



# ThinkSystem SR665 V3 System Configuration Guide



**Machine Types:** 7D9A, 7D9B

## Note

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

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

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

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

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## Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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



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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

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

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

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.

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

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

### CAUTION:

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

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

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

1. If you need to power off the server, make sure that the power cord is disconnected.

### S002



### CAUTION:

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

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

2. Check the power cord.

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

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

a. Go to:

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

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

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

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

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

3. Check for any obvious non-Lenovo alterations. Use good judgment as to the safety of any non-Lenovo alterations.

4. Check inside the server for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.

5. Check for worn, frayed, or pinched cables.

6. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.





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## Chapter 1. Introduction

The ThinkSystem SR665 V3 server (7D9A and 7D9B) is a 2-socket 2U server that features the 4th generation EPYC™ processor family of AMD®. The server offers a broad selection of drive and slot configurations, high performance, and expansion for various IT workloads. Combining performance and flexibility, the server is a great choice for enterprises of all sizes.

Figure 1. ThinkSystem SR665 V3



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## Features

Performance, ease of use, reliability, and expansion capabilities are key considerations in the design of your 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.

Your server implements the following features and technologies:

- **Features on Demand**

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

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

- **Lenovo XClarity Controller (XCC)**

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

The server supports Lenovo XClarity Controller 2 (XCC2). For additional information about Lenovo XClarity Controller 2 (XCC2), refer to <https://pubs.lenovo.com/lxcc-overview/>.

- **UEFI-compliant server firmware**

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

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

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

- **Large system-memory capacity**

The server supports up to 24 TruDDR5 dual inline memory modules (DIMMs) with error correcting code (ECC). For more information about the specific types and maximum amount of memory, see “[Technical specifications](#)” on page 3.

- **Large data-storage capacity and hot-swap capability**

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

Storage capacity is different depending on server model. See “[Technical specifications](#)” on page 3 for more information.

- **Lightpath Diagnostics**

Lightpath Diagnostics provides LEDs to help you diagnose problems. For more information about the Lightpath Diagnostics, see “[System LEDs and diagnostics display](#)” on page 39.

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

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

- **Active Energy Manager**

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

- **Redundant networking connection**

The Lenovo XClarity Controller provides failover capability to a redundant Ethernet connection with the applicable application installed. If a problem occurs with the primary Ethernet connection, all Ethernet traffic that is associated with the primary connection is automatically switched to the optional redundant Ethernet connection. If the applicable device drivers are installed, this switching occurs without data loss and without user intervention.

- **Redundant cooling**

The redundant cooling by the fans in the server enables continued operation if one rotor of a fan fails.

- **ThinkSystem RAID support**

The ThinkSystem RAID adapter provides hardware redundant array of independent disks (RAID) support to create configurations, supporting RAID levels 0, 1, 5, 6, 10, 50, and 60.

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## Tech Tips

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

To find the Tech Tips available for your server:

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

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

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## Security advisories

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

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

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

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

## Specifications

Summary of the features and specifications of the server. Depending on the model, some features might not be available, or some specifications might not apply. The latest specifications information is always available at <https://lenovopress.lenovo.com/>.

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

Specification category	Technical specifications	Mechanical specifications	Environmental specifications
<b>Content</b>	<ul style="list-style-type: none"> <li>• Processor</li> <li>• Memory</li> <li>• Internal drives</li> <li>• Expansion slots</li> <li>• Storage controller</li> <li>• Graphics processing units (GPU)</li> <li>• Integrated functions and I/O connectors</li> <li>• Network</li> <li>• System fan</li> <li>• Power supplies</li> <li>• Minimal configuration for debugging</li> <li>• Operating systems</li> </ul>	<ul style="list-style-type: none"> <li>• Dimension</li> <li>• Weight</li> </ul>	<ul style="list-style-type: none"> <li>• Acoustical noise emissions</li> <li>• Environment</li> <li>• Water requirements</li> <li>• Particulate contamination</li> </ul>

## Technical specifications

Summary of the technical specifications of server. Depending on the model, some features might not be available, or some specifications might not apply. The latest specifications information is always available at <https://lenovopress.lenovo.com/>.

Processor
<p>Supports fourth-generation AMD® EPYC™ processors, with 5nm process technology.</p> <ul style="list-style-type: none"> <li>• Up to two processors with the new LGA 6096 (SP5) socket</li> <li>• Up to 96 Zen4 cores (192 threads) per socket</li> <li>• Up to 4 xGMI3 links at up to 32 GT/s</li> <li>• Thermal Design Power (TDP): up to 400 watts</li> </ul> <p>For a list of supported processors, see <a href="https://serverproven.lenovo.com/">https://serverproven.lenovo.com/</a>.</p>

## Memory

See “Memory module installation rules and order” in *User Guide* or *Hardware Maintenance Guide* for detailed information about memory configuration and setup.

- Slots: 24 dual inline memory module (DIMM) slots (12 channels per processor, 1 DIMM per channel)
- Memory module types:
  - TruDDR5 RDIMM: 16 GB (1Rx8), 32 GB (2Rx8), 48 GB (2Rx8)
  - TruDDR5 10x4 RDIMM: 32 GB (1Rx4), 64 GB (2Rx4), 96 GB (2Rx4)
  - TruDDR5 9x4 RDIMM: 32 GB (1Rx4), 64 GB (2Rx4)
  - TruDDR5 3DS RDIMM: 128 GB (4Rx4), 256 GB (8Rx4)
- Capacity:
  - Minimum: 16 GB (1 x 16 GB RDIMM)
  - Maximum: 6 TB (24 x 256 GB 3DS RDIMM)
- Speed: 4800 MT/s

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

## Internal drives

- Front drive bays:
  - Up to 24 x 2.5-inch hot-swap SAS/SATA/NVMe drives
  - Up to 12 x 3.5-inch hot-swap SAS/SATA drives
  - Up to 4 x 3.5-inch hot-swap NVMe drives
- Middle drive bays:
  - Up to 8 x 2.5-inch hot-swap SAS/SATA/NVMe drives
  - Up to 4 x 3.5-inch hot-swap SAS/SATA drives
- Rear drive bays:
  - Up to 8 x 2.5-inch hot-swap SAS/SATA drives
  - Up to 4 x 3.5-inch hot-swap SAS/SATA drives
  - Up to 4 x 2.5-inch hot-swap NVMe drives
  - Up to two 7mm drives
- Up to two internal M.2 drives

## Expansion slots

- Up to 12 PCIe slots
- One OCP module slot

PCIe slot availability is based on riser selection and rear drive bay selection. See “Rear view” on page 24 and “PCIe slots and PCIe adapters” in *User Guide* or *Hardware Maintenance Guide*.

## Storage controller

- SAS/SATA HBA adapters
  - ThinkSystem 4350-8i SAS/SATA 12Gb HBA
  - ThinkSystem 4350-16i SAS/SATA 12Gb HBA
  - ThinkSystem 440-8i SAS/SATA PCIe Gen4 12Gb HBA
  - ThinkSystem 440-16i SAS/SATA PCIe Gen4 12Gb HBA
  - ThinkSystem 440-16i SAS/SATA PCIe Gen4 12Gb Internal HBA\*
  - ThinkSystem 440-8e SAS/SATA PCIe Gen4 12Gb HBA
  - ThinkSystem 440-16e SAS/SATA PCIe Gen4 12Gb HBA
- SAS/SATA RAID adapters
  - ThinkSystem RAID 5350-8i PCIe 12Gb Adapter
  - ThinkSystem RAID 5350-8i PCIe 12Gb Internal Adapter\*
  - ThinkSystem RAID 9350-8i 2GB Flash PCIe 12Gb Adapter
  - ThinkSystem RAID 9350-8i 2GB Flash PCIe 12Gb Internal Adapter\*
  - ThinkSystem RAID 9350-16i 4GB Flash PCIe 12Gb Adapter
  - ThinkSystem RAID 9350-16i 4GB Flash PCIe 12Gb Internal Adapter\*
  - ThinkSystem RAID 540-8i PCIe Gen4 12Gb Adapter
  - ThinkSystem RAID 540-16i PCIe Gen4 12Gb Adapter
  - ThinkSystem RAID 940-8i 4GB Flash PCIe Gen4 12Gb Adapter
  - ThinkSystem RAID 940-16i 4GB Flash PCIe Gen4 12Gb Adapter
  - ThinkSystem RAID 940-16i 8GB Flash PCIe Gen4 12Gb Adapter
  - ThinkSystem RAID 940-16i 8GB Flash PCIe Gen4 12Gb Internal Adapter\*
  - ThinkSystem RAID 940-32i 8GB Flash PCIe Gen4 12Gb Adapter
  - ThinkSystem RAID 940-8e 4GB Flash PCIe Gen4 12Gb Adapter
- Expander: ThinkSystem 48 port 12Gb Internal Expander\*

### Notes:

- \*Custom form factor (CFF) adapters that are supported only for server models with 2.5-inch front drive bays and two processors.
- For more information about the RAID/HBA adapters, see [Lenovo ThinkSystem RAID Adapter and HBA Reference](#).

## Graphics processing unit (GPU)

Your server supports the following GPUs:

- Double-wide:
  - NVIDIA® A30, A40, A16, A100, H100, RTX A2000, RTX A4500, A6000, L40, L40S
  - AMD® Instinct MI210
- Single-wide: NVIDIA® A2, L4

For GPU supporting rules, see “Thermal rules” in *User Guide* or *Hardware Maintenance Guide*.

## Integrated functions and I/O connectors

- Lenovo XClarity Controller (XCC), which provides service processor control and monitoring functions, video controller, and remote keyboard, video, mouse, and remote drive capabilities.
  - The server supports Lenovo XClarity Controller 2 (XCC2). For additional information about Lenovo XClarity Controller 2 (XCC2), refer to <https://pubs.lenovo.com/lxcc-overview/>.
- Front connectors:
  - One VGA connector (optional)
  - One USB 3.2 Gen 1 (5 Gbps) connector
  - One USB 2.0 connector with XCC system management function
  - One external diagnostics connector
  - One integrated diagnostics panel (optional)
- Rear connectors:
  - One VGA connector
  - Three USB 3.2 Gen 1 (5 Gbps) connectors
  - One XCC system management port
  - Two or four Ethernet connectors on the OCP module (optional)
  - One serial port (optional)

Network
<ul style="list-style-type: none"> <li>OCP module in the rear or front of the server, which provides two or four Ethernet connectors for network support</li> </ul> <p><b>Note:</b> If ThinkSystem Redundant System Management Port Adapter is installed on the server, it will not be displayed on the PCIe card list of system management software, such as XCC, LXPM, and so on.</p>

System fan
<ul style="list-style-type: none"> <li>Supported fan types: <ul style="list-style-type: none"> <li>Standard fan 6038 (single-rotor, 17000 RPM)</li> <li>Performance fan 6056 (dual-rotor, 21000 RPM)</li> </ul> </li> <li>Fan redundancy: N+1 redundancy, one redundant fan rotor <ul style="list-style-type: none"> <li>One processor: five hot-swap system fans (one redundant fan rotor)</li> <li>Two processors or one processor with middle/rear bay or Riser 3: six hot-swap system fans (one redundant fan rotor)</li> </ul> </li> </ul> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>Single-rotor hot-swap fans cannot be mixed with dual-rotor hot-swap fans.</li> <li>The redundant cooling by the fans in the server enables continued operation if one rotor of a fan fails.</li> <li>When the system is powered off but still plugged in to AC power, fans 1 and 2 may continue to spin at a much lower speed. This is the system design to provide proper cooling.</li> </ul>

Power supplies				
The server supports up to two hot-swap power supplies for redundancy.				
Power supply	100–127 V ac	200–240 V ac	240 V dc	-48 V dc
750W Platinum	√	√	√	
750W Titanium		√	√	
1100W Platinum	√	√	√	
1100W Titanium		√	√	
1800W Platinum		√	√	
1800W Titanium		√	√	
2400W Platinum		√	√	
2600W Titanium		√	√	
1100W -48V DC				√
<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.</b></li> <li><b>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> </ul>				

Minimal configuration for debugging
<ul style="list-style-type: none"> <li>One processor in socket 1</li> <li>One memory module in slot 7</li> <li>One power supply unit</li> <li>One HDD/SSD drive, one M.2 drive, or one 7mm drive (if OS is needed for debugging)</li> <li>Five system fans</li> </ul>

## Operating systems

Supported and certified operating systems:

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

References:

- Complete list of available operating systems: <https://lenovopress.lenovo.com/osig>.
- OS deployment instructions, see “Deploy the operating system” on page 78.

## Mechanical specifications

Summary of the mechanical specifications of server. Depending on the model, some features might not be available, or some specifications might not apply. The latest specifications information is always available at <https://lenovopress.lenovo.com/>.

### Dimension

- Form factor: 2U
- Height: 86.5 mm (3.4 inches)
- Width:
  - With rack latches: 482.0 mm (19.0 inches)
  - Without rack latches: 444.6 mm (17.5 inches)
- Depth: 763.7 mm (30.1 inches)

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

### Weight

Up to 39 kg (86 lb), depending on the server configuration

## Environmental specifications

Summary of the environmental specifications of server. Depending on the model, some features might not be available, or some specifications might not apply. The latest specifications information is always available at <https://lenovopress.lenovo.com/>.

<b>Acoustical noise emissions</b>				
The server has the following acoustic noise emissions declaration.				
	Minimal	Typical	Storage	GPU
Sound power levels (L <sub>WA</sub> d)				
Idling	5.9 Bel	6.5 Bel	7.3 Bel	7.3 Bel
Operating	6.5 Bel	8.1 Bel	7.5 Bel	8.7 Bel
Sound pressure level (L <sub>pAm</sub> )				
Idling	41.5 dBA	51 dBA	60.2 dBA	60.2 dBA
Operating	48.3 dBA	66.6 dBA	61.3 dBA	71.9 dBA
The declared sound levels are based on the following configurations, which may change depending on configurations or conditions.				
Config.	Minimal	Typical	Storage	GPU
Chassis (2U)	Front 8 x 2.5"	Front 16 x 2.5"	Front 12 x 3.5" + rear 4 x 2.5"	Front 16 x 2.5"
Fan	6 x standard fans	6 x high performance fans	6 x high performance fans	6 x high performance fans
Processor	2 x 240 W	2 x 300 W	2 x 240 W	2 x 300 W
DIMM	12 x 64 GB	24 x 64 GB	12 x 64 GB	24 x 64 GB
Drive	8 x 2.4 TB SAS HDDs	16 x 2.4 TB SAS HDDs	Front 12 x 14 TB + rear 4 x 2 TB SAS HDDs	16 x 2.4 TB SAS HDDs
RAID	1 x RAID 940-8i	1 x RAID 940-8i	1 x RAID 940-16i	1 x RAID 940-16i
OCP	1 x Intel E810-DA2 10/25GbE SFP28 2-Port OCP			
PSU	2 x 1100 W	2 x 1800 W	2 x 1800 W	2 x 2400 W
GPU	None	None	None	3 x A100
<b>Notes:</b>				
<ul style="list-style-type: none"> <li>• These sound levels were measured in controlled acoustical environments according to procedures specified by ISO7779 and are reported in accordance with ISO 9296.</li> <li>• Government regulations (such as those prescribed by OSHA or European Community Directives) may govern noise level exposure in the workplace and may apply to you and your server installation. The actual sound pressure levels in your installation depend upon a variety of factors, including the number of racks in the installation; the size, materials, and configuration of the room; the noise levels from other equipment; the room ambient temperature, and employee's location in relation to the equipment. Further, compliance with such government regulations depends on a variety of additional factors, including the duration of employees' exposure and whether employees wear hearing protection. Lenovo recommends that you consult with qualified experts in this field to determine whether you are in compliance with the applicable regulations.</li> </ul>				



## Environment

ThinkSystem SR665 V3 complies with ASHRAE Class A2 specifications with most configurations, and depending on the hardware configuration, also complies with ASHRAE Class A3 and Class A4 specifications. System performance may be impacted when the operating temperature is outside ASHRAE A2 specification.

Depending on the hardware configuration, SR665 V3 server also complies with ASHRAE Class H1 specification. System performance may be impacted when the operating temperature is outside ASHRAE H1 specification.

The restrictions to ASHRAE support are as follows (cooling by air):

- The ambient temperature must be limited to 35°C or lower if the server has any of the following components:
  - Broadcom 57416 10GBASE-T 2-port OCP
  - Broadcom 57454 10GBASE-T 4-port OCP
  - Network interface cards (NICs) at a rate greater than or equal to 100 GB
  - Parts with AOC and at the rate of 25 GB
- The ambient temperature must be limited to 30°C or lower if the server has any of the following components:
  - 24 x 2.5" or 12 x 3.5" front bay with middle or rear bay
  - GPU (except front 24 x 2.5" configurations and configurations with Group E processors)
  - Parts with AOC and at a rate greater than 25 GB
  - 9654(P)/9554(P)/9174F/9754/9734/9684X processors using performance heat sinks in a front 8 x 2.5"/8 x 3.5"/16 x 2.5" standard configuration.
  - Group E processors using advanced heat sinks in a front 12 x 3.5"/24 x 2.5" configuration without middle/rear bay
- The ambient temperature must be limited to 25°C or lower if the server has any of the following components:
  - 9274F/9374F/9474F using performance heat sinks in a front 8 x 2.5"/8 x 3.5"/16 x 2.5" standard configuration
  - 9654(P)/9554(P)/9174F/9754/9734 using performance heat sinks in a front 24 x 2.5" configuration without middle/rear bay
  - 9654(P)/9554(P)/9174F/9754/9734/9684X in a front 8 x 2.5"/8 x 3.5"/16 x 2.5" + GPU configuration
  - 24 x 2.5" front bay + GPU
  - Gen5 7.68 TB or larger capacity NVMe in a configuration with middle/rear bay
  - Group A (240 W < cTDP ≤ 300 W) processor in a configuration with middle/rear bay
  - ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM-A v1

The restrictions to ASHRAE support are as follows (cooling by Direct Water Cooling Module (DWCM)):

- The ambient temperature must be limited to 35°C or lower if the server has any of the following components:
  - Broadcom 57416 10GBASE-T 2-port OCP
  - Broadcom 57454 10GBASE-T 4-port OCP
  - Network interface cards (NICs) at a rate greater than or equal to 100 GB
  - Parts with AOC and at the rate of 25 GB
- The ambient temperature must be limited to 30°C or lower if the server has any of the following components:
  - Gen5 7.68 TB or larger capacity NVMe in a configuration with middle/rear bay
  - three 300 W or 350 W GPUs installed in a configuration with 16 x 2.5" or 8 x 3.5" front bay
  - three 300 W GPUs installed in an 8 x 2.5" + FIO or 16 x 2.5" + FIO configuration
  - three H100/L40S GPUs installed in a configuration with 24 x 2.5" front bay or in an 8 x 2.5" + FIO or 16 x 2.5" + FIO configuration
  - ThinkSystem 96GB TruDDR5 4800MHz (2Rx4) RDIMM-A installed in a GPU configuration
  - ThinkSystem 128GB TruDDR5 4800MHz (4Rx4) 3DS RDIMM-A v1 installed in a GPU configuration
  - ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM-A v1 installed in a standard configuration with standard fans or a storage configuration with 24 x 2.5" front bay and standard fans
  - parts with AOC and at a rate greater than 25 GB
- The ambient temperature must be limited to 25°C or lower if the server has any of the following components:
  - three A40 or L40 GPUs installed in a configuration with 24 x 2.5" front bay or in an 8 x 2.5" + FIO or 16 x 2.5" + FIO configuration
  - ThinkSystem 256GB TruDDR5 4800MHz (8Rx4) 3DS RDIMM-A v1 installed in a configuration with 12 x 3.5" front bay and performance fans

For detailed thermal information, see "Thermal rules" in *User Guide* or *Hardware Maintenance Guide*.

## Environment

**Note:** When the ambient temperature is greater than the supported max temperature (ASHARE A4 45°C), the server will shut down. The server will not power on again until the ambient temperature falls within the supported temperature range.

- **Air temperature:**

- Operating

- ASHRAE class H1: 5°C to 25°C (41°F to 77°F)

The maximum ambient temperature decreases by 1°C for every 500 m (1640 ft) increase in altitude above 900 m (2,953 ft)

- ASHRAE class A2: 10°C to 35°C (50°F to 95°F)

The maximum ambient temperature decreases by 1°C for every 300 m (984 ft) increase in altitude above 900 m (2,953 ft)

- ASHRAE class A3: 5°C to 40°C (41°F to 104°F)

The maximum ambient temperature decreases by 1°C for every 175 m (574 ft) increase in altitude above 900 m (2,953 ft)

- ASHRAE class A4: 5°C to 45°C (41°F to 113°F)

The maximum ambient temperature decreases by 1°C for every 125 m (410 ft) increase in altitude above 900 m (2,953 ft)

- Server off: 5°C to 45°C (41°F to 113°F)
- Shipment/storage: -40°C to 60°C (-40°F to 140°F)

- **Maximum altitude:** 3,050 m (10,000 ft)

- **Relative Humidity** (non-condensing):

- Operating

- ASHRAE class H1: 8%–80%; maximum dew point: 17°C (62.6°F)
- ASHRAE class A2: 8%–80%; maximum dew point: 21°C (70°F)
- ASHRAE class A3: 8%–85%; maximum dew point: 24°C (75°F)
- ASHRAE class A4: 8%–90%; maximum dew point: 24°C (75°F)

- Shipment/storage: 8% to 90%

## Water requirements

### Water requirements

ThinkSystem SR665 V3 is supported in the following environment:

- Maximum pressure: 3 bars
- Water inlet temperature and flow rates:

Water inlet temperature	Water flow rate
50°C (122°F)	1.5 liters per minute (lpm) per server
45°C (113°F)	1 liter per minute (lpm) per server
40°C (104°F) or lower	0.5 liters per minute (lpm) per server

**Note:** The water required to initially fill the system side cooling loop must be reasonably clean, bacteria-free water (<100 CFU/ml) such as de-mineralized water, reverse osmosis water, de-ionized water, or distilled water. The water must be filtered with an in-line 50 micron filter (approximately 288 mesh). The water must be treated with anti-biological and anti-corrosion measures.

