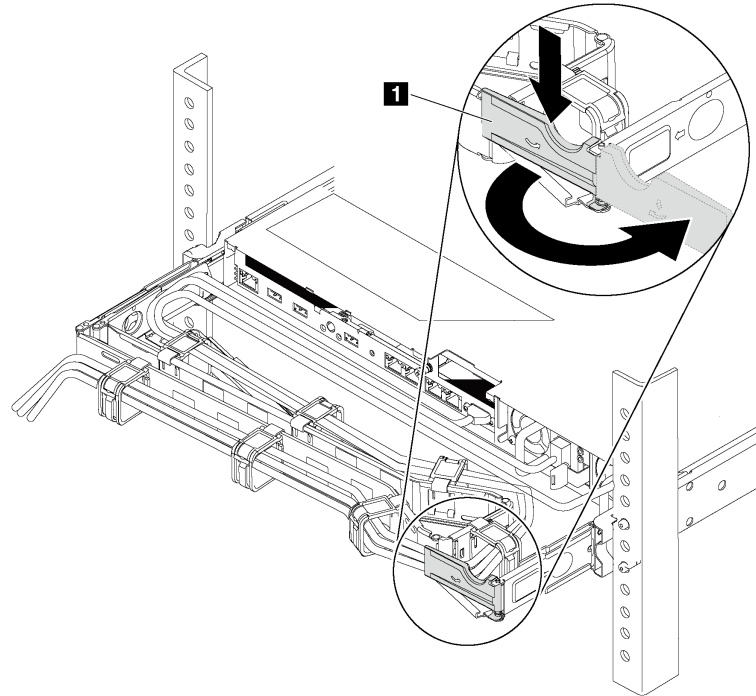


Figure 200. CMA adjustment

- a. Press down the stop bracket **1** and rotate it to the open position.
- b. Rotate the CMA out of the way to gain access to the power supply bay.

Step 2. If there is a power-supply filler installed, remove it.

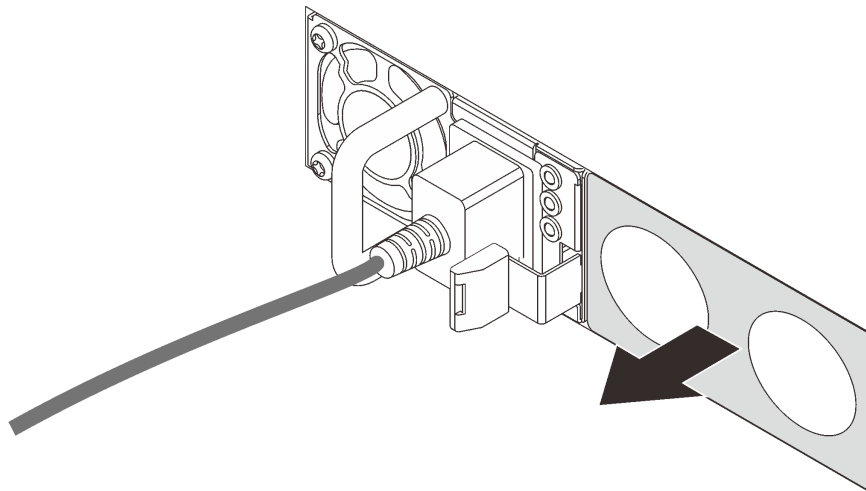


Figure 201. Hot-swap power supply filler removal



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

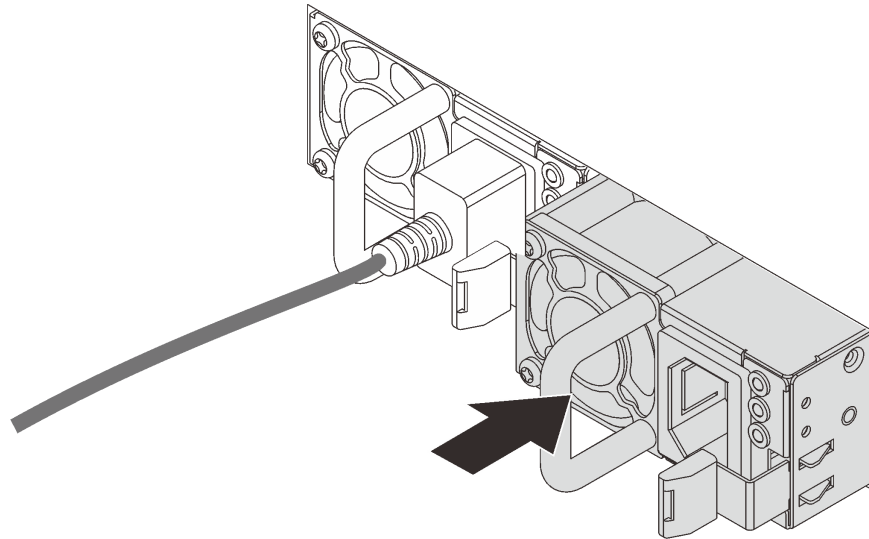


Figure 202. Hot-swap power supply installation

After installing the hot-swap power supply:

1. Connect one end of the power cord to the new power supply connector; then, connect the other end of the power cord into a properly grounded electrical outlet.
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.

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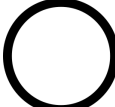

## TCM/TPM adapter replacement (for Chinese Mainland only)

Use this information to remove and install the TCM/TPM adapter (sometimes called a daughter card).

For customers in Chinese Mainland, integrated TPM is not supported. However, customers in Chinese Mainland can install a Trusted Cryptographic Module (TCM) adapter or a TPM adapter (sometimes called a daughter card).

## Remove the TCM/TPM adapter (for Chinese Mainland only)

Use this information to remove the TCM/TPM adapter.

	<b>“Read the installation Guidelines”</b> on page 155		<b>“Power off the server for this task”</b> on page 20		<b>“ATTENTION: Static Sensitive Device</b> Ground package before opening” on page 158
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Before removing the TCM/TPM adapter, remove the top cover. See [“Remove the top cover”](#) on page 169.

To remove the TCM/TPM adapter, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS_).

- Step 1. Locate the TCM/TPM connector on the system board.
- Step 2. Press and hold the release latch, and then lift the TCM/TPM adapter straight up.

**Notes:**

- Carefully handle the TCM/TPM adapter by its edges.
- Your TCM/TPM adapter might look slightly different from the illustration.

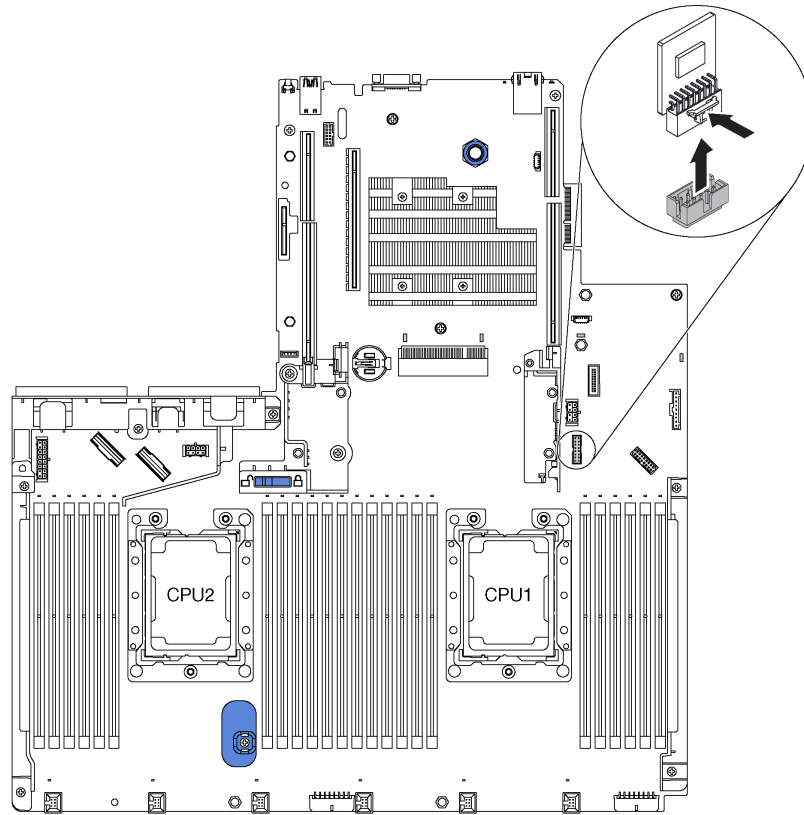


Figure 203. TCM/TPM adapter removal

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

## Install the TCM/TPM adapter (for Chinese Mainland only)

Use this information to install the TCM/TPM adapter.

	<p><b>“Read the installation Guidelines” on page 155</b></p>		<p><b>“ATTENTION: Static Sensitive Device</b> Ground package before opening” on page 158</p>
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Before installing the TCM/TPM adapter, touch the static-protective package that contains the new TCM/TPM adapter to any unpainted surface on the outside of the server. Then, take the new TCM/TPM adapter out of the package and place it on a static-protective surface.

To install the TCM/TPM adapter, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGawn7D7XTgDS_).

Step 1. Locate the TCM/TPM connector on the system board.

Step 2. Insert the TCM/TPM adapter into the TCM/TPM connector on the system board.

### Notes:

- Carefully handle the TCM by its edges.
- Your TCM/TPM adapter might look slightly different from the illustration.

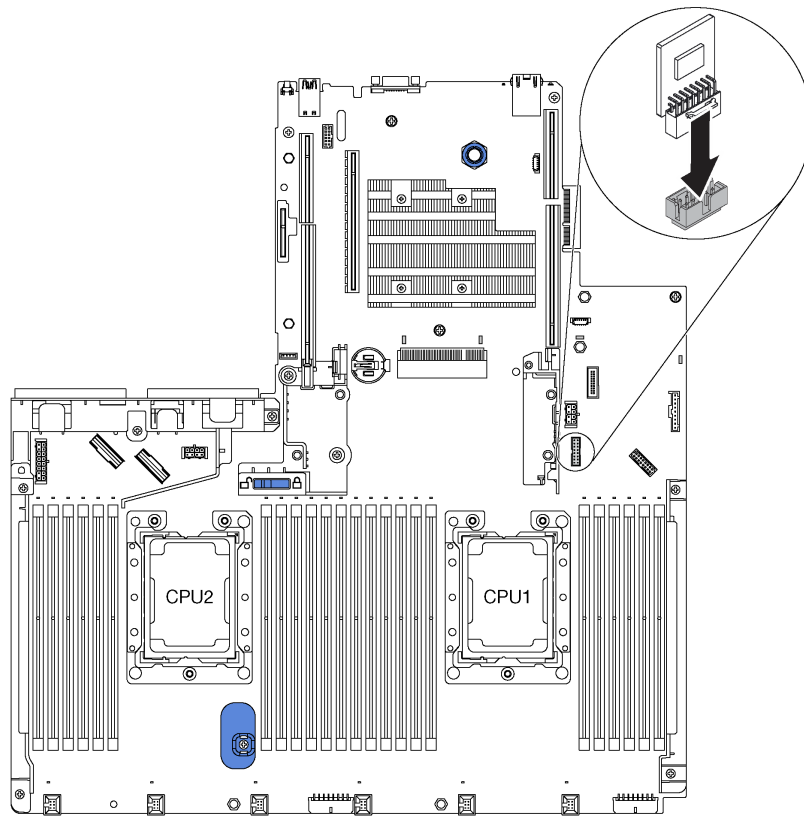


Figure 204. TCM/TPM adapter installation

After installing the TCM/TPM adapter, complete the parts replacement. See “[Complete the parts replacement](#)” on page 286.

