White Paper for K24V2 Series Servers

Powered by AMD Processors

For K24-E2-A0-R0-01

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Applicable Model

Server Model	Node Model	Maintenance	Cooling
K24-E2-A0-R0-01	KM1160-E2-A0-R0-00	Rear access	Air cooling

Technical Support

Global Service Hotline:	(+1) 844-912-0007
Address:	1501 McCarthy Blvd, Milpitas, CA 95035 AIVRES SYSTEMS INC.
Website:	https://aivres.com
Email:	serversupport@aivres.com

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Preface

Abstract

This document describes the K24V2 AMD-based server's appearance, features, performance parameters, and software and hardware compatibility, providing in-depth information of the server.

Intended Audience

This document is intended for pre-sales engineers.

Symbol Conventions

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

Symbol	Description
DANGER	A potential for serious injury, or even death if not properly handled
WARNING	A potential for minor or moderate injury if not properly handled
CAUTION	A potential loss of data or damage to equipment if not properly handled
IMPORTANT	Operations or information that requires special attention to ensure successful installation or configuration
NOTE	Supplementary description of document information

Revision History

Version	Date	Description of Changes
V1.0	2025/04/25	Initial release

Table of Contents

1 Product Overview

The K24V2 AMD-based system is a high-density multi-node server that is powered by the AMD EPYC 9004 series processors (Genoa/Bergamo). The server offers excellent performance, outstanding reliability, and intelligent power and fan control capabilities within a standard 2U chassis. It features flexible storage configurations, saving rack space while reducing energy consumption and deployment costs. Designed for virtualization and other compute-intensive application scenarios, the server provides flexible solutions for various scenarios of the distributed or hyper-converged infrastructure, including cloud resource pools and big data analytics.

Figure 1-1 K24-E2-A0-R0-01 (No Drive Configuration)

Figure 1-2 K24-E2-A0-R0-01 (24 × 2.5-Inch Drive Configuration)

2 Features

2.1 Scalability and Performance

Table 2-1 Scalability and Performance

Technical Feature	Description
AMD EPYC 9004 Series Processors	• One processor supports up to 128 cores, a max. boost frequency of 4.4 GHz (for 16-core processors), an L3 cache of up to 384 MB, and a TDP of up to 360 W. - One processor supports 12 memory channels and 128 PCIe 5.0 lanes, with CXL 1.1+ technology supported. - A node supports 1 processor with up to 128 cores and 256 threads, maximizing the concurrent execution of multi-threaded applications. - Supports AMD Turbo Core Technology that automatically scales CPU speeds up to the max. boost frequency at peak workloads, allowing processor cores to exceed the maximum thermal design power (TDP) for a limited time. - Supports AMD Simultaneous Multithreading Technology (SMT) that allows up to 2 threads to run on each core to improve the performance of multi-threaded applications. - Supports AMD Virtualization (AMD-V) technology that integrates hardware-level virtualization features, allowing the operating system to better utilize the hardware for virtualization workloads.
DIMM Form Factor	A node supports up to 12 DDR5 ECC DIMMs (4,800 MT/s or 5,600 MT/s, RDIMMs), delivering high availability and a memory capacity of up to 1.5 TB. Note: For DIMMs with a rated speed of 5,600 MT/s, the actual operating speed will be degraded to 4,800 MT/s due to memory speed limitation of AMD EPYC 9004 series processors.
Flexible Drive Configurations	Provides elastic and expandable storage solutions to meet different capacity and upgrade requirements.

Technical Feature	Description
Support for All-SSD Configuration	Delivers all-SSD configurations, bringing higher I/O performance over all-HDD or HDD-SSD mixing configurations.
24 Gbps Serial Attached SCSI (SAS)	Quadruples the internal storage data transfer rate of the 6 Gbps SAS solution, maximizing the performance of storage I/O-intensive applications.
AMD Integrated I/O Technology	The processors integrate the PCIe 5.0 controllers to significantly reduce I/O latency and enhance overall system performance. The server supports CXL 1.1+ technology that is based on the PCIe 5.0 physical-layer infrastructure, enabling resource sharing between different PCIe devices.
PCIe 5.0 Expansion	• When equipped with dual-slot PCIe riser cards, the server supports up to 8 HHHL PCIe 5.0 x16 expansion cards (up to 2 cards per node). • When equipped with single-slot PCIe riser cards, the server supports up to 4 HHHL PCIe 5.0 x16 expansion cards (up to 1 card per node).
OCP Expansion	Supports 4 PCIe 5.0 x16 OCP slots that can flexibly support 10/25/100/200 Gb hot-plug OCP 3.0 cards (1 card per node). Note: The hot-plug feature of OCP 3.0 cards has been validated on Red Hat Enterprise Linux 9.0, but support on other operating systems is not guaranteed.

2.2 Availability and Serviceability

Table 2-2 Availability and Serviceability

Technical Feature	Description
Hot-Swap SATA/SAS/NVMe Drives	RAID cards support RAID levels 0/1/10/5/50/6, and provides RAID cache, with data protection enabled by the super-capacitor in case of power failures.
Reliability	• SSDs are much more reliable than traditional HDDs, increasing system uptime. • The BMC monitors system parameters in real time and sends alerts in advance, enabling technicians to take

Technical Feature	Description
	appropriate measures in time to ensure stable operation and minimize system downtime.
Availability	• The LEDs on the front and rear panels and the BMC Web GUI indicate the status of key components and quickly lead technicians to failed (or failing) components, simplifying maintenance and speeding up troubleshooting. • Each node supports 1 hot-swap PSU, and the server supports 4 PSUs in 2+2 redundancy. • The server supports up to 6 fan modules with N+1 rotor redundancy, improving overall system availability.
Maintenance Efficiency	• The BMC management network port on the rear panel enables remote BMC O&M, improving O&M efficiency. • The nodes are hot-swappable, simplifying O&M. • The online memory diagnosis function helps service personnel quickly locate the DIMM to be serviced.

2.3 Manageability and Security

Table 2-3 Manageability and Security

Technical Feature	Description
Remote Management	The BMC monitors the system operating status and enables remote management.
Network Controller Sideband Interface (NC-SI) Feature	Allows a network port to serve as a management port and a service port. The NC-SI feature is disabled by default and can be enabled/disabled through the BIOS or BMC. Note: The service port with NC-SI enabled supports: • Being bonded to the network port of the OCP 3.0 card. • Enablement/Disablement and configuration of Virtual Local Area Network (VLAN). VLAN is disabled by default. • Both IPv6 and IPv4 addresses. The prefix length of IPv6 subnet mask or subnet mask of IPv4, IP addresses, and default gateways can be configured.
Unified Extensible Firmware Interface (UEFI)	The industry-standard UEFI improves the efficiency of setup, configuration and update, and simplifies the error handling process.

Technical Feature	Description
TPM & TCM	Trusted Platform Module (TPM) 2.0 and Trusted Cryptography Module (TCM) provide advanced encryption.
Firmware Update Mechanism	The firmware update mechanism based on digital signatures prevents unauthorized firmware updates.
UEFI Secure Boot	Protects the system from malicious bootloaders.
Hierarchical Password Protection in BIOS	Ensures system boot and management security.
BIOS Secure Flash and BIOS Lock Enable (BLE)	Reduce attacks from malicious software on the BIOS flash region.
Dual-Image Mechanism for BMC	Recovers firmware upon detection of corrupted firmware.
BMC Secure Boot	Protects BMC from malicious tampering.
BMC Management Security	Supports flexible BMC access control policies and double factor authentication.
System Secure Erase Function	The optional system secure erase function can wipe data on the storage devices with one click.
Intelligent Management Software KSManage	Allows centralized management of the server and full lifecycle management covering unified part-level asset management, intelligent monitoring and alerting, automatic inspection, fault diagnosis and reporting, energy consumption management, and firmware update/configuration.
KSManage Boot	Enables rapid server initialization and supports batch RAID configuration and OS deployment.
Intelligent Management System BMC	Provides various security features such as identification and authentication, authorization and access control, Web security configuration, and log audit, offering industry-leading security reinforcement capabilities.

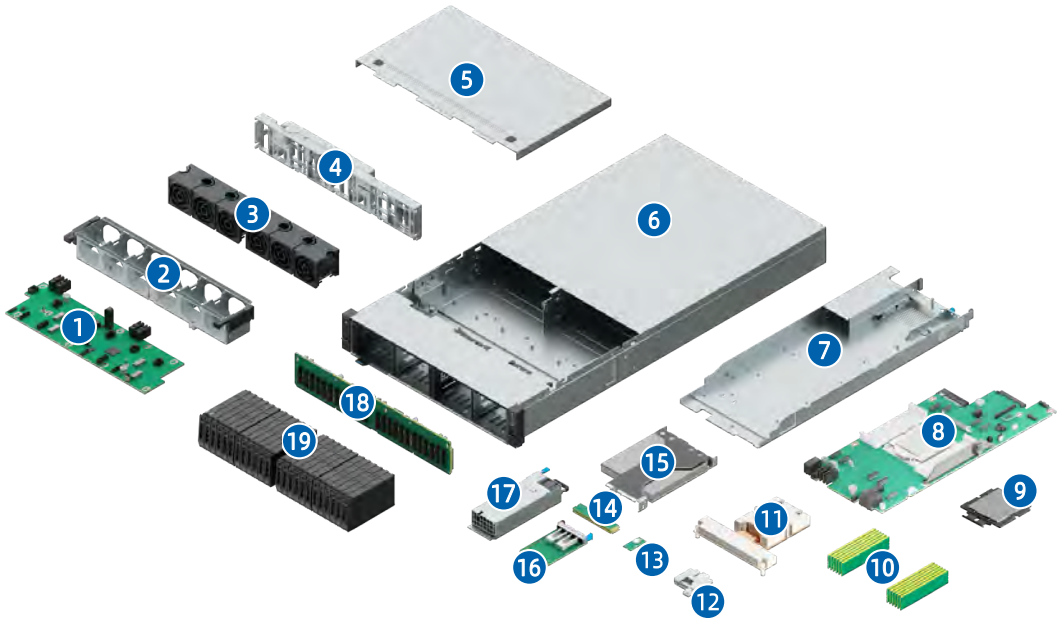
2.4 Energy Efficiency

Table 2-4 Energy Efficiency

Technical Feature	Description
80 Plus Platinum/Titanium PSUs	Equipped with 80 Plus Platinum/Titanium PSUs of different power efficiency levels, with a power efficiency of up to 94% (Platinum) or 96% (Titanium) at a load of 50%.
2+2 Redundant PSUs	Supports AC/DC power input with improved power conversion efficiency.
VRD Solution	Features the high-efficiency single-board voltage regulator-down (VRD) solution, reducing DC-DC conversion loss.
Intelligent Fan Speed Control and CPU Frequency Scaling	Supports Proportional-Integral-Derivative (PID) intelligent fan speed control and intelligent CPU frequency scaling, conserving energy.
System Cooling Design	Offers a fully-optimized system cooling design with energy-efficient cooling fans, lowering energy consumption from system cooling.
Power Capping and Power Control	Provides power capping and power control measures.