## Particulate contamination

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

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

Table 1. Limits for particulates and gases

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

## Management options

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

## Overview

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

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

## Functions

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

### Notes:

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

## Chapter 2. Server components

This section contains information about each of the components associated with the server.

### Front view

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

Refer to the following front views for different server models:

- “Front view with eight 2.5-inch front drive bays (model 1)” on page 15
- “Front view with eight 2.5-inch front drive bays (model 2)” on page 16
- “Front view with sixteen 2.5-inch front drive bays (model 1)” on page 16
- “Front view with sixteen 2.5-inch front drive bays (model 2)” on page 17
- “Front view with sixteen 2.5-inch front drive bays (model 3)” on page 17
- “Front view with twenty-four 2.5-inch front drive bays” on page 18
- “Front view with 2.5-inch front drive bays (backplane-less)” on page 18
- “Front view with eight 3.5-inch front drive bays” on page 18
- “Front view with twelve 3.5-inch front drive bays” on page 19
- “Front view with 3.5-inch front drive bays (backplane-less)” on page 19

#### Front view with eight 2.5-inch front drive bays (model 1)

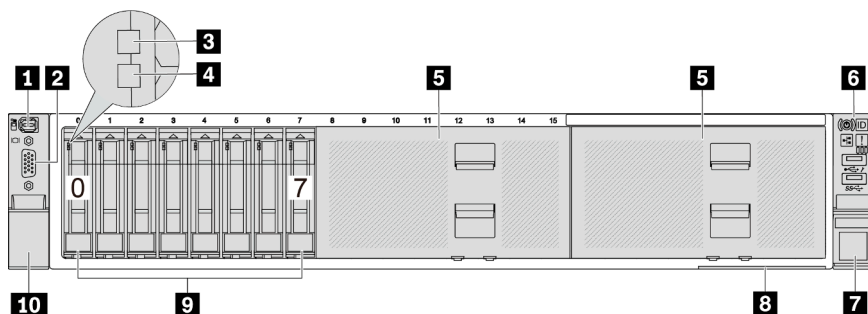


Table 2. Components on the front of the server

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 20	<b>2</b> “VGA connector (optional)” on page 21
<b>3</b> “Drive activity LED” on page 20	<b>4</b> “Drive status LED” on page 20
<b>5</b> “Drive bay fillers” on page 20	<b>6</b> “Front I/O module (on rack latch)” on page 21
<b>7</b> “Rack latch (right)” on page 21	<b>8</b> “Pull-out information tab” on page 21
<b>9</b> “Drive bays” on page 20	<b>10</b> “Rack latch (left)” on page 21

### Front view with eight 2.5-inch front drive bays (model 2)

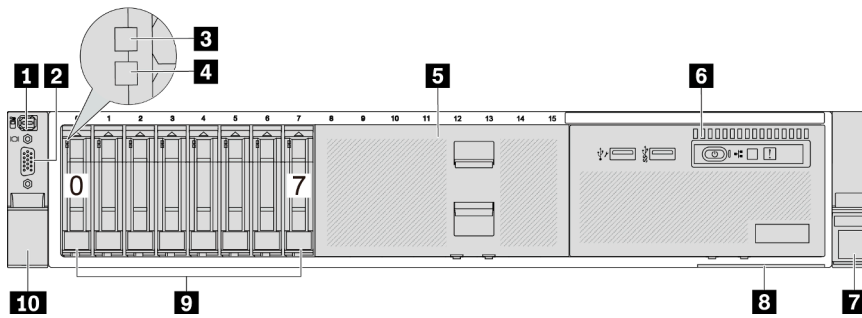


Table 3. Components on the front of the server

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 20	<b>2</b> “VGA connector (optional)” on page 21
<b>3</b> “Drive activity LED” on page 20	<b>4</b> “Drive status LED” on page 20
<b>5</b> “Drive bay filler” on page 20	<b>6</b> “Front I/O module (on media bay)” on page 21
<b>7</b> “Rack latch (right)” on page 21	<b>8</b> “Pull-out information tab” on page 21
<b>9</b> “Drive bays” on page 20	<b>10</b> “Rack latch (left)” on page 21

### Front view with sixteen 2.5-inch front drive bays (model 1)

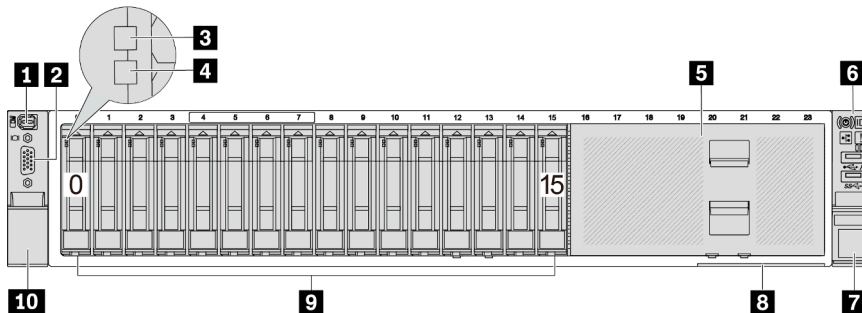


Table 4. Components on the front of server models

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 20	<b>2</b> “VGA connector (optional)” on page 21
<b>3</b> “Drive activity LED” on page 20	<b>4</b> “Drive status LED” on page 20
<b>5</b> “Drive bay filler” on page 20	<b>6</b> “Front I/O module (on rack latch)” on page 21
<b>7</b> “Rack latch (right)” on page 21	<b>8</b> “Pull-out information tab” on page 21
<b>9</b> “Drive bays” on page 20	<b>10</b> “Rack latch (left)” on page 21



### Front view with sixteen 2.5-inch front drive bays (model 2)

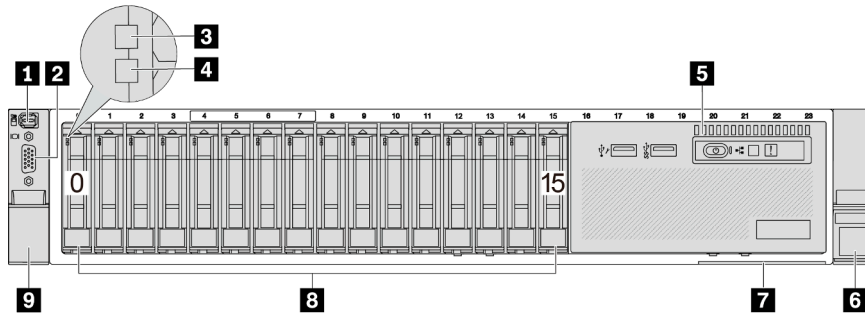


Table 5. Components on the front of the server

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 20	<b>2</b> “VGA connector (optional)” on page 21
<b>3</b> “Drive activity LED” on page 20	<b>4</b> “Drive status LED” on page 20
<b>5</b> “Front I/O module (on media bay)” on page 21	<b>6</b> “Rack latch (right)” on page 21
<b>7</b> “Pull-out information tab” on page 21	<b>8</b> “Drive bays” on page 20
<b>9</b> “Rack latch (left)” on page 21	

### Front view with sixteen 2.5-inch front drive bays (model 3)

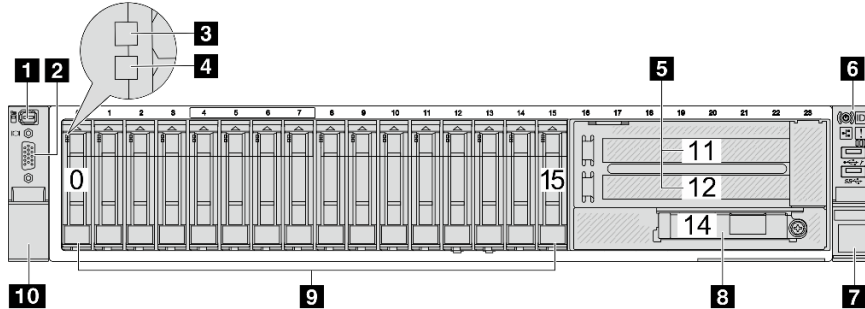


Table 6. Components on the front of server models

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 20	<b>2</b> “VGA connector (optional)” on page 21
<b>3</b> “Drive activity LED” on page 20	<b>4</b> “Drive status LED” on page 20
<b>5</b> “PCIe slots (x2)” on page 21	<b>6</b> “Front I/O module (on rack latch)” on page 21
<b>7</b> “Rack latch (right)” on page 21	<b>8</b> “Ethernet connectors on OCP module (optional)” on page 21
<b>9</b> “Drive bays” on page 20	<b>10</b> “Rack latch (left)” on page 21

### Front view with twenty-four 2.5-inch front drive bays

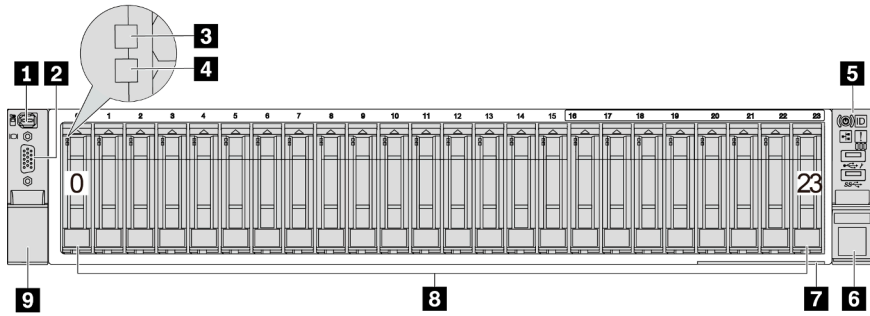


Table 7. Components on the front of server models

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 20	<b>2</b> “VGA connector (optional)” on page 21
<b>3</b> “Drive activity LED” on page 20	<b>4</b> “Drive status LED” on page 20
<b>5</b> “Front I/O module (on rack latch)” on page 21	<b>6</b> “Rack latch (right)” on page 21
<b>7</b> “Pull-out information tab” on page 21	<b>8</b> “Drive bays” on page 20
<b>9</b> “Rack latch (left)” on page 21	

### Front view with 2.5-inch front drive bays (backplane-less)

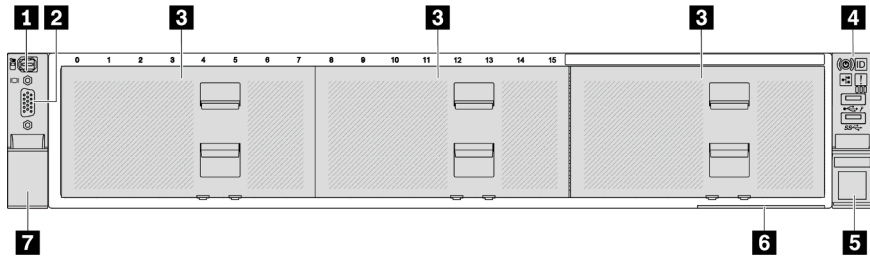


Table 8. Components on the front of server models

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 20	<b>2</b> “VGA connector (optional)” on page 21
<b>3</b> “Drive bay fillers” on page 20	<b>4</b> “Front I/O module (on rack latch)” on page 21
<b>5</b> “Rack latch (right)” on page 21	<b>6</b> “Pull-out information tab” on page 21
<b>7</b> “Rack latch (left)” on page 21	

### Front view with eight 3.5-inch front drive bays

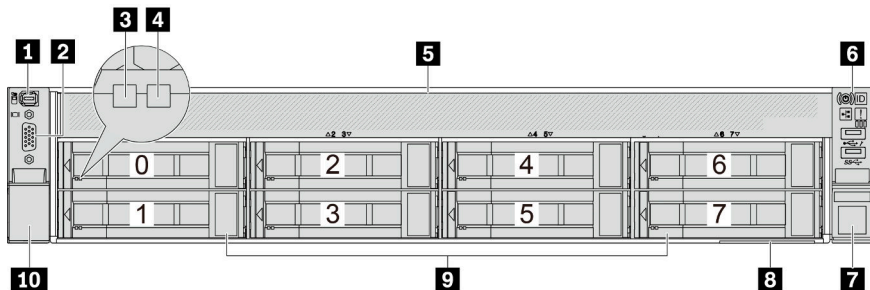


Table 9. Components on the front of server models

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 20	<b>2</b> “VGA connector (optional)” on page 21
<b>3</b> “Drive activity LED” on page 20	<b>4</b> “Drive status LED” on page 20
<b>5</b> “Drive bay filler” on page 20	<b>6</b> “Front I/O module (on rack latch)” on page 21
<b>7</b> “Rack latch (right)” on page 21	<b>8</b> “Pull-out information tab” on page 21
<b>9</b> “Drive bays” on page 20	<b>10</b> “Rack latch (left)” on page 21

Front view with twelve 3.5-inch front drive bays

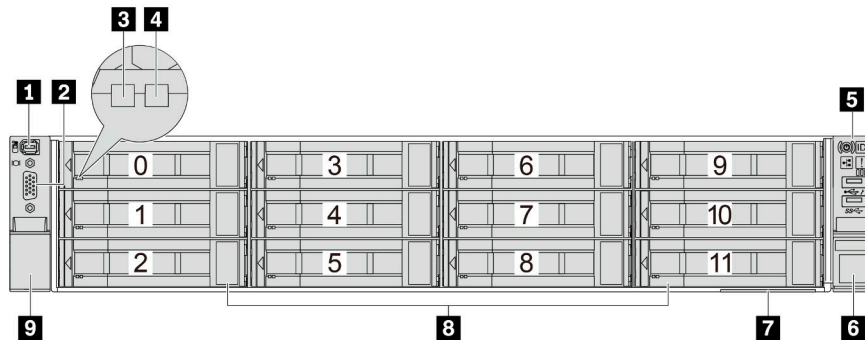


Table 10. Components on the front of server models

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 20	<b>2</b> “VGA connector (optional)” on page 21
<b>3</b> “Drive activity LED” on page 20	<b>4</b> “Drive status LED” on page 20
<b>5</b> “Front I/O module (on rack latch)” on page 21	<b>6</b> “Rack latch (right)” on page 21
<b>7</b> “Pull-out information tab” on page 21	<b>8</b> “Drive bays” on page 20
<b>9</b> “Rack latch (left)” on page 21	

Front view with 3.5-inch front drive bays (backplane-less)

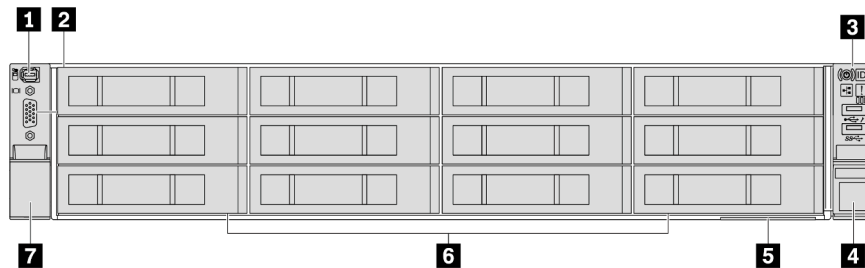


Table 11. Components on the front of server models

Callout	Callout
<b>1</b> “External diagnostics connector (optional)” on page 20	<b>2</b> “VGA connector (optional)” on page 21
<b>3</b> “Front I/O module (on rack latch)” on page 21	<b>4</b> “Rack latch (right)” on page 21

Table 11. Components on the front of server models (continued)

Callout	Callout
<b>5</b> “Pull-out information tab” on page 21	<b>6</b> “Drive bay fillers” on page 20
<b>7</b> “Rack latch (left)” on page 21	

## Front components overview

### Drive bays

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

### Drive bay filler

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

### Drive LEDs

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

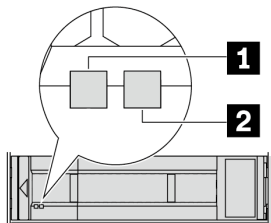


Figure 2. Drive LEDs

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

### External diagnostics connector

The connector is for connecting an external diagnostics handset. For more about its functions, see “External diagnostics handset” in *User Guide*.

## Front I/O module

The front I/O module provides controls, connectors, and LEDs. The front I/O module varies by model. For more information, see [“Front I/O module” on page 21](#).

## PCIe slots

The PCIe slots are on the rear or front of the server, and your server supports up to 12 PCIe slots. For more information, see “PCIe slots and PCIe adapters” in *User Guide* or *Hardware Maintenance Guide*.

## Pull-out information tab

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

For more information, see [Set the network connection for the Lenovo XClarity Controller](#).

## 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.

## VGA connector

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

## Ethernet connectors

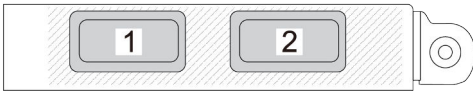


Figure 3. OCP module (two connectors)

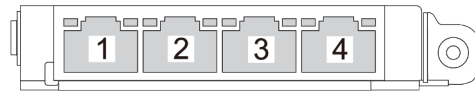


Figure 4. OCP module (four connectors)

The OCP module provides two or four extra Ethernet connectors for network connections. By default, any of the connectors on the OCP module can function as a shared management connector.

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## Front I/O module

The front I/O module provides controls, connectors, and LEDs. The front I/O module varies by model.

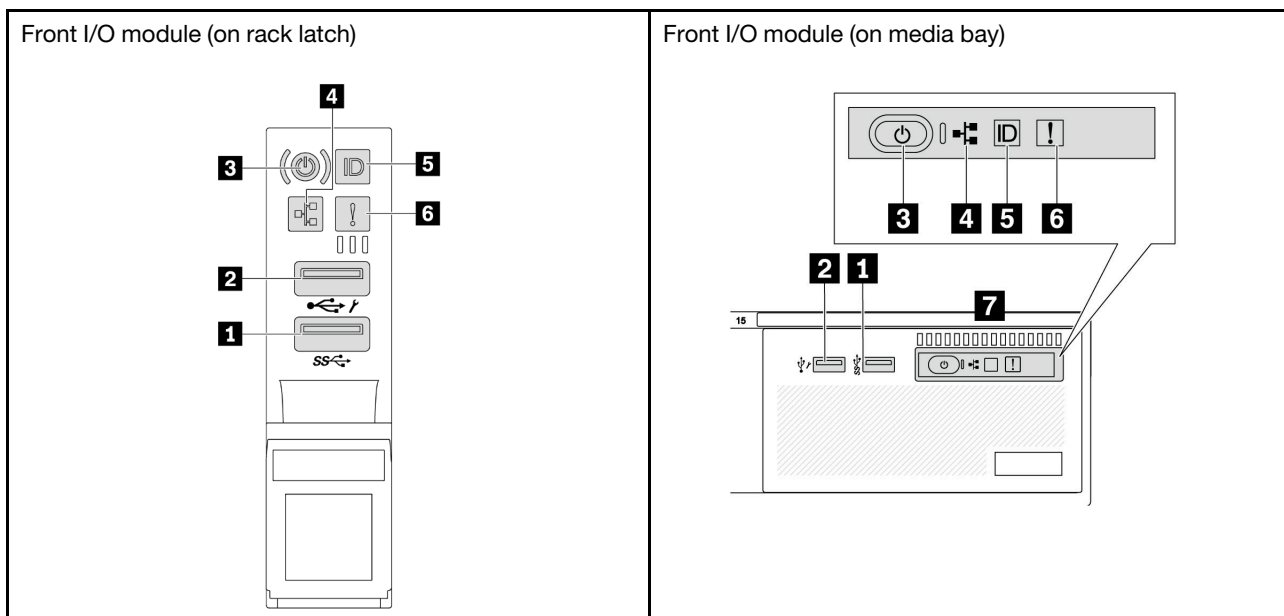


Table 12. Components on the front I/O module

Callout	Callout
<b>1</b> USB 3 (5 Gbps) connector	<b>2</b> USB 2.0 connector with XClarity Controller management
<b>3</b> Power button with power status LED	<b>4</b> Network activity LED (for OCP module)
<b>5</b> System ID button with system ID LED	<b>6</b> System error LED
<b>7</b> Front operator panel or integrated diagnostics panel	

### **1** USB 3 (5 Gbps) connector

The USB 3.2 Gen 1 (5 Gbps) connector can be used to attach a USB-compatible device, such as a USB keyboard, USB mouse, or USB storage device.

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

Depending on the setting, this connector supports USB 2.0 function, XClarity Controller management function, or both. It is the only USB port that supports USB automation update of the firmware and RoT security module.

- If the connector is set for USB 2.0 function, it can be used to attach a USB-compatible device, such as a USB keyboard, USB mouse, or USB storage device.
- If the connector is set for XClarity Controller management function, it can be used to connect the server to an android or iOS device, where you can then install and launch the Lenovo XClarity Mobile app to manage the system using XClarity Controller.