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## Processor and heat sink replacement

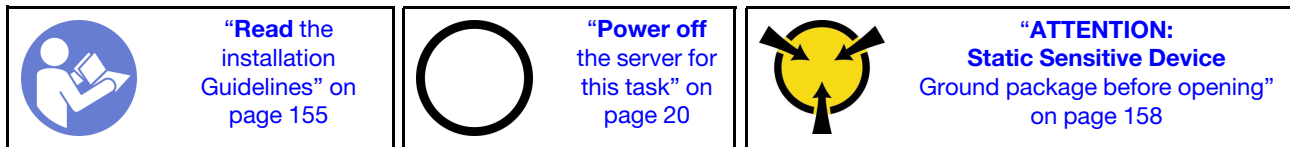
Use the following procedures to replace an assembled processor and heat sink, known as a processor-heat-sink module (PHM), a processor, or a heat sink.

**Attention:** Before you begin replacing a processor, make sure that you are using Lenovo proven alcohol cleaning pad and thermal grease.

**Important:** The processor in your server can throttle, temporarily lowering speed to reduce heat output, in response to thermal conditions. In instances where the throttling period is of extremely short duration (100 ms or less), the only indication will be an entry in the event log. In these instances the event can be ignored and processor replacement is not required.

## Remove a processor and heat sink

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



### Attention:

- Intel Xeon SP Gen 2 is supported on the system board with part number 01PE847. If you use the system board with part number 01GV275, 01PE247, or 01PE934, update your system firmware to the latest level before installing a Intel Xeon SP Gen 2. Otherwise, the system cannot be powered on.
- Each processor socket must always contain a cover or a PHM. When removing or installing a PHM, protect empty processor sockets with a cover.
- Do not touch the processor socket or processor contacts. Processor-socket contacts are very fragile and easily damaged. Contaminants on the processor contacts, such as oil from your skin, can cause connection failures.
- Remove and install only one PHM at a time. If the system board supports multiple processors, install the PHMs starting with the first processor socket.
- 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.
- To ensure the best performance, check the manufacturing date on the new heat sink and make sure it does not exceed 2 years. Otherwise, wipe off the existing thermal grease and apply the new grease onto it for optimal thermal performance.

Before removing a PHM:

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

1. Remove the top cover. See [“Remove the top cover”](#) on page 169.
2. Remove the air baffle. See [“Remove the air baffle”](#) on page 174.
3. Remove any parts and disconnect any cables that might impede your access to the PHM.

To remove a PHM, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

Step 1. Remove the PHM from the system board.

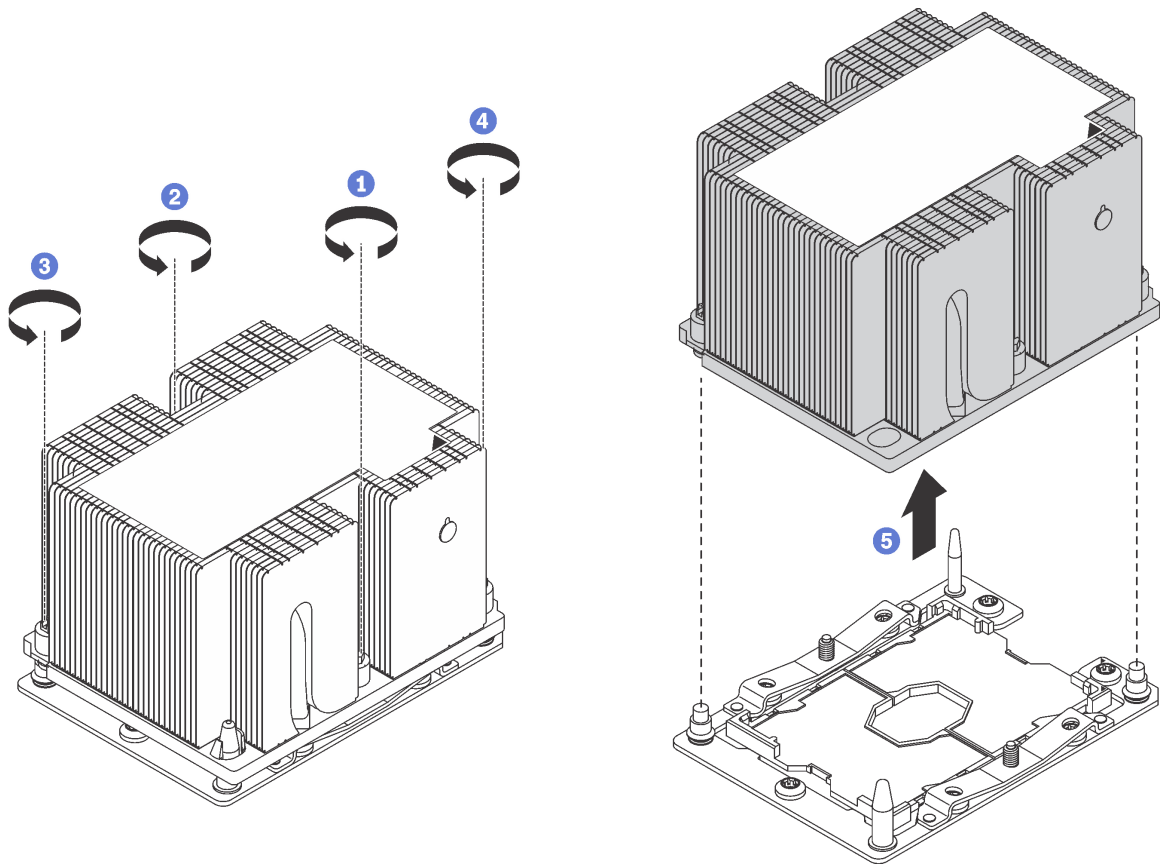


Figure 205. Removing a PHM

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

- a. Fully loosen the Torx T30 captive fasteners on the processor-heat-sink module *in the removal sequence shown* on the heat-sink label.
- b. Lift the processor-heat-sink module from the processor socket.

After removing a PHM:

- If you are removing the PHM as part of a system board replacement, set the PHM aside.
- If you are removing the PHM, remove the fan 6 after you remove the PHM. Then, install a fan filler to cover the place.

- If you are replacing the processor or heat sink, separate the processor and its retainer from the heat sink.

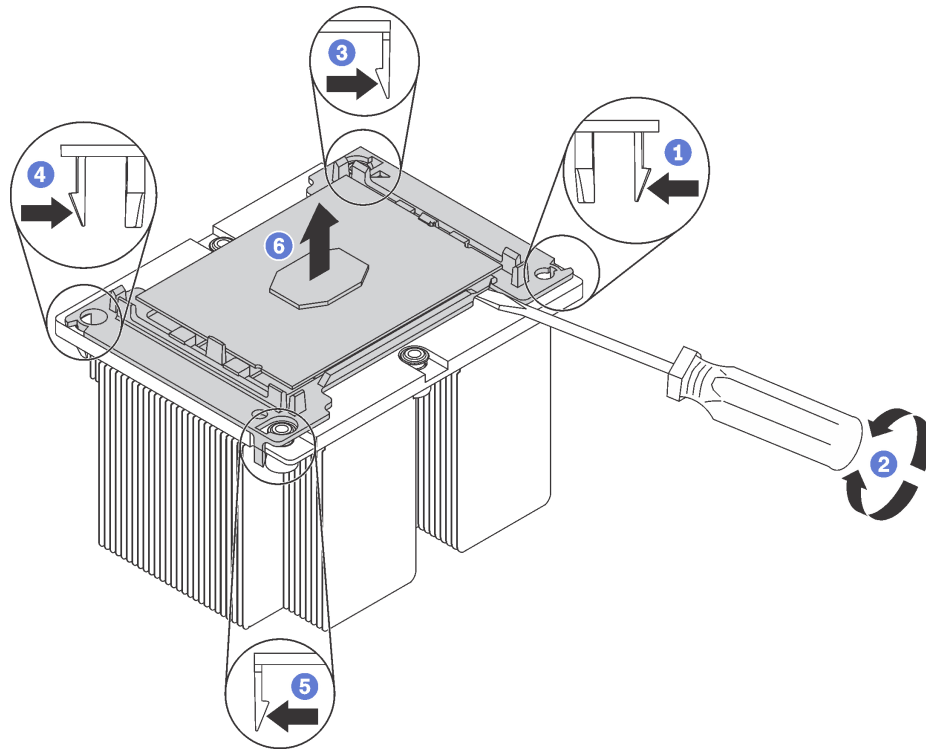


Figure 206. Separating a heat sink from a processor

1. Press the retaining clip at the corner of the processor retainer closest to the pry point; then, gently pry this corner of the retainer away from the heat sink with a flat-bladed screwdriver, using a twisting motion to break the processor-to-heat-sink seal.
2. Release the remaining retaining clips and lift the processor and retainer from the heat sink.
3. After separating the processor and retainer from the heat sink, hold the processor and retainer with the thermal-grease side down and the processor-contact side up to prevent the processor from falling out of the retainer.

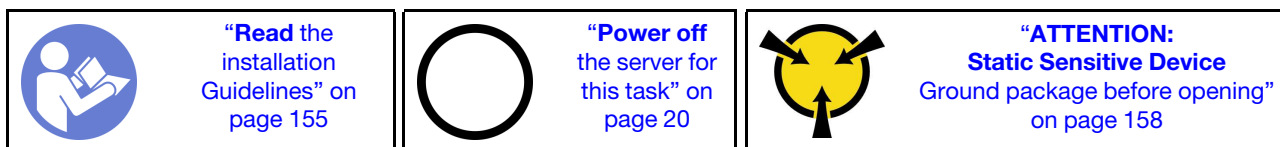
**Note:** The processor retainer will be removed and discarded in a later step and replaced with a new one.

- If you are replacing the processor, you will be reusing the heat sink. Wipe the thermal grease from the bottom of the heat sink using an alcohol cleaning pad.
- If you are replacing the heat sink, you will be reusing the processor. Wipe the thermal grease from the top of the processor using an alcohol cleaning pad.

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

## Install a processor and heat sink

This task has instructions for installing an assembled processor and heat sink, known as a processor-heat-sink module (PHM), a processor, and a heat sink. All of these tasks require a Torx T30 driver.



### Attention:

- Intel Xeon SP Gen 2 is supported on the system board with part number 01PE847. If you use the system board with part number 01GV275, 01PE247, or 01PE934, update your system firmware to the latest level before installing a Intel Xeon SP Gen 2. Otherwise, the system cannot be powered on.
- Each processor socket must always contain a cover or a PHM. When removing or installing a PHM, protect empty processor sockets with a cover.
- Do not touch the processor socket or processor contacts. Processor-socket contacts are very fragile and easily damaged. Contaminants on the processor contacts, such as oil from your skin, can cause connection failures.
- Remove and install only one PHM at a time. If the system board supports multiple processors, install the PHMs starting with the first processor socket.
- 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.
- To ensure the best performance, check the manufacturing date on the new heat sink and make sure it does not exceed 2 years. Otherwise, wipe off the existing thermal grease and apply the new grease onto it for optimal thermal performance.