3 System Parts Breakdown

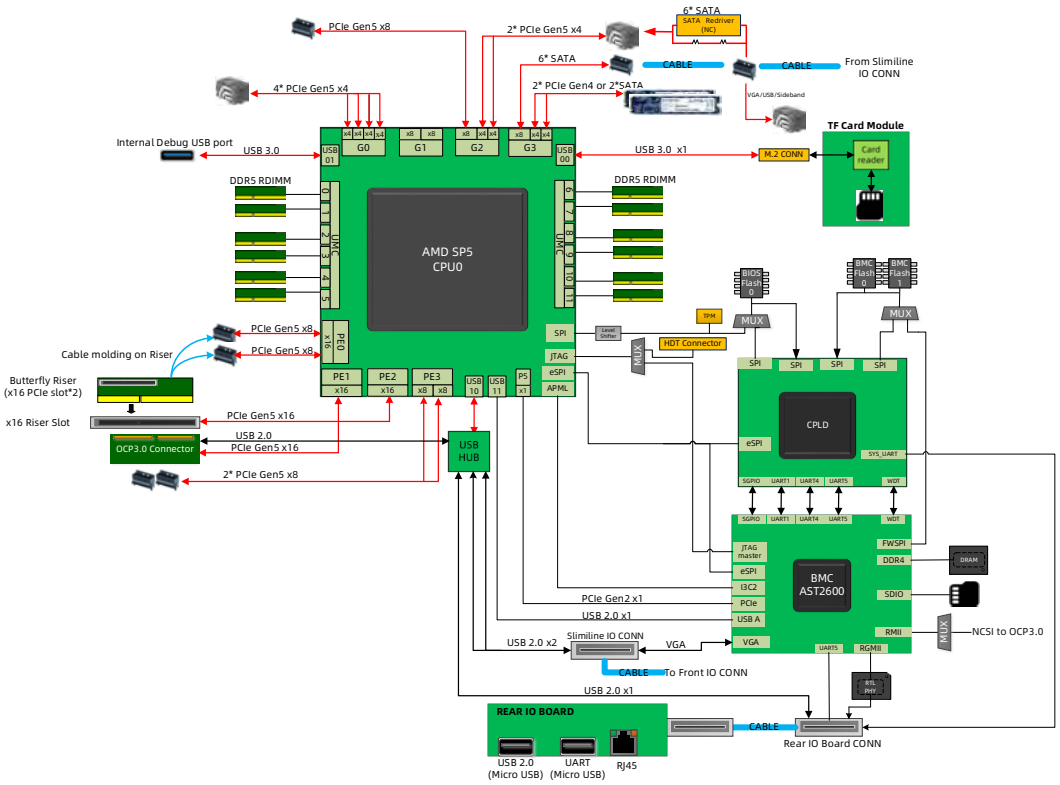
Figure 3-1 Exploded View



Item	Feature	Item	Feature
1	Midplane	2	Fan Cage
3	6056 Fan Module × 6	4	Middle Wall
5	Top Cover	6	Server Chassis
7	Node Chassis	8	Motherboard
9	CPU	10	DIMM × 12
11	Heatsink	12	I/O Module
13	TF Card Module	14	M.2 SSD × 2
15	PCIe Riser Module	16	OCP 3.0 Card
17	PSU	18	Drive Backplane
19	Drive Module × 24	-	-

4 System Logical Diagram

Figure 4-1 System Logical Diagram



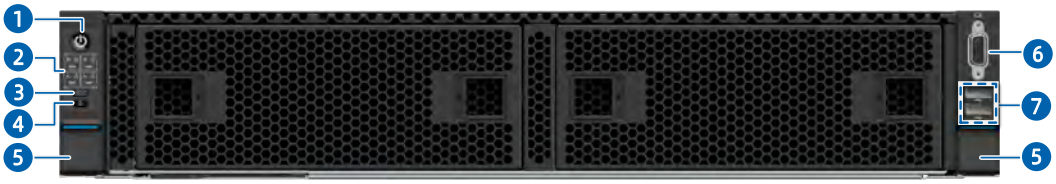
- A node supports 1 AMD EPYC 9004 series processor.
- A node supports up to 12 DDR5 RDIMMs.
- A node supports up to 2 PCIe 5.0 x16 slots and 1 OCP 3.0 card.
- The RAID cards are connected to CPUs via the PCIe bus, and connected to the drive backplanes via high-density cables. Multiple local storage configurations are supported through different drive backplanes.
- A motherboard supports 2 USB 2.0 ports, 2 PCIe x4/SATA M.2 SSDs, 1 system TF adapter, and 1 BMC TF card slot.
- A motherboard integrates an AST2600 management chip and supports 1 VGA port, 1 BMC management network port, 1 system debug/BMC management serial port, and other connectors.

5 Hardware Description

5.1 Front Panel

5.1.1 No Drive Configuration

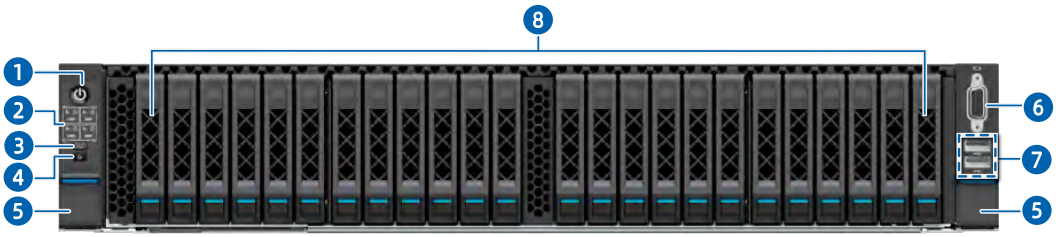
Figure 5-1 Front View



Item	Feature	Item	Feature
1	Power Button and LED	2	Node LEDs
3	Node Switch Button	4	UID/BMC RST Button
5	Ear Latch × 2	6	VGA Port
7	USB 2.0 Port × 2	-	-

5.1.2 24 × 2.5-Inch Drive Configuration

Figure 5-2 Front View



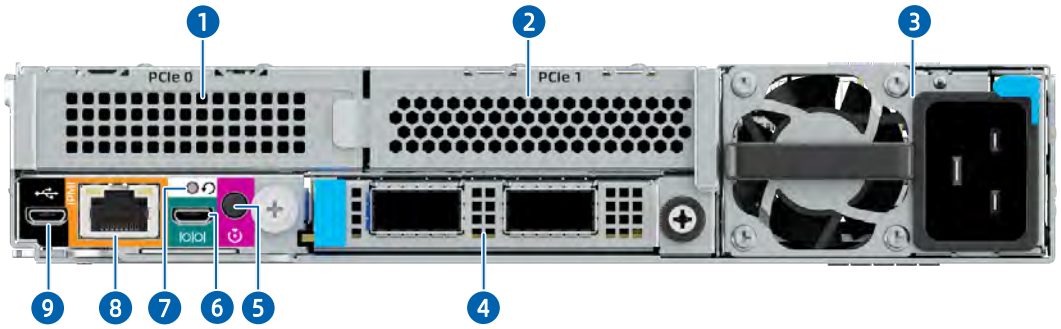
Item	Feature	Item	Feature
1	Power Button and LED	2	Node LEDs
3	Node Switch Button	4	UID/BMC RST Button
5	Ear Latch × 2	6	VGA Port
7	USB 2.0 Port × 2	8	Drive Bay × 24

5.2 Rear Panel

Figure 5-3 Rear View of the Server

Item	Feature	Item	Feature
1	Node 2	2	Node 0
3	Node 1	4	Node 3

Figure 5-4 Rear View of a Node

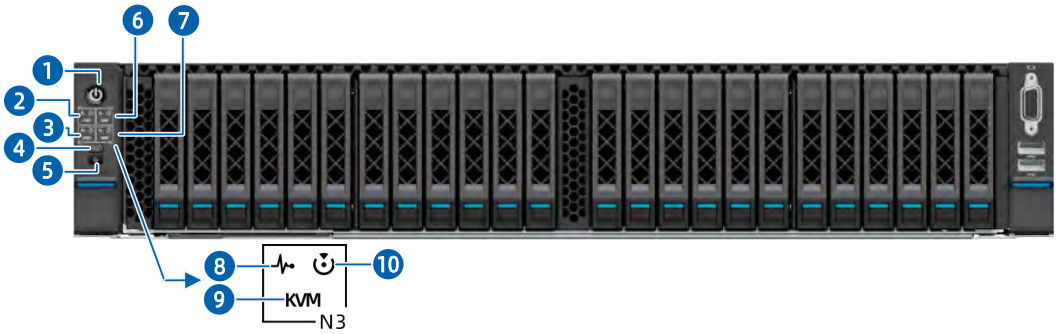


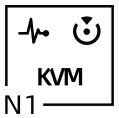
Item	Feature	Item	Feature
1	PCIe Slot 0	2	PCIe Slot 1
3	PSU	4	OCP 3.0 Card
5	UID/BMC RST Button and LED	6	System Debug/BMC Management Serial Port
7	System Reset Button	8	BMC Management Network Port
9	Micro USB 2.0 Port	-	-

5.3 LEDs and Buttons

5.3.1 Front Panel LEDs and Buttons

Figure 5-5 Front Panel LED and Button Locations



Item	Icon	Feature	Description
1		Power Button and LED	• Power button: - Press and release the button to power on the system from the standby state. - Press and hold the button for 4 seconds to force a shutdown from the power-on state. • Power LED: - Off = No power - Solid green = Power-on state - Solid orange = Standby state
2		Node 0 LEDs	Include node 0 health LED, node 0 UID LED, and node 0 selected LED.
3		Node 1 LEDs	Include node 1 health LED, node 1 UID LED, and node 1 selected LED.
4		Node Switch Button	Press and release the button to switch the nodes. The USB and VGA ports on the front panel serve as output ports for the selected node.
5		UID/BMC RST Button	• Press and release the button to turn on or off the UID LED. • Press and hold the button for 6 seconds to force a BMC reset.

Item	Icon	Feature	Description
6	N2 KVM	Node 2 LEDs	Include node 2 health LED, node 2 UID LED, and node 2 selected LED.
7	KVM N3	Node 3 LEDs	Include node 3 health LED, node 3 UID LED, and node 3 selected LED.
8		Node Health LED	• Off = Normal • Blinking red (1 Hz) = A warning error occurs • Solid red = A critical error occurs
9	KVM	Node Selected LED	• Off = The current node is not selected • Solid white = The current node is selected
10		Node UID LED	Solid blue = The UID LED is activated by the UID button or via the BMC

NOTE

- Warning error: Errors that result in redundancy degradation or loss, and other errors that have a minor impact on the system running and that require attention.
- Critical error: Errors that result in system crash/restart or part failure, and other errors that have a major impact on the system running and that require immediate action.

5.3.2 Rear Panel LEDs and Buttons

Figure 5-6 Rear Panel LED and Button Locations

Item	Icon	Feature	Description
1		System Reset Button	Press the button to reset the node OS.
2		UID/BMC RST Button and LED	• Node UID/BMC RST button: - Press and release the button to turn on or off the UID LED. - Press and hold the button for 6 seconds to force a BMC reset. • Node UID LED: - Blinking blue = KVM is enabled or firmware is being updated - Solid blue = The UID LED is activated by the UID button or via the BMC

5.4 Port Description

5.4.1 Front Panel Port Description

Figure 5-7 Front Panel Port Locations

Item	Port	Description
1	VGA Port	Enables you to connect a display terminal (for example, the monitor or KVM) to the system.
2	USB 2.0 Port × 2	Enables you to connect a USB 2.0 device to the system. Note: Make sure that the USB device is in good condition, or it may cause the server to work abnormally.

5.4.2 Rear Panel Port Description

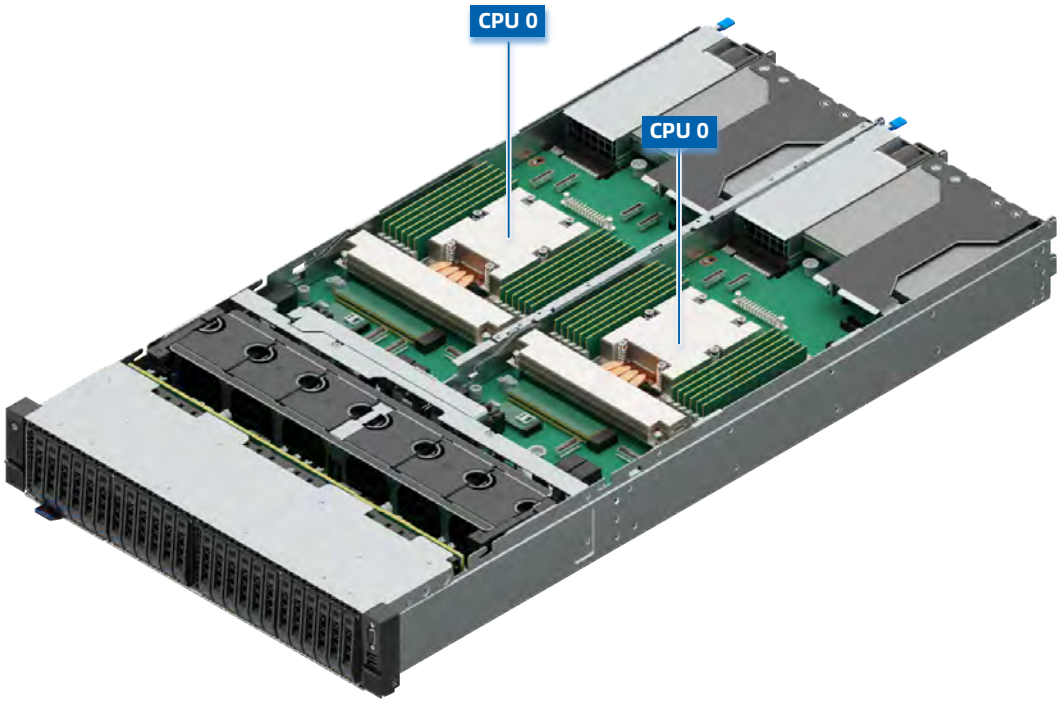
Figure 5-8 Rear Panel Port Locations

Item	Port	Description
1	Micro USB 2.0 Port	Enables you to transfer data.
2	BMC Management Network Port	Enables you to manage the server. Note: It is a Gigabit Ethernet port that supports 100 Mbps and 1,000 Mbps auto-negotiation.
3	System Debug/BMC Management Serial Port	Enables you to debug and monitor the system/BMC.

5.5 Processors

- A node supports 1 AMD EPYC 9004 series processor.
- The processors used in a server must bear the same part number (P/N code).
- For specific processor options, consult your local sales representative or refer to 7.2 Hardware Compatibility.

