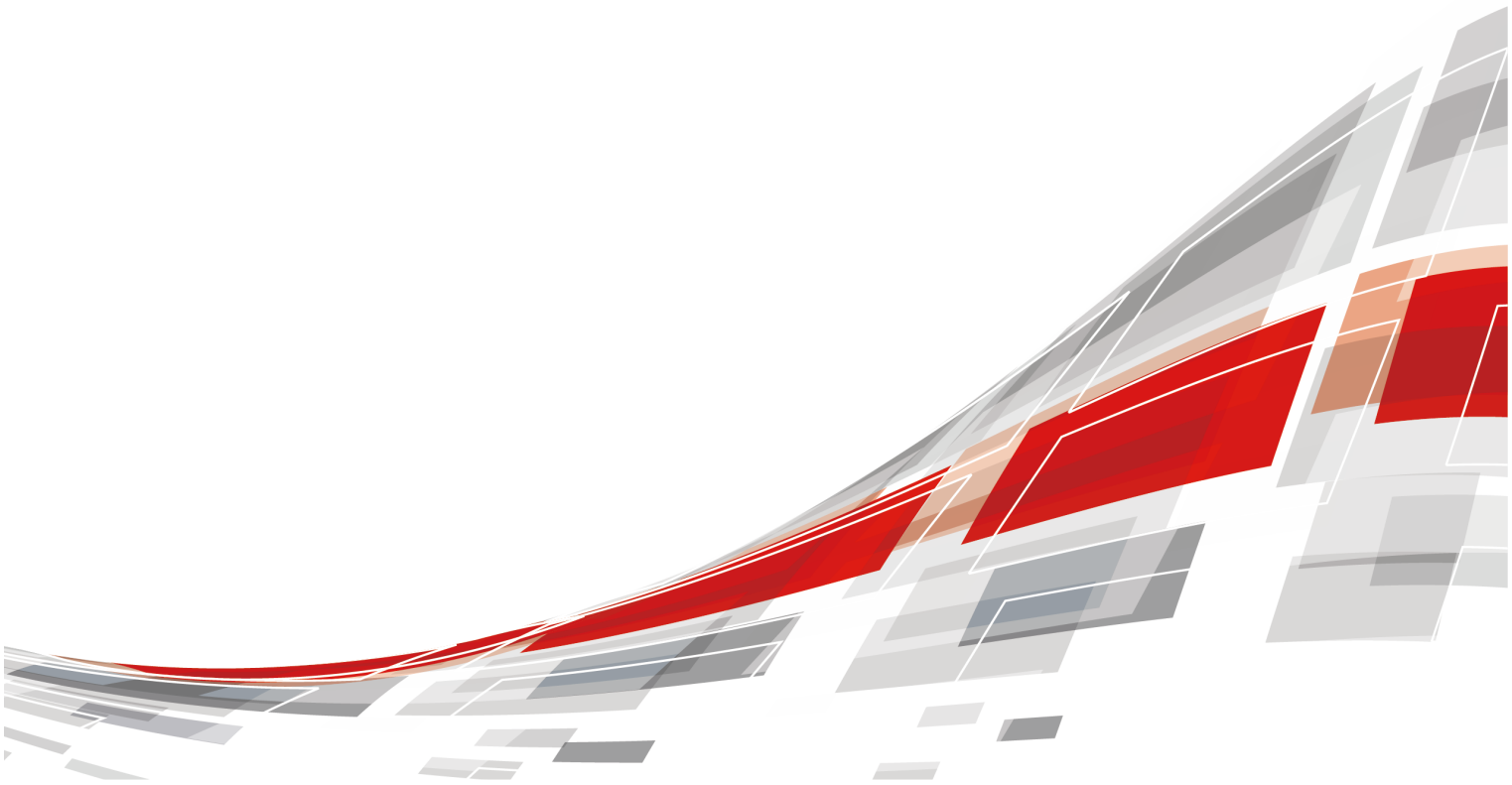
# FusionServer G5500 V6 Server

# Technical White Paper

**Issue** 05

**Date** 2024-07-30



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## xFusion Digital Technologies Co., Ltd.

Address: 9th Floor, Building 1, Zensun Boya Square, Longzihu Wisdom Island
Zhengdong New District 450046
Zhengzhou, Henan Province
People's Republic of China

Website: https://www.xfusion.com

# About This Document

## Purpose

This document describes the appearance, features, performance parameters, and hardware and software compatibility of the FusionServer G5500 V6, so that users can have an in-depth and detailed understanding of FusionServer G5500 V6.

## Intended Audience

This document is intended for presales engineers.

## Symbol Conventions

The symbols that may be found in this document are defined as follows.

| Symbol | Description |
| --- | --- |
| DANGER | Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury. |
| WARNING | Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury. |
| CAUTION | Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury. |
| NOTICE | Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results.<br>NOTICE is used to address practices not related to personal injury. |
| NOTE | Supplements the important information in the main text.<br>NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration. |

# Change History

| Issue | Date | Description |
| --- | --- | --- |
| 05 | 2024-07-30 | Updated **6.2 Environmental Specifications**. |
| 04 | 2024-07-10 | Updated **1 Product Overview** and **6.1 Technical Specifications**. |
| 03 | 2023-12-13 | • Added **11 Waste Product Recycling**.<br>• Updated **A.4 Nameplate**. |
| 02 | 2023-07-24 | • Deleted information about the 24 x 3.5" drive configuration (16 x SAS/SATA + 8 x NVMe).<br>• Updated **5.4.1.5 Memory Module Installation Positions**. |
| 01 | 2022-12-30 | This issue is the first official release. |

# Contents



# 1 Product Overview

The FusionServer G5500 V6 server (G5500 V6 for short) is a server that is optimized in HPC as well as data training and inference for deep learning for scenarios such as AI, HPC, cloud computing, and big data analysis. It supports multiple types of heterogeneous processors and applies to both enterprise and public cloud deployments.

The G5500 V6 is a 4U AI server that features supreme performance, flexible scalability, and balanced storage.

NOTE

For details about the G5500 V6 nameplate, see **A.4 Nameplate**.

**Figure 1-1** G5500 V6

# 2 Product Features

## Performance

- The G5500 V6 supports third-generation Intel® Xeon® Scalable processors (Ice Lake), each of which provides up to 40 cores, 3.6 GHz frequency, a 60 MB L3 cache, and up to three 11.2 GT/s UPI links between the processors, the server delivers supreme processing performance.
  - It supports two processors with 80 cores and 160 threads to maximize the concurrent execution of multithreaded applications.
  - The L2 cache capacity is increased. Each core exclusively occupies 1.25 MB L2 cache, and at least 1.5 MB L3 cache.
  - Intel Turbo Boost Technology 2.0 allows processor cores to run faster than the frequency specified in the Thermal Design Power (TDP) configuration if they are operating below power, current, and temperature specification limits.
  - Intel hyper-threading technology enables each processor core to run up to two threads, improving parallel computation capability.
  - The hardware-assisted Intel® Virtualization Technology (Intel® VT) allows the operating system (OS) to better use hardware to address virtualization workloads.
  - Intel® Advanced Vector Extensions 512 (Intel AVX-512) significantly accelerates floating-point performance for computing-intensive applications.
  - Intel DL Boost (VNNI) is supported to improve the performance of deep learning applications.
  - The Intel® SGX and Intel® TME security features provide fine-grained data protection through application isolation in the memory, and defend against physical attacks through full memory encryption.
- The G5500 V6 supports a maximum of 32 DDR4 ECC 3200 MT/s DIMMs. The DDR4 ECC DIMMs support registered DIMMs (RDIMMs) or load-reduced DIMMs (LRDIMMs). They provide high speed and availability. A server supports a maximum memory capacity of 8192 GB and a maximum memory bandwidth of 400 GB/s in theory.
- Flexible drive configurations cater to a variety of business requirements and ensure high elasticity and scalability of storage resources.

- The use of 12 Gbit/s SCSI (SAS) serial connection for internal storage provides twice data transmission rate than the use of 6 Gbit/s SAS connection, maximizing the performance of I/O-intensive applications.
- With Intel integrated I/O, the third-generation Intel® Xeon® Scalable processors integrate the PCIe 4.0 controller to shorten I/O latency and improve overall system performance.

## Scalability

- Flexible drive configurations cater to a variety of business requirements and ensure high elasticity and scalability of storage resources.
- The server supports a maximum of 24 x 3.5" front drives.
- The server supports a maximum of 4 x 2.5" NVMe U.2 drives.
- The server supports up to 12 PCIe 4.0 x16 expansion slots.
- Three OCP3.0 NICs or two OCP3.0 NICs can be configured. When two OCP3.0 NICs are configured, one OCP NIC supports Multi-Host, GE/10GE/25GE/100GE NICs can be flexibly configured, and orderly hot swap is supported.

  NOTE

  The hot swap of the OCP NIC depends on the OS driver. Ensure that the OS has been started and the OCP hot swap-related drivers have been loaded.
- Two M.2 modules can be configured.

## Availability and Serviceability

- Carrier-class components with process expertise ensure high system reliability and availability.
- The server supports hot-swappable SAS/SATA drives, for which RAID 0, 1, 1E, 10, 5, 50, 6, and 60 can be configured (the RAID levels supported depend on the RAID controller card used). It also uses a supercapacitor to protect the RAID cache data against power failures.
- The server provides simplified O&M and efficient troubleshooting through the UID/HLY indicators on the front panel, fault diagnosis LED, and iBMC WebUI.
- The panel provides the iBMC direct connect management port to support local iBMC O&M, improving O&M efficiency.
- The server provides four hot-swappable PSUs in 2+2 redundancy mode and six hot-swappable fan modules in N+1 redundancy mode, improving system availability.
- The onboard Intelligent Baseboard Management Controller (iBMC) can continuously monitor system parameters, trigger alarms, and take recovery measures to minimize shutdown.
- For more information about the warranty in the global market, see **Warranty**.

## Manageability and Security

- The built-in iBMC monitors server operating status and provides remote management.
- A password is required for accessing the BIOS, ensuring system boot and management security.

- The Network Controller Sideband Interface (NC-SI) feature allows a network port to simultaneously serve as a management port and a service port. The NC-SI feature is disabled by default and can be enabled on the iBMC or BIOS.

  NOTE

  The service port with NC-SI enabled supports the following configuration:

  - Configuring any network port on the OCP 3.0 NIC or PCIe NIC (with NC-SI enabled).
  - Enabling, disabling, and setting a virtual local area network (VLAN) ID for this port. The VLAN ID is **0** and disabled by default.
  - Configuring IPv4 addresses (IPv4 address, subnet mask, and default gateway) and IPv6 addresses (IPv6 address, prefix length) for this port.
- The integrated Unified Extensible Firmware Interface (UEFI) improves setup, configuration, and update efficiency and simplifies fault clearance.
- The lockable server chassis panel ensures local data security.
- Chassis cover opening detection is supported to enhance physical security.
- Intel Execute Disable Bit (EDB) function prevents certain types of malicious buffer overflow attacks when working with a supported OS.
- Intel® Trusted Execution Technology prevents malicious software attacks based on hardware, prevents the firmware on the device from being maliciously modified, and prevents unauthorized boot block execution.
- Intel® Software Guard Extensions (Intel®SGX) technology allows applications to run in their own independent space without being affected by other software running in the system, thereby enhancing security.
- The secure boot based on the chip RoT implements level-by-level firmware verification starting from the hardware RoT and builds a complete secure boot chain.
- The trusted platform module (TPM) provides advanced encryption functions, such as digital signatures and remote authentication.
- The following requirements in NIST SP 800-147B are met:
  - The BIOS firmware digital signature update mechanism is supported. During the upgrade, the digital signature is verified to prevent unauthorized BIOS firmware upgrade.
  - The flash security protection mechanism is supported to prevent unauthorized modification of the flash memory in the OS.

## Energy Efficiency

- The server supports 80 PLUS Platinum/Titanium PSUs of different energy efficiency levels. The PSU efficiency reaches 96% at 50% load.
- Active/standby power supply and HVDC power supply are supported, improving the efficiency of the power supply system.
- Efficient voltage regulator-down (VRD) power supplies for boards minimize the energy loss from DC-to-DC power conversion.
- Area-based, Proportional-Integral-Derivative (PID) intelligent fan speed adjustment and intelligent CPU frequency scaling optimize heat dissipation and reduce overall system power consumption.
- The improved thermal design with energy-efficient fans ensures optimal heat dissipation and reduces system power consumption.

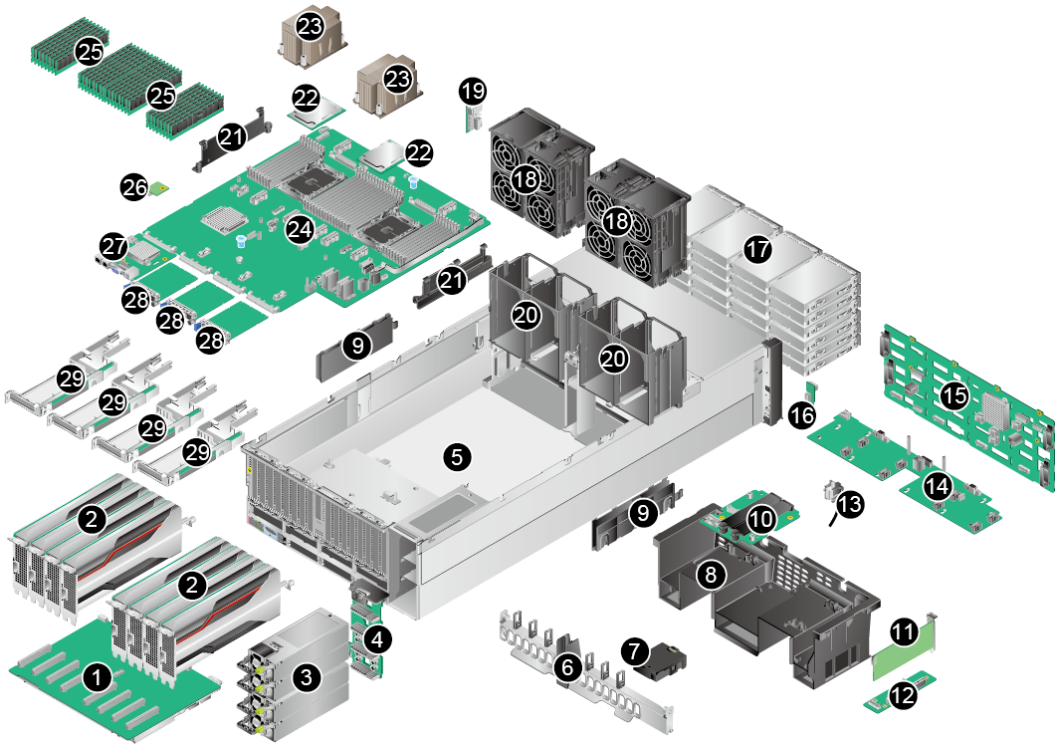
  

- The server is protected with power capping and power control measures.
- Staggered spinup of drives reduces the server boot power consumption.

# 3 Physical Structure

**Figure 3-1** Physical structure (example: 24 x 3.5" drives)



| | | | |
|---|---|---|---|
| 1 | PCIe switch board | 2 | GPU |
| 3 | PSUs | 4 | Power adapter board |
| 5 | Chassis | 6 | GPU beam |
| 7 | Supercapacitor | 8 | Air duct |
| 9 | Cable management arm (CMA) | 10 | M.2 SSD |

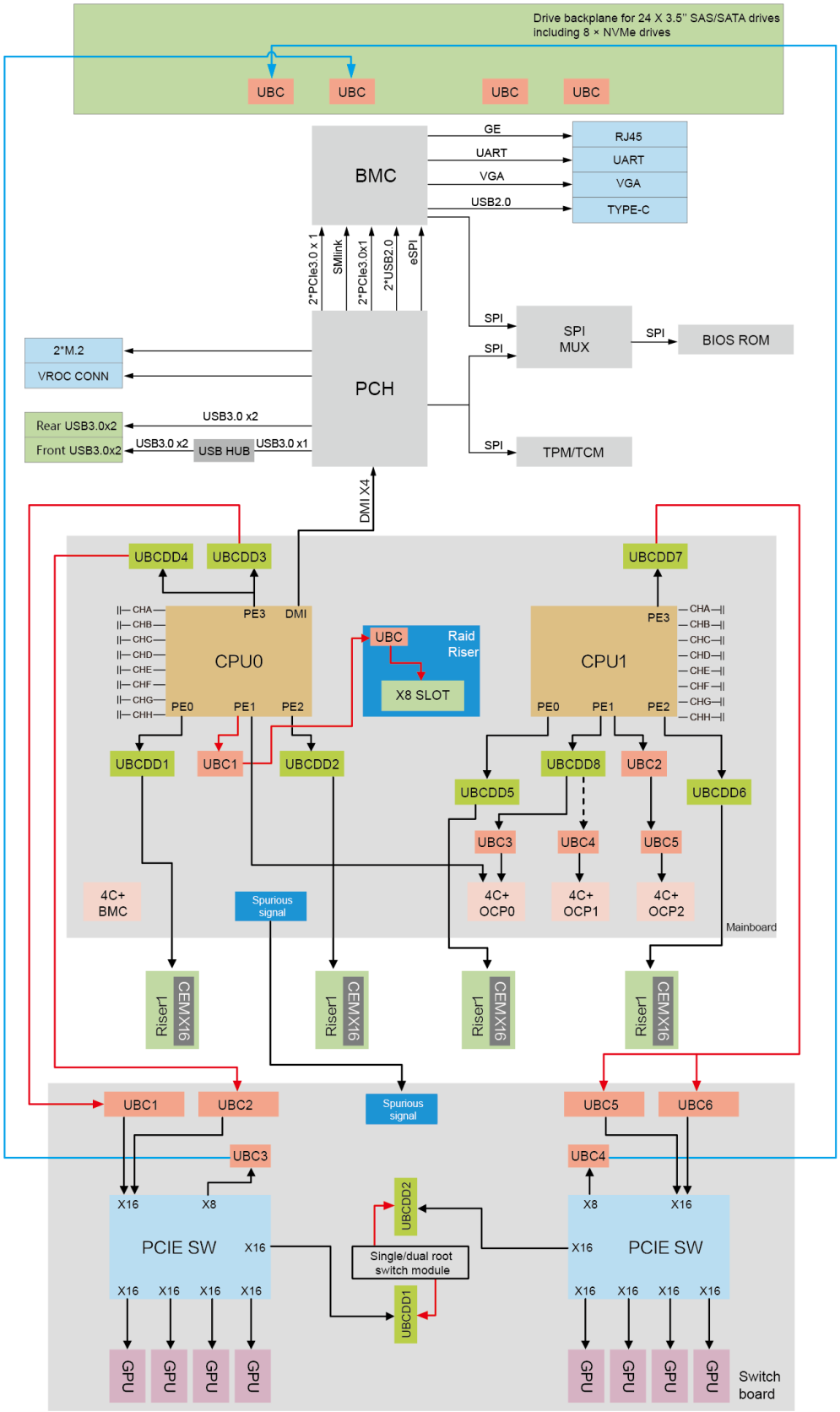
| | | | |
|---|---|---|---|
| 11 | PCIe plug-in RAID controller card | 12 | Riser card in which the PCIe plug-in RAID controller card is inserted |
| 13 | Intrusion sensor | 14 | Fan board |
| 15 | 24 x 3.5" drive backplane | 16 | Left mounting ear plate |
| 17 | 3.5" drives | 18 | Fan modules |
| 19 | Right mounting ear plate | 20 | Fan module frame |
| 21 | CMA | 22 | Processors |
| 23 | Processor heat sink | 24 | Mainboard |
| 25 | Memory modules | 26 | TPM/TCM |
| 27 | BMC card | 28 | OCP 3.0 NICs |
| 29 | NIC riser modules | - | - |

# 4 Logic Structure

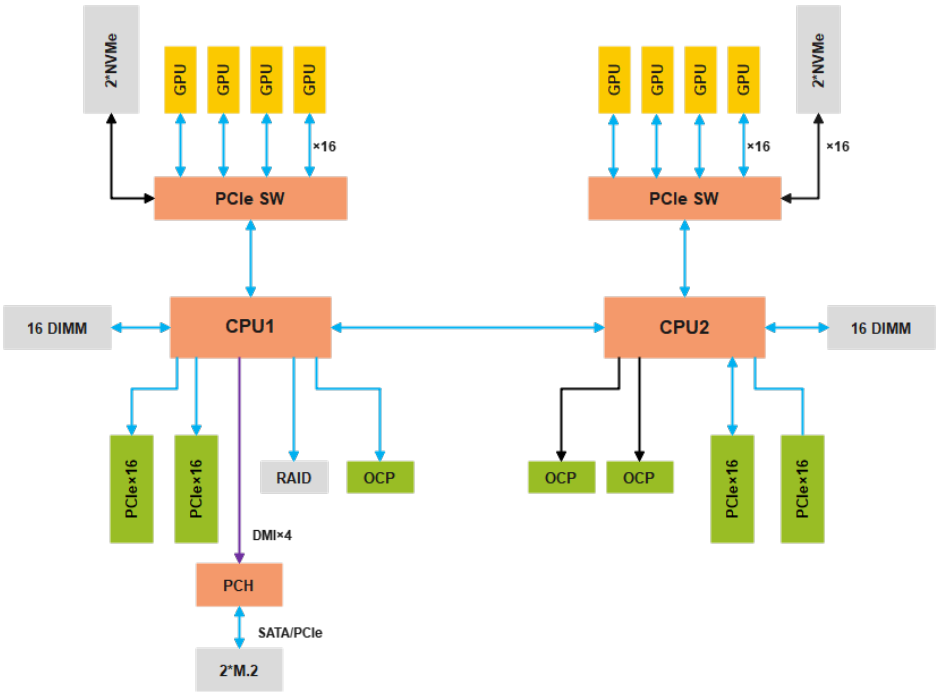
**Figure 4-1** Logical structure 1 (24 x 3.5" drive configuration)



- The server supports two 3rd Generation Intel®Xeon®scalable processors (Ice Lake).
- The server supports up to 32 memory modules.
- The processors interconnect with each other through three UPI links at a speed of up to 11.2 GT/s.
- The processors connect to the PCIe riser card through the PCIe buses, and the riser card connects to the mainboard through cables. Therefore, the processors can be flexibly configured as required.
- CPU 1 supports one OCP 3.0 NIC, and CPU 2 supports two OCP 3.0 NICs.
- The RAID controller card on the mainboard connects to CPU 1 through PCIe buses, and connects to the drive backplane through SAS signal cables. A variety of drive backplanes are provided to support different local storage configurations.
- The LBG-R Platform Controller Hub (PCH) is integrated on the mainboard to support five USB 3.0 ports.
- The BMC management chip integrated on the mainboard provides a video graphics array (VGA) port, a management network port, and a serial port.
- The G5500 V6 supports multiple logical topologies including balanced and cascaded topologies. You can configure a dual-root switchover module (whose P/N code is 0258Y074) using iBMC to quickly adapt to different service scenarios and achieve optimal service performance. The details are as follows:
  - As shown in **Figure 4-2**, the balanced topology is applicable to large-scale deep learning training.