### Notes:

- PHMs are keyed for the socket where they can be installed and for their orientation in the socket.
- See <https://static.lenovo.com/us/en/serverproven/index.shtml> 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 PHM or replacement processor, update your system firmware to the latest level. See **“Firmware updates” on page 16**.
- Installing an additional PHM can change the memory requirements for your system. See **“Memory module installation rules” on page 201** for a list of microprocessor-to-memory relationships.
- Optional devices available for your system might have specific processor requirements. See the documentation that comes with the optional device for information.
- The PHM for your system might be different than the PHM shown in the illustrations.
- Intel Xeon 6137, 6242R, 6246R, 6248R, 6250, 6256, or 6258R processor is supported only when the following requirements are met:
  - The server chassis is the twenty-four 2.5-inch-bay chassis.
  - The operating temperature is equal to or less than 30°C.
  - Up to eight drives are installed in the drive bays 8–15.
- Intel Xeon 6144, 6146, 8160T, 6126T, 6244, and 6240Y processor, or processors with TDP equal to 200 watts or 205 watts (excluding 6137, 6242R, 6246R, 6248R, 6250, 6256, or 6258R) are supported only when the following requirements are met:
  - The server chassis is the twenty-four 2.5-inch-bay chassis.
  - Up to eight drives are installed in the drive bays 8–15 if the operating temperature is equal to or less than 35°C, or up to sixteen drives are installed in the drive bays 0–15 if the operating temperature is equal to or less than 30°C.

Before installing a PHM:

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

1. Remove the existing PHM, if one is installed. See [“Remove a processor and heat sink” on page 268](#).
2. If you are replacing a heat sink, replace the processor retainer. *Processor retainers should not be reused.*

**Note:** Replacement processors come with both rectangular and square processor retainers. A rectangular retainer comes attached to the processor. The square retainer can be discarded.

- a. Remove the old processor retainer.

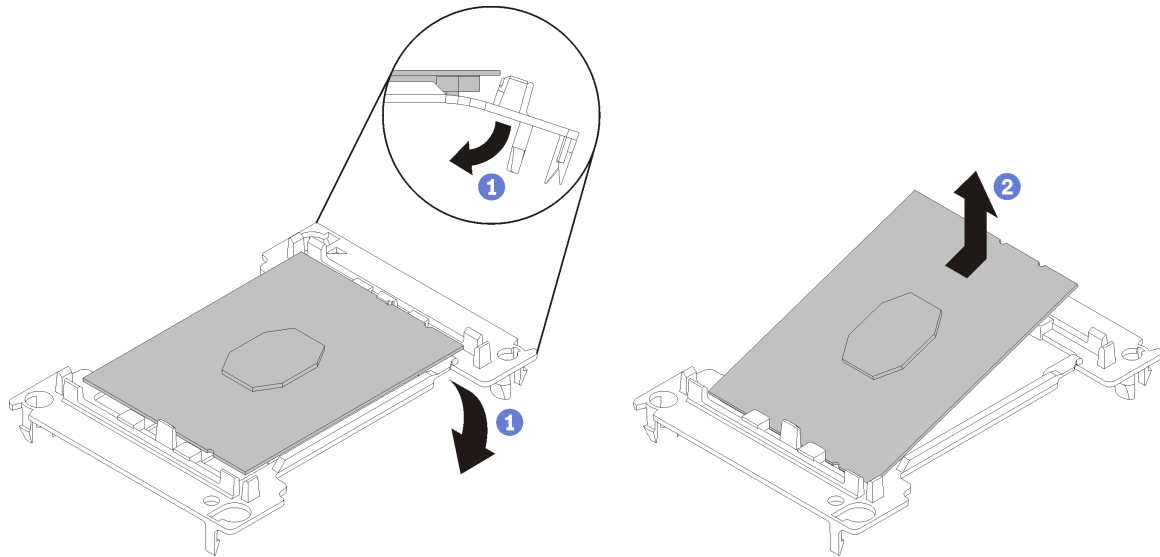


Figure 207. Removing a processor retainer

**Note:** When the processor is out of its retainer, hold the processor by the long edges to prevent touching the contacts or the thermal grease, if it is applied.

With the processor-contact side up, flex the ends of the retainer down and away from the processor to release the retaining clips; then, remove the processor from the retainer. Discard the old retainer.

- b. Install a new processor retainer.



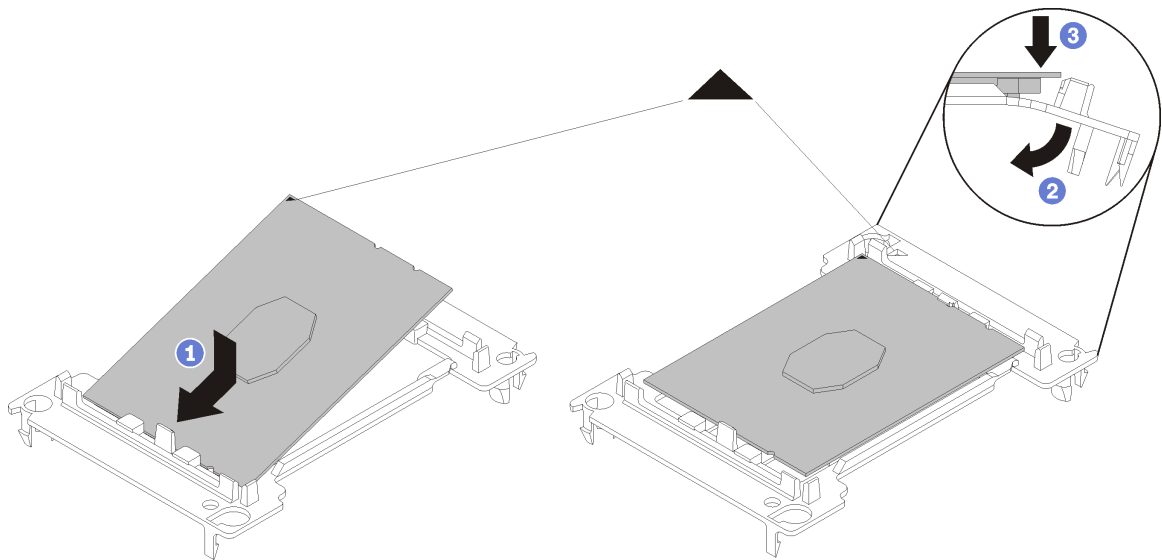


Figure 208. Installing a processor retainer

- 1) Position the processor on the new retainer so that the triangular marks align; then, insert the unmarked end of the processor into the retainer.
- 2) Holding the inserted end of the processor in place, flex the opposite end of the retainer down and away from the processor until you can press the processor under the clip on the retainer.

To prevent the processor from falling out of the retainer after it is inserted, keep the processor-contact side up and hold the processor-retainer assembly by the sides of the retainer.

- 3) If there is any old thermal grease on the processor, gently clean the top of the processor using an alcohol cleaning pad.

**Note:** If you are applying new thermal grease on the top of the processor, make sure to do it after the alcohol has fully evaporated.

3. If you are replacing a processor:
  - a. Remove the processor identification label from the heat sink and replace it with the new label that comes with the replacement processor.
  - b. To ensure the best performance, check the manufacturing date on the new heat sink and make sure it does not exceed 2 years. Otherwise, wipe off the existing thermal grease and apply the new grease onto it for optimal thermal performance.
  - c. Apply new thermal grease (1/2-syringe, 0.65 g) to the top of the new processor. If you have cleaned the top of the processor with an alcohol cleaning pad, make sure to apply the new thermal grease after the alcohol has fully evaporated.

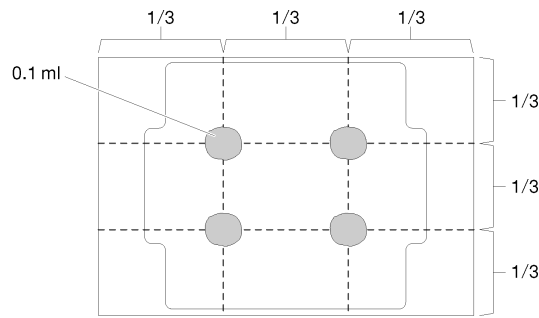


Figure 209. Thermal grease application

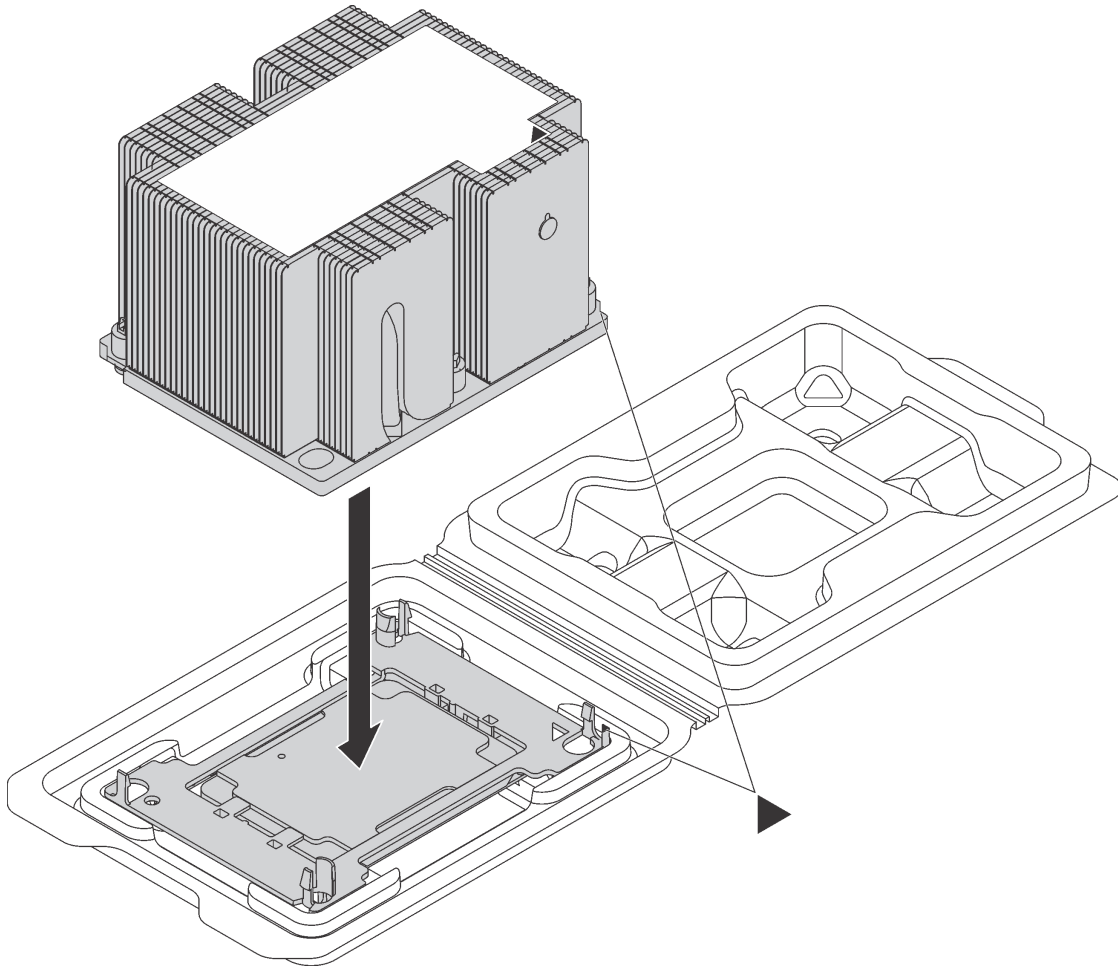
4. If you are replacing a heat sink, remove the processor identification label from the old heat sink and place it on the new heat sink in the same location. The label is on the side of the heat sink closest to the triangular alignment mark.

