



KAYTUS Server KE1160V1

White Paper

Document Version: V1.0
Release Date: August 22, 2023

Copyright © 2023 KAYTUS SINGAPORE PTE. LTD. All rights reserved.

No part of this document may be reproduced or transmitted in any form or by any means without prior written consent.

Technical Support

Global Service Hotline:	(+1) 844-860-0011/(+1) 325-880-0011
Address:	22 Sin Ming Lane, #06-76, Midview City, Singapore 573969 KAYTUS SINGAPORE PTE. LTD.
Website:	https://www.kaytus.com
Email:	servicesupport@kaytus.com

Environmental Protection

Please dispose of product packaging by recycling at a local recycling center for a greener planet.

Trademarks

All the trademarks or registered trademarks mentioned herein may be the property of their respective holders.

Security Statement

We are intensely focused on server product safety and have placed a high priority on this. For better understanding of our server products, carefully read through the following security risk statements.

- When servers are to be repurposed or retired, we recommended restoring their firmware factory settings, delete information and clear logs from BIOS and BMC to protect data privacy. Meanwhile, we recommend you to wipe the drive data thoroughly and securely with trusted erasing tools.-You can use InManage Server Provisioning. Contact us for specific server models to which InManage Server Provisioning is applicable.
- For server open source software statements, please contact us.
- Some interfaces and commands for production, assembly and return-to-depot, and advanced commands for locating faults, if used improperly, may cause equipment abnormality or business interruption. This is not described herein. Please contact us for such information.
- External ports of our servers do not use private protocols for communication.
- Our products will not initiative obtain or use your personal data. Only when you consent to use certain functions or services, some personal data such as IP address and email address for alerts may be obtained or used during business operation or fault location. We have implemented necessary measures on product functions to ensure personal data security throughout the data lifecycle, including but not limited to data collection, storage, use, transmission, and destruction. Meanwhile, you are obligated to establish necessary user privacy policies in accordance with applicable national/regional laws and regulations to fully protect user personal data.
- Committed to product data security, we have implemented necessary measures on product functions to protect system operation and security data throughout its lifecycle in strict accordance with relevant laws, regulations and supervision

requirements. As the owner of system operation and security data, you are obligated to establish necessary data security policies and take adequate measures in accordance with applicable national/regional laws and regulations to fully protect system operation and security data.

- We will remain committed to the safety of our products and solutions to achieve better customer satisfaction. We have established emergency response procedures and action plans for security vulnerabilities, so that product safety issues can be dealt with in a timely manner. Please contact us for any safety problems found or necessary support on security vulnerabilities when using our products.

Disclaimer

The purchased products, services and features shall be bound by the contract made between the customer and us. All or part of the products, services and features described herein may not be within your purchase or usage scope. Unless otherwise agreed in the contract, we make no express or implied statement or warranty on the contents herein. Images provided herein are for reference only and may contain information or features that do not apply to your purchased model. This document is only used as a guide. We shall not be liable for any damage, including but not limited to loss of profits, loss of information, interruption of business, personal injury, or any consequential damage incurred before, during, or after the use of our products. We assume you have sufficient knowledge of servers and are well trained in protecting yourself from personal injury or preventing product damages during operation and maintenance. The information in this document is subject to change without notice. We shall not be liable for technical or editorial errors or omissions contained in this document.

Abstract






This document describes the KE1160V1 server's appearance, features, performance parameters, and software and hardware compatibility of components, providing a profound understanding of KE1160V1.

Intended Audience

This white paper 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	2023/08/22	Initial release

Table of Contents

1	Product Overview	5
2	Features	6
2.1	High Performance	6
2.2	Stronger Environmental Adaptation	6
2.3	Flexible Scalability	6
2.4	Easy Operation and Maintenance	7
2.5	Compliance with OTII Specifications for 1U Servers.....	7
2.6	Clock Synchronization	7
2.7	Wireless Modules	9
3	System Parts Breakdown	10
4	System Architecture.....	11
4.1	Board System Architecture	11
4.2	System Architecture	12
5	Hardware Description.....	13
5.1	Front Panel.....	13
5.1.1	Front View.....	13
5.1.2	Front Panel Buttons and LEDs	13
5.1.3	Ports	14
5.2	Rear Panel.....	16
5.2.1	Rear View.....	16
5.2.2	LEDs and Buttons	16
5.2.3	Ports	17
5.3	Processors.....	17
5.4	Memory	19
5.5	Storage Drive	22
5.5.1	Drives.....	22
5.5.2	Drive LEDs	23
5.5.3	RAID Controller Card	23
5.6	Network	23
5.7	I/O Expansion	23
5.7.1	PCIe Card	23
5.7.2	PCIe Slot.....	24
5.7.3	PCIe Slot Description	24
5.8	Power Supply Unit.....	25
5.9	Fans	25
5.10	Single Board.....	26

5.10.1	Motherboard	26
5.10.2	Drive Backplane.....	27
6	Product Specifications	28
6.1	Technical Specifications	28
6.2	Environmental Specifications.....	30
6.3	Physical Specifications	32
7	Software and Hardware Compatibility.....	33
7.1	Operating System.....	33
7.2	Hardware Compatibility	34
7.2.1	CPU Specifications	34
7.2.2	Memory Specifications.....	34
7.2.3	Storage Specifications	34
7.2.4	SAS Card/RAID Controller Card Specifications	35
7.2.5	NIC Specifications	35
7.2.6	GPU Specifications	36
7.2.7	Power Supply Specifications.....	36
8	Regulatory Information	37
8.1	Security	37
8.1.1	General Statement.....	37
8.1.2	Personal Security	37
8.1.3	Equipment Safety	39
8.1.4	Precautions for Moving the Equipment.....	39
8.1.5	Weight Limit for Handling by a Single Person.....	40
9	Limited Warranty	41
9.1	Warranty Service	41
9.1.1	Remote Technical Support.....	41
9.1.2	RMA Service	42
9.1.3	ARMA Service	42
9.1.4	9 × 5 × NBD Onsite Service	42
9.1.5	24 × 7 × 4 Onsite Service	43
9.2	Our Service SLA	43
9.3	Warranty Exclusions	43
10	System Management.....	45
10.1	Intelligent Management System ISBMC	45
10.2	InManage	46
10.3	InManage Tools.....	50
11	Certification.....	51
12	Appendix A.....	52

12.1	Operating Temperature and Specification Limits	52
12.2	Model.....	53
12.3	RAS Features	53
12.4	Sensor List.....	53
13	Appendix B Terms	57
13.1	A - E.....	57
13.2	F - J.....	57
13.3	K - O	58
13.4	P - T.....	58
13.5	U - Z	59
14	Appendix C Abbreviations	60
14.1	A - E.....	60
14.2	F - J.....	61
14.3	K - O	62
14.4	P - T.....	63
14.5	U - Z	65

1 Product Overview

The KE1160V1 is a server optimized by us for communication and lightweight edge computing applications. It is developed based on the Open Telecom IT Infrastructure (OTII) specifications of the Open Data Center Committee (ODCC), an open source hardware organization in China. Besides, this server inherits the design concepts of openness, high performance, intelligence and flexibility of M5 servers. It features high performance, flexible scalability, lightweight structure and low power consumption in a healthy and open ecosystem, which makes it an ideal option for various types of enterprises covering Internet, communication, transportation, energy, finance and other industries that have special development needs for edge computing or intelligent edge services. With multiple functions such as computing, network and heterogeneous acceleration in a limited space, it is suitable for ICT convergence, 5G deployment, Industrial Internet, smart retail, smart manufacturing, and other scenarios that have high requirements for the deployment environment, bandwidth, and time synchronization, while meeting the server architecture design and computing performance requirements.