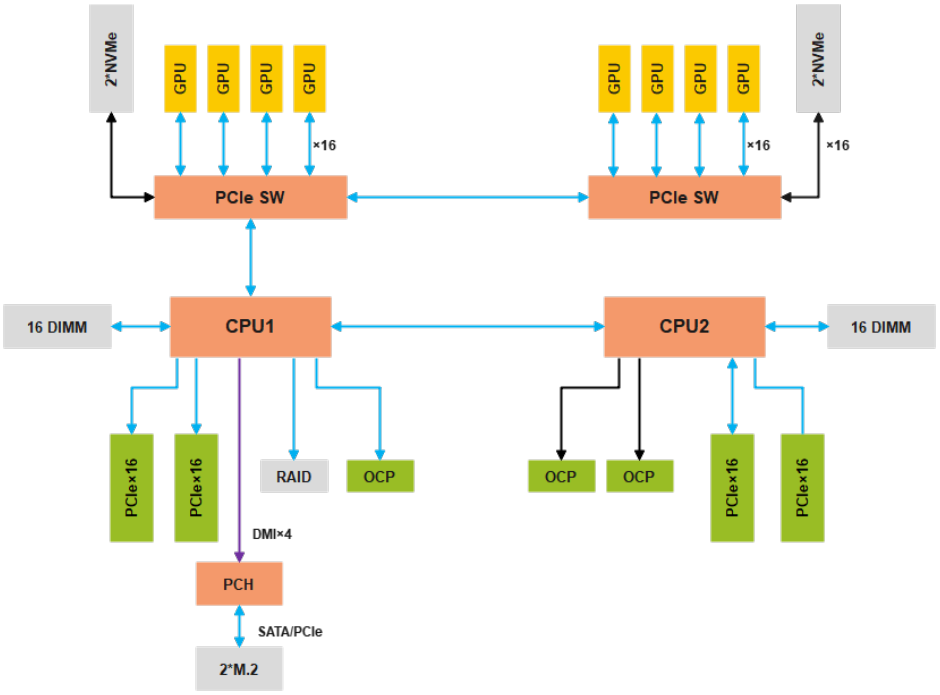
**Figure 4-2** Balanced topology




  - As shown in **Figure 4-3**, the cascaded topology is applicable to small- and medium-scale deep learning training and inference, public cloud, and HPC scenarios.

**Figure 4-3** Cascaded topology



# 5 Hardware Description

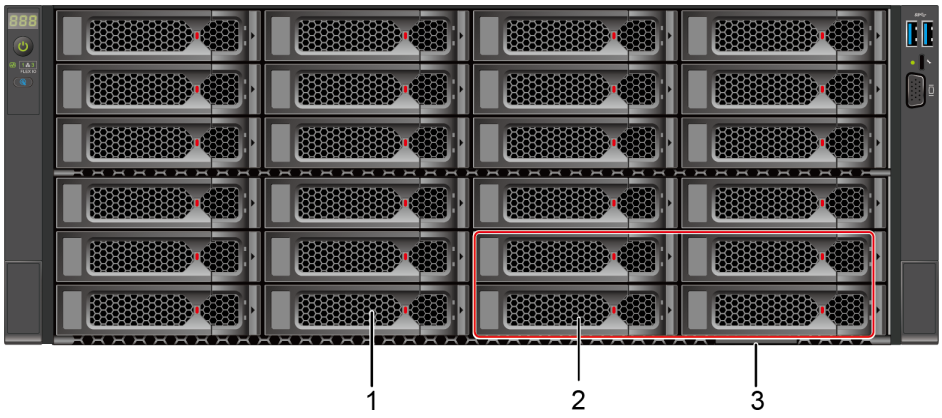


## 5.1 Front Panel

### 5.1.1 Appearance

- 24 x 3.5" drive configuration (20 x SAS/SATA + 4 x NVMe/SAS/SATA)

**Figure 5-1** Front view



| | | | |
|---|---|---|---|
| 1 | SATA/SAS drives | 2 | SAS/SATA/NVMe drive |
| 3 | Slide-out label plate (with an SN label) | - | - |

## 5.1.2 Indicators and Buttons

### Indicator and Button Positions

- 24 x 3.5" drive configuration

**Figure 5-2** Indicators and buttons on the front panel


| | | | |
|---|---|---|---|
| 1 | Fault diagnosis LED | 2 | Power button/indicator |
| 3 | Health status indicator | 4 | UID button/indicator |
| 5 | FlexIO card 1 presence indicator | 6 | FlexIO card 3 presence indicator |
| 7 | iBMC direct connect management port indicator | - | - |

### Indicator and Button Descriptions

**Table 5-1** Indicators and buttons on the front panel

| Silkscreen | Indicator and Button | Description |
|---|---|---|
| 888 | Fault diagnosis LED | • ---: The device is operating properly.<br>• Error code: A component is faulty. For details about fault codes, see the *iBMC Alarm Handling*. |

| Silkscreen | Indicator and Button | Description |
| --- | --- | --- |
|  | Power button/ indicator | Power indicator:<br>● Off: The device is powered off.<br>● Steady green: The device is powered on.<br>● Blinking yellow: The iBMC is starting. The power button is locked and cannot be pressed. The iBMC is started in about 1 minute, and then the power indicator is steady yellow.<br>● Steady yellow: The device is in the standby state.<br>Power button:<br>● When the device is powered on, you can press this button to gracefully shut down the OS.<br>**NOTE**<br>For different OSs, you may need to shut down the OS as prompted.<br>● When the device is powered on, you can hold down this button for 6 seconds to forcibly power off the device.<br>● When the power indicator is steady yellow, you can press this button to power on the server node. |
|  | Health status indicator | ● Off: The device is powered off or faulty.<br>● Blinking red at 1 Hz: A major alarm has been generated on the system.<br>● Blinking red at 5 Hz: A critical alarm has been generated on the system.<br>● Steady green: The device is operating properly. |

| Silkscreen | Indicator and Button | Description |
| --- | --- | --- |
|  | UID button/ indicator | The UID button/indicator helps identify and locate a device.<br>UID indicator:<br>● Off: The device is not being located.<br>● Blinking or steady blue: The device is being located.<br>UID button:<br>● You can control the UID indicator status by pressing the UID button or using the iBMC.<br>● You can press this button to turn on or off the UID indicator.<br>● You can press and hold down this button for 4 to 6 seconds to reset the iBMC. |
|  | FlexIO card presence indicator | Indicates whether the FlexIO card is detected.<br>● Off: The OCP 3.0 network adapter is not in position.<br>● Blinking green at 0.5 Hz: The OCP 3.0 network adapter is in position but is not powered on.<br>● Blinking green at 2 Hz: The OCP 3.0 network adapter is in position and has just been inserted.<br>● Steady green: The OCP 3.0 network adapter is in position, and the power supply is normal. |

| Silkscreen | Indicator and Button | Description |
| --- | --- | --- |
| | iBMC direct connect management port indicator | Indicates the status when the iBMC direct connect management port connects to a terminal (local PC or Android mobile phone):<br>● Off: No terminal is connected.<br>● Blinking green at short intervals for 3 seconds and then off: The port is disabled.<br>● Steady green: The terminal is connected.<br>Indicates the status when the iBMC direct connect management port connects to a USB device:<br>● Blinking red at long intervals: The job fails or an error is reported when the job is complete.<br>● Blinking green at short intervals: The job is being executed.<br>● Blinking green at short intervals for 3 seconds and then off: The port is disabled.<br>● Steady green: The server configuration file is being copied from the USB device or the job is successfully completed. |

## 5.1.3 Ports

### Port Positions

- 24 x 3.5" drive configuration

**Figure 5-3** Ports on the front panel


| | | | |
| --- | --- | --- | --- |
| 1 | USB 3.0 ports | 2 | iBMC direct connect management port |
| 3 | VGA port | - | - |

## Port Description

**Table 5-2** Ports on the front panel

| Name | Type | Number [Note] | Description |
|---|---|---|---|
| VGA port | DB15 | 1 | Used to connect a display terminal, such as a monitor or KVM. |
| iBMC direct connect management port[a] | USB Type-C<br>**NOTE**<br>The USB 2.0 protocol is supported. | 1 | Used to connect to a local PC or mobile phone through a USB Type-C cable to monitor and manage the system.<br>**NOTE**<br>Only local PCs running Windows 10 and mobile phones running Android are supported.<br>● To log in to the iBMC from the local PC, enter **https://***IP address of the iBMC management network port* in the address box of the browser on the local PC.<br>● When accessing the iBMC through a mobile phone, you need to use the mobile application FusionMobile to access the iBMC. For details, see the *FusionMobile User Guide*.<br>Used to connect to a USB device.<br>**NOTICE**<br>● Before connecting an external USB device, ensure that the USB device functions properly; otherwise, it may adversely impact the server.<br>● For details about how to connect a USB device to the iBMC direct connect management port, see the *iBMC User Guide*. |

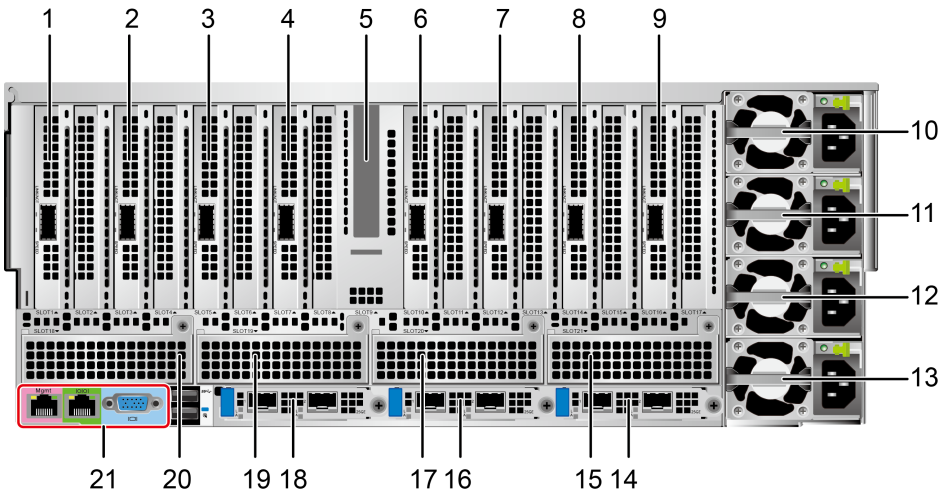
| Name | Type | Number [Note] | Description |
|---|---|---|---|
| USB port | USB 3.0 | 2 | Used to connect to a USB 3.0 device.<br>**NOTICE**<br>• Before connecting an external USB device, ensure that the USB device functions properly; otherwise, it may adversely impact the server.<br>• For details about how to connect a USB device to the iBMC direct connect management port, see the *iBMC User Guide*. |
| a: The VGA port and the iBMC direct connect management port cannot be used at the same time.<br>Note: The number of ports varies depending on the server configuration. This table lists the maximum number of ports in different configurations. | | | |

# 5.2 Rear Panel

## 5.2.1 Appearance

- 24 x 3.5" drive configuration

**Figure 5-4** Rear view




| | | | |
|---|---|---|---|
| 1 | Slot 1 (PCIe 4.0 x16) | 2 | Slot 3 (PCIe 4.0 x16) |
| 3 | Slot 5 (PCIe 4.0 x16) | 4 | Slot 7 (PCIe 4.0 x16) |
| 5 | Slot 9 (PCIe 4.0 x16)[a] | 6 | Slot 10 (PCIe 4.0 x16) |

| | | | |
|---|---|---|---|
| 7 | Slot 12 (PCIe 4.0 x16) | 8 | Slot 14 (PCIe 4.0 x16) |
| 9 | Slot 16 (PCIe 4.0 x16) | 10 | PSU 1 |
| 11 | PSU 2 | 12 | PSU 3 |
| 13 | PSU 4 | 14 | FlexIO card 3 |
| 15 | Slot 21 (PCIe 4.0 x16) | 16 | FlexIO card 2 |
| 17 | Slot 20 (PCIe 4.0 x16) | 18 | FlexIO card 1 |
| 19 | Slot 19 (PCIe 4.0 x16) | 20 | Slot 18 (PCIe 4.0 x16) |
| 21 | BMC card | - | - |
| a: This is supported only in the pass-through expansion board scenario. | | | |

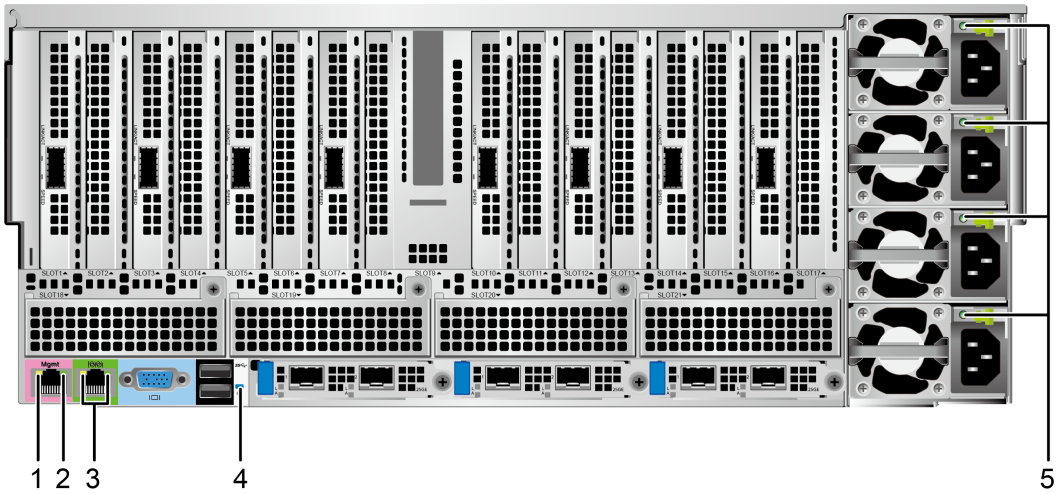
NOTE

- For details about the OCP 3.0 NIC, see **5.6.1 OCP 3.0 NICs**.
- The figure is for reference only. The appearance may vary according to the server configuration.

## 5.2.2 Indicators and Buttons

### Indicator Positions

**Figure 5-5** Indicators on the rear panel




| | | | |
|---|---|---|---|
| 1 | Data transmission status indicator for the management network port | 2 | Connection status indicator for the management network port |

| | | | |
|---|---|---|---|
| 3 | Serial port indicator<br>**NOTE**<br>Reserved and unavailable currently | 4 | UID indicator |
| 5 | PSU indicator | - | - |

## Indicator Description

**Table 5-3** Indicators on the rear panel

| Silkscreen | Indicator | Description |
|---|---|---|
| - | Data transmission status indicator for the management network port | ● Off: No data is being transmitted.<br>● Blinking yellow: Data is being transmitted. |
| - | Connection status indicator for the management network port | ● Off: The network is not connected.<br>● Steady green: The network port is properly connected. |
| - | PSU indicator | ● Off: No power is supplied.<br>● Blinking green at 1 Hz:<br>– The input is normal, and the server is in the standby state.<br>– The input is overvoltage or undervoltage.<br>– The PSU is in deep hibernation mode.<br>● Blinking green at 4 Hz: The firmware is being upgraded online.<br>● Steady green: The input and output are normal.<br>● Steady orange: The input is normal but there is no output.<br>**NOTE**<br>The possible causes of no output are as follows:<br>● Power supply overtemperature protection<br>● Power output overcurrent or short-circuit<br>● Output overvoltage<br>● Short-circuit protection<br>● Device failure (excluding failure of all devices) |

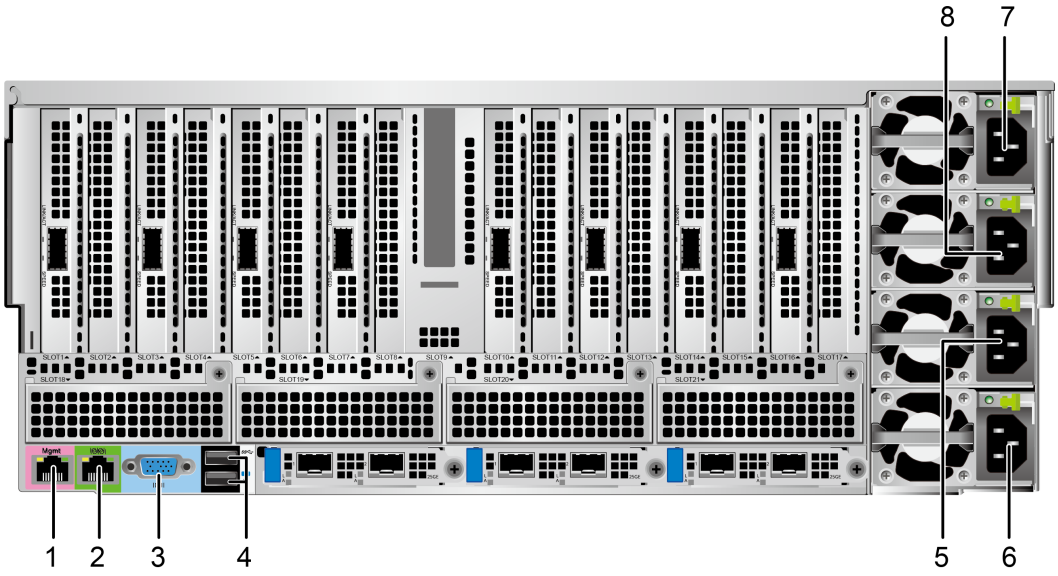
  

| Silkscreen | Indicator | Description |
| --- | --- | --- |
| | UID indicator | The UID indicator helps identify and locate a device.<br>● Off: The device is not being located.<br>● Blinking or steady blue: The device is being located.<br>**NOTE**<br>You can control the UID indicator status by pressing the UID button or using the iBMC. |

## 5.2.3 Ports

### Port Positions

**Figure 5-6** Ports on the rear panel




| | | | |
| --- | --- | --- | --- |
| 1 | Management network port | 2 | Serial port |
| 3 | VGA port | 4 | USB 3.0 ports |
| 5 | Socket for PSU 3 | 6 | Socket for PSU 4 |
| 7 | Socket for PSU 1 | 8 | Socket for PSU 2 |