Figure 5-9 Processor Locations

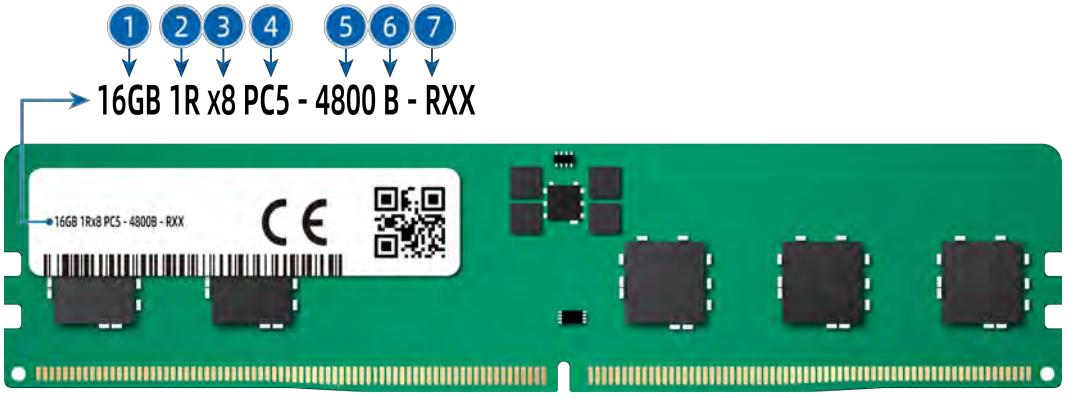


5.6 DDR5 DIMMs

5.6.1 Identification

To determine DIMM characteristics, refer to the label attached to the DIMM and the following figure and table.

Figure 5-10 DIMM Identification



Item	Description	Example
1	Capacity	• 16 GB • 32 GB • 64 GB

Item	Description	Example
		• 128 GB • 256 GB
2	Rank(s)	• 1R = Single rank • 2R = Dual rank • 2S2R = Two ranks of two high stacked 3DS DRAM • 2S4R = Four ranks of two high stacked 3DS DRAM • 4R = Quad rank
3	Data width of DRAM	• x4 = 4 bits • x8 = 8 bits
4	DIMM slot type	PC5 = DDR5
5	Maximum memory speed	• 4,800 MT/s • 5,600 MT/s
6	CAS latency	• SDP 4800B = 40-39-39 • 3DS 4800B = 46-39-39 • SDP 5600B = 46-45-45 • 3DS 5600B = 52-45-45
7	DIMM type	R = RDIMM

5.6.2 Memory Subsystem Architecture

A node supports 12 DIMM slots and 12 memory channels per CPU.

Table 5-1 DIMM Slot List

CPU	Channel ID	Silk Screen
CPU0	Channel A	CPU0_CAD0
	Channel B	CPU0_CBD0
	Channel C	CPU0_CCD0
	Channel D	CPU0_CDD0
	Channel E	CPU0_CED0
	Channel F	CPU0_CFD0
	Channel G	CPU0_CGD0

CPU	Channel ID	Silk Screen
	Channel H	CPU0_CHD0
	Channel I	CPU0_CID0
	Channel J	CPU0_CJD0
	Channel K	CPU0_CKD0
	Channel L	CPU0_CLD0

5.6.3 Compatibility

Refer to the following rules to select the DDR5 DIMMs.

IMPORTANT

- A server must use DDR5 DIMMs with the same part number (P/N code). All DDR5 DIMMs operate at the same speed, which is the lowest of:
  - Memory speed supported by a specific CPU.
  - Maximum operating speed of a specific memory configuration.
- Mixing DDR5 DIMMs of different specifications (capacity, bit width, rank, height, etc.) is not supported.
- For specific memory options, consult your local sales representative or refer to 7.2 Hardware Compatibility.

- DDR5 DIMMs can be used with the AMD EPYC 9004 series processors. The maximum memory capacity supported is identical for different CPU models.
- The total memory capacity is the sum of all DDR5 DIMM capacities.
- The total memory capacity should not exceed the maximum value supported by the CPU.
- The maximum number of DIMMs supported varies with the CPU type, DIMM type and rank quantity.

NOTE

Maximum number of DIMMs supported per channel ≤ Maximum number of ranks supported per channel ÷ Number of ranks per DIMM.

Table 5-2 DDR5 DIMM (4,800 MT/s) Specifications

Item	Value				
Capacity per DDR5 DIMM (GB)	16	32	64	96	128
Type	RDIMM	RDIMM	RDIMM	RDIMM	RDIMM
Rated speed (MT/s)	4,800	4,800	4,800	4,800	4,800
Operating voltage (V)	1.1	1.1	1.1	1.1	1.1
Maximum number of DDR5 DIMMs supported in a server[1]	48	48	48	48	48
Maximum capacity of DDR5 DIMMs supported in a server (GB)[2]	768	1,536	3,072	4,608	6,144
Actual speed (MT/s)	4,800	4,800	4,800	4,800	4,800
Notes: 1. The maximum number of DDR5 DIMMs supported is based on the quad-node configuration. 2: It indicates the maximum memory capacity supported when all the DIMM slots are populated with DDR5 DIMMs. The information above is for reference only. Consult your local sales representative for details.					

Table 5-3 DDR5 DIMM (5,600 MT/s) Specifications

Item	Value				
Capacity per DDR5 DIMM (GB)	16	32	64	96	128
Type	RDIMM	RDIMM	RDIMM	RDIMM	RDIMM
Rated speed (MT/s)	5,600	5,600	5,600	5,600	5,600
Operating voltage (V)	1.1	1.1	1.1	1.1	1.1
Maximum number of DDR5 DIMMs supported in a server[1]	48	48	48	48	48
Maximum capacity of DDR5 DIMMs supported in a server (GB)[2]	768	1,536	3,072	4,608	6,144
Actual speed (MT/s)	4,800	4,800	4,800	4,800	4,800
Notes: 1. The maximum number of DDR5 DIMMs supported is based on the quad-node configuration. 2: It indicates the maximum memory capacity supported when all the DIMM slots are populated with DDR5 DIMMs. The information above is for reference only. Consult your local sales representative for details.					

5.6.4 Population Rule

General population rule for DDR5 DIMMs:

- Install DIMMs only when the corresponding processor is installed.

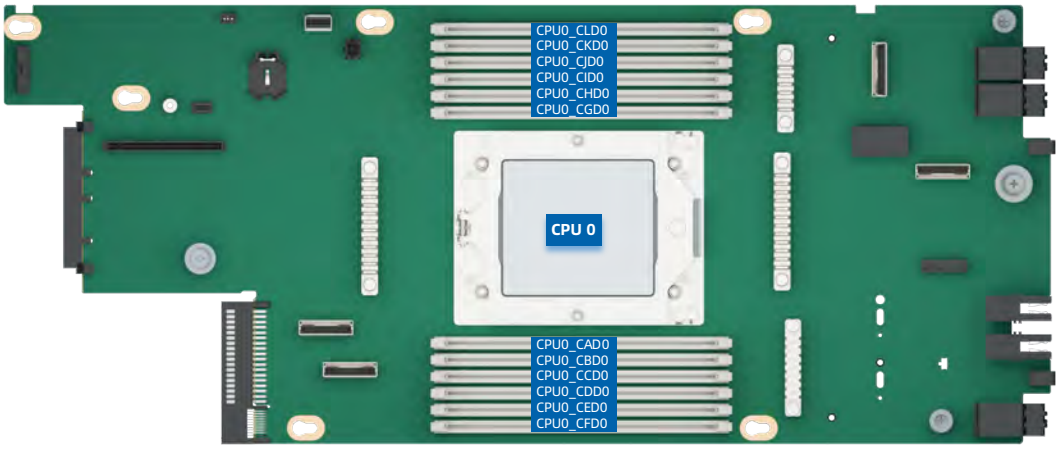
5.6.5 DIMM Slot Layout

Up to 48 DDR5 DIMMs can be installed in a server, and a balanced DIMM configuration is recommended for optimal memory performance. DIMM configuration must be compliant with the DIMM population rules.

IMPORTANT

At least 1 DDR5 DIMM should be installed on the corresponding memory channel of CPU0.

Figure 5-11 DIMM Slot Layout



DDR5 DIMM population rules:

Table 5-4 DDR5 DIMM Population Rules

DDR	CPU0											
QTY	CAD0	CBD0	CCD0	CDD0	CED0	CFD0	CGD0	CHD0	CID0	CJD0	CKD0	CLD0
1	●											
2	●						●					
4	●		●				●		●			
6	●	●	●				●	●	●			
8	●	●	●		●		●	●	●		●	
10	●	●	●	●	●		●	●	●	●	●	
12	●	●	●	●	●	●	●	●	●	●	●	●

5.7 Storage

CAUTION

Mixing of storage controllers may result in drive letter drift under the OS.

5.7.1 Drive Configuration

NOTE

For the physical drive No. of the configuration, refer to 5.7.2 Drive Numbering.

Table 5-5 Drive Configuration

Configuration	Front Drives	Internal Drives	Drive Management Mode
24 × 2.5-Inch SAS/SATA/NVMe Drive Configuration	24 × 2.5-inch drive (drive bays with physical drive No. 0 to 5 support SAS/SATA/NVMe drives)	2 × SATA/ PCIe M.2 SSD	• SATA SSD: PCIe RAID card/CPU • SAS SSD: PCIe RAID card • NVMe SSD: CPU • M.2 SSD: CPU

5.7.2 Drive Numbering

Figure 5-12 Drive Numbering (24 × 2.5-Inch Drive Configuration)

Configuration	Physical Drive No.	Drive No. Identified by the BMC	Front/Rear	Drive Number Identified by the 8i RAID Card
24 × SAS/SATA	0 to 5	0 to 5	Front	0 to 5
24 × NVMe	0 to 5	0 to 5	Front	-

5.7.3 Drive LEDs

1. SAS/SATA Drive LEDs

Figure 5-13 SAS/SATA Drive LEDs

<table>
<tr><th colspan="2">Activity LED (①)</th><th colspan="3">Locator/Error LED (②)</th><th rowspan="2">Description</th></tr>
<tr><th>Green</th><th colspan="2">Blue</th><th colspan="2">Red</th></tr>
<tr><td rowspan="2">Off</td><td rowspan="2">Off</td><td>RAID created</td><td>RAID not created</td><td rowspan="2">Drive absent</td></tr>
<tr><td>Solid on</td><td>Off</td></tr>
<tr><td>Solid on</td><td>Off</td><td colspan="2">Off</td><td>Drive present but not in use</td></tr>
<tr><td>Blinking (4 Hz)</td><td>Off</td><td colspan="2">Off</td><td>Drive present and in use</td></tr>
<tr><td>Blinking (4 Hz)</td><td colspan="3">Solid pink</td><td>Copyback/Rebuild in progress</td></tr>
<tr><td>Solid on</td><td>Solid on</td><td colspan="2">Off</td><td>Drive selected but not in use</td></tr>
<tr><td>Blinking (4 Hz)</td><td>Solid on</td><td colspan="2">Off</td><td>Drive selected and in use</td></tr>
<tr><td>Off</td><td>Solid on</td><td colspan="2">Off</td><td>Drive is selected but fails</td></tr>
<tr><td>Any status</td><td>Off</td><td colspan="2">Solid on</td><td>Drive fails</td></tr>
</table>

2. NVMe Drive LEDs

Figure 5-14 NVMe Drive LEDs

Activity LED (①)	Locator/Error LED (②)		Description
Green	Blue	Red	
Off	Off	Off	Drive absent
Solid on	Off	Off	Drive present but not in use
Blinking (4 Hz)	Off	Off	Drive present and in use
Blinking (4 Hz)	Solid pink		Copyback/Rebuild/Initializing/ Verifying in progress
Solid on	Solid on	Off	Drive selected but not in use
Blinking (4 Hz)	Solid on	Off	Drive selected and in use
Off	Solid on	Off	Drive is selected but fails
Any status	Off	Solid on	Drive fails

5.7.4 RAID Cards

RAID cards provide functions such as RAID configuration, RAID level migration, and drive roaming.

For specific RAID card options, consult your local sales representative or refer to 7.2 Hardware Compatibility.

5.8 Network

NICs provide network expansion capabilities.

- The OCP slots support OCP 3.0 cards. Users can select the OCP 3.0 cards as needed.
- The PCIe expansion slots support PCIe NICs. Users can select the PCIe cards as needed.
- For specific NIC options, consult your local sales representative or refer to 7.2 Hardware Compatibility.

5.9 I/O Expansion

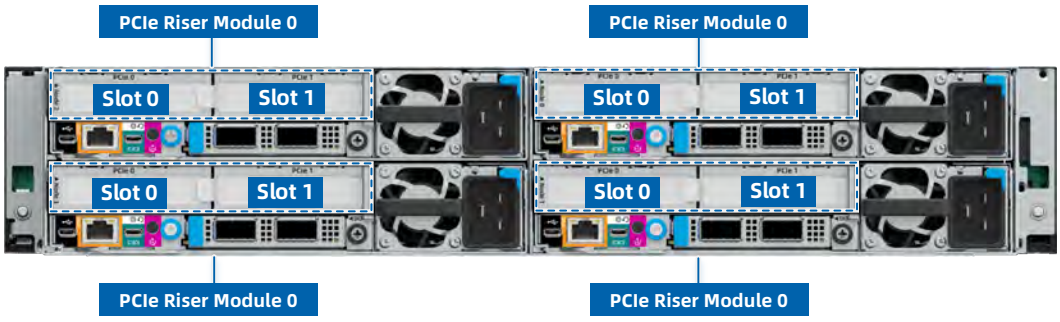
5.9.1 PCIe Expansion Cards

PCIe expansion cards provide system expansion capabilities.