For details about using the Lenovo XClarity Mobile app, refer to [https://pubs.lenovo.com/lxca/lxca\\_usemobileapp](https://pubs.lenovo.com/lxca/lxca_usemobileapp).

- 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.

### **3** Power button with power status LED

You can press this button to turn the server on and off manually. The power status LED helps you determine the current power status.

Status	Color	Description
Off	None	Power is not present, or the power supply unit has failed.
Fast blinking (about four flashes per second)	Green	<ul style="list-style-type: none"> <li>The server is off, but the XClarity Controller is initializing, and the server is not ready to be powered on.</li> <li>System-board-assembly power has failed.</li> </ul>
Slow blinking (about one flash per second)	Green	The server is off and is ready to be powered on (standby state).
Solid on	Green	The server is on and running.

#### 4 Network activity LED

Compatibility of the NIC adapter and the network activity LED:

NIC adapter	Network activity LED
OCP module	Support
PCIe NIC adapter	Not support

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

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

#### 5 System ID button with system ID LED

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

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 are not limited to the following errors:</p> <ul style="list-style-type: none"> <li>• A fan failure</li> <li>• A memory error</li> <li>• A storage failure</li> <li>• A PCIe device failure</li> <li>• A power supply failure</li> <li>• A processor error</li> <li>• A system I/O board or processor board error</li> </ul>	<ul style="list-style-type: none"> <li>• Check the Lenovo XClarity Controller event log and the system event log to determine the exact cause of the error.</li> <li>• Check if additional LEDs elsewhere in the server are also lit that will direct you to the source of the error. See <a href="#">“System LEDs and diagnostics display” on page 39</a>.</li> <li>• Save the log if necessary.</li> </ul>
Off	None	The server is off, or the server is on and is working correctly.	None.

### **7** Front operator panel or integrated diagnostics panel

Depending on the server model, the server comes with the front operator panel (without LCD display) or the integrated diagnostics panel (with LCD display).

The integrated diagnostic panel provides an LCD display to quickly access system information such as active errors, system status, firmware information, network information, and health information. For details, see [“Integrated diagnostics panel” on page 41](#).

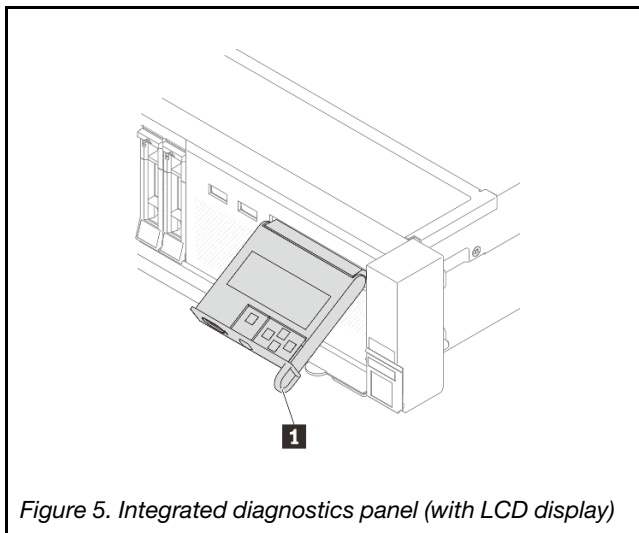


Figure 5. Integrated diagnostics panel (with LCD display)

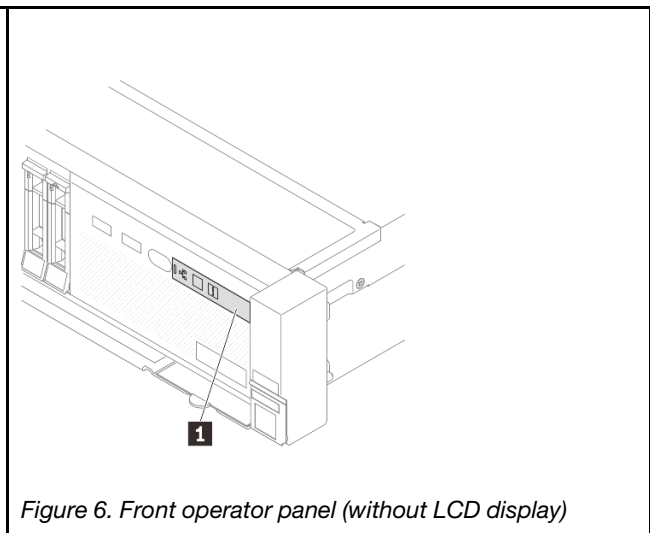


Figure 6. Front operator panel (without LCD display)

## Rear view

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

Refer to the following rear views for different server models:

- [“Rear view with eight PCIe slots” on page 25](#)
- [“Rear view with ten PCIe slots” on page 25](#)
- [“Rear view with four 2.5-inch rear drive bays and six PCIe slots” on page 26](#)
- [“Rear view with eight 2.5-inch rear drive bays and four PCIe slots” on page 26](#)
- [“Rear view with two 3.5-inch rear drive bays and four PCIe slots” on page 27](#)



- “Rear view with four 3.5-inch rear drive bays and two PCIe slots” on page 27
- “Rear view with seven PCIe slots and a DWCM” on page 28
- “Rear view with nine PCIe slots and a DWCM” on page 28
- “Rear view with four 2.5-inch rear drive bays, five PCIe slots, and a DWCM” on page 29
- “Rear view with eight 2.5-inch rear drive bays, three PCIe slots, and a DWCM” on page 29
- “Rear view with two 3.5-inch rear drive bays, three PCIe slots, and a DWCM” on page 30
- “Rear view with four 3.5-inch rear drive bays, one PCIe slot, and a DWCM” on page 30

### Rear view with eight PCIe slots

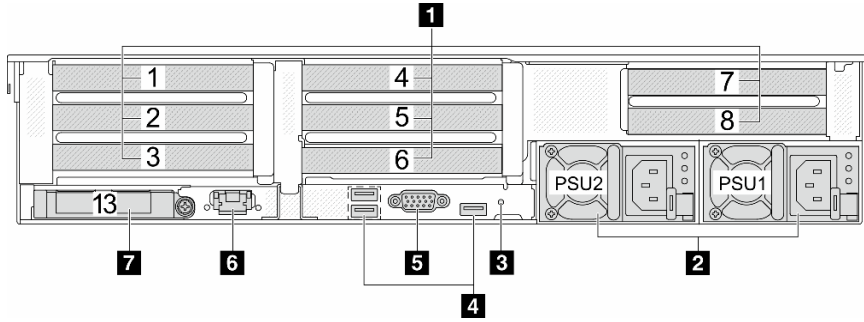


Table 13. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 31	<b>2</b> “Power supply units” on page 31
<b>3</b> “NMI button” on page 31	<b>4</b> “USB 3 (5 Gbps) connectors (3)” on page 31
<b>5</b> “VGA connector” on page 31	<b>6</b> “XCC system management port” on page 31
<b>7</b> “Ethernet connectors on OCP module (optional)” on page 32	

### Rear view with ten PCIe slots

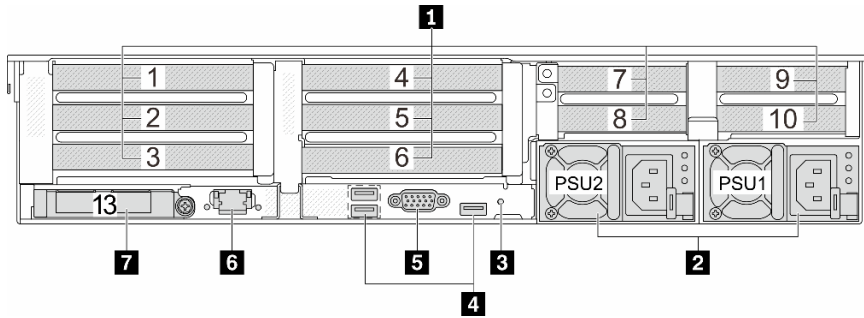


Table 14. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 31	<b>2</b> “Power supply units” on page 31
<b>3</b> “NMI button” on page 31	<b>4</b> “USB 3 (5 Gbps) connectors (3)” on page 31
<b>5</b> “VGA connector” on page 31	<b>6</b> “XCC system management port” on page 31
<b>7</b> “Ethernet connectors on OCP module (optional)” on page 32	

### Rear view with four 2.5-inch rear drive bays and six PCIe slots

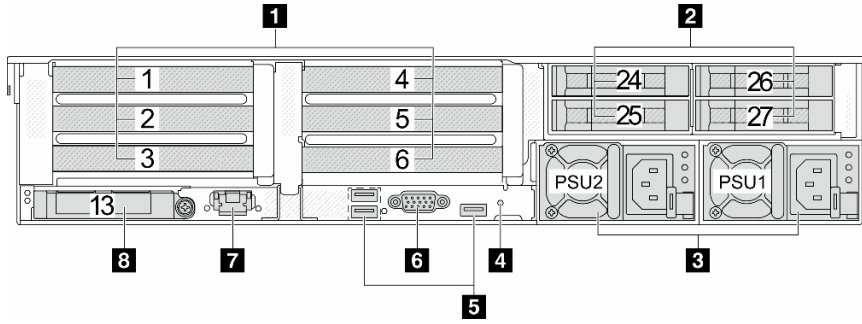


Table 15. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 31	<b>2</b> “Rear 2.5-inch drive bays (4)” on page 31
<b>3</b> “Power supply units” on page 31	<b>4</b> “NMI button” on page 31
<b>5</b> “USB 3 (5 Gbps) connectors (3)” on page 31	<b>6</b> “VGA connector” on page 31
<b>7</b> “XCC system management port” on page 31	<b>8</b> “Ethernet connectors on OCP module (optional)” on page 32

### Rear view with eight 2.5-inch rear drive bays and four PCIe slots

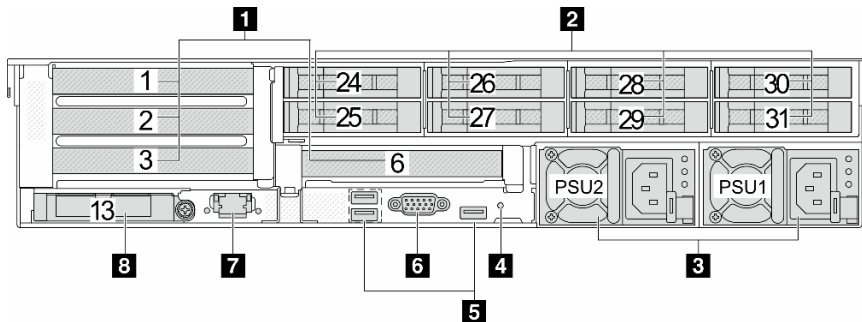


Table 16. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 31	<b>2</b> “Rear 2.5-inch drive bays (8)” on page 31
<b>3</b> “Power supply units” on page 31	<b>4</b> “NMI button” on page 31
<b>5</b> “USB 3 (5 Gbps) connectors (3)” on page 31	<b>6</b> “VGA connector” on page 31
<b>7</b> “XCC system management port” on page 31	<b>8</b> “Ethernet connectors on OCP module (optional)” on page 32

### Rear view with two 3.5-inch rear drive bays and four PCIe slots

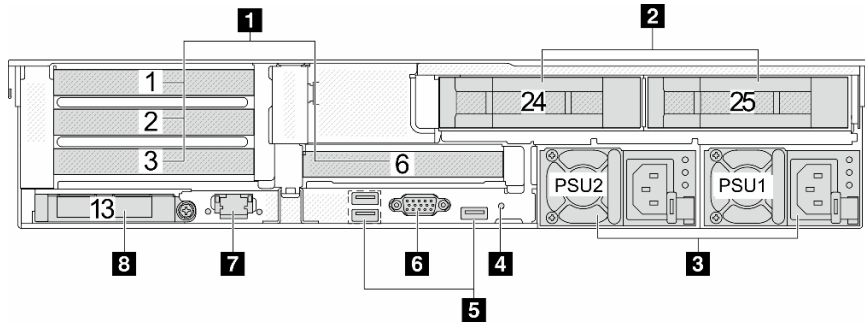


Table 17. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 31	<b>2</b> “Rear 3.5-inch drive bays (2)” on page 31
<b>3</b> “Power supply units” on page 31	<b>4</b> “NMI button” on page 31
<b>5</b> “USB 3 (5 Gbps) connectors (3)” on page 31	<b>6</b> “VGA connector” on page 31
<b>7</b> “XCC system management port” on page 31	<b>8</b> “Ethernet connectors on OCP module (optional)” on page 32

### Rear view with four 3.5-inch rear drive bays and two PCIe slots

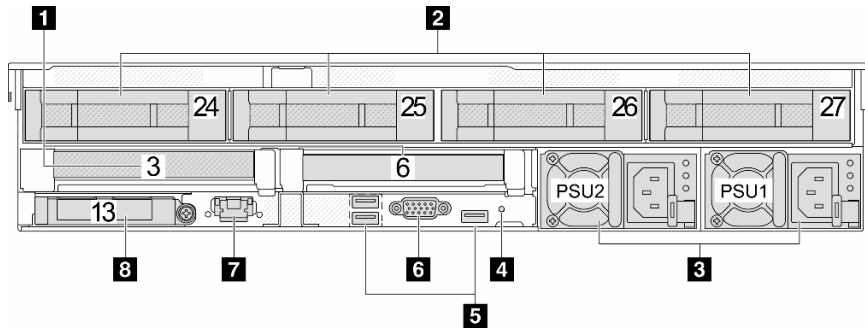


Table 18. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 31	<b>2</b> “Rear 3.5-inch drive bays (4)” on page 31
<b>3</b> “Power supply units” on page 31	<b>4</b> “NMI button” on page 31
<b>5</b> “USB 3 (5 Gbps) connectors (3)” on page 31	<b>6</b> “VGA connector” on page 31
<b>7</b> “XCC system management port” on page 31	<b>8</b> “Ethernet connectors on OCP module (optional)” on page 32

### Rear view with seven PCIe slots and a DWCM

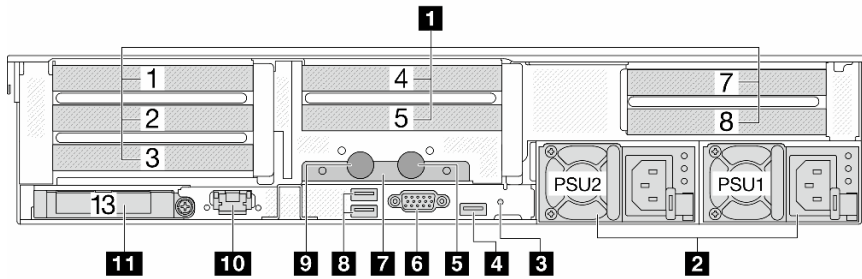


Table 19. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 31	<b>2</b> “Power supplies” on page 31
<b>3</b> “NMI button” on page 31	<b>4</b> “USB 3 (5 Gbps) connector” on page 31
<b>5</b> Outlet hose	<b>6</b> “VGA connector” on page 31
<b>7</b> Hose holder	<b>8</b> “USB 3 (5 Gbps) connectors” on page 31
<b>9</b> Inlet hose	<b>10</b> “XCC system management port” on page 31
<b>11</b> “Ethernet connectors on OCP module (optional)” on page 32	

### Rear view with nine PCIe slots and a DWCM

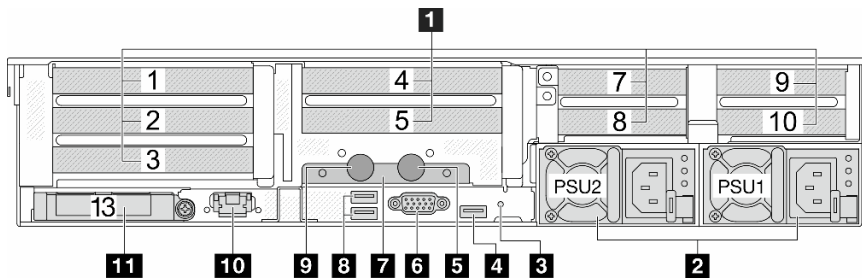


Table 20. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 31	<b>2</b> “Power supplies” on page 31
<b>3</b> “NMI button” on page 31	<b>4</b> “USB 3 (5 Gbps) connector” on page 31
<b>5</b> Outlet hose	<b>6</b> “VGA connector” on page 31
<b>7</b> Hose holder	<b>8</b> “USB 3 (5 Gbps) connectors” on page 31
<b>9</b> Inlet hose	<b>10</b> “XCC system management port” on page 31
<b>11</b> “Ethernet connectors on OCP module (optional)” on page 32	

**Rear view with four 2.5-inch rear drive bays, five PCIe slots, and a DWCM**

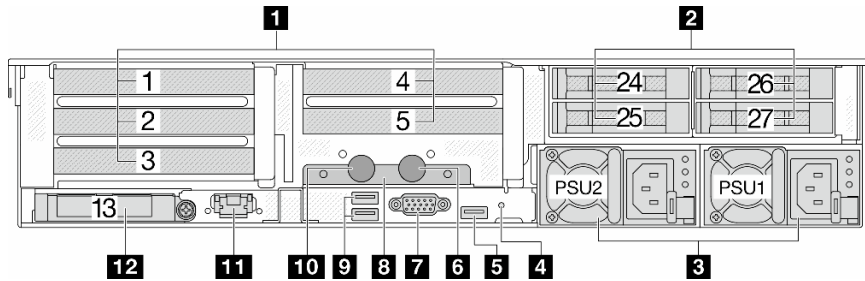


Table 21. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 31	<b>2</b> “Rear 2.5-inch drive bays (4)” on page 31
<b>3</b> “Power supplies” on page 31	<b>4</b> “NMI button” on page 31
<b>5</b> “USB 3 (5 Gbps) connector” on page 31	<b>6</b> Outlet hose
<b>7</b> “VGA connector” on page 31	<b>8</b> Hose holder
<b>9</b> “USB 3 (5 Gbps) connectors” on page 31	<b>10</b> Inlet hose
<b>11</b> “XCC system management port” on page 31	<b>12</b> “Ethernet connectors on OCP module (optional)” on page 32

**Rear view with eight 2.5-inch rear drive bays, three PCIe slots, and a DWCM**

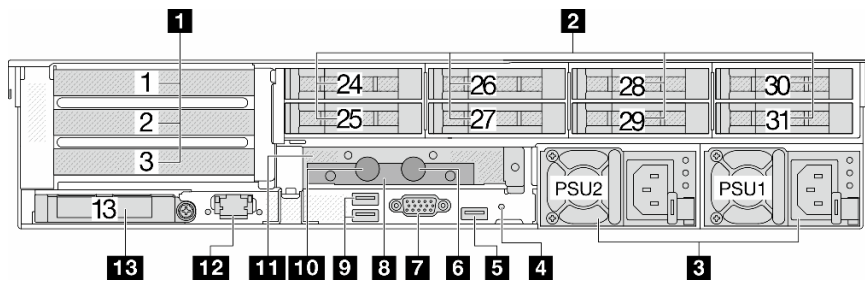


Table 22. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 31	<b>2</b> “Rear 2.5-inch drive bays (8)” on page 31
<b>3</b> “Power supplies” on page 31	<b>4</b> “NMI button” on page 31
<b>5</b> “USB 3 (5 Gbps) connector” on page 31	<b>6</b> Outlet hose
<b>7</b> “VGA connector” on page 31	<b>8</b> Hose holder
<b>9</b> “USB 3 (5 Gbps) connectors” on page 31	<b>10</b> Inlet hose
<b>11</b> 1FH riser cage for DWCM	<b>12</b> “XCC system management port” on page 31
<b>13</b> “Ethernet connectors on OCP module (optional)” on page 32	

**Rear view with two 3.5-inch rear drive bays, three PCIe slots, and a DWCM**

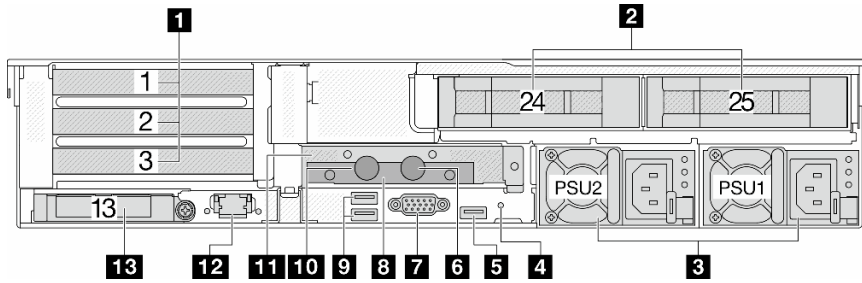


Table 23. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 31	<b>2</b> “Rear 3.5-inch drive bays (2)” on page 31
<b>3</b> “Power supplies” on page 31	<b>4</b> “NMI button” on page 31
<b>5</b> “USB 3 (5 Gbps) connector” on page 31	<b>6</b> Outlet hose
<b>7</b> “VGA connector” on page 31	<b>8</b> Hose holder
<b>9</b> “USB 3 (5 Gbps) connectors” on page 31	<b>10</b> Inlet hose
<b>11</b> 1FH riser cage for DWCM	<b>12</b> “XCC system management port” on page 31
<b>13</b> “Ethernet connectors on OCP module (optional)” on page 32	

**Rear view with four 3.5-inch rear drive bays, one PCIe slot, and a DWCM**

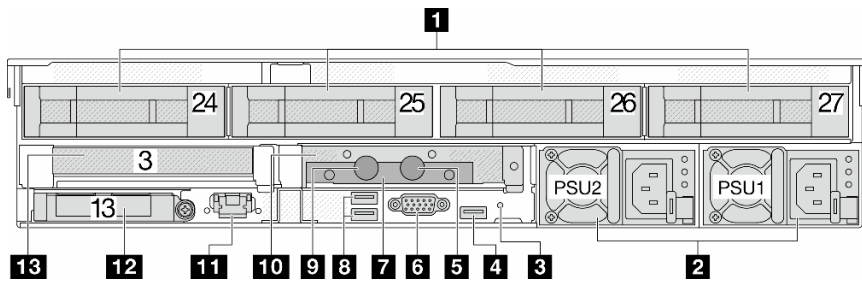


Table 24. Components on the rear of the server

Callout	Callout
<b>1</b> “PCIe slots” on page 31	<b>2</b> “Rear 3.5-inch drive bays (4)” on page 31
<b>3</b> “Power supplies” on page 31	<b>4</b> “NMI button” on page 31
<b>5</b> “USB 3 (5 Gbps) connector” on page 31	<b>6</b> Outlet hose
<b>7</b> “VGA connector” on page 31	<b>8</b> Hose holder
<b>9</b> “USB 3 (5 Gbps) connectors” on page 31	<b>10</b> Inlet hose
<b>11</b> 1FH riser cage for DWCM	<b>12</b> “XCC system management port” on page 31
<b>13</b> “Ethernet connectors on OCP module (optional)” on page 32	

## Rear components overview

### PCIe slots

The PCIe slots are on the rear or front of the server, and your server supports up to 12 PCIe slots. For more information, see “PCIe slots and PCIe adapters” in *User Guide* or *Hardware Maintenance Guide*.