Figure 1-1 KE1160V1 Appearance



2 Features

The KE1160V1 maintains high quality, performance and reliability of our servers for edge computing applications. It adopts the ultimate design philosophy and exquisite manufacturing process in the improvement of scalability, manageability, energy efficiency and other aspects.

2.1 High Performance

- KE1160V1 supports 1 Intel® Xeon® D processor (Skylake-D) with up to 16 cores, 32 threads, a TDP of up to 105 W, a max Turbo frequency of 2.2 GHz and an L3 cache of 22 MB, enabling powerful processing capabilities.
- The CPU supports 4 channels and 4 DDR4 DIMMs with the capacity of 64 GB and the frequency of up to 2,666 MHz per DIMM.
- KE1160V1 supports up to 4 × 2.5-inch drive, enabling higher storage rates and capacity.
- Supports 4 onboard 10 GbE optical ports and up to 2 NICs (2 × 25 Gbps network port) to provide ultimate network performance.
- Supports 3 clock synchronization methods with nanosecond-level accuracy.

2.2 Stronger Environmental Adaptation

- The server is only 420 mm (16.54 in.) deep, nearly 1/2 shorter than that of general-purpose servers.
- Adaptability: Supports long-term operation in the temperature range of -5°C to +55°C (23°F to 131°F) and the humidity of 5% - 95% (expanded temperature) or 10% - 90% (normal temperature).
- Features Class B electromagnetic compatibility and dust-proof, corrosion-resistant and seismic design, meeting telecommunications standards.
- Wall mountable.

2.3 Flexible Scalability

- Up to 2 PCIe 3.0 slots for 2 PCIe x16 cards.
- Up to 2 FHFL PCIe x16 GPUs or heterogeneous accelerator cards.
- Supports wireless module expansion.

2.4 Easy Operation and Maintenance

- The modular design and front-side O&M improve the convenience and efficiency of O&M.
- Front I/O design and separated hot and cold air ducts improve the heat dissipation efficiency of the server room.

2.5 Compliance with OTII Specifications for 1U Servers

Open Telecom IT Infrastructure (OTII) project is developed by the Open Data Center Committee (ODCC), the largest open source hardware organization in China. It is the first server development and cooperation project giving priority to form customized, standard and consistent server technology solutions and products in terms of 5G and edge computing.

OTII 1U servers feature shallow depth, expanded temperature adaptability, front side maintenance and unified management ports, making them more suitable for wireless access to server rooms and edge server rooms with bad conditions, which is important for promoting the deployment of virtualized wireless BBU products in the future, exploring further development of edge computing services, and reducing the access transformation cost.

General technical requirements:

- 1U rack server, applicable to standard cabinets with the width of 482.6 (19 in.) and the depth of 600 mm (23.62 in.).
- Front side maintenance for switches, LEDs, drives, network cables and so on.
- Rear fans that support backup in case of a fan failure.
- Rear PSUs that adopt rear cable outlets by default. But it is recommended to reserve front cable outlets for such PSUs.
- Long-term stable operation at an ambient temperature within the range of -5°C to +55°C (23°F to 131°F).
- Unified management interfaces and enhanced management.
- Compatible with mainstream server operating systems and virtualization software.

2.6 Clock Synchronization

To meet the demand for synchronizing the high-precision time of base stations through wireless networks, three clock synchronization modes (GPS, IEEE 1588 and

cascade signaling) should be supported to adapt to different deployment environments. This server uses the PCIe slot pins as defined in the PCIe specification to pass 1PPS signals as per the OTII specifications, simplifying the installation and reducing the cable costs. The server motherboard is designed to allow for relevant signal connections. In addition, two RJ45 RS422 connectors are reserved on the front panel in accordance with the OTII specifications and are used to support cascade clock synchronization. See the table below for the definitions of the PCIe slot pins and the front panel RS422 connector pins.

Table 2-1 Special PCIe Slot Pins

PCIe Slot Pin No.	Original Pin	Reset Signal	Electrical Level	Signal Direction	Pin Description
A19	RSVD2	NIC_1588V2_PPS_OUT	3.3V LVCMOS	Motherboard output signal	Onboard NIC 1588 1PPS output signal, PCIe card 1PPS input signal
A32	RSVD4	NIC_1588V2_PPS_IN	3.3V LVCMOS	Motherboard input signal	Onboard NIC 1PPS input signal, PCIe card 1PPS output signal
A50	RSVD7	SLOT1_SLOT2_PPS	3.3V LVCMOS	Bidirectional signal	1PPS signal between 2 PCIe slots
B30	RSVD3	SYNC_CLK_OUTPUT	3.3V LVCMOS	Motherboard input signal	PCIe card outputs signals by referring to the clock when receiving the signals (optional)
B12	RSVD1	UART_TOD_TXD	3.3V LVCMOS	Motherboard input signal	PCIe card TOD serial port output signal (Slot2 only)
B82	RSVD6	UART_TOD_RXD	3.3V LVCMOS	Motherboard output signal	PCIe card TOD serial port input signal (Slot2 only)

Table 2-2 Front Panel RS422 Connector Pins

Pin No.	Pin Definition	Pin Description
1	NC	Hanging by default (high resistance)
2	NC	Hanging by default (high resistance)

