Huawei FusionServer Pro 2288X V5 Server V100R005

Technical White Paper

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About This Document

Purpose

This document describes the 2288X V5 rack server in terms of features, structure, specifications, and component compatibility.

Intended Audience

This document is intended for:

- Huawei presales engineers
- Channel partner presales engineers
- Enterprise 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. NOTICE is used to address practices not related to personal injury.

Symbol	Description
NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Issue	Date	Description
03	2020-04-20	• This issue is the third official release.
02	2020-03-05	• The issue is the second official release.
01	2019-12-31	• This issue is the first official release.

Contents

1 Overview

Huawei FusionServer Pro 2288X V5 (marked as H22X-05 on the nameplate, 2288X V5 for short) is a new-generation 2U 2-socket rack server designed for Internet, Internet Data Center (IDC), cloud computing, enterprise, and telecom applications.

The 2288X V5 is ideal for IT core services, cloud computing, high-performance computing, distributed storage, big data processing, enterprise or telecom applications, and other complex workloads.

The reliable 2288X V5 features low power consumption, high scalability, easy deployment, and simplified management.

Figure 1-1 Physical structure of a 2288X V5 with 12 x 3.5" drives (example)

2 Features

Performance and Scalability

- Powered by two Intel® Xeon® Scalable Skylake or Cascade Lake processors, the server provides up to 28 cores, 3.8 GHz frequency, a 38.5 MB L3 cache, and two 10.4 GT/s UPI links between the processors, which deliver supreme processing performance.
  - It supports up to two processors with 56 cores and 112 threads to maximize the concurrent execution of multithreaded applications.
  - An L2 cache is added. Each core can exclusively use 1 MB of L2 cache and at least 1.375 MB of 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 operating system (OS) vendors 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.
  - The Cascade Lake processors support Intel® Deep Learning Boost vector neural network instructions (VNNI) to improve the performance of deep learning applications.
- The server supports double data rate 4 (DDR4) registered dual in-line memory modules (RDIMMs) and load-reduced DIMMs (LRDIMMs) with error checking and correcting (ECC). A server fully configured with twenty-four 2933 MT/s memory modules (only available with Cascade Lake processors) provides 3072 GB memory space and the maximum theoretical memory bandwidth of 249.9375 GB/s.
- Flexible drive configurations cater to a variety of business requirements and ensure high elasticity and scalability of storage resources.
- The use of all solid-state drives (SSDs) is supported. An SSD supports up to 100 times more I/O operations per second (IOPS) than a typical hard disk

drive (HDD). The use of all SSDs provides higher I/O performance than the use of all HDDs or a combination of HDDs and SSDs.

- The LANs on motherboard (LOMs) and Open Compute Project (OCP) 2.0 mezzanine cards provide a variety of ports to meet different networking requirements.
- With Intel integrated I/O, the Intel® Xeon® Scalable processors integrate the PCIe 3.0 controller to shortens I/O latency and improve overall system performance.
- The server supports up to eight PCIe 3.0 slots.

Availability and Serviceability

- Carrier-class components with process expertise ensure high system reliability and availability.
- The server uses hot-swappable SAS/SATA/NVMe drives. It supports RAID 0, 1, 1E, 10, 5, 50, 6, and 60, depending on the RAID controller card used. It also uses a supercapacitor to protect the RAID cache data against power failures.
- The SSDs offer better reliability than HDDs, ensuring continued system performance.
- The server provides simplified O&M and efficient troubleshooting through the UID/HLY indicators on the front panel, fault diagnosis LED, and iBMC web interface.
- The built-in iBMC monitors system parameters in real time, triggers alarms, and performs recovery actions to minimize the system downtime.
- Huawei provides a three-year warranty for parts replacement and onsite repair for the servers used in China. Huawei provides a 10-hour-a-day, 7-day-a-week support program. Service requests will be handled the next business day. Optional service upgrades are available.
- Huawei provides a three-year warranty for parts replacement and repair for the servers used outside China. Huawei provides a 9-hour-a-day, 5-day-a-week support program. Service requests will be handled the next business day. Huawei delivers the repaired or new parts within 45 calendar days after receiving the defective parts.

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) allows a network port to serve as a management port and a service port for maximized return on investment (ROI) for customers. The NC-SI feature is disabled by default and can be enabled through the iBMC or BIOS.
- The integrated Unified Extensible Firmware Interface (UEFI) improves setup, configuration, and update efficiency and simplifies fault handling.
- Lockable server chassis panel ensures security of local data.
- The Advanced Encryption Standard–New Instruction (AES NI) algorithm allows faster and stronger encryption.

- Intel Execute Disable Bit (EDB) function prevents certain types of malicious buffer overflow attacks when working with a supported OS.
- Intel Trusted Execution Technology enhances security using hardware-based defense against malicious software attacks, allowing applications to run independently.
- The trusted platform module (TPM) and trusted cryptography module (TCM) provide advanced encryption functions, such as digital signatures and remote authentication.

NOTE

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

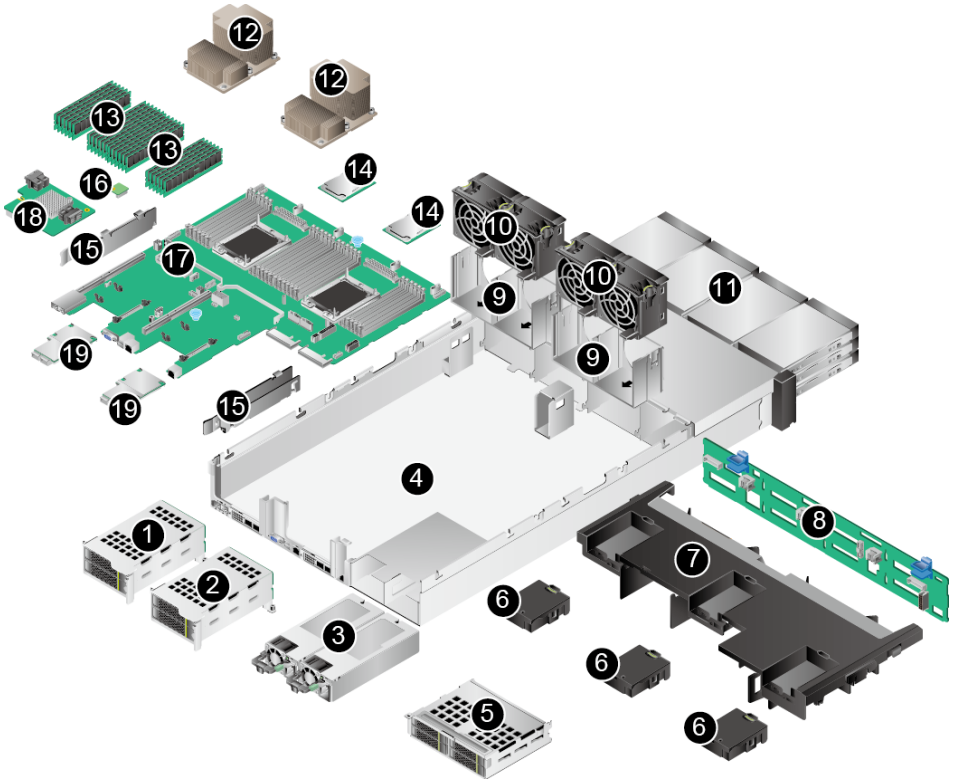
- Configuring any port on the LOM, OCP 2.0 mezzanine card 1, or PCIe NIC as the service port with NC-SI enabled. Host port 1 is configured by default.
- Enabling, disabling, and setting a virtual local area network (VLAN) ID for this port. The VLAN ID is **0** and disabled by default.
- Configuring IPv4 addresses (IPv4 address, subnet mask, and gateway) and IPv6 addresses (IPv6 address, prefix length, and gateway) for this port.

Energy Efficiency

- The 80 Plus Platinum power supply units (PSUs) of multiple power ratings provide 94% power efficiency at 50% load.
- The server supports active/standby power supplies and high-voltage DC (HVDC) for improved power supply efficiency.
- Efficient voltage regulator-down (VRD) power supplies for boards minimize the energy loss from DC/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 spin-up for drives reduces the server boot power consumption.
- Intel® Intelligent Power Capability allows a processor to be powered on or off based on requirements.
- Low-voltage Intel® Xeon® Scalable processors consume less energy, ideally suited for data centers and telecommunications environments constrained by power and thermal limitations.
- SSDs consume 80% less power than HDDs.

3 Physical Structure

Figure 3-1 Physical structure of a 2288X V5 with 12 x 3.5" drives (example)

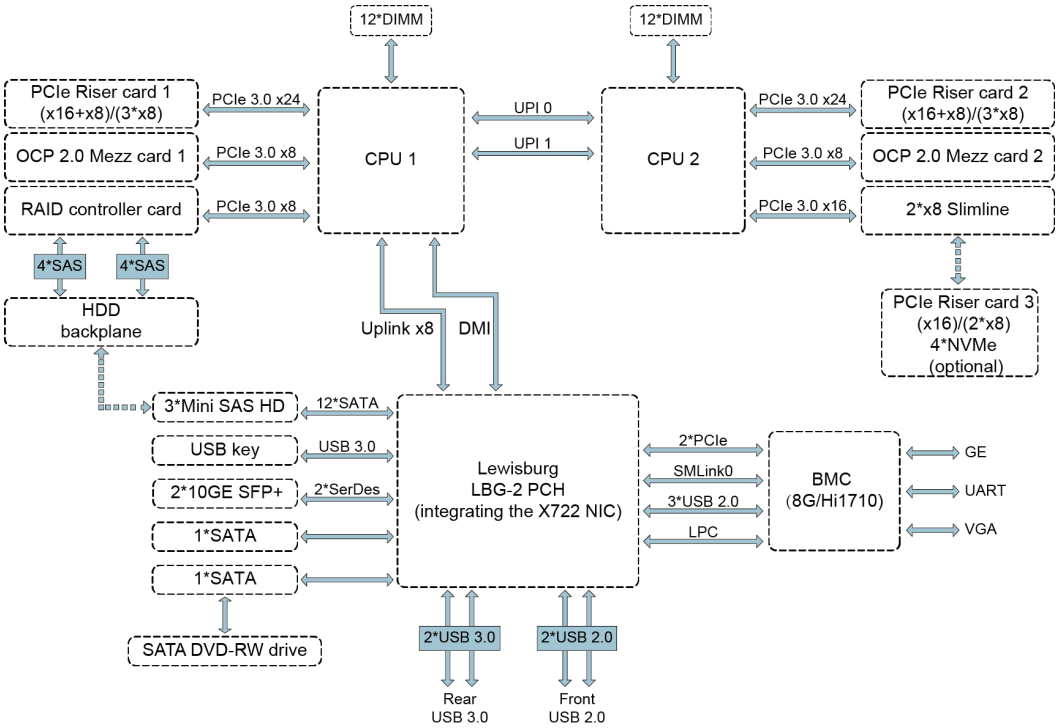


1	I/O module 1	2	I/O module 2
3	PSUs	4	Chassis
5	I/O module 3	6	Supercapacitor holders
7	Air duct	8	Front-drive backplane
9	Fan module brackets	10	Fan modules
11	Front drives	12	Heat sinks

13	Memory modules	14	Processors
15	Cable organizers	16	TPM/TCM
17	Mainboard	18	Screw-in RAID controller card
19	OCP 2.0 mezzanine cards	-	-

4 Logical Structure

Figure 4-1 2288X V5 logical structure



- The server supports one or two Intel® Xeon® Scalable processors.
- The server supports up to 24 memory modules.
- The CPUs (processors) interconnect with each other through two UPI links at a speed of up to 10.4 GT/s.
- Three PCIe riser cards connect to the processors through PCIe buses to provide ease of expandability and connection.
- CPUs 1 and 2 each support one OCP 2.0 mezzanine card.
- 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-2 Platform Controller Hub (PCH) supports two 10GE optical LOM ports.
- The server uses Hi1710 management chip and supports a video graphic array (VGA) port, a management network port, and a debug serial port.

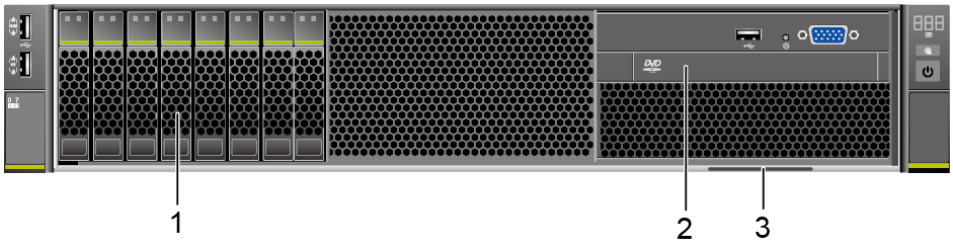
5 Hardware Description

5.1 Front Panel

5.1.1 Appearance

- 8 x 2.5" drive configuration

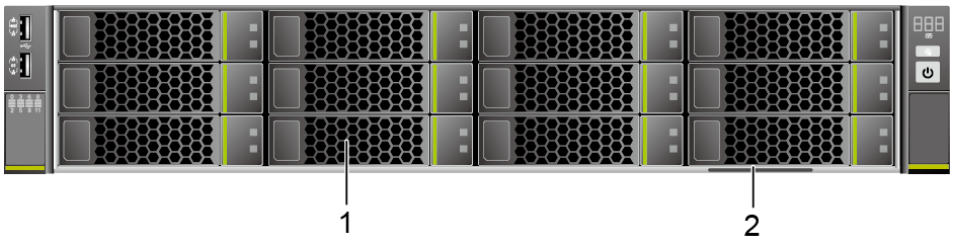
Figure 5-1 Front view



1	Drives	2	(Optional) Built-in DVD drive
3	Slide-out label plate (with an SN label)	-	-

- 12 x 3.5" drive configuration

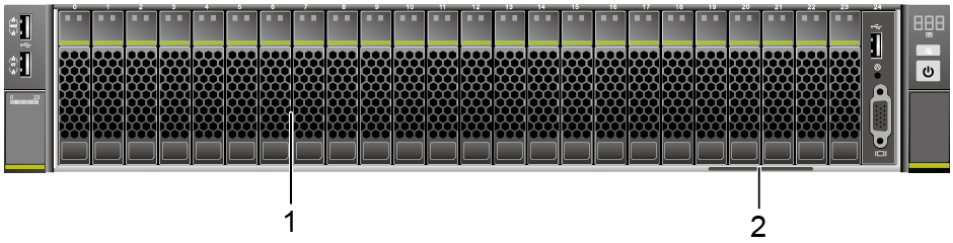
Figure 5-2 Front view



1	Drives	2	Slide-out label plate (with an SN label)

- 24 x 2.5" drive configuration

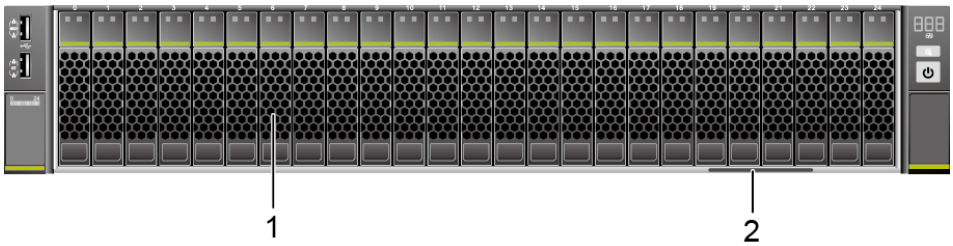
Figure 5-3 Front view



1	Drives	2	Slide-out label plate (with an SN label)

- 25 x 2.5" drive configuration

Figure 5-4 Front view



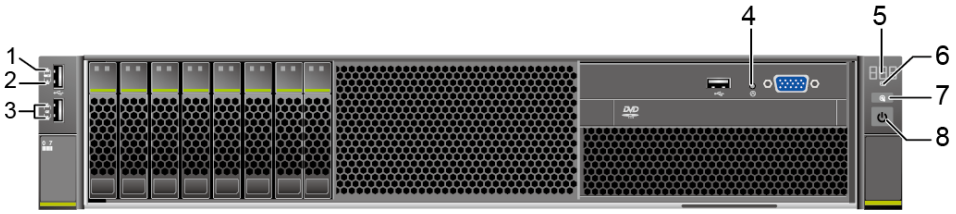
1	Drives	2	Slide-out label plate (with an SN label)

5.1.2 Indicators and Buttons

Positions

- 8 x 2.5" drive configuration

Figure 5-5 Indicators and buttons on the front panel



1	10GE LOM port 1 connection status indicator	2	10GE LOM port 2 connection status indicator
3	GE LOM port connection status indicator **NOTE** The indicator is reserved.	4	Non-Maskable Interrupt (NMI) button
5	Fault diagnosis LED	6	Health status indicator
7	UID button/indicator	8	Power button/indicator

- 12 x 3.5" drive configuration

Figure 5-6 Indicators and buttons on the front panel

1	10GE LOM port 1 connection status indicator	2	10GE LOM port 2 connection status indicator

3	GE LOM port connection status indicator **NOTE** The indicator is reserved.	4	Fault diagnosis LED
5	Health status indicator	6	UID button/indicator
7	Power button/indicator	-	-

- 24 x 2.5" drive configuration

Figure 5-7 Indicators and buttons on the front panel

1	10GE LOM port 1 connection status indicator	2	10GE LOM port 2 connection status indicator
3	GE LOM port connection status indicator **NOTE** The indicator is reserved.	4	Fault diagnosis LED
5	Health status indicator	6	UID button/indicator
7	Power button/indicator	8	NMI button

- 25 x 2.5" drive configuration

Figure 5-8 Indicators and buttons on the front panel

1	10GE LOM port 1 connection status indicator	2	10GE LOM port 2 connection status indicator

3	GE LOM port connection status indicator **NOTE** The indicator is reserved.	4	Fault diagnosis LED
5	Health status indicator	6	UID button/indicator
7	Power button/indicator	-	-

Indicator and Button Description

Table 5-1 Indicators and buttons on the front panel

Silkscreen	Indicator/ Button	Description
	Fault diagnosis LED	• ---: The device is operating normally. • Fault code: A component is faulty. For details about error codes, see **FusionServer Pro Rack Server iBMC Alarm Handling**.
	Power button/ indicator	Power indicator: • Off: The device is not powered on. • Steady green: The device is powered on. • Blinking yellow: The power button is locked. The power button is locked when the iBMC is starting. • Steady yellow: The device is ready to power on. Power button: • When the device is powered on, you can press this button to gracefully shut down the OS. • When the device is powered on, holding down this button for 6 seconds will forcibly power off the device. • When the power indicator is steady green, you can press this button to power on the device.