## Port Description

**Table 5-4** Ports on the rear panel

| Name | Type | Quantity | Description |
| --- | --- | --- | --- |
| Management network port | RJ45 | 1 | iBMC management network port, which is used to manage the server.<br>**NOTE**<br>The management network port is a GE port that supports 100 Mbit/s and 1000 Mbit/s auto-negotiation. |
| Serial port | RJ45 | 1 | A port used for debugging. By default, it serves as the OS serial port. You can also set it as the iBMC serial port on the iBMC CLI.<br>**NOTE**<br>The port is a 3-wire serial communication port, and its default baud rate is 115,200 bit/s. |
| VGA port | DB15 | 1 | Used to connect a display terminal, such as a monitor or KVM. |
| USB port | USB 3.0 | 2 | Used to connect to a USB 3.0 device.<br>**NOTICE**<br>● The maximum current is 1.3 A for an external USB device.<br>● Before connecting an external USB device, ensure that the USB device functions properly; otherwise, it may adversely impact the server.<br>● The USB 3.0 port can be used to supply power to low-power peripherals. However, the USB 3.0 port must comply with the USB specifications. To run advanced peripherals, such as external CD/DVD drives, an external power supply is required. |

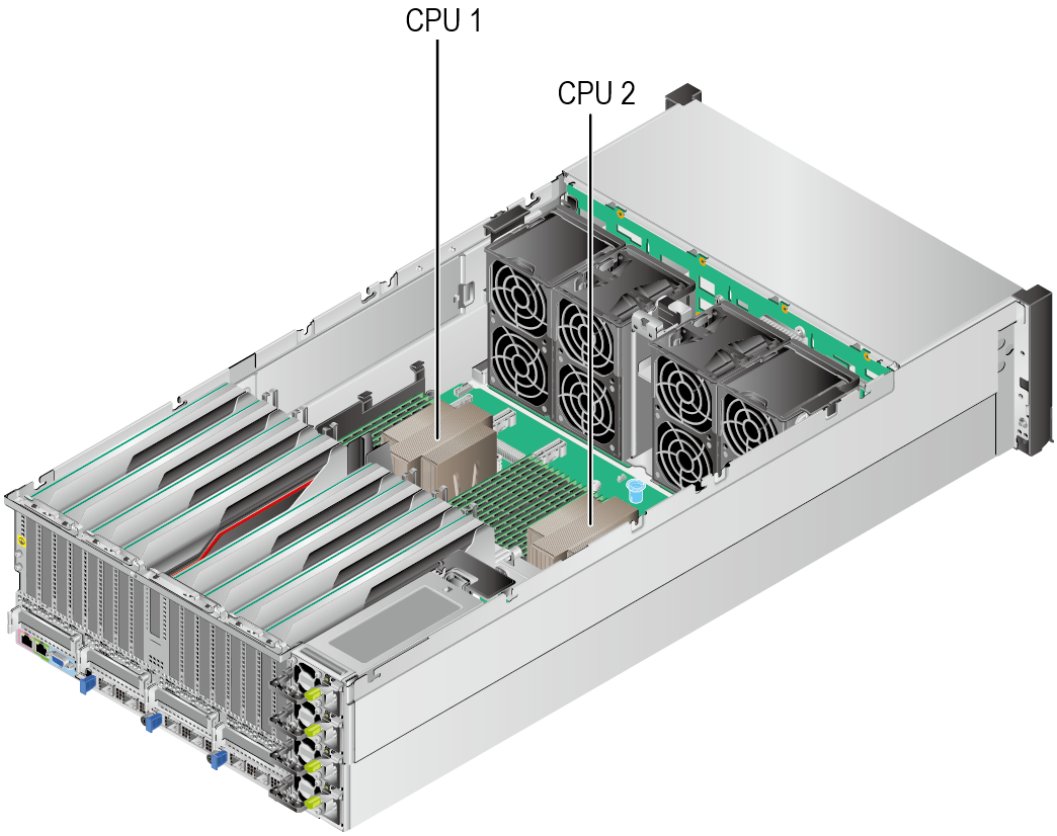
  

| Name | Type | Quantity | Description |
| --- | --- | --- | --- |
| PSU socket | - | 2 | Used to connect to a power distribution unit (PDU) through a power cable. You can select the PSUs as required.<br>**NOTE**<br>When determining the PSUs, ensure that the rated power of the PSUs is greater than that of the server. |

# 5.3 Processors

- The server supports two processors.
- Processors of the same model must be used in a server.
- For details about the optional components, consult the local sales representative or see "Search Parts" in the compatibility list on the technical support website.

**Figure 5-7** Positions of processors



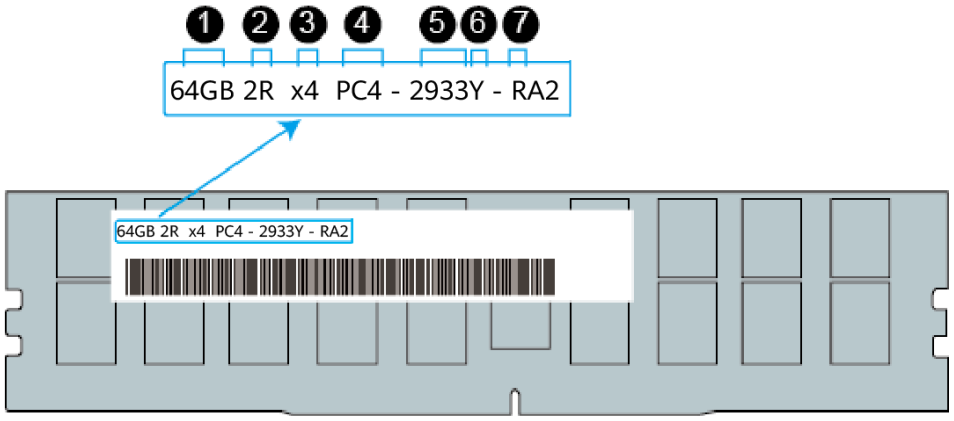

# 5.4 Memory

# 5.4.1 DDR4 Memory

## 5.4.1.1 Memory Identifier

You can determine the memory module properties based on the label attached to the memory module.

**Figure 5-8** Memory identifier




| No. | Description | Example |
|---|---|---|
| 1 | Capacity | • 16 GB<br>• 32 GB<br>• 64 GB<br>• 128 GB<br>• 256 GB |
| 2 | rank(s) | • 1R = Single rank<br>• 2R = Dual rank<br>• 4R = Quad rank<br>• 8R = Octal rank |
| 3 | Data width on the DRAM | • x4: 4-bit<br>• x8: 8-bit |
| 4 | Type of the memory interface | • PC4 = DDR4 |
| 5 | Maximum memory speed | • 2933 MT/S<br>• 3200 MT/S |
| 6 | Memory latency parameters (CL-tRCD-tRP) | • W = 20-20-20<br>• Y = 21-21-21<br>• AA = 22-22-22 |
| 7 | DIMM type | • R = RDIMM<br>• L = LRDIMM |

| No. | Description | Example |
| --- | --- | --- |
| 8 | SPD version | • 10: SPD version<br>• 10: SPD versions from Byte 192 to Byte 447 |
| 9 | Temperature grade | • Extended temperature grade (XT): 0°C to 95°C (32°F to 203°F)<br>• Normal temperature grade (NT): 0°C to 85°C (32°F to 185°F) |

### 5.4.1.2 Memory Subsystem Architecture

The server provides 32 memory interfaces. Each processor integrates eight memory channels.

Install the memory modules in the primary memory channels first. If the primary memory channel is not populated, the memory modules in secondary memory channel cannot be used.

**Table 5-5** Memory channels

| CPU | Channel | DIMM |
| --- | --- | --- |
| CPU 1 | A (primary) | DIMM000(A) |
| | A | DIMM001(I) |
| | B (primary) | DIMM010(B) |
| | B | DIMM011(J) |
| | C (primary) | DIMM020(C) |
| | C | DIMM021(K) |
| | D (primary) | DIMM030(D) |
| | D | DIMM031(L) |
| | E (primary) | DIMM040(E) |
| | E | DIMM041(M) |
| | F (primary) | DIMM050(F) |
| | F | DIMM051(N) |
| | G (primary) | DIMM060(G) |
| | G | DIMM061(O) |
| | H (primary) | DIMM070(H) |

| CPU | Channel | DIMM |
|---|---|---|
| | H | DIMM071(P) |
| CPU 2 | A (primary) | DIMM100(A) |
| | A | DIMM101(I) |
| | B (primary) | DIMM110(B) |
| | B | DIMM111(J) |
| | C (primary) | DIMM120(C) |
| | C | DIMM121(K) |
| | D (primary) | DIMM130(D) |
| | D | DIMM131(L) |
| | E (primary) | DIMM140(E) |
| | E | DIMM141(M) |
| | F (primary) | DIMM150(F) |
| | F | DIMM151(N) |
| | G (primary) | DIMM160(G) |
| | G | DIMM161(O) |
| | H (primary) | DIMM170(H) |
| | H | DIMM171(P) |

### 5.4.1.3 Memory Compatibility

Observe the following rules when configuring DDR4 DIMMs:

NOTICE

- A server must use DDR4 DIMMs of the same part number (P/N code), and the memory speed is the minimum value of the following items:
  - Memory speed supported by a CPU.
  - Maximum operating speed of a memory module.
- The DDR4 DIMMs of different types (RDIMM and LRDIMM) and specifications (capacity, bit width, rank, and height) cannot be used together.
- For details about the optional components, consult the local sales representative or see "Search Parts" in the compatibility list on the technical support website.

- The memory can be used with the third-generation Intel® Xeon® Scalable processors (Ice Lake). The maximum memory capacity supported by all processor models is the same.

- For details about the type of a single memory module, see "Search Parts" in the compatibility list on the technical support website.
- The maximum number of memory modules supported depends on the memory module type and number of ranks.

  NOTE

  - Each memory channel supports a maximum of eight ranks. The number of memory modules supported by each channel follows the following rule:
  - Number of memory modules supported by each channel ≤ Number of ranks supported by each memory channel/Number of ranks supported by each memory module.
- Each memory channel supports more than eight ranks for load-reduced DIMMs (LRDIMMs).

  NOTE

  A quad-rank LRDIMM generates the same electrical load as a single-rank RDIMM on a memory bus.

**Table 5-6** DDR4 DIMM specifications

| Parameter | | Value | | | | |
|---|---|---|---|---|---|---|
| Capacity per DDR4 DIMM (GB) | | 16 | 32 | 64 | 128 | 256 |
| Type | | RDIMM | RDIMM | RDIMM | RDIMM | RDIMM |
| Rated speed (MT/s) | | 3200 | 3200 | 3200 | 3200 | 2933 |
| Operating voltage (V) | | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 |
| Maximum number of DDR4 DIMMs in a server[a] | | 32 | 32 | 32 | 32 | 32 |
| Maximum DDR4 DIMM capacity of the server (GB) | | 512 | 1024 | 2048 | 4096 | 8192 |
| Actual speed (MT/s) | 1 DPC[b] | 3200 | 3200 | 3200 | 3200 | 2933 |
| | 2 DPC | 3200 | 3200 | 3200 | 3200 | 2933 |

- a: The maximum number of DDR4 memory modules is based on dual-processor configuration.
- b: DIMM per channel (DPC) indicates the number of memory modules per channel.
- The information listed in this table is for reference only. For details, consult the local sales representative.

### 5.4.1.4 DIMM Installation Rules

Observe the following rules when configuring DDR4 DIMMs:

- Install memory modules only when corresponding processors are installed.
- Do not mix LRDIMMs and RDIMMs in the same server.
- Install filler memory modules in vacant slots.

Observe the following rules when configuring DDR4 DIMMs in specific operating mode:

- Rank sparing mode
  - Comply with the general installation guidelines.
  - At least two ranks must be configured for each channel.
  - A maximum of two standby ranks can be configured for each channel.
  - The capacity of a standby rank must be greater than or equal to that of other ranks in the same channel.
- Installation rules for the memory mirroring mode
  - Comply with the general installation guidelines.
  - Each processor supports four integrated memory controllers (IMCs), and each IMC has two channels for installing memory modules. The installed memory modules must be identical in size and organization.
  - For a multi-processor configuration, each processor must have a valid memory mirroring configuration.
- Installation rules for the memory patrol mode
  - Comply with the general installation guidelines.

### 5.4.1.5 Memory Module Installation Positions

A server supports up to 32 DDR4 DIMMs. To maximize performance, you are advised to use balanced memory configuration.

Observe the memory module installation rules when configuring memory modules. For details, see the memory configuration guide on the technical support website.

**NOTICE**

At least one DDR4 DIMM must be installed in the primary memory channels corresponding to each CPU.

**Figure 5-9** Memory module installation positions

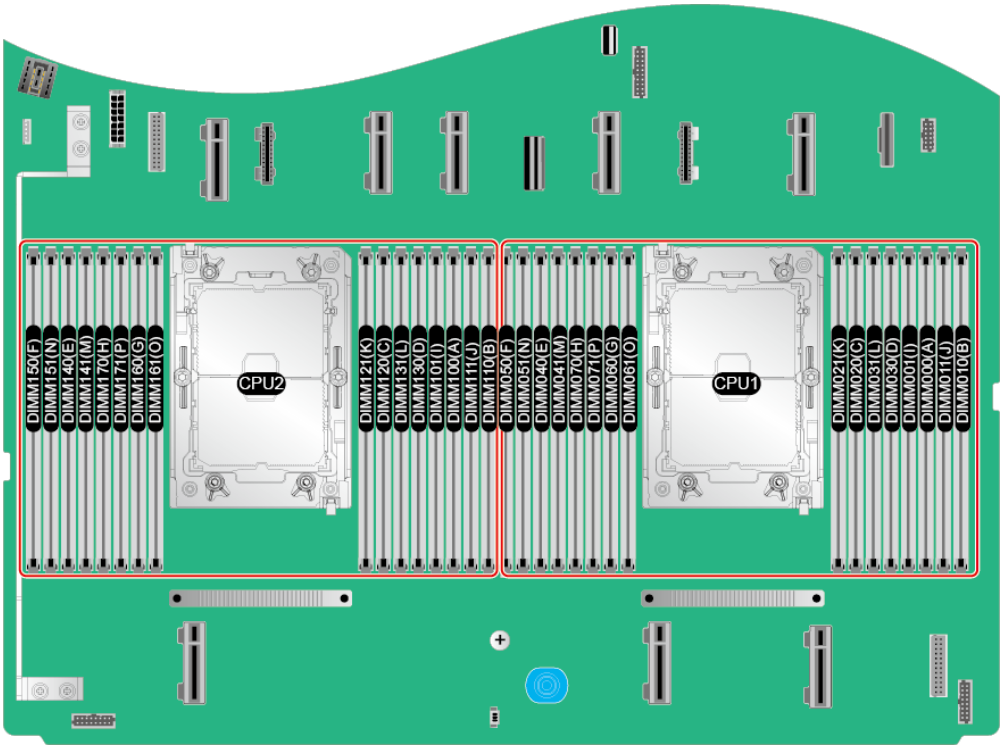


**Figure 5-10** DDR4 DIMM installation guidelines (2 processors)

| CPU | Channel | DIMM Slot | Number of DIMMs (✓: recommended ○: not recommended) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ○ | ✓ |
| | | | 2 | 4 | 8 | 12 | 16 | 24 | 24 | 32 |
| CPU1 | A | DIMM000(A) | ● | ● | ● | ● | ● | ● | ● | ● |
| | | DIMM001(I) | | | | | | ● | ● | ● |
| | B | DIMM010(B) | | | | ● | ● | ● | ● | ● |
| | | DIMM011(J) | | | | | | ● | | ● |
| | C | DIMM020(C) | | | ● | ● | ● | ● | ● | ● |
| | | DIMM021(K) | | | | | | ● | ● | ● |
| | D | DIMM030(D) | | | | | ● | | ● | ● |
| | | DIMM031(L) | | | | | | | | ● |
| | E | DIMM040(E) | | ● | ● | ● | ● | ● | ● | ● |
| | | DIMM041(M) | | | | | | ● | ● | ● |
| | F | DIMM050(F) | | | | ● | ● | ● | ● | ● |
| | | DIMM051(N) | | | | | | ● | | ● |
| | G | DIMM060(G) | | | ● | ● | ● | ● | ● | ● |
| | | DIMM061(O) | | | | | | ● | ● | ● |
| | H | DIMM070(H) | | | | | ● | | ● | ● |
| | | DIMM071(P) | | | | | | | | ● |
| CPU2 | A | DIMM100(A) | ● | ● | ● | ● | ● | ● | ● | ● |
| | | DIMM101(I) | | | | | | ● | ● | ● |
| | B | DIMM110(B) | | | | ● | ● | ● | ● | ● |
| | | DIMM111(J) | | | | | | ● | | ● |
| | C | DIMM120(C) | | | ● | ● | ● | ● | ● | ● |
| | | DIMM121(K) | | | | | | ● | ● | ● |
| | D | DIMM130(D) | | | | | ● | | ● | ● |
| | | DIMM131(L) | | | | | | | | ● |
| | E | DIMM140(E) | | ● | ● | ● | ● | ● | ● | ● |
| | | DIMM141(M) | | | | | | ● | ● | ● |
| | F | DIMM150(F) | | | | ● | ● | ● | ● | ● |
| | | DIMM151(N) | | | | | | ● | | ● |
| | G | DIMM160(G) | | | ● | ● | ● | ● | ● | ● |
| | | DIMM161(O) | | | | | | ● | ● | ● |
| | H | DIMM170(H) | | | | | ● | | ● | ● |
| | | DIMM171(P) | | | | | | | | ● |
| Note | When 24 DIMMs are configured, the recommended installation (marked with ✓) achieves better performance than the installation that is not recommended (marked with ○). However, only the installation that is not recommended (marked with ○) supports SNC2, Hemi, SGX, and UMA X-skt. | | | | | | | | | |

#### 5.4.1.6 Memory Protection Technologies

DDR4 DIMMs support the following memory protection technologies:

- ECC
- Memory Mirroring
- Memory Single Device Data Correction (SDDC)
- Failed DIMM Isolation
- Memory Thermal Throttling
- Command/Address Parity Check and Retry
- Memory Demand/Patrol Scrubbing
- Memory Data Scrambling
- Memory Multi Rank Sparing
- Post Package Repair (PPR)
- Write Data CRC Protection
- Adaptive Data Correction - Single Region (ADC-SR)
- Adaptive Double Device Data Correction - Multiple Region (ADDDC-MR)
- Partial Cache Line Sparing (PCLS)

# 5.5 Storage

## 5.5.1 Drive Configuration and Drive Numbering

### 5.5.1.1 24 x 3.5" Drive Configuration (20 x SAS/SATA + 4 x NVMe/SAS/SATA)

## Drive Configurations

**Table 5-7** Drive configurations

| Configuration | Front Drive | Drive Management Mode |
| --- | --- | --- |
| 24 x 3.5" drives + 8 x dual-width GPUs standard switch model configuration | • Front drive: 24 x 3.5"<br>– Slots 0 to 15 support only SAS/SATA drives.<br>– Slots 16 and 17 support SAS/SATA/NVMe drives<br>– Slots 18 to 21 support only SAS/SATA drives.<br>– Slots 22 and 23 support SAS/SATA/NVMe drives | • SAS/SATA drive: 1 x PCIe plug-in RAID controller card[a]<br>• NVMe drive: PCIe switch |
| • a: Currently, only the 9540-8i and 9560-8i PCIe plug-in RAID controller cards are supported.<br>• For details about the optional components, consult the local sales representative or see "Search Parts" in the compatibility list on the technical support website. | | |

## Drive Numbering

**NOTICE**

The drive numbers identified by the RAID controller card vary depending on the cabling of the RAID controller card. This section uses the drive numbers identified by a RAID controller card that adopts the default cabling described in "Internal Cabling" in the server *Maintenance and Service Guide*.

- Numbers of all drives configured in **Table 5-7**.

**Figure 5-11** Drive numbering


**Table 5-8** Drive numbering

| Drive number | Drive Number Displayed on the iBMC WebUI | Drive Number Identified by the RAID Controller Card |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 1 | 1 |
| 2 | 2 | 2 |
| 3 | 3 | 3 |
| 4 | 4 | 4 |
| 5 | 5 | 5 |
| 6 | 6 | 6 |
| 7 | 7 | 7 |
| 8 | 8 | 8 |
| 9 | 9 | 9 |
| 10 | 10 | 10 |
| 11 | 11 | 11 |
| 12 | 12 | 12 |
| 13 | 13 | 13 |
| 14 | 14 | 14 |
| 15 | 15 | 15 |
| 16[a] | 16 | 16[Note] |
| 17[a] | 17 | 17[Note] |
| 18 | 18 | 18 |
| 19 | 19 | 19 |

| Drive number | Drive Number Displayed on the iBMC WebUI | Drive Number Identified by the RAID Controller Card |
|---|---|---|
| 20 | 20 | 20 |
| 21 | 21 | 21 |
| 22[a] | 22 | 22[Note] |
| 23[a] | 23 | 23[Note] |

- a: SAS/SATA/NVMe drives are supported.
- Note: If the slot is configured with an SAS/SATA drive, the RAID controller card can manage the drive and allocate a number to the drive.
- For details about the optional components, consult the local sales representative or see "Search Parts" in the compatibility list on the technical support website.