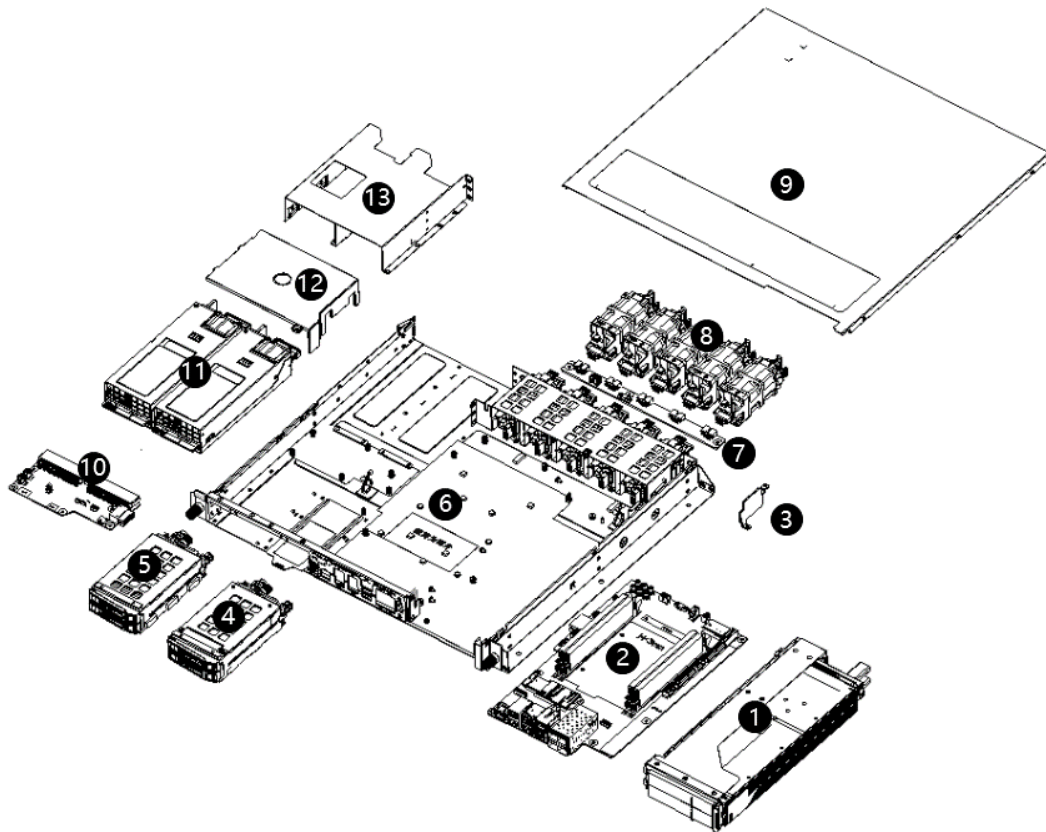
3	RS422_1_N	1PPS signal (negative)
4	GND	RS422 electrical level GND
5	GND	RS422 electrical level GND
6	RS422_1_P	1PPS signal (positive)
7	RS422_2_N	TOD information (negative)
8	RS422_2_P	TOD information (positive)

2.7 Wireless Modules

4/5G and Wi-Fi wireless networks are supported.

3 System Parts Breakdown

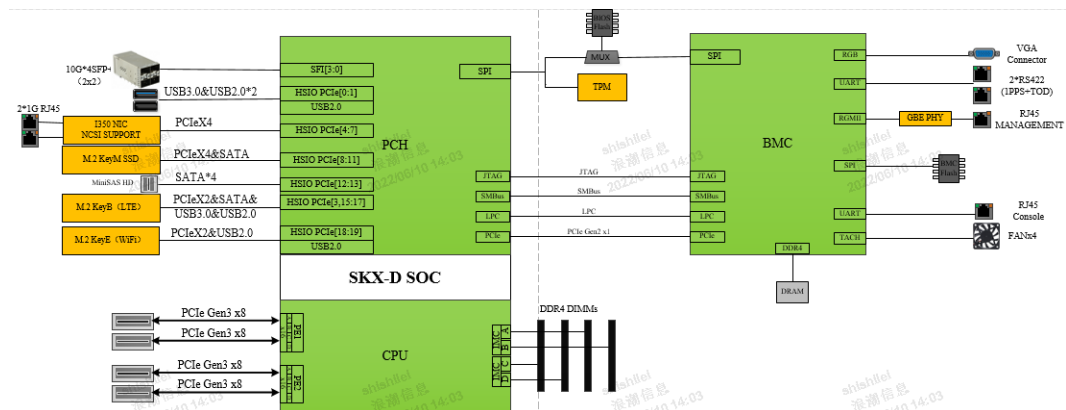
Figure 3-1 KE1160V1 System Parts Breakdown



Item	Feature	Item	Feature
1	PCIe	2	Motherboard
3	Air Duct 1	4	Drive Modules
5	Drive Modules	6	Chassis
7	Fan Board	8	Fans
9	Top Cover	10	Power Backplane
11	PSUs	12	Air Duct 2
13	PSU Cage		

4.1 Board System Architecture

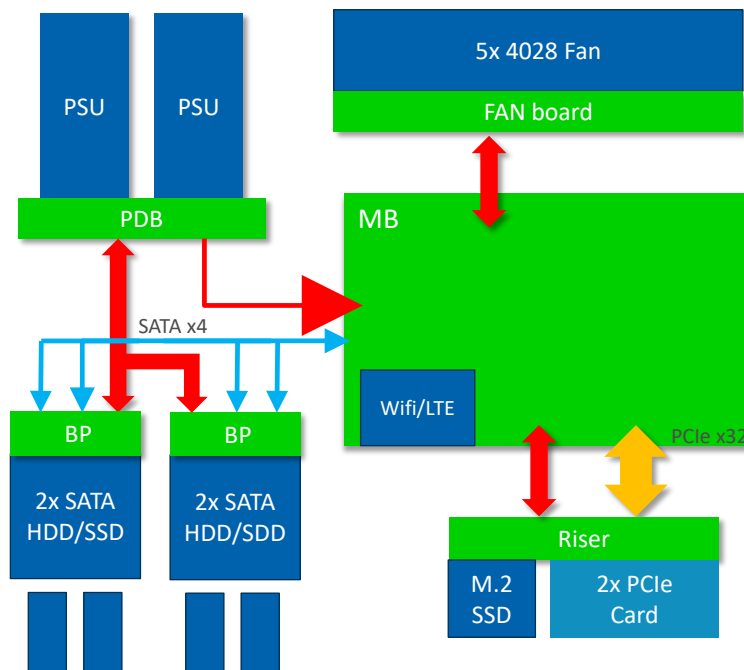
Figure 4-1 KE1160V1 Motherboard System Architecture



- KE1160V1 supports 1 Intel® Xeon® D processor (Skylake-D) with a TDP of up to 105 W.
- Supports 4 DIMMs.
- Supports 2 PCIe 3.0 x16 slots through a PCIe riser module and supports up to 2 FHFL single-width PCIe devices.
- Supports up to 4 × 2.5-inch SAS/SATA drive through 2 drive backplanes which can be directly connected to the CPU (PCH) or connected to it through an SAS PCIe card. Supports 1 internal M.2 SATA/NVMe drive, or 2 M.2 SATA drives expanded through M.2 RAID adapter.
- The motherboard supports 2 front USB 3.0 ports through CPU.
- The motherboard integrates an AST2500 management chip and supports an external Video Graphics Array (VGA) port, management network port, serial port, and TF card.
- Supports 4 onboard 10 GbE optical module ports, 2 onboard 1 GbE RJ45 ports and IEEE 1588v2. Supports 1PPS/TOD clock synchronization cascading port (RJ45).
- Supports LTE/5G/Wi-Fi (optional).