### Hot-swap drives and drive bays

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

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

### Power supply units

The hot-swap redundant power supply units help you avoid significant interruption to the operation of the system when a power supply unit fails. You can purchase a power supply option from Lenovo and install the power supply unit to provide power redundancy without turning off the server.

On each power supply unit, there are three status LEDs near the power cord connector. For information about the LEDs, see [“Power supply LEDs” on page 53](#).

### NMI button

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

### USB 3 (5 Gbps) connectors

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

### VGA connector

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

### XCC system management port

The server has a 1 GB RJ-45 connector dedicated to Lenovo XClarity Controller (XCC) functions. Through the system management port, you can access the Lenovo XClarity Controller directly by connecting your laptop to the management port using an Ethernet cable. Make sure that you modify the IP settings on the laptop so that it is on the same network as the server default settings. A dedicated management network provides additional security by physically separating the management network traffic from the production network.

For more information, see:

- [Set the network connection for the Lenovo XClarity Controller](#)
- [“XCC system management port LEDs” on page 53](#)

## Ethernet connectors

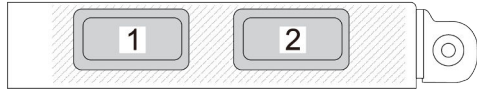


Figure 7. OCP module (two connectors)

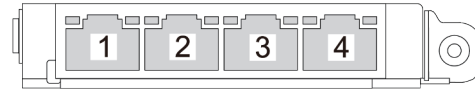


Figure 8. OCP module (four connectors)

The OCP module provides two or four extra Ethernet connectors for network connections. By default, any of the connectors on the OCP module can function as a shared management connector.

## Inlet and outlet hoses

The Direct Water Cooling Module (DWCM) spreads two hoses out to connect to the manifolds. The inlet hose conveys warm water from the facility to the cold plates to cool down the processors, and the outlet hose conducts hot water out of the DWCM to realize system cooling.

---

## Top view

This section contains information on the top view of the server with standard heat sinks or a direct water cooling module (DWCM).

### Notes:

- The following illustrations show the top view of the server without any air baffle, middle cage, or rear cage installed.
- The following illustrations show the server rear configuration with three riser assemblies. The server rear configurations vary by server model. For details, see [“Rear view” on page 24](#).



**Top view with standard heat sinks**

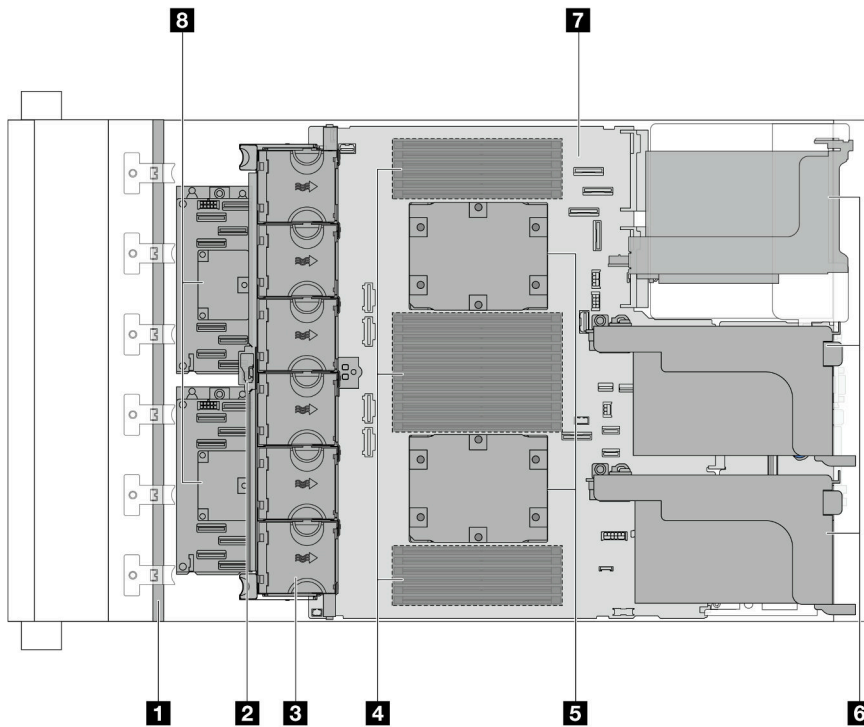


Figure 9. Top view with standard heat sinks

Table 25. Component identification (top view with standard heat sinks)

<b>1</b> Front backplane(s)	<b>2</b> Intrusion switch
<b>3</b> System fans	<b>4</b> Memory modules
<b>5</b> Processors and heat sinks	<b>6</b> Riser assemblies
<b>7</b> System board assembly	<b>8</b> CFF RAID adapter/expander

**Note:** The illustration shows the server with CFF adapters which are available only in the 2.5-inch chassis. In some configurations, there might be installed with a RAID flash power module. For details, see “Location of RAID flash power modules” in *User Guide* or *Hardware Maintenance Guide*.

### Top view with DWCM

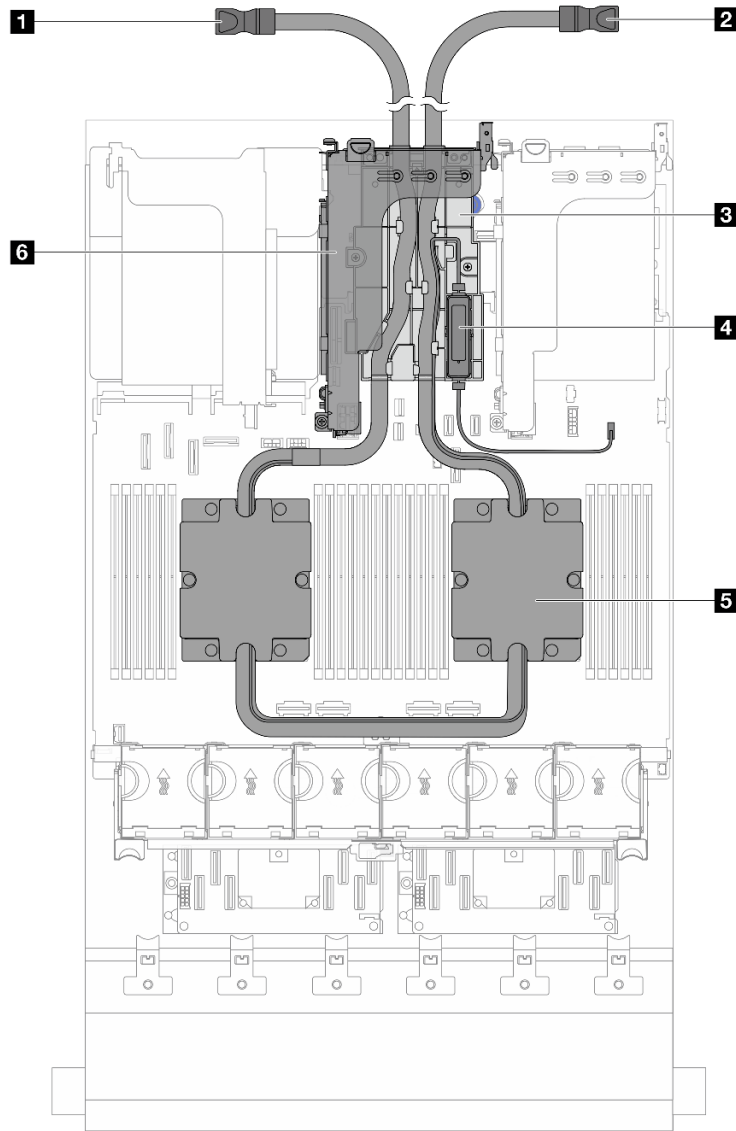


Figure 10. Top view with DWCM

Table 26. Components identification (top view with DWCM)

<b>1</b> Outlet hose	<b>2</b> Inlet hose
<b>3</b> Hose holder	<b>4</b> Liquid detection sensor module
<b>5</b> Cold plate assembly	<b>6</b> Riser cage for DWCM

## System-board-assembly layout

This section provides information about the connectors, switches, and jumpers that are available on the system board assembly.

The following illustration shows the layout of the system board assembly that contains the firmware and RoT security module, system I/O board, and processor board.

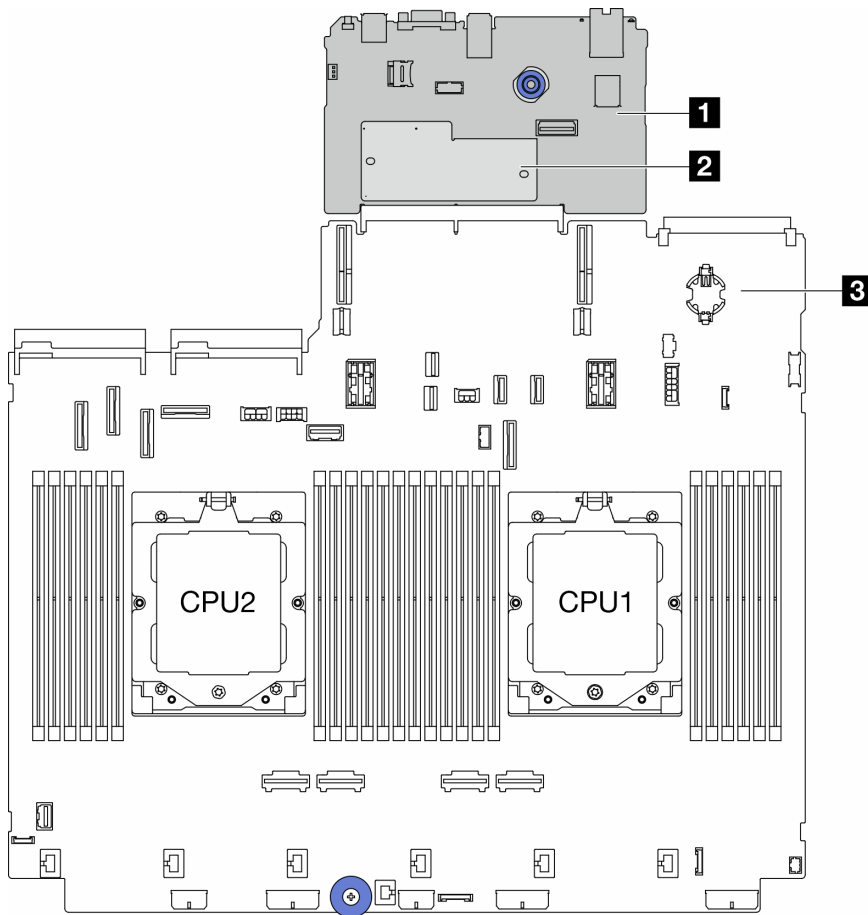


Figure 11. System-board-assembly layout

<b>1</b> System I/O board	<b>2</b> Firmware and RoT security module	<b>3</b> Processor board
---------------------------	---	--------------------------

For information about the LEDs that are available on the system board assembly, see:

- [“System-board-assembly LEDs” on page 55](#)
- [“LEDs on the firmware and RoT security module” on page 57](#)
- [“System-board-assembly connectors” on page 35](#)
- [“System-board-assembly switch” on page 37](#)

## System-board-assembly connectors

This section provides information about the internal connectors on the system I/O board and processor board.

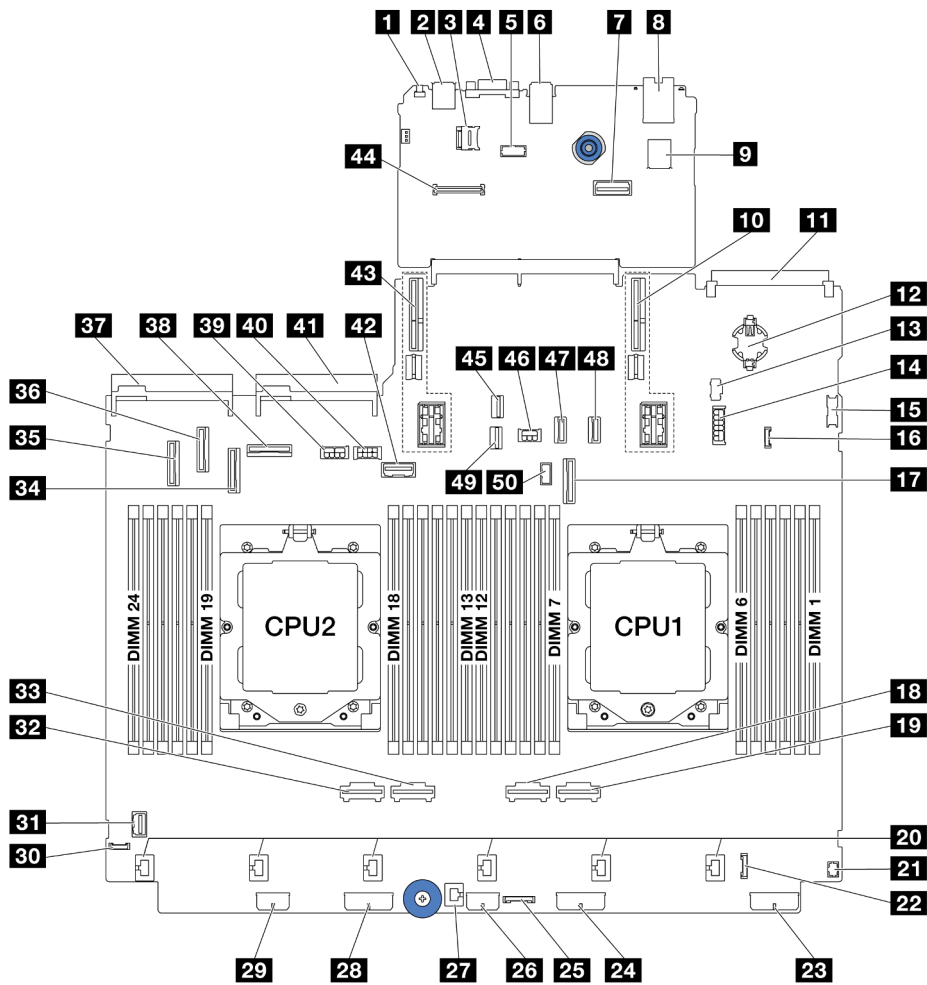


Figure 12. System-board-assembly connectors

Table 27. System-board-assembly connectors

<b>1</b> NMI button	<b>2</b> Rear USB connector
<b>3</b> MicroSD socket	<b>4</b> VGA connector
<b>5</b> Serial port connector	<b>6</b> Rear USB connectors
<b>7</b> Second management Ethernet connector	<b>8</b> XCC system management port
<b>9</b> Internal USB connector	<b>10</b> Riser 1 slot
<b>11</b> OCP module connector	<b>12</b> CMOS battery (CR2032)
<b>13</b> M.2 power connector	<b>14</b> 7mm / Rear 4x2.5" backplane power connector
<b>15</b> Front USB connector	<b>16</b> Leak detection connector
<b>17</b> PCIe connector 9 / SATA connector 2	<b>18</b> PCIe connector 2
<b>19</b> PCIe connector 1	<b>20</b> Fan 1-6 connectors
<b>21</b> Front I/O connector for Y cable <sup>note</sup>	<b>22</b> Front I/O connector <sup>note</sup>
<b>23</b> Backplane 3 power connector	<b>24</b> Backplane 2 power connector

Table 27. System-board-assembly connectors (continued)

<b>25</b> CFF retimer connector	<b>26</b> CFF expander power connector
<b>27</b> Intrusion switch connector	<b>28</b> Backplane 1 power connector
<b>29</b> CFF RAID/HBA power connector	<b>30</b> External diagnostics connector
<b>31</b> Front VGA connector	<b>32</b> PCIe connector 4
<b>33</b> PCIe connector 3	<b>34</b> PCIe connector 7 / SATA connector 1
<b>35</b> PCIe connector 5 / SATA connector 0	<b>36</b> PCIe connector 6
<b>37</b> Power supply 1 connector	<b>38</b> PCIe connector 8
<b>39</b> GPU power connector	<b>40</b> Riser 3 power connector
<b>41</b> Power supply 2 connector	<b>42</b> Riser 3 sideband connector
<b>43</b> Riser 2 slot	<b>44</b> RoT module connector
<b>45</b> M.2 signal connector	<b>46</b> Rear backplane power connector
<b>47</b> PCIe connector 10 / SATA connector 3	<b>48</b> PCIe connector 11 / SATA connector 4
<b>49</b> 7mm backplane signal connector	<b>50</b> Rear backplane sideband connector

**Notes:**

- The front I/O module on rack latch or the front I/O module on media bay with an integrated diagnostics panel is connected to connector **22**.
- The front I/O module on media bay with a front operator panel is connected to connectors **21** and **22** using a Y cable.

For details, see “Front I/O connectors” in *User Guide* or *Hardware Maintenance Guide*.

## System-board-assembly switch

This section provides information about locations and functions of the switch block on the system I/O board and processor board.

**Important:**

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

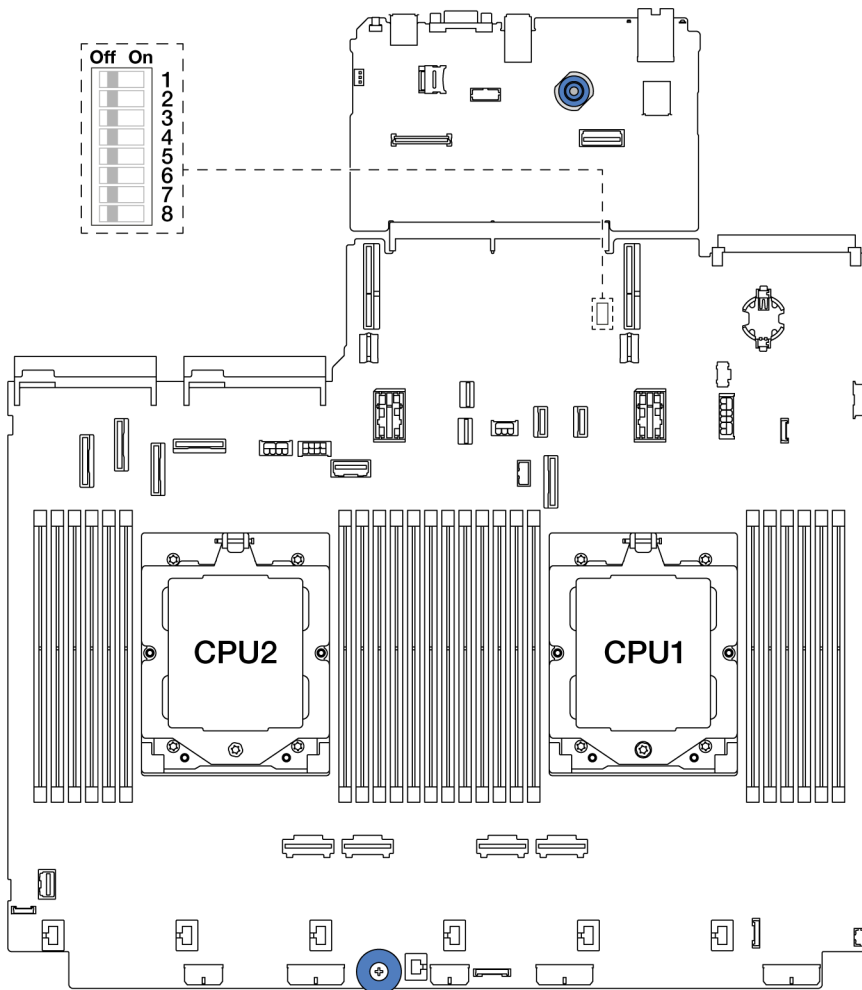


Figure 13. Switch block on the system board assembly

Table 28. Switch block on the system board assembly

Switch number	Switch name	Default position	Description
SW5-1	Force BMC CPU reset	Off	Forces BMC and CPU into reset when changing it to the ON position.
SW5-2	Clear CMOS	Off	Clears the real-time clock (RTC) registry when changing it to the ON position.
SW5-3	Password override	Off	Overrides the power-on password when changing it to the ON position.
SW5-4	FPGA reset	Off	Forces FPGA into reset when changing it to the ON position.
SW5-5	Reserved	Off	Reserved
SW5-6	Reserved	Off	Reserved
SW5-7	Reserved	Off	Reserved
SW5-8	Reserved	Off	Reserved

---

## System LEDs and diagnostics display

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

- [“Drive LEDs” on page 39](#)
- [“Front operator panel LEDs” on page 39](#)
- [“Integrated diagnostics panel” on page 41](#)
- [“External diagnostics handset” on page 46](#)
- [“Rear system LEDs” on page 52](#)
- [“XCC system management port LEDs” on page 53](#)
- [“Power supply LEDs” on page 53](#)
- [“System-board-assembly LEDs” on page 55](#)
- [“LEDs on the firmware and RoT security module” on page 57](#)

### Drive LEDs

This topic provides information on drive LEDs.