Silkscreen	Indicator/ Button	Description
	UID button/ indicator	The UID button/indicator helps identify and locate a device. UID indicator: ● Off: The device is not being located. ● Blinking blue: The device has been located and is distinguished from other devices that have also been located. ● Steady blue: The device is being located. UID button: ● You can turn on or off the UID indicator by pressing the UID button on the panel or by using the iBMC CLI or WebUI. ● You can press this button to turn on or off the UID indicator. ● You can press and hold down this button for 4 to 6 seconds to reset the iBMC.
	Health status indicator	● Off: The device is powered off or is faulty. ● Blinking red at 1 Hz: A major alarm has been generated on the system. ● Blinking red at 5 Hz: A critical alarm has been generated on the system. ● Steady green: The device is operating properly.
○	NMI button	A non-maskable interrupt (NMI) is generally triggered to stop the OS for debugging. To trigger an NMI, press this button or click the button on the iBMC WebUI. **NOTICE** ● Press the NMI button only when the OS is abnormal. Do not press this button when the server is operating properly. An NMI does not gracefully shut down the OS and causes service interruption and data loss. ● Before pressing the NMI button, ensure that the OS has the NMI processing program. Otherwise, the OS may crash. Exercise caution when pressing this button.

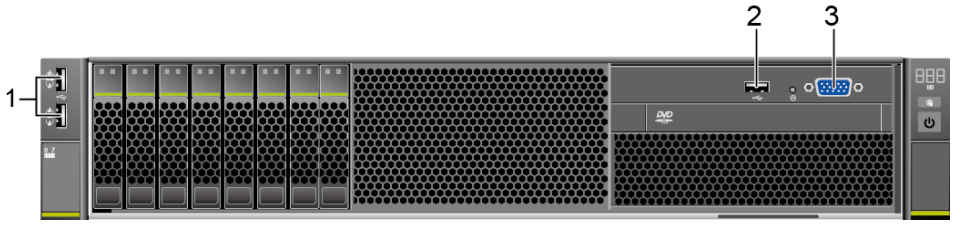
Silkscreen	Indicator/ Button	Description
	LOM port connection status indicator	Each indicator shows the connection status of an Ethernet LOM port. • Off: The network port is not in use or has failed. • Steady green: The network port is properly connected. **NOTE** • The indicators correspond to the two 10GE network ports integrated on the mainboard. • The LOM has a standby power supply and will not be powered off even if the service system is powered off. As long as the LOM ports are properly connected to other working network devices, the network ports will remain connected and the indicators are on.

5.1.3 Ports

Port Positions

- 8 x 2.5" drive configuration

Figure 5-9 Ports on the front panel



1	USB 2.0 ports	2	USB 3.0 port
3	VGA port	-	-

- 12 x 3.5" drive configuration

Figure 5-10 Ports on the front panel

1	USB 2.0 ports	-	-

- 24 x 2.5" drive configuration

Figure 5-11 Ports on the front panel

1	USB 2.0 ports	2	USB 3.0 port
3	VGA port	-	-

- 25 x 2.5" drive configuration

Figure 5-12 Ports on the front panel

1	USB 2.0 ports	-	-

Port Description

Table 5-2 Ports on the front panel

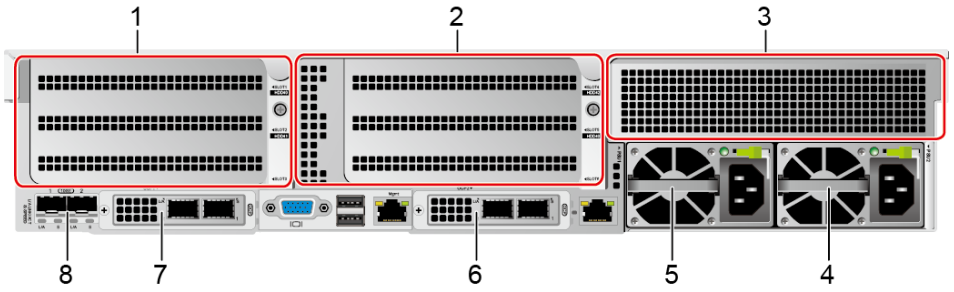
Port	Type	Quantity[Note]	Description
VGA port	DB15	1	Used to connect a display terminal, such as a monitor or KVM.
USB port	USB 2.0	2	Used to connect to a USB device.

Port	Type	Quantity[Note]	Description
	USB 3.0	1	**NOTICE** Before connecting an external USB device, check that the USB device functions properly. The server may operate abnormally if an abnormal USB device is connected.
Note: The number of ports varies depending on server configuration. This table lists the maximum number of ports in different configurations.			

5.2 Rear Panel

5.2.1 Appearance

Figure 5-13 Rear view



1	I/O module 1	2	I/O module 2
3	I/O module 3	4	PSU 2
5	PSU 1	6	(Optional) OCP 2.0 mezzanine card 2
7	(Optional) OCP 2.0 mezzanine card 1	8	LOM

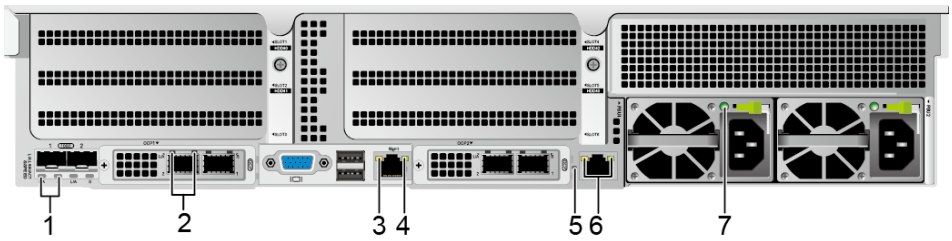
NOTE

- I/O module 1 can be configured with a PCIe riser module or a module with drives and PCIe card.
- I/O modules 2 and 3 can be configured with drive modules or PCIe riser modules.
- For details about the LOM and OCP 2.0 mezzanine card, see **5.6 Network**.
- The preceding figure is for reference only.

5.2.2 Indicators

Indicator Positions

Figure 5-14 Indicators on the rear panel



1	LOM indicators	2	OCP 2.0 mezzanine card indicators
3	Data transmission status indicator of the management network port	4	Connection status indicator for the management network port
5	UID indicator	6	Serial port indicators **NOTE** The indicators are reserved.
7	PSU indicator	-	-

Indicator Description

Table 5-3 Indicators on the rear panel

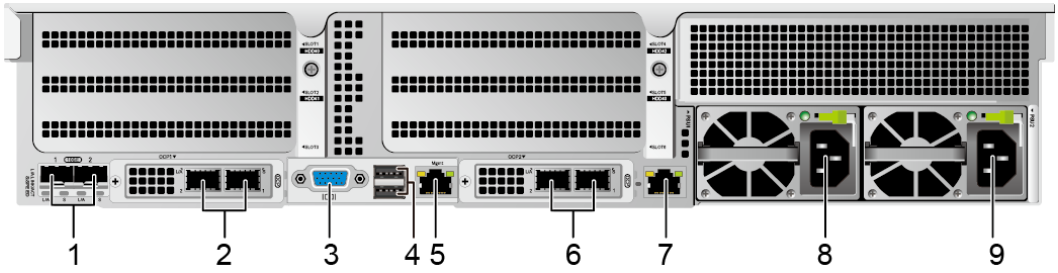
Indicator	Description
LOM indicators	For details, see **5.6.1 LOMs**.
OCP 2.0 mezzanine card indicators	For details, see **5.6.2 OCP 2.0 Mezzanine Cards**.
Data transmission status indicator of the management network port	• Off: No data is being transmitted. • Blinking yellow: Data is being transmitted.
Connection status indicator for the management network port	• Off: The network port is not connected. • Steady green: The network port is properly connected.

Indicator	Description
UID indicator	The UID indicator helps identify and locate a device. • Off: The device is not being located. • Blinking blue: The device has been located and is differentiated from other devices that have also been located. • Steady blue: The device is being located. **NOTE** You can turn on or off the UID indicator by pressing the UID button or remotely running a command on the iBMC CLI.
PSU indicator	• Off: No power is supplied. • Blinking green at 1 Hz: – The input is normal, and the server is standby. – The input is overvoltage or undervoltage. – The PSU is in deep hibernation mode. • Blinking green at 4 Hz: The firmware is being upgraded online. • Steady green: The power input and output are normal. • Steady orange: The input is normal, but no power output is supplied. **NOTE** The possible causes of no power output are as follows: • Power supply overtemperature protection • Power output overcurrent or short-circuit • Output overvoltage • Short-circuit protection • Device failure (excluding failure of all devices)

5.2.3 Ports

Port Positions

Figure 5-15 Rear view



1	LOM ports	2	Ports for OCP 2.0 mezzanine card 1
3	VGA port	4	USB 3.0 ports
5	Management network port	6	Ports for OCP 2.0 mezzanine card 2
7	Serial port	8	Socket for PSU 1
9	Socket for PSU 2	-	-

Port Description

Table 5-4 Ports on the rear panel

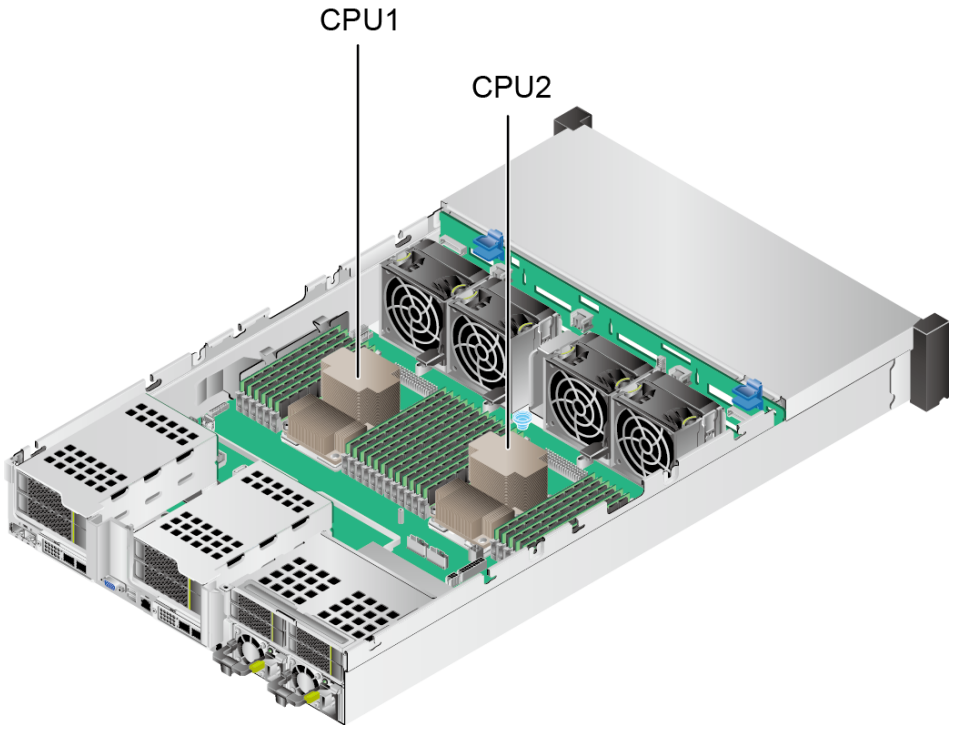
Port	Type	Quantity	Description
LOM port	10GE optical port	2	For details, see **5.6.1 LOMs**.
OCP 2.0 mezzanine card port	-	-	For details, see **5.6.2 OCP 2.0 Mezzanine Cards**.
VGA port	DB15	1	Used to connect a display terminal, such as a monitor or KVM.
USB port	USB 3.0	2	Used to connect to a USB device. **NOTICE** Before connecting an external USB device, check that the USB device functions properly. The server may operate abnormally if an abnormal USB device is connected.
Management network port	1000BASE-T	1	Used for server management. **NOTE** The management network port is a GE port that supports 100 Mbit/s and 1000 Mbit/s auto-negotiation.

Port	Type	Quantity	Description
Serial port	RJ45	1	Default operating system serial port used for debugging. You can also set it as the iBMC serial port by using the iBMC command. **NOTE** The port uses 3-wire serial communication interface, and the default baud rate is 115,200 bit/s.
PSU socket	-	2	Used to connect to the power distribution unit (PDU) in the cabinet. You can select the number of power supply units (PSUs) as required. **NOTE** • When determining the quantity of PSUs, ensure that the rated power of the PSUs is greater than that of the server. • If only one PSU is used, **Predicted PSU Status** cannot be set to **Active/Standby** on the iBMC WebUI.

5.3 Processor

- The server supports one or two processors.
- If only one processor is required, install it in socket **CPU1**.
- The same model of processors must be used in a server.
- Contact your local Huawei sales representative or use the **Intelligent Computing Compatibility Checker** to determine the components to be used.

Figure 5-16 Processor positions

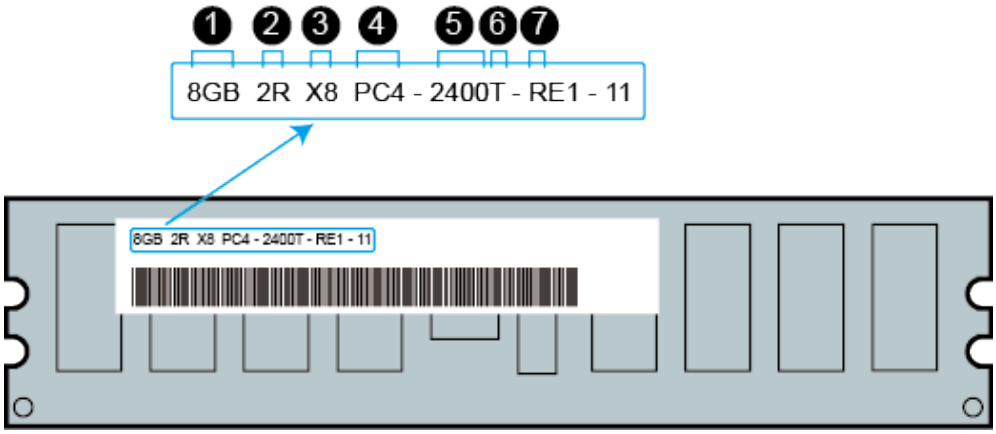


5.4 Memory

5.4.1 Memory Identifier

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

Figure 5-17 Memory identifier



callout	Description	Definition
1	Capacity of the memory module	• 8 GB • 16 GB • 32 GB • 64 GB • 128 GB
2	Number of ranks of the memory module	• 1R: single-rank • 2R: dual-rank • 4R: quad-rank • 8R: octal-rank
3	Data width on the DRAM	• X4: 4-bit • X8: 8-bit
4	Type of the memory interface	• PC3: DDR3 • PC4: DDR4
5	Maximum memory speed	• 2133 MT/S • 2400 MT/S • 2666 MT/S • 2933 MT/S
6	Column Access Strobe (CAS) latency	• P: 15 • T: 17
7	DIMM type	• R: RDIMM • L: LRDIMM

5.4.2 Memory Subsystem Architecture

The 2288X V5 provides 24 memory slots. Each processor integrates six memory channels.

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

Table 5-5 Memory channels

CPU	Memory Channel	Memory Slot
CPU 1	A (primary)	DIMM000(A)
	A	DIMM001(G)
	B (primary)	DIMM010(B)

CPU	Memory Channel	Memory Slot
	B	DIMM011(H)
	C (primary)	DIMM020(C)
	C	DIMM021(I)
	D (primary)	DIMM030(D)
	D	DIMM031(J)
	E (primary)	DIMM040(E)
	E	DIMM041(K)
	F (primary)	DIMM050(F)
	F	DIMM051(L)
CPU2	A (primary)	DIMM100(A)
	A	DIMM101(G)
	B (primary)	DIMM110(B)
	B	DIMM111(H)
	C (primary)	DIMM120(C)
	C	DIMM121(I)
	D (primary)	DIMM130(D)
	D	DIMM131(J)
	E (primary)	DIMM140(E)
	E	DIMM141(K)
	F (primary)	DIMM150(F)
	F	DIMM151(L)

5.4.3 Memory Compatibility

Observe the following rules when configuring DDR4 memory modules:

NOTICE

- A server must use the same model of DDR4 memory modules, and all the memory modules operate at the same speed, which is the smallest value of:
  - Memory speed supported by a processor
  - Maximum operating speed of a memory module
- The DDR4 memory modules of different types (RDIMM and LRDIMM) and specifications (capacity, bit width, rank, and height) cannot be used together.
- Contact your local Huawei sales representative or use the **Intelligent Computing Compatibility Checker** to determine the components to be used.

- The memory can be used with Intel® Xeon® Scalable Skylake and Cascade Lake processors. The maximum memory capacity supported varies depending on the processor model.
  - Skylake processors
    - M processors: 1.5 TB/socket
    - Other processors: 768 GB/socket
  - Cascade Lake processors
    - L processors: 4.5 TB/socket
    - M processors: 2 TB/socket
    - Other processors: 1 TB/socket
- The total memory capacity is the sum of the capacity of all DDR4 memory modules.

NOTICE

The total memory capacity cannot exceed the maximum memory capacity supported by the CPUs.

- Use the **Intelligent Computing Compatibility Checker** to determine the capacity type of a single memory module.
- The maximum number of memory modules supported by a server varies depending on the CPU type, memory type, rank quantity, and operating voltage.

  NOTE

  Each memory channel supports a maximum of 8 ranks. The number of memory modules supported by each channel varies depending on the number of ranks supported by each channel:

  Number of memory modules supported by each channel ≤ Number of ranks supported by each memory channel/Number of ranks supported by each memory module
- A memory channel supports more than eight ranks for LRDIMMs.