4.2 System Architecture

Figure 4-2 KE1160V1 System Architecture



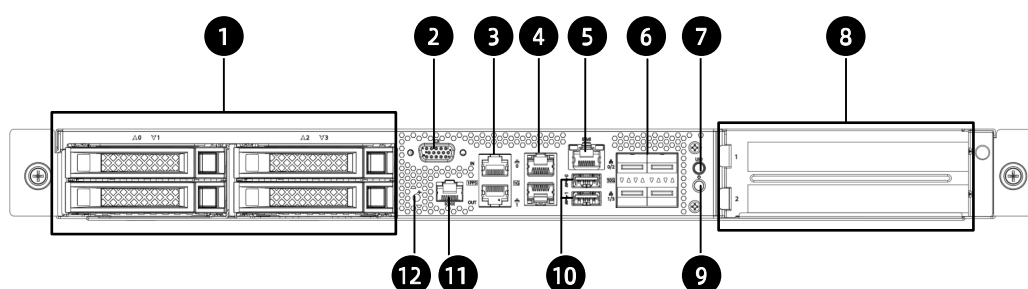
- KE1160V1 supports 4 SSDs directly connected to the CPU.
- The uplink bandwidth of the connection between CPU and riser is provided by a PCIe GenZ x32 riser card with 2 PCIe 3.0 x16 slots. The 2 x16 slots support standard PCIe devices and add-in clock accelerator cards.
- Supports LTE/5G/Wi-Fi (optional).
- Supports 5 single-rotor 4028 fans to reduce noise.
- Board-to-board connectors are used in power supply for simplified internal space and easy maintenance.

5 Hardware Description

5.1 Front Panel

5.1.1 Front View

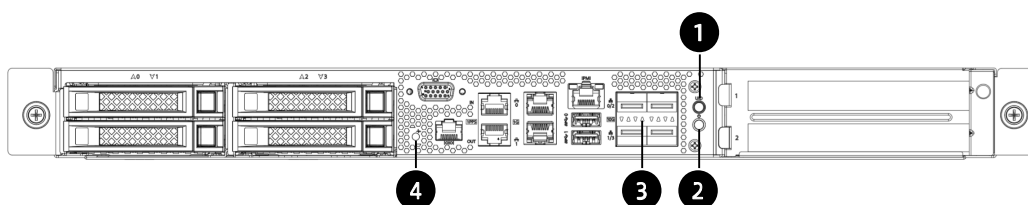
Figure 5-1 Front Panel



Item	Feature	Item	Feature
1	Drive Bays	7	UID/BMC RST Button
2	VGA Port	8	PCIe Slot × 2
3	Clock Synchronization Cascading Port (RJ45) × 2	9	PSU LED/Button
4	1 GbE Network Port (RJ45) × 2	10	USB 3.0 Port × 2
5	BMC Management Network Port	11	System Serial Port
6	10 GbE Network Port (SFP+) × 4	12	System Status LED

5.1.2 Front Panel Buttons and LEDs

Figure 5-2 Front Panel LEDs and Buttons



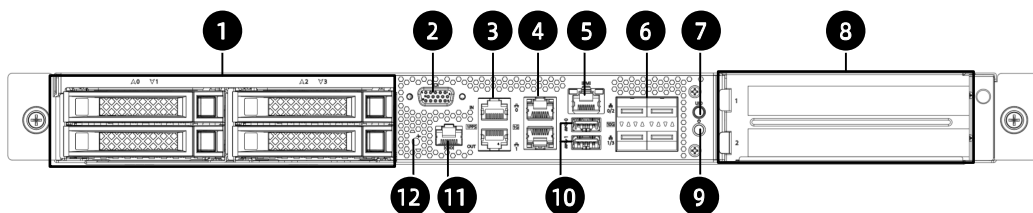
Item	Feature	Description
1	UID/BMC RST Button	<ul style="list-style-type: none"> Solid blue = UID LED is turned on manually or in the OS Flashing blue = KVM is launched or firmware

Item	Feature	Description
		update in process <ul style="list-style-type: none"> Long press 6s to force BMC to reset
2	Power Button and LED	<ul style="list-style-type: none"> Solid green = Power on state Solid amber = Standby state Long press 4s to force a shutdown Power button description: <ul style="list-style-type: none"> Short press the button in the power-on state to shut down the OS. Short press the button when the server is ready for startup to power on the server.
3	10 GbE Network Port LED	<ul style="list-style-type: none"> Solid green = Normal Flashing green = There is data transmission
4	System Status LED	<ul style="list-style-type: none"> Solid green = Normal Solid yellow = A warning occurs Solid red = A failure occurs

5.1.3 Ports

1. Port Location

Figure 5-3 Front Panel Ports







Item	Feature	Item	Feature
1	Drive Bays	7	UID/BMC RST Button
2	VGA Port	8	PCIe Slot (1-2)
3	Clock Synchronization Cascading Port (RJ45) × 2	9	PSU LED/Button

Item	Feature	Item	Feature
4	1 GbE Network Port (RJ45) × 2	10	USB 3.0 Port × 2
5	BMC Management Network Port	11	System Serial Port
6	10 GbE Network Port (SFP+) × 4	12	System Status LED

2. Port Description

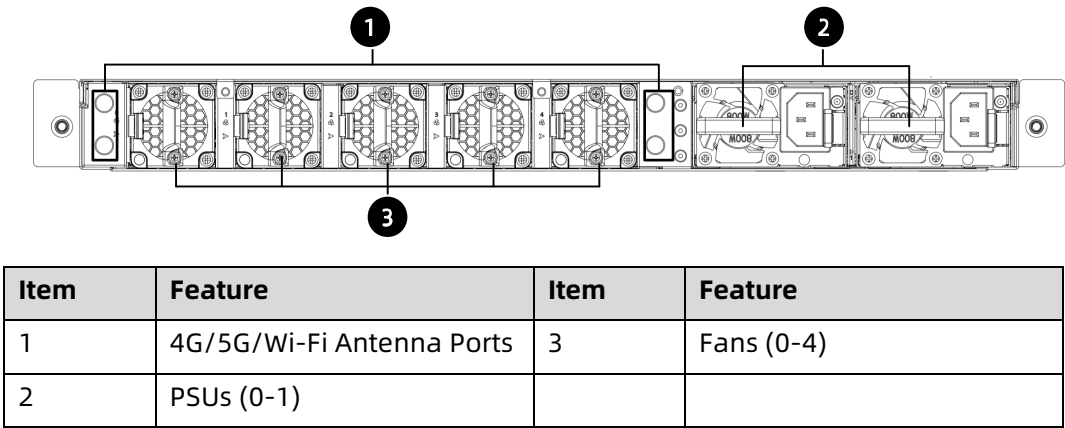
Table 5-1 Front Panel Ports

Port	Type	Quantity	Description
System Serial Port	RJ45	1	<p>Enables you to capture system logs and use the BMC debugging function</p> <p> <small>NOTE</small> The RJ45 serial port with a default baud rate of 115,200 bit/s is used.</p>
Management Network Port	RJ45	1	<p>An iSBMC management network port that enables you to manage the server</p> <p> <small>NOTE</small> It is a 1 GbE network port of 100/1,000 Mbps (auto-negotiation).</p>
VGA Port	DB15	1	Enables you to connect a display terminal, for example, a monitor or keyboard, video and mouse (KVM), to the system
USB Port	USB 3.0	2	<p>Enables you to connect a USB 2.0 or 3.0 device to the system</p> <p> <small>IMPORTANT</small> When using an external USB device, the maximum current supported by the USB device connected is 0.9 A. Make sure the USB device is in good condition or it may cause the server to work abnormally.</p>
Network Port	SFP	2	<p>Enables you to connect an SFP optical module to the system</p> <p> <small>NOTE</small> It is a 10 GbE network port of 1,000/10,000 Mbps (auto-negotiation).</p>