## 5.5.2 Drive Indicators

### SAS/SATA Drive Indicators

**Figure 5-12** SAS/SATA drive indicators

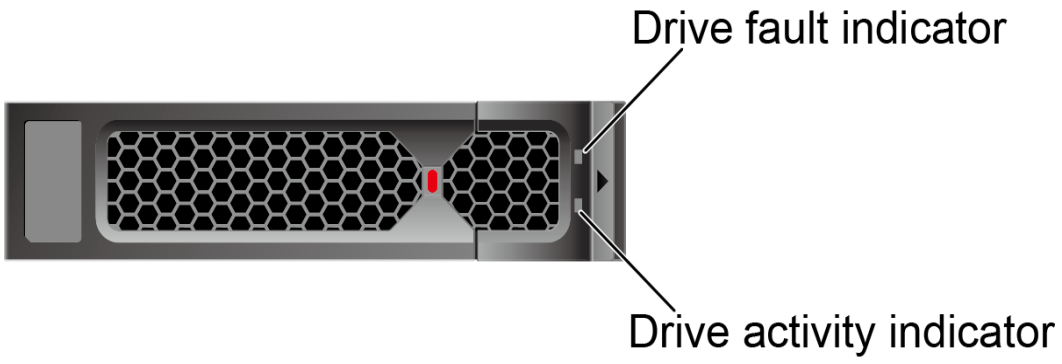



**Table 5-9** SAS/SATA drive indicator description

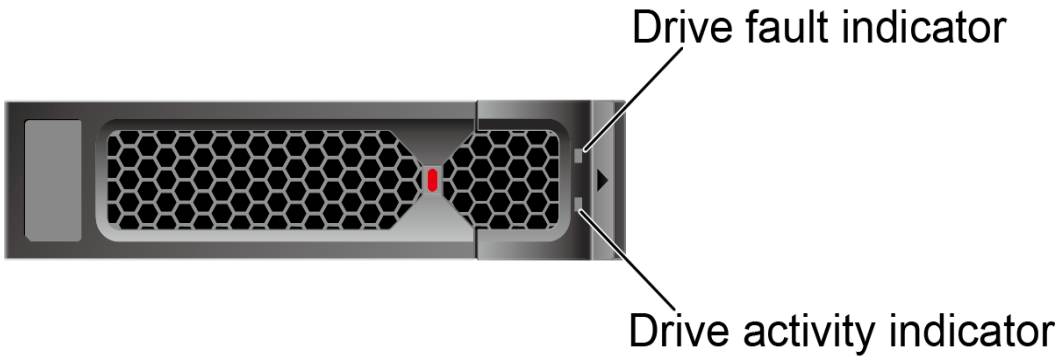
| Active Indicator (Green) | Fault Indicator (Red/Blue) | State Description |
|---|---|---|
| Off | Off | The drive is not detected. |
| Steady on | Off | The drive is detected. |
| Blinking at 4 Hz | Off | Data is being read or written properly, or data on the primary drive is being rebuilt. |
| Steady on | Blinking blue at 4 Hz | The drive is being located. |

| Active Indicator (Green) | Fault Indicator (Red/Blue) | State Description |
|---|---|---|
| Blinking at 1 Hz | Blinking red at 1 Hz synchronously | Data on the secondary drive is being rebuilt. |
| Off | Red steady on | A drive in a RAID array is removed. |
| Steady on | Red steady on | The drive is faulty. |

## NVMe Drive Indicators

**Figure 5-13** NVMe drive indicators




- If the VMD function is enabled and the latest VMD driver is installed, the NVMe drives support surprise hot swap.

  **Table 5-10** NVMe drive indicator description (VMD function enabled)

| Active Indicator (Green) | Fault Indicator (Red/Blue) | State Description |
|---|---|---|
| Off | Off | The NVMe drive is not detected. |
| Steady on | Off | The NVMe drive is detected and operating properly. |
| Blinking at 4 Hz | Off | Data is being read from or written to the NVMe drive. |
| Steady on/ blinking | Blinking blue at 4 Hz | The NVMe drive is being located. |
| Blinking at 1 Hz | Blinking red at 1 Hz synchronously | Data on the secondary NVMe drive is being rebuilt. |
| Steady on/off | Red steady on | The NVMe drive is faulty. |

- If the VMD function is disabled, the NVMe drives support only orderly hot swap.

**Table 5-11** NVMe drive indicator description (VMD function disabled)

| Active Indicator (Green) | Fault Indicator (Red/Blue) | State Description |
|---|---|---|
| Off | Off | The NVMe drive is not detected. |
| Steady on | Off | The NVMe drive is detected and operating properly. |
| Blinking at 4 Hz | Off | Data is being read from or written to the NVMe drive. |
| Steady on/ blinking | Blinking blue at 4 Hz | The NVMe drive is being located. |
| Off | Blinking red at 0.5 Hz | The NVMe drive has completed the hot swap process and is removable. |
| Off | Blinking red at 2 Hz | The NVMe drive is being hot-swapped. |
| Steady on/off | Red steady on | The NVMe drive is faulty. |

### 5.5.3 RAID Controller Card

The RAID controller card supports RAID configuration, RAID level migration, and drive roaming.

- For details about the optional components, consult the local sales representative or see "Search Parts" in the compatibility list on the technical support website.
- For details about the RAID controller card, see the server *RAID Controller Card User Guide*.

## 5.6 Network

### 5.6.1 OCP 3.0 NICs

The OCP 3.0 NICs provide network expansion capabilities.

- The FlexIO slots support OCP 3.0 NICs. You can insert the NICs as required.
- For details about the optional components, consult the local sales representative or see "Search Parts" in the compatibility list on the technical support website.
- For details about OCP 3.0 NICs, see the documents of each OCP 3.0 NIC.

#### 24 x 3.5" Drive Configuration

The following two configurations are supported:

- Three PCIe 4.0 x8 OCP 3.0 NICs.
- One PCIe 4.0 x8 OCP 3.0 NIC and one PCIe 4.0 x8+x8 OCP 3.0 NIC (supporting Multi-host).

# 5.7 I/O Expansion

## 5.7.1 PCIe Cards

PCIe cards are used to expand the server's performance.

- A maximum of 16 PCIe 4.0 expansion slots are supported.
- For details about the optional components, consult the local sales representative or see "Search Parts" in the compatibility list on the technical support website.
- When IB cards are used to build an IB network, ensure that the IPoIB modes of the IB cards at both ends of the network are the same. For details, contact technical support.

## 5.7.2 PCIe Slots

### Positions of PCIe Slots

**Figure 5-14** PCIe slots (example: 24 x 3.5" drive configuration)

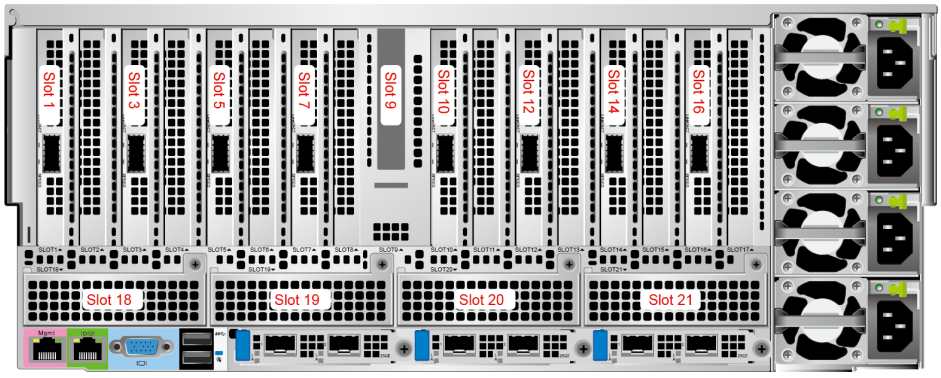
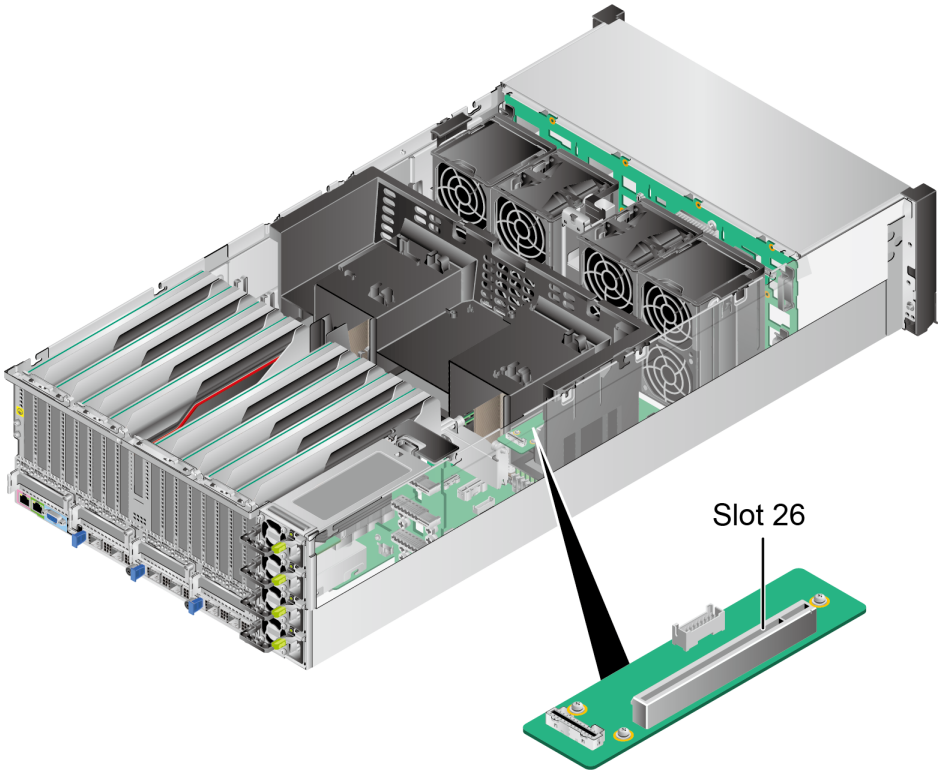


**Figure 5-15** PCIe slot



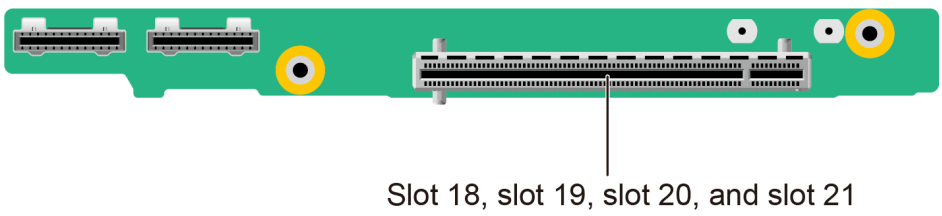

- I/O module 1 provides slots 18, 19, 20, and 21. Select corresponding PCIe riser cards based on the NIC module types.
- The built-in riser module provides slot 26 and support a built-in PCIe plug-in RAID controller card.
- The front GPU riser module provides slot 23 and slot 25 and supports two GPUs.

## PCIe Riser Card

- PCIe riser card of I/O module 1

  It is installed in I/O module 1 and provides PCIe slots 18, 19, 20, and 21.

  **Figure 5-16** PCIe Riser Card

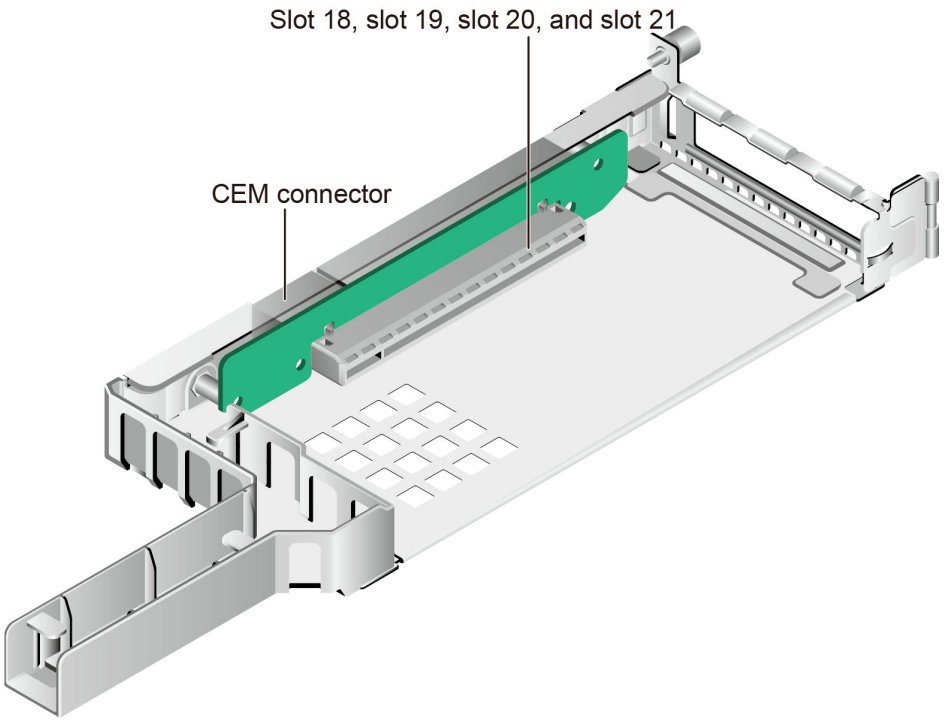



- PCIe riser card 2 of I/O module 1

  It is installed in I/O module 1 and provides PCIe slots 18, 19, 20, and 21.

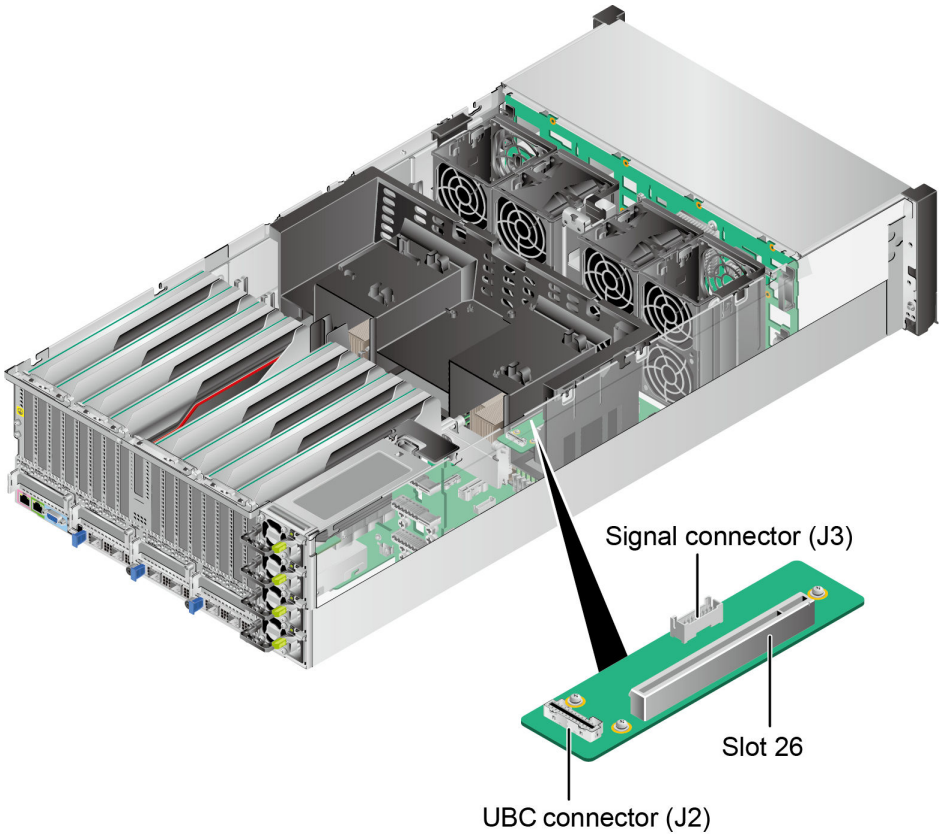
  

**Figure 5-17** PCIe riser card




- PCIe riser card of the built-in riser module
  It is installed in the built-in riser module and provides PCIe slot 26.

**Figure 5-18** PCIe riser card



# 5.7.3 PCIe Slot Description

## Server PCIe Slot Information

**Table 5-12** PCIe slots for configuring 24 x 3.5" drives

| PCIe Riser Card | PCIe Slot | PCIe Slot or Port Description | CPU | PCIe Port No. | Switch | PCIe Device Supported by the PCIe Slot or Port |
|---|---|---|---|---|---|---|
| PCIe Riser Card Supported by the Rear GPU Module | Slot 1 | PCIe 4.0 x16[a] (x16)[b] | CPU 1 | PE 3 | SW 0 | FHFL dual-width |
| | Slot 3 | PCIe 4.0 x16 (x16) | CPU 1 | PE 3 | SW 0 | FHFL dual-width |
| | Slot 5 | PCIe 4.0 x16 (x16) | CPU 1 | PE 3 | SW 0 | FHFL dual-width |
| | Slot 7 | PCIe 4.0 x16 (x16) | CPU 1 | PE 3 | SW 0 | FHFL dual-width |
| | Slot 10 | PCIe 4.0 x16 (x16) | CPU 2 | PE 3 | SW 1 | FHFL dual-width |
| | Slot 12 | PCIe 4.0 x16 (x16) | CPU 2 | PE 3 | SW 1 | FHFL dual-width |
| | Slot 14 | PCIe 4.0 x16 (x16) | CPU 2 | PE 3 | SW 1 | FHFL dual-width |
| | Slot 16 | PCIe 4.0 x16 (x16) | CPU 2 | PE 3 | SW 1 | FHFL dual-width |
| PCIe riser card supported by I/O module 1 | Slot 18 | PCIe 4.0 x16 (x16) | CPU 1 | PE 0 | - | HHHL |
| | Slot 19 | PCIe 4.0 x16 (x16) | CPU 1 | PE 2 | - | HHHL |
| | Slot 20 | PCIe 4.0 x16 (x16) | CPU 2 | PE 0 | - | HHHL |

| PCIe Riser Card | PCIe Slot | PCIe Slot or Port Description | CPU | PCIe Port No. | Switch | PCIe Device Supported by the PCIe Slot or Port |
|---|---|---|---|---|---|---|
| | Slot 21 | PCIe 4.0 x16 (x16) | CPU 2 | PE 2 | - | HHHL |
| PCIe riser card of I/O module 2 | Slot 26 | PCIe 4.0 x16 (x8) | CPU 1 | PE 1 (0–7) | - | HHHL |
| - | FlexIO card 1 | PCIe 4.0 x16 (x8, x8 + x8[c]) | CPU 1 | PE 1 (8–15) | - | OCP 3.0 specifications |
| | FlexIO card 2 | PCIe 4.0 x8 | CPU 2 | PE 1 (8–15) | - | OCP 3.0 specifications |
| | FlexIO card 3 | PCIe 4.0 x8 | CPU 2 | PE 1 (0–7) | - | OCP 3.0 specifications |

- a: PCIe 4.0 refers to the PCIe of the fourth generation, and **x16** refers to the physical slot width. This also applies to the content below.
- b: The **x16** in brackets indicates that the link bandwidth is x16. This also applies to the content below.
- c: FlexIO card 1 can be redirected through a cable. FlexIO card 1 supports Multi-host function.
- The PCIe x16 slots are compatible with PCIe x16, PCIe x8, PCIe x4, and PCIe x1 cards. That is, the PCIe slot width cannot be smaller than the PCIe card link width.
- The FHFL PCIe slots are compatible with FHFL PCIe cards, FHHL PCIe cards, and HHHL PCIe cards.
- The maximum power supply of each PCIe slot is 75 W.

## Server Bus/Device/Function Number (B/D/F) Information

The server's B/D/F information may change with PCIe card configurations. You can obtain the B/D/F information of the server using the following methods:

- BIOS serial port log: If the serial port log has been collected, you can query the B/D/F information of the server by searching for the keyword **RootBusBDF**.
- UEFI Shell: You can obtain the B/D/F of the server using the **pci** command. Run the **help pci** command to obtain the specific usage of the **pci** command.

- The following describes how to obtain the B/D/F information on different OSs.
  - Linux OS: You can obtain the B/D/F information of the server running the **lspci -vvv** command.