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

5. Assemble the processor and heat sink, if these components are separate.

**Notes:**

- If you are replacing a processor, install the heat sink onto the processor and retainer while the processor and retainer are in the shipping tray.
- If you are replacing a heat sink, remove the heat sink from its shipping tray and place the processor and retainer in the opposite half of the heat sink shipping tray with the processor-contact side down. To prevent the processor from falling out of the retainer, hold the processor-retainer assembly by its sides with the processor-contact side up until you turn it over to fit in the shipping tray.



*Figure 210. Assembling a PHM in the shipping tray*

- a. Align the triangular marks on the processor retainer and the heat sink or align the triangular mark on the processor retainer with the notched corner of the heat sink.
- b. Insert the processor-retainer clips into the holes on the heat sink.
- c. Press the retainer into place until the clips at all four corners engage.

To install a PHM, complete the following steps:

**Watch the procedure**

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

- Step 1. Remove the processor socket cover, if one is installed on the processor socket, by placing your fingers in the half-circles at each end of the cover and lifting it from the system board.
- Step 2. Install the processor-heat-sink module on the system board.

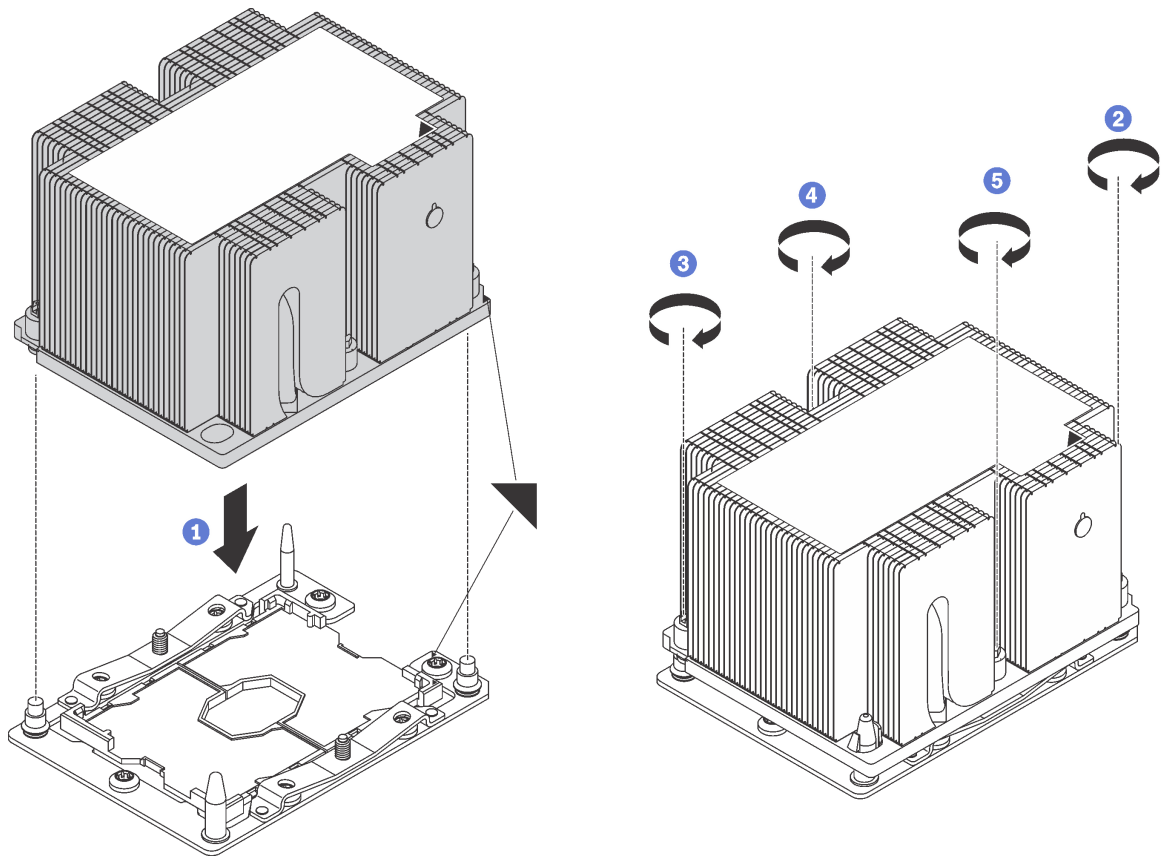


Figure 211. Installing a PHM

- a. Align the triangular marks and guide pins on the processor socket with the PHM; then, insert the PHM into the processor socket.

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

- b. Fully tighten the Torx T30 captive fasteners *in the installation sequence shown* on the heat-sink label. Tighten the screws until they stop; then, visually inspect to make sure that there is no gap between the screw shoulder beneath the heat sink and the microprocessor socket. (For reference, the torque required for the nuts to fully tighten is 1.4 – 1.6 newton-meters, 12 – 14 inch-pounds).

After installing a PHM:

1. Complete the parts replacement. See [“Complete the parts replacement” on page 286](#).

## System board replacement

Use this information to remove and install the system board.

**Important:** Before you return the system board, make sure that you install the processor socket dust covers from the new system board. To replace a processor socket dust cover:

1. Take a dust cover from the processor socket assembly on the new system board and orient it correctly above the processor socket assembly on the removed system board.
2. Gently press down the dust cover legs to the processor socket assembly, pressing on the edges to avoid damage to the socket pins. You might hear a click on the dust cover is securely attached.
3. **Make sure** that the dust cover is securely attached to the processor socket assembly.

#### **S017**



#### **CAUTION:**

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

#### **S012**


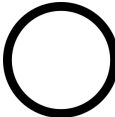



#### **CAUTION:**

**Hot surface nearby.**

## **Remove the system board**

Use this information to remove the system board.

 <p><b>“Read the installation Guidelines”</b> on page 155</p>	 <p><b>“Power off the server for this task”</b> on page 20</p>	 <p><b>“ATTENTION: Static Sensitive Device</b> Ground package before opening” on page 158</p>
--	---	---

Before removing the system board:

1. Remove the top cover. See [“Remove the top cover” on page 169](#).
2. Remove the air baffle. See [“Remove the air baffle” on page 174](#).
3. Remove the system fan cage. See [“Remove the system fan cage” on page 182](#).
4. Record where the cables are connected to the system board; then, disconnect all the cables.

**Attention:** Disengage all latches, cable clips, release tabs, or locks on cable connectors beforehand. Failing to release them before removing the cables will damage the cable connectors on the system board. Any damage to the cable connectors may require replacing the system board.

5. Remove any of the following components that are installed on the system board and put them in a safe, static-protective place. See the related topics in this chapter.

- memory modules
- LOM adapter
- M.2 backplane
- TCM/TPM (for Chinese Mainland only)
- CMOS battery
- RAID adapter on the RAID adapter slot
- PCIe adapters
- Riser assemblies
- Rear hot-swap drive assembly
- PHM

**Important:** Do not disassemble the PHM.

6. Pull out the power supplies slightly. Ensure that they are disconnected from the system board.

To remove the system board, complete the following step:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

Step 1. Lift the release pin **1** and hold the lifting handle **2** at the same time and slide the system board toward the front of the server. Then, lift the system board out of the chassis.

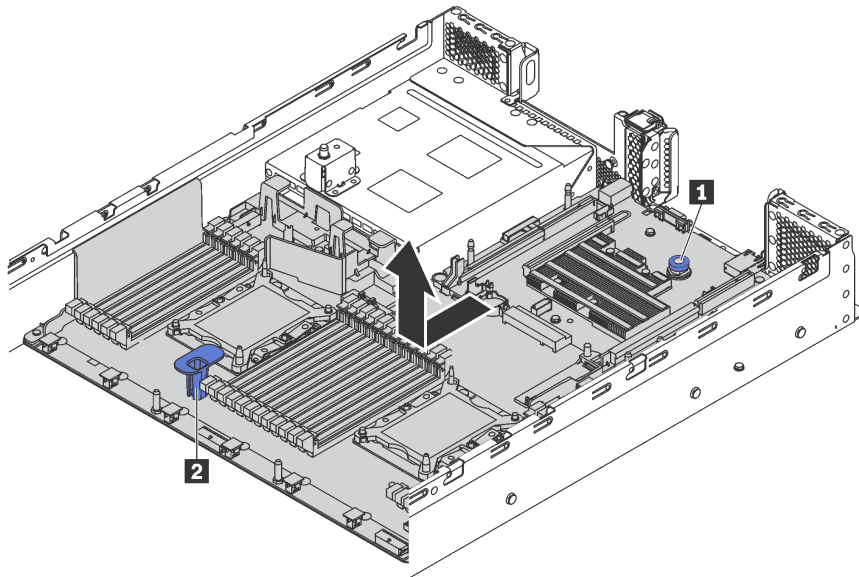


Figure 212. System board removal

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

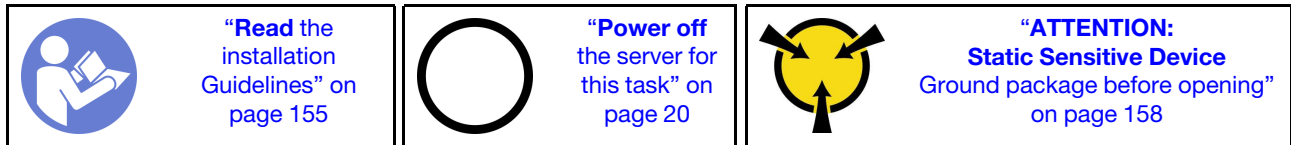
**Important:** Before you return the system board, make sure that you install the processor socket dust covers from the new system board. To replace a processor socket dust cover:

1. Take a dust cover from the processor socket assembly on the new system board and orient it correctly above the processor socket assembly on the removed system board.
2. Gently press down the dust cover legs to the processor socket assembly, pressing on the edges to avoid damage to the socket pins. You might hear a click on the dust cover is securely attached.
3. **Make sure** that the dust cover is securely attached to the processor socket assembly.

If you are planning to recycle the system board, follow the instructions in “Disassemble the system board for recycle” on page 305 for compliance with local regulations.

## Install the system board

Use this information to install the system board.



To install the system board, complete the following steps:

### Watch the procedure

A video of this procedure is available at [https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa\\_wn7D7XTgDS\\_](https://www.youtube.com/playlist?list=PLYV5R7hVcs-A25P7vBoGa_wn7D7XTgDS_).