NOTE

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

Table 5-6 DDR4 memory specifications

Parameter		Specifications					
Maximum capacity per DDR4 memory module (GB)		16	16	32	32	64	128
Rated speed (MT/s)		2666	2933	2666	2933	2933	2933
Rank		Dual rank	Dual rank	Dual rank	Dual rank	Dual rank	Quad rank
Operating voltage (V)		1.2	1.2	1.2	1.2	1.2	1.2
Maximum number of DDR4 memory modules in a server[a]		24	24	24	24	24	24
Maximum DDR4 memory capacity of the server (GB)[b]		384	384	768	768	1536	3072
Maximum operating speed (MT/s)	1DPC[c]	2666	2933[d]	2666	2933[d]	2933[d]	2933[d]
	2DPC	2666	2666	2666	2666	2666	2666

- a: The maximum number of DDR4 memory modules is based on dual-processor configuration. The value is halved for a server with only one processor.
- b: The maximum DDR4 memory capacity varies depending on the processor type. The value listed in this table is based on the assumption that memory modules are fully configured.
- c: DPC (DIMM per channel) indicates the number of DIMMs per channel.
- d: If the Cascade Lake processor is used, the maximum operating speed of a memory module can reach 2933 MT/s. If the Skylake processor is used, the maximum operating speed of a memory module can reach 2666 MT/s only.

5.4.4 Memory Installation Guidelines

- Observe the following when configuring DDR4 memory modules:
  - Install memory modules only when corresponding processors are installed.
  - Do not install LRDIMMs and RDIMMs in the same server.
  - Install filler memory modules in vacant slots.
- Observe the following when configuring DDR4 memory modules in specific operating mode:
  - Memory sparing mode
    - Comply with the general installation guidelines.
    - Each memory channel must have a valid online spare configuration.
    - The channels can have different online spare configurations.
    - Each populated channel must have a spare rank.
  - Memory mirroring mode
    - Comply with the general installation guidelines.
    - Each processor supports two integrated memory controllers (IMCs). At least two channels of each IMC are used for installing memory modules (channels 1 and 2, or channels 1, 2, and 3). The memory modules installed must be identical in size and organization.
    - For a multi-processor configuration, each processor must have a valid memory mirroring configuration.
  - Memory scrubbing mode
    - Comply with the general installation guidelines.

5.4.5 Memory Installation Positions

A 2288X V5 supports a maximum of 24 DDR4 memory modules. Balanced memory configuration is recommended for optimal memory performance.

NOTICE

At least one DDR4 memory module must be installed in the memory slots corresponding to CPU 1.

Figure 5-18 Memory slots

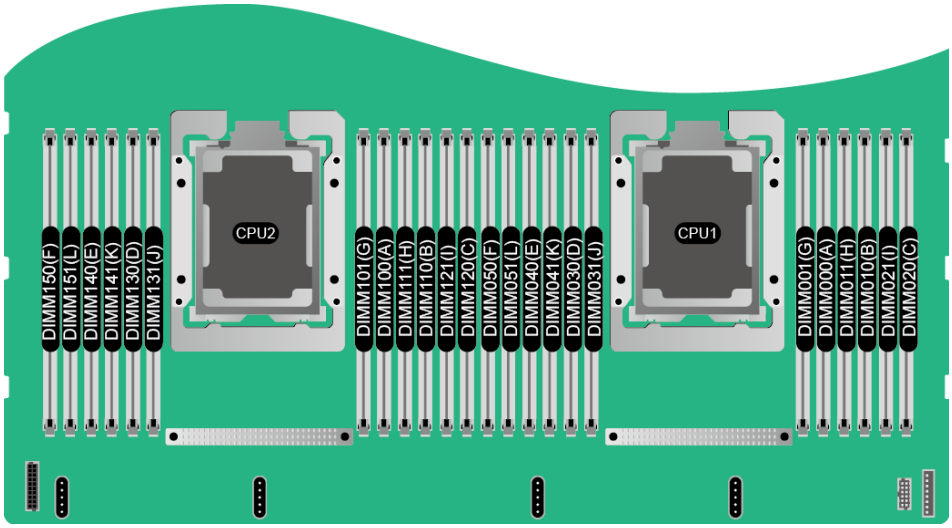


Figure 5-19 DDR4 memory installation guidelines (1 processor)

CPU	Channel	DIMM Slot	Number of DIMMs (✓: recommended ○: not recommended)											
			✓	✓	✓	✓	○	✓	○	✓	○	○	○	✓
			1	2	3	4	5	6	7	8	9	10	11	12
CPU 1	A	DIMM000(A)	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM001(G)							•	•	•	•	•	•
	B	DIMM010(B)		•	•	•	•	•	•	•	•	•	•	•
		DIMM011(H)								•	•	•	•	•
	C	DIMM020(C)			•		•	•	•		•	•	•	•
		DIMM021(I)									•		•	•
	D	DIMM030(D)				•	•	•	•	•	•	•	•	•
		DIMM031(J)								•		•	•	•
	E	DIMM040(E)				•	•	•	•	•	•	•	•	•
		DIMM041(K)								•		•	•	•
	F	DIMM050(F)						•	•		•	•	•	•
		DIMM051(L)												•

Figure 5-20 DDR4 memory installation guidelines (2 processors)

CPU	Channel	DIMM Slot	Number of DIMMs (✓: recommended ○: not recommended)																							
			○	✓	○	✓	○	✓	○	✓	○	○	○	✓	○	○	○	✓	○	○	○	○	○	○	○	✓
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
CPU1	A	DIMM000(A)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM001(G)													•	•	•	•	•	•	•	•	•	•	•	•
	B	DIMM010(B)			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM011(H)															•	•	•	•	•	•	•	•	•	•
	C	DIMM020(C)					•	•			•	•	•	•	•	•			•	•	•	•	•	•	•	•
		DIMM021(I)																	•	•			•	•	•	•
	D	DIMM030(D)							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM031(J)															•	•			•	•	•	•	•	•
	E	DIMM040(E)							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM041(K)															•	•			•	•	•	•	•	•
	F	DIMM050(F)											•	•	•	•			•	•	•	•	•	•	•	•
		DIMM051(L)																							•	•
CPU2	A	DIMM100(A)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM101(G)														•	•	•	•	•	•	•	•	•	•	•
	B	DIMM110(B)				•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM111(H)																•	•	•	•	•	•	•	•	•
	C	DIMM120(C)						•	•			•	•	•	•	•	•			•	•	•	•	•	•	•
		DIMM121(I)																		•	•			•	•	•
	D	DIMM130(D)								•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM131(J)																•	•			•	•	•	•	•
	E	DIMM140(E)								•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
		DIMM141(K)																•	•			•	•	•	•	•
	F	DIMM150(F)												•	•	•	•			•	•	•	•	•	•	•
		DIMM151(L)																								•

5.4.6 Memory Protection Technologies

The following memory protection technologies are supported:

- ECC
- Full Mirror
- Address Range Mirror
- Rank Sparing Mode
- Lockstep
- Failed DIMM Isolation
- Memory Thermal Throttling
- Memory Address Parity Protection
- ADDDC
- Memory Demand/Patrol Scrubbing
- Data Scrambling
- ADDDC+1

5.5 Storage

5.5.1 Drive Configurations

Table 5-7 Drive configurations

Configuration	Maximum Front Drives	Maximum Rear Drives	Drive Management Mode
8 x 2.5" drive pass-through configuration 1	• 8 x 2.5" – Slots 0 to 7 support only SATA drives.	• I/O module 3: 4 x 2.5" – Slots 44 to 47 support only NVMe drives.	PCH
8 x 2.5" drive pass-through configuration 2	• 8 x 2.5" – Slots 0 to 7 support only SAS/SATA drives.	• I/O module 3: 4 x 2.5" – Slots 44 to 47 support only NVMe drives.	1 x screw-in RAID controller card
8 x 2.5" drive pass-through configuration 3	• 8 x 2.5" – Slots 0 to 7 support only SAS/SATA drives.	• I/O module 3: 4 x 2.5" – Slots 44 to 47 support only NVMe drives.	1 x PCIe RAID controller card
12 x 3.5" drive pass-through configuration 1	• 12 x 3.5" – Slots 0 to 11 support only SATA drives.	• I/O module 1: 2 x 3.5" – Slots 40 and 41 support only SATA drives. • I/O module 3: 4 x 2.5" – Slots 44 to 47 support only NVMe drives.	PCH

Configuration	Maximum Front Drives	Maximum Rear Drives	Drive Management Mode
12 x 3.5" drive pass-through configuration 2	• 12 x 3.5" – Slots 0 to 11 support only SAS/SATA drives.	• I/O module 1: 2 x 3.5" – Slots 40 and 41 support only SAS/SATA drives. • I/O module 2: 2 x 3.5" – Slots 42 and 43 support only SAS/SATA drives. • I/O module 3: 4 x 2.5" – Slots 44 to 47 support only NVMe drives.	1 x screw-in RAID controller card
12 x 3.5" drive pass-through configuration 3	• 12 x 3.5" – Slots 0 to 11 support only SAS/SATA drives.	• I/O module 1: 2 x 2.5" – Slots 40 and 41 support only SAS/SATA drives. • I/O module 2: 2 x 3.5" – Slots 42 and 43 support only SAS/SATA drives. • I/O module 3: 4 x 2.5" – Slots 44 to 47 support only NVMe drives.	1 x PCIe RAID controller card

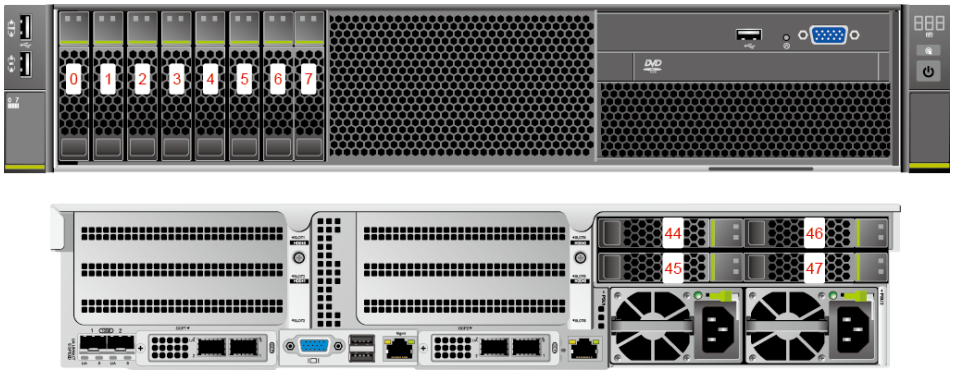
Configuration	Maximum Front Drives	Maximum Rear Drives	Drive Management Mode
12 x 3.5" drive EXP configuration	• 12 x 3.5" – Slots 0 to 11 support only SAS/SATA drives.	• I/O module 1: 2 x 2.5" – Slots 40 and 41 support only SAS/SATA drives. • I/O module 2: 2 x 3.5" – Slots 42 and 43 support only SAS/SATA drives. • I/O module 3: 4 x 2.5" – Slots 44 to 47 support NVMe drives.	1 x PCIe RAID controller card
24 x 2.5" drive pass-through configuration 1	• 24 x 2.5" – Slots 0 to 23 support only SAS/SATA drives.	• I/O module 3: 4 x 2.5" – Slots 44 to 47 support only NVMe drives.	1 x screw-in RAID controller card + 2 x PCIe RAID controller cards[a]
24 x 2.5" drive pass-through configuration 2	• 24 x 2.5" – Slots 0 to 23 support only SAS/SATA drives.	• I/O module 3: 4 x 2.5" – Slots 44 to 47 support only NVMe drives.	3 x PCIe RAID controller cards[a]
25 x 2.5" drive EXP configuration	• 25 x 2.5" – Slots 0 to 24 support only SAS/SATA drives.	• I/O module 1: 2 x 2.5 – Slots 40 and 41 support only SAS/SATA drives. • I/O module 3: 4 x 2.5" – Slots 44 to 47 support only NVMe drives.	1 x PCIe RAID controller card

Configuration	Maximum Front Drives	Maximum Rear Drives	Drive Management Mode
• a: A maximum of three RAID controller cards are supported. Every eight front drives require one RAID controller card. • Contact your local Huawei sales representative or use the **Intelligent Computing Compatibility Checker** to determine the components to be used.			

5.5.2 Drive Numbering

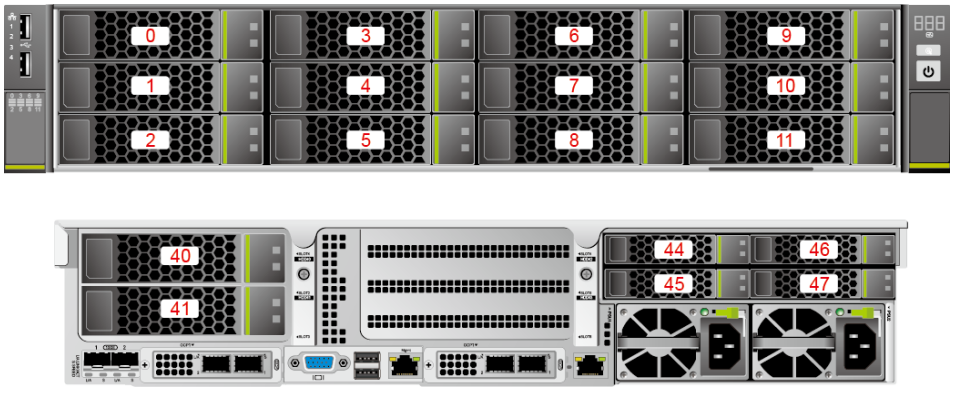
- 8 x 2.5" drive pass-through configuration

Figure 5-21 Drive numbering



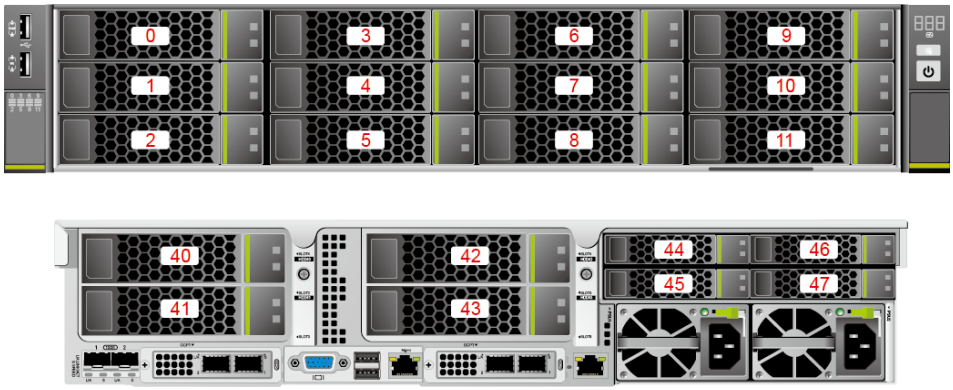
- 12 x 3.5" drive pass-through configuration 1

Figure 5-22 Drive numbering



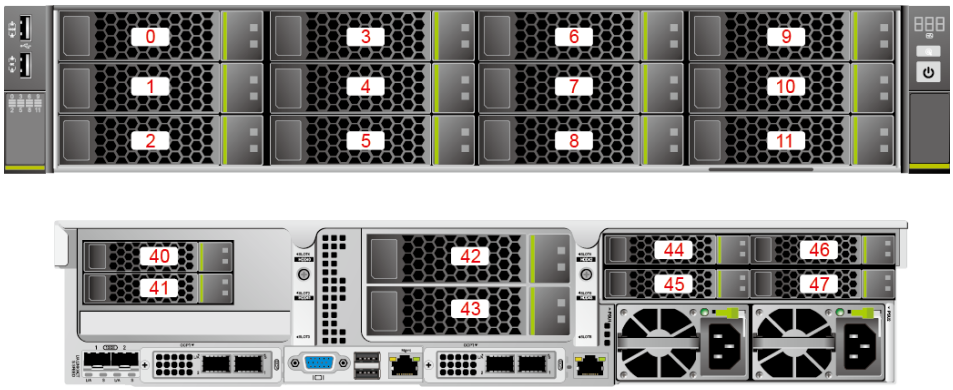
- 12 x 3.5" drive pass-through configuration 2

Figure 5-23 Drive numbering



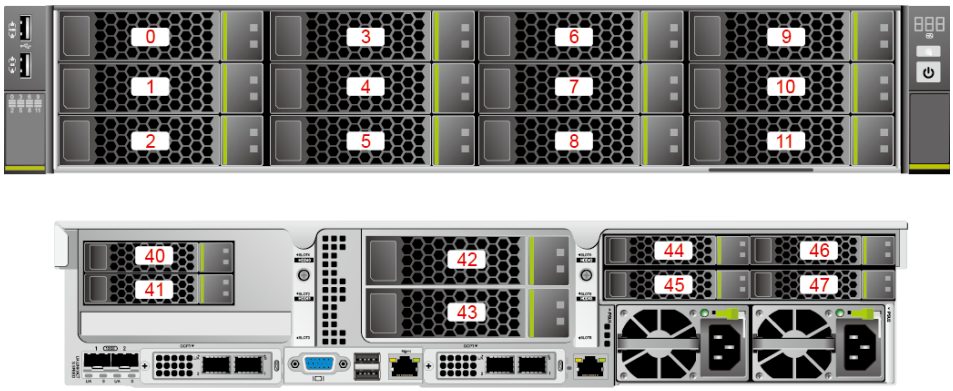
- 12 x 3.5" drive pass-through configuration 3