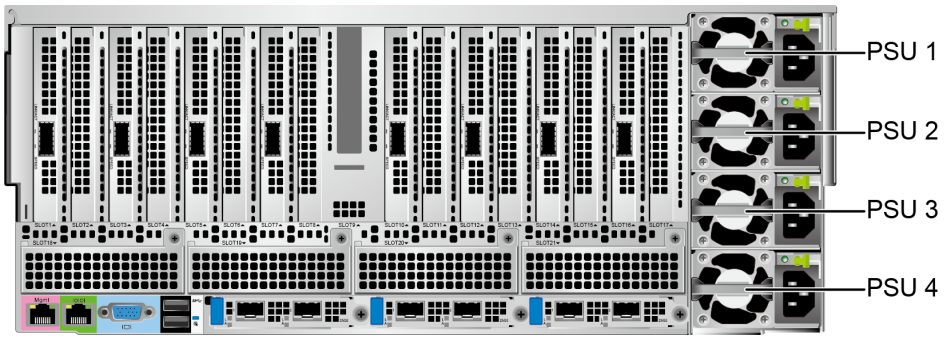
    NOTE

    If the OS does not support the **lspci** command by default, obtain the **pci-utils** package from the **yum** source and install it to make the OS support the command.
  - Windows OS: After installing the **pci-utils** package, run the **lspci** command to obtain the B/D/F information of the server.
  - VMware OS: The **lspci** command is supported by default. You can directly obtain the B/D/F information of the server running the **lspci** command.

# 5.8 PSUs

- The server supports a maximum of four PSUs.
- The server supports AC PSUs.
- The PSUs are hot-swappable.
- The PSUs support 2+2 redundancy or 3+1 redundancy when four PSU are configured.
- PSUs of the same P/N code must be used in a server.
- The PSUs are protected against short circuit. Double-pole fuse is provided for the PSUs with dual input live wires.
- For details about the optional components, consult the local sales representative or see "OS and Parts Compatibilit" in the compatibility list on the technical support website.

**Figure 5-19** Positions of PSUs




# 5.9 Fan Modules

- Supports four fan modules. Each module contains two layers of fans. (Fan xA on the upper layer, Fan xB on the lower layer, and x indicates the fan module number), available with 6 or 8 fans.

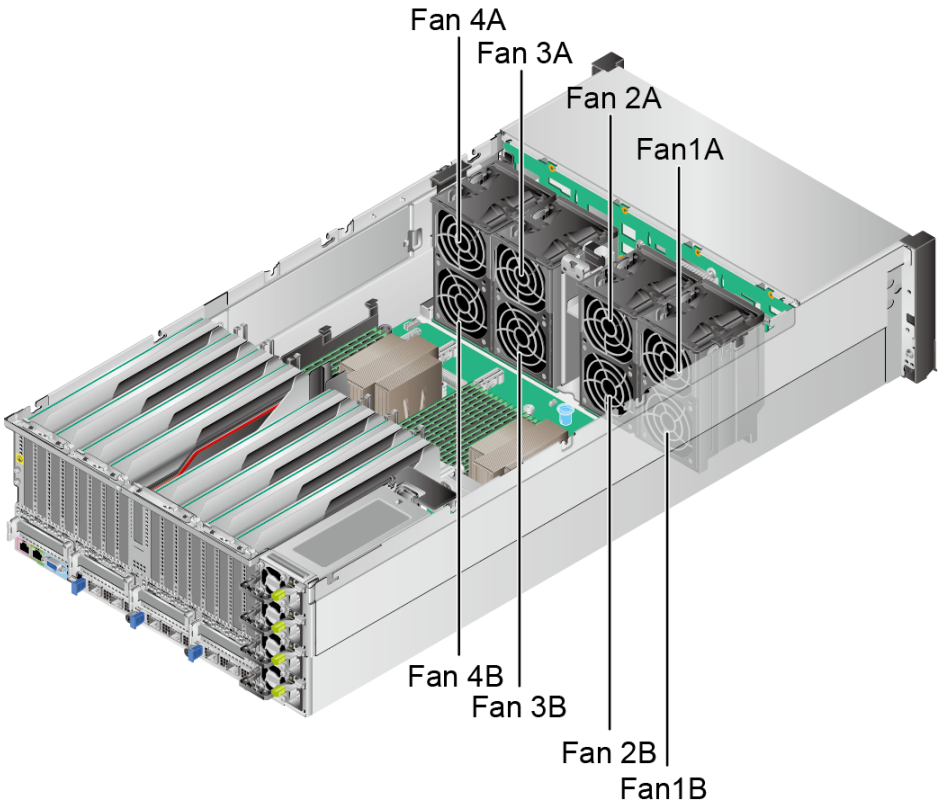
NOTE

- When six fans are configured:
  - The P/N codes of the fan modules installed in Fan 1 and Fan 4 must be the same. Fan 2 and Fan 3 must have the same fan module P/N code.
  - Fans 1A and 4A are installed with fan filler modules, and fans in other locations.
- When eight fans are configured:
  - Fan 1/2/3/4 fan module P/N codes must be the same.
  - Fans are installed on all Fan 1A/1B/2A/2B/3A/3B/4A/4B.

– Six fans are required for the 24 x 3.5" drive configuration.
– Eight fans are required for the 12 x 3.5" drive configuration.

- The fan modules are hot-swappable.
- N+1 redundancy is supported. That is, the server can work properly when a single fan fails.
- The fan speed can be adjusted.

**Figure 5-20** Positions of fan modules in a server with 12 x 3.5" drives (example)

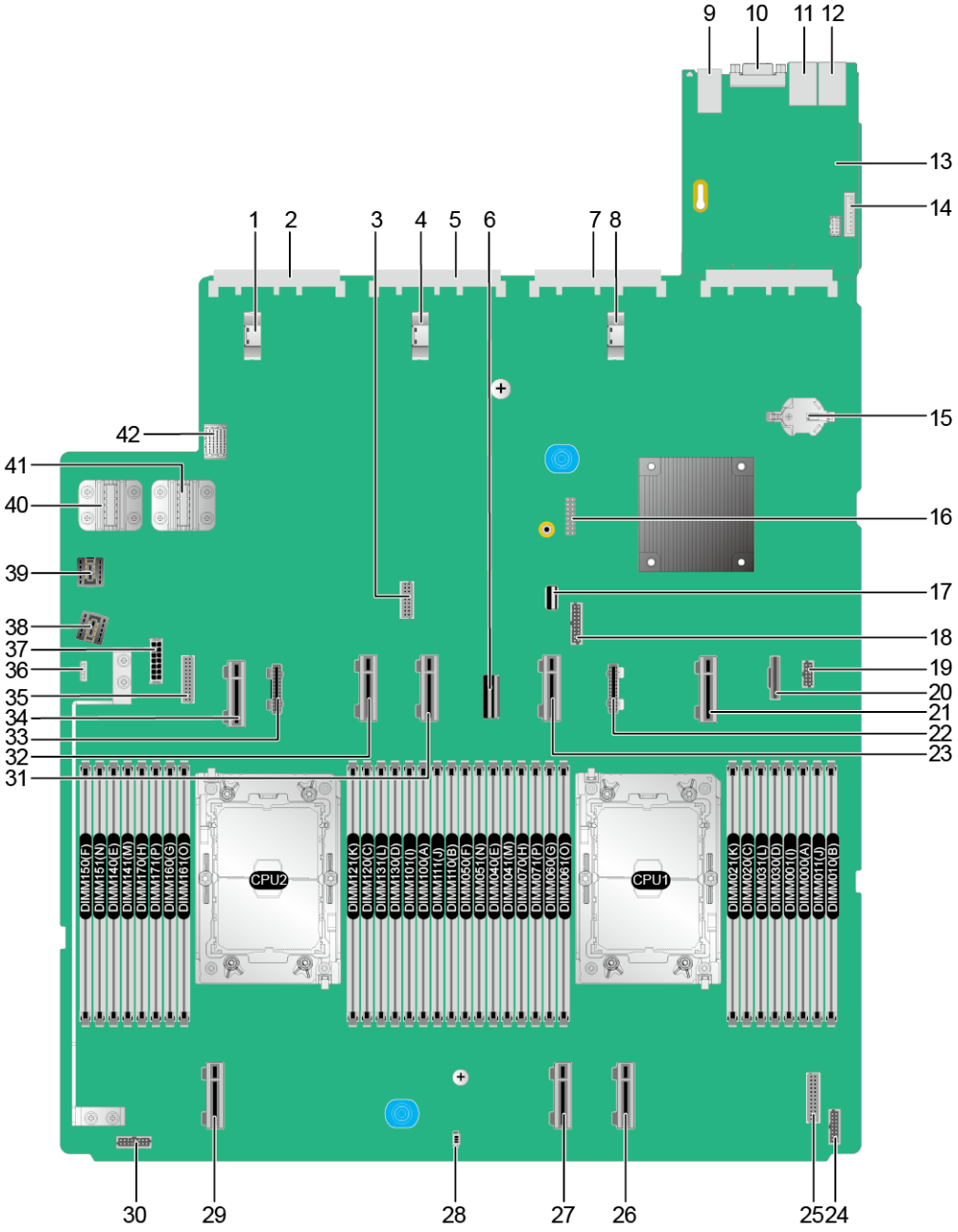



# 5.10 Boards

## 5.10.1 Mainboard

**Figure 5-21** Mainboard




| | | | |
|---|---|---|---|
| 1 | OCP 3.0 network adapter 3 UBC connector (UBC2-3/ J6054) | 2 | OCP 3.0 network adapter 3 connector (OCP3 CONN/ J7023) |
| 3 | RAID controller card low-speed signal connector (RAID MIS/J7017) | 4 | OCP 3.0 network adapter 2 UBC connector (UBC2-2B/ J6071) |

| | | | |
|---|---|---|---|
| 5 | OCP 3.0 network adapter 2 connector (OCP2 CONN/ J7016) | 6 | Rear I/O board low-speed signal connector (BACK IO BOARD/J7000) |
| 7 | OCP 3.0 network adapter 1 connector (OCP1 CONN/ J7014) | 8 | OCP 3.0 network adapter 1 UBC connector (UBC2-2A/ J42) |
| 9 | 2 x USB 3.0 ports (USB3.0 CONN/J88) | 10 | Rear VGA port (VGA CONN/J60) |
| 11 | Serial port (COM/J6020) | 12 | BMC management port (BMC_GE/J6019) |
| 13 | BMC management board | 14 | LCD connector (LCD CONN/J6025) |
| 15 | Battery | 16 | TPM/TCM connector (J6065) |
| 17 | Built-in USB 3.0 port (INNER USB3.0/J6067) | 18 | M.2 low-speed signal connector (M.2 MIS/J61) |
| 19 | NC-SI connector (NCSI CONN/J7013) | 20 | PCH SATA port A&B connector (PORT(A-B) M. 2/J7009) |
| 21 | CPU 1 UBC DD connector (UBCDD 1-1/J64) | 22 | RAID controller card UBC connector (UBC 1-2/J6051) |
| 23 | CPU 1 UBC DD connector (UBCDD 1-3/J6052) | 24 | Fan board signal connector (FAN BOARD/J7022) |
| 25 | Right mounting ear connector (R_EAR BOARD/J7012) | 26 | CPU 1 UBC DD connector (UBCDD 1-5/J37) |
| 27 | CPU 1 UBC DD connector (UBCDD 1-4/J49) | 28 | Intrusion sensor connector (INTRUDER/S2) |
| 29 | CPU 2 UBC DD connector (UBCDD 2-5/J41) | 30 | Drive backplane low-speed signal connector (FRONT HDD BP/J6082) |
| 31 | CPU 2 UBC DD connector (UBCDD 2-1/J6053) | 32 | CPU 2 UBC DD connector (UBCDD 2-2/J45) |
| 33 | UBC 2 straight connector (UBC 2-3/J7060) | 34 | CPU 2 UBC DD connector (UBCDD 2-4/J53) |
| 35 | Left mounting ear connector (L_EAR BOARD/ J7003) | 36 | VROC key connector (VROC KEY/J6066)[a] |
| 37 | Fan board power 2 connector (FAN PWR_2/ J7006) | 38 | Fan board power 1 connector (FAN PWR_1/ J7010) |

| | | | |
|---|---|---|---|
| 39 | PSU backplane input power connector (PWR IN/ J6093) | 40 | Copper bar power connector (PWR GND/ J7008) |
| 41 | Copper bar power connector (PWR 12V_IN/ J7007) | 42 | PSU backplane power connector (PDB MIS CONN/J7005) |
| a: The reserved connector is temporarily unavailable. | | | |

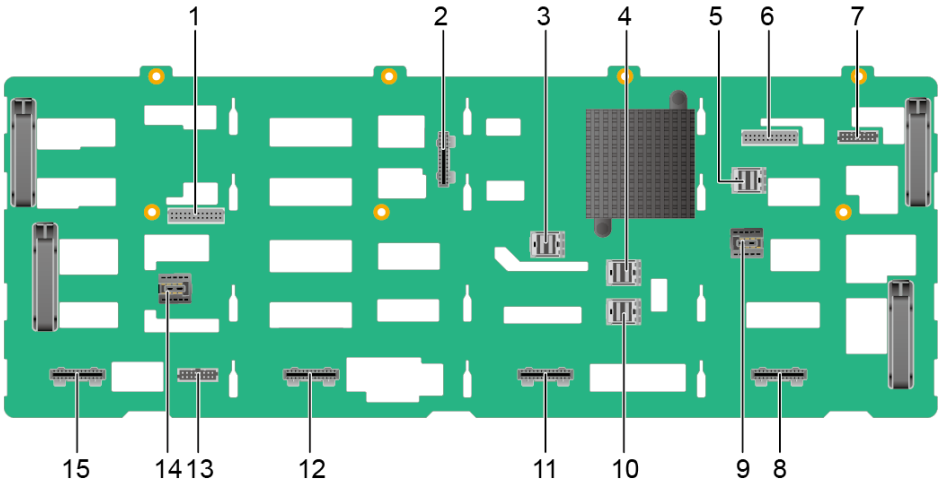
## 5.10.2 Drive Backplane

### Front-Drive Backplane

- 24 x 3.5" drive backplane

  The backplane is supported by all drive configurations in section **5.5.1.1 24 x 3.5" Drive Configuration (20 x SAS/SATA + 4 x NVMe/SAS/SATA)**.

**Figure 5-22** 24 x 3.5" drive EXP backplane 1 (20 x SAS/SATA + 4 x NVMe)

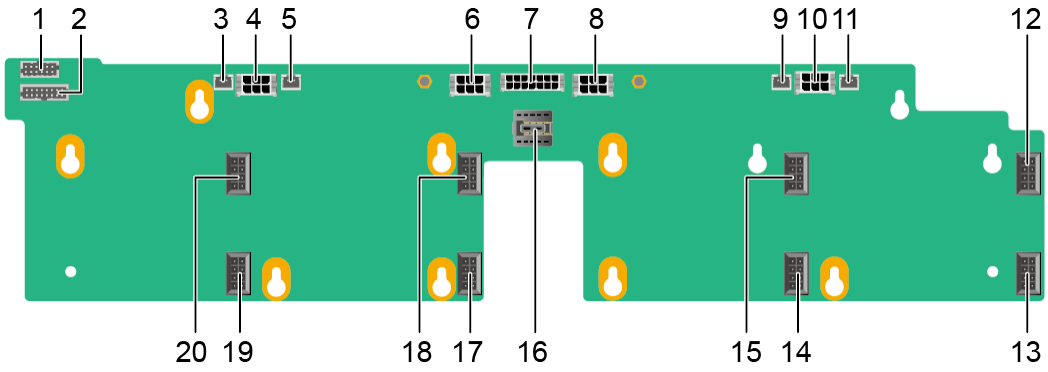



| | | | |
|---|---|---|---|
| 1 | Low-speed signal connector (REAR BP0/ J37) | 2 | UBC high-speed signal connector (J1) |
| 3 | mini-SAS HD connector (REAR BP PORTA/J34) | 4 | mini-SAS HD connector (REAR BP PORTB/J35) |
| 5 | mini-SAS HD connector (REAR BP0/1 J33) | 6 | Low-speed signal connector (REAR BP1/ J38) |
| 7 | Low-speed signal connector (MAIN BOARD/J40) | 8 | UBC 4 high-speed connector (J5) |

| | | | |
|---|---|---|---|
| 9 | Power connector (24HDD POWER MAIN BOARD/ J42) | 10 | mini-SAS HD connector (REAR BP PORTC/J36) |
| 11 | UBC 3 high-speed connector (J4) | 12 | UBC 2 high-speed connector (J3) |
| 13 | Low-speed signal connector (REAR BP/ J39) | 14 | Power connector (POWER REAR BP/J43) |
| 15 | UBC 1 high-speed connector (J2) | - | - |

## 5.10.3 Fan Board

**Figure 5-23** Fan board

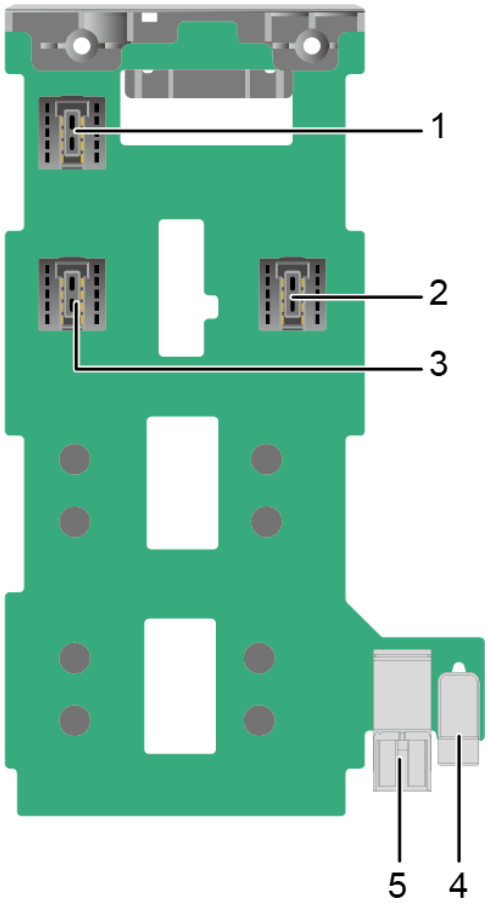



| | | | |
|---|---|---|---|
| 1 | LAAC JTAG connector (LAAC JTAG/J17) | 2 | Fan board signal connector (MISC CONN/J3) |
| 3 | Water detection cable presence detection connector (LIQ PRES1/ J19)[a] | 4 | LAAC connector (LAAC4/ J16) |
| 5 | Water detection cable leakage detection connector (LIQ LEAK1/ J18)[a] | 6 | LAAC connector (LAAC3/ J15) |
| 7 | Fan board power connector 2 (POWER CONN2/J2) | 8 | LAAC connector (LAAC2/ J14) |
| 9 | Water detection cable presence detection connector (LIQ PRES2/ J21)[a] | 10 | LAAC connector (LAAC1/ J13) |

| | | | |
|---|---|---|---|
| 11 | Water detection cable leakage detection connector (LIQ LEAK2/ J20)[a] | 12 | Fan connector (FAN1A/J5) |
| 13 | Fan connector (FAN1B/J7) | 14 | Fan connector (FAN2B/J8) |
| 15 | Fan connector (FAN2A/J6) | 16 | Fan board power connector 1 (POWER CONN1/J4) |
| 17 | Fan connector (FAN3B/ J11) | 18 | Fan connector (FAN3A/J9) |
| 19 | Fan connector (FAN4B/ J12) | 20 | Fan connector (FAN4A/ J10) |
| a: Reserved and unavailable currently | | | |