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

Step 2. Hold the release pin **1** and the lifting handle **2** at the same time to lower the system board into the chassis. Then, slide the system board to the rear of the server.

Ensure that:

- The new system board is engaged by the mounting stud **3** on the chassis.
- The rear connectors on the new system board are inserted into the corresponding holes in the rear panel.
- The release pin **1** secures the system board in place.

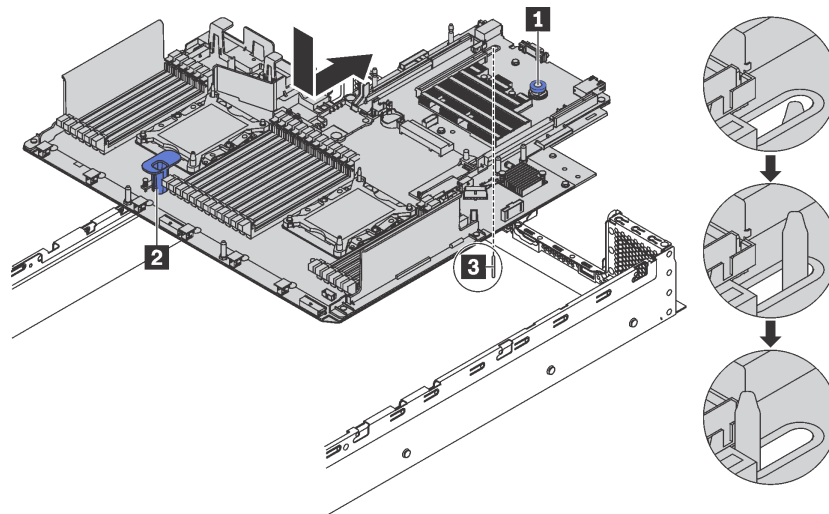


Figure 213. System board installation

After installing the system board:

1. Install any components that you removed from the failing system board. See the related topics in [Chapter 3 “Hardware replacement procedures” on page 155](#).
2. Push the power supplies into the bays until they click into place.
3. Complete the parts replacement. See [“Complete the parts replacement” on page 286](#).
4. Update the machine type and serial number with new vital product data (VPD). Use the Lenovo XClarity Provisioning Manager to update the machine type and serial number. See [“Update the machine type and serial number” on page 280](#).
5. Enable TPM/TCM. See [“Enable TPM/TCM” on page 282](#).
6. Optionally, enable Secure Boot. See [“Enable UEFI Secure Boot” on page 285](#).

## Update the machine type and serial number

After the system board is replaced by trained service technicians, the machine type and serial number must be updated.

There are two methods available to update the machine type and serial number:

- From Lenovo XClarity Provisioning Manager

To update the machine type and serial number from Lenovo XClarity Provisioning Manager:

1. Start the server and press F1 to display the Lenovo XClarity Provisioning Manager interface.
2. If the power-on Administrator password is required, enter the password.
3. From the System Summary page, click **Update VPD**.



4. Update the machine type and serial number.

- From Lenovo XClarity Essentials OneCLI

Lenovo XClarity Essentials OneCLI sets the machine type and serial number in the Lenovo XClarity Controller. Select one of the following methods to access the Lenovo XClarity Controller and set the machine type and serial number:

- Operate from the target system, such as LAN or keyboard console style (KCS) access
- Remote access to the target system (TCP/IP based)

To update the machine type and serial number from Lenovo XClarity Essentials OneCLI:

1. Download and install Lenovo XClarity Essentials OneCLI.

To download Lenovo XClarity Essentials OneCLI, go to the following site:

<https://datacentersupport.lenovo.com/solutions/HT116433>

2. Copy and unpack the OneCLI package, which also includes other required files, to the server. Make sure that you unpack the OneCLI and the required files to the same directory.
3. After you have Lenovo XClarity Essentials OneCLI in place, type the following commands to set the machine type and serial number:

```
onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model> [access_method]
onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n> [access_method]
```

Where:

*<m/t\_model>*

The server machine type and model number. Type *m t m xxxxyyy*, where *xxx* is the machine type and *yyy* is the server model number.

*<s/n>*

The serial number on the server. Type *sn zzzzzzz*, where *zzzzzz* is the serial number.

*[access\_method]*

The access method that you select to use from the following methods:

- Online authenticated LAN access, type the command:

```
[--bmc-username <xcc_user_id> --bmc-password <xcc_password>]
```

Where:

*xcc\_user\_id*

The BMC/IMM/XCC account name (1 of 12 accounts). The default value is USERID.

*xcc\_password*

The BMC/IMM/XCC account password (1 of 12 accounts).

Example commands are as follows:

```
onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model> --bmc-username <xcc_user_id>
--bmc-password <xcc_password>
onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n> --bmc-username <xcc_user_id>
--bmc-password <xcc_password>
```

- Online KCS access (unauthenticated and user restricted):

You do not need to specify a value for *access\_method* when you use this access method.

Example commands are as follows:

```
onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model>
onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n>
```

**Note:** The KCS access method uses the IPMI/KCS interface, which requires that the IPMI driver be installed.

- Remote LAN access, type the command:  
`[--bmc <xcc_user_id>:<xcc_password>@<xcc_external_ip>]`

Where:

*xcc\_external\_ip*

The BMC/IMM/XCC IP address. There is no default value. This parameter is required.

*xcc\_user\_id*

The BMC/IMM/XCC account (1 of 12 accounts). The default value is USERID.

*xcc\_password*

The BMC/IMM/XCC account password (1 of 12 accounts).

**Note:** BMC, IMM, or XCC internal LAN/USB IP address, account name, and password are all valid for this command.

Example commands are as follows:

```
onecli config set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model>
--bmc <xcc_user_id>:<xcc_password>@<xcc_external_ip>
onecli config set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n>
--bmc <xcc_user_id>:<xcc_password>@<xcc_external_ip>
```

4. Reset the Lenovo XClarity Controller to the factory defaults. Go to [https://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/NN1ia\\_c\\_resettingthexcc.html](https://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/NN1ia_c_resettingthexcc.html) for more information.

## Enable TPM/TCM

The server supports Trusted Platform Module (TPM), Version 1.2 or Version 2.0.

**Note:** For customers in Chinese Mainland, integrated TPM is not supported. However, customers in Chinese Mainland can install a Trusted Cryptographic Module (TCM) adapter or a NationZ TPM adapter (sometimes called a daughter card). Customers in Chinese Mainland should download Lenovo Business Vantage to enable TCM. For more information, see [https://datacentersupport.lenovo.com/en/en/downloads/ds548665-18alenovo\\_business\\_vantage\\_-\\_release\\_letter\\_-\\_20171205\\_v221770130-for-unknown-os](https://datacentersupport.lenovo.com/en/en/downloads/ds548665-18alenovo_business_vantage_-_release_letter_-_20171205_v221770130-for-unknown-os) and [https://download.lenovo.com/servers/mig/2021/02/09/43299/LBV\\_v2.2.177.0130\\_readme\\_20180903.txt](https://download.lenovo.com/servers/mig/2021/02/09/43299/LBV_v2.2.177.0130_readme_20180903.txt).

When a system board is replaced, you must make sure that the TPM/TCM policy is set correctly.

### CAUTION:

**Take special care when setting the TPM/TCM policy. If it is not set correctly, the system board can become unusable.**

## Set the TPM/TCM policy

By default, a replacement system board is shipped with the TPM/TCM policy set to **undefined**. You must modify this setting to match the setting that was in place for the system board that is being replaced.

There are two methods available to set the TPM policy:

- From Lenovo XClarity Provisioning Manager

To set the TPM policy from Lenovo XClarity Provisioning Manager:

1. Start the server and press F1 to display the Lenovo XClarity Provisioning Manager interface.
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.
  - **TCM enabled - Chinese Mainland only.** Customers in Chinese Mainland should choose this setting if a TCM adapter is installed.
  - **TPM 2.0 enabled - Chinese Mainland only.** Customers in Chinese Mainland should choose this setting if a TPM 2.0 adapter is installed.
  - **TPM enabled - ROW.** Customers outside of Chinese Mainland should choose this setting.
  - **Permanently disabled.** Customers in Chinese Mainland should use this setting if no TPM or TCM adapter is installed.

**Note:** Although the setting **undefined** is available as a policy setting, it should not be used.

- From Lenovo XClarity Essentials OneCLI

**Note:** Please note that a Local IPMI user and password must be setup in Lenovo XClarity Controller for remote accessing to the target system.

To set the TPM policy from Lenovo XClarity Essentials OneCLI:

1. Read TpmTcmPolicyLock to check whether the TPM\_TCM\_POLICY has been locked:  
`OneCli.exe config show imm.TpmTcmPolicyLock --override --imm <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:

- For the customer in Chinese Mainland with no TCM/TPM:  
`OneCli.exe config set imm.TpmTcmPolicy "NeitherTpmNorTcm" --override --imm <userid>:<password>@<ip_address>`
- For the customer in Chinese Mainland that has installed TCM/TPM module on the original system (TCM/TPM module should be moved to the FRU prior to changing policy)  
`OneCli.exe config set imm.TpmTcmPolicy "TcmOnly" --override --imm <userid>:<password>@<ip_address>`
- For the customer outside of Chinese Mainland:  
`OneCli.exe config set imm.TpmTcmPolicy "TpmOnly" --override --imm <userid>:<password>@<ip_address>`

3. Issue reset command to reset system:

`OneCli.exe misc ospower reboot --imm <userid>:<password>@<ip_address>`

4. Read back the value to check whether the change has been accepted:

`OneCli.exe config show imm.TpmTcmPolicy --override --imm <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 "TcmOnly", which means TCM\_ALLOWED.
- Below 4 steps must also be used to 'lock' the TPM\_TCM\_POLICY when using OneCli commands:

5. Read TpmTcmPolicyLock to check whether the TPM\_TCM\_POLICY has been locked, command as below:

`OneCli.exe config show imm.TpmTcmPolicyLock --override --imm <userid>:<password>@<ip_address>`

The value must be 'Disabled', it means TPM\_TCM\_POLICY is NOT locked and must be set.

6. Lock the TPM\_TCM\_POLICY:

```
OneCli.exe config set imm.TpmTcmPolicyLock "Enabled"--override --imm <userid>:<password>@<ip_address>
```

7. Issue reset command to reset system, command as below:

```
OneCli.exe misc ospower reboot --imm <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 invalid, UEFI will lock the TPM\_TCM\_POLICY setting.

The valid value for imm.TpmTcmPolicy includes 'NeitherTpmNorTcm', 'TpmOnly' and 'TpmOnly'.

If the imm.TpmTcmPolicy is set as 'Enabled' but imm.TpmTcmPolicy value is invalid, UEFI will reject the 'lock' request and change imm.TpmTcmPolicy back to 'Disabled'.

8. Read back the value to check whether the 'Lock' is accepted or rejected. command as below:

```
OneCli.exe config show imm.TpmTcmPolicy --override --imm <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.

Procedure also requires that Physical Presence is enabled. The Default value for FRU will be enabled. PhysicalPresencePolicyConfiguration.PhysicalPresencePolicy=Enable

## Assert Physical Presence

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.