Figure 5-24 Drive numbering



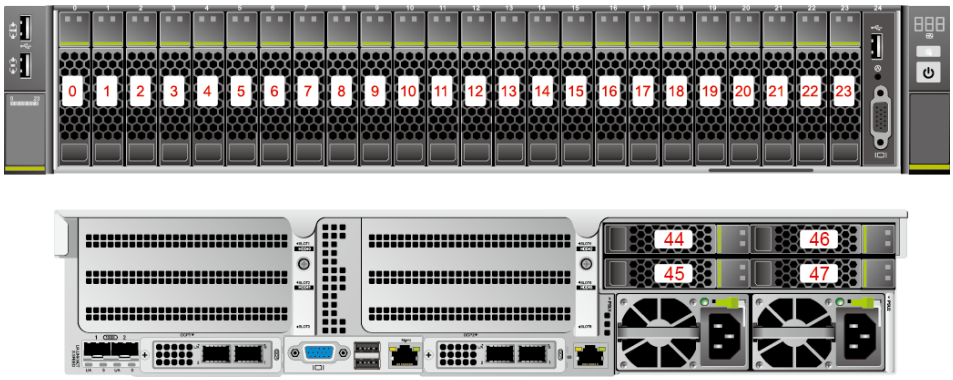
- 12 x 3.5" drive EXP configuration

Figure 5-25 Drive numbering



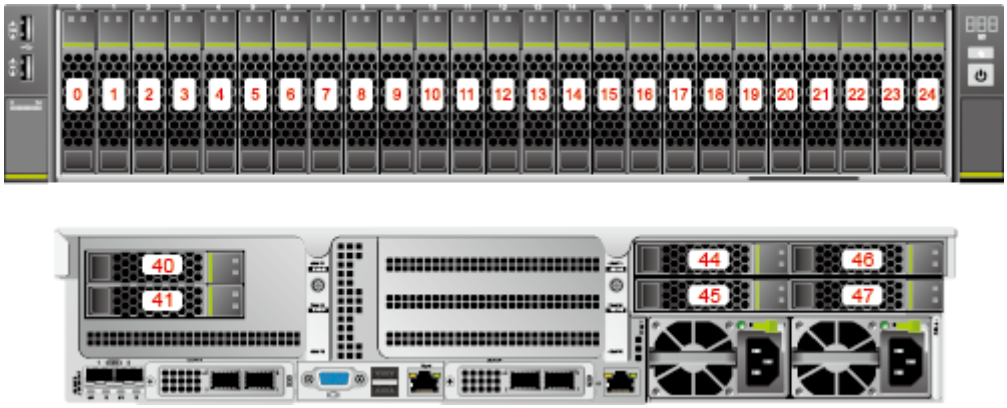
- 24 x 2.5" drive pass-through configuration

Figure 5-26 Drive numbering



- 25 x 2.5" drive EXP configuration

Figure 5-27 Drive numbering



5.5.3 Drive Indicators

SAS/SATA Drive Indicators

Figure 5-28 SAS/SATA drive indicators

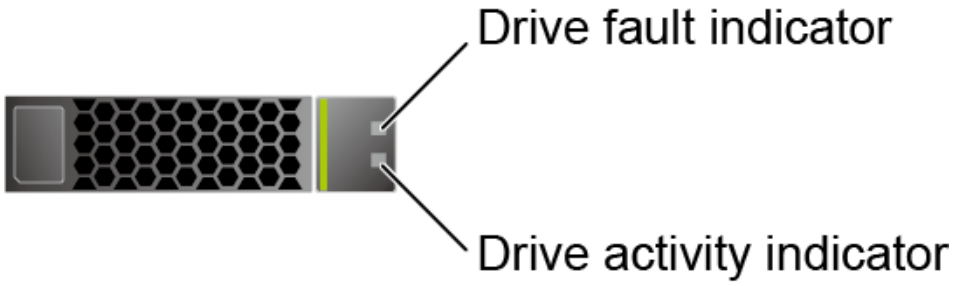


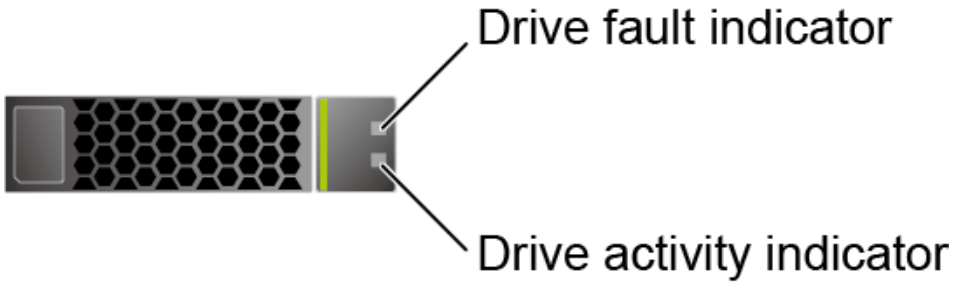
Table 5-8 Description of SAS/SATA drive indicators

Activity Indicator (Green)	Fault Indicator (Yellow)	Description
Steady on	Off	The drive is in position.

Activity Indicator (Green)	Fault Indicator (Yellow)	Description
Blinking at 4 Hz	Off	Data is being read or written normally, or data on the primary drive is being rebuilt.
Steady on	Blinking at 1 Hz	The drive is being located.
Blinking at 1 Hz	Blinking at 1 Hz	The data on the secondary drive is being rebuilt.
Off	Steady on	A member drive in the RAID array is removed.
Steady on	Steady on	The drive is faulty.

NVMe Drive Indicators

Figure 5-29 NVMe drive indicators



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

  Table 5-9 Description of NVMe drive indicators (VMD enabled)

Activity Indicator (Green)	Fault Indicator (Yellow)	Description
Off	Off	The NVMe drive cannot be detected.
Steady on	Off	The NVMe drive is working properly.
Blinking at 2 Hz	Off	Data is being read from or written to the NVMe SSD.
Off	Blinking at 2 Hz	The NVMe drive is being located.
Off	Blinking at 8 Hz	The data on the secondary NVMe drive is being rebuilt.
Steady on/Off	Steady on	The NVMe drive is faulty.

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

Table 5-10 NVMe drive indicators (VMD disabled)

Activity Indicator (Green)	Fault Indicator (Yellow)	Description
Off	Off	The NVMe drive cannot be detected.
Steady on	Off	The NVMe drive is working properly.
Blinking at 2 Hz	Off	Data is being read from or written to the NVMe drive.
Off	Blinking at 2 Hz	The NVMe drive is being located or hot-swapped.
Off	Blinking at 0.5 Hz	The hot removal process is complete, and the NVMe drive is removable.
Steady on/Off	Steady on	The NVMe drive is faulty.

5.5.4 RAID Controller Card

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

- PCIe plug-in RAID controller cards and screw-in RAID controller cards are supported.
- Contact your local Huawei sales representative or use the **Intelligent Computing Compatibility Checker** to determine the components to be used.
- For details about the RAID controller card, see **Huawei V5 Server RAID Controller Card User Guide**.

5.6 Network

5.6.1 LOMs

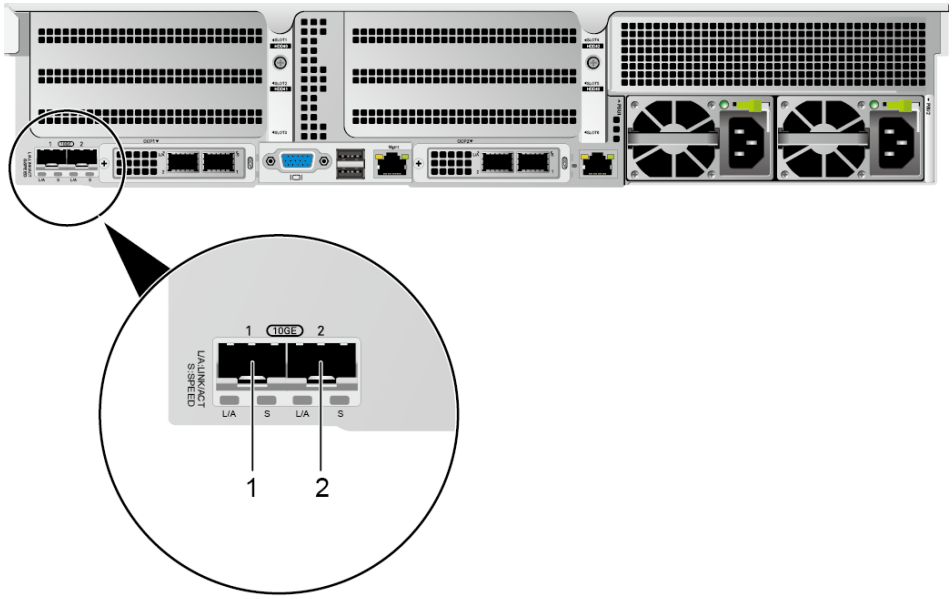
LOMs provide network expansion capabilities.

Table 5-11 LOMs supported by the 2288X V5

NIC Type	Chip Model	Port Type	Number of Ports	NC-SI	WOL	PXE
LOM	X722	10GE optical port	2	√	√	√

NIC Type	Chip Model	Port Type	Number of Ports	NC-SI	WOL	PXE
• Use **Intelligent Computing Compatibility Checker** to obtain information about the cables and optical modules supported by the LOM ports. • Rate specifications of the LOM ports (10GE optical ports): – Rate negotiation mode: auto-negotiation 10000 Mbit/s (full duplex) – Supported rate: 10000 Mbit/s – Rates not supported: 10/100/1000 Mbit/s • The LOM ports do not support forced rates. • Forcibly powering off a server will cause intermittent NC-SI disconnection and disable the Wake on LAN (WOL) function of the LOM ports. To restore the NC-SI connection, refresh the iBMC WebUI.						

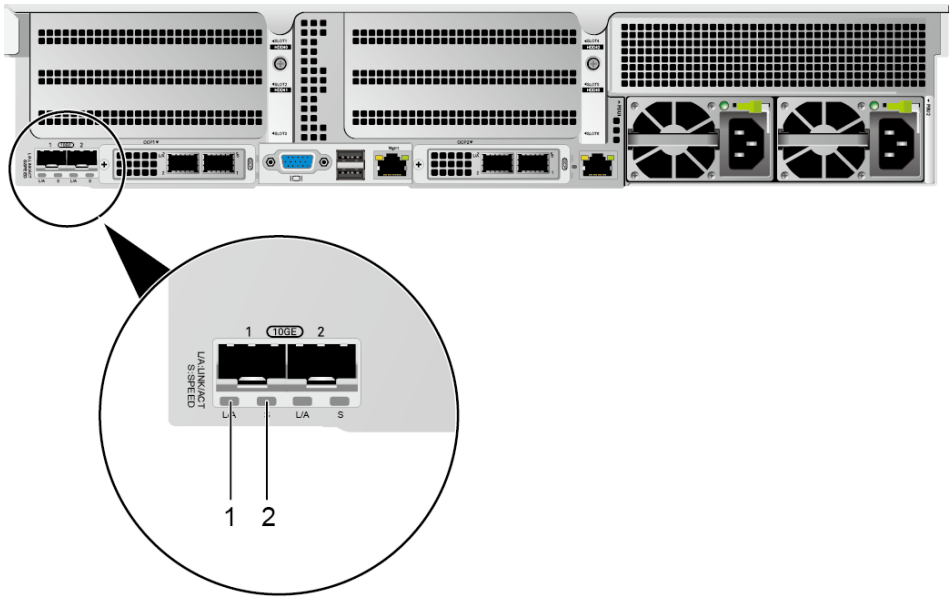
Figure 5-30 LOM ports



1	10GE LOM port 1	2	10GE LOM port 2

Indicator Positions

Figure 5-31 LOM indicators



1	Connection status indicator/Data transmission status indicator for a 10GE optical port	2	Data transmission rate indicator for a 10GE optical port

Indicator Description

Table 5-12 LOM indicators

Indicator	Description
Connection status indicator/Data transmission status indicator for a 10GE optical port	• Off: The network port is not connected. • Blinking green: Data is being transmitted. • Steady green: The network port is properly connected.
Data transmission rate indicator for a 10GE optical port	• Off: The network port is not connected. • Steady green: The data transmission rate is 10 Gbit/s. • Steady yellow: The data transmission rate is lower than 10 Gbit/s.

5.6.2 OCP 2.0 Mezzanine Cards

OCP 2.0 mezzanine cards provide network expansion capabilities.

- Supports on-demand configuration.
- Contact your local Huawei sales representative or use the **Intelligent Computing Compatibility Checker** to determine the components to be used.

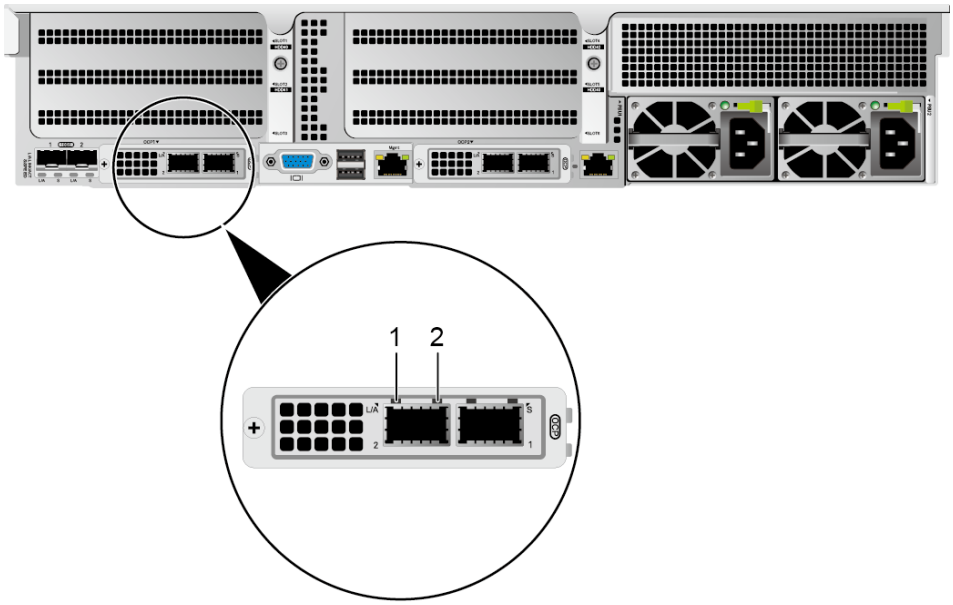
Table 5-13 OCP 2.0 mezzanine cards supported by the 2288X V5

NIC Type	Chip Model	Port Type	Number of Ports	NC-SI	WOL	PXE
OCP 2.0 mezzanine card 1	CX5	25GE optical port	2	√	√	√
OCP 2.0 mezzanine card 2	CX5	25GE optical port	2	×	√	√

Indicator Positions

- OCP 2.0 mezzanine card indicators (2 x 25GE optical ports)

Figure 5-32 OCP 2.0 mezzanine card indicators (2 x 25GE optical ports)



1	Connection status indicator/Data transmission status indicator for a 25GE optical port	2	Data transmission rate indicator for a 25GE optical port

Indicator Description

Table 5-14 OCP 2.0 mezzanine card indicators

Indicator	Description
Connection status indicator/Data transmission status indicator for a 25GE optical port	• Off: The network port is not connected. • Blinking green: Data is being transmitted. • Steady green: The network port is properly connected.
Data transmission rate indicator for a 25GE optical port	• Off: The network port is not connected. • Steady green: The data transmission rate is 25 Gbit/s. • Steady yellow: The data transmission rate is 10 Gbit/s.

5.7 I/O Expansion

5.7.1 PCIe Cards

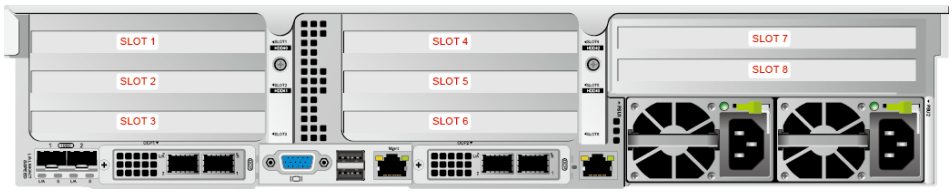
PCIe cards provide ease of expandability and connection.

- Eight slots for standard PCIe cards are supported.
- Contact your local Huawei sales representative or use the **Intelligent Computing Compatibility Checker** to determine the components to be used.

5.7.2 PCIe Slots

PCIe Slots

Figure 5-33 PCIe slots



- I/O module 1 provides slots 1 to 3. If a dual-slot PCIe riser module is used, slot 2 is unavailable. If a module with 2 x 2.5" drives and one PCIe card is used, slots 1 and 2 are unavailable.
- I/O module 2 provides slots 4 to 6. If a dual-slot PCIe riser module is used, slot 5 is unavailable.
- I/O module 3 provides slots 7 to 8. If a single-slot PCIe riser module is used, slot 8 is unavailable.

NOTE

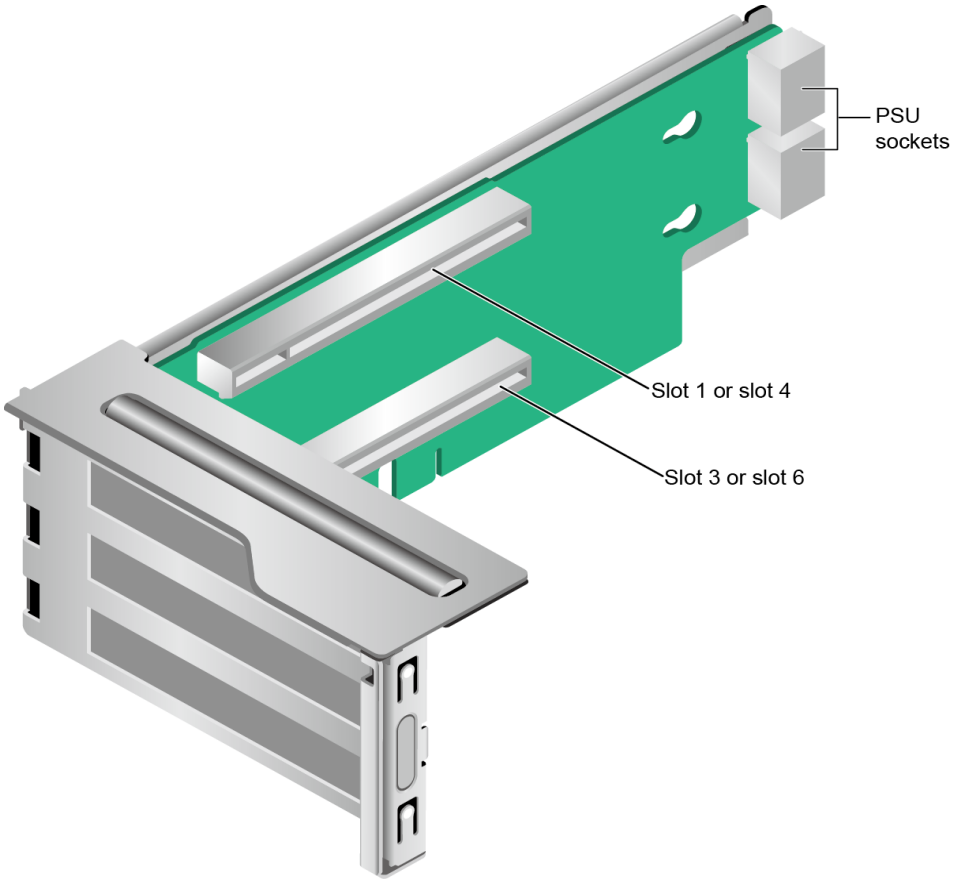
Observe the following rules when configuring GPU cards:

- GPU cards are not supported if a module with 2 x 2.5" drives and one PCIe card is installed in I/O module 1.
- A dual-slot PCIe riser module in I/O module 1 or 2 can house only one FHFL single-slot or dual-slot PCIe x16 GPU card in slot 1 or 4.
- A three-slot PCIe riser module in I/O module 1 or 2 does not support dual-slot GPU cards.
- A single-slot PCIe riser module in I/O module 3 can house only one HHHL single-slot x16 GPU card.
- A two-slot PCIe riser module in I/O module 3 does not support dual-slot GPU cards.
- All GPU cards except HHHL GPU cards must be installed in dedicated PCIe riser modules.