5.2 Rear Panel

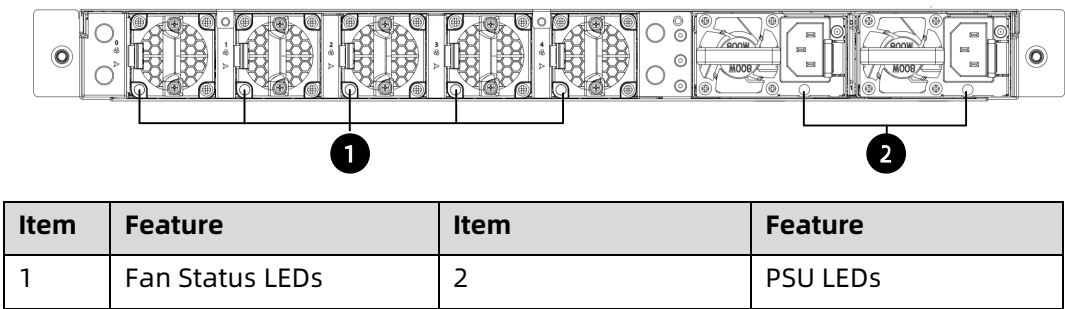
5.2.1 Rear View

Figure 5-4 Rear Panel



5.2.2 LEDs and Buttons

Figure 5-5 Rear Panel LEDs



1. LED and Button Description

Table 5-2 Description of Rear Panel LEDs

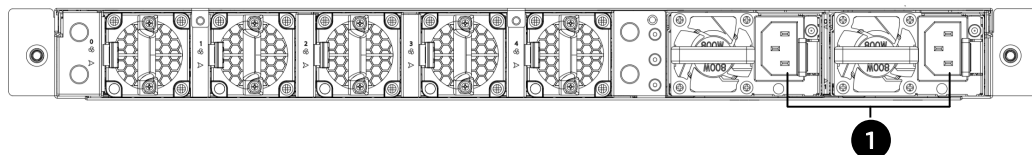
LED	Description
PSU LEDs	<ul style="list-style-type: none">• Solid green = Normal• Off = No AC power to PSU• Solid amber = PSU critical event causing a shutdown• Flashing amber at 1 Hz = PSU warning event where the PSU continues to operate• Flashing green at 1 Hz = PSU operating in standby mode

LED	Description
	<p>with AC input</p> <ul style="list-style-type: none"> Flashing green at 0.33 Hz (on for 2 seconds and off for 1 second) = PSU in cold redundant state Flashing green at 2 Hz = PSU firmware updating
Fan Status LEDs	<ul style="list-style-type: none"> Off = Normal Solid red = A fan failure occurs

5.2.3 Ports

1. Port Locations


Figure 5-6 Rear Panel Ports



Item	Feature
1	PSU Ports

2. Port Description

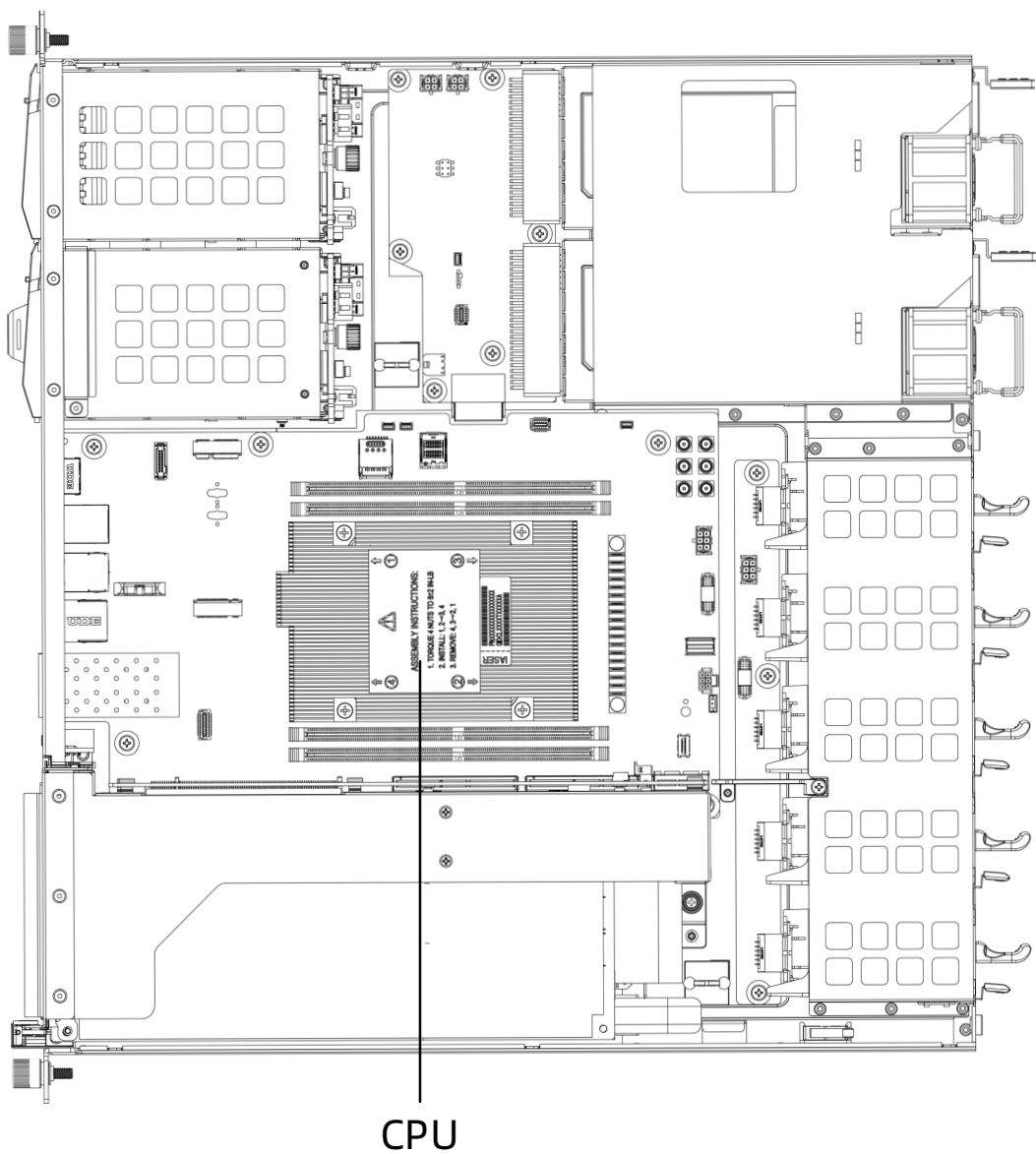
Table 5-3 Rear Panel Ports

Port	Type	Quantity	Description
PSU Port	-	4	<p>Connected through a power cord. User can optionally configure the PSUs as required</p> <p> NOTE Make sure that the rated power of the PSUs is greater than that of the server when selecting PSUs.</p>

5.3 Processors

- KE1160V1 supports 1 onboard processor. The processor is installed beneath the heatsink and cannot be replaced.