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

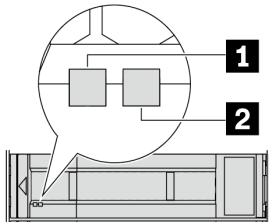


Figure 14. Drive LEDs

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

### Front operator panel LEDs

This topic provides information on the front operator panel LEDs.

Depending on the server model, the server comes with the front operator panel without LCD display or front operator with LCD display (integrated diagnostics panel). For information about the integrated diagnostics panel with LCD display, see [“Integrated diagnostics panel” on page 41](#).

The following illustration shows the front operator panel on the media bay. For some server models, the front operator panel is integrated on the rack latch. See “[Front I/O module](#)” on page 21.

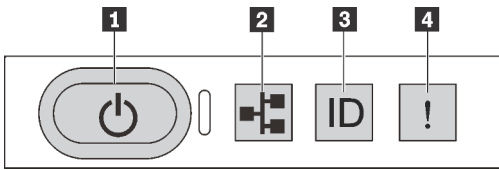


Figure 15. Front operator panel LEDs

<b>1</b> Power button with power status LED (green)	<b>2</b> Network activity LED (green)
<b>3</b> System ID button with system ID LED (blue)	<b>4</b> System error LED (yellow)

### **1 Power button with power status LED (green)**

You can press the power button to power on the server when you finish setting up the server. You also can hold the power button for several seconds to power off the server if you cannot shut down the server from the operating system. The states of the power LED are as follows:

Status	Color	Description
Off	None	Power is not present, or the power supply unit has failed.
Fast blinking (about four flashes per second)	Green	<ul style="list-style-type: none"> <li>The server is off, but the XClarity Controller is initializing, and the server is not ready to be powered on.</li> <li>System-board-assembly power has failed.</li> </ul>
Slow blinking (about one flash per second)	Green	The server is off and is ready to be powered on (standby state).
Solid on	Green	The server is on and running.

### **2 Network activity LED (green)**

Compatibility of the NIC adapter and the network activity LED:

NIC adapter	Network activity LED
OCP module	Support
PCIe NIC adapter	Not support

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

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



### 3 System ID button with system ID LED (blue)

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

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

### 4 System error LED (yellow)

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

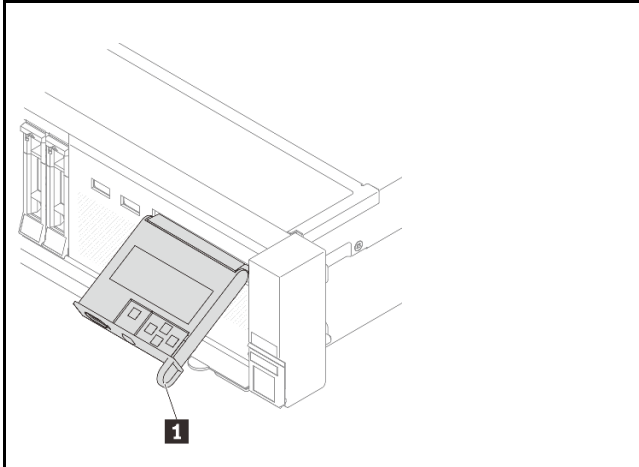
Status	Color	Description	Action
On	Yellow	An error has been detected on the server. Causes might include but are not limited to the following errors: <ul style="list-style-type: none"><li>• A fan failure</li><li>• A memory error</li><li>• A storage failure</li><li>• A PCIe device failure</li><li>• A power supply failure</li><li>• A processor error</li><li>• A system I/O board or processor board error</li></ul>	<ul style="list-style-type: none"><li>• Check the Lenovo XClarity Controller event log and the system event log to determine the exact cause of the error.</li><li>• Check if additional LEDs elsewhere in the server are also lit that will direct you to the source of the error. See <a href="#">“System LEDs and diagnostics display” on page 39</a>.</li><li>• Save the log if necessary.</li></ul>
Off	None	The server is off, or the server is on and is working correctly.	None.

## Integrated diagnostics panel

The integrated diagnostics panel is attached to the front of the server, while it allows quick access to system information such as errors, system status, firmware, network, and health information.

- [“Diagnostics panel location” on page 42](#)
- [“Diagnostics panel overview” on page 42](#)
- [“Options flow diagram” on page 42](#)
- [“Full menu list” on page 43](#)

## Diagnostics panel location



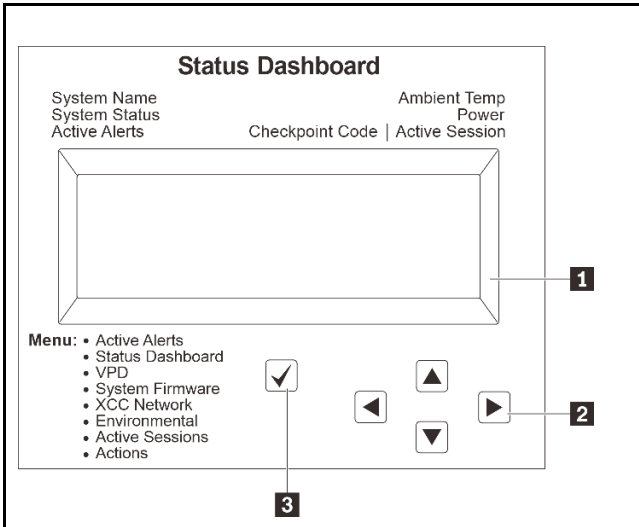
**1** The handle with which the panel can be pulled out and inserted into the server.

### Notes:

- The panel can be inserted or pulled out regardless of the system status.
- When pulling out the panel, carefully hold it by the handle and avoid any hard pulling.

## Diagnostics panel overview

The diagnostics device consists of an LCD display and 5 navigation buttons.



**1** LCD display

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

Press the scroll buttons to locate and select system information.

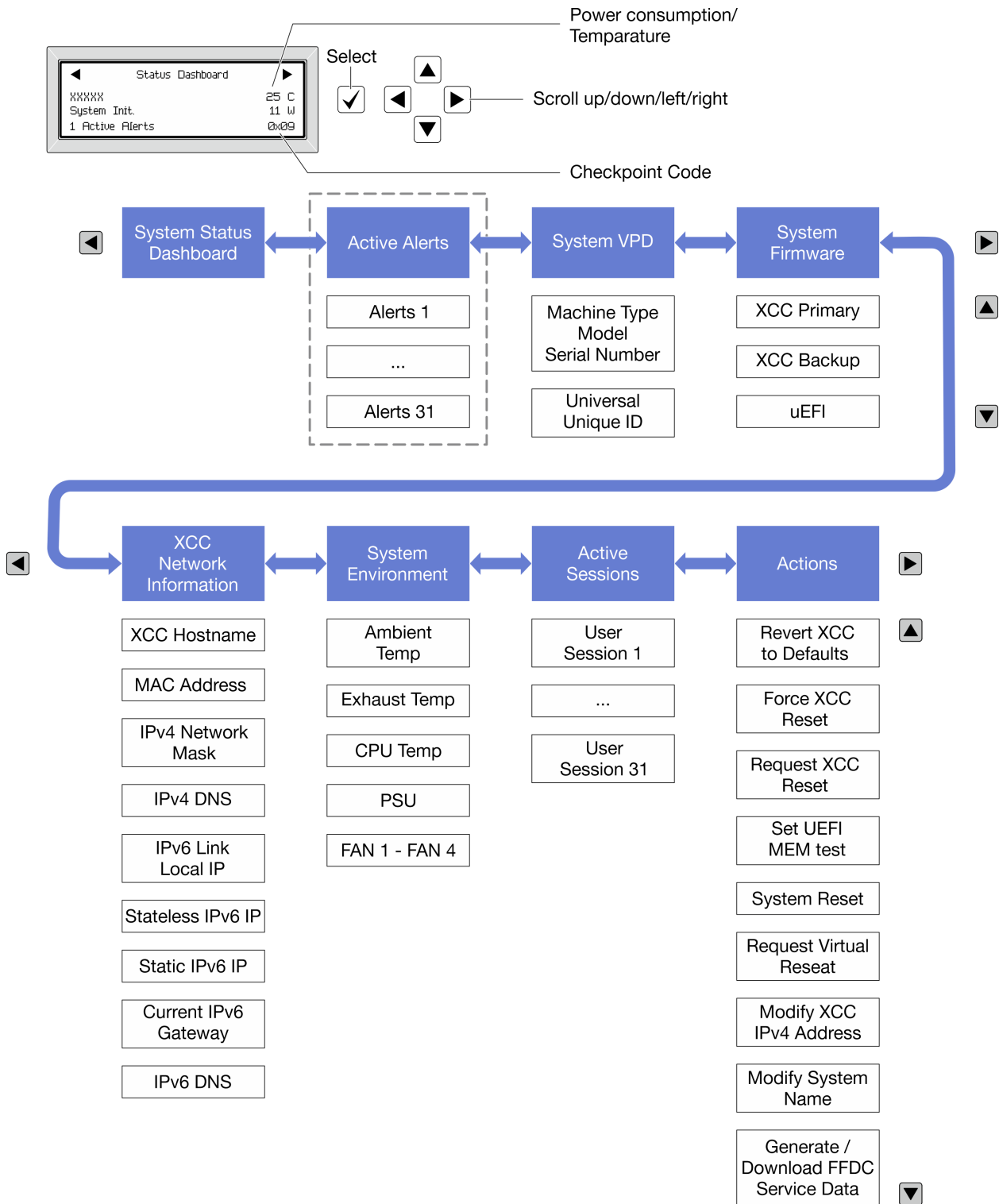
**3** Select button

Press the select button to select from the options in the menu.

## Options flow diagram

The LCD panel displays various system information. Navigate through the options with the scroll keys.

Depending on the model, the options and entries on the LCD display might be different.



**Full menu list**

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

Depending on the model, the options and entries on the LCD display might be different.

## Home Menu (System Status Dashboard)

Home Menu	Example
<p><b>1</b> System name</p> <p><b>2</b> System status</p> <p><b>3</b> Active alert quantity</p> <p><b>4</b> Temperature</p> <p><b>5</b> Power consumption</p> <p><b>6</b> Checkpoint code</p>	<p>The screenshot shows a 'Status Dashboard' with the following information:         <ul style="list-style-type: none"> <li><b>1</b>: System name (xxxxxx)</li> <li><b>2</b>: System status (System Init.)</li> <li><b>3</b>: Active alert quantity (1 Active Alerts)</li> <li><b>4</b>: Temperature (25 C)</li> <li><b>5</b>: Power consumption (11 W)</li> <li><b>6</b>: Checkpoint code (0x09)</li> </ul> </p>

## Active Alerts

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

## System VPD Information

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

## System Firmware

Sub Menu	Example
XCC Primary <ul style="list-style-type: none"> <li>Firmware level (status)</li> <li>Build ID</li> <li>Version number</li> <li>Release date</li> </ul>	XCC Primary (Active) Build: DVI399T Version: 4.07 Date: 2020-04-07
XCC Backup <ul style="list-style-type: none"> <li>Firmware level (status)</li> <li>Build ID</li> <li>Version number</li> <li>Release date</li> </ul>	XCC Backup (Active) Build: D8BT05I Version: 1.00 Date: 2019-12-30
UEFI <ul style="list-style-type: none"> <li>Firmware level (status)</li> <li>Build ID</li> <li>Version number</li> <li>Release date</li> </ul>	UEFI (Inactive) Build: DOE101P Version: 1.00 Date: 2019-12-26

## XCC Network Information

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

## System Environmental Information

Sub Menu	Example
<ul style="list-style-type: none"> <li>• Ambient temperature</li> <li>• CPU temperature</li> <li>• PSU status</li> <li>• Spinning speed of fans by RPM</li> </ul>	Ambient Temp: 24 C CPU1 Temp: 50 C PSU1: Vin= 213 w Inlet= 26 C FAN1 Front: 21000 RPM FAN2 Front: 21000 RPM FAN3 Front: 21000 RPM FAN4 Front: 21000 RPM

## Active Sessions

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

## Actions

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

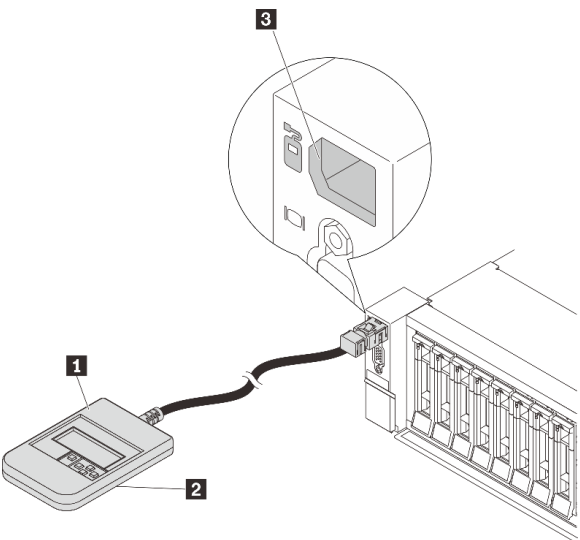
## External diagnostics handset

The external diagnostics handset is an external device that can be connected to the server with a cable, and it allows quick access to system information such as errors, system status, firmware, network, and health information.

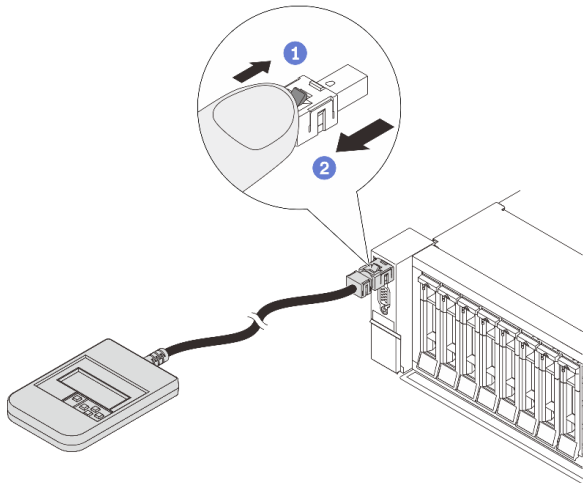
**Note:** The external diagnostics handset is an optional part that needs to be purchased separately.

- [“Location of the external diagnostics handset” on page 47](#)
- [“Diagnostics panel overview” on page 47](#)
- [“Options flow diagram” on page 49](#)
- [“Full menu list” on page 50](#)

## Location of the external diagnostics handset

Location	Description
<p>The external diagnostics handset is connected to the server with an external cable.</p> 	<p><b>1</b> External diagnostics handset</p>
	<p><b>2</b> Magnetic bottom With this component, the diagnostics handset can be attached to the top or side of the rack with hands spared for service tasks.</p>
	<p><b>3</b> External diagnostics connector This connector is located on the front of the server and is used to connect an external diagnostics handset.</p>

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

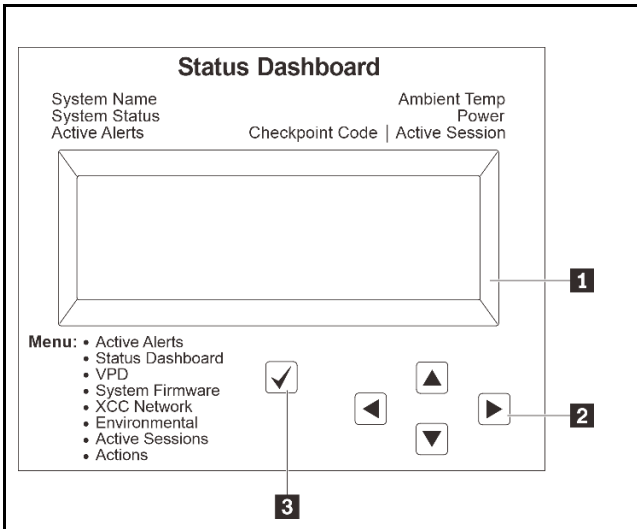


Step 1. Press the plastic clip on the plug in the shown direction.

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

### Diagnostics panel overview

The diagnostics device consists of an LCD display and 5 navigation buttons.



**1** LCD display

**2** Scroll buttons (up/down/left/right)  
 Press the scroll buttons to locate and select system information.

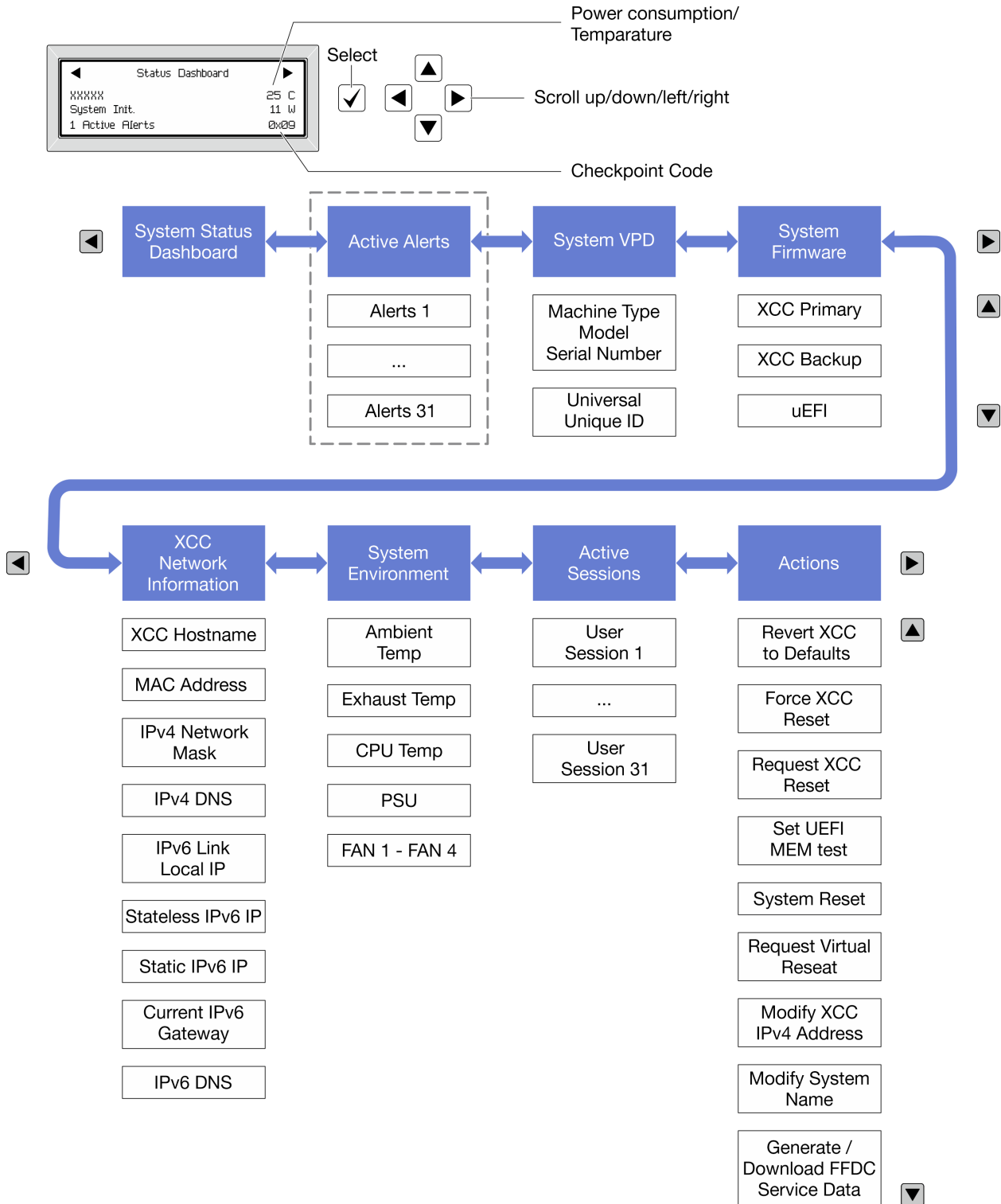
**3** Select button  
 Press the select button to select from the options in the menu.



## Options flow diagram

The LCD panel displays various system information. Navigate through the options with the scroll keys.

Depending on the model, the options and entries on the LCD display might be different.



## Full menu list

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

Depending on the model, the options and entries on the LCD display might be different.