There are two ways to assert the Physical Presence:

1. If the Physical Presence Policy is enabled, you can assert Physical Presence through the Lenovo XClarity Provisioning Manager or through the Lenovo XClarity Controller.
2. Switch the hardware jumpers on the system board.

**Notes:** If the Physical Presence Policy has been disabled:

1. Set the hardware Physical Presence jumper on the system board to assert Physical Presence.
2. Enable the Physical Presence Policy using either F1 (UEFI Settings) or Lenovo XClarity Essentials OneCLI.

### Assert Physical Presence through the 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:

[http://sysmgmt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/dw1lm\\_c\\_chapter2\\_openingandusing.html](http://sysmgmt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/dw1lm_c_chapter2_openingandusing.html)

2. Click **BMC Configuration** → **Security** and verify that Physical Presence is set to **assert**.

### Assert Physical Presence through the hardware

You can also assert hardware Physical Presence through the use of a jumper on the system board. For more information about asserting hardware Physical Presence through the use of a jumper, see:

["System board jumpers" on page 36](#)

## Set the TPM version

To be able to set the TPM version, Physical Presence must be asserted.

The Lenovo XClarity Provisioning Manager or the Lenovo XClarity Essentials OneCLI can be used to set the TPM version.

To set the TPM version:

1. Download and install Lenovo XClarity Essentials OneCLI.
  - a. Go to <http://datacentersupport.lenovo.com> and navigate to the support page for your server.
  - b. Click **Drivers & Software**.
  - c. Navigate to the version of Lenovo XClarity Essentials OneCLI for your operating system and download the package.
2. Run the following command to set the TPM version:

**Note:** You can change the TPM version from 1.2 to 2.0 and back again. However, you can toggle between versions a maximum of 128 times.

### To set the TPM version to version 2.0:

```
OneCli.exe config set TrustedComputingGroup.DeviceOperation "Update to TPM2.0 compliant"  
--bmc userid:password@ip_address
```

### To set the TPM version to version 1.2:

```
OneCli.exe config set TrustedComputingGroup.DeviceOperation "Update to TPM1.2 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.

For more information about the Lenovo XClarity Essentials OneCLI `set` command, see:

[http://sysmgmt.lenovofiles.com/help/topic/toolstr\\_cli\\_lenovo/onecli\\_r\\_set\\_command.html](http://sysmgmt.lenovofiles.com/help/topic/toolstr_cli_lenovo/onecli_r_set_command.html)

## Enable UEFI Secure Boot

Optionally, you can enable UEFI Secure Boot.

There are two methods available to enable UEFI Secure Boot:

- From Lenovo XClarity Provisioning Manager

To enable UEFI Secure Boot from Lenovo XClarity Provisioning Manager:

1. Start the server and press F1 to display the Lenovo XClarity Provisioning Manager interface.
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.

- From Lenovo XClarity Essentials OneCLI

To enable UEFI Secure Boot from Lenovo XClarity Essentials OneCLI:

1. Download and install Lenovo XClarity Essentials OneCLI.

To download Lenovo XClarity Essentials OneCLI, go to the following site:

<https://datacentersupport.lenovo.com/solutions/HT116433>

2. Run the following command to enable Secure Boot:

```
OneCli.exe config set SecureBootConfiguration.SecureBootSetting Enabled --bmc <userid>:<password>@<ip_address>
```

where:

- *<userid>:<password>* are the credentials used to access the BMC (Lenovo XClarity Controller interface) of your server. The default user ID is USERID, and the default password is PASSWORD (zero, not an uppercase o)
- *<ip\_address>* is the IP address of the BMC.

For more information about the Lenovo XClarity Essentials OneCLI `set` command, see:

[http://sysmgt.lenovofiles.com/help/topic/toolsctr\\_cli\\_lenovo/onecli\\_r\\_set\\_command.html](http://sysmgt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_set_command.html)

---

## 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 170.
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 16.
  - Use the Lenovo XClarity Provisioning Manager to update the UEFI configuration. For more information, see: [http://sysmgt.lenovofiles.com/help/topic/LXPM/UEFI\\_setup.html](http://sysmgt.lenovofiles.com/help/topic/LXPM/UEFI_setup.html)
  - 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: [http://sysmgt.lenovofiles.com/help/topic/LXPM/RAID\\_setup.html](http://sysmgt.lenovofiles.com/help/topic/LXPM/RAID_setup.html)

**Note:** Make sure the latest version of ThinkSystem M.2 with Mirroring Enablement Kit Firmware is applied to avoid virtual disk/array missing after system board replacement.

---

## Chapter 4. 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. If the server is managed by the Chassis Management Module 2 or by the Lenovo XClarity Administrator, alerts are automatically forwarded to those management applications.

**Note:** For a listing of events, including user actions that might need to be performed to recover from an event, see the *Messages and Codes Reference*, which is available at:  
[http://thinksystem.lenovofiles.com/help/topic/7X05/pdf\\_files.html](http://thinksystem.lenovofiles.com/help/topic/7X05/pdf_files.html)

#### Lenovo XClarity Administrator event log

If you are using Lenovo XClarity Administrator to manage server, network, and storage hardware, you can view the events from all managed devices through the XClarity Administrator.

## Logs

Severity	Serviceability	Date and Time	System	Event	System Type	Source Date
Warning	Support	Jan 30, 2017, 7:48:07 AM	Chassis114:...	Node Node 08 device	Chassis	Jan 30, 20
Warning	Support	Jan 30, 2017, 7:48:07 AM	Chassis114:...	Node Node 02 device	Chassis	Jan 30, 20
Warning	User	Jan 30, 2017, 7:48:07 AM	Chassis114:...	I/O module IO Module	Chassis	Jan 30, 20
Warning	User	Jan 30, 2017, 7:48:07 AM	Chassis114:...	Node Node 08 incom	Chassis	Jan 30, 20

Figure 214. Lenovo XClarity Administrator event log

For more information about working with events from XClarity Administrator, see:

[http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/events\\_vieweventlog.html](http://sysmgt.lenovofiles.com/help/topic/com.lenovo.lxca.doc/events_vieweventlog.html)

### Lenovo XClarity Controller event log

The Lenovo XClarity Controller monitors the physical state of the server and its components using sensors that measure internal physical variables such as temperature, power-supply voltages, fan speeds, and component status. The Lenovo XClarity Controller provides various interfaces to systems management software and to system administrators and users to enable remote management and control of a server.

The Lenovo XClarity Controller monitors all components of the server and posts events in the Lenovo XClarity Controller event log.

Severity	Source	Event ID	Message	Date
Error	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
Warning	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
Info	System	0X4000000E00000000	Remote login successful. Login ID: userid from webguis at IP address: 10.104.194.180.	27 Jul 2015, 08:11:04 AM
Info	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 215. Lenovo XClarity Controller event log

For more information about accessing the Lenovo XClarity Controller event log, see:

[http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/event\\_log.html](http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/event_log.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 I/O assembly” on page 26](#)
- [“Rear view LEDs” on page 31](#)
- [“System board LEDs” on page 34](#)

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## 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. Turn 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. Turn on and configure the server each time you remove or disconnect a device.
  - Any external devices,
  - Surge-suppressor device (on the server).
  - Printer, mouse, and non-Lenovo devices,
  - Each adapter.
  - Hard disk drives.
  - Memory modules until you reach the minimum configuration that is supported for the server.

**Note:** For minimal configuration for debugging, see [“Specifications” on page 3](#).

4. Turn on the server.

If the problem is solved when you remove an adapter from the server, but the problem recurs when you install the same adapter again, suspect the adapter. If the problem recurs when you replace the adapter with a different one, try a different PCIe slot.

If the problem appears to be a networking problem and the server passes all system tests, suspect a network cabling problem that is external to the server.

## Resolving suspected power problems

Power problems can be difficult to solve. For example, a short circuit can exist anywhere on any of the power distribution buses. Usually, a short circuit will cause the power subsystem to shut down because of an overcurrent condition.

Complete the following steps to diagnose and resolve a suspected power problem.

Step 1. Check the event log and resolve any errors related to the power.

**Note:** Start with the event log of the application that is managing the server. For more information about event logs, see [“Event logs” on page 287](#).

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 [“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 the hub supports auto-negotiation. If it does not, try configuring the integrated Ethernet controller manually to match the speed and duplex mode of the hub.
- Step 4. Check the Ethernet controller LEDs on the 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 the application that is managing the server and follow the suggested actions to resolve any event codes.

- If you are managing the server from the Lenovo XClarity Administrator, begin with the Lenovo XClarity Administrator event log.
- If you are using some other management application, begin with the Lenovo XClarity Controller event log.

For more information about event logs, see “Event logs” on page 287.

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 309).

## Turn on and turn 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 291
- “The power button does not work (server does not start)” on page 291
- “Server does not power on” on page 292
- “Server does not turn off” on page 292

### 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://static.lenovo.com/us/en/serverproven/index.shtml> 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 XClarity Controller product documentation:

[http://sysmgmt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/dw1lm\\_c\\_chapter2\\_openingandusing.html](http://sysmgmt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/dw1lm_c_chapter2_openingandusing.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.

Complete the following steps until the problem is resolved:

1. Make sure that the power button on the server is working correctly:
  - a. Disconnect the server power cords.
  - b. Reconnect the server power cords.
  - c. Reseat the operator information panel cable, and then repeat steps a and b.
    - If the server starts, reseat the operator information panel.

- If the problem remains, replace the operator information panel.
2. Make sure that:
    - The power cords are correctly connected to the server and to a working electrical outlet.
    - The LEDs on the power supply do not indicate a problem.
  3. Reseat the power supplies.
  4. Replace each power supply, restarting the server each time:
    - memory modules
    - Power supplies
  5. If you just installed an optional device, remove it, and restart the server. If the server starts, you might have installed more devices than the power supply supports.

### **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. Reseat the power supply.
5. Replace the power supply.

### **Server does not turn off**

Complete the following steps until the problem is resolved:

1. Determine whether you are using an Advanced Configuration and Power Interface (ACPI) or a non-ACPI operating system. If you are using a non-ACPI operating system, complete the following steps:
  - a. Press **Ctrl+Alt+Delete**.
  - b. Turn off the server by pressing the power button and holding it down for 5 seconds.
  - c. Restart the server.
  - d. If the server fails POST and the power button does not work, disconnect the power cord for 20 seconds; then, reconnect the power cord and restart the server.
2. If the problem remains or if you are using an ACPI-aware operating system, suspect the system board.

## **Memory problems**

Use this information to resolve issues related to memory.

- [“Displayed system memory less than installed physical memory” on page 292](#)
- [“Multiple memory modules in a channel identified as failing” on page 294](#)
- [“Attempt to change to another DCPMM mode fails” on page 294](#)
- [“Extra namespace appears in an interleaved region” on page 294](#)

### **Displayed system memory less than installed physical memory**

Complete the following steps until the problem is resolved:

**Note:** Each time you install or remove a memory module, you must disconnect the server from the power source; then, wait 10 seconds before restarting the server.

1. Make sure that:

- No error LEDs are lit on the operator information panel.
  - 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.
  - When DCPMMs are installed:
    - a. If the memory is set in App Direct or Mixed Memory Mode, all the saved data have been backed up, and created namespaces are deleted before any DCPMM is replaced.
    - b. Refer to “Intel Optane DC Persistent Memory (DCPMM) setup” in *Setup Guide* and see if the displayed memory fits the mode description.
    - c. If DCPMMs are recently set in Memory Mode, turn it back to App Direct Mode and examine if there is namespace that has not been deleted (see “Intel Optane DC Persistent Memory (DCPMM) setup” in *Setup Guide*).
    - d. Go to the Setup Utility, select **System Configuration and Boot Management → Intel Optane DCPMMs → Security**, and make sure all the DCPMM units are unlocked.
2. Reseat the memory modules, and then restart the server.
  3. Check the POST error log:
    - If a memory module was disabled by a systems-management interrupt (SMI), replace the memory module.
    - If a memory module was disabled by the user or by POST, reseat the memory module; then, run the Setup utility and enable the memory module.
  4. Run memory diagnostics. Power on the system and press **F1** when the logo screen appears, the Lenovo XClarity Provisioning Manager interface will start. Perform memory diagnostics with this interface. Go to **Diagnostics → Run Diagnostic → Memory test** or **DCPMM test**.

When DCPMMs are installed, run diagnostics based on the current DCPMM mode:

- App Direct Mode
  - Run **DCPMM Test** for DCPMMs.
  - Run **Memory Test** for DRAM DIMMs.
- Memory Mode and Mixed Memory Mode
  - Run **DCPMM Test** for App Direct capacity of DCPMMs.
  - Run **Memory Test** for memory capacity of DCPMMs.

**Note:** DRAM DIMMs in these two modes act as cache, and are not applicable to memory diagnostics.

5. Reverse the modules between the channels (of the same processor), and then restart the server. If the problem is related to a memory module, replace the failing memory module.
 

**Note:** When DCPMMs are installed, only adopt this method in Memory Mode.
6. Re-enable all memory modules using the Setup Utility, and restart the system.
7. (Trained technician only) Install the failing memory module into a memory module connector for processor 2 (if installed) to verify that the problem is not the processor or the memory module connector.

## Multiple memory modules in a channel identified as failing

**Note:** Each time you install or remove a memory module, you must disconnect the solution from the power source; then, wait 10 seconds before restarting the solution.

1. Reseat the memory modules; then, restart the solution.
2. Remove the highest-numbered memory module of those that are identified and replace it with an identical known good memory module; then, restart the solution. Repeat as necessary. If the failures continue after all identified memory modules are replaced, go to step 4.
3. Return the removed memory modules, one at a time, to their original connectors, restarting the solution after each memory module, until a memory module fails. Replace each failing memory module with an identical known good memory module, restarting the solution after each memory module replacement. Repeat step 3 until you have tested all removed memory modules.
4. Replace the highest-numbered memory module of those identified; then, restart the solution. Repeat as necessary.
5. Reverse the memory modules between the channels (of the same processor), and then restart the solution. If the problem is related to a memory module, replace the failing memory module.
6. (Trained technician only) Install the failing memory module into a memory module connector for processor 2 (if installed) to verify that the problem is not the processor or the memory module connector.
7. (Trained technician only) Replace the system board.

## Attempt to change to another DCPMM mode fails

After the DCPMM mode is changed and the system is successfully restarted, if the DCPMM mode stays the same instead of being changed, check the DRAM DIMMs and DCPMM capacity to see if it meets the requirement of the new mode (see “Intel Optane DC Persistent Memory (DCPMM) setup” in *Setup Guide*).

## Extra namespace appears in an interleaved region

If there are two created namespaces in one interleaved region, VMware ESXi ignores the created namespaces and creates an extra new namespace during system booting. To solve this problem, delete the created namespaces in either the Setup Utility or the operating system before the first booting with ESXi.

## Hard disk drive problems

Use this information to resolve issues related to the hard disk drives.

- [“Server cannot recognize a hard disk drive” on page 294](#)
- [“Multiple hard disk drives fail” on page 295](#)
- [“Multiple hard disk drives are offline” on page 295](#)
- [“A replacement hard disk drive does not rebuild” on page 295](#)
- [“Green hard disk drive activity LED does not represent actual state of associated drive” on page 296](#)
- [“Yellow hard disk drive status LED does not represent actual state of associated drive” on page 296](#)

## Server cannot recognize a hard disk 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 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:
  - 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 F1, the Lenovo XClarity Provisioning Manager interface is displayed by default. You can perform hard disk drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → HDD 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 the hard disk drive backplane.
  - 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 F1, the Lenovo XClarity Provisioning Manager interface is displayed by default. You can perform hard disk drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → HDD test**.

Based on those tests:

- If the adapter passes the test but the drives are not recognized, replace the backplane signal cable and run the tests again.
- Replace the backplane.
- If the adapter fails the test, disconnect the backplane signal cable from the adapter and run the tests again.
- If the adapter fails the test, replace the adapter.

### **Multiple hard disk 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 disk drives are offline**

Complete the following steps until the problem is solved:

- View the Lenovo XClarity Controller event log for events related to power supplies or vibration issues and resolve those events.
- View the storage subsystem log for events related to the storage subsystem and resolve those events.

### **A replacement hard disk drive does not rebuild**

Complete the following steps until the problem is solved:

1. Make sure that the hard disk drive is recognized by the adapter (the green hard disk drive activity LED is flashing).
2. Review the SAS/SATA RAID adapter documentation to determine the correct configuration parameters and settings.

### **Green hard disk drive activity LED does not represent actual state of associated drive**

Complete the following steps until the problem is solved:

1. If the green hard disk drive activity LED does not flash when the drive is in use, run the diagnostics tests for the hard disk drives. When you start a server and press F1, the Lenovo XClarity Provisioning Manager interface is displayed by default. You can perform hard disk drive diagnostics from this interface. From the Diagnostic page, click **Run Diagnostic → HDD test**.
2. If the drive passes the test, replace the backplane.
3. If the drive fails the test, replace the drive.

### **Yellow hard disk drive status LED does not represent actual state of associated drive**

Complete the following steps until the problem is solved:

1. Turn off the server.
2. Reseat the SAS/SATA adapter.
3. Reseat the backplane signal cable and backplane power cable.
4. Reseat the hard disk drive.
5. Turn on the server and observe the activity of the hard disk drive LEDs.