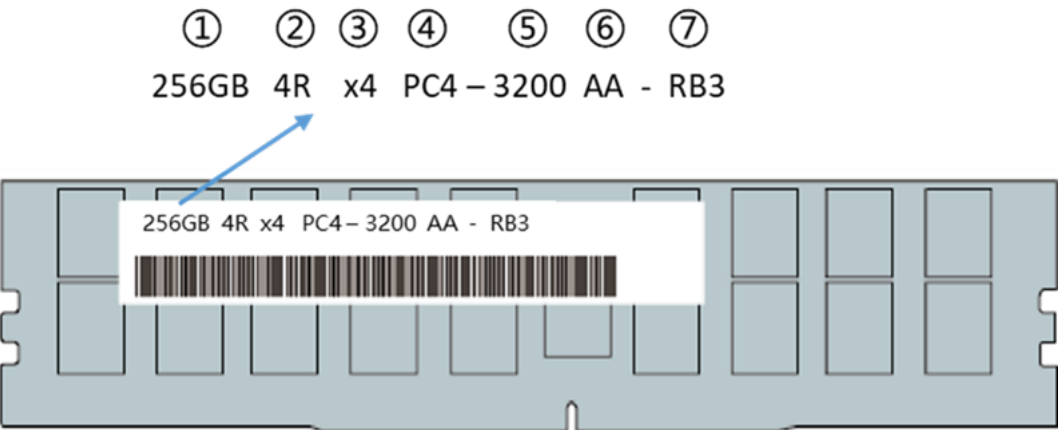
Figure 5-7 Processor Location



5.4 Memory

1. DIMM Identification

Figure 5-8 DIMM Identification



Item	Description	Example
1	Capacity	<ul style="list-style-type: none">• 16 GB• 32 GB• 64 GB
2	Rank(s)	<ul style="list-style-type: none">• 1R = Single rank• 2R = Dual rank• 2S2R = 3DS 2Hi 2 rank• 4DR = DDP 4 rank• 4R = Quad rank
3	Data width of DRAM	<ul style="list-style-type: none">• x4 = 4 bits• x8 = 8 bits
4	DIMM slot type	PC4 = DDR4
5	Maximum memory speed	<ul style="list-style-type: none">• 2,933 MT/s• 3,200 MT/s
6	CAS latency time	SDP chip based <ul style="list-style-type: none">• V = CAS 19-19-19

Item	Description	Example
		<ul style="list-style-type: none"> Y = CAS 21-21-21 AA = CAS 22-22-22 3DS chip based <ul style="list-style-type: none"> V = CAS 22-19-19 Y = CAS 24-21-21 AA = CAS 26-22-22
7	DIMM type	<ul style="list-style-type: none"> R = RDIMM L = LRDIMM

2. DIMM Subsystem Architecture

The server supports 4 DIMM slots.

Install DIMMs in the slots of active DIMM channels first. DIMMs in the standby channels cannot be used normally if no DIMMs are installed in the active channels.

Table 5-4 Channel Composition

Channel Allocation	Channel ID	Composition
CPU0	Channel A	CPU0_CAD0
	Channel B	CPU0_CBD0
	Channel D	CPU0_CDD0
	Channel E	CPU0_CED0

3. DIMM Compatibility

Configure the DDR4 DIMMs by referring to the rules as follows:



IMPORTANT

- The server must use DDR4 DIMMs of the same Part No. (P/N code) with the operating speed at the lowest value of each item below:
 - The memory speed supported by a specific CPU.
 - The maximum working speed of a specific memory configuration.
- Mixed use of DDR4 DIMMs of different types and specifications (capacity, bit width, rank, height, and so on) is not supported.
- For specific system options, consult your local sales representative or refer to

Table 5-5 DDR4 DIMM Parameters

Parameter		Value		
Capacity per DDR4 DIMM (GB)		16	32	64
Type		RDIMM/LRDIMM	RDIMM/LRDIMM	RDIMM/LRDIMM
Rated speed (MT/s)		3,200	3,200	3,200
Operating voltage (V)		1.2	1.2	1.2
Maximum quantity of DDR4 DIMMs supported in the server ^a		32	32	32
Maximum capacity of DDR4 DIMMs supported in the server (GB) ^b		512	1,024	2,048
Actual speed (MT/s)	1DPC ^c	3,200	3,200	3,200
	2DPC	2,933	2,933	2,933
<p>a: The maximum number of DDR4 DIMMs supported is based on the 2-processor configuration. If the 1-processor configuration is selected, the number should be halved.</p> <p>b: The maximum capacity of DDR4 DIMMs supported needs to consider the CPU type, and its maximum value at full load is selected here.</p> <p>c: DIMM Per Channel (DPC), the number of DIMMs configured per memory channel.</p> <p>The above information is for reference only. Please consult your local sales representative for details.</p>				

4. DIMM Population Rules



NOTE

This section describes the DIMM population rules when DDR4 DIMMs are fully configured.

General population rules for DDR4 DIMMs:

- Mixed use of LRDIMMs and RDIMMs is not allowed.
- Install dummies in the DIMM slots where no DIMMs are installed.