- A node supports up to 2 PCIe 5.0 expansion slots and 1 dedicated slot for the OCP 3.0 card.
- For specific PCIe expansion card options, consult your local sales representative or refer to 7.2 Hardware Compatibility.

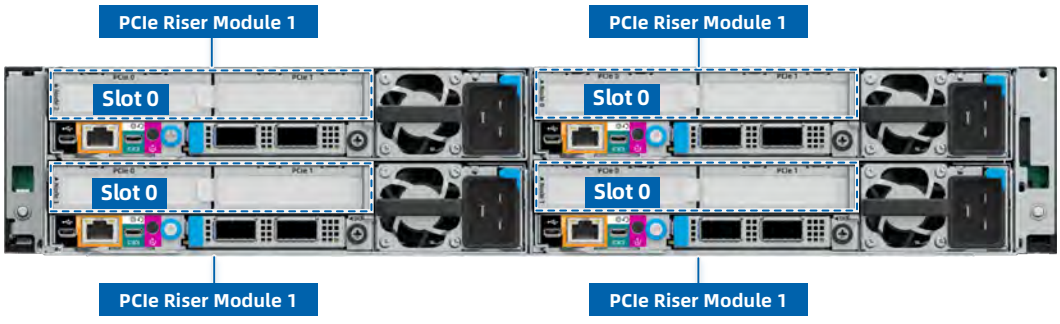
5.9.2 PCIe Slot Locations

Figure 5-15 PCIe Slots - Dual-Slot PCIe Riser Module Configuration



- Slot 0 and slot 1 reside in PCIe riser module 0.

Figure 5-16 PCIe Slots - Single-Slot PCIe Riser Module Configuration

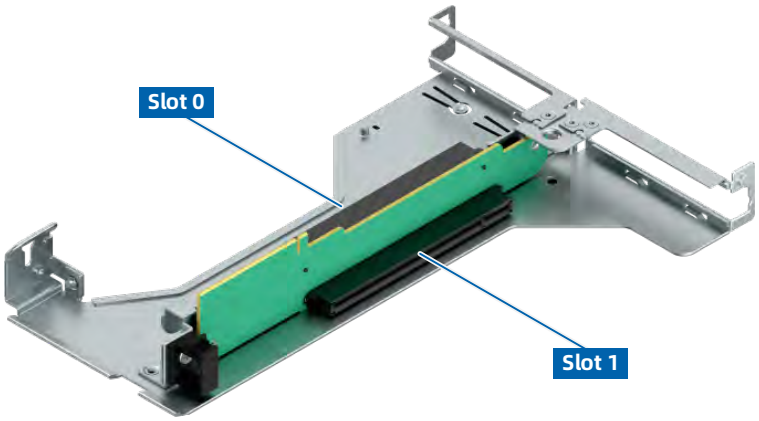


- Slot 0 resides in PCIe riser module 1.

5.9.3 PCIe Riser Modules

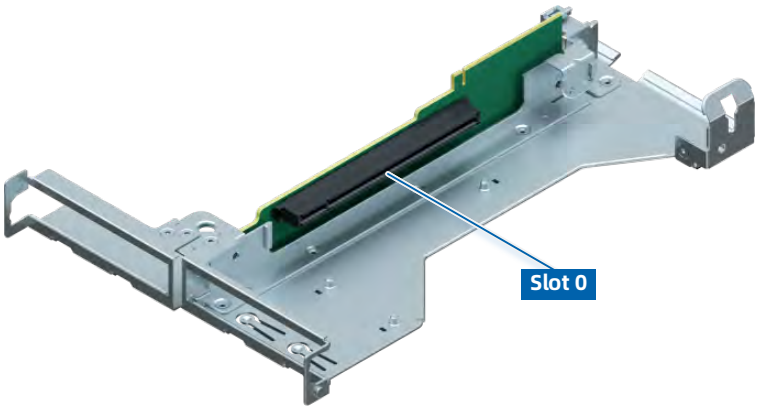
- PCIe Riser Module 0 (2 × PCIe x16 slot): Slot 0 and slot 1

Figure 5-17 PCIe Riser Module 0



- PCIe Riser Module 1 (1 × PCIe x16 slot): Slot 0

Figure 5-18 PCIe Riser Module 1



5.9.4 PCIe Slot Description

NOTE

When a CPU is absent, its corresponding PCIe slots are not available.

Table 5-6 PCIe Slot Description

PCIe Slot	Owner	PCIe Standard	Connector Width	Bus Width	Port No.	Form Factor
Slot 0	CPU0	PCIe 5.0	x16	x16	P0	HHHL
Slot 1	CPU0	PCIe 5.0	x16	x16	P2	HHHL

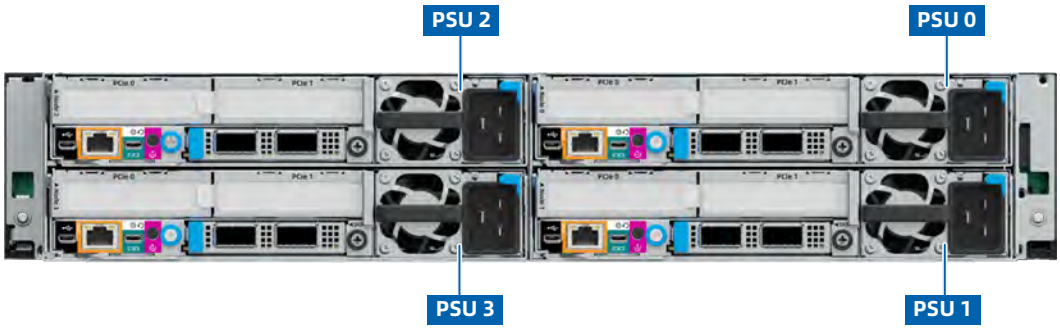
PCIe Slot	Owner	PCIe Standard	Connector Width	Bus Width	Port No.	Form Factor
OCP 3.0 Slot	CPU0	PCIe 5.0	x16	x16	P1	SFF OCP 3.0

5.10 PSUs

- The server supports 4 PSUs.
- A node supports 1 PSU.
- The server supports AC or DC power input.
- The PSUs are hot-swappable.
- The server must use PSUs with the same part number (P/N code).

5.10.1 PSU Locations

Figure 5-19 PSU Locations



5.10.2 PSU LED

NOTE

The PSU appearance and LED location may vary with the PSU model. The following figure is for reference only.

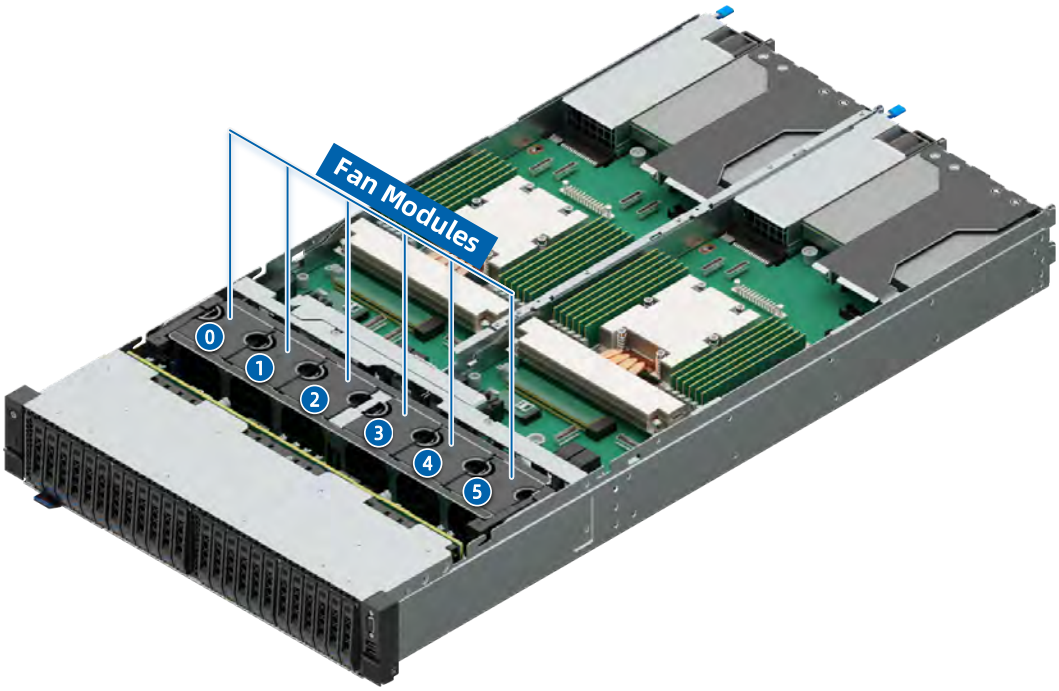
Figure 5-20 PSU LED

PSU LED (①) Status	Description
Solid green	Normal
Off	No AC/DC input to the PSU
Solid amber	PSU critical event causing a shutdown (possible causes: PSU overtemperature protection, PSU overcurrent protection, PSU overvoltage protection, short circuit protection)
Blinking amber (1 Hz)	PSU warning event where the PSU continues to operate (possible causes: PSU overtemperature warning, PSU overcurrent warning, excessively low fan speed warning)
Blinking green (1 Hz)	PSU operating in standby mode with normal input
Blinking green (on for 2 seconds and off for 1 second)	PSU in sleep state for cold redundancy
Blinking green (2 Hz)	PSU firmware updating

5.11 Fan Modules

- The server supports 6 non-hot-swap 6056 fan modules with N+1 rotor redundancy. The server can continue working properly when a single fan rotor fails.
- The server supports intelligent fan speed control.
- The server must use fan modules with the same part number (P/N code).

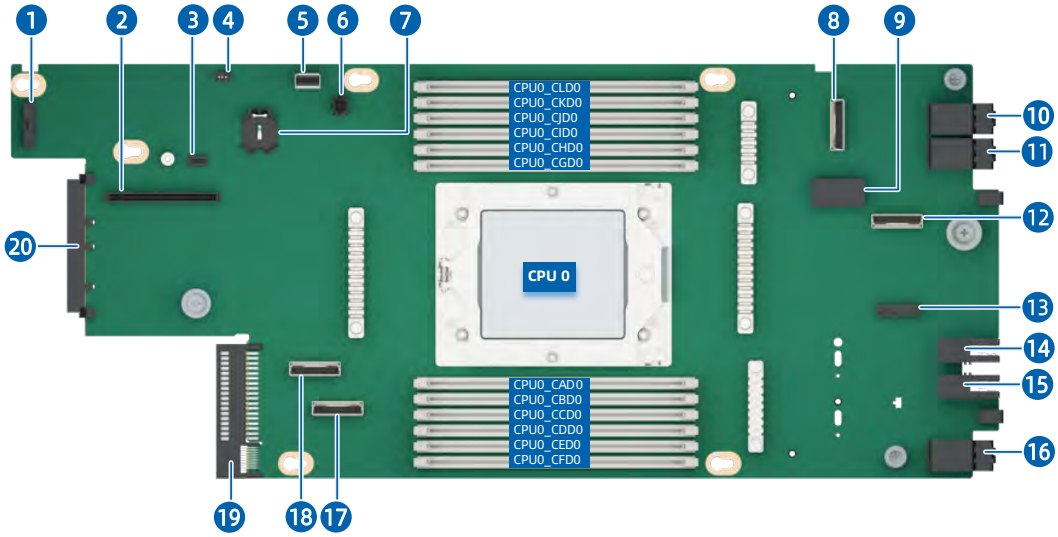
Figure 5-21 Fan Module Locations



5.12 Boards

5.12.1 Motherboard

Figure 5-22 Motherboard



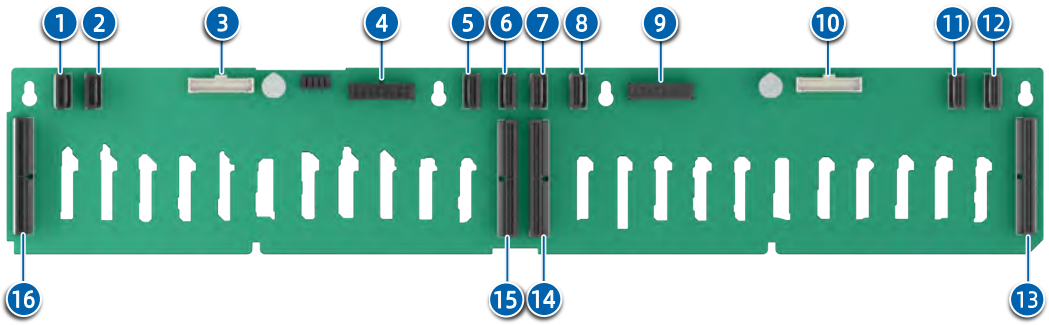
Item	Feature	Item	Feature
1	I/O Board Connector	2	PCIe Riser Slot
3	TPM/TCM Connector	4	CMOS Jumper