## 5.10.4 PSU Backplane

**Figure 5-24** PSU backplane



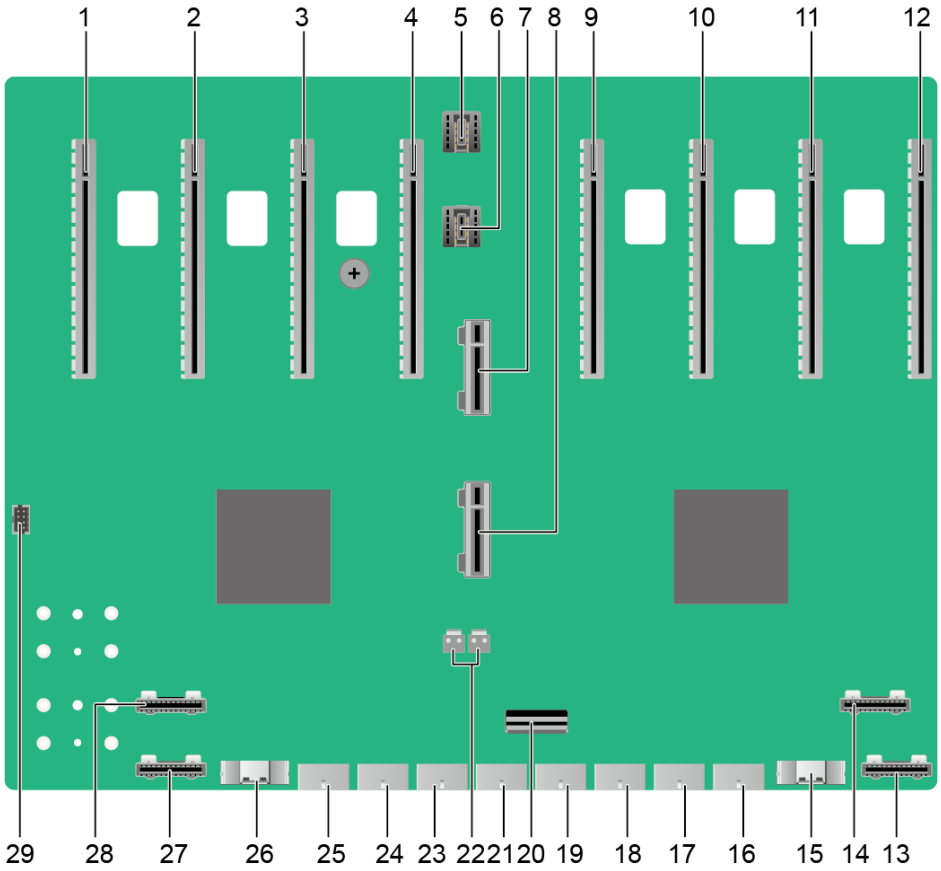

  

| | | | |
|---|---|---|---|
| 1 | Power connector (HDD BP/ J100) | 2 | Power connector (RSW-2& MB/J102) |
| 3 | Power connector (RSW-1&RISER/J101) | 4 | Guide sleeve (J108) |
| 5 | Spurious signal connector (J103) | - | - |

## 5.10.5 PCIe Switch Board

### 24 x 3.5" Drive Configuration

**Figure 5-25** PCIe switch board



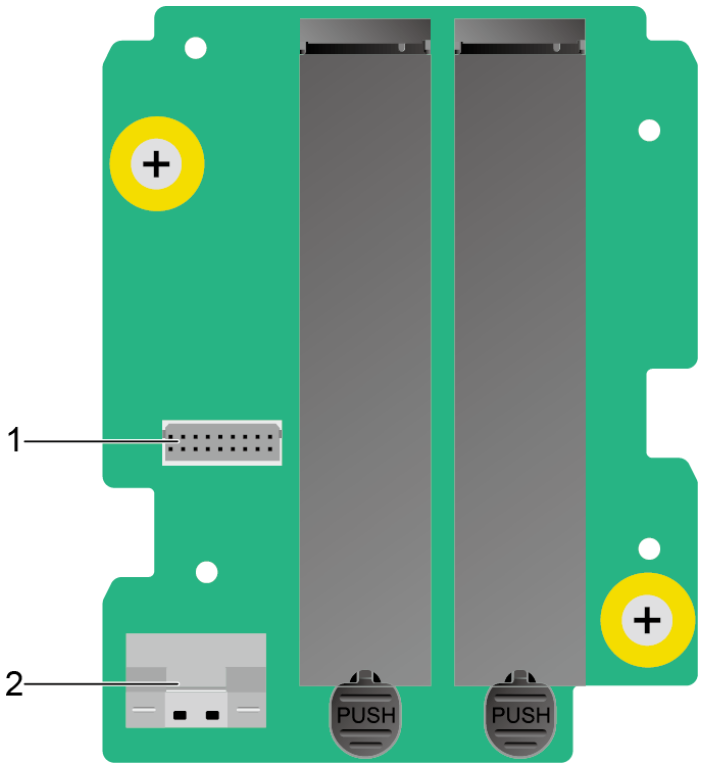

| | | | |
|---|---|---|---|
| 1 | CEM connector (PCIE SLOT16 X16/J18) | 2 | CEM connector (PCIE SLOT14 X16/J17) |
| 3 | CEM connector (PCIE SLOT12 X16/J16) | 4 | CEM connector (PCIE SLOT10 X16/J15) |
| 5 | Power connector (PWR CON1/J121) | 6 | Power connector (PWR CON2/J122) |

| | | | |
|---|---|---|---|
| 7 | UBCDD high-speed connector (UBCDD1-1/ J133) | 8 | UBCDD high-speed connector (UBCDD2-1/ J134) |
| 9 | CEM connector (PCIE SLOT7 X16/J14) | 10 | CEM connector (PCIE SLOT5 X16/J13) |
| 11 | CEM connector (PCIE SLOT3 X16/J12) | 12 | CEM connector (PCIE SLOT1 X16/J11) |
| 13 | UBC high-speed connector (UBC1-5B/J137) | 14 | UBC high-speed connector (UBC1-5A/J136) |
| 15 | UBC high-speed connector (UBC6-HDDBP/J140) | 16 | GPU power connector (GPU PWR CONN1/J111) |
| 17 | GPU power connector (GPU PWR CONN3/J112) | 18 | GPU power connector (GPU PWR CONN5/J113) |
| 19 | GPU power connector (GPU PWR CONN7/J114) | 20 | Low-speed signal connector (MISC CONN/ J102) |
| 21 | GPU power connector (GPU PWR CONN10/J115) | 22 | Power connector (BACK_RISER1/2_PWR/ J119/J120) |
| 23 | GPU power connector (GPU PWR CONN12/J116) | 24 | GPU power connector (GPU PWR CONN14/J117) |
| 25 | GPU power connector (GPU PWR CONN16/J118) | 26 | UBC high-speed connector (UBC5-HDDBP/J141) |
| 27 | UBC high-speed connector (UBC2-4B/J139) | 28 | UBC high-speed connector (UBC2-4B/J138) |
| 29 | Low-speed signal connector (DPU/J144) | - | - |

## 5.10.6 M.2 SSD Adapter Card

**Figure 5-26** M.2 SSD adapter card




| | | | |
|---|---|---|---|
| 1 | Signal connector (J1) | 2 | High-speed connector (J2) |

# 6 Product Specifications



## 6.1 Technical Specifications

**Table 6-1** Technical specifications

| Category | Specifications |
| --- | --- |
| Form factor | 4U AI server |
| Chipset | Intel® C621A |
| Processors | Supports one or two processors.<br>● Third-generation Intel® Xeon® Scalable processors (Ice Lake)<br>● Built-in memory controller and eight memory channels per processor<br>● Built-in PCIe controller supporting PCIe 4.0 and 64 lanes per processor<br>● Three UPI buses between processors, providing up to 11.2 GT/s transmission speed per channel<br>● Up to 40 cores<br>● Max. 3.6 GHz<br>● Min. 1.5 MB L3 cache per core<br>● Max. 270 W TDP<br>**NOTE**<br>The preceding information is for reference only. For details, see "Search Parts" in the compatibility list on the technical support website. |

| Category | Specifications |
| --- | --- |
| Memory | Provides 32 memory module slots.<br>● Up to 32 DDR4 DIMMs<br>– RDIMM or RDIMM-3DS supported<br>– Max. 3200 MT/s memory speed<br>– The DDR4 DIMMs of different types (RDIMM and LRDIMM) and specifications (capacity, bit width, rank, and height) cannot be used together.<br>– A server must use DDR4 DIMMs of the same P/N code.<br>**NOTE**<br>The preceding information is for reference only. For details, see "Search Parts" in the compatibility list on the technical support website. |

| Category | Specifications |
| --- | --- |
| Storage | Supports a variety of drive configurations. For details, see **5.5.1 Drive Configuration and Drive Numbering**.<br>● Supports two M.2 SSDs.<br>**NOTE**<br>● The M.2 SSD is used only as a boot device for installing the OS. Small-capacity (32 GB or 64 GB) M.2 SSDs do not support logging due to poor endurance. If a small-capacity M.2 SSD is used as the boot device, a dedicated log drive or log server is required for logging. For example, you can dump VMware logs in either of the following ways:<br>● Redirect the **/scratch**. For details, see **https://kb.vmware.com/s/article/1033696**.<br>● Configure the **syslog**. For details, see **https://kb.vmware.com/s/article/2003322**.<br>● The M.2 SSD cannot be used to store data due to poor endurance. In write-intensive applications, the M.2 SSD will wear out in a short time.<br>If you want to use SSDs or HDDs as data storage devices, use enterprise-level SSDs or HDDs with high DWPD.<br>● The M.2 SSD is not recommended for write-intensive service software due to poor endurance.<br>● Do not use M.2 SSDs for cache.<br>● Supports hot swap of SAS/SATA/NVMe U.2 drives.<br>**NOTE**<br>When NVMe drives are configured, note the following:<br>● Before using the VMD function, contact technical support engineers of the OS vendor to check whether the OS supports the VMD function. If yes, check whether the VMD driver needs to be manually installed and check the installation method.<br>● Surprise hot swap is supported if the VMD function is enabled and the latest Intel VMD driver is installed.<br>● Orderly hot swap is supported if the VMD function is disabled.<br>● Supports multiple types of RAID controller cards. For details, see "OS and Parts Compatibility" in the **Compatibility List**.<br>– The RAID controller card supports RAID configuration, RAID level migration, and drive roaming.<br>– The RAID controller card supports a supercapacitor for power-off protection to ensure user data security.<br>– The PCIe plug-in RAID controller card occupies one built-in PCIe slot.<br>For details about the RAID controller card, see the server *RAID Controller Card User Guide*. |

| Category | Specifications |
| --- | --- |
| | **NOTE**<br>If the BIOS is in legacy mode, the 4K drive cannot be used as the boot drive. |
| Network | The OCP 3.0 network adapters provide network expansion capabilities.<br>● Three or two OCP3.0 network adapters are supported. If two OCP3.0 network adapters are configured, one OCP network adapter supports the Multi-Host function.<br>● Supports orderly hot swap.<br>**NOTE**<br>The OCP 3.0 network adapter supports orderly hot swap only when the VMD function is disabled.<br>● Supports a variety of OCP 3.0 network adapters. For details, see "OS and Parts Compatibility" in the **Compatibility List**.<br>● Supports a variety of OCP 3.0 NICs. For details, visit the technical support website and see **Search Parts** in the compatibility list. |
| I/O expansion | Supports 16 PCIe slots.<br>● 12 PCIe network adapter slots<br>● Three OCP 3.0 network adapter slots<br>● One built-in PCIe slot<br>For details, see **5.7.2 PCIe Slots** and **5.7.3 PCIe Slot Description**.<br>**NOTE**<br>The preceding information is for reference only. For details, see "Search Parts" in the compatibility list on the technical support website. |
| Port | Supports a variety of ports.<br>● Ports on the front panel:<br>– One USB Type-C iBMC direct connect management port<br>– Two USB 3.0 ports<br>– One DB15 VGA port<br>● Ports on the rear panel:<br>– Two USB 3.0 ports<br>– One DB15 VGA port<br>– One RJ45 serial port<br>– One RJ45 management network port<br>**NOTE**<br>You are not advised to install the OS on the USB storage media. |

| Category | Specifications |
| --- | --- |
| Video card | An SM750 video chip with 32 MB display memory is integrated on the mainboard. The maximum display resolution is 1920 x 1200 at 60 Hz with 16 M colors.<br>**NOTE**<br>• The integrated video card can provide the maximum display resolution (1920 x 1200) only after the video card driver matching the OS version is installed. Otherwise, only the default resolution supported by the OS is provided.<br>• If both the front and rear VGA ports are connected to monitors, only the monitor connected to the front VGA port displays information. |
| System management | • UEFI<br>• iBMC<br>• NC-SI<br>• Integration with third-party management systems |
| Security feature | • Power-on password<br>• Administrator password<br>• TPM (for China and outside China)/TCM (only for China)<br>• Secure boot<br>• Front bezel (optional)<br>• Chassis cover opening detection |

# 6.2 Environmental Specifications

**Table 6-2** Environmental specifications

| Category | Specifications |
| --- | --- |
| Temperature | • Operating temperature: 5°C to 35°C (41°F to 95 °F) (ASHRAE Classes A1 to A4 compliant)<br>• Storage temperature (within three months): –30°C to +60°C (–22°F to +140°F)<br>• Storage temperature (within six months): –15°C to +45°C (5°F to 113°F)<br>• Storage temperature (within one year): –10°C to +35°C (14°F to 95°F)<br>• Maximum rate of temperature change: 20ºC (36ºF) per hour, and 5ºC (9ºF) per 15 minutes<br>**NOTE**<br>The highest operating temperature varies depending on the server configuration. For details, see the **A.3 Operating Temperature Limitations**. |

| Category | Specifications |
| --- | --- |
| Relative humidity (non-condensing) | ● Operating humidity: 8% to 90%<br>● Storage humidity (within three months): 8% to 85%<br>● Storage humidity (within six months): 8% to 80%<br>● Storage humidity (within one year): 20% to 75%<br>● Maximum rate of humidity change: 20% per hour<br>● Operational climatic range category<br>8% RH with -12°C (10.4°F) minimum dew point to 90% RH with 21°C (69.8°F) maximum dew point (ASHRAE Classes A2 compliant) |
| Air volume | ≥ 330 cubic feet per minute (CFM) |
| Operating altitude | ≤ 3050 m (10006.56 ft)<br>● When the server configuration complies with ASHRAE Classes A1 and A2 and the altitude is above 900 m (2952.76 ft), the highest operating temperature decreases by 1°C (1.8°F) for every increase of 300 m (984.24 ft).<br>● HDDs cannot be used at an altitude of over 3050 m (10006.56 ft). |
| Corrosive gaseous contaminant | Maximum growth rate of the corrosion product thickness:<br>● Copper corrosion rate test: 300 Å/month (meeting level G1 requirements of the ANSI/ISA-71.04-2013 standard on gaseous corrosion)<br>● Silver corrosion rate test: 200 Å/month |
| Particle contaminant | ● The equipment room environment meets the requirements of ISO 14664-1 Class 8.<br>● There is no explosive, conductive, magnetic, or corrosive dust in the equipment room.<br>**NOTE**<br>It is recommended that the particulate pollutants in the equipment room be monitored by a professional organization. |

| Category | Specifications |
| --- | --- |
| Acoustic noise | The declared A-weighted sound power levels (LWAd) and declared average bystander position A-weighted sound pressure levels (LpAm) listed are measured at 23°C (73.4°F) in accordance with ISO 7779 (ECMA 74) and declared in accordance with ISO 9296 (ECMA 109).<br>● Idle:<br>– LWAd: 6.16Bels<br>– LpAm: 49.4dBA<br>● Operating:<br>– LWAd: 7.01Bels<br>– LpAm: 57.4dBA<br>**NOTE**<br>Actual sound levels generated during server operation vary depending on server configuration, load, and ambient temperature. |

NOTE

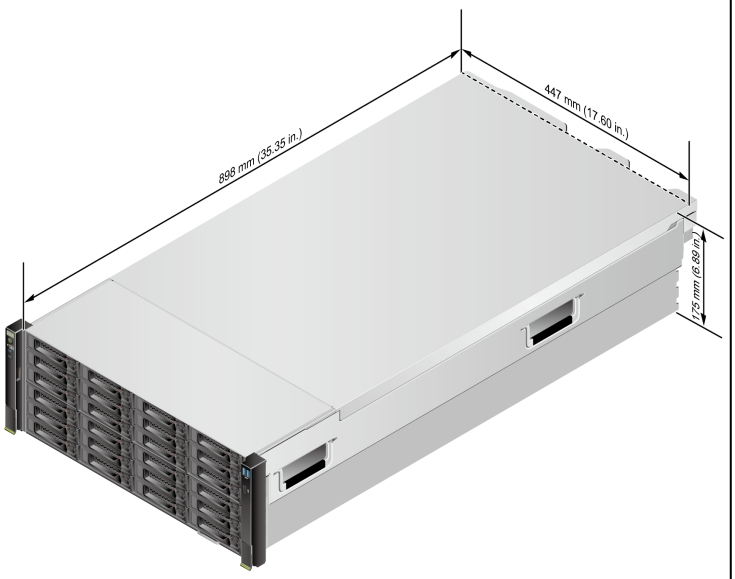
SSDs and HDDs (including NL-SAS, SAS, and SATA) cannot be preserved for a long time in the power-off state. Data may be lost or faults may occur if the preservation duration exceeds the specified maximum duration. When drives are preserved under the storage temperature and humidity specified in the preceding table, the following preservation time is recommended:

- Maximum preservation duration of SSDs:
  - 12 months in power-off state without data stored
  - 3 months in power-off state with data stored
- Maximum preservation duration of HDDs:
  - 6 months in unpacked/packed and powered-off state
- The maximum preservation duration is determined according to the preservation specifications provided by drive vendors. For details, see the manuals provided by drive vendors.

# 6.3 Physical Specifications

**Table 6-3** Physical specifications

| Category | Description |
| --- | --- |
| Dimensions (H x W x D) | • Chassis with 3.5" drives: 175 mm x 447 mm x 898 mm (6.89 in. x 17.60 in. x 35.35 in.)<br><br>**Figure 6-1** Physical dimensions (example: 24 x 3.5" drive chassis)<br>  <br><br>**NOTE**<br>See **Figure 6-1** for methods in measuring physical dimensions of the chassis. |
| Installation dimension requirements | • Requirements for cabinet installation:<br>Standard cabinet compliant with the International Electrotechnical Commission (IEC) 297 standard<br>– Cabinet width: 482.6 mm (19.00 in.)<br>– Cabinet depth ≥ 1100 mm (43.31 in.)<br>• Requirements for guide rail installation:<br>– The adjustable L-shaped guide rails apply to cabinets with a distance of 610 mm to 950 mm (24.02 in. to 37.40 in.) between the front and rear mounting bars.<br>– Ball bearing rail kit: applies to cabinets with a distance of 609 mm to 950 mm (23.98 in. to 37.40 in.) between the front and rear mounting bars. |

| Category | Description |
| --- | --- |
| Fully equipped weight | ● Net weight:<br>– Maximum weight for server with 24 x 3.5" drives: 71 kg (156.53 lb)<br>● Packing materials: 24 kg (52.91 lb) |
| Power consumption | Power consumption parameters vary with server configurations (including ErP-standard configurations). For details, see Power Calculator on the technical support website. |

# 7 Software and Hardware Compatibility

For details about the OS and hardware, see the compatibility list on the technical support website.

NOTICE

- If incompatible components are used, the device may be abnormal. Such a fault is beyond the scope of technical support and warranty.
- The performance of servers is closely related to application software, basic middleware software, and hardware. The slight differences of the application software, middleware basic software, and hardware may cause performance inconsistency between the application layer and test software layer.
  - If the customer has requirements on the performance of specific application software, contact technical support to apply for proof of concept (POC) tests in the pre-sales phase to determine detailed software and hardware configurations.
  - If the customer has requirements on hardware performance consistency, specify the specific configuration requirements (for example, specific drive models, RAID controller cards, or firmware versions) in the presales phase.

# 8 Safety Instructions



## 8.1 Security

### General Statement

- Comply with local laws and regulations when operating devices. These safety instructions are only a supplement.
- The "DANGER", "WARNING", and "CAUTION" information in this document does not represent all the safety instructions, but supplements to the safety instructions.
- Observe all safety instructions provided on the device labels when installing hardware. Follow them in conjunction with these Safety Instructions.
- Operators of special types of work (such as electricians and operators of forklifts) must be certified or authorized by the local government or authority.

**⚠ WARNING**

In a household scenario, operation of this device may cause wireless interference.

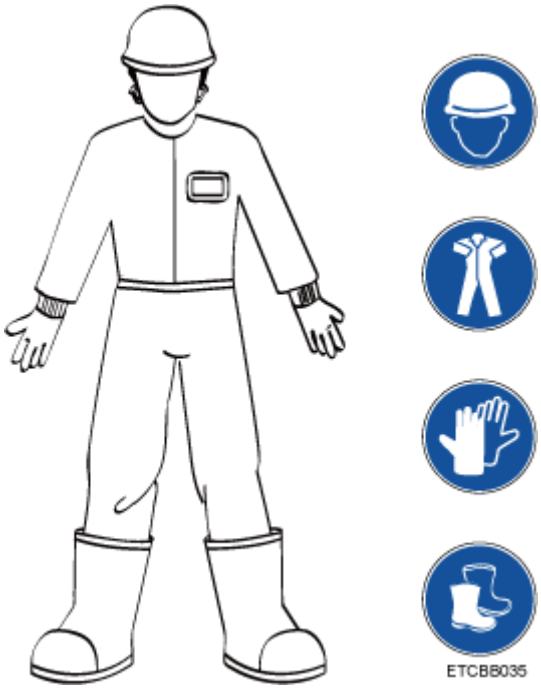
### Personal Safety

- This device is not suitable for use in places where children may be present.
- Only certified or authorized personnel are allowed to install device.
- Discontinue any dangerous operations and take protective measures. Report anything that could cause personal injury or device damage to a project supervisor.
- Do not move devices or install cabinets and power cables in hazardous weather conditions.