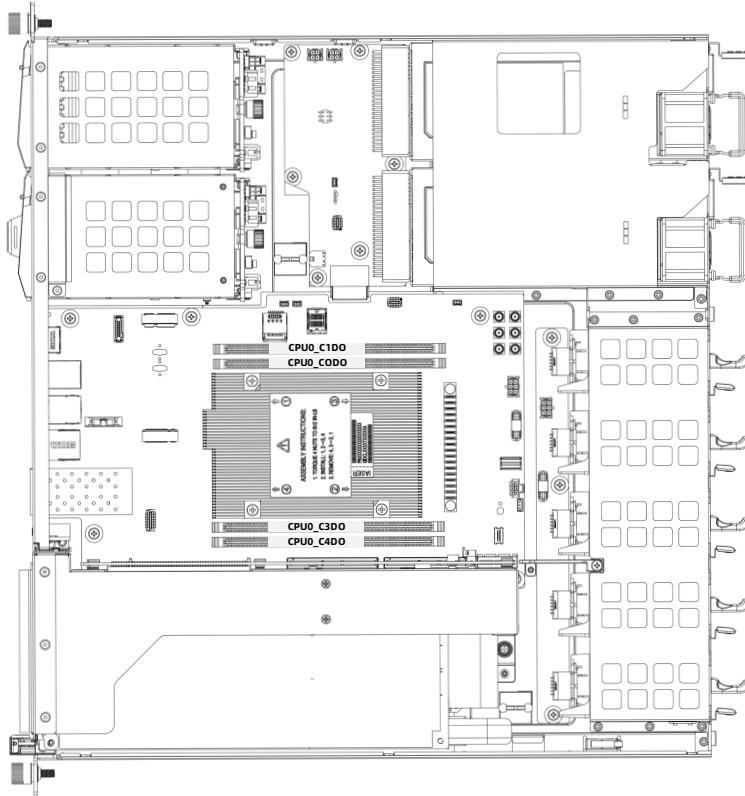
Population rules for DDR4 DIMMs in the standby mode:

- Follow the general population rules.
- The online standby configuration for each channel must be valid.

- Each channel can have a different active online standby configuration.
- Each channel with a DIMM installed must have a spare column.

5. DIMM Slot Layout

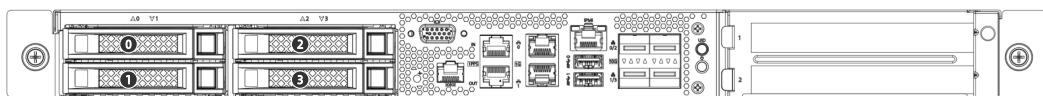
Figure 5-9 DIMM Location and Codes



5.5 Storage Drive

5.5.1 Drives

Figure 5-10 Drive Codes



5.5.2 Drive LEDs

Figure 5-11 Drive Tray LEDs

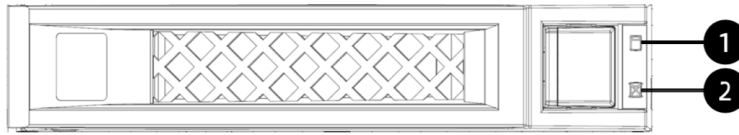


Table 5-6 Drive Tray LED Description

Item	Feature	Description
1	Activity LED	Solid green = Drive is present but not in use Flashing green = Drive is present and in use
2	Error LED	Solid red = Drive error or failure Solid blue = Drive is being located Solid pink = RAID rebuilding

5.5.3 RAID Controller Card

A RAID controller card provides functions such as RAID configuration, RAID level migration, and disk roaming.

- For specific system options, consult your local sales representative or refer to [7.2 Hardware Compatibility](#).

5.6 Network

The server supports multiple types of network expansion.

- Supports 4 onboard 10 GbE optical module ports.
- Supports 2 onboard 1 GbE RJ45 ports.
- The PCIe expansion slot supports up to 2 PCIe NICs and can be configured as required.
- For specific system options, consult your local sales representative or refer to [7.2 Hardware Compatibility](#).

5.7 I/O Expansion

5.7.1 PCIe Card

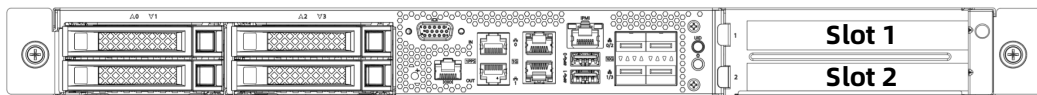
The PCIe card offers system scalability.

- Supports up to 2 PCIe 3.0 expansion slots.
- PCIe riser module provides the slots including Slot1 and Slot2.
- For specific system options, consult your local sales representative or refer to [7.2 Hardware Compatibility](#).

5.7.2 PCIe Slot

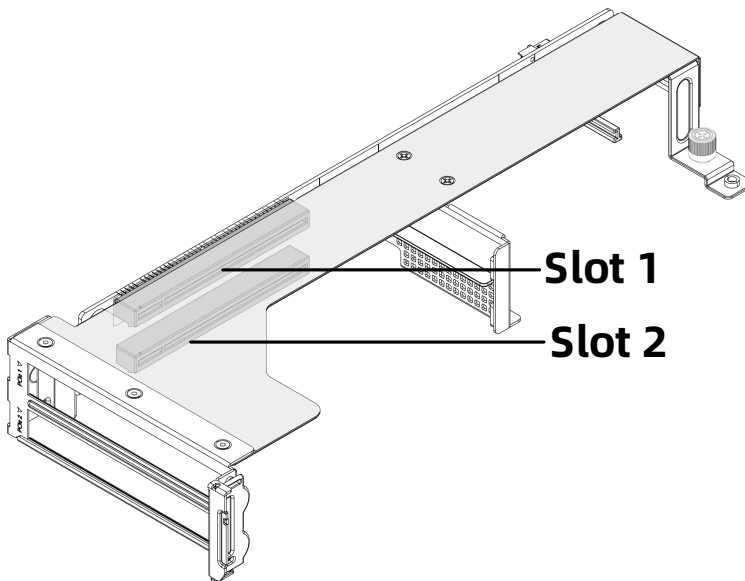
1. PCIe Slot Location

Figure 5-12 PCIe Slots - Front View of Chassis



2. PCIe Riser Module

Figure 5-13 PCIe Riser Module



5.7.3 PCIe Slot Description

Table 5-7 PCIe Slot Description

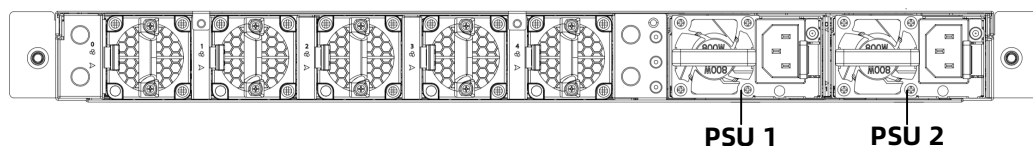
PCIe Slot	Owner	PCIe Standard	Connector Bandwidth	Bus Bandwidth	Form Factor
Slot1	CPU0	PCIe 3.0	x16	x16	FHFL
Slot2	CPU0	PCIe 3.0	x16	x16	FHFL

- A PCIe x16 slot is compatible with a PCIe card with the bus bandwidth of x16, x8, x4, or x1. It is not upward compatible, that is, the bandwidth of the PCIe slot should be larger than that of the inserted PCIe card.
- A FHFL PCIe slot is compatible with FHFL PCIe card, FHHL PCIe card, and HHHL PCIe card.
- The power supply capacity of each PCIe slot is up to 75 W.

5.8 Power Supply Unit

- Supports AC or DC PSUs.
- Hot-swappable.
- Supports 1 or 2 PSUs. Supports 1+1 redundant backup when 2 PSUs are configured.
- The server must use PSUs of the same Part No. (P/N code).
- Provides short-circuit protection, and provides bipolar fuses for PSUs supporting dual-live-wire input.
- For specific system options, consult your local sales representative or refer to [7.2 Hardware Compatibility](#).