Item	Feature	Item	Feature
5	SLIM_VGA0 Connector	6	PCIe Riser Power Connector
7	Button Cell Battery Socket	8	SLIM_SATA Connector
9	M.2 SSD Connector × 2	10	Low-Speed High-Density Connector
11	High-Speed High-Density Connector	12	SLIM_SATA_VGA1 Connector
13	System TF Card Adapter Connector	14	Bus Bar - GND
15	Bus Bar - +12V	16	High-Speed High-Density Connector
17	MCIO Connector (MCIO_CPU0_P0_AC)	18	MCIO Connector (MCIO_CPU0_P0_EG)
19	PSU Connector	20	OCP 3.0 Card Connector

5.12.2 Front Drive Backplane

- 24 × 2.5-Inch SAS/SATA/NVMe Drive Backplane

Figure 5-23 24 × 2.5-Inch SAS/SATA/NVMe Drive Backplane



Item	Feature	Item	Feature
1	MCIO_NVME_SATA x4 Connector	2	MCIO_NVME_SATA x4 Connector
3	Sideband Signal Connector	4	Power Connector 1
5	MCIO_NVME x4 Connector	6	MCIO_NVME x4 Connector
7	MCIO_NVME_SATA x4 Connector	8	MCIO_NVME_SATA x4 Connector
9	Power Connector 0	10	Sideband Signal Connector
11	MCIO_NVME x4 Connector	12	MCIO_NVME x4 Connector

Item	Feature	Item	Feature
13	MCIO_NVME x16 Connector	14	MCIO_NVME_SATA x16 Connector
15	MCIO_NVME x16 Connector	16	MCIO_NVME_SATA x16 Connector

6 Product Specifications

6.1 Technical Specifications

Table 6-1 Technical Specifications

Item	Description
Form Factor	2U4N rack server
Processor	A node supports 1 AMD EPYC 9004 series processor. • Up to 128 cores per CPU (with a base frequency of 2.25 GHz) • Integrated memory controllers and 12 memory channels per processor • Integrated PCIe 5.0 controllers and 128 PCIe lanes per processor • Max. boost frequency of 4.4 GHz (for 16-core processors) • TDP up to 360 W • L3 cache up to 384 MB per CPU Note: The information above is for reference only. See 7.2 Hardware Compatibility for details.
Memory	• The server supports 48 DIMM slots (12 slots per node). • A node supports up to 12 DDR5 DIMMs. - ECC RDIMMs supported - Up to 4,800 MT/s - Mixing DDR5 DIMMs of different specifications (capacity, bit width, rank, height, etc.) is not supported. - A server must use DDR5 DIMMs with the same part number (P/N code). Notes: • For DIMMs with a rated speed of 5,600 MT/s, the actual operating speed will be degraded to 4,800 MT/s due to memory speed limitation of AMD EPYC 7004 series processors. • The information above is for reference only. See 7.2 Hardware Compatibility for details.
Storage	• Supports multiple drive configurations. See 5.7.1 Drive Configuration for details. • Front (for the server):

Item	Description
	- No drives or - Up to 24 × 2.5-inch SAS/SATA/NVMe drive (hot-swap) • Internal (for a node): - Up to 2 PCIe x4/SATA M.2 SSDs - 2 TF cards Notes: • M.2 SSDs are only used as boot devices for OS installation. • Due to low endurance, M.2 SSDs are unsuitable for data storage, particularly in scenarios involving frequent data writing and erasing. Otherwise, it can lead to rapid SSD wear-out, resulting in damage and potential failure. • If data storage devices are required, it is advisable to use enterprise-level HDDs or SSDs with a higher Drive Writes Per Day (DWPD). • Write-intensive business software can cause M.2 SSDs to exceed their write lifespan, resulting in permanent damage. Therefore, M.2 SSDs are not recommended for such scenarios. • M.2 SSDs must not be used for caching.
Network	• Up to four 10/25/100/200 Gb hot-plug OCP 3.0 cards (up to 1 card per node) • 1/10/25/100 Gb PCIe NICs • 1 BMC management network port of 100/1,000 Mbps auto-negotiation per node Note: The hot-plug feature of OCP 3.0 cards has been validated on Red Hat Enterprise Linux 9.0, but support on other operating systems is not guaranteed.
I/O Expansion	Supports PCIe expansion slots. • With rear PCIe riser modules: - A node supports up to 2 standard PCIe expansion slots and 1 dedicated slot for the OCP 3.0 card. - The server supports up to 8 standard PCIe expansion slots and 4 dedicated slots for OCP 3.0 cards. Note: For details, see 5.9.2 PCIe Slot Locations and 5.9.4 PCIe Slot Description.
Port	• Front (for the server): - 2 × USB 2.0 port - 1 × VGA port • Rear (for a node): - 1 × micro USB 2.0 port - 1 × system debug/BMC management serial port

Item	Description
	- 1 × BMC management network port Note: OS installation on the USB storage media is not recommended.
Display	Integrated VGA on the motherboard with a video memory of 64 MB and a maximum 16M color resolution of 1,920 × 1,200 at 60 Hz Note: The integrated VGA can support a maximum resolution of 1,920 × 1,200 only when the video driver matching the OS version is installed; otherwise, only the default resolution of the OS is supported.
System Management	• UEFI/Legacy • BMC • NC-SI • KSManage • KSManage Tools
Security	• Trusted Platform Module (TPM) 2.0 and Trusted Cryptography Module (TCM) • Firmware update mechanism based on digital signatures • UEFI Secure Boot • Hierarchical BIOS password protection • BIOS Secure Flash and BIOS Lock Enable (BLE) • Dual-image mechanism for BMC

6.2 Environmental Specifications

Table 6-2 Environmental Specifications

Item	Description
Temperature[1,2]	• Operating: 10°C to 35°C (50°F to 95°F) • Storage (packed): -40°C to 70°C (-40°F to 158°F) • Storage (unpacked): -40°C to 70°C (-40°F to 158°F)
Relative Humidity (RH, non-condensing)	• Operating: 5% to 90% RH • Storage (packed): 5% to 93% RH • Storage (unpacked): 5% to 93% RH
Altitude	• Operating: 0 to 3,050 m (0 to 10,007 ft)

Item	Description
	• Shipping (storage): 0 to 12,000 m (0 to 39,370 ft)
Corrosive Gaseous Contaminants	Maximum growth rate of corrosion film thickness: • Copper coupon: 300 Å/month (compliant with the gaseous corrosivity level of G1 defined in ANSI/ISA-71.04-2013) • Silver coupon: 200 Å/month (compliant with the gaseous corrosivity level of G1 defined in ANSI/ISA-71.04-2013)
Acoustic Noise[3,4,5]	Noise emissions are measured in accordance with ISO 7779 (ECMA 74) and declared in accordance with ISO 9296 (ECMA 109). Listed are the declared A-weighted sound power levels (LWAd) and the declared average bystander position A-weighted sound pressure levels (LpAm) at a server operating temperature of 23°C (73.4°F): • Idle: - LWAd: 7.7 B - LpAm: 61.6 dBA • Operating: - LWAd: 8.7 B - LpAm: 70.7 dBA

Notes:

1. Standard operating temperature:

- 10°C to 35°C (50°F to 95°F) is the standard operating temperature range at sea level. At the altitude of 0 to 3,050 m (0 to 10,007 ft), derate the maximum allowable temperature by 1°C per 305 m (1°F per 556 ft). No direct sustained sunlight is permitted. The maximum temperature gradient is 20°C/h (36°F/h). Both the altitude and the maximum temperature gradient vary with server configurations.
- Any fan failure or operations above 30°C (86°F) may lead to system performance degradation.

2. Expanded operating temperature:

- For some configurations, the supported system inlet ambient temperature can be expanded to 5°C to 10°C (41°F to 50°F) and 35°C to 40°C (95°F to 104°F) at sea level. At an altitude of 0 to 950 m (0 to 3,117 ft), derate the maximum allowable operating temperature by 1°C per 305 m (1°F per 556 ft). At an altitude of 950 to 3,050 m (3,117 to 10,007 ft), derate the maximum allowable operating temperature by 1°C per 175 m (1°F per 319 ft).
- For some configurations, the supported system inlet ambient temperature can be expanded to 40°C to 45°C (104°F to 113°F) at sea level. At an altitude of 0 to 950 m (0 to 3,117 ft), derate the maximum allowable operating temperature by 1°C per 305 m (1°F per 556 ft). At an altitude of 950 to 3,050 m (3,117 to 10,007 ft), derate the maximum allowable operating temperature by 1°C per 125 m (1°F per 228 ft).
- Any fan failure or operations under the expanded operating temperature may lead to system performance degradation.

3. This document lists the LWAd and LpAm of the product at a 23°C (73.4°F) ambient environment. All measurements are conducted in conformance with ISO 7779 (ECMA 74) and declared in conformance with ISO 9296 (ECMA 109). Contact your sales representative for more information.

4. The sound levels shown here were measured based on the specific configurations of a server. Sound levels vary with server configurations, workloads, ambient temperatures, and other factors. These values are for reference only and subject to change without further notice.

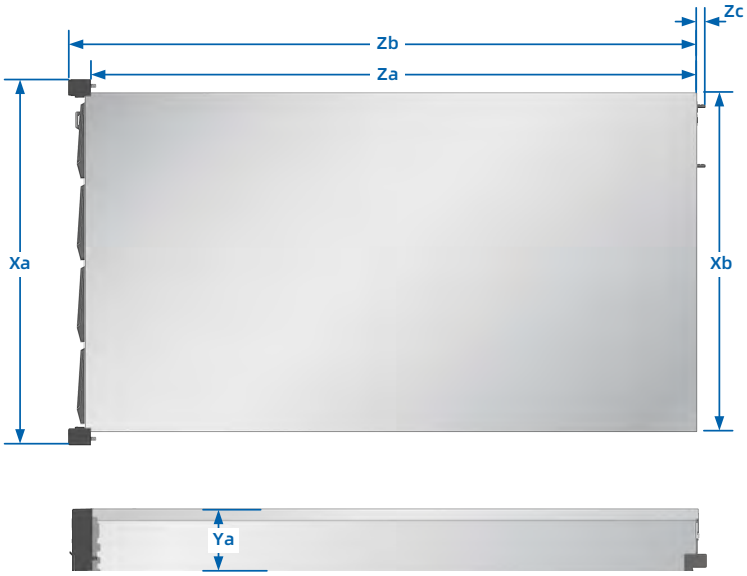
5. Product conformance to cited normative standards is based on sample testing, evaluation, or assessment. This product or family of products is eligible to bear the appropriate compliance logos and statements.

6.3 Physical Specifications

Table 6-3 Physical Specifications

Item	Description
Outer Packaging Dimensions (L × W × H)	• Node: 981 × 391 × 287 mm (38.62 × 15.39 × 11.30 in.) • Server (without pallets): 1,168 × 722 × 287 mm (45.98 × 28.43 × 11.30 in.)
Installation Dimension Requirements	• Installation requirements for the cabinet are as follows: - General cabinet compliant with the International Electrotechnical Commission 297 (IEC 297) standard - Width: 482.6 mm (19 in.) - Depth: Above 1,000 mm (39.37 in.) • Installation requirements for the server rails are as follows: - Static rail (L-shaped) kit: The distance between the front and rear mounting flanges ranges from 650 to 910 mm (25.59 to 35.83 in.).
Weight	24 × 2.5-inch drive configuration (with all drives installed): • Net weight: 43.8 kg (96.56 lbs) • Gross weight: 54.2 kg (119.49 lbs) (including server, packaging box, rails and accessory box) Note: The server weight varies by configuration.

Figure 6-1 Server Chassis Dimensions



Model	Xa	Xb	Ya	Za	Zb	Zc
K24-E2-A0-R0-01	482 mm (18.98 in.)	447 mm (17.60 in.)	87 mm (3.43 in.)	855 mm (33.66 in.)	880 mm (34.65 in.)	24.95 mm (0.98 in.)

7 Operating System and Hardware Compatibility

This section describes the OS and hardware compatibility of the server. For the latest compatibility configuration and the component models not listed in this document, contact your local sales representative.

IMPORTANT

- Using incompatible components may cause the server to work abnormally, and such failures are not covered by technical support or warranty.
- Hardware compatibility may vary by the model. Contact your sales representatives to confirm the detailed hardware configurations during the pre-sales phase.
- The server performance is strongly influenced by application software, middleware and hardware. The subtle differences in them may lead to performance variation in the application and test software.
  - For requirements on the performance of specific application software, contact your sales representative to confirm the detailed hardware and software configurations during the pre-sales phase.
  - For requirements on hardware performance consistency, define specific configuration requirements (for example, specific drive models, RAID cards, or firmware versions) during the pre-sales phase.