PCIe Riser Modules

- PCIe riser module 1 (universal)
  - Provides PCIe slots 1 and 3 when installed in I/O module 1.
  - Provides PCIe slots 4 and 6 when installed in I/O module 2.

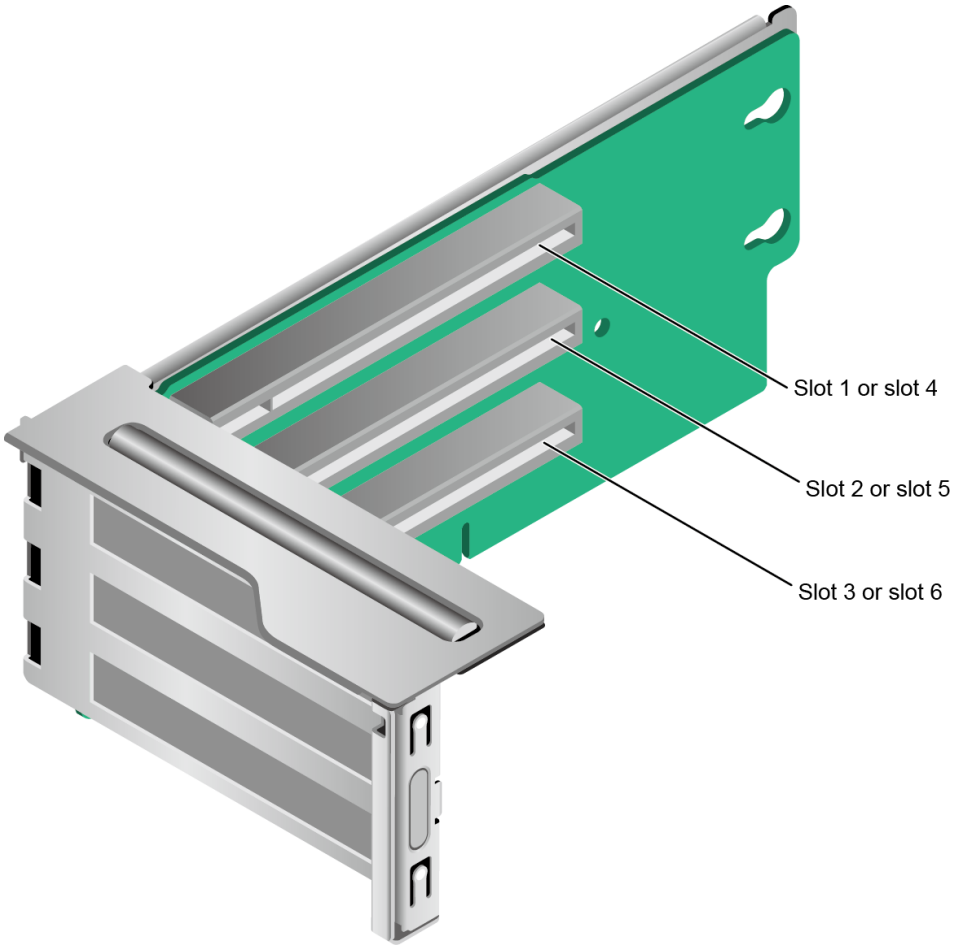
Figure 5-34 PCIe riser module 1



- PCIe riser module 2 (universal)
  - Provides PCIe slots 1, 2, and 3 when installed in I/O module 1.

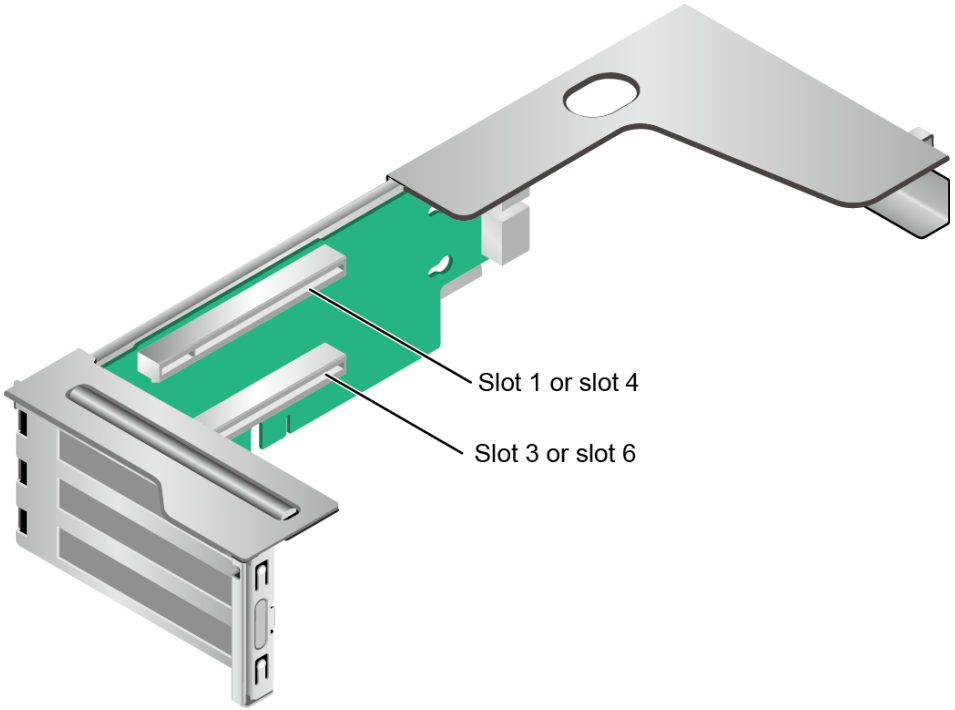
– Provides PCIe slots 4, 5, and 6 when installed in I/O module 2.

Figure 5-35 PCIe riser module 2



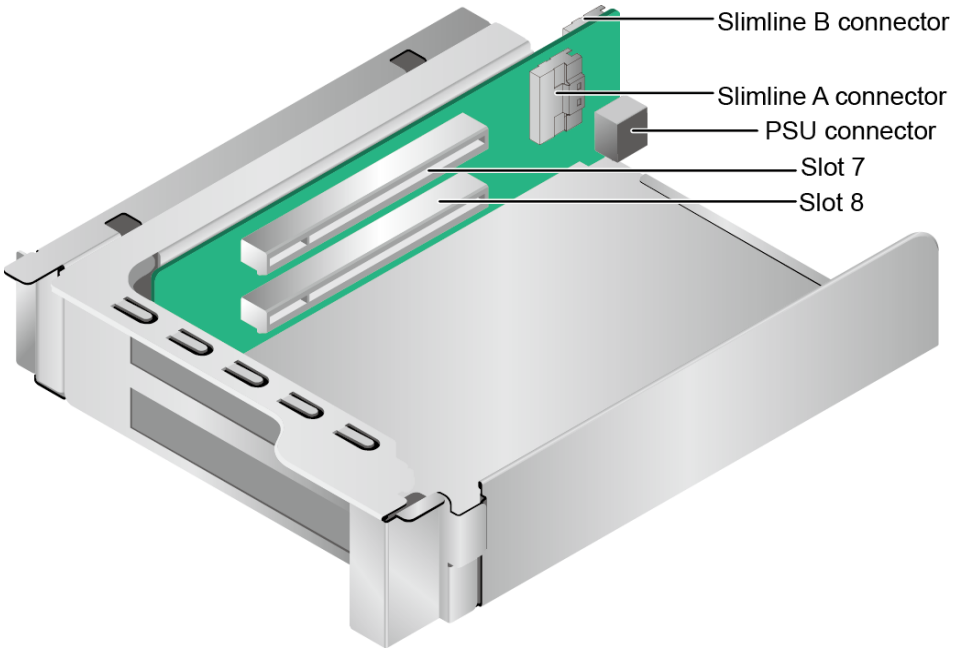
- PCIe riser module 3 (for GPU cards only)
  – Provides PCIe slots 1 and 3 when installed in I/O module 1.
  – Provides PCIe slots 4 and 6 when installed in I/O module 2.

Figure 5-36 PCIe riser module 3



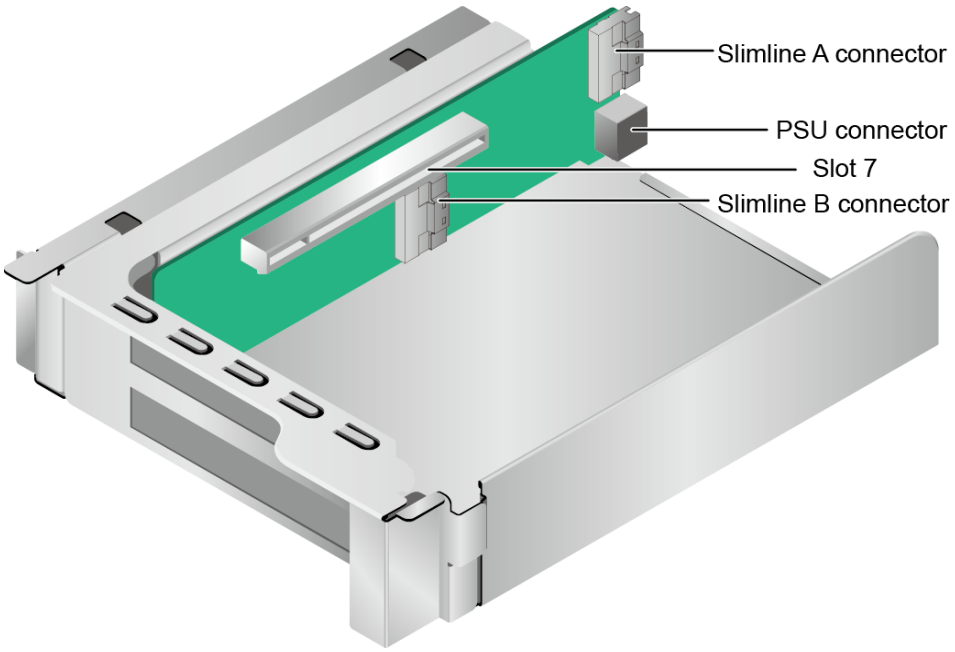
- PCIe riser module 4
  Provides PCIe slots 7 and 8 when installed in I/O module 3.

Figure 5-37 PCIe riser module 4



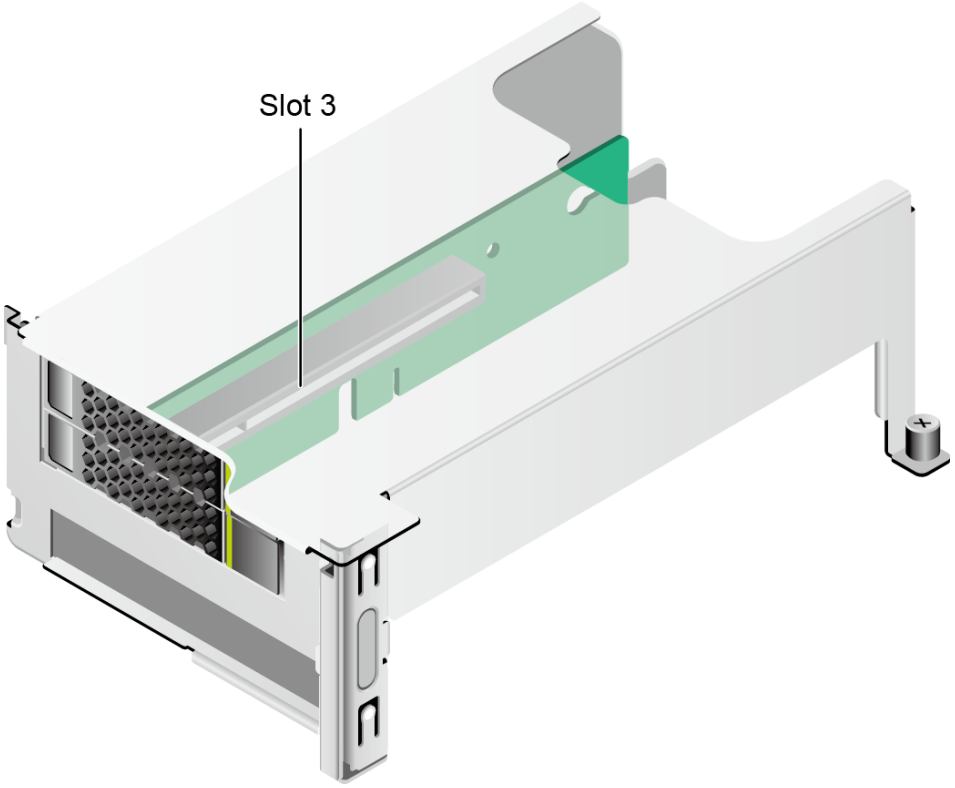
- PCIe riser module 5
  Provides PCIe slot 7 when installed in I/O module 3.

Figure 5-38 PCIe riser module 5



- PCIe riser module 6
  Provides PCIe slot 3 when installed in I/O module 1.

Figure 5-39 PCIe riser module 6



5.7.3 PCIe Slot Description

NOTE

The PCIe slots mapping to a vacant CPU socket are unavailable.

Table 5-15 PCIe slot description

PCIe Slot	CPU	PCIe Standards	Connector Width	Bus Width	Port No.	Root Port (B/D/F)	Device (B/D/F)	Slot Size
RAID controller card	CPU 1	PCIe 3.0	x8	x8	Port3A	5D/00/0	5E/00/0	-
LOM	CPU 1	PCIe 3.0	x8	x8	Port1A	17/00/0	1A/00/0	-
OCP 2.0 mezzanine card 1	CPU 1	PCIe 3.0	x8	x8	Port1C	17/02/0	1C/00/0	-
OCP 2.0 mezzanine card 2	CPU 2	PCIe 3.0	x8	x8	Port2A	AE/00/0	AF/00/0	-

PCIe Slot	CPU	PCIe Standards	Connector Width	Bus Width	Port No.	Root Port (B/D/F)	Device (B/D/F)	Slot Size
Slot 1	CPU 1	PCIe 3.0	x16	• 2-slot PCIe riser module (PRM): x16 • 3-slot PRM: x8 • Module with 2 x 2.5" drives and one PCIe card: N/A	Port2A	3A/00/0	3B/00/0	FHFL

PCIe Slot	CPU	PCIe Standards	Connector Width	Bus Width	Port No.	Root Port (B/D/F)	Device (B/D/F)	Slot Size
Slot 2	CPU 1	PCIe 3.0	x16	• 2-slot PRM: N/A • 3-slot PRM: x8 • Module with 2 x 2.5" drives and one PCIe card: N/A	Port2C	3A/02/0	3E/00/0	FHFL
Slot 3	CPU 1	PCIe 3.0	x16	x8	Port3C	5D/02/0	5E/00/0	FHHL
Slot 4	CPU 2	PCIe 3.0	x16	• 2-slot PRM: x16 • 3-slot PRM: x8	Port1A	85/00/0	86/00/0	FHFL

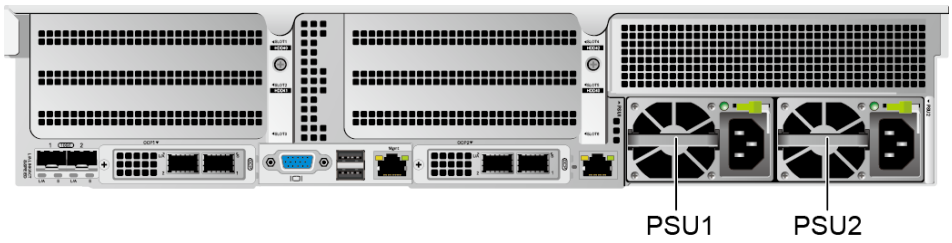
PCIe Slot	CPU	PCIe Standards	Connector Width	Bus Width	Port No.	Root Port (B/D/F)	Device (B/D/F)	Slot Size
Slot 5	CPU 2	PCIe 3.0	x16	• 2-slot PRM: N/A • 3-slot PRM: x8	Port1C	85/02/0	89/00/0	FHFL
Slot 6	CPU 2	PCIe 3.0	x16	x8	Port2C	AE/02/0	B0/00/0	FHHL
Slot 7	CPU 2	PCIe 3.0	x16	• 1-slot PRM: x16 • 2-slot PRM: x8	Port3A	D7/00/0	D8/00/0	HHHL
Slot 8	CPU 2	PCIe 3.0	x8	• 1-slot PRM: N/A • 2-slot PRM: x8	Port3C	D7/02/0	DB/00/0	HHHL

PCIe Slot	CPU	PCIe Standards	Connector Width	Bus Width	Port No.	Root Port (B/D/F)	Device (B/D/F)	Slot Size
• The B/D/F (Bus/Device/Function Number) values are the default values when the server is fully configured with PCIe devices. The values may vary if the server is not fully configured with PCIe devices or if a PCIe card with a PCI bridge is configured. • Root Port (B/D/F) indicates the B/D/F of an internal PCIe root port of the processor. • Device (B/D/F) indicates the B/D/F (displayed on the OS) of an onboard or extended PCIe device. • The PCIe x16 slots are backward compatible with PCIe x8, PCIe x4, and PCIe x1 cards. The PCIe cards are not forward compatible. That is, the PCIe slot width cannot be smaller than the PCIe card link width. • The full-height half-length (FHHL) PCIe slots are backward compatible with half-height half-length (HHHL) PCIe cards. • All slots support PCIe cards of up to 75 W. The power of a PCIe card varies depending on its model. • The SP520, SP521, and SP522 do not support driveless server configuration. PXE boot is recommended for driveless servers.								