### Home Menu (System Status Dashboard)

Home Menu	Example
<ul style="list-style-type: none"> <li>1 System name</li> <li>2 System status</li> <li>3 Active alert quantity</li> <li>4 Temperature</li> <li>5 Power consumption</li> <li>6 Checkpoint code</li> </ul>	<p>The screenshot shows a 'Status Dashboard' screen with the following information:         <ul style="list-style-type: none"> <li>1: System name (represented by 'xxxxxx')</li> <li>2: System status ('System Init.')</li> <li>3: Active alert quantity ('1 Active Alerts')</li> <li>4: Temperature ('25 C')</li> <li>5: Power consumption ('11 W')</li> <li>6: Checkpoint code ('0x09')</li> </ul> </p>

### Active Alerts

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

### System VPD Information

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

## System Firmware

Sub Menu	Example
XCC Primary <ul style="list-style-type: none"> <li>Firmware level (status)</li> <li>Build ID</li> <li>Version number</li> <li>Release date</li> </ul>	XCC Primary (Active) Build: DVI399T Version: 4.07 Date: 2020-04-07
XCC Backup <ul style="list-style-type: none"> <li>Firmware level (status)</li> <li>Build ID</li> <li>Version number</li> <li>Release date</li> </ul>	XCC Backup (Active) Build: D8BT05I Version: 1.00 Date: 2019-12-30
UEFI <ul style="list-style-type: none"> <li>Firmware level (status)</li> <li>Build ID</li> <li>Version number</li> <li>Release date</li> </ul>	UEFI (Inactive) Build: DOE101P Version: 1.00 Date: 2019-12-26

## XCC Network Information

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

## System Environmental Information

Sub Menu	Example
<ul style="list-style-type: none"> <li>• Ambient temperature</li> <li>• CPU temperature</li> <li>• PSU status</li> <li>• Spinning speed of fans by RPM</li> </ul>	Ambient Temp: 24 C CPU1 Temp: 50 C PSU1: Vin= 213 w Inlet= 26 C FAN1 Front: 21000 RPM FAN2 Front: 21000 RPM FAN3 Front: 21000 RPM FAN4 Front: 21000 RPM

## Active Sessions

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

## Actions

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

## Rear system LEDs

This topic provides information on the system ID LED and the system error LED on the rear of the server.

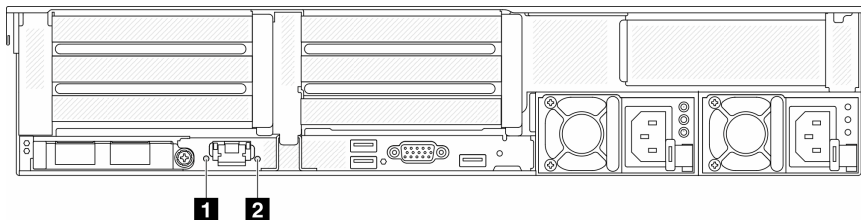


Figure 16. Rear system LEDs

LED	Description	Action
<b>1</b> System ID LED (blue)	This LED helps you to visually locate the server.	A system ID button with LED is also located on the front of the server. You can press the system ID button to turn on/off or blink the front and rear ID LEDs.
<b>2</b> System error LED (yellow)	LED on: an error has occurred.	Check system logs or internal error LEDs to identify the failed part. For more information, see <a href="#">System error LED</a> .

## XCC system management port LEDs

This topic provides information on LEDs of XCC system management port.

The following table describes the problems that are indicated by LEDs on XCC system management port.

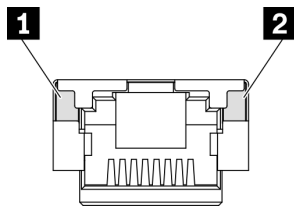


Figure 17. XCC system management port LEDs

LED	Description
<b>1</b> Ethernet port link LED	Use this green LED to distinguish the network connectivity status: <ul style="list-style-type: none"> <li>Off: The network link is disconnected.</li> <li>Green: The network link is established.</li> </ul>
<b>2</b> Ethernet port activity LED	Use this green LED to distinguish the network activity status: <ul style="list-style-type: none"> <li>Off: The server is disconnected from a LAN.</li> <li>Green: The network is connected and active.</li> </ul>

## Power supply LEDs

This topic provides information about various power supply LED status and corresponding action suggestions.

The following minimal configuration is required for the server to start:

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

The following table describes the problems that are indicated by various combinations of the power-supply LEDs and the power-on LED and suggested actions to correct the detected problems.

**Note:** Depending on the power supply type, your power supply might look slightly different from the following illustration.

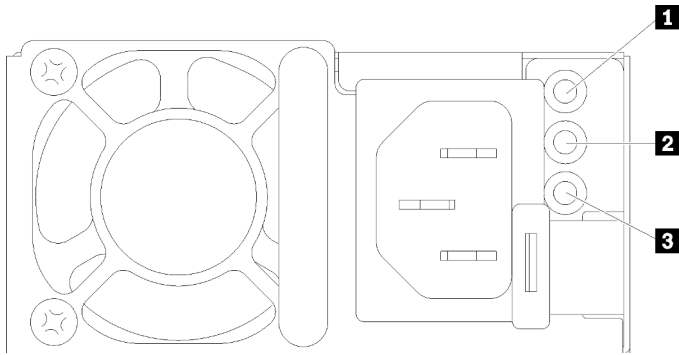


Figure 18. Power supply LEDs

LED	Description
<b>1</b> Input status	<p>The input status LED can be in one of the following states:</p> <ul style="list-style-type: none"> <li>• Green: The power supply is connected to the input power source.</li> <li>• Off: The power supply is disconnected from the input power source.</li> </ul>
<b>2</b> Output status	<p>The output status LED can be in one of the following states:</p> <ul style="list-style-type: none"> <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> <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.</li> </ul> <p>To disable zero-output mode, log in to the Lenovo XClarity Controller web interface, choose <b>Server Configuration → Power Policy</b>, disable <b>Zero Output Mode</b>, and then click <b>Apply</b>. If you disable zero-output mode, both power supplies will be in the active state.</p>
<b>3</b> Power supply error LED	<ul style="list-style-type: none"> <li>• Off: The power supply is working normally</li> <li>• Yellow: Dump the FFDC log from affected systems and escalate to next level for PSU data log reviewing.</li> </ul>

## System-board-assembly LEDs

The following illustration shows the light-emitting diodes (LEDs) on the system board assembly that contains the system I/O board and processor board.

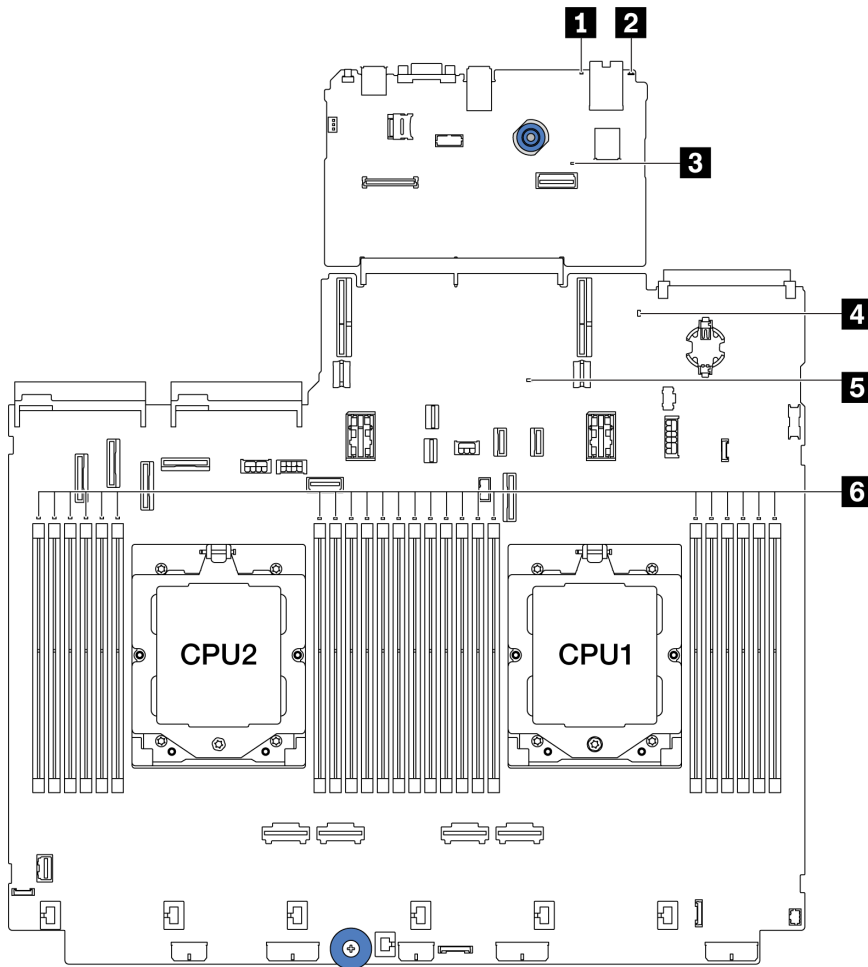


Figure 19. System-board-assembly LEDs

Table 29. System-board-assembly LEDs

LED	Description	Action
<b>1</b> System error LED (yellow)	LED on: An error has occurred.	Check system logs or internal error LEDs to identify the failed part. For more information, see <a href="#">System error LED</a> .
<b>2</b> System ID LED (blue)	This LED helps you visually locate the server.	A system ID button with LED is also located on the front of the server. You can press the system ID button to turn on/off or blink the front and rear ID LEDs.

Table 29. System-board-assembly LEDs (continued)

LED	Description	Action
<p><b>3</b> XCC heartbeat LED (green)</p>	<p>The XCC heartbeat LED helps you identify the XCC status.</p> <ul style="list-style-type: none"> <li>• Blinking (about one flash per second): XCC is working normally.</li> <li>• Blinking at other speeds or always on: XCC is at the initial phase or is working abnormally.</li> <li>• Off: XCC is not working.</li> </ul>	<ul style="list-style-type: none"> <li>• If the XCC heartbeat LED is always off or always on, do the following: <ul style="list-style-type: none"> <li>– If XCC cannot be accessed: <ol style="list-style-type: none"> <li>1. Re-plug the power cord.</li> <li>2. Check and ensure that the system I/O board and the firmware and RoT security module are installed correctly. (Trained technician only) Reinstall them if needed.</li> <li>3. (Trained technician only) Replace the firmware and RoT security module.</li> <li>4. (Trained technician only) Replace the system I/O board.</li> </ol> </li> <li>– If XCC can be accessed, replace the system I/O board.</li> </ul> </li> <li>• If the XCC heartbeat LED is blinking fast over 5 minutes, do the following: <ol style="list-style-type: none"> <li>1. Re-plug the power cord.</li> <li>2. Check and ensure that the system I/O board and the firmware and RoT security module are installed correctly. (Trained technician only) Reinstall them if needed.</li> <li>3. (Trained technician only) Replace the firmware and RoT security module.</li> <li>4. (Trained technician only) Replace the system I/O board.</li> </ol> </li> <li>• If the XCC heartbeat LED is blinking slowly over 5 minutes, do the following: <ol style="list-style-type: none"> <li>1. Re-plug the power cord.</li> <li>2. Check and ensure that the system I/O board and the firmware and RoT security module are installed correctly. (Trained technician only) Reinstall them if needed.</li> <li>3. If the problem remains, contact Lenovo Support.</li> </ol> </li> </ul>
<p><b>4</b> System status LED (green)</p>	<p>The system status LED indicates the working status of the system.</p> <ul style="list-style-type: none"> <li>• Fast blinking (about four flashes per second): Power fault or waiting for XCC power permission ready</li> <li>• Slow blinking (about one flash per second): Power off and is ready to be powered on (standby state).</li> <li>• ON: Power on</li> </ul> <p>Video of LED blinking status is available at: <a href="#">YouTube</a></p>	<ul style="list-style-type: none"> <li>• If the system status LED is blinking fast over 5 minutes and cannot power on, check the XCC heartbeat LED and follow the <a href="#">actions for the XCC heartbeat LED</a>.</li> <li>• If the system status LED remains off or is blinking fast (about four flashes per second) and the system error LED on the front panel is on (yellow), the system is in a power fault status. Do the following: <ol style="list-style-type: none"> <li>1. Re-plug the power cord.</li> <li>2. Remove installed adapters/devices, one at a time, until you reach the minimal configuration for debugging.</li> <li>3. (Trained technician only) If the problem remains, capture FFDC log, and replace the processor board.</li> </ol> </li> </ul>



Table 29. System-board-assembly LEDs (continued)

LED	Description	Action
		4. If the problem still remains, contact Lenovo Support.
<b>5</b> FPGA heartbeat LED (green)	<p>The FPGA heartbeat LED helps you identify the FPGA status.</p> <ul style="list-style-type: none"> <li>Blinking (about one flash per second) : FPGA is working normally.</li> <li>On or off: FPGA is not working.</li> </ul>	<p>If the FPGA heartbeat LED is always off or always on, do the following:</p> <ol style="list-style-type: none"> <li>Replace the processor board.</li> <li>If the problem remains, contact Lenovo Support.</li> </ol>
<b>6</b> DIMM error LEDs (Amber)	LED on: an error has occurred to the DIMM the LED represents.	For more information, see “Memory problems” in <i>User Guide</i> or <i>Hardware Maintenance Guide</i> .

## LEDs on the firmware and RoT security module

The following illustrations show the light-emitting diodes (LEDs) on the ThinkSystem V3 Firmware and Root of Trust Security Module (firmware and RoT security module).

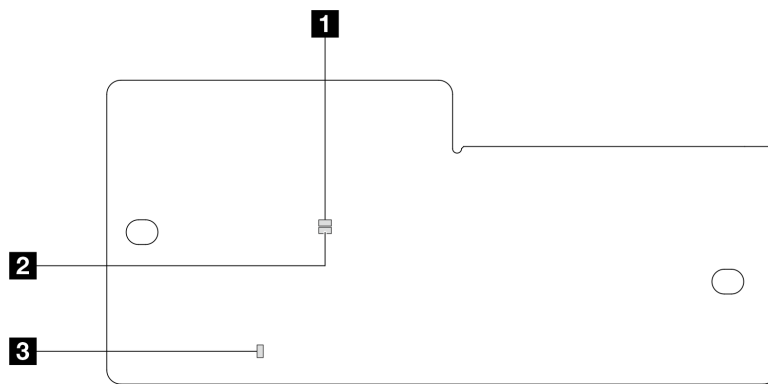


Figure 20. LEDs on the firmware and RoT security module

<b>1</b> AP0 LED (Green)	<b>2</b> AP1 LED (Green)	<b>3</b> Fatal Error LED (Amber)
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Table 30. LEDs description

Scenario	AP0 LED	AP1 LED	Fatal Error LED	FPGA heartbeat LED <sup>note</sup>	XCC heartbeat LED <sup>note</sup>	Actions
RoT security module fatal firmware failure	Off	Off	On	N/A	N/A	Replace the firmware and RoT security module.
	Blink	N/A	On	N/A	N/A	Replace the firmware and RoT security module.
	Blink	N/A	On	On	N/A	Replace the firmware and RoT security module.

Table 30. LEDs description (continued)

Scenario	AP0 LED	AP1 LED	Fatal Error LED	FPGA heartbeat LED <sup>note</sup>	XCC heartbeat LED <sup>note</sup>	Actions
No system power (FPGA heartbeat LED off)	Off	Off	Off	Off	Off	If the AC power is on, but the system board assembly does not have power, then: <ol style="list-style-type: none"> <li>1. Check the power supply unit (PSU) or power interposer board (PIB) if any. If the PSU or PIB has any error, replace it.</li> <li>2. If the PSU or PIB is good, do the following:               <ol style="list-style-type: none"> <li>a. Replace the system I/O board.</li> <li>b. Replace the processor board.</li> </ol> </li> </ol>
XCC firmware recoverable error	Blink	N/A	Off	N/A	N/A	Information only. No action is required.
XCC firmware is recovered from error	Blink	N/A	Off	N/A	N/A	Information only. No action is required.
UEFI firmware authentication failure	N/A	Blink	Off	N/A	N/A	Information only. No action is required.
UEFI firmware is recovered from authentication failure	N/A	On	Off	N/A	N/A	Information only. No action is required.
System is OK (FPGA heartbeat LED is On)	On	On	Off	On	On	Information only. No action is required.

**Note:** For locations of the FPGA LED and XCC heartbeat LED, see [“System-board-assembly LEDs” on page 55](#).

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## Chapter 3. Parts list

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

- “2.5-inch drive bay chassis” on page 59
- “3.5-inch drive bay chassis” on page 63

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### 2.5-inch drive bay chassis

Use the parts list in this section to identify each of the components that are available for server models with 2.5-inch front drive bays.

For more information about ordering parts:

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

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

**Note:** Depending on the model, your server might look slightly different from the illustration. Some parts are available only on some models.

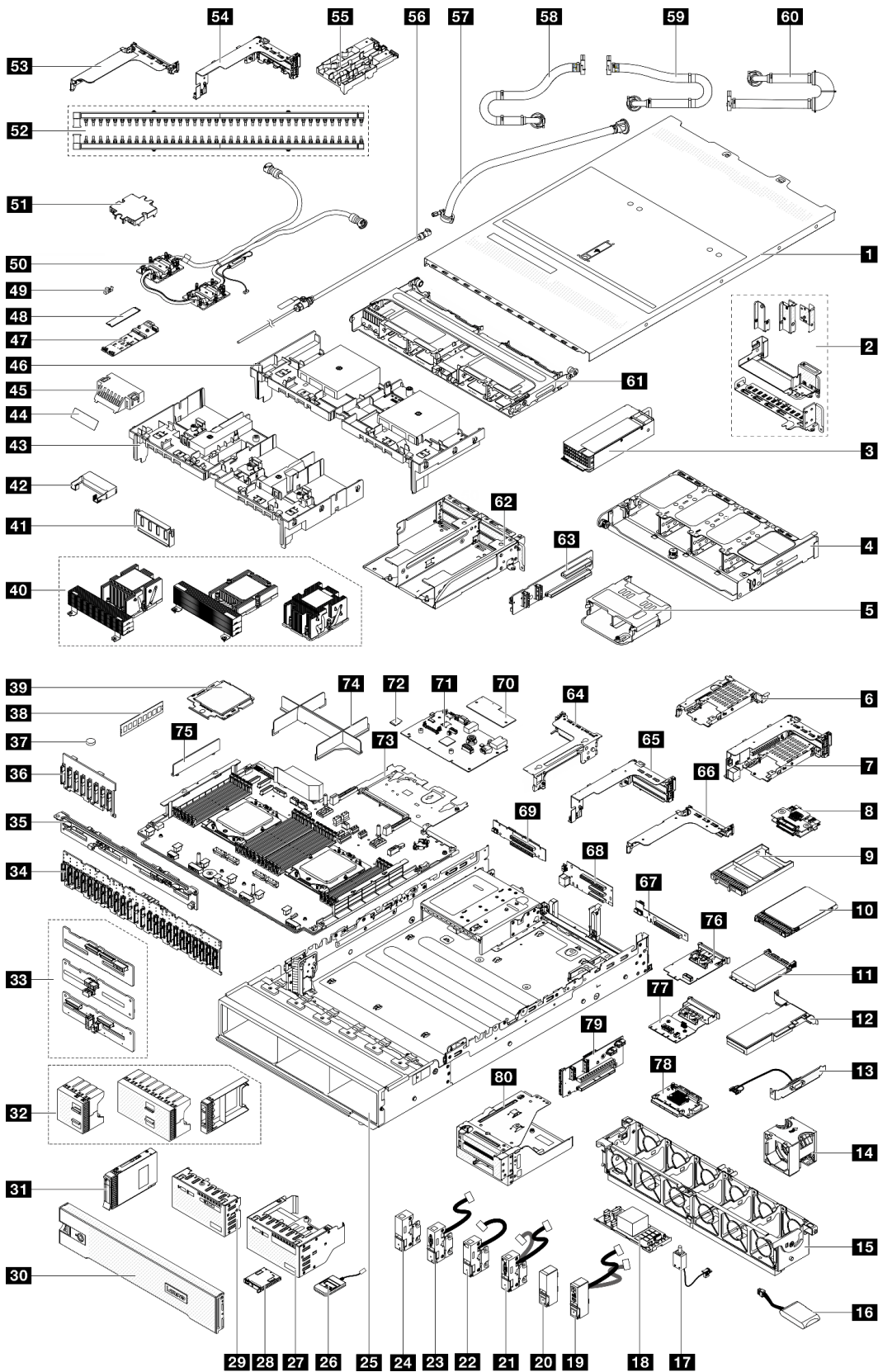


Figure 21. Server components (2.5-inch drive bay chassis)