7.1 Supported Operating Systems

Table 7-1 Supported Operating Systems

OS Version
Windows Server 2022
Red Hat Enterprise Linux 9.0
Debian 11.6.0
Ubuntu 22.04.1
Ubuntu 20.04.5

NOTE

After installing Linux OS, add **iommu=pt** in the OS. See the OS installation guide on our website for details.

7.2 Hardware Compatibility

7.2.1 CPU Specifications

The server supports 4 nodes and each node supports 1 AMD EPYC 9004 series processor with a TDP of up to 360 W.

Table 7-2 CPU Specifications

Model	Cores	Threads	Base Frequency (GHz)	Max. Boost Frequency (GHz)	Cache (MB)	TDP (W)
9654	96	192	2.40	3.70	384	360
9554	64	128	3.10	3.75	256	360
9354P	32	64	3.25	3.80	256	280
9654P	96	192	2.40	3.70	384	360
9554P	64	128	3.10	3.75	256	360
9634	84	168	2.25	3.70	384	290
9454P	48	64	2.75	3.80	256	290
9334	32	56	2.70	3.90	128	210
9754	128	256	2.25	3.10	256	360
9734	112	224	2.20	3.00	256	340
9354	32	64	3.25	3.80	256	280
9454	48	64	2.75	3.80	256	290

7.2.2 DIMM Specifications

The server supports 4 nodes and each node supports up to 12 DDR5 RDIMMs. Each processor supports 12 memory channels with 1 DIMM per channel.

Table 7-3 DIMM Specifications

Type	Capacity (GB)	Speed (MT/s)	Data Width	Organization
RDIMM	16	4,800	x80	1R x8
RDIMM	32	4,800	x80	2R x8
RDIMM	64	4,800	x80	2R x4
RDIMM	32	4,800	x80	1R x4
RDIMM	96	4,800	x80	2R x4
RDIMM	96	5,600Note	x80	2R x4

Note: The actual operating speed of the DIMMs is 4,800 MT/s, as constrained by the memory speed supported by the AMD EPYC 9004 series processors.

7.2.3 Drive Specifications

Table 7-4 SAS SSD Specifications

Type	Capacity	Max. Qty.
SAS SSD	960 GB	8
SAS SSD	1.92 TB	8
SAS SSD	3.84 TB	8
SAS SSD	7.68 TB	8
SAS SSD	15.36 TB	8

Table 7-5 SATA SSD Specifications

Type	Capacity	Max. Qty.
SATA SSD	480 GB	24
SATA SSD	960 GB	24
SATA SSD	1.92 TB	24
SATA SSD	3.84 TB	24

Table 7-6 NVMe SSD Specifications

Type	Capacity	Max. Qty.
NVMe SSD	480 GB	24

Type	Capacity	Max. Qty.
NVMe SSD	960 GB	24
NVMe SSD	1.92 TB	24
NVMe SSD	3.84 TB	24
NVMe SSD	7.68 TB	24

Table 7-7 M.2 SSD Specifications

Type	Capacity (GB)	Max. Qty.
PCIe M.2 SSD	960	8
SATA M.2 SSD	480	8
SATA M.2 SSD	240	8

7.2.4 RAID Card Specifications

Table 7-8 RAID Card Specifications

Type	Description
RAID Card	RAID_BRCM_8R0_9560-8i_4G_SMSAS3_PCIE4_7

7.2.5 NIC Specifications

Table 7-9 OCP Card Specifications

Type	Description	Speed (Gbps)	Port Qty.
OCP 3.0 Card	NIC_I_25G_E810XXVDA2_LC_OCP3x8_2_XR	25	2
	NIC_I_100G_E810CQDA2_LC_OCP3x16_2_XR	100	2
	NIC_M_100G_MCX623436AN_LC_OCP3x16_2_XR	100	2
	NIC_BROADCM_100G_57508_LC_OCP3x16_2_XR	100	2
	NIC_BROADCM_100G_57504_LC_OCP3x16_XR	100	1

Table 7-10 PCIe NIC Specifications

Type	Description	Speed (Gbps)	Port Qty.
PCIe NIC	NIC_I_25G_E810XXVDA2_LC_PCIEx8_2_XR	25	2
	NIC_M_25G_MCX631102AN_LC_PCIEx8_2_XR	25	2
	NIC_BROADCM_25G_57414_LC_PCIEx8_2_XR_42C	25	2
	NIC_I_100G_E810CQDA2_LC_PCIEx16_2_XR	100	2
	NIC_M_100G_MCX623106AN_LC_PCIEx16_2_XR	100	2

7.2.6 PSU Specifications

The server supports up to 4 CR68 PSUs in 2+2 redundancy. The PSUs share a common electrical and structural design that allows for hot-swap and tool-less installation into the server with the PSUs locking automatically after being inserted into the power bay. The CR68 PSUs are 80 Plus Platinum or Titanium rated with various output powers, allowing customers to choose as needed.

- The following rated 115 Vac and 230 Vac PSUs in 2+2 redundancy are supported:
  - 2,200 W Platinum PSU: 1,000 W (115 Vac), 2,200 W (230 Vac)
  - 2,200 W Titanium PSU: 1,000 W (115 Vac), 2,200 W (230 Vac)
  - 2,000 W Platinum PSU: 1,000 W (115 Vac), 2,000 W (230 Vac)
  - 2,000 W Titanium PSU: 1,000 W (115 Vac), 2,000 W (230 Vac)

NOTE

At a rated input voltage of 115 Vac, the output power of a 2,000/2,200 W PSU will be derated to 1,000 W.

- Operating voltage range:
  - 115 Vac: 90 Vac to 132 Vac
  - 230 Vac: 180 Vac to 264 Vac

8 Regulatory Information

8.1 Safety

8.1.1 General

- Strictly comply with local laws and regulations while installing the equipment. The safety instructions in this section are only a supplement to local safety regulations.
- To ensure personal safety and to prevent damage to the equipment, all personnel must strictly observe the safety instructions in this section and on the device labels.
- People performing specialized activities, such as electricians and electric forklift operators, must possess qualifications recognized by the local government or authorities.

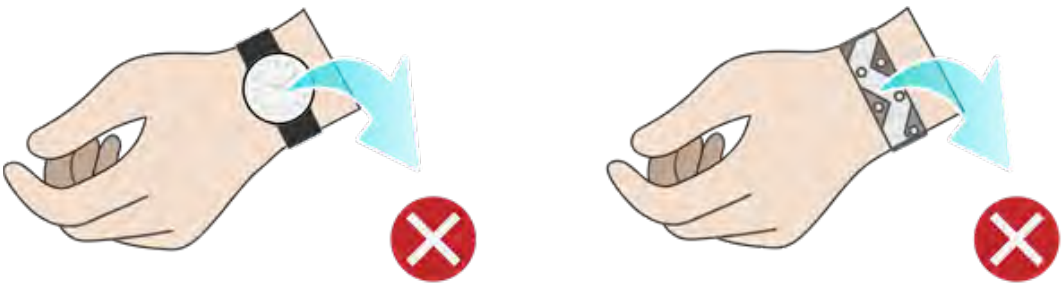
8.1.2 Personal Safety

- Only personnel certified or authorized by us are allowed to perform the installation procedures.
- Stop any operation that could cause personal injury or equipment damage. Report to the project manager and take effective protective measures.
- Working during thunderstorms, including but not limited to handling equipment, installing cabinets and installing power cords, is forbidden.
- Do not carry the weight over the maximum load per person allowed by local laws or regulations. Arrange appropriate installation personnel and do not overburden them.
- Installation personnel must wear clean work clothes, work gloves, safety helmets and safety shoes, as shown in Figure 8-1.

Figure 8-1 Protective Clothing

- Before touching the equipment, put on ESD clothes and ESD gloves or an ESD wrist strap, and remove any conductive objects such as wrist watches or metal jewelry, as shown in Figure 8-2, in order to avoid electric shock or burns.

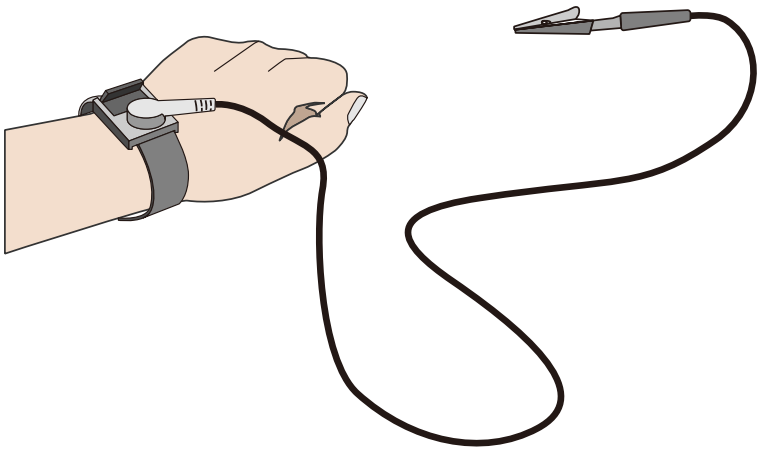
Figure 8-2 Removing Conductive Objects



How to put on an ESD strap (Figure 8-3).

1. Put your hand through an ESD wrist strap.
2. Tighten the strap buckle to ensure a snug fit.
3. Plug the alligator clip of the ESD wrist strap into the corresponding jack on the grounded cabinet or grounded chassis.

Figure 8-3 Wearing an ESD Wrist Strap



- Use tools correctly to avoid personal injury.
- When moving or lifting equipment above shoulder height, use lifting devices and other tools as necessary to avoid personal injury or equipment damage due to equipment slippage.
- The power sources of the server carry a high voltage. Direct contact or indirect contact through damp objects with the high-voltage power source is fatal.
- To ensure personal safety, ground the server before connecting power.
- When using ladders, always have someone hold and guard the bottom of the ladders. In order to prevent injury, never use a ladder alone.
- When connecting, testing or replacing optical fiber cable, avoid looking into the optical port without eye protection in order to prevent eye damage from laser light.

8.1.3 Equipment Safety

- To ensure personal safety and prevent equipment damage, use only the power cords and cables that come with the server. Do not use them with any other equipment.
- Before touching the equipment, put on ESD clothing and ESD gloves to prevent static electricity from damaging the equipment.
- When moving the server, hold the bottom of the server. Do not hold the handles of any module installed in the server, such as PSUs, fan modules, drive modules, or motherboard. Handle the equipment with care at all times.
- Use tools correctly to avoid damage to the equipment.
- Connect the power cords of active and standby PSUs to different PDUs to ensure high system reliability.

- To ensure equipment safety, always ground the equipment before powering it on.

8.1.4 Transportation Precautions

Contact the manufacturer for precautions before transportation as improper transportation may damage the equipment. The precautions include but are not limited to:

- Hire a trusted logistics company to move all equipment. The transportation process must comply with international transportation standards for electronic equipment. Always keep the equipment being transported right-side up. Avoid collision, moisture, corrosion, packaging damage or contamination.
- Transport the equipment in its original packaging.
- If the original packaging is unavailable, separately package heavy and bulky components (such as chassis, blade servers and blade switches), and fragile components (such as optical modules and PCIe expansion cards).
- Power off all equipment before shipping.

8.1.5 Manual Handling Weight Limits


CAUTION

Observe local laws or regulations regarding the manual handling weight limits per person. The limits shown on the equipment and in the document are recommendations only.

Table 8-1 lists the manual handling weight limits per person specified by some organizations.

Table 8-1 Manual Handling Weight Limits per Person

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

9 Limited Warranty

This limited warranty applies only to the original purchasers of our products who are direct customers or distributors of us (“Customer”).

We warrant all our hardware products, if properly used and installed, to be free from defects in material and workmanship within the warranty period. The term “Hardware Product” is limited to the hardware components and required firmware. The term “Hardware Product” DOES NOT include software applications or programs, and DOES NOT include products or peripherals that are not supplied by us. We may, at our discretion, repair or replace the defective parts. Repair or replacement parts may be new, used, or equivalent to new in performance and reliability. Repair or replacement parts are warranted to be free of defects in material or workmanship for ninety (90) calendar days or for the remainder of the warranty period of the product, whichever is longer.

Service offerings may vary by geographic region. Please contact your representative to identify service levels and needs for your region.

9.1 Warranty Service

Our warranty service includes 24 × 7 remote technical support, RMA (Return Material Authorization) Service, ARMA (Advanced Return Material Authorization) Service, 9 × 5 × NBD (Next Business Day) Onsite Service and 24 × 7 × 4 Onsite Service.

9.1.1 Remote Technical Support

The 24 × 7 remote technical support can be obtained through hotline, e-mail, and Service Portal*[1]. Through hotline and e-mail support, our engineers help customers diagnose the causes of malfunctions and provide solutions. Service Portal*[1] provides access to firmware, customized update files, and related manuals for Hardware Products. Customer may also access the Service Portal*[1] to submit an RMA request or an ARMA request for parts replacement or repair.