5.8 PSUs

- The server supports one or two PSUs.
- The server supports AC or DC PSUs.
- The PSUs are hot-swappable.
- The server supports two PSUs in 1+1 redundancy.
- The same model of PSUs 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.
- Contact your local Huawei sales representative or use the **Intelligent Computing Compatibility Checker** to determine the components to be used.

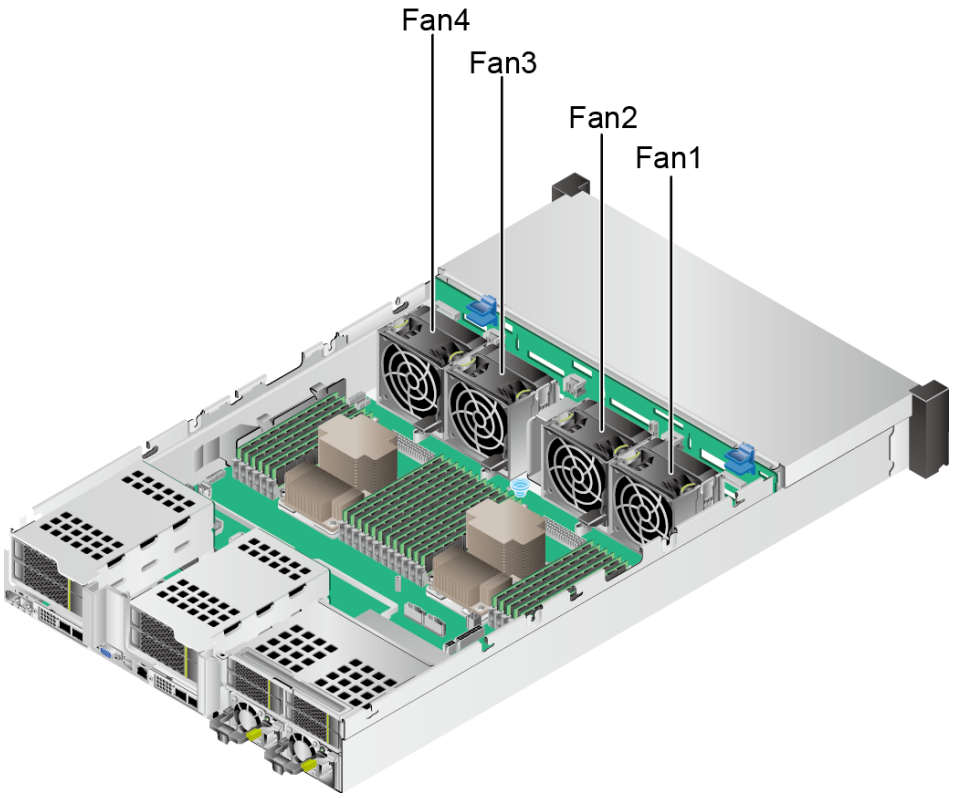
Figure 5-40 PSU positions



5.9 Fans

- The server supports four fan modules.
- The fan modules are hot-swappable.
- The server tolerates failure of a single fan.
- The fan speed can be adjusted.
- The same model of fan modules must be used in a server.

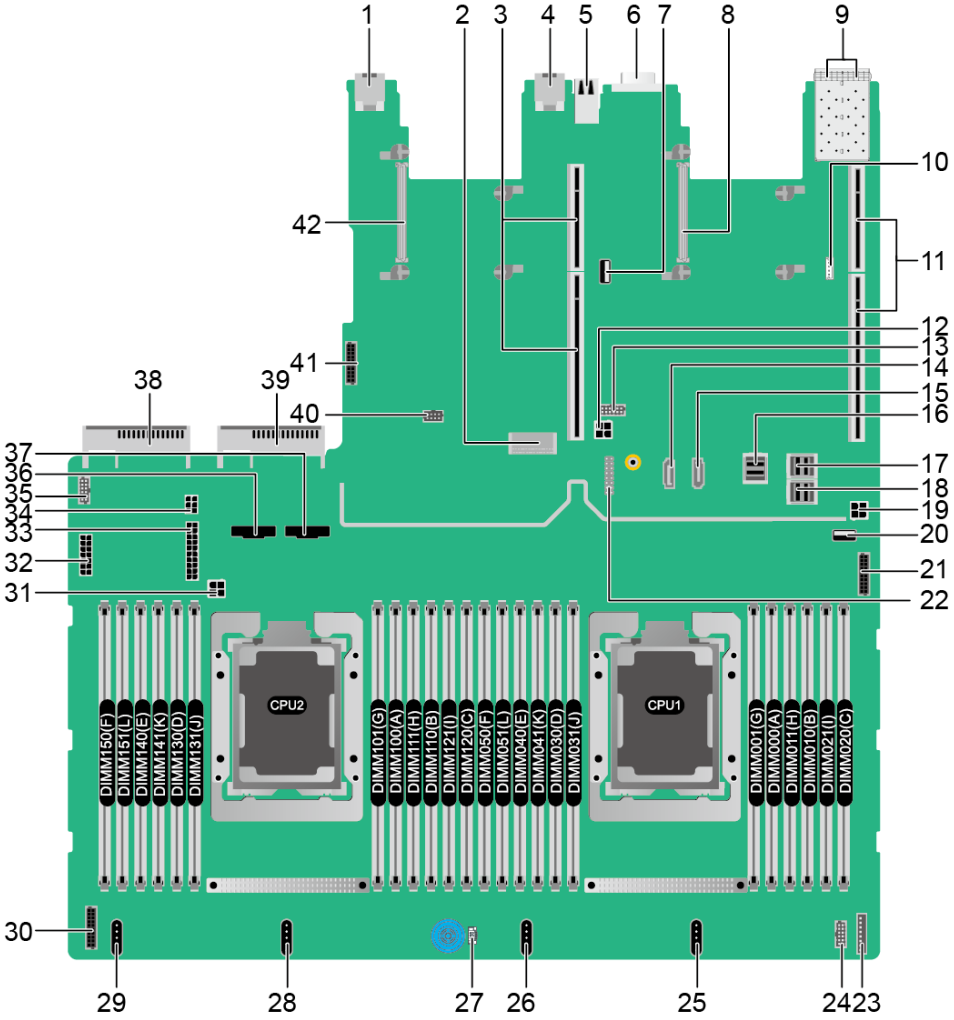
Figure 5-41 Fan module positions



5.10 Boards

5.10.1 Mainboard

Figure 5-42 2288X V5 mainboard



1	Serial port (COM/J177)	2	RAID controller card connector (RAID CARD/ J48)
3	PCIe riser 2 slots (PCIE RISER2 (CPU2)/J115/J116)	4	Management network port (BMC GE/J180)
5	2 x USB 3.0 ports (USB3.0 CONN/J169)	6	VGA connector (VGA/ J112)
7	USB 3.0 port (INNER USB3.0/J181)	8	OCP 2.0 mezzanine card 1 slot (OCP1/J178)
9	2 x 10GE optical ports (10GE PORT/J88/J89)	10	VROC key port (VROC KEY/J130)[a]

11	PCIe riser 1 slots (PCIE RISER1 (CPU1)/J80/J108)	12	Rear-drive backplane power connector 2 (REAR BP PWR2/J126)
13	NC-SI connector (NCSI CONN/J99)	14	SATA signal connector 2 (SATA2/J71)
15	SATA signal connector 1 (SATA1/J67)	16	mini-SAS HD connector A (MINIHD PORTA/J86)
17	mini-SAS HD connector C (MINIHD PORTC/J85)	18	mini-SAS HD connector B (MINIHD PORTB/J84)
19	Rear-drive backplane power connector 1 (REAR BP PWR1/J127)	20	USB 3.0 port (FRONT USB3.0/J173)[b]
21	Right mounting ear connector (RCIA BOARD/ J167)	22	TPM port (TPM/J55)
23	LCD connector (LCD CONN/J87)[a]	24	VGA connector (VGA BOARD/J160)
25	Fan 4 connector (2U FAN4/J148)	26	Fan 3 connector (2U FANA3/J145)
27	Intrusion sensor connector (INTRUDER/S1)[a]	28	Fan 2 connector (2U FAN2/J146)
29	Fan 1 connector (1U/2U FAN1/J105)	30	Drive backplane connector (HDD BP CONN/J162)
31	Built-in drive power connector (INNER HDD PWR/J171)[a]	32	Drive backplane power connector 1 (HDD BP PWR1/J128)
33	Drive backplane power connector 2 (HDD BP PWR2/J166)	34	Rear-drive backplane power connector 3 (REAR BP PWR3/J182)
35	Rear 4 x 2.5-inch drive backplane low-speed signal connector (REAR 4*2.5 HDD BP/J164)	36	CPU 2 slimline A connector (CPU2 SLIMLINE A/J140)
37	CPU 2 slimline B connector (CPU2 SLIMLINE B/J139)	38	PSU 2 connector (PSU2/ J157)
39	PSU 1 connector (PSU1/ J156)	40	Built-in drive low-speed signal connector (INNER HDD BP/J122)[a]

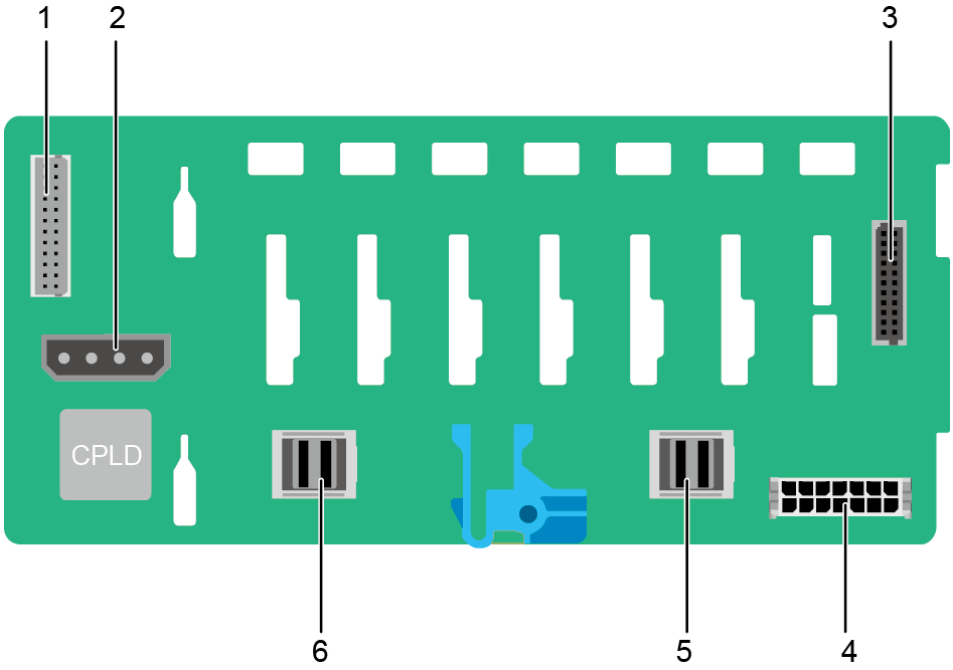
41	Left mounting ear connector (LCIA BOARD/ J161)	42	OCP 2.0 mezzanine card 2 slot (OCP2/J179)
• a: This port is a reserved port, which is unavailable. • b: The built-in USB 3.0 port can be connected to the front USB 3.0 port through a USB cable. It cannot be used directly.			

5.10.2 Drive Backplane

Front-Drive Backplane

- 8 x 2.5" drive pass-through backplane

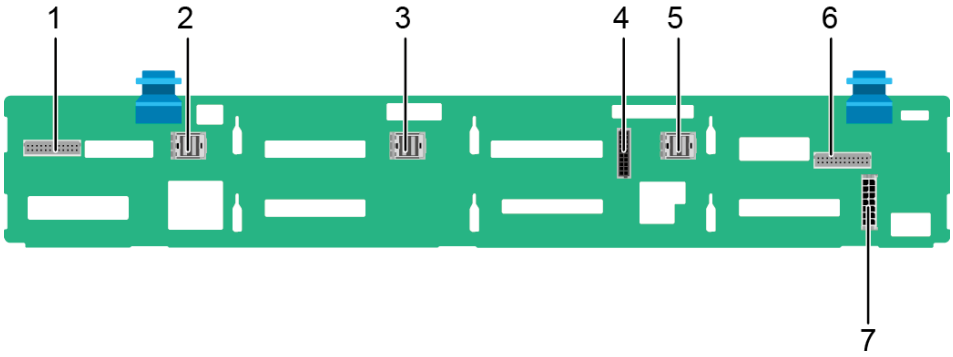
Figure 5-43 8 x 2.5" drive pass-through backplane (BOM 03026VRB)



1	Indicator signal cable connector (REAR BP1/J3) **NOTE** The connector is reserved.	2	DVD drive power connector (DVD/J11)
3	Backplane signal cable connector (HDD BP/J1)	4	Power connector (POWER/J2)
5	mini-SAS HD connector (PORT A/J28)	6	mini-SAS HD connector (PORT B/J29)

- 12 x 3.5" drive pass-through backplane

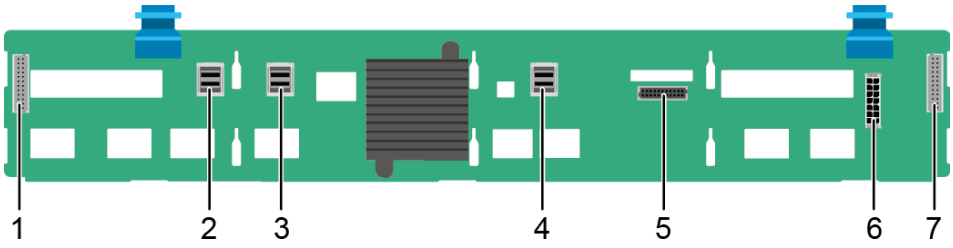
Figure 5-44 12 x 3.5" drive pass-through backplane (BOM 03025VYU)



1	Indicator signal cable connector (REAR BP0/J7)	2	mini-SAS HD connector (PORT C/J5)
3	mini-SAS HD connector (PORT B/J4)	4	Backplane signal cable connector (HDD BP/J6)
5	mini-SAS HD connector (PORT A/J3)	6	Indicator signal cable connector (REAR BP1/J8)
7	Power connector (POWER/J1)	-	-

- 12 x 3.5" drive EXP backplane

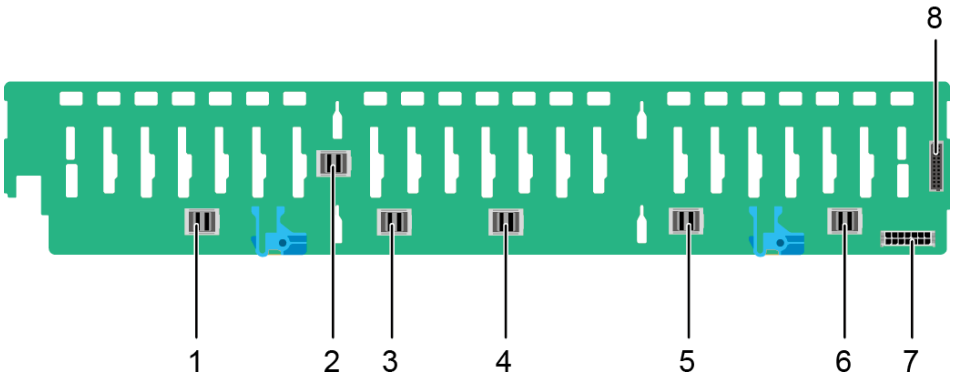
Figure 5-45 12 x 3.5" drive EXP backplane (BOM 03027FAT)



1	Indicator signal cable connector (REAR BP0/J31)	2	mini-SAS HD connector (PORT A/J28)
3	mini-SAS HD connector (PORT B/J29)	4	mini-SAS HD connector (REAR PORT/J34)
5	Backplane signal cable connector (HDD BP/J35)	6	Power connector (POWER/J24)
7	Indicator signal cable connector (REAR BP1/J32)	-	-

- 24 x 2.5" drive pass-through backplane

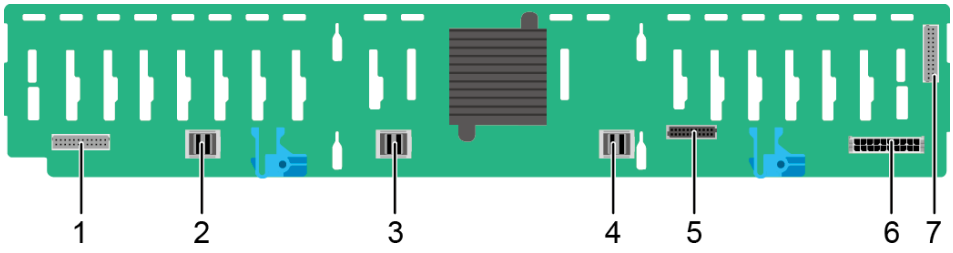
Figure 5-46 24 x 2.5" drive pass-through backplane (BOM 03026VRD)



1	mini-SAS HD connector (PORT 3B/J33)	2	mini-SAS HD connector (PORT 3A/J39)
3	mini-SAS HD connector (PORT 2B/J31)	4	mini-SAS HD connector (PORT 2A/J30)
5	mini-SAS HD connector (PORT 1B/J29)	6	mini-SAS HD connector (PORT 1A/J28)
7	Power connector (POWER/J24)	8	Backplane signal cable connector (HDD_BP/J1)

- 25 x 2.5" drive EXP backplane

Figure 5-47 25 x 2.5" drive EXP backplane (BOM 03027QFN)