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

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

Description	Type	Description	Type
<b>1</b> Top cover	T1	<b>2</b> Rear wall brackets	T1
<b>3</b> Power supply unit	T1	<b>4</b> Rear 8 x 2.5-inch drive cage	T1
<b>5</b> Rear 4 x 2.5-inch drive cage	T1	<b>6</b> 7mm drive cage (1U)	T1
<b>7</b> 7mm drive cage (2FH + 7mm)	T1	<b>8</b> 7mm drive backplanes	T2
<b>9</b> 7mm drive bay filler	C	<b>10</b> 7mm drive	T1
<b>11</b> OCP module	T1	<b>12</b> PCIe adapter	T1
<b>13</b> Serial port module	T1	<b>14</b> System fan	T1
<b>15</b> System fan cage	T1	<b>16</b> RAID flash power module	T1
<b>17</b> Intrusion switch	T1	<b>18</b> CFF RAID adapter/expander	T2
<b>19</b> Right rack latch with front I/O module	T1	<b>20</b> Standard right rack latch	T1
<b>21</b> Left rack latch with VGA and external diagnostics ports	T1	<b>22</b> Left rack latch with external diagnostics port	T1
<b>23</b> Left rack latch with VGA port	T1	<b>24</b> Standard left rack latch	T1
<b>25</b> Chassis	F	<b>26</b> External diagnostics handset	T1
<b>27</b> Front I/O module with integrated diagnostics panel	T1	<b>28</b> Integrated diagnostics panel	T1
<b>29</b> Front I/O module with front operator panel	T1	<b>30</b> Security bezel	C
<b>31</b> 2.5-inch drive	T1	<b>32</b> 2.5-inch drive fillers (1-bay, 4-bay, or 8-bay)	C
<b>33</b> Middle/Rear 4 x 2.5-inch drive backplane	T1	<b>34</b> Front 24 x 2.5-inch expander backplane	T1
<b>35</b> Rear 8 x 2.5-inch drive backplane	T1	<b>36</b> Front 8 x 2.5-inch drive backplane	T1
<b>37</b> CMOS battery (CR2032)	C	<b>38</b> Memory module	T1
<b>39</b> Processor	F	<b>40</b> Heat sinks	F
<b>41</b> GPU air baffle filler	C	<b>42</b> Add-on air baffle (for GPU air baffle)	T1
<b>43</b> GPU air baffle	T1	<b>44</b> Mylar for standard air baffle filler <sup>note</sup>	C
<b>45</b> Standard air baffle filler	C	<b>46</b> Standard air baffle	T1
<b>47</b> M.2 drive backplane	T1	<b>48</b> M.2 drive	T1
<b>49</b> M.2 retainer clip	T1	<b>50</b> Direct water cooling module	F
<b>51</b> Cold plate cover	C	<b>52</b> Manifolds	FRU
<b>53</b> 1FH riser cage for DWCM	C	<b>54</b> 3FH riser cage for DWCM	C
<b>55</b> Hose holder	C	<b>56</b> Bleeder kit	FRU

Description	Type	Description	Type
<b>57</b> 42U in-row hose kit	FRU	<b>58</b> 42U/48U in-rack connection hose (return side)	FRU
<b>59</b> 48U in-rack connection hose (supply side)	FRU	<b>60</b> 42U in-rack connection hose (supply side)	FRU
<b>61</b> Middle drive cage	T1	<b>62</b> 4LP riser 3/4 cage	T1
<b>63</b> Riser 3/4 card	T1	<b>64</b> Riser 3 cage	T1
<b>65</b> Riser 1 or riser 2 cage	T1	<b>66</b> 1U riser cage	T1
<b>67</b> Riser card (LP)	T1	<b>68</b> Riser 1 or riser 2 card	T1
<b>69</b> Riser 3 card	T2	<b>70</b> Firmware and RoT security module	F
<b>71</b> System I/O board	F	<b>72</b> MicroSD card	T1
<b>73</b> Processor board	F	<b>74</b> Processor filler	C
<b>75</b> 2U cable wall bracket	T1	<b>76</b> Management NIC adapter	T1
<b>77</b> Rear OCP interposer card	T1	<b>78</b> Front OCP interposer card	T1
<b>79</b> Riser 5 card	T2	<b>80</b> Front adapter cage	T1

**Note:** The Mylar is needed only for configurations with DWCM and is pasted on the outside of the standard air baffle filler. For details, see “Install the air baffle” in *User Guide* or *Hardware Maintenance Guide*.

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## 3.5-inch drive bay chassis

Use the parts list in this section to identify each of the components that are available for server models with 3.5-inch front drive bays.

For more information about ordering parts:

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

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

**Note:** Depending on the model, your server might look slightly different from the illustration. Some parts are available only on some models.

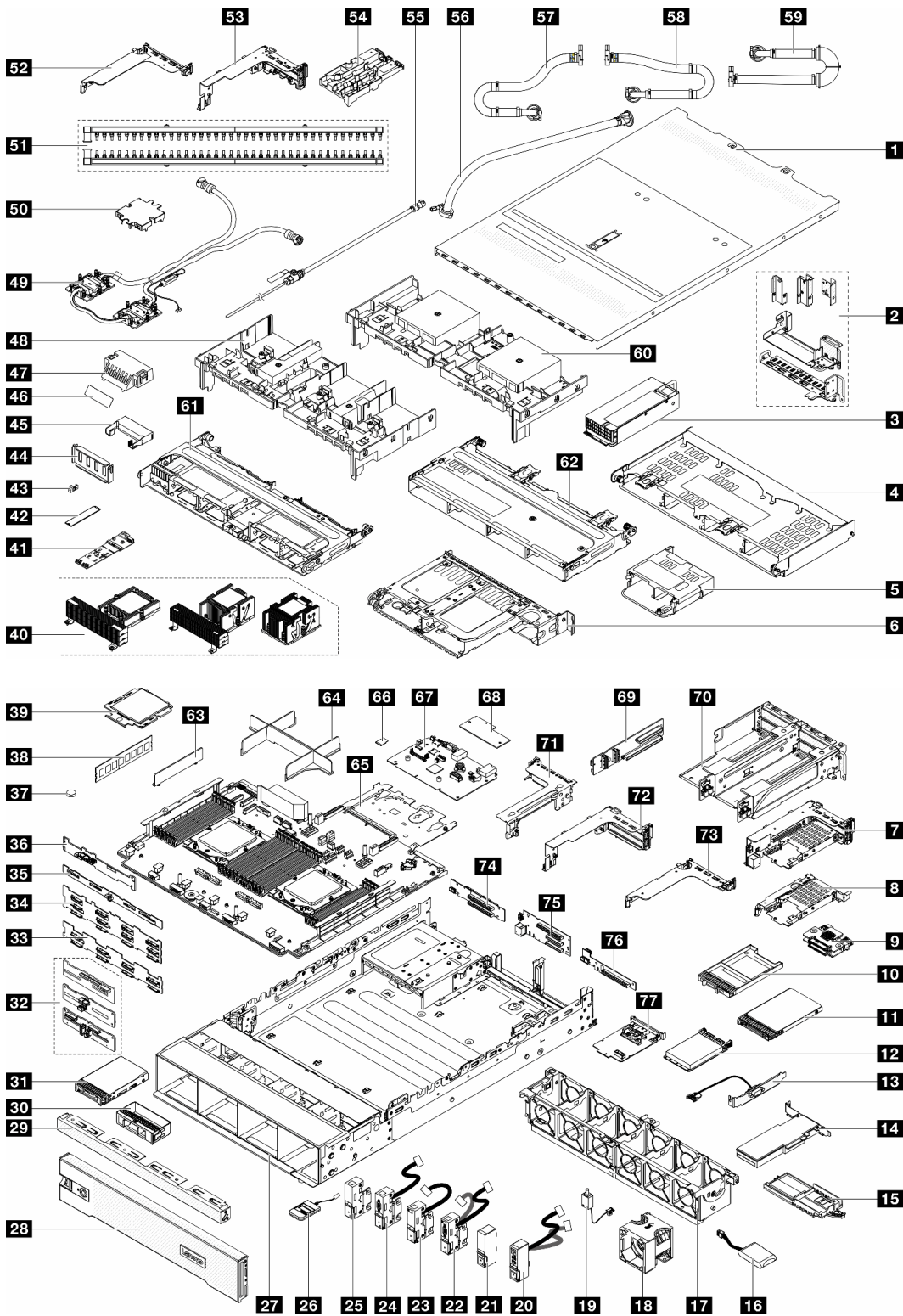


Figure 22. Server components (3.5-inch drive bay chassis)

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

- **T1:** Tier 1 customer replaceable unit (CRU). Replacement of Tier 1 CRUs is your responsibility. If Lenovo installs a Tier 1 CRU at your request with no service agreement, you will be charged for the installation.



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

Description	Type	Description	Type
<b>1</b> Top cover	T1	<b>2</b> Rear wall brackets	T1
<b>3</b> Power supply unit	T1	<b>4</b> Rear 4 x 3.5-inch drive cage	T1
<b>5</b> Rear 4 x 2.5-inch drive cage	T1	<b>6</b> Rear 2 x 3.5-inch drive cage	T1
<b>7</b> 7mm drive cage (2FH + 7mm)	T1	<b>8</b> 7mm drive cage (1U)	T1
<b>9</b> 7mm drive backplanes	T2	<b>10</b> 7mm drive bay filler	C
<b>11</b> 7mm drive	T1	<b>12</b> OCP module	T1
<b>13</b> Serial port module	T1	<b>14</b> PCIe adapter	T1
<b>15</b> RAID flash power module holder	T1	<b>16</b> RAID flash power module	T1
<b>17</b> System fan cage	T1	<b>18</b> System fan	T1
<b>19</b> Intrusion switch	T1	<b>20</b> Right rack latch with front I/O module	T1
<b>21</b> Standard right rack latch	T1	<b>22</b> Left rack latch with VGA and external diagnostics ports	T1
<b>23</b> Left rack latch with external diagnostics port	T1	<b>24</b> Left rack latch with VGA port	T1
<b>25</b> Standard left rack latch	T1	<b>26</b> External diagnostics handset	T1
<b>27</b> Chassis	F	<b>28</b> Security bezel	C
<b>29</b> 3.5-inch drive fillers (4-bay)	C	<b>30</b> 3.5-inch drive fillers (1-bay)	C
<b>31</b> 3.5-inch drive	T1	<b>32</b> Middle/Rear 4 x 2.5-inch drive backplane	T1
<b>33</b> Front 8 x 3.5-inch drive backplane	T1	<b>34</b> Front 12 x 3.5-inch drive backplane:	T1
<b>35</b> Rear 4 x 3.5-inch drive backplane	T1	<b>36</b> Rear 2 x 3.5-inch drive backplane	T1
<b>37</b> CMOS battery (CR2032)	C	<b>38</b> Memory module	T1
<b>39</b> Processor	F	<b>40</b> Heat sinks:	F
<b>41</b> M.2 drive backplane	T1	<b>42</b> M.2 drive	T1
<b>43</b> M.2 retainer clip	T1	<b>44</b> GPU air baffle filler	C
<b>45</b> Add-on air baffle (for GPU air baffle)	T1	<b>46</b> Mylar for standard air baffle filler <sup>note</sup>	C
<b>47</b> Standard air baffle filler	C	<b>48</b> GPU air baffle	T1
<b>49</b> Direct water cooling module	F	<b>50</b> Cold plate cover	C
<b>51</b> Manifolds	FRU	<b>52</b> 1FH riser cage for DWCM	C
<b>53</b> 3FH riser cage for DWCM	C	<b>54</b> Hose holder	C
<b>55</b> Bleeder kit	FRU	<b>56</b> 42U in-row hose kit	FRU
<b>57</b> 42U/48U in-rack connection hose (return side)	FRU	<b>58</b> 48U in-rack connection hose (supply side)	FRU

Description	Type	Description	Type
<b>59</b> 42U in-rack connection hose (supply side)	FRU	<b>60</b> Standard air baffle	T1
<b>61</b> Middle 8 x 2.5-inch drive cage	T1	<b>62</b> Middle 4 x 3.5-inch drive cage	T1
<b>63</b> 2U cable wall bracket	T1	<b>64</b> Processor filler	C
<b>65</b> Processor board	F	<b>66</b> MicroSD card	T1
<b>67</b> System I/O board	F	<b>68</b> Firmware and RoT security module	F
<b>69</b> Riser 3/4 card	T1	<b>70</b> 4LP riser 3/4 cage	T1
<b>71</b> Riser 3 cage	T1	<b>72</b> Riser 1 or riser 2 cage	T1
<b>73</b> 1U riser cage	T1	<b>74</b> Riser 3 card	T2
<b>75</b> Riser 1 or riser 2 card	T1	<b>76</b> Riser card (LP)	T1
<b>77</b> Management NIC adapter	T1		

**Note:** The Mylar is needed only for configurations with DWCM and is pasted on the outside of the standard air baffle filler. For details, see “Install the air baffle” in *User Guide* or *Hardware Maintenance Guide*.

## Power cords

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

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

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

### Notes:

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

---

## Chapter 4. Unboxing and setup

Information in this section assists you on unboxing and setting up the server. When unboxing the server, check if the items in the package are correct, and learn where to find information of server serial number and Lenovo XClarity Controller access. Make sure to follow the instructions in [“Server setup checklist” on page 69](#) when setting up the server.

---

### Server package contents

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

The server package includes the following items:

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

#### Notes:

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

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

---

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

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

#### Identifying your server

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

The illustration below shows the locations of the ID labels which contain the model number, machine type, and serial number of the server.

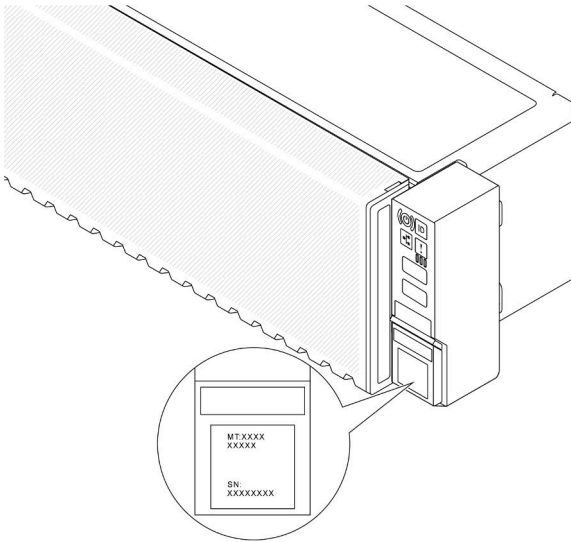


Figure 23. Locations of the ID labels

### Lenovo XClarity Controller network access label

The Lenovo XClarity Controller (XCC) network access label is attached to the pull-out information tab located near the lower right corner in the front of the chassis, with MAC address accessible with a pull. After you receive the server, peel the XCC network access label away and store it in a safe place.

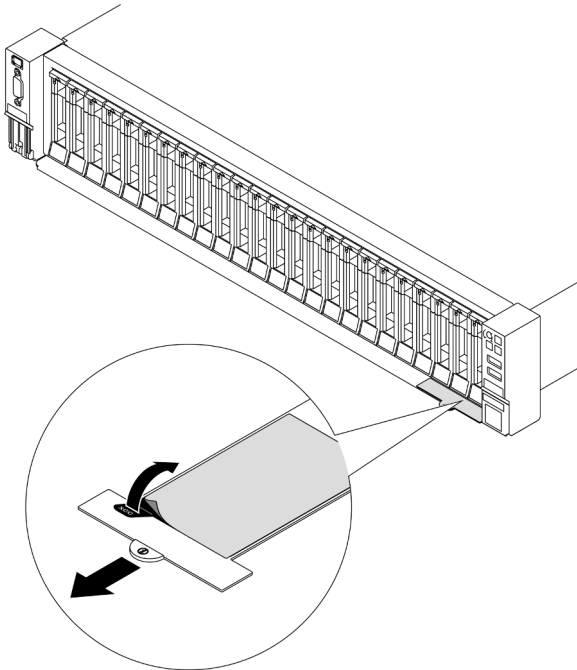


Figure 24. Lenovo XClarity Controller network access label on the pull-out information tab

### Service Label and QR code

The system Service Label, which is located on the top cover, provides a quick response (QR) code for mobile access to service information. You can scan the QR code with a mobile device using a QR code reader application and get quick access to the Service Information web page. The Service Information web page

provides additional information for parts installation and replacement videos, and error codes for solution support.

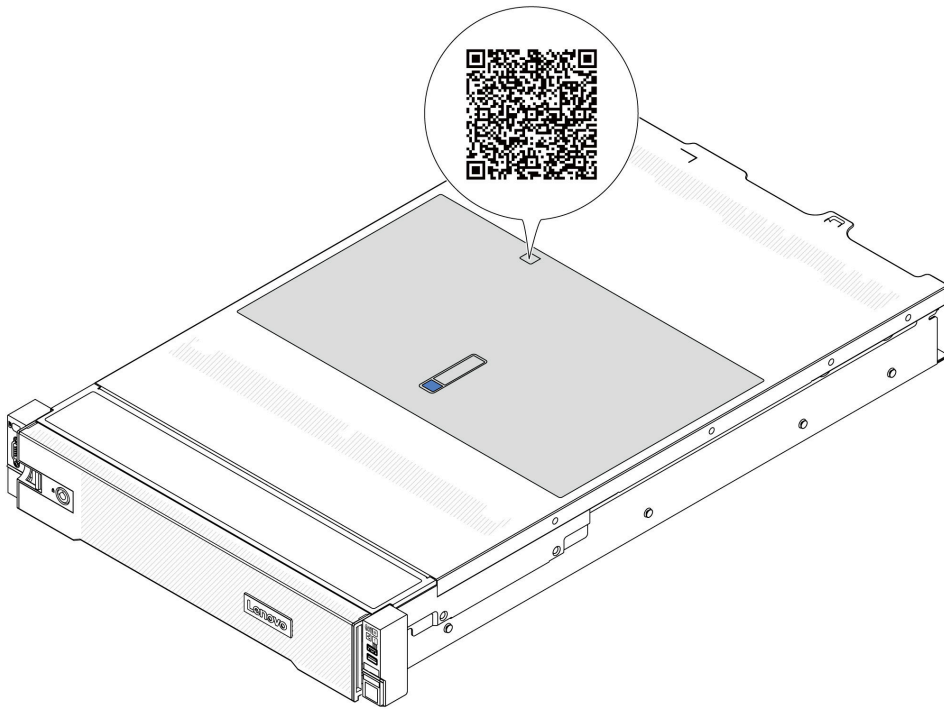


Figure 25. Service label and QR code

---

## Server setup checklist

Use the server setup checklist to ensure that you have performed all tasks that are required to set up your server.

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

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

### Setup the server hardware

Complete the following procedures to setup the server hardware.

1. Unpack the server package. See [“Server package contents” on page 67](#).
2. Install any required hardware or server options. See the related topics in “Hardware replacement procedures” in *User Guide* or *Hardware Maintenance Guide*.
3. If necessary, install the rail and CMA to a standard rack cabinet. Follow the instruction in *Rail Installation Guide* and *CMA Installation Guide* that comes with the rail installation kit.
4. If necessary, install the server into a standard rack cabinet. See “Install the server to rack” in *User Guide* or *Hardware Maintenance Guide*.
5. Connect all external cables to the server. See [Chapter 2 “Server components” on page 15](#) for connectors locations.

Typically, you will need to connect the following cables:

- Connect server to the power source
- Connect server to the data network
- Connect the server to the storage device
- Connect the server to the management network

6. Power on the server.

Power button location and power LED are specified in:

- [Chapter 2 “Server components” on page 15](#)
- [“System LEDs and diagnostics display” on page 39.](#)

Power button location and power LED are specified in [Chapter 2 “Server components” on page 15.](#)

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.

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

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

See [“System LEDs and diagnostics display” on page 39](#) for more information on the LED indications.

## Configure the system

Complete the following procedures to configure the system. For detailed instructions, refer to [Chapter 5 “System configuration” on page 71.](#)

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

The following information is available for RAID configuration:

- <https://lenovopress.lenovo.com/lp0578-lenovo-raid-introduction>
- <https://lenovopress.lenovo.com/lp0579-lenovo-raid-management-tools-and-resources>

4. Install the operating system.
5. Back up the server configuration.
6. Install the applications and programs for which the server is intended to be used.

---

## Chapter 5. System configuration

Complete these procedures to configure your system.

---

### Set the network connection for the Lenovo XClarity Controller

Before you can access the Lenovo XClarity Controller over your network, you need to specify how Lenovo XClarity Controller will connect to the network. Depending on how the network connection is implemented, you might need to specify a static IP address as well.

The following methods are available to set the network connection for the Lenovo XClarity Controller if you are not using DHCP:

- If a monitor is attached to the server, you can use Lenovo XClarity Provisioning Manager to set the network connection.

Complete the following steps to connect the Lenovo XClarity Controller to the network using the Lenovo XClarity Provisioning Manager.

1. Start the server.
2. Press the key specified in the on-screen instructions to display the Lenovo XClarity Provisioning Manager interface. (For more information, see the “Startup” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>.)
3. Go to **LXPM → UEFI Setup → BMC Settings** to specify how the Lenovo XClarity Controller will connect to the network.
  - If you choose a static IP connection, make sure that you specify an IPv4 or IPv6 address that is available on the network.
  - If you choose a DHCP connection, make sure that the MAC address for the server has been configured in the DHCP server.
4. Click **OK** to apply the setting and wait for two to three minutes.
5. Use an IPv4 or IPv6 address to connect Lenovo XClarity Controller.

**Important:** The Lenovo XClarity Controller is set initially with a user name of USERID and password of PASSW0RD (with a zero, not the letter O). This default user setting has Supervisor access. It is required to change this user name and password during your initial configuration for enhanced security.

- If no monitor is attached to the server, you can set the network connection through the Lenovo XClarity Controller interface. Connect an Ethernet cable from your laptop to XCC system management port on your server. For the location of the XCC system management port, see [Chapter 2 “Server components” on page 15](#).