## **Monitor and video problems**

Use this information to solve problems related to a monitor or video.

- [“Incorrect characters are displayed” on page 296](#)
- [“Screen is blank” on page 296](#)
- [“Screen goes blank when you start some programs” on page 297](#)
- [“The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted.” on page 297](#)
- [“The wrong characters appear on the screen” on page 297](#)

### **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 16](#).

### **Screen is blank**

1. If the server is attached to a KVM switch, bypass the KVM switch to eliminate it as a possible cause of the problem: connect the monitor cable directly to the correct connector on the rear of the server.
2. The management controller remote presence function is disabled if you install an optional video adapter. To use the management controller remote presence function, remove the optional video adapter.
3. If the server installed with the graphical adapters while turning on the server, the Lenovo logo displays on the screen after approximately 3 minutes. This is normal operation while the system loads.
4. Make sure that:
  - The server is turned on. If there is no power to the server.



- The monitor cables are connected correctly.
  - The monitor is turned on and the brightness and contrast controls are adjusted correctly.
5. Make sure that the correct server is controlling the monitor, if applicable.
  6. Make sure that corrupted server firmware is not affecting the video; see [“Firmware updates” on page 16](#).
  7. Observe the LEDs on the system board; if the codes are changing, go to step 6.
  8. Replace the following components one at a time, in the order shown, restarting the server each time:
    - a. Monitor
    - b. Video adapter (if one is installed)
    - c. (Trained technician only) System board

### **Screen goes blank when you start some programs**

1. Make sure that:
  - The 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 16](#).

## **Keyboard, mouse, or USB-device problems**

Use this information to solve problems related to a keyboard, mouse, or USB device.

- [“All or some keys on the keyboard do not work.” on page 298](#)

- [“Mouse does not work.” on page 298](#)
- [“USB-device does not work.” on page 298](#)

#### **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.

#### **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 F1 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 not recognized” on page 298](#)
- [“PCIe adapter is not recognized or is not functioning” on page 299](#)
- [“A Lenovo optional device that worked previously does not work now. ” on page 299](#)
- [“A Lenovo optional device that was just installed does not work.” on page 299](#)
- [“A Lenovo optional device that worked previously does not work now. ” on page 299](#)

#### **External USB device not recognized**

Complete the following steps until the problem is resolved:

1. 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.
2. Use the Setup utility to make sure that the device is configured correctly.

3. If the USB device is plugged into a hub or the console breakout cable, unplug the device and plug it directly into the USB port on the front of the compute node.

### **PCIe adapter is not recognized or is not functioning**

Complete the following steps until the problem is resolved:

1. Check the event log and resolve any issues related to the device.
2. Validate that the device is supported for the server (see <https://static.lenovo.com/us/en/serverproven/index.shtml>).
3. Make sure that the adapter is installed in a correct slot.
4. Make sure that the proper device drivers are installed for the device.
5. Resolve any resource conflicts if running legacy mode (UEFI).
6. Check <http://datacentersupport.lenovo.com> for any tech tips (also known as retain tips or service bulletins) that might be related to the adapter.
7. Ensure any adapter external connections are correct and that the connectors are not physically damaged.

### **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. Remove one of the PCIe adapters.
2. Restart the system and press F1 to display the Lenovo XClarity Provisioning Manager system setup interface.
3. Click **UEFI Setup → System Settings → Devices and I/O Ports → MM Config Base**; then, modify the setting to the lower memory capacity. For example, modify 3 GB to 2 GB or modify 2 GB to 1 GB.
4. Save the settings and restart the system.
5. The action for this step will differ based on whether or not the restart is successful.
  - If the restart is successful, shut down the solution and reinstall the PCIe card you removed.
  - If the restart failed, repeat step 2 to step 5.

### **A Lenovo optional device that was just installed does not work.**

1. Make sure that:
  - The device is supported for the server (see <https://static.lenovo.com/us/en/serverproven/index.shtml>).
  - 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 F1 to display the system setup interface. Whenever memory or any other device is changed, you must update the configuration.
2. Reseat the device that you just installed.
3. Replace the device that you just installed.

### **A Lenovo optional device that worked previously does not work now.**

1. Make sure that all of the cable connections for the device are secure.
2. If the device comes with test instructions, use those instructions to test the device.
3. If the failing device is a SCSI device, make sure that:
  - The cables for all external SCSI devices are connected correctly.
  - The last device in each SCSI chain, or the end of the SCSI cable, is terminated correctly.

- Any external SCSI device is turned on. You must turn on an external SCSI device before you turn on the server.
4. Reseat the failing device.
  5. Replace the failing device.

## 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 300](#)
- [“Serial device does not work” on page 300](#)

### 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 300](#)
- [“Intermittent KVM problems” on page 301](#)
- [“Intermittent unexpected restarts” on page 301](#)

### Intermittent external device problems

Complete the following steps until the problem is solved.

1. Make sure that the correct device drivers are installed. See the manufacturer's Web site for documentation.
2. For a USB device:

- a. Make sure that the device is configured correctly.

Restart the server and press F1 to display the Lenovo XClarity Provisioning Manager system setup interface. Then, click **System Settings → Devices and I/O Ports → USB Configuration**.

- b. Connect the device to another port. If using a USB hub, remove the hub and connect the device directly to the compute node. Make sure that the device is configured correctly for the port.

### Intermittent 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 compute node.
3. Test the console breakout cable on a working compute node 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 restarts

**Note:** Some correctable errors require that the server restart 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 time-out value (POST Watchdog Timer).

To check the POST watchdog time, restart the server and press F1 to display the Lenovo XClarity Provisioning Manager system setup interface. Then, click **BMC Settings → POST Watchdog Timer**.

2. If the reset occurs after the operating system starts, disable any automatic server restart (ASR) utilities, such as the Automatic Server Restart IPMI Application for Windows, or any ASR devices that are installed.
3. See the management controller event log to check for an event code that indicates a restart. See [“Event logs” on page 287](#) for information about viewing the event log.

## 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.

## Network problems

Use this information to resolve issues related to networking.

- [“Cannot wake server using Wake on LAN” on page 302](#)

- [“Could not log in using LDAP account with SSL enabled” on page 302](#)

### **Cannot wake server using Wake on LAN**

Complete the following steps until the problem is resolved:

1. If you are using the dual-port network adapter and the server is connected to the network using Ethernet 5 connector, check the system-error log or IMM2 system event log (see [“Event logs” on page 287](#)), make sure:
  - a. Fan 3 is running in standby mode, if Emulex dual port 10GBase-T embedded adapter is installed.
  - b. The room temperature is not too high (see [“Specifications” on page 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.

- [“The server immediately displays the POST Event Viewer when it is turned on” on page 302](#)
- [“Server is unresponsive \(POST is complete and operating system is running\)” on page 303](#)
- [“Server is unresponsive \(cannot press F1 to start System Setup\)” on page 303](#)
- [“Voltage system board fault is displayed in the event log” on page 303](#)
- [“Unusual smell” on page 304](#)
- [“Server seems to be running hot” on page 304](#)
- [“Cannot enter legacy mode after installing a new adapter” on page 304](#)
- [“Cracked parts or cracked chassis” on page 304](#)

### **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://static.lenovo.com/us/en/serverproven/index.shtml>.

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 compute node, complete the following steps:
  1. If you are using a KVM connection, make sure that the connection is operating correctly. Otherwise, make sure that the keyboard and mouse are operating correctly.
  2. If possible, log in to the compute node and verify that all applications are running (no applications are hung).
  3. Restart the compute node.
  4. If the problem remains, make sure that any new software has been installed and configured correctly.
  5. Contact your place of purchase of the software or your software provider.
- If you are accessing the compute node from a remote location, complete the following steps:
  1. Make sure that all applications are running (no applications are hung).
  2. Attempt to log out of the system and log back in.
  3. Validate the network access by pinging or running a trace route to the compute node from a command line.
    - a. If you are unable to get a response during a ping test, attempt to ping another compute node in the enclosure to determine whether it is a connection problem or compute node problem.
    - b. Run a trace route to determine where the connection breaks down. Attempt to resolve a connection issue with either the VPN or the point at which the connection breaks down.
  4. Restart the compute node remotely through the management interface.
  5. If the problem remains, verify that any new software has been installed and configured correctly.
  6. Contact your place of purchase of the software or your software provider.

### **Server is unresponsive (cannot press F1 to 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 F1 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.

### **Voltage system board fault is displayed in the event log**

Complete the following steps until the problem is solved.

1. Revert the system to the minimum configuration. See [“Specifications” on page 3](#) for the minimally required number of processors and memory modules.
2. Restart the system.
  - If the system restarts, add each of the items that you removed one at a time, restarting 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 compute nodes or chassis:

1. Make sure that the room temperature is within the specified range (see [“Specifications” on page 3](#)).
2. Check the management processor event log for rising temperature events. If there are no events, the compute node is running within normal operating temperatures. Note that you can expect some variation in temperature.

### Cannot enter legacy mode after installing a new adapter

Complete the following procedure to solve the problem.

1. Go to **UEFI Setup → Devices and I/O Ports → Set Option ROM Execution Order**.
2. Move the RAID adapter with operation system installed to the top of the list.
3. Select **Save**.
4. Reboot the system and auto boot to operation system.

### Cracked parts or cracked chassis

Contact Lenovo Support.

## 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.

---

### Disassemble the system board for recycle

Follow the instructions in this section to disassemble the system board before recycling.

Before disassembling the system board:

1. Remove the system board from the server (see [“Remove the system board” on page 277](#)).
2. Refer to local environmental, waste or disposal regulations to ensure compliance.

Complete the following steps to disassemble the system board:

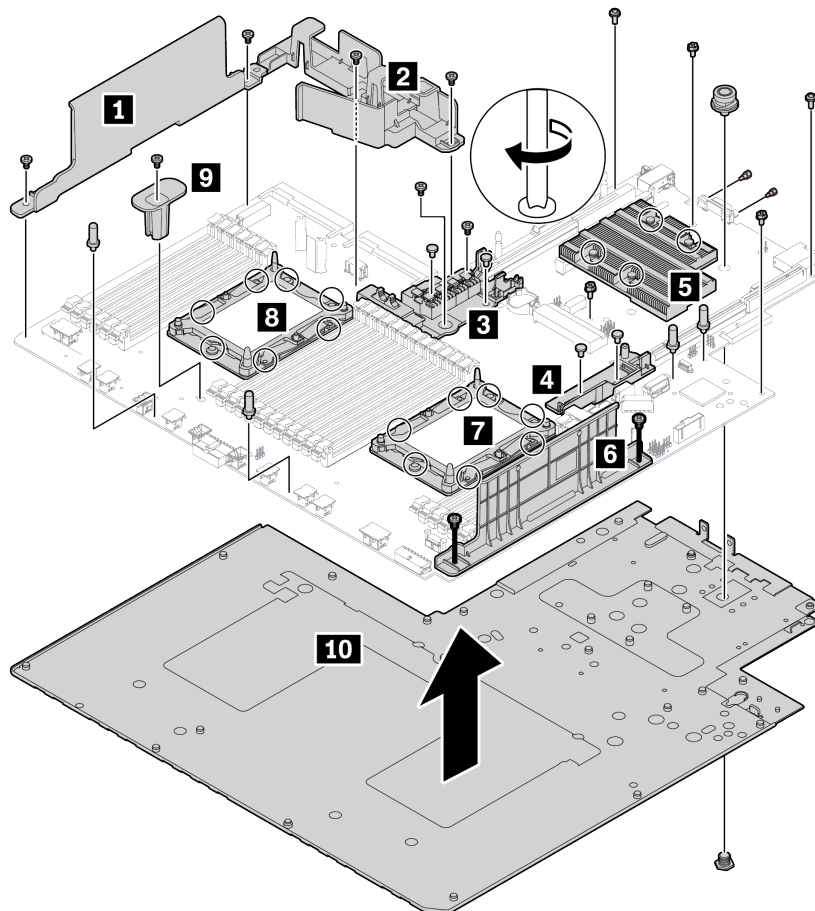


Figure 216. Disassembling the system board

Step 1. Remove the following components as illustrated:

- 14 philip screws (with PH2 screwdriver)
- 14 torx screws on the PHM bolster plates **7 8** (with T20 torx screwdriver)
- Four PH2 captive screws on the heat sink **5** (with PH2 screwdriver)
- Four plastic rivets on two internal raid holder **3 4** (with screwdriver)
- Four standoffs (with 7 mm wrench)
- Two hexagon bolts on VGA connector (with 5 mm wrench)
- One plunger (with 11 mm and 16 mm wrench)

Step 2. Separate the components **1 2 3 4 5 6 7 8 9 10** from the system board.

After disassembling the system board, comply with local regulations when recycling.

---

## Appendix B. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about Lenovo products, you will find a wide variety of sources available from Lenovo to assist you.

On the World Wide Web, up-to-date information about Lenovo systems, optional devices, services, and support are available at:

<http://datacentersupport.lenovo.com>

**Note:** IBM is Lenovo's preferred service provider for ThinkSystem.

---

### Before you call

Before you call, there are several steps that you can take to try and solve the problem yourself. If you decide that you do need to call for assistance, gather the information that will be needed by the service technician to more quickly resolve your problem.

#### Attempt to resolve the problem yourself

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The 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://static.lenovo.com/us/en/serverproven/index.shtml> to make sure that the hardware and software is 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 believe that you require warranty service for your Lenovo product, the service technicians will be able to assist you more efficiently if you prepare before you call. You can also see <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 [http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/NN1ia\\_c\\_servicesandsupport.html](http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/NN1ia_c_servicesandsupport.html).
- For more information about using the CLI to collect service data, see [http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/nn1ia\\_r\\_ffdccommand.html](http://sysmgt.lenovofiles.com/help/topic/com.lenovo.systems.management.xcc.doc/nn1ia_r_ffdccommand.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 can be run in-band from the operating system. In addition to the hardware service data, Lenovo XClarity Essentials OneCLI can collect information about the operating system, such as the operating system event log.

To obtain service data, you can run the `getinfor` command. For more information about running the `getinfor`, see [http://sysmgmt.lenovofiles.com/help/topic/toolsctr\\_cli\\_lenovo/onecli\\_r\\_getinfor\\_command.html](http://sysmgmt.lenovofiles.com/help/topic/toolsctr_cli_lenovo/onecli_r_getinfor_command.html).

---

## Contacting Support

You can contact Support to obtain help for your issue.

You can receive hardware service through a Lenovo Authorized Service Provider. To locate a service provider authorized by Lenovo to provide warranty service, go to <https://datacentersupport.lenovo.com/serviceprovider> and use filter searching for different countries. For Lenovo support telephone numbers, see <https://datacentersupport.lenovo.com/supportphonenumberlist> for your region support details.



---

## Appendix C. Notices

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## Important notes

Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1 024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard-disk-drive bays with the largest currently supported drives that are available from Lenovo.

Maximum memory might require replacement of the standard memory with an optional memory module.

Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write cycles that it can be subjected to, expressed as total bytes written (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. Lenovo is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

Lenovo makes no representations or warranties with respect to non-Lenovo products. Support (if any) for the non-Lenovo products is provided by the third party, not Lenovo.

Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

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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.

---

## 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	-	○	○	○	○	○
印刷電路板	-	○	○	○	○	○

備考1. “超出0.1 wt %” 及 “超出0.01 wt %” 係指限用物質之百分比含量超出百分比含量基準值。  
 Note1: “exceeding 0.1wt%” and “exceeding 0.01 wt%” indicate that the percentage content of the restricted substance exceeds the reference percentage value of presence condition.

備考2. “○” 係指該項限用物質之百分比含量未超出百分比含量基準值。  
 Note2: “○” indicates that the percentage content of the restricted substance does not exceed the percentage of reference value of presence.

備考3. “-” 係指該項限用物質為排除項目。  
 Note3: The “-” indicates that the restricted substance corresponds to the exemption.

## Taiwan Region import and export contact information

Contacts are available for Taiwan Region import and export information.

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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