Information needed when requesting support:

- Contact name, phone number, e-mail address
- System serial number, part number, model and location (address) of the product needing service
- Detailed description of problem, logs (SELs and blackbox logs, and any other related logs from OS), screenshot of issue, pictures of damaged/faulty parts, etc.

9.1.2 RMA Service

Standard Replacement: When a hardware failure occurs, Customer may submit an RMA request to us via e-mail or Service Portal*[1]. We will review and approve the RMA submission at our own discretion, and provide an RMA number and return information that Customer may use to return the defective part(s) for the RMA service. We will ship out replacement part(s) within one (1) business day after receiving the defective part(s) and cover one-way shipment.

NOTE

- Customer should return the defective parts in original packaging to our designated service center at their own expense.
- After our further diagnosing and testing, if the defective parts conform to our repair policy, we will ship out the repair or replacement parts at our own expense; otherwise, we will return the defective parts at Customer's expense.
- If Customer needs to designate a logistics company, allocation of the shipping cost to us/Customer will be redefined.

9.1.3 ARMA Service

Advanced Replacement: If a problem with our hardware products cannot be resolved via hotline or e-mail support and replacement part(s) are required, we will ship out replacement part(s) in advance within one (1) business day. Customer should return defective part(s) within five (5) business days after receiving the replacement(s). The shipping cost coverage varies by region. Contact your sales representative for details.

NOTE

- Customer should return the defective parts in original packaging to our designated service center.
- We will ship out the replacement parts at our own expense after completing remote diagnosis.
- If Customer needs to designate a logistics company, allocation of the shipping cost to us/Customer will be redefined.

9.1.4 9 × 5 × NBD Onsite Service

When we ultimately determine that an onsite service call is required to repair or replace a defect, the call will be scheduled in accordance with the Response Time

Commitment. The response time is measured from the time when the remote troubleshooting is completed and logged to the arrival of a service engineer and parts to Customer location for repair.

NOTE

9 × 5 × NBD: Our service engineer typically arrives at the customer's data center on the next business day. Service engineers are available on local business day from 9:00 am to 6:00 pm local time. Calls received/dispatches after 5:00 pm local time will require an additional day for the service engineer to arrive.

9.1.5 24 × 7 × 4 Onsite Service

When we ultimately determine that an onsite service call is required to repair or replace a defect, the call will be scheduled in accordance with the Response Time Commitment. The response time is measured from the time when the remote troubleshooting is completed and logged to the arrival of a service engineer and parts to Customer location for repair.

NOTE

24 × 7 × 4: Our service engineer typically arrives at the customer site within 4 hours. Service engineers are available at any time, including weekends and local national holidays.

9.2 Our Service SLA

We offer a variety of Service Level Agreements (SLA)*[2] to meet customer requirements.

- RMA Service
- ARMA Service
- 9 × 5 × NBD Onsite Service
- 24 × 7 × 4 Onsite Service

9.3 Warranty Exclusions

We do not guarantee that there will be no interruptions or mistakes during the use of the products. We will not undertake any responsibility for the losses arising from any operation not conducted according to instructions intended for Hardware Products.

The Limited Warranty does not apply to

- expendable or consumable parts, such as, but not limited to, batteries or protective coatings that are designed to diminish over time, unless failure has occurred during DOA period due to a defect in material or workmanship;
- any cosmetic damage, such as, but not limited to, scratches, dents, broken plastics, metal corrosion, or mechanical damage, unless failure has occurred during DOA period due to a defect in material or workmanship;
- damage or defects caused by accident, misuse, abuse, contamination, improper or inadequate maintenance or calibration or other external causes;
- damage or defects caused by operation beyond the parameters as stipulated in the user documentation;
- damage or defects by software, interfacing, parts or supplies not provided by us;
- damage or defects by improper storage, usage, or maintenance;
- damage or defects by virus infection;
- loss or damage in transit which is not arranged by us;
- Hardware Products that have been modified or serviced by non-authorized personnel;
- any damage to or loss of any personal data, programs, or removable storage media;
- the restoration or reinstallation of any data or programs except the software installed by us when the product is manufactured;
- any engineering sample, evaluation unit, or non-mass production product that is not covered under warranty service;
- any solid-state drive (SSD) which has reached its write endurance limit.

In no event will we be liable for any direct loss of use, interruption of business, lost profits, lost data, or indirect, special, incidental or consequential damages of any kind regardless of the form of action, whether in contract, tort (including negligence), strict liability or otherwise, even if we have been advised of the possibility of such damage, and whether or not any remedy provided should fail of its essential purpose.

*1 Service Portal availability is subject to customer type and customer location. Please contact your representative to learn more.

*2 Not all SLA offerings are available at all customer locations. Some SLA offerings may be limited to geolocation and/or customer type. Please contact your representative to learn more.

10 System Management

10.1 Intelligent Management System BMC

BMC, a remote server management system, supports mainstream management specifications in the industry such as IPMI 2.0 and Redfish 1.13. BMC features high operational reliability, easy serviceability for different business scenarios, accurate and comprehensive fault diagnosis capabilities, and industry-leading security reinforcement capabilities.

BMC supports:

- IPMI 2.0
- Redfish 1.13
- SNMP v1/v2c/v3
- HTML5/Java remote consoles (Keyboard, Video, Mouse)
- remote virtual media
- login via web browsers
- intelligent fault diagnosis

Table 10-1 BMC Features

Feature	Description
Management Interface	Supports extensive remote management interfaces for various server O&M scenarios. The supported interfaces include: • IPMI • SMASH CLP • SNMP • HTTPS • Web GUI • Redfish • RESTful • Syslog
Accurate and Intelligent Fault Location	IDL, a fault diagnosis system, offers accurate and comprehensive hardware fault location capabilities, and outputs detailed fault causes and handling suggestions.

Feature	Description
Alert Management	Supports rich automatic remote alert capabilities, including proactive alerting mechanisms such as SNMP Trap (v1/v2c/v3), email alerts and syslog remote alerts to ensure 24 × 7 reliability.
Remote Console KVM	Supports HTML5- and Java-based remote console to remotely control and operate the monitor/mouse/keyboard of the server, providing highly available remote management capabilities without on-site operation.
Virtual Network Console (VNC)	Supports mainstream third-party VNC clients without relying on Java, improving management flexibility.
Remote Virtual Media	Supports virtualizing local images, USB devices, and folders as media devices of remote servers, simplifying OS installation, file sharing, and other O&M tasks.
Web GUI	Supports the visual management interface developed by us, displaying abundant information of the server and components, and offers easy-to-use Web GUIs.
Crash Screenshot and Crash Video Recording	Supports automatic crash screenshot and crash video recording (video needs to be enabled manually) to capture the last screen and video before crash; provides manual screenshot, which can quickly capture the screen for easy inspection at scheduled time
Dual Flash and Dual Image	Supports dual flash and dual image, enabling automatic flash failover in case of software or flash corruption, improving operational reliability.
Power Capping	Supports power capping, increasing deployment density and reducing energy consumption.
IPv4/IPv6	Supports both IPv4 and IPv6, enhancing network deployment flexibility.
Auto-Switching of Management Network Port	Supports auto-switching between the dedicated management network port and shared management network port, providing customers with flexible network deployment solutions for different management network deployment scenarios.
BMC Self-Diagnosis and Self-Recovery System	• Supports the reliable dual watchdog mechanism for hardware and software, enabling automatic restoration of BMC in case of BMC abnormality. • Provides a thermal protection mechanism, which is automatically triggered when the BMC is abnormal to

Feature	Description
	ensure that the fan operates at safe speeds to avoid system overheating. • Supports self-diagnosis of processors, memory modules, and storage devices of BMC, and automatically cleans the workload to restore to normal when the device usage rate is too high.
Power Control	Supports virtual power buttons for power on/off, power cycle and reset.
UID LED	Supports remote lighting of the UID LED for locating the server in the server room.
Secure Firmware Update	• Supports firmware update based on secure digital signatures, and mismatch prevention mechanism for firmware from different manufacturers and firmware for different models • Supports firmware update of BMC/BIOS/CPLD/PSU.
Serial Port Redirection	Supports remote redirection of the system serial port, BMC serial port and other serial ports, and directs the server-side serial port output to the local administrator via the network for server debugging.
Storage Information Display	Displays RAID logical array information and drive information, and supports remote RAID creation for improved deployment efficiency.
User Role Management	Supports user detail management based on user roles and flexible creation of user roles with different privileges, and provides more user roles to allow administrators to grant different privileges to O&M personnel.
Security Features	Adopts the industry-leading server security baseline standard V3.0. SSH, HTTPS, SNMP and IPMI use secure and reliable algorithms. BMC offers capabilities including secure update and boot and security reinforcement mechanisms such as anti-replay, anti-injection, and anti-brute force.
Double Factor Authentication	Supports double factor authentication for local BMC users. Users need to log in to the BMC with both password and certificate, thus to prevent attacks caused by password leakage.
Configuration Exporting and Importing	To import and export the existing system configurations.

Feature	Description
System Information Display	Displays the server basic information such as the information and health status of major server components, including CPU, memory, power supply, device inventory, hard drive, network adapter, and security chip.
Fan Management	Displays the status, current speed, duty ratio, and other information of a fan module. You can select the fan control mode and preset the speed for each fan module in the Manual Fan Control mode.
Power Policy	To set how the server operating system reacts under the BMC's control when AC power is reconnected to the server.
One-Key Erasing	To perform non-recoverable erasing on all storage devices of the server, preventing data leakage when the server is to be retired.
System Lockdown	After this feature is enabled, some parameters of the server cannot be set and some operations cannot be performed on the server.

10.2 KSManage

The server is compatible with the latest version of KSManage, a new-generation infrastructure O&M management platform for data centers.

Built on cutting-edge O&M concepts, KSManage provides users with leading and efficient overall management solutions for data centers to ensure advanced infrastructure management. This platform provides a rich set of functions such as centralized asset management, in-depth fault diagnosis, component fault early warning, intelligent energy consumption management, 3D automatic topologies, and stateless automatic deployment. With these functions, users can implement centralized O&M of servers, storage devices, network devices, security devices, and edge devices, effectively improving O&M efficiency, reducing O&M costs, and ensuring the secure, reliable, and stable operation of data centers. KSManage offers:

- lightweight deployment in multiple scenarios and full lifecycle management of devices
- high reliability and on-demand scalability enabled by 1 to N data collectors
- intelligent asset management and real-time tracking of asset changes
- comprehensive monitoring for overall business control

- intelligent fault diagnosis for reduced maintenance time
- second-level performance monitoring for real-time status of devices
- batch configuration, deployment and update, shortening the time needed to bring the production environment online
- improved firmware version management efficiency
- standardized northbound interfaces for easy integration and interfacing

Table 10-2 KSManage Features

Feature	Description
Home	Display of basic information (data centers, server rooms, cabinets, assets and alerts), quick addition of devices and custom home page
Assets	• Batch asset import, automatic asset discovery, and full lifecycle management of assets • Management of the full range of our server family, including general-purpose rack servers, AI servers, multi-node servers, edge servers and all-in-one servers • Management of our general-purpose disk arrays and distributed storage devices • Management of network devices (switches, routers, etc.), security devices (firewalls, load balancers, etc.), cabinets and clouds • Management of data centers • Asset warranty information management, asset inventory reports for server acceptance, asset attribute expansion, etc.
Monitor	• Display of real-time alerts, history alerts, blocked alerts and events • Fault prediction of drives and memories • Custom inspection plan and inspection result management • Notification record viewing • Intelligent fault diagnosis and analysis, automatic fault reporting and repair ticket viewing • Trap management and Redfish management • Management of monitoring rules, such as alert rules, notification rules, blocking rules, alert noise reduction

Feature	Description
	rules, compression rules and fault reporting rules, and redefinition of above rules
Control	• Quick start of firmware update, OS installation, power management, drive data erasing and stress test • Batch firmware update (BMC/BIOS/RAID Card/NIC/Drive/HBA Card/MB CPLD/BP CPLD/PSU) • Batch firmware configuration (BMC/BIOS) • Batch RAID configuration and OS deployment for servers • Secure and quick drive data erasing • CPU and memory stress test • Automatic firmware baseline management • BMC and BIOS snapshot management • Repositories for update files
Energy Efficiency	• Overview of data center power consumption trend chart and carbon emission trend chart • Setting of server dynamic power consumption policies and minimum power consumption policies • Carbon asset and carbon emission management
Log	• Fault log record management • Diagnosis record and diagnosis rule management
Topologies	• Centralized management of multiple data centers and panoramic 3D views, including dynamic display of power consumption, temperature, alerts and cabinet capacity of the data center • Network topologies
Reports	• Management of warranty information reports, alert reports, asset reports, hardware reports and performance reports • Export of reports in .xlsx format
System	• Password management, alert forwarding and data dump • Customized KSManage parameters
Security	Security control of KSManage via a set of security policies such as user management, role management, authentication management (local authentication and LDAP authentication) and certificate management

10.3 KSManage Tools

Table 10-3 Features of KSManage Tools

Feature	Description
KSManage Kits	A lightweight automatic batch O&M tool for servers, mainly used for server deployment, routine maintenance, firmware update, fault handling, etc.
KSManage Boot	A unified batch management platform for bare metals, with features including firmware management, hardware configuration, system deployment and migration, stress test and in-band management
KSManage Server CLI	Fast integration with third-party management platforms, delivering a new O&M mode of Infrastructure as Code (IaC)
KSManage Driver	Operates under the OS and gets system asset and performance information via the in-band mode, providing users with more comprehensive server management capabilities.
KSManage Server Provisioning	Offers users with RAID configuration, intelligent OS installation, firmware update, hardware diagnosis, secure erasing and software upgrade, using the TF card as the carrier.