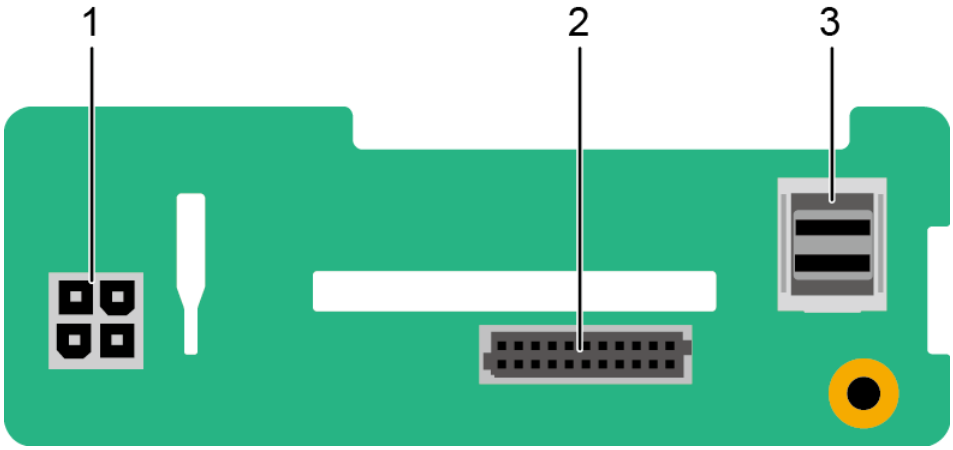
1	Indicator signal cable connector (REAR BP0/ J32)	2	mini-SAS HD connector (PORT A/J28)
3	mini-SAS HD connector (PORT B/J29)	4	mini-SAS HD connector (REAR PORT/J31)
5	Backplane signal cable connector (HDD_BP/J1)	6	Power connector (POWER/J24)

7	Indicator signal cable connector (REAR BP1/ J35)	-	-

Rear-Drive Backplane

- 2 x 2.5" drive backplane

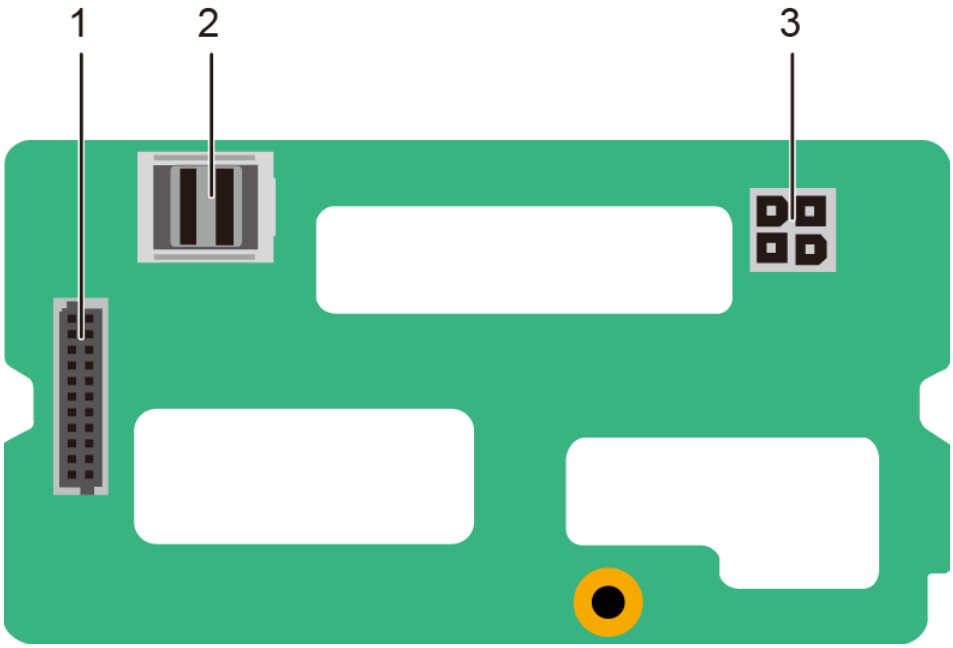
Figure 5-48 2 x 2.5" drive backplane (BOM 03026XYQ)



1	Power connector (BP PWR/J1)	2	Indicator signal cable connector (REAR BP/J5)
3	mini-SAS HD connector (REAR PORT/J2)	-	-

- 2 x 3.5" drive backplane

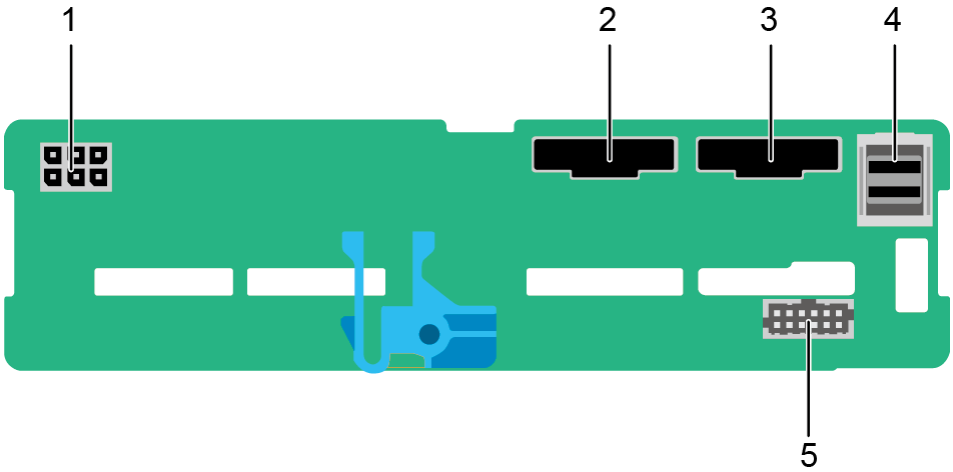
Figure 5-49 2 x 3.5" drive backplane (BOM 03026XYR)



1	Indicator signal cable connector (REAR BP/J5)	2	mini-SAS HD connector (REAR PORT/J2)
3	Power connector (BP PWR/J1)	-	-

- 4 x 2.5" drive backplane

Figure 5-50 4 x 2.5" drive backplane (BOM 03026XBS)



1	Power connector (REAR BP PWR3/J24)	2	Slimline A connector (SLIMLINE A/J8)

3	Slimline B connector (SLIMLINE B/J9)	4	mini-SAS HD connector (PORT A/J2)
5	Backplane signal cable connector (HDD BP/J23)	-	-

6 Product Specifications

6.1 Technical Specifications

Table 6-1 Technical specifications

Category	Specifications
Form factor	2U rack server
Chipset	Intel® C622
Processors	Supports one or two processors. • Intel® Xeon® Scalable (Skylake and Cascade Lake) processors • Built-in memory controller and six memory channels • Built-in PCIe controller, supporting PCIe 3.0 and 48 lanes per processor • Two UPI buses between processors, providing up to 10.4GT/s transmission per channel • Up to 28 cores (2.7 GHz) • Max. 3.8 GHz (four cores) • Min. 1.375 MB L3 cache per core • Max. 205 W TDP **NOTE** The preceding information is for reference only. Use the **Intelligent Computing Compatibility Checker** to obtain specific information.

Category	Specifications
Memory	Supports 24 memory modules of the following types: • Up to 24 DDR4 memory modules • Max. 2933 MT/s memory speed • RDIMM and LRDIMM support • The DDR4 memory modules of different types (RDIMM and LRDIMM) and specifications (capacity, bit width, rank, and height) cannot be used together. **NOTE** The preceding information is for reference only. Use the **Intelligent Computing Compatibility Checker** to obtain specific information.
Storage	Supports a variety of drive configurations. For details, see **5.5.1 Drive Configurations**. • Supports hot swap of SAS/SATA/NVMe drives. **NOTE** The NVMe drives support: • Surprise hot swap if the VMD function is enabled and the latest Intel VMD driver is installed. • Orderly hot swap if the VMD function is disabled. • Supports a variety of RAID controller cards. Use the **Intelligent Computing Compatibility Checker** to obtain information about the specific RAID controller cards supported. – The RAID controller card supports RAID configuration, RAID level migration, and drive roaming. – The RAID controller card does not occupy a standard PCIe slot. For details about the RAID controller card, see **Huawei V5 Server RAID Controller Card User Guide**. • Supports SAS HBA cards or SAS RAID controller card (with a 2 GB or 4 GB cache) to improve storage performance and data security. **NOTE** If the BIOS is in legacy mode, the 4K drive cannot be used as the boot drive.

Category	Specifications
Network	Supports expansion capability of multiple types of networks. • LOM – Supports two 10GE optical ports via the NIC chip integrated on the mainboard. – The LOM ports support NC-SI, WOL, and PXE. • OCP 2.0 mezzanine card – Supports on-demand configuration. – Supports a full range of OCP 2.0 mezzanine cards. Use the **Intelligent Computing Compatibility Checker** to obtain information about the specific OCP 2.0 cards supported.
I/O expansion	11 PCIe 3.0 slots: • One slot dedicated for a RAID controller card, two dedicated for OCP 2.0 mezzanine cards, and eight for standard PCIe cards. For details, see **5.7.2 PCIe Slots** and **5.7.3 PCIe Slot Description**. • Support Huawei proprietary PCIe SSD cards to bolster I/O performance for applications such as searching, caching, and download services. • Supports GPU cards. **NOTE** The preceding information is for reference only. Use the **Intelligent Computing Compatibility Checker** to obtain specific information.

Category	Specifications
Ports	Supports a variety of ports. ● Ports on the front panel: – Two USB 2.0 ports – One USB 3.0 port – One DB15 VGA port **NOTE** For the server that uses 12 x 3.5" drive configuration, the front panel provides only two USB 2.0 ports. ● Ports on the rear panel: – Two USB 3.0 ports – One DB15 VGA port – One RJ45 serial port – One RJ45 system management port – Two 10GE optical ports ● Built-in ports: – Two USB 3.0 ports – Two SATA ports **NOTE** In the 8 x 2.5" or 24 x 2.5" drive configuration, only one USB 3.0 port and two SATA built-in ports are provided. **NOTE** You are not advised to install the operating system on a USB flash drive.
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. **NOTE** ● The integrated video card can provide the maximum display resolution (1920 x 1200) only after the video card driver matching the operating system version is installed. Otherwise, only the default resolution supported by the operating system is provided. ● If both the front and rear VGA ports of a device are connected to a monitor, the front VGA port is used by default.
System management	● UEFI ● iBMC ● NC-SI ● Integration with third-party management systems
Security features	● Power-on password ● Administrator password ● TCM (only in China)/TPM ● Front bezel (optional)

6.2 Environmental Specifications

Table 6-2 Environmental specifications

Category	Specifications
Temperature	• Operating temperature: 5°C to 45°C (41°F to 113°F) (ASHRAE Classes A2 to A4 compliant) • Storage temperature (≤ 72 hours): –40°C to +65°C (–40°F to +149°F) • Long-term storage temperature (> 72 hours): 21°C to 27°C (69.8°F to 80.6°F) • Maximum temperature change rate: 20°C/h (36°F/h) **NOTE** The highest operating temperature varies depending on the server configuration. For details, see **A.2 Operating Temperature Limitations** .
Relative humidity (RH, non-condensing)	• Operating humidity: 8% to 90% • Storage humidity (≤ 72 hours): 5% to 95% • Long-term storage humidity (> 72 hours): 30% to 69% • Maximum change rate: 20%/h
Air volume	≥ 204 cubic feet per minute (CFM)
Altitude	• Operating altitude ≤ 3050 m (10006.44 ft) – If the server complying with ASHRAE Class A2 is used in a place above 900 m (2952.76 ft), the highest operating temperature decreases by 1°C (1.8°F) for every increase of 300 m (984.25 ft). – If the server complying with ASHRAE Class A3 is used in a place above 900 m (2952.76 ft), the highest operating temperature decreases by 1°C (1.8°F) for every increase of 175 m (574.15 ft). – If the server complying with ASHRAE Class A4 is used in a place above 900 m (2952.76 ft), the highest operating temperature decreases by 1°C (1.8°F) for every increase of 125 m (410.10 ft). • HDDs cannot be used at an altitude of over 3000 m (9842.4 ft).
Corrosive gaseous contaminant	Maximum corrosion product thickness growth rate: • Copper corrosion rate test: 300 Å/month (meeting level G1 requirements of the ANSI/ISA-71.04-2013 standard on gaseous corrosion) • Silver corrosion rate test: 200 Å/month

Category	Specifications
Particle contaminant	• The equipment room environment meets the requirements of ISO 14664-1 Class 8. • There is no explosive, conductive, magnetic, or corrosive dust in the equipment room. **NOTE** It is recommended that the particulate pollutants in the equipment room be monitored by a professional organization.
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). • Idle: – LWAd: 5.64 Bels – LpAm: 42.2 dBA • Operating: – LWAd: 6.08 Bels – LpAm: 46.8 dBA **NOTE** Actual sound levels generated during operation vary depending on server configuration, load, and ambient temperature.

6.3 Physical Specifications

Table 6-3 Physical specifications

Category	Description
Dimensions (H x W x D)	• Chassis with 3.5" drives: 87.5 mm x 447 mm x 750 mm (3.44 in. x 17.60 in. x 29.53 in.) • Chassis with 2.5" drives: 86.1 mm x 447 mm x 708 mm (3.39 in. x 17.60 in. x 27.87 in.)

Category	Description
Installation space	• Requirements for cabinet installation: Cabinet compliant with the International Electrotechnical Commission (IEC) 297 standard – Cabinet width: 482.6 mm (19 in.) – Cabinet depth ≥ 1000 mm (39.37 in.) • Requirements for guide rail installation: – L-shaped guide rails: apply only to Huawei cabinets. – Static rail kit: applies to cabinets with a distance of 543.5 mm to 848.5 mm (21.40 in. to 33.41 in.) between the front and rear mounting bars. – Ball bearing rail kit: applies to cabinets with a distance of 610 mm to 914 mm (24.02 in. to 35.98 in.) between the front and rear mounting bars.
Weight in full configuration	• Maximum net weight: – Server with 8 x 2.5" drives: 25.1 kg (55.35 lb) Full configuration: 8 x 2.5" front drives + 4 x 2.5" rear drives (I/O module 3) – Server with 12 x 3.5" drives: 34.1 kg (75.19 lb) Full configuration: 12 x 3.5" front drives + 2 x 3.5" rear drives (I/O module 1) + 2 x 3.5" rear drives (I/O module 2) + 4 x 2.5" rear drives (I/O module 3) – Server with 24 x 2.5" drives: 29.4 kg (64.83 lb) Full configuration: 24 x 2.5" front drives + 4 x 2.5" rear drives (I/O module 3) – Server with 25 x 2.5" drives: 30.5 kg (67.25 lb) Full configuration: 25 x 2.5" front drives + 2 x 2.5" rear drives (I/O module 1) + 4 x 2.5" rear drives (I/O module 3) • Packaging materials: 5 kg (11.03 lb)
Power consumption	The power consumption parameters vary with hardware configurations (including the configurations complying with EU ErP). Use the **Intelligent Computing Product Power Calculator** to obtain specific information.

7 Software and Hardware Compatibility

Use the **Intelligent Computing Compatibility Checker** to obtain information about the operating systems and hardware supported.

NOTICE

Do not use incompatible components. Otherwise, the server may fail to work properly. The technical support and warranty do not cover faults caused by incompatible components.

8 Safety Instructions

8.1 Safety Instructions

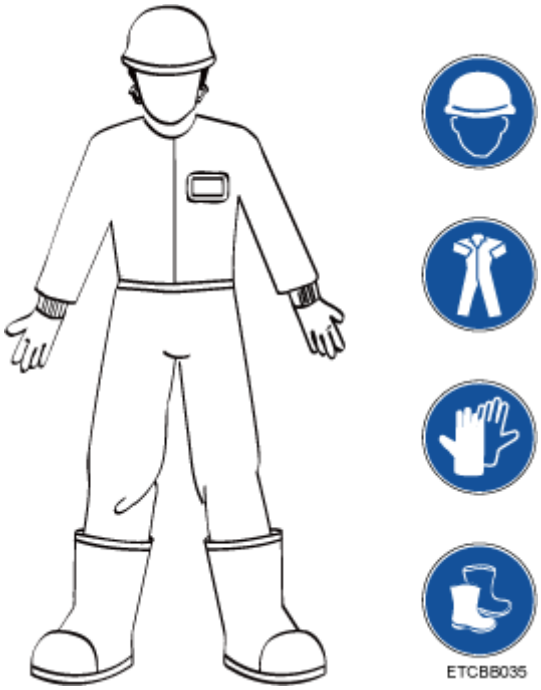
General Instructions

- Comply with all local laws and regulations when installing the hardware. The safety instructions in this document are only supplemental to local laws and regulations.
- The "DANGER", "WARNING", and "CAUTION" information in this document does not represent all the safety instructions, but supplements to the safety instructions.
- To ensure safety when installing hardware, follow all safety instructions provided on the device labels and in this document.
- Only qualified personnel are allowed to perform special tasks, such as performing high-voltage operations and driving a forklift.
- Take protective measures if a Class A product is used in residential areas as it is likely to cause radio interference.

Personal Safety

- Only personnel certified or authorized by Huawei are allowed to install the hardware.
- Stop any operation that may cause personal injury or equipment damage, report the problem to a project supervisor immediately, and take protective measures.
- Do not operate the product or handle cables during thunderstorms.
- Before carrying devices, note the following points:
  - Do not carry more weight than is permitted by local laws or regulations.
  - Ensue that there are enough people to carry the devices.
- Wear clean protective gloves, ESD clothing, a protective hat, and protective shoes, as shown in **Figure 8-1**.

Figure 8-1 Protective clothing



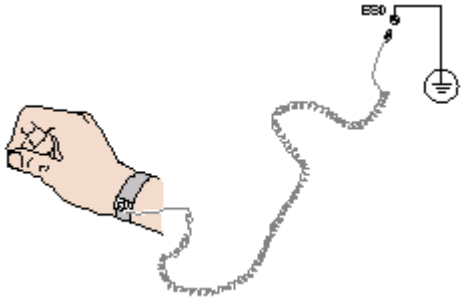
- Before touching a device, ensure that you are wearing ESD clothing and ESD gloves (or wrist strap), and remove any conductive objects (such as watches and jewelry). **Figure 8-2** shows conductive objects that must be removed before you touch a device.

Figure 8-2 Conductive objects to be removed

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

a. Secure the ESD wrist strap around your wrist.
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 rack or chassis.

Figure 8-3 Wearing an ESD wrist strap



- Exercise caution when using tools that could cause personal injury.
- If the installation position of the device is above shoulder height, use a stacker to lift it. This will prevent it from falling.
- To prevent electric shock, do not touch high-voltage cables directly or indirectly. A high-voltage power supply may be powering the device.
- Properly ground a device before powering it on.
- Do not use a ladder alone. Have someone else hold the ladder steady to prevent accidents.
- To avoid damaging your eyes when installing, testing, or replacing optical cables, do not look into optical ports without eye protection.