- Do not carry the weight that is over the maximum load per person allowed by local laws or regulations. Check the maximum device weight and arrange required personnel.
- Wear clean protective gloves, ESD clothing, a protective hat, and protective shoes, as shown in **Figure 8-1**.

**Figure 8-1** Protective clothing




- Before touching a device, wear ESD clothing and gloves (or wrist strap), and remove conductive objects (such as watches and jewelry). **Figure 8-2** shows conductive objects that must be removed before you touch a device.

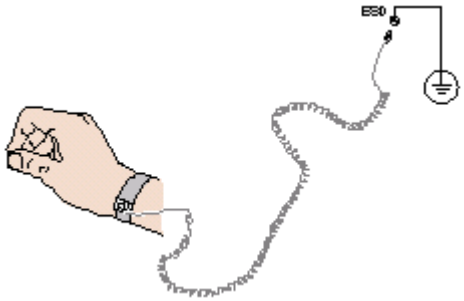
**Figure 8-2** Removing conductive objects


**Figure 8-3** shows how to wear an ESD wrist strap.

a. Put your hands into the ESD wrist strap.
b. Fasten the strap buckle and ensure that the ESD wrist strap is in contact with your skin.
c. Insert the ground terminal attached to the ESD wrist strap into the jack on the grounded cabinet or chassis.

**Figure 8-3** Wearing an ESD wrist strap



- Exercise caution when using tools.
- If the installation position of a device is higher than the shoulders of the installation personnel, use a vehicle such as a lift to facilitate installation. Prevent the device from falling down and causing personal injury or damage to the device.
- The device is powered by high-voltage power sources. Direct or indirect contact (especially through damp objects) with high-voltage power sources may result in serious injury or death.
- Ground a device before powering it on. Otherwise, high voltage leakage current may cause personal injury.
- When a ladder is used, ensure that another person holds the ladder steady to prevent accidents.
- Do not look into optical ports without eye protection when installing, testing, or replacing optical cables.

## Device Security

- Use the recommended power cables at all times.
- Use power cables only for dedicated servers. Do not use them for other devices.
- Use dedicated power cables to ensure equipment and personal safety.
- When moving a device, hold the bottom of the device. Do not hold the handles of the installed modules, such as the PSUs, fan modules, drives, and the mainboard. Handle the device with care.
- Exercise caution to prevent damage to the device when using tools during installation or maintenance.
- Connect the primary and secondary power cables to different power distribution units (PDUs) to ensure reliable device operation.
- Ground a device before powering it on. Otherwise, high voltage leakage current may cause device damage.

## Transportation Precautions

Improper transportation may damage device. Contact the manufacturer for precautions before attempting transportation.

Transportation precautions include but are not limited to:

- The logistics company engaged to transport the device must be reliable and comply with international standards for transporting electronics. Ensure that the

device being transported is always kept upright. Take necessary precautions to prevent collisions, corrosion, package damage, damp conditions, and pollution.

- Transport each device in its original packaging.
- If the original packaging is unavailable, package heavy, bulky parts (such as chassis and blades) and fragile parts (such as PCIe cards and optical modules) separately.

  NOTE

  For details about components supported by the server, see "Search Parts" in the compatibility list on the technical support website.
- Ensure that all devices are powered off before transportation.

### Maximum Weight Carried by a Person

CAUTION

The maximum weight allowed to be carried by a person is subject to local laws or regulations. The markings on the device and the descriptions in the documentation are for reference only.

Table 8-1 lists the maximum weight a person is permitted to carry as stipulated by a number of organizations.

**Table 8-1** Maximum weight carried per person

| Organization | Weight (kg/lb) |
| --- | --- |
| European Committee for Standardization (CEN) | 25/55.13 |
| International Organization for Standardization (ISO) | 25/55.13 |
| National Institute for Occupational Safety and Health (NIOSH) | 23/50.72 |
| Health and Safety Executive (HSE) | 25/55.13 |
| General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ) | • Male: 15/33.08<br>• Female: 10/22.05 |

For more information about safety instructions, see *Server Safety Information*.

## 8.2 Maintenance and Warranty

For details about the maintenance policy, visit **Customer Support Service**.

For details about the warranty policy, visit **Warranty**.

# 9 System Management

The server the new-generation Intelligent Baseboard Management Controller (iBMC), which complies with Intelligent Platform Management Interface 2.0 (IPMI 2.0) specifications and provides highly reliable hardware monitoring and management.

The iBMC supports the following features and protocols:

- Various management interfaces

  The iBMC provides the following standard interfaces to meet various system integration requirements:

  – DCMI 1.5 interface
  – IPMI 1.5/IPMI 2.0 interface
  – Command-line interface
  – Redfish interface
  – Hypertext Transfer Protocol Secure (HTTPS)
  – Simple Network Management Protocol (SNMP)
- Fault monitoring and diagnosis

  Faults can be detected and rectified in advance to ensure 24/7 stable running of the device.

  – The iBMC allows screenshots and videos to be created when the system breaks down, facilitating cause analysis of the system breakdown.
  – The iBMC offers screen snapshots and videos, simplifying routine preventive maintenance, recording, and auditing.
  – The fault diagnose management (FDM) function supports component-based precise fault diagnosis, facilitating component fault locating and replacement.
  – The iBMC supports the reporting of alarms through syslog packets, trap packets, and emails, helping the upper-layer NMS to collect the fault information about the server.
- Security management
  – Software image backup improves system security. Even if the running software breaks down, the system can be started from the backup image.
  – Diversified user security control interfaces are provided to ensure user login security.

  - Multiple types of certificates can be imported and replaced to ensure data transmission security.
- System maintenance interface
  - The virtual KVM and virtual media functions facilitate remote maintenance.
  - Out-of-band RAID monitoring and configuration are supported to improve RAID configuration efficiency and management capability.
  - Smart Provisioning provides a convenient operation interface for installing the OS, configuring RAID, and performing the upgrade without a CD-ROM.
- Various network protocols
  - The NTP synchronizes network time to optimize time configuration.
  - The iBMC supports domain name system (DNS) and Lightweight Directory Application Protocol (LDAP) to implement domain management and directory service.
- Intelligent power management
  - The power capping technology helps you easily improve deployment density.
  - The iBMC uses dynamic power saving to reduce operational expenditure (OPEX).
- License Management

  By managing licenses, you can use the features of the iBMC advanced edition in authorization mode.

  Compared with the standard edition, the iBMC advanced edition provides more advanced features, such as:
  - Implements the OS deployment using Redfish.
  - Collect the original data of intelligent diagnosis using Redfish.

# 10 Certifications

| Country/Region | Certification | Standard |
| --- | --- | --- |
| China | CCC | GB4943.1-2011<br>GB9254-2008(Class A)<br>GB17625.1-2012 |

# 11 Waste Product Recycling

If product users need product recycling service provided by xFusion after products are scrapped, contact technical support for services.

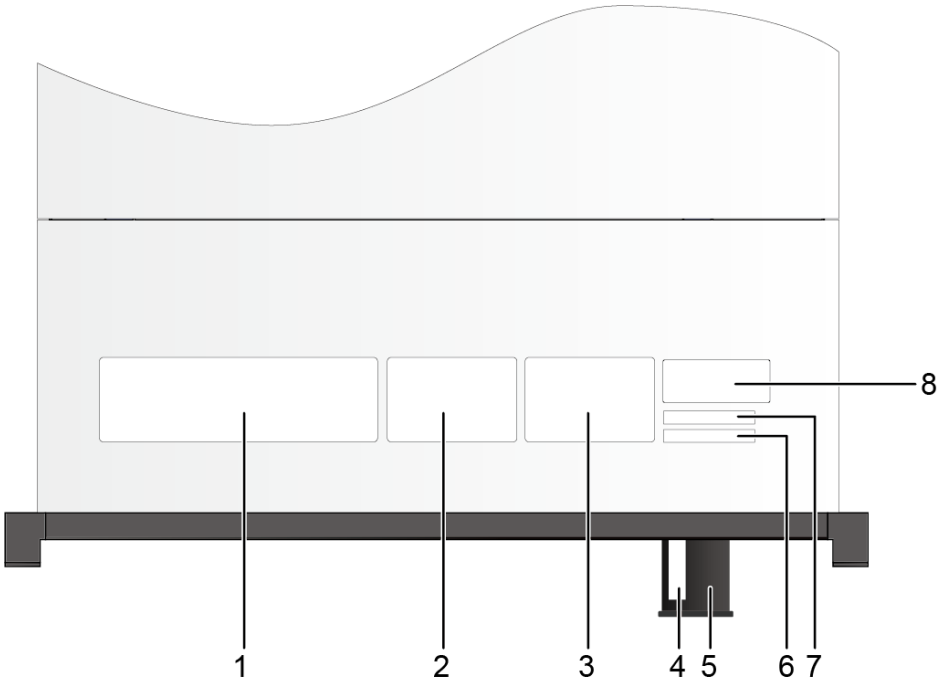
  

# A Appendix

## A.1 Chassis Label Information

### A.1.1 Chassis Head Label

**Figure A-1** Chassis head label




| | | | |
|---|---|---|---|
| 1 | Nameplate | 2 | Certificate |
| 3 | Quick access label | 4 | SN<br>**NOTE**<br>For details, see **Product SN**. |

| | | | |
|---|---|---|---|
| 5 | Slide-out label plate<br>**NOTE**<br>The position of the slide-out label plate varies depending on the server model or configuration. For details, see **5.1.1 Appearance**. | 6 | SN<br>**NOTE**<br>For details, see **Product SN**. |
| 7 | Reserved space for customized label | 8 | Pressure-proof label<br>**NOTE**<br>This label warns users not place any objects on top of a rack-mounted device. |

## A.1.1.1 Nameplate

**Figure A-2** Nameplate example

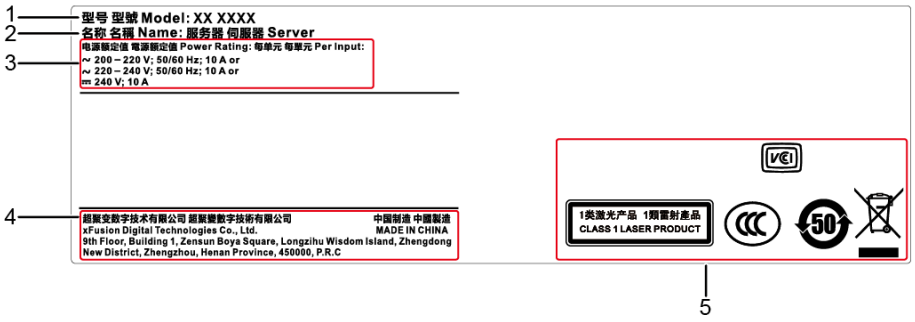



**Table A-1** Nameplate description

| No. | Description |
|---|---|
| 1 | Server model<br>For details, see **A.4 Nameplate**. |
| 2 | Device name |
| 3 | Power supply requirements |
| 4 | Vendor information |
| 5 | Certification marks |

### A.1.1.2 Certificate

**Figure A-3** Certificate example


**Table A-2** Certificate description

| No. | Description |
| --- | --- |
| 1 | Order |
| 2 | No.<br>**NOTE**<br>For details, see **Figure A-4** and **Table A-3**. |
| 3 | QC inspector |
| 4 | Production date |
| 5 | No. barcode |

**Figure A-4** Certificate number example

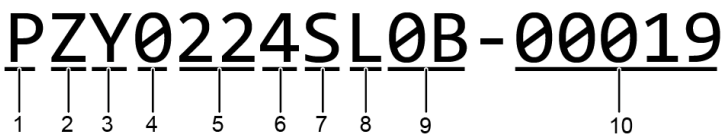



**Table A-3** Certificate number description

| No. | Description |
| --- | --- |
| 1 | **P**: a fixed value for this digit |
| 2 | **Z**: a fixed value for this digit |
| 3 | • **Y**: a server<br>• **B**: a semi-finished server<br>• **N**: a spare part |

| No. | Description |
| --- | --- |
| 4 | **0**: a value for the reserved digit |
| 5 | Year (two characters) |
| 6 | Month (one character)<br>● Digits 1 to 9 indicate January to September respectively.<br>● Letters A to C indicate October to December respectively. |
| 7 | Day (one character)<br>● Digits 1 to 9 indicate the 1st to 9th.<br>● Letters A to H indicate the 10th to 17th.<br>● Letters J to N indicate the 18th to 22nd.<br>● Letters P to Y indicate the 23rd to 31st. |
| 8 | Hour (one character)<br>● Digits 0 to 9 indicate 0:00 to 9:00.<br>● Letters A to H indicate 10:00 to 17:00.<br>● Letters J to N indicate 18:00 to 22:00.<br>● Letters P to Q indicate 23:00 to 24:00. |
| 9 | Serial number (two characters). |
| 10 | Manufacturing serial number (five characters). |

### A.1.1.3 Quick Access Label

**Figure A-5** Quick access label example

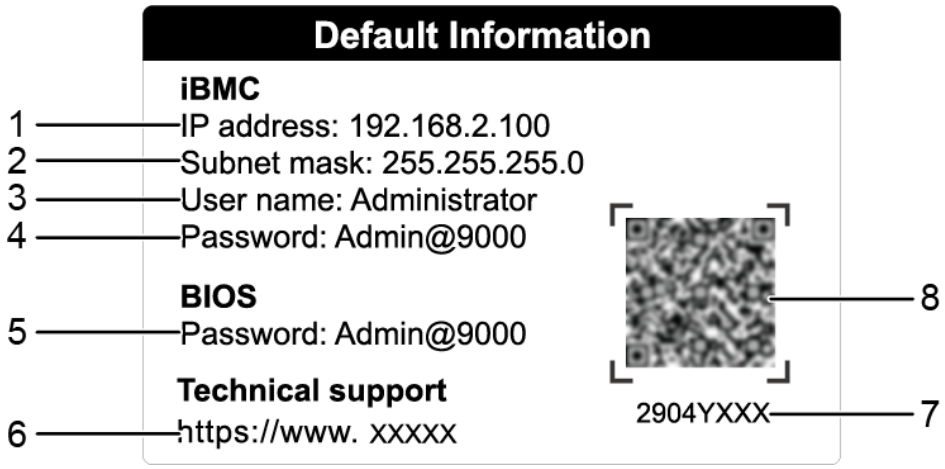
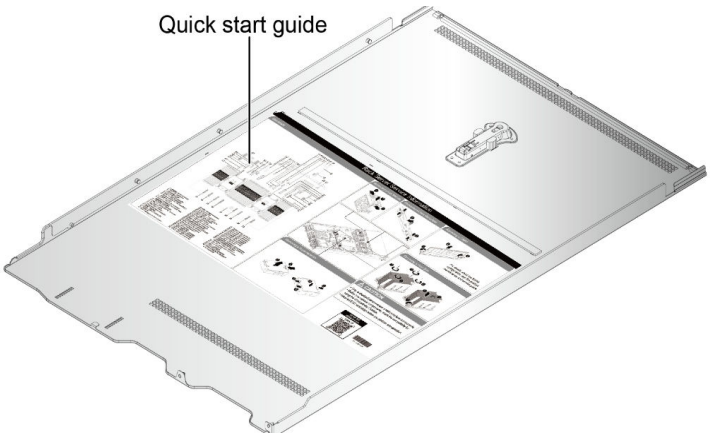


**Table A-4** Quick access label description

| No. | Description |
| --- | --- |
| 1 | Default IP address of the iBMC management network port |
| 2 | Default subnet mask of the iBMC management network port |
| 3 | Default iBMC username |
| 4 | Default iBMC password |
| 5 | Default BIOS password |
| 6 | Technical support website |
| 7 | P/N code |
| 8 | QR code<br>**NOTE**<br>Scan the QR code to obtain technical support resources. |

## A.1.2 Chassis Internal Label

**Figure A-6** Chassis internal label



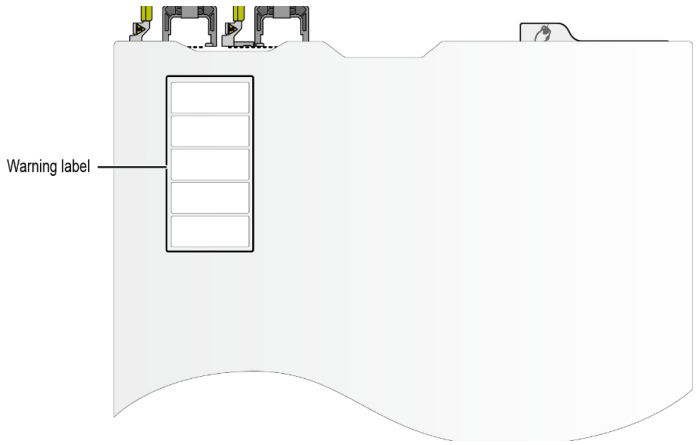

NOTE

- The quick start guide is located on the inside of the chassis cover. It describes how to remove the mainboard components, important components of the chassis, precautions, and QR codes of technical resources. The pictures are for reference only. For details, see the actual product.
- The quick start guide is optional. For details, see the actual product.

## A.1.3 Chassis Tail Label

**Figure A-7** Chassis tail label




NOTE

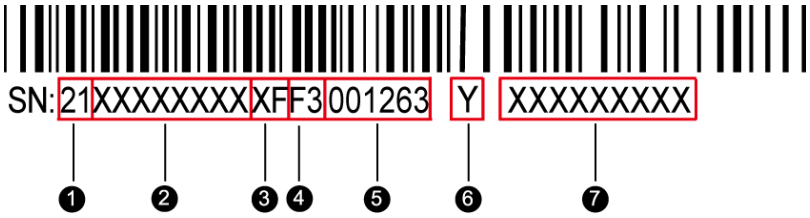
For details about the warning label, see *Server Security Information*.

# A.2 Product Serial Number

The serial number (SN) on the slide-out label plate uniquely identifies a device. The SN is required when you contact technical support. **SN example 1** and **SN example 2** show two SN examples.

- SN example 1

**Figure A-8** SN example 1




- SN example 2

**Figure A-9** SN example 2

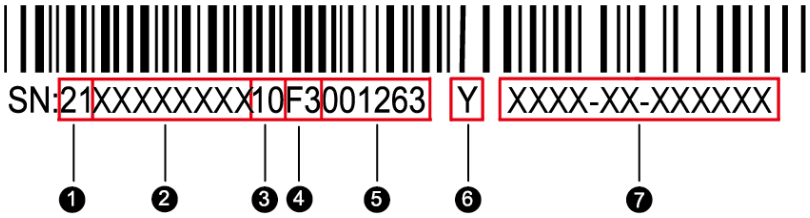


**Table A-5** SN description

| No. | Description |
| --- | --- |
| 1 | SN ID (two characters), which is 21. |
| 2 | Material identification code (eight digits), that is, processing code. |
| 3 | Vendor code (two digits), that is, the code of the processing place. |
| 4 | Year and month (two characters).<br>● The first character indicates the year.<br>– Digits 1 to 9 indicate years 2001 to 2009, respectively.<br>– Letters A to H indicate years 2010 to 2017, respectively.<br>– Letters J to N indicate years 2018 to 2022, respectively.<br>– Letters P to Y indicate years 2023 to 2032, respectively.<br>**NOTE**<br>The years from 2010 are represented by upper-case letters excluding I, O, and Z because the three letters are similar to the digits 1, 0, and 2.<br>● The second character indicates the month.<br>– Digits 1 to 9 indicate January to September, respectively.<br>– Letters A to C indicate October to December, respectively. |
| 5 | Sequence number (six characters). |
| 6 | RoHS compliance (one character). Y indicates environmental-friendly processing. |
| 7 | Internal model, that is, product name. The actual board model format may vary. For details, see the actual board model. |

# A.3 Operating Temperature Limitations

**Table A-6** Operating temperature limitations

| Configuration | Maximum Operating Temperature 30℃ (86°F) | Maximum Operating Temperature 35°C (95°F) |
| --- | --- | --- |
| 24 x 3.5" drive configuration | All configurations are supported. | The A40 GPU is supported when the number of 3.5" front drives is less than or equal to 20. |

NOTE

- When reducing the number of front drives, configure a mask with the high-ventilation rate.
- When a single fan is faulty, the highest operating temperature is 5°C (9°F) lower than the rated value.
- It is recommended that servers be deployed at an interval of 1U to reduce server noise and improve server energy efficiency.

# A.4 Nameplate

| Certified Model | Remarks |
| --- | --- |
| G5500 V6 | Global |
| H52GP-06 | Global |
| Note: The nameplate depends on the actual product. | |

# A.5 RAS Features

The server supports a variety of Reliability, Availability, and Serviceability (RAS) features. You can configure these features for better performance.

For details about RAS features, see the *Whitley Platform Server RAS Feature Technical White Paper*.