**Note:** Make sure that you modify the IP settings on the laptop so that it is on the same network as the server default settings.

The default IPv4 address and the IPv6 Link Local Address (LLA) is provided on the Lenovo XClarity Controller Network Access label that is affixed to the Pull Out Information Tab. See [“Identify the server and access the Lenovo XClarity Controller” on page 67](#).

- If you are using the Lenovo XClarity Administrator Mobile app from a mobile device, you can connect to the Lenovo XClarity Controller through the Lenovo XClarity Controller USB connector on the server. For the location of the Lenovo XClarity Controller USB connector, see [Chapter 2 “Server components” on page 15](#).

**Note:** The Lenovo XClarity Controller USB connector mode must be set to manage the Lenovo XClarity Controller (instead of normal USB mode). To switch from normal mode to Lenovo XClarity Controller management mode, hold the ID button on the server for at least 3 seconds until its LED flashes slowly (once every couple of seconds). See [Chapter 2 “Server components” on page 15](#) for the location of the ID button.

To connect using the Lenovo XClarity Administrator Mobile app:

1. Connect the USB cable of your mobile device to the Lenovo XClarity Controller USB connector on the server.
2. On your mobile device, enable USB tethering.
3. On your mobile device, launch the Lenovo XClarity Administrator mobile app.
4. If automatic discovery is disabled, click **Discovery** on the USB Discovery page to connect to the Lenovo XClarity Controller.

For more information about using the Lenovo XClarity Administrator Mobile app, see:

[https://pubs.lenovo.com/lxca/lxca\\_usemobileapp](https://pubs.lenovo.com/lxca/lxca_usemobileapp)

---

## Set USB port for Lenovo XClarity Controller connection

Before you can access the Lenovo XClarity Controller through the USB port, you need to configure the USB port for Lenovo XClarity Controller connection.

### Server support

To see if your server supports accessing Lenovo XClarity Controller through the USB port, check one of the following:

- Refer to [Chapter 2 “Server components” on page 15](#).



- If there is a wrench icon on the USB port of your server, you can set the management USB port to connect to Lenovo XClarity Controller. It is also the only USB port that supports USB automation update of the firmware and RoT security module.

### Setting the USB port for Lenovo XClarity Controller connection

You can switch the USB port between normal and Lenovo XClarity Controller management operation by performing one of the following steps.

- Hold the ID button for at least 3 second until its LED flashes slowly (once every couple of seconds). See [Chapter 2 “Server components” on page 15](#) for ID button location.
- From the Lenovo XClarity Controller management controller CLI, run the `usbfp` command. For information about using the Lenovo XClarity Controller CLI, see the “Command-line interface” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>.
- From the Lenovo XClarity Controller management controller web interface, click **BMC Configuration → Network → USB Management Port Assignment**. For information about Lenovo XClarity Controller web interface functions, see the “Description of XClarity Controller functions on web interface” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>.

### Checking USB port current setting

You can also check the current setting of the USB port using the Lenovo XClarity Controller management controller CLI (`usbfp` command) or the Lenovo XClarity Controller management controller web interface (**BMC Configuration → Network → USB Management Port Assignment**). See the “Command-line



interface” and “Description of XClarity Controller functions on web interface” sections in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxccc-overview/>.

---

## Update the firmware

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:
  - <https://lenovopress.lenovo.com/lp0656-lenovo-thinksystem-firmware-and-driver-update-best-practices>
- The latest firmware can be found at the following site:
  - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr665v3/downloads/driver-list/>
- You can subscribe to product notification to stay up to date on firmware updates:
  - <https://datacentersupport.lenovo.com/solutions/ht509500>

### Update Bundles (Service Packs)

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

### Update method terminology

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

### Firmware updating tools

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

Tool	Update Methods Supported	Core System Firmware Updates	I/O Devices Firmware Updates	Drive Firmware Updates	Graphical user interface	Command line interface	Supports Update Bundles (Service Packs)
<b>Lenovo XClarity Provisioning Manager (LXPM)</b>	In-band <sup>2</sup> On-Target	√			√		
<b>Lenovo XClarity Controller (XCC)</b>	In-band <sup>4</sup> Out-of-band Off-Target	√	Selected I/O devices	√ <sup>3</sup>	√		√
<b>Lenovo XClarity Essentials OneCLI (OneCLI)</b>	In-band Out-of-band On-Target Off-Target	√	All I/O devices	√ <sup>3</sup>		√	√
<b>Lenovo XClarity Essentials UpdateXpress (LXCE)</b>	In-band Out-of-band On-Target Off-Target	√	All I/O devices		√		√
<b>Lenovo XClarity Essentials Bootable Media Creator (BoMC)</b>	In-band Out-of-band Off-Target	√	All I/O devices		√ (BoMC application)	√ (BoMC application)	√
<b>Lenovo XClarity Administrator (LXCA)</b>	In-band <sup>1</sup> Out-of-band <sup>2</sup> Off-Target	√	All I/O devices		√		√
<b>Lenovo XClarity Integrator (LXCI) for VMware vCenter</b>	Out-of-band Off-Target	√	Selected I/O devices		√		
<b>Lenovo XClarity Integrator (LXCI) for Microsoft Windows Admin Center</b>	In-band Out-of-band On-Target Off-Target	√	All I/O devices		√		√

Tool	Update Methods Supported	Core System Firmware Updates	I/O Devices Firmware Updates	Drive Firmware Updates	Graphical user interface	Command line interface	Supports Update Bundles (Service Packs)
<b>Lenovo XClarity Integrator (LXCI) for Microsoft System Center Configuration Manager</b>	In-band On-Target	√	All I/O devices		√		√
<b>Notes:</b> <ol style="list-style-type: none"> <li>For I/O firmware updates.</li> <li>For BMC and UEFI firmware updates.</li> <li>Drive firmware update is only supported by the tools and methods below: <ul style="list-style-type: none"> <li>XCC Bare Metal Update (BMU): In-band, and requires system reboot.</li> <li>Lenovo XClarity Essentials OneCLI: <ul style="list-style-type: none"> <li>For drives supported by ThinkSystem V2 and V3 products (legacy drives): In-band, and does not require system reboot.</li> <li>For drives supported only by ThinkSystem V3 products (new drives): Staging to XCC and complete the update with XCC BMU (In-band, and requires system reboot.).</li> </ul> </li> </ul> </li> <li>Bare Metal Update (BMU) only.</li> </ol>							

- **Lenovo XClarity Provisioning Manager**

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

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

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

“Firmware Update” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>

- **Lenovo XClarity Controller**

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

**Notes:**

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

For additional information about configuring Ethernet over USB, see:

“Configuring Ethernet over USB” section in the XCC documentation version compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>

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

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

“Updating Server Firmware” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>

- **Lenovo XClarity Essentials OneCLI**

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

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

[https://pubs.lenovo.com/lxce-onecli/onecli\\_c\\_update](https://pubs.lenovo.com/lxce-onecli/onecli_c_update)

- **Lenovo XClarity Essentials UpdateXpress**

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

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

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

- **Lenovo XClarity Essentials Bootable Media Creator**

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

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

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

- **Lenovo XClarity Administrator**

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

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

[https://pubs.lenovo.com/lxca/update\\_fw](https://pubs.lenovo.com/lxca/update_fw)

- **Lenovo XClarity Integrator offerings**

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

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

<https://pubs.lenovo.com/lxci-overview/>

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## Configure the firmware

Several options are available to install and set up the firmware for the server.

**Important:** Lenovo does not recommend setting option ROMs to **Legacy**, but you can conduct this setting if necessary. Note that this setting prevents UEFI drivers for the slot devices from loading, which may cause negative side effects to Lenovo software, such as LXCA, OneCLI, and XCC. These side effects include but

are not limited to the inability to determine adapter card details, such as model name and firmware levels. For example, "ThinkSystem RAID 930-16i 4GB Flash" may be displayed as "Adapter 06:00:00". In some cases, the functionality on a specific PCIe adapter may not be enabled properly.

- **Lenovo XClarity Provisioning Manager (LXPM)**

From Lenovo XClarity Provisioning Manager, you can configure the UEFI settings for your server.

**Notes:** The Lenovo XClarity Provisioning Manager provides a Graphical User Interface to configure a server. The text-based interface to system configuration (the Setup Utility) is also available. From Lenovo XClarity Provisioning Manager, you can choose to restart the server and access the text-based interface. In addition, you can choose to make the text-based interface the default interface that is displayed when you start LXPM. To do this, go to **Lenovo XClarity Provisioning Manager → UEFI Setup → System Settings → <F1>Start Control → Text Setup**. To start the server with Graphic User Interface, select **Auto** or **Tool Suite**.

See the following documentations for more information:

- Search for the LXPM documentation version compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>
- *UEFI User Guide* at <https://pubs.lenovo.com/uefi-overview/>

- **Lenovo XClarity Essentials OneCLI**

You can use the config application and commands to view the current system configuration settings and make changes to Lenovo XClarity Controller and UEFI. The saved configuration information can be used to replicate or restore other systems.

For information about configuring the server using Lenovo XClarity Essentials OneCLI, see:

[https://pubs.lenovo.com/lxce-onecli/onecli\\_c\\_settings\\_info\\_commands](https://pubs.lenovo.com/lxce-onecli/onecli_c_settings_info_commands)

- **Lenovo XClarity Administrator**

You can quickly provision and pre-provision all of your servers using a consistent configuration. Configuration settings (such as local storage, I/O adapters, boot settings, firmware, ports, and Lenovo XClarity Controller and UEFI settings) are saved as a server pattern that can be applied to one or more managed servers. When the server patterns are updated, the changes are automatically deployed to the applied servers.

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

[https://pubs.lenovo.com/lxca/server\\_configuring](https://pubs.lenovo.com/lxca/server_configuring)

- **Lenovo XClarity Controller**

You can configure the management processor for the server through the Lenovo XClarity Controller Web interface, the command-line interface, or Redfish API.

For information about configuring the server using Lenovo XClarity Controller, see:

“Configuring the Server” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>

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## Memory module configuration

Memory performance depends on several variables, such as memory mode, memory speed, memory ranks, memory population and processor.

Information about optimizing memory performance and configuring memory is available at the Lenovo Press website:

<https://lenovopress.lenovo.com/servers/options/memory>

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

[https://dcsc.lenovo.com/#/memory\\_configuration](https://dcsc.lenovo.com/#/memory_configuration)

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## RAID configuration

Using a Redundant Array of Independent Disks (RAID) to store data remains one of the most common and cost-efficient methods to increase server's storage performance, availability, and capacity.

RAID increases performance by allowing multiple drives to process I/O requests simultaneously. RAID can also prevent data loss in case of a drive failure by reconstructing (or rebuilding) the missing data from the failed drive using the data from the remaining drives.

RAID array (also known as RAID drive group) is a group of multiple physical drives that uses a certain common method to distribute data across the drives. A virtual drive (also known as virtual disk or logical drive) is a partition in the drive group that is made up of contiguous data segments on the drives. Virtual drive is presented up to the host operating system as a physical disk that can be partitioned to create OS logical drives or volumes.

An introduction to RAID is available at the following Lenovo Press website:

<https://lenovopress.lenovo.com/lp0578-lenovo-raid-introduction>

Detailed information about RAID management tools and resources is available at the following Lenovo Press website:

<https://lenovopress.lenovo.com/lp0579-lenovo-raid-management-tools-and-resources>

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## Deploy the operating system

Several options are available to deploy an operating system on the server.

### Available operating systems

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

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

### Tool-based deployment

- **Multi-server**

Available tools:

- Lenovo XClarity Administrator

[https://pubs.lenovo.com/lxca/compute\\_node\\_image\\_deployment](https://pubs.lenovo.com/lxca/compute_node_image_deployment)

- Lenovo XClarity Essentials OneCLI

[https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_uxspi\\_proxy\\_tool](https://pubs.lenovo.com/lxce-onecli/onecli_r_uxspi_proxy_tool)

- Lenovo XClarity Integrator deployment pack for SCCM (for Windows operating system only)  
[https://pubs.lenovo.com/lxci-deploypack-sccm/dpsccm\\_c\\_endtoend\\_deploy\\_scenario](https://pubs.lenovo.com/lxci-deploypack-sccm/dpsccm_c_endtoend_deploy_scenario)

- **Single-server**

Available tools:

- Lenovo XClarity Provisioning Manager  
“OS Installation” section in the LXPM documentation compatible with your server at <https://pubs.lenovo.com/lxpm-overview/>
- Lenovo XClarity Essentials OneCLI  
[https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_uxspi\\_proxy\\_tool](https://pubs.lenovo.com/lxce-onecli/onecli_r_uxspi_proxy_tool)
- Lenovo XClarity Integrator deployment pack for SCCM (for Windows operating system only)  
[https://pubs.lenovo.com/lxci-deploypack-sccm/dpsccm\\_c\\_endtoend\\_deploy\\_scenario](https://pubs.lenovo.com/lxci-deploypack-sccm/dpsccm_c_endtoend_deploy_scenario)

## Manual deployment

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

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

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## Back up the server configuration

After setting up the server or making changes to the configuration, it is a good practice to make a complete backup of the server configuration.

Make sure that you create backups for the following server components:

- **Management processor**

You can back up the management processor configuration through the Lenovo XClarity Controller interface. For details about backing up the management processor configuration, see:

“Backing up the BMC configuration” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>.

Alternatively, you can use the `save` command from Lenovo XClarity Essentials OneCLI to create a backup of all configuration settings. For more information about the `save` command, see:

[https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_save\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_save_command)

- **Operating system**

Use your backup methods to back up the operating system and user data for the server.





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## Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about Lenovo products, you will find a wide variety of sources available from Lenovo to assist you.

On the World Wide Web, up-to-date information about Lenovo systems, optional devices, services, and support are available at:

<http://datacentersupport.lenovo.com>

**Note:** IBM is Lenovo's preferred service provider for ThinkSystem.

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### Before you call

Before you call, there are several steps that you can take to try and solve the problem yourself. If you decide that you do need to call for assistance, gather the information that will be needed by the service technician to more quickly resolve your problem.

#### Attempt to resolve the problem yourself

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The online help also describes the diagnostic tests that you can perform. The documentation for most systems, operating systems, and programs contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

You can find the product documentation for your ThinkSystem products at the following location:

<https://pubs.lenovo.com/>

You can take these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated software, firmware, and operating-system device drivers for your Lenovo product. (See the following links) The Lenovo Warranty terms and conditions state that you, the owner of the Lenovo product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
  - Drivers and software downloads
    - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr665v3/downloads/driver-list/>
  - Operating system support center
    - <https://datacentersupport.lenovo.com/solutions/server-os>
  - Operating system installing instructions
    - <https://pubs.lenovo.com/thinksystem#os-installation>
- If you have installed new hardware or software in your environment, check <https://serverproven.lenovo.com/> to make sure that the hardware and software are supported by your product.
- Refer to “Problem Determination” in *User Guide* or *Hardware Maintenance Guide* for instructions on isolating and solving issues.

- Go to <http://datacentersupport.lenovo.com> and check for information to help you solve the problem.

To find the Tech Tips available for your server:

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

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

- Check Lenovo Data Center Forum at [https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv\\_eg](https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg) to see if someone else has encountered a similar problem.

### Gathering information needed to call Support

If you require warranty service for your Lenovo product, the service technicians will be able to assist you more efficiently if you prepare the appropriate information before you call. You can also go to <http://datacentersupport.lenovo.com/warrantylookup> for more information about your product warranty.

Gather the following information to provide to the service technician. This data will help the service technician quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.

- Hardware and Software Maintenance agreement contract numbers, if applicable
- Machine type number (Lenovo 4-digit machine identifier). Machine type number can be found on the ID label, see “[Identify the server and access the Lenovo XClarity Controller](#)” on page 67.
- Model number
- Serial number
- Current system UEFI and firmware levels
- Other pertinent information such as error messages and logs

As an alternative to calling Lenovo Support, you can go to <https://support.lenovo.com/servicerequest> to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to the service technicians. The Lenovo service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

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## Collecting service data

To clearly identify the root cause of a server issue or at the request of Lenovo Support, you might need collect service data that can be used for further analysis. Service data includes information such as event logs and hardware inventory.

Service data can be collected through the following tools:

- **Lenovo XClarity Provisioning Manager**

Use the Collect Service Data function of Lenovo XClarity Provisioning Manager to collect system service data. You can collect existing system log data or run a new diagnostic to collect new data.

- **Lenovo XClarity Controller**

You can use the Lenovo XClarity Controller web interface or the CLI to collect service data for the server. The file can be saved and sent to Lenovo Support.

- For more information about using the web interface to collect service data, see the “Backing up the BMC configuration” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>.

- For more information about using the CLI to collect service data, see the “XCC `ffdc` command” section in the XCC documentation compatible with your server at <https://pubs.lenovo.com/lxcc-overview/>.

- **Lenovo XClarity Administrator**

Lenovo XClarity Administrator can be set up to collect and send diagnostic files automatically to Lenovo Support when certain serviceable events occur in Lenovo XClarity Administrator and the managed endpoints. You can choose to send diagnostic files to Lenovo Support using Call Home or to another service provider using SFTP. You can also manually collect diagnostic files, open a problem record, and send diagnostic files to the Lenovo Support.

You can find more information about setting up automatic problem notification within the Lenovo XClarity Administrator at [https://pubs.lenovo.com/lxca/admin\\_setupcallhome](https://pubs.lenovo.com/lxca/admin_setupcallhome).

- **Lenovo XClarity Essentials OneCLI**

Lenovo XClarity Essentials OneCLI has inventory application to collect service data. It can run both in-band and out-of-band. When running in-band within the host operating system on the server, OneCLI can collect information about the operating system, such as the operating system event log, in addition to the hardware service data.

To obtain service data, you can run the `getinfor` command. For more information about running the `getinfor`, see [https://pubs.lenovo.com/lxce-onecli/onecli\\_r\\_getinfor\\_command](https://pubs.lenovo.com/lxce-onecli/onecli_r_getinfor_command).

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## Contacting Support

You can contact Support to obtain help for your issue.

You can receive hardware service through a Lenovo Authorized Service Provider. To locate a service provider authorized by Lenovo to provide warranty service, go to <https://datacentersupport.lenovo.com/serviceprovider> and use filter searching for different countries. For Lenovo support telephone numbers, see <https://datacentersupport.lenovo.com/supportphonenumber> for your region support details.



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## Appendix B. Documents and supports

This section provides handy documents, driver and firmware downloads, and support resources.

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### Documents download

This section provides introduction and download link for handy documents.

#### Documents

Download the following product documentations at:

[https://pubs.lenovo.com/sr665-v3/pdf\\_files](https://pubs.lenovo.com/sr665-v3/pdf_files)

- **Rail Installation Guides**
  - Rail installation in a rack
- **User Guide**
  - Complete overview, system configuration, hardware components replacing, and troubleshooting.  
Selected chapters from *User Guide*:
    - **System Configuration Guide** : Server overview, components identification, system LEDs and diagnostics display, product unboxing, setting up and configuring the server.
    - **Hardware Maintenance Guide** : Installing hardware components, cable routing, and troubleshooting.
- **Messages and Codes Reference**
  - XClarity Controller, LXPM, and uEFI events
- **UEFI Manual**
  - UEFI setting introduction

**Note:** SR665 V3 configured with Direct Water Cooling Module (DWCM) can be installed in the ThinkSystem Heavy Duty Full Depth Rack Cabinets. For ThinkSystem Heavy Duty Full Depth Rack Cabinets User Guide, see [ThinkSystem Heavy Duty Full Depth Rack Cabinets User Guide](#).

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### Support websites

This section provides driver and firmware downloads and support resources.

#### Support and downloads

- Drivers and Software download website for ThinkSystem SR665 V3
  - <https://datacentersupport.lenovo.com/products/servers/thinksystem/sr665v3/downloads/driver-list/>
- Lenovo Data Center Forum
  - [https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv\\_eg](https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg)
- Lenovo Data Center Support for ThinkSystem SR665 V3
  - <https://datacentersupport.lenovo.com/tw/en/products/servers/thinksystem/sr665v3>
- Lenovo License Information Documents
  - <https://datacentersupport.lenovo.com/documents/Invo-eula>

- Lenovo Press website (Product Guides/Datasheets/White papers)
  - <https://lenovopress.lenovo.com/>
- Lenovo Privacy Statement
  - <https://www.lenovo.com/privacy>
- Lenovo Product Security Advisories
  - [https://datacentersupport.lenovo.com/product\\_security/home](https://datacentersupport.lenovo.com/product_security/home)
- Lenovo Product Warranty Plans
  - <http://datacentersupport.lenovo.com/warrantylookup>
- Lenovo Server Operating Systems Support Center website
  - <https://datacentersupport.lenovo.com/solutions/server-os>
- Lenovo ServerProven website (Options compatibility lookup)
  - <https://serverproven.lenovo.com/>
- Operating System Installation Instructions
  - <https://pubs.lenovo.com/thinksystem#os-installation>
- Submit an eTicket (service request)
  - <https://support.lenovo.com/servicerequest>
- Subscribe to Lenovo Data Center Group product notifications (Stay up to date on firmware updates)
  - <https://datacentersupport.lenovo.com/solutions/ht509500>

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## Appendix C. Notices

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Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

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## Important notes

Processor speed indicates the internal clock speed of the processor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1 024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

When referring to 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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## 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:

[https://pubs.lenovo.com/important\\_notices/](https://pubs.lenovo.com/important_notices/)



## 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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