Equipment Safety

- Use the recommended power cables at all times.
- Always use the power cables delivered with the devices.
- Wear ESD clothing and gloves before handling a device. This prevents electrostatic damage.
- 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 equipment with care.
- Exercise caution when using tools that could cause personal injury.
- Connect the primary and secondary power cables to different power distribution units (PDUs) to ensure reliable system operation.
- Properly ground a device before powering it on.

Transportation Precautions

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

Exercise caution when transporting equipment.

- The logistics company engaged to transport the equipment must be reliable and comply with international standards for transporting electronics. Ensure that the equipment being transported is always upright. Take necessary precautions to prevent collisions, corrosion, package damage, damp conditions and pollution.
- Transport the equipment 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 GPUs and SSDs) separately.

  NOTE

  Use **Intelligent Computing Compatibility Checker** to obtain information abut the components supported by a node or server.
- Ensure that all devices are powered off before transportation.

Limits for the Maximum Weight Carried Per Person

CAUTION

To reduce the risk of personal injury, comply with local regulations with regard to the maximum weight one person is permitted to carry.

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

Table 8-1 Maximum weight one person is permitted to carry

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)	• Men: 15/33.08 • Women: 10/22.05

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

8.2 Maintenance and Warranty

For details about the maintenance and warranty, see **Maintenance & Warranty**.

9 System Management

The server uses Huawei proprietary intelligent Baseboard Management Controller (iBMC) to implement remote server management. The iBMC complies with Intelligent Platform Management Interface (IPMI) 2.0 and provides highly reliable hardware monitoring and management.

Features

The iBMC supports the following features and protocols:

- KVM and text console redirection
- Remote virtual media
- IPMI
- SNMP
- Common information model (CIM)
- Redfish
- Browser-based login

Specifications

Table 9-1 iBMC specifications

Feature	Description
Management interface	Integrates with any standard management system through the following interfaces or protocols: • IPMI • CLI • HTTPS • SNMP • Redfish
Fault detection	Detects and accurately locates faults in hardware, for example, an FRU.

Feature	Description
System watchdog	Supports BIOS POST, OS watchdog, and automatic system reset after fault timeout. Users can enable or disable these features individually.
Boot device configuration	Supports out-of-band configuration for boot devices.
Alarm management	Supports alarm management and reports alarms using the SNMP trap, Simple Mail Transfer Protocol (SMTP), and syslog service to ensure 24/7 operating.
Integrated virtual KVM	Provides remote maintenance measures and VNC service for troubleshooting.
Integrated virtual media	Virtualizes local media devices, images, USB keys, and folders into media devices on a remote server, simplifying OS installation. (The virtual DVD drive supports a maximum transmission rate of 8 MB/s.)
WebUI	Provides a user-friendly graphical user interface (GUI), simplifying user configuration and query operations.
Fault reproduction	Reproduces faults to help diagnose them quickly.
Screen snapshots and screen videos	Allows users to view screenshots and videos without login, facilitating routine preventive maintenance inspection (PMI).
Black Box	Allows users to enable or disable the black box function and download black box data.
DNS/LDAP	Supports domain management and directory services, significantly simplifying network and configuration management.
Dual-image backup	If iBMC software fails, it starts again from a backup image.
Asset management	Supports intelligent asset management.
Intelligent power management	Uses power capping to increase deployment density, and uses dynamic energy saving to reduce operating expenditure.
IPv6	Supports IPv6 to ensure sufficient IP addresses.
Network Controller Sideband Interface (NC-SI)	Supports NC-SI, allowing access the iBMC through the service network port.

10 Certifications

Country/Region	Certification	Standards
China	CCC	GB4943.1-2011 GB9254-2008 (Class A) GB17625.1-2012

A Appendix

A.1 Product SN

The serial number (SN) on the slide-out label plate uniquely identifies a device. The SN is required when you contact Huawei technical support.

Figure A-1 SN example

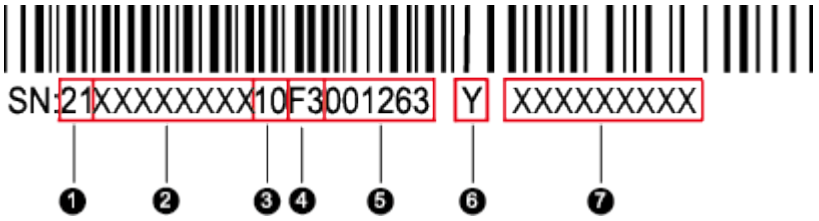


Table A-1 SN description

Callout No.	Description
1	SN ID (two characters), which is **21**.
2	Material identification code (8 characters), that is, the processing code.
3	Vendor code (two characters). **10** indicates Huawei, and other values indicate outsourcing vendors.

Callout No.	Description
4	Year and month (two characters). ● The first character indicates the year. – Digits 1 to 9 indicate years 2001 to 2009, respectively. – Letters A to H indicate years 2010 to 2017, respectively. – Letters J to N indicate years 2018 to 2022, respectively. – Letters P to Y indicate years 2023 to 2032, respectively. **NOTE** The years from 2010 are represented by uppercase letters excluding I, O, and Z because the three letters are similar to digits 1, 0, and 2. ● The second character indicates the month. – Digits 1 to 9 indicate January to September, respectively. – Letters A to C indicate October to December, respectively.
5	Sequence number (six characters).
6	RoHS compliance (one character). **Y** indicates RoHS compliant.
7	Internal model, that is, product name.

A.2 Operating Temperature Limitations

Table A-2 Operating temperature limitations

Configuration	Max. 30°C (86°F)	Max. 35°C (95°F)	Max. 40°C (104°F)	Max. 45°C (113°F)
8 x 2.5" drive pass-through configuration	• All options supported	Options not supported: • V100 GPU cards • T4 GPU cards	Options not supported: • PCIe SSD cards • Passive GPU cards	Options supported: • Platinum 8153, Gold 6152/6140 / 6126/5118 /5215, Silver 4216/4215 /4214, and other processors lower than 105 W. Options not supported: • PCIe SSD cards • Passive GPU cards • Rear drives • IB and OPA cards • OCP 2.0 mezzanine cards
12 x 3.5" drive pass-through configuration	• V100 GPU cards not supported	Options not supported: • V100 GPU cards • T4 GPU cards	Options not supported: • PCIe SSD cards • Passive GPU cards • Rear drives • OCP 2.0 mezzanine cards	-

Configuration	Max. 30°C (86°F)	Max. 35°C (95°F)	Max. 40°C (104°F)	Max. 45°C (113°F)
12 x 3.5" drive EXP configuration	• V100 GPU cards not supported	Options not supported: • V100 GPU cards • T4 GPU cards	Options not supported: • PCIe SSD cards • Passive GPU cards • Rear drives • OCP 2.0 mezzanine cards	-
24 x 2.5" drive pass-through configuration	• V100 GPU cards not supported	Options not supported: • V100 GPU cards • T4 GPU cards	Options not supported: • PCIe SSD cards • Passive GPU cards • Rear drives • OCP 2.0 mezzanine cards	-
25 x 2.5" drive EXP configuration	• V100 GPU cards not supported	Options not supported: • V100 GPU cards • T4 GPU cards	Options not supported: • PCIe SSD cards • Passive GPU cards • Rear drives • OCP 2.0 mezzanine cards	-

NOTE

- When a single fan is faulty:
  - The maximum operating temperature is 5°C (41°F) lower than the rated value.
  - System performance will be affected if GPU cards are configured.
- If V100 GPU cards are configured:
  - The maximum operating temperature is 30°C (86°F) in the 8 x 2.5" drive pass-through configuration.
  - V100 GPU cards are not supported in the 12 x 3.5" and 24 x 2.5" drive pass-through configurations.
  - V100 GPU cards are not supported in the 12 x 3.5" and 25 x 2.5" drive EXP configurations.
- If T4 GPU cards are configured:
  - The maximum operating temperature is 35°C (95°F) in the 8 x 2.5" drive pass-through configuration.
  - The maximum operating temperature is 30°C (86°F) in the 12 x 3.5" and 24 x 2.5" drive pass-through configurations.
  - The maximum operating temperature is 30°C (86°F) in the 12 x 3.5" and 25 x 2.5" drive EXP configurations.
- If OCP 2.0 mezzanine cards are configured:
  - The maximum operating temperature is 40°C (104°F) in the 8 x 2.5" drive pass-through configuration.
  - The maximum operating temperature is 35°C (95°F) in the 12 x 3.5" and 24 x 2.5" drive pass-through configurations.
  - The maximum operating temperature is 35°C (95°F) in the 12 x 3.5" and 25 x 2.5" drive EXP configurations.

A.3 RAS Features

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

For details about how to configure RAS features, see **Huawei Server Purley Platform BIOS Parameter Reference**.

Table A-3 RAS features

Module	Feature	Description
CPU	Corrected Machine Check Interrupt	Corrects error-triggered interruption.
DIMM	Failed DIMM Isolation	Identifies a faulty DIMM and isolates it from others before it is replaced.
	Memory Thermal Throttling	Automatically adjusts DIMM temperatures to avoid damage due to overheating.

Module	Feature	Description
	Rank Sparing	Allocates some memory ranks as backup ranks to prevent the system from crashing due to uncorrectable errors.
	Memory Address Parity Protection	Detects memory command and address errors.
	Memory Demand and Patrol Scrubbing	Corrects errors upon detection. If these errors are not corrected promptly, uncorrectable errors may occur.
	Memory Mirroring	Improves system reliability.
	Single Device Data Correction	Provides a single-device multi-bit error correction capability to improve memory reliability.
	Device Tagging	Degrades and rectifies DIMM device faults to improve DIMM availability.
	Data Scrambling	Optimizes data stream distribution and reduces the error possibility to improve the reliability of data streams in the memory and the capability to detect address errors.
PCIe	PCIe Advanced Error Reporting	Improves server serviceability.
UPI	Intel UPI Link Level Retry	Provides a retry mechanism upon errors to improve UPI reliability.
	Intel UPI Protocol Protection via CRC	Provides cyclic redundancy check (CRC) protection for UPI packets to improve system reliability.
System	Core Disable for Fault Resilient Boot (FRB)	Isolates a faulty CPU core during startup to improve system reliability and availability.
	Corrupt Data Containment Mode	Identifies the memory storage unit that contains corrupted data to minimize the impact on the running programs and improve system reliability.
	Socket disable for Fault Resilient Boot (FRB)	Isolates a faulty socket during the BIOS startup process to improve system reliability.

Module	Feature	Description
	Architected Error Records	With the enhanced machine check architecture (eMCA) feature, the BIOS collects error information from hardware registers in compliance with UEFI specifications, sends the error information to the OS over the APEI of the Advanced Configuration and Power Interface (ACPI), and locates the error unit, improving system availability.
	Error Injection Support	Injects errors to verify various RAS features.
	Machine Check Architecture	Provides software recovery for uncorrectable errors to improve system availability.
	eMCA: Gen2	Improves system availability.
	OOB access to MCA registers	The OBB system accesses MCA registers by using the Platform Environment Control Interface (PECI). If a fatal error occurs in the system, the out-of-band system collects onsite data to facilitate fault analysis and locating and improve system serviceability.
	BIOS Abstraction Layer for Error Handling	The BIOS processes errors and reports the error information to the OS and the server in compliance with specifications to improve system serviceability.
	BIOS-based Predictive Failure Analysis (PFA)	The BIOS provides physical unit information for DIMM errors, and the OS traces and predicts errors, and isolates error memory pages.

A.4 Sensor List

Sensor	Description	Component
Inlet Temp	Air inlet temperature	Left mounting ear
Outlet Temp	Air outlet temperature	Mainboard
PCH Temp	PCH bridge temperature	Mainboard

Sensor	Description	Component
CPU*N* Core Rem	CPU core temperature	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* DTS	CPU DTS value	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* Margin	CPU Margin	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* VDDQ Temp	CPU VDDQ temperature	Mainboard *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* VRD Temp	CPU VRD temperature	Mainboard *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* MEM Temp	CPU DIMM temperature	DIMMs of CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
OCP*N* Temp	OCP 2.0 mezzanine card chip temperature	Chip of OCP*N* *N* indicates the slot number of the OCP 2.0 mezzanine card. The value is **1** or **2**.
OCP*N* OP Temp	OCP 2.0 mezzanine card optical module temperature	Optical module of OCP*N* *N* indicates the slot number of the OCP 2.0 mezzanine card. The value is **1** or **2**.
SYS 3.3V	Mainboard 3.3 V voltage	Mainboard
SYS 5V	Mainboard 5.0 V voltage	Mainboard
SYS 12V_1	Mainboard 12.0 V voltage	Mainboard
SYS 12V_2	Mainboard 12.0 V voltage	Mainboard

Sensor	Description	Component
CPU*N* VCore	1.8 V CPU voltage	Mainboard *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* DDR VDDQ	1.2 V DIMM voltage	Mainboard *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* DDR VDDQ2	1.2 V DIMM voltage	Mainboard *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* VSA	CPU VSA voltage	Mainboard *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* VCCIO	CPU VCCIO voltage	Mainboard *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* VMCP	CPU VMCP voltage	Mainboard *N* indicates the CPU number. The value is **1** or **2**.
FAN*N* Speed	Fan speed	Fan module*N* *N* indicates the fan module number. The value ranges from **1** to **4**.
Power	Server input power	PSU
PS*N* VIN	Input voltage of PSU*N*	PSU*N* *N* indicates the PSU number. The value is **1** or **2**.
Disks Temp	Maximum temperature of SAS/SATA drives	SAS/SATA drives
Power*N*	PSU input power	PSU*N* *N* indicates the PSU number. The value is **1** or **2**.

Sensor	Description	Component
PCH Status	PCH chip fault diagnosis health status	Mainboard
CPU*N* UPI Link	CPU UPI link fault diagnosis health status	Mainboard or CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* Prochot	CPU Prochot	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* Status	CPU status	CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
CPU*N* Memory	CPU memory status	DIMMs of CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
FAN*N* Status	Fan status	Fan module*N* *N* indicates the fan module number. The value ranges from **1** to **4**.
DIMM*N*	DIMM status	DIMM*N* *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
PCIE Status	PCIe status	PCIe cards
Power Button	Power button pressed state	Mainboard and power button
Watchdog2	Watchdog	Mainboard
Mngmnt Health	Management subsystem health status	Management modules
UID Button	UID button status	Mainboard
PwrOk Sig. Drop	Voltage dip status	Mainboard
PwrOn TimeOut	Power-on timeout	Mainboard

Sensor	Description	Component
PwrCap Status	Power capping status	Mainboard
HDD Backplane	Entity presence	Drive backplane
HDD BP Status	Drive backplane health status	Drive backplane
Riser*N* Card	Entity presence	Riser card*N* *N* indicates the riser card slot number. The value ranges from **1** to **3**.
SAS Cable	Entity presence	SAS cable on the mainboard
FAN*N* R Presence	Fan presence	Fan module*N* *N* indicates the fan module number. The value ranges from **1** to **4**.
RAID Presence	RAID controller card presence	RAID controller card
LCD Status	LCD health status	LCD
LCD Presence	LCD presence	LCD
PS Redundancy	Redundancy failure due to PSU removal	PSU
PS*N* Status	PSU status	PSU*N* *N* indicates the PSU number. The value is **1** or **2**.
PS*N* Fan Status	PSU fan status	PSU*N* *N* indicates the PSU number. The value is **1** or **2**.
PS*N* Temp Status	PSU presence	PSU*N* *N* indicates the PSU number. The value is **1** or **2**.
DISK*N*	Drive status	Drive*N* *N* indicates the drive slot number. The value ranges from **0** to **24** or from **36** to **47**.
LOM P1 Link Down	LOM	LOM

Sensor	Description	Component
LOM P2 Link Down	LOM	LOM
LOM P3 Link Down	LOM	LOM
LOM P4 Link Down	LOM	LOM
PCIe RAID$ Temp	PCIe RAID controller card temperature	PCIe RAID controller card
RAID Temp	RAID controller card temperature	RAID controller card
RAID Status	RAID controller card health status	RAID controller card
RAID PCIE ERR	RAID controller card fault diagnosis health status	RAID controller card
IB$ TEMP	IB adapter temperature	IB adapter
PCIe$ OP Temp	PCIe card optical module temperature	PCIe cards
PCIe NIC$ Temp	PCIe card chip temperature	PCIe cards
PCIe FC$ Temp	PCIe card chip temperature	PCIe cards
RAID Card BBU	RAID controller card BBU	BBU supercapacitor of RAID controller card
SM380 Temp	25GE NIC chip temperature	PCIe cards
PCIe$ NIC Temp	PCIe card chip temperature	PCIe cards
PS$ Inlet Temp	PSU air inlet temperature	PSU
CPU*N* AEP Temp	CPU DCPMM temperature	DCPMMs of CPU*N* *N* indicates the CPU number. The value is **1** or **2**.
FPGA# Temp	FPGA card temperature	PCIe cards
FPGA# EnvTemp	FPGA card operating temperature	PCIe cards
FPGA# DDR Temp	FPGA card memory temperature	PCIe cards
FPGA# Power	FPGA card power	PCIe cards

Sensor	Description	Component
FPGA# OP Temp	FPGA card optical module temperature	PCIe cards

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 upper-level management system, so that the management system can manage the objects.

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 10M and 100M 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 keyboard, video 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. A PCI system can be transformed to a PCIe one by modifying the physical layer instead of software. PCIe delivers a faster speed and can replace almost all AGP and PCI buses.

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.
system event log (SEL)	A non-volatile area and interfaces used to store system events for later 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 or chassis. 1 U = 44.45 mm
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

CD	calendar day
CE	Conformite Europeenne
CIM	Common Information Model
CLI	command-line interface

D

DC	direct current
DDR3	double date rate 3
DDR4	double date 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
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

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

Q

QPI	Quick Path Interconnect

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

UDIMM	unbuffered dual in-line memory module
UEFI	Unified Extensible Firmware Interface
UID	unit identification light
UL	Underwriter Laboratories Inc.
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

W

WEEE	waste electrical and electronic equipment
WSMAN	Web Service Management