# A.6 Sensor List

| Sensor | Description | Component |
| --- | --- | --- |
| Inlet Temp | Air inlet temperature | Indicator board |
| Outlet Temp | Air outlet temperature | BMC card |

| Sensor | Description | Component |
| --- | --- | --- |
| PCH Temp | PCH bridge temperature | Mainboard |
| CPU*N* Core Rem | CPU core temperature | NCPU*N*<br>*N* indicates the CPU number. The value is **1** or **2**. |
| CPU*N* DTS | CPU DTS value | CPU*N*<br>*N* indicates the CPU number. The value is **1** or **2**. |
| CPU*N* Margin | CPU Margin | CPU*N*<br>*N* indicates the CPU number. The value is **1** or **2**. |
| CPU*N* VRD Temp | CPU VRD temperature | Mainboard<br>*N* indicates the CPU number. The value is **1** or **2**. |
| CPU*N* MEM Temp | CPU memory module temperature | Memory module corresponding to CPU *N*<br>*N* indicates the CPU number. The value is **1** or **2**. |
| CPU*N* 12V | 12 V voltage supplied by the mainboard to the CPU | Mainboard<br>*N* indicates the CPU number. The value is **1** or **2**. |
| Riser 12V | 12 V voltage supplied by the mainboard to the riser card | Mainboard |
| SYS 3.3V | Mainboard 3.3 V voltage | Mainboard |
| CPU*N* DDR VDDQ | 1.2 V DIMM voltage | Mainboard<br>*N* indicates the CPU number. The value is **1** or **2**. |
| MEM Power | Total power consumption of the memory module in the power-on state | Mainboard |
| CPU Power | Power consumption of CPU 1 in the power-on state | Mainboard |

| Sensor | Description | Component |
| --- | --- | --- |
| CPU*N* VCCIN | CPU VCCIN voltage | Mainboard<br>*N* indicates the CPU number. The value is **1** or **2**. |
| CPU*N* VSA | CPU VSA voltage | Mainboard<br>*N* indicates the CPU number. The value is **1** or **2**. |
| CPU*N* P1V8 | CPU P1V8 voltage | Mainboard<br>*N* indicates the CPU number. The value is **1** or **2**. |
| CPU*N* VCCIO | CPU VCCIO voltage | Mainboard<br>*N* indicates the CPU number. The value is **1** or **2**. |
| CPU*N* VCCANA | CPU VCCANA voltage | Mainboard<br>*N* indicates the CPU number. The value is **1** or **2**. |
| FAN*N*A F Speed | Fan speed | Fan module *N*<br>*N* indicates the fan module number. The value is **2** or **3**. |
| FAN*N*A R Speed | | |
| FAN*N*B F Speed | | Fan module *N*<br>*N* indicates the fan module number. The value ranges from 1 to 4. |
| FAN*N*B R Speed | | |
| Power | Server input power | PSU |
| PS$ VIN | Input voltage | PSU |
| Disks Temp | Maximum drive temperature | Drive |
| SSD Disk$ Temp | SSD temperature | SSD |
| SSD MaxTemp | Maximum SSD temperature (reported by BMA) | SSD |
| PCH Status | PCH chip fault diagnosis health status | Mainboard |

| Sensor | Description | Component |
| --- | --- | --- |
| CPU*N* UPI Link | CPU UPI link fault diagnosis health status | Mainboard or CPU *N*<br>*N* indicates the CPU number. The value is **1** or **2**. |
| CPU*N* Prochot | CPU Prochot | CPU*N*<br>*N* indicates the CPU number. The value is **1** or **2**. |
| CPU*N* Status | CPU status detection | CPU*N*<br>*N* indicates the CPU number. The value is **1** or **2**. |
| CPU*N* Memory | Status of the memory module corresponding to the CPU | Memory module corresponding to CPU *N*<br>*N* indicates the CPU number. The value is **1** or **2**. |
| FAN2A Status | Fan fault status | Fan *N*<br>*N* indicates the fan module number. The value ranges from 1 to 4. |
| FAN3A Status | | |
| FAN*N*B Status | | |
| DIMM*N* | DIMM status | DIMM *N*<br>*N* indicates the DIMM slot number. |
| RTC Battery | RTC battery status. An alarm is generated when the voltage is lower than 1 V. | RTC battery on the mainboard |
| PCIE Status | PCIe status error | PCIe card |
| Power Button | Power button pressed state | Mainboard and power button |
| Watchdog2 | Watchdog | Mainboard |
| Mngmnt Health | Management subsystem health status | Management module |
| UID Button | UID button status | Mainboard |
| PwrOk Sig. Drop | Voltage drop status | Mainboard |
| PwrOn TimeOut | Power-on timeout | Mainboard |
| PwrCap Status | Power capping status | Mainboard |

| Sensor | Description | Component |
| --- | --- | --- |
| HDD BP$ Temp | Drive backplane temperature | Drive backplane |
| M2Disk1 | Status of the M.2 drive on the riser card | M.2 adapter card |
| M2Disk2 | | |
| M2 Adapter Temp | M.2 adapter temperature | M.2 adapter card |
| BIOBoard$ Temp | I/O board temperature | I/O board |
| SW1 VDD0V8 | 0.8 V voltage monitoring | PCIe switch board |
| SW2 VDD0V8 | | |
| SW1 VRD Temp | Switch board temperature monitoring | PCIe switch board |
| SW2 VDD Temp | | |
| SW1 VDD1V25 | 1.25 V voltage monitoring | PCIe switch board |
| SW2 VDD1V25 | | |
| PS Redundancy | Redundancy failure due to PSU removal | PSU |
| RAID Status | RAID controller card health status | RAID controller card |
| RAID PCIE ERR | RAID controller card health status fault diagnosis | RAID controller card |
| Raid$ BBU Temp | RAID controller card capacitor temperature | RAID controller card |
| PS$ Status | PSU fault status | PSU backplane |
| PS$ Fan Status | PSU fan fault status | PSU backplane |
| PS$ Temp Status | PSU presence status | PSU backplane |
| DISK*N* | Drive status | Drive *N*<br>*N* indicates the slot number of the drive. The value ranges from 0 to 23. |
| PCIe RAID$ Temp | Temperature of the PCIe plug-in RAID controller card | PCIe plug-in RAID controller card |
| PCIe$ OP Temp | PCIe card optical module temperature | PCIe card |
| PCIe NIC$ Temp | PCIe card chip temperature | PCIe card |

| Sensor | Description | Component |
| --- | --- | --- |
| PCIe$ Chip0 Temp | 1951 chip temperature sensor | GPU |
| PCIe$ Chip1 Temp | | |
| 1711 Core Temp | Core temperature of the BMC management chip | BMC card |
| PS$ IIn | PSU input current | PSU |
| PS$ IOut | PSU output current | PSU |
| PS$ Pout | PSU output power | PSU |
| PS$ Temp | Maximum internal temperature of the PSU | PSU |
| PS$ Inlet Temp | PSU air inlet temperature | PSU |
| AreaIntrusion | Listening to the unpacking action | Mainboard |
| Power$ | Power of a PSU | PSU |
| OCP$ Temp | OCP card chip temperature | OCP 3.0 network adapter |
| CPU*N* PMem Temp | CPU PMem module temperature | PMem memory corresponding to CPU *N*<br>*N* indicates the CPU number. The value is **1** or **2**. |
| Riser$ Temp | Riser card temperature | Riser card |
| NPU$ AICORE Temp | AI chip temperature of the NPU card | NPU card |
| NPU$ HBM Temp | NPU HBM temperature | NPU card |
| NPU$ NIMBUS Temp | NIMBUS temperature of the NPU card | NPU card |
| NPU$ OP Temp | NPU card optical module temperature | NPU card |
| NPU$ Outlet Temp | Air outlet temperature of the NPU card | NPU card |
| NPU$ Inlet Temp | Air inlet temperature of the NPU card | NPU card |
| NPU$ VRD Temp | VRD temperature of the NPU card | NPU card |
| LCD Status | LCD health status | LCD |
| LCD Presence | LCD presence | LCD |

| Sensor | Description | Component |
| --- | --- | --- |
| PCIe$ Temp | PCIe card chip temperature | PCIe card |
| PCIe$ Card BBU | BBU status of the PCIe plug-in RAID controller card | PCIe plug-in RAID controller card |
| GPU$ Power | GPU power | GPU |
| GPU$ Temp | GPU temperature | GPU |
| GPU$ HBM Temp | HBM chip temperature of the GPU | GPU |
| CPU Usage | CPU usage | N/A |
| Memory Usage | Memory usage | |
| ACPI State | ACPI status | |
| SysFWProgress | Software processes and system startup errors | |
| System Notice | Hot restart reminder and fault diagnosis program information collection | |
| System Error | System suspension or restart. Check the background logs. | |
| SysRestart | System restart causes | |
| Boot Error | Boot error | |
| BMC Boot Up | BMC startup event | |
| BMC Time Hopping | Time hopping | |
| NTP Sync Failed | NTP synchronization failure and recovery events | |
| SEL Status | SEL full or clearing events | |
| Op. Log Full | Operation log full or events being cleared | |
| Sec. Log Full | Security log full or events being cleared | |
| Host Loss | System monitoring software (BMA) link loss detection | |

# A.7 FAQs About Optical Modules

The server NIC must be used with optical modules that have passed the compatibility test of xFusion. With uncertain transmission reliability, optical modules that have not been tested for compatibility may affect the service stability. xFusion is not liable for any problems caused by the use of optical modules that have not been tested for compatibility by xFusion and will not fix such problems in principle.

When performing the compatibility tests on the optical modules used by servers, xFusion comprehensively verifies their functions to ensure their quality. The verified items include optical module plugging or unplugging, transmit and receive optical power, signal transmission quality, basic data reading, error tolerance, compatibility, electromagnetic compatibility (EMC), and environmental performance.

**Table A-7** Problems of using optical modules that have not been tested for compatibility and corresponding causes

| Symptom | Cause |
| --- | --- |
| Due to non-standard structure and size, an optical module fails to be inserted into the optical interface or removed after being inserted. | Structures or sizes of some optical modules that have not been tested for compatibility do not comply with the Multi-Source Agreement (MSA). When such an optical module is installed on an optical interface, the size of this optical module hinders optical module installation on adjacent optical interfaces. In addition, optical modules can be unlocked through self-unlocking, press-unlocking, push-unlocking, or tilt-unlocking. For optical modules that have not been tested for compatibility, the server may not be able to have the optical modules removed that are not unlocked through press-unlocking. |
| Data bus defects cause the data bus suspension of a device. | Some optical modules that have not been tested for compatibility have defects in data bus designs. Using such an optical module causes suspension of the connected data bus on the device. As a result, data on the suspended bus cannot be read. |
| An optical module with improper edge connector size damages electronic components of the optical interface. | If an optical module that has not been tested for compatibility with improper edge connector size is used on an optical interface, electronic components of the optical interface will be damaged by short circuits. |
| Unnormalized temperature monitoring causes incorrect alarms. | The temperature monitoring systems of some optical modules that have not been tested for compatibility do not comply with industry standards and report temperature values higher than the real temperature. When such optical modules are used, the system will report incorrect temperature alarms. |

| Symptom | Cause |
| --- | --- |
| Improper register settings cause errors or failures in reading parameters or diagnostic information. | Some optical modules that have not been tested for compatibility have improper register values on page A0, which can cause errors or failures when the data bus attempts to read parameters or diagnostic information. |
| Optical modules bring electromagnetic interference to nearby devices. | Some optical modules that have not been tested for compatibility are not designed in compliance with EMC standards and have low anti-interference capability. Additionally, they bring electromagnetic interference to nearby devices. |
| Services are interrupted when an optical module is operating under overtemperature. | The operating temperature ranges of optical modules that have not been tested for compatibility cannot meet service requirements. When they are used under a relatively high temperature, the optical power decreases, resulting in service interruption. |
| Optical modules cannot work properly when the temperature change rate exceeds the normal range without adapting to the heat dissipation policy of the server. | Some optical modules that are not tested for compatibility have poor heat dissipation. Since they are not adapted to the heat dissipation policy of the server, abnormally high temperatures may occur continuously after they are running for a period of time. As a result, the optical modules cannot work properly. |

# B Glossary

## B.1 A-E

### B

| | |
|---|---|
| baseboard management controller (BMC) | The BMC complies with the Intelligent Platform Management Interface (IPMI). It collects, processes, and stores sensor signals, and monitors the operating status of components. The BMC provides the hardware status and alarm information about the managed objects to the management system so that the management system can implement unified management of the devices. |

### E

| | |
|---|---|
| ejector lever | A part on the panel of a device used to facilitate installation or removal of the device. |
| Ethernet | A baseband local area network (LAN) architecture developed by Xerox Corporation by partnering with Intel and DEC. Ethernet uses the Carrier Sense Multiple Access/Collision Detection (CSMA/CD) access method and allows data transfer over various cables at 10 Mbit/s. The Ethernet specification is the basis for the IEEE 802.3 standard. |

# B.2 F-J

## G

| | |
|---|---|
| Gigabit Ethernet (GE) | An extension and enhancement of traditional shared media Ethernet standards. It is compatible with 10 Mbit/s and 100 Mbit/s Ethernet and complies with IEEE 802.3z standards. |

## H

| | |
|---|---|
| Hot swap | Replacing or adding components without stopping or shutting down the system. |

# B.3 K-O

## K

| | |
|---|---|
| KVM | A hardware device that provides public video, keyboard and mouse (KVM). |

# B.4 P-T

## P

| | |
|---|---|
| panel | An external component (including but not limited to ejector levers, indicators, and ports) on the front or rear of the server. It seals the front and rear of the chassis to ensure optimal ventilation and electromagnetic compatibility (EMC). |

| | |
|---|---|
| Peripheral Component Interconnect Express (PCIe) | A computer bus PCI, which uses the existing PCI programming concepts and communication standards, but builds a faster serial communication system. Intel® is the main sponsor for PCIe. PCIe is used only for internal interconnection. PCIe is based on the existing PCI system. Therefore, the existing PCI system can be converted into PCIe only by modifying the physical layer without modifying the software. PCIe has a faster rate. It can replace almost all existing internal buses (including AGP and PCI). |

## R

| | |
|---|---|
| redundancy | A mechanism that allows a backup device to automatically take over services from a faulty device to ensure uninterrupted running of the system. |
| redundant array of independent disks (RAID) | A storage technology that combines multiple physical drives into a logical unit for the purposes of data redundancy and performance improvement. |

## S

| | |
|---|---|
| server | A special computer that provides services for clients over a network. |
| Standby 12 V Out (SV12) | Standby 12 V output of the PSU. |
| System event log (SEL) | Event records stored in the system used for subsequent fault diagnosis and system recovery. |

# B.5 U-Z

## U

| | |
|---|---|
| U | A unit defined in International Electrotechnical Commission (IEC) 60297-1 to measure the height of a cabinet, chassis, or subrack. 1 U = 44.45 mm = 1.75 in. |
| UltraPath Interconnect (UPI) | A point-to-point processor interconnect developed by Intel®. |

# C Acronyms and Abbreviations

## C.1 A-E

### A

| | |
|---|---|
| **AC** | alternating current |
| **AES** | Advanced Encryption Standard New Instruction Set |
| **ARP** | Address Resolution Protocol |
| **AVX** | Advanced Vector Extensions |

### B

| | |
|---|---|
| **BBU** | backup battery unit |
| **BIOS** | Basic Input/Output System |
| **BMC** | Baseboard Management Controller |

### C

| | |
|---|---|
| CCC | China Compulsory Certification |
| **CD** | calendar day |
| **CE** | Conformite Europeenne |
| **CIM** | Common Information Model |
| **CLI** | command-line interface |

### D

| | |
|---|---|
| **DC** | direct current |
| **DDR4** | Double Data Rate 4 |
| **DDDC** | double device data correction |
| **DEMT** | Dynamic Energy Management Technology |
| **DIMM** | dual in-line memory module |
| **DRAM** | dynamic random-access memory |
| **DVD** | digital video disc |

### E

| | |
|---|---|
| **ECC** | error checking and correcting |
| **ECMA** | European Computer Manufacturer Association |
| **EDB** | Execute Disable Bit |
| **EID** | Enclosure ID (backplane ID) |
| **EN** | European Efficiency |
| **ERP** | enterprise resource planning |
| **ETS** | European Telecommunication Standards |

## C.2 F-J

### F

| | |
|---|---|
| **FB-DIMM** | Fully Buffered DIMM |
| **FC** | Fiber Channel |
| **FCC** | Federal Communications Commission |
| **FCoE** | Fibre Channel Over Ethernet |
| **FTP** | File Transfer Protocol |

## G

| | |
|---|---|
| **GE** | Gigabit Ethernet |
| **GPIO** | General Purpose Input/Output |
| **GPU** | graphics processing unit |

## H

| | |
|---|---|
| **HA** | high availability |
| **HDD** | hard disk drive |
| **HPC** | high-performance computing |
| **HTTP** | Hypertext Transfer Protocol |
| **HTTPS** | Hypertext Transfer Protocol Secure |

## I

| | |
|---|---|
| **iBMC** | Intelligent Baseboard Management Controller |
| **IC** | Industry Canada |
| **ICMP** | Internet Control Message Protocol |
| **IDC** | Internet Data Center |
| **IEC** | International Electrotechnical Commission |
| **IEEE** | Institute of Electrical and Electronics Engineers |
| **IGMP** | Internet Group Message Protocol |
| **IOPS** | input/output operations per second |
| **IP** | Internet Protocol |
| **IPC** | intelligent power capability |
| **IPMB** | Intelligent Platform Management Bus |
| **IPMI** | Intelligent Platform Management Interface |

# C.3 K-O

## K

| | |
|---|---|
| **KVM** | keyboard, video, and mouse |

## L

| | |
|---|---|
| **LC** | Lucent connector |
| **LRDIMM** | load-reduced dual in-line memory module |
| **LED** | light emitting diode |
| **LOM** | LAN on motherboard |

## M

| | |
|---|---|
| **MAC** | media access control |
| **MMC** | module management controller |

## N

| | |
|---|---|
| **NBD** | next business day |
| **NC-SI** | Network Controller Sideband Interface |

## O

| | |
|---|---|
| **OCP** | Open Compute Project |

# C.4 P-T

## P

| | |
|---|---|
| **PCIe** | Peripheral Component Interconnect Express |

| | |
|---|---|
| **PDU** | power distribution unit |
| **PHY** | physical layer |
| **PMBUS** | power management bus |
| **POK** | power OK |
| **PWM** | pulse-width modulation |
| **PXE** | Preboot Execution Environment |

## R

| | |
|---|---|
| **RAID** | redundant array of independent disks |
| **RAS** | reliability, availability and serviceability |
| **RDIMM** | registered dual in-line memory module |
| **REACH** | Registration Evaluation and Authorization of Chemicals |
| **RJ45** | registered jack 45 |
| **RoHS** | Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment |

## S

| | |
|---|---|
| **SAS** | Serial Attached Small Computer System Interface |
| **SATA** | Serial Advanced Technology Attachment |
| **SCM** | supply chain management |
| **SDDC** | single device data correction |
| **SERDES** | serializer/deserializer |
| **SGMII** | serial gigabit media independent interface |
| **SMI** | serial management interface |
| **SMTP** | Simple Mail Transfer Protocol |
| **SNMP** | Simple Network Management Protocol |
| **SOL** | serial over LAN |

| | |
|---|---|
| **SONCAP** | Standards Organization of Nigeria-Conformity Assessment Program |
| **SSD** | solid-state drive |
| **SSE** | Streaming SIMD Extensions |

### T

| | |
|---|---|
| **TACH** | tachometer signal |
| **TBT** | Turbo Boost Technology |
| **TCG** | Trusted Computing Group |
| **TCM** | trusted cryptography module |
| **TCO** | total cost of ownership |
| **TDP** | thermal design power |
| **TELNET** | Telecommunication Network Protocol |
| **TET** | Trusted Execution Technology |
| **TFM** | TransFlash module |
| **TFTP** | Trivial File Transfer Protocol |
| **TOE** | TCP offload engine |
| **TPM** | trusted platform module |

## C.5 U-Z

### U

| | |
|---|---|
| **UBC** | Union Bus Connector |
| **UBC DD** | Union Bus Connector Double Density |
| **UDIMM** | unbuffered dual in-line memory module |
| **UEFI** | Unified Extensible Firmware Interface |
| **UID** | unit identification light |
| **UL** | Underwriter Laboratories Inc. |
| **UPI** | UltraPath Interconnect |
| **USB** | Universal Serial Bus |

## V

| | |
|---|---|
| **VCCI** | Voluntary Control Council for Interference by Information Technology Equipment |
| **VGA** | Video Graphics Array |
| **VLAN** | Virtual local area network |
| **VRD** | Voltage regulator-down |
| **VROC** | Virtual RAID on CPU |

## W

| | |
|---|---|
| **WEEE** | Waste Electrical and Electronic Equipment |
| **WSMAN** | Web Service Management |