11 Certifications

Table 11-1 Certifications

Country/Region	Certification	Mandatory/Voluntary
International	CB	Voluntary
EU	CE	Mandatory
US	FCC	Mandatory
	UL	Voluntary
	Energy Star	Voluntary
Korea	KC	Mandatory

12 Appendix A

12.1 Thermal Restrictions

Table 12-1 Thermal Restrictions

Configuration	Max. Operating Temp.: 30°C (86°F)	Max. Operating Temp.: 35°C (95°F)
No Drive Configuration	CPU TDP ≤360 W	CPU TDP ≤360 W
24 × 2.5-Inch SATA/SAS/NVMe Drive Configuration	CPU TDP ≤280 W	• CPU TDP ≤280 W • NICs <100 Gb

NOTE

- The maximum operating temperature is 5°C (9°F) lower than the rated value if a single fan rotor fails.
- Single fan failure may affect system performance.

12.2 Model

Table 12-2 Model

Certified Model	Description
K24-E2-A0-R0-01	Global

12.3 RAS Features

The server supports a variety of RAS (Reliability, Availability, and Serviceability) features. By configuring these features, the server can provide greater reliability, availability, and serviceability.

12.4 Sensor List

Table 12-3 Sensor List

Sensor	Description	Sensor Location	Remarks
Inlet_Temp	Air inlet temperature	Right mounting ear	-
MB_Inlet_Temp	Motherboard air inlet temperature	Motherboard	
MB_Outletx_Temp	Motherboard air outlet x temperature	Motherboard	x indicates the air outlet number with a value of 0 to 1
CPU0_Temp	CPU core temperature	CPU	-
CPU0_DIMM_T	The maximum temperature among DDR5 DIMMs of a CPU	CPU DIMMs	-
P2V5_BMC_STBY	2.5 V voltage supplied by the motherboard to the BMC	Motherboard	-
SYS_12V	System 12 V voltage	Motherboard	-
SYS_3V3	System 3.3 V voltage	Motherboard	-
P1V2_STBY_SENSOR	System 1.2 V standby voltage	Motherboard	-
P1V05_STBY_USB	System 1.05 V standby voltage for USB devices	Motherboard	-
P1V8_S5_P0	System 1.8 V voltage for system S5 status	Motherboard	-
P1V8_STBY_SENSOR	System 1.8 V standby voltage	Motherboard	-
RTC_Battery	Motherboard RTC battery voltage	Motherboard RTC battery	-
P3V3_STBY_SCALED	System 3.3 V standby voltage	Motherboard	-
STBY_5V	System 5 V standby voltage	Motherboard	-

Sensor	Description	Sensor Location	Remarks
P1V_BMC_STBY_SEN	BMC 1 V standby voltage	Motherboard	-
P3V3_BMC_RGM_STB	BMC 1 V standby voltage for NICs	Motherboard	-
PVDDCR_0	CPU partial voltage 0 for group A/E	Motherboard	-
PVDDCR_SOC_P0	CPU0 PVDDCR SOC partial voltage	Motherboard	-
PVDDCR_1	CPU partial voltage 1 for group A/E	Motherboard	-
PVDD11_S3_P0	CPU PVDD11 partial voltage for S3 status	Motherboard	-
PVDDIO_P0	CPU PVDDIO partial voltage	Motherboard	-
PSUx_Inlet_Temp	PSUx temperature	PSUx	x indicates the PSU number with a value of 0 to 3
PSUx_VIN	PSUx input voltage	PSUx	x indicates the PSU number with a value of 0 to 3
PSUx_VOUT	PSUx output voltage	PSUx	x indicates the PSU number with a value of 0 to 3
PSUx_PIN	PSUx input power	PSUx	x indicates the PSU number with a value of 0 to 3
PSUx_POUT	PSUx output power	PSUx	x indicates the PSU number with a value of 0 to 3
Node_Power	Total power of a node	Motherboard	-
Total_Power	Total power of the server	PSUs	-
CPU0_Power	Total CPU power	CPUs	-
Memory_Power	Total memory power	Motherboard	-
FAN_Power	Total fan power	Fans	-
FANx_F_Speed	FANx speed	FANx	

Sensor	Description	Sensor Location	Remarks
FANx_R_Speed			x indicates the fan module number with a value of 0 to 5
CPU0_VR_Temp	CPU VR temperature	Motherboard	-
RAID_Temp	The maximum temperature among all RAID cards	RAID cards	-
HDD_MAX_Temp	The maximum temperature among all drives	Drives	-
NVME_Temp	NVMe drive temperature	NVMe drive	-
IOBoard_Temp	I/O board temperature	I/O board	-
Riser0_Temp	Riser card 0 temperature	Riser card	-
OCP_NIC_Temp	OCP card temperature	OCP card	-
PCIe_NIC_Temp	PCIe NIC temperature	PCIe NIC	-
OCP_NIC_SFP_Temp	OCP card SFP temperature	SFP	-
PCIe_NIC_SFP_T	PCIe NIC SFP temperature	SFP	-
M.2_Temp	M.2 SSD temperature	M.2 SSD	-
E1.S_Temp	The maximum temperature among all E1.S SSDs	E1.S SSDs	-
HDD_BP_Temp	Drive backplane temperature	Drive backplane	-
PSUx_IIN	PSUx input current	PSUx	x indicates the PSU number with a value of 0 to 3
PSUx_IOUT	PSUx output current	PSUx	x indicates the PSU number with a value of 0 to 3

Sensor	Description	Sensor Location	Remarks
PCIe_HCA_Temp	Temperature of the HCA card in the PCIe slot	HCA card	-
PCIe_HCA_SFP_T	HCA card SFP temperature	SFP	-
P12V_CPU0_DIMM 1	CPU0 DIMM group 1 12 V voltage	Motherboard	-
P12V_CPU0_DIMM 2	CPU0 DIMM group 2 12 V voltage	Motherboard	-
DIMM1_Current	DIMM group 1 current	Motherboard	-
DIMM2_Current	DIMM group 2 current	Motherboard	-
CPU0_Status	CPU status	CPU	-
SEL_Status	SEL status	Virtual sensor	-
PSU_Mismatch	PSU model mismatch	PSUs	-
PSU_Redundant	PSU redundancy status	PSUs	-
PSUx_Status	PSUx status	PSUx	x indicates the PSU number with a value of 0 to 3
FANx_Status	FANx health status	FANx	x indicates the fan module number with a value of 0 to 5
FAN_Redundant	Fan redundancy status	Fans	-
PCIe_Status	Error status of PCIe expansion cards	PCIe expansion cards	-
POST_Status	POST status	Virtual sensor	-
PWR_CAP_Fail	Power capping failure	Motherboard	-
CPU0_CxD0	DIMM status	DIMM	x indicates the DIMM number with a value of A to L
ACPI_PWR	ACPI power status	Virtual sensor	-
Sys_Health	System health status	Motherboard	-

Sensor	Description	Sensor Location	Remarks
BIOS_Boot_Up	BIOS boot up complete	Virtual sensor	-
BMC_Boot_Up	BMC boot up complete	Virtual sensor	-
F_HDDx	Drive status	Drive	x indicates the drive number with a value of 0 to 5
TPM_Verify	TPM verification status	TPM	-
PWR_On_TMOUT	Power-on timeout	Virtual sensor	-
System_Error	Emergency system errors	Virtual sensor	-
CPU0 Prochot	CPU overtemperature	CPU	-
CPU0 Memhot	DIMM overtemperature	DIMMs	-
System Status	System status	Virtual sensor	-
CPU0 ThermalTrip	CPU thermal trip	CPU	-
UID_Button	The UID button is pressed	Right mounting ear	-
Power_Button	The power button is pressed	Right mounting ear	-
SysRestart	System restart cause	Virtual sensor	-
PWR_Drop	Voltage drop status	Motherboard	-
SysShutdown	System shutdown cause	Virtual sensor	-
Watchdog2	Watchdog 2 overflow and action	Virtual sensor	-
AMDFCH_Status	AMD CPU FCH status	CPU	-
AMDSATA_Status	AMD CPU SATA status	CPU	-
AMDUSB_Status	AMD CPU USB status	CPU	-
AMDSMN_Status	AMD CPU SMN status	CPU	-
Power_Limit	The power limit is exceeded	Virtual sensor	-

Sensor	Description	Sensor Location	Remarks
Thermal_Limit	The temperature limit is exceeded	Virtual sensor	-
FW_Update	Firmware update notification	Virtual sensor	-

13 Appendix B Acronyms and Abbreviations

A

AC	Alternating Current
ACPI	Advanced Configuration and Power Interface
AI	Artificial Intelligence
ANSI	American National Standards Institute
AQSIQ	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China
ARMA	Advanced Return Material Authorization

B

BIOS	Basic Input Output System
BLE	BIOS Lock Enable
BMC	Baseboard Management Controller
BP	Backplane

C

CAS	Column Address Strobe
CB	Certification Body
CE	Conformite Europeenne
CEN	European Committee for Standardization
CLI	Command-Line Interface
CMOS	Complementary Metal-Oxide-Semiconductor

CPLD	Complex Programmable Logic Device
CPU	Central Processing Unit
CXL	Compute Express Link

D

DC	Direct Current
DDR5	Double Data Rate 5
DIMM	Dual In-line Memory Module
DOA	Dead on Arrival
DRAM	Dynamic Random-Access Memory
DWPD	Drive Writes Per Day

E

ECC	Error-Correcting Code
ECMA	European Computer Manufacturer Association
EMC	Electromagnetic Compatibility
EN	European Norm
ESD	Electro-static Discharge

F

FCC	Federal Communications Commission
FCH	Fusion Controller Hub
FW	Firmware

G

GUI	Graphical User Interface

H

HBA	Host Bus Adapter
HCA	Host Channel Adapter
HDD	Hard Disk Drive
HHHL	Half-Height Half-Length
HSE	Health and Safety Executive
HTML	HyperText Markup Language
HTTPS	HyperText Transfer Protocol Secure

I

ID	Identification
IEC	International Electrotechnical Commission
I/O	Input/Output
IP	Internet Protocol
IPMI	Intelligent Platform Management Interface
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISA	International Society of Automation
ISO	International Organization for Standardization

K

KC	Korean Certification
KVM	Keyboard, Video, Mouse

L

LC	Lucent Connector
LDAP	Lightweight Directory Access Protocol
LED	Light Emitting Diode

M

MCIO	Mini Cool Edge Input/Output
ME	Management Engine

N

NBD	Next Business Day
NC-SI	Network Controller Sideband Interface
NIC	Network Interface Card
NIOSH	National Institute for Occupational Safety and Health
NVMe	Non-Volatile Memory Express

O

OCP	Open Compute Project
O&M	Operations and Maintenance
OS	Operating System

P

PCIe	Peripheral Component Interconnect Express
PDU	Power Distribution Unit
PID	Proportional, Integral, Derivative

POST	Power-On Self-Test
PSU	Power Supply Unit
PWR	Power

R

RAID	Redundant Arrays of Independent Disks
RAS	Reliability, Availability, Serviceability
RDIMM	Registered Dual In-line Memory Module
RDMA	Remote Direct Memory Access
RH	Relative Humidity
RJ45	Registered Jack 45
RMA	Return Material Authorization
RST	Reset
RTC	Real Time Clock

S

SAS	Serial Attached SCSI
SATA	Serial Advanced Technology Attachment
SCSI	Small Computer System Interface
SDP	System Demonstration Platform
SEL	System Event Log
SFF	Small Form Factor
SFP	Small Form-factor Pluggable
SLA	Service Level Agreements
SMASH	Systems Management Architecture for Server Hardware
SNMP	Simple Network Management Protocol

SSD	Solid State Drive
SSH	Secure Shell
STB	Standby
SYS	System
Syslog	System Log

T

TCM	Trusted Cryptography Module
TDP	Thermal Design Power
TF	TransFlash
TPM	Trusted Platform Module

U

UEFI	Unified Extensible Firmware Interface
UID	Unit Identification
UL	Underwriters Laboratories
USB	Universal Serial Bus

V

VGA	Video Graphics Array
VLAN	Virtual Local Area Network
VMD	Volume Management Device
VNC	Virtual Network Console
VR	Voltage Regulator
VRD	Voltage Regulator Down