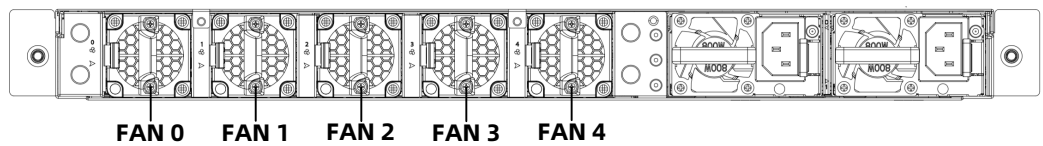
Figure 5-14 PSU Location



5.9 Fans

- Supports 5 fan modules (4028).
- Hot-swappable.
- Supports N+1 redundancy, which means that the server can continue working properly when a single fan fails.
- Supports intelligent fan speed control.
- Fan modules configured in the same server must have the same Part No. (P/N code).

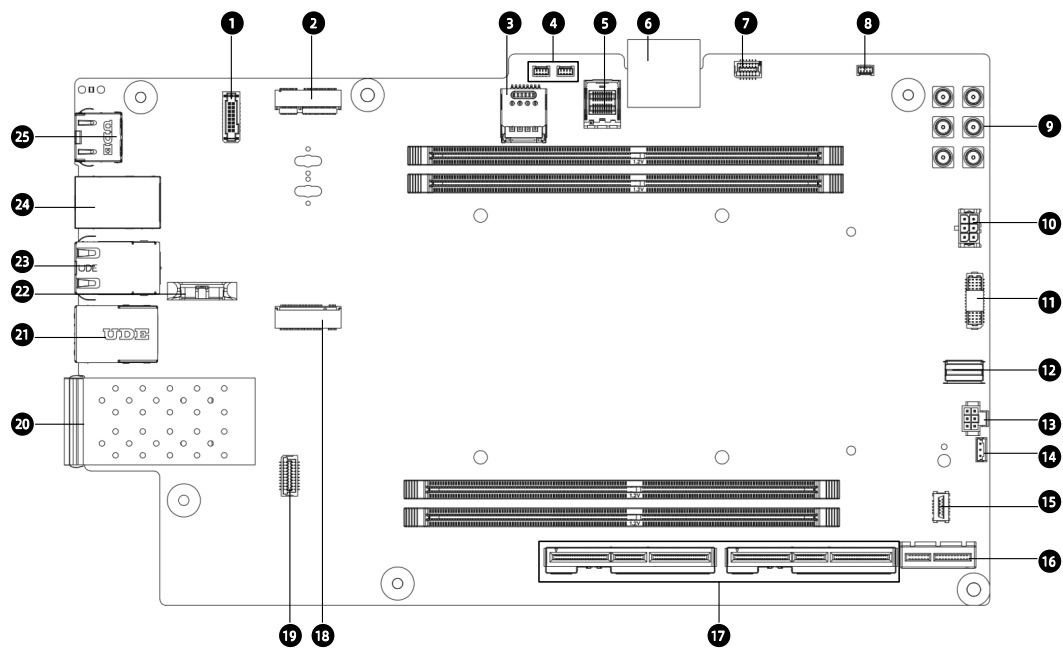
Figure 5-15 Fan Module Location



5.10 Single Board

5.10.1 Motherboard

Figure 5-16 KE1160V1 Motherboard



Item	Feature	Item	Feature
1	VGA Port	14	Intrusion Switch Connector
2	Wi-Fi Module Slot	15	TPM Connector
3	SIM Slot	16	PCIe_Riser Card Power Slot
4	Drive Backplane I ² C Connector	17	PCIe_Riser Card Slot
5	SATA Connector	18	LTE Module Slot
6	Power Supply Connector	19	I/O Board Connector
7	PSU Board Management Connector	20	10 GbE Network Port (SFP+) × 4
8	Power Board I ² C Connector	21	USB 3.0 Port × 2 and BMC Management Network Port
9	Reserved Clock Connector	22	Battery Socket

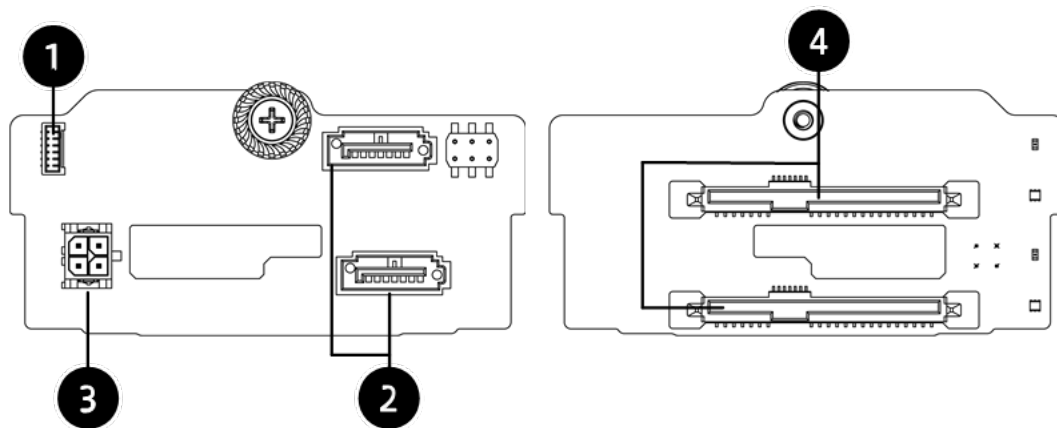
Item	Feature	Item	Feature
10	Fan Board Power Connector	23	1 GbE Network Port (RJ45) × 2
11	Fan Board Control Connector	24	Clock Synchronization Cascading Port (RJ45) × 2
12	M.2 SSD Connector	25	System Serial Port
13	PCIe Card Power Connector		

5.10.2 Drive Backplane

1. Front Drive Backplane

- HDD0 and HDD1: Supports 2.5-inch SAS/SATA drive pass-through configuration.
- HDD2 and HDD3: Supports 2.5-inch SAS/SATA drive pass-through configuration.

Figure 5-17 Backplane for 2.5-inch Drive Pass-through Configuration











Item	Feature	Item	Feature
1	VPP Connector	2	Slimline Connector
3	Power Connector	4	SAS Connector

6 Product Specifications

6.1 Technical Specifications

Table 6-1 Technical Specifications

Item	Description
Form Factor	1U rack server
Processor	<p>Supports 1 processor</p> <ul style="list-style-type: none">• Supports 1 Intel® Xeon® D processor (Skylake-D)• Integrated memory controller and 4 memory channels• Supports integrated PCIe controllers and PCIe 3.0 with 32 lanes• Up to 16 cores• Max Turbo frequency of 2.2 GHz• Minimum L3 cache per core is 1.375 MB• TDP up to 105 W <p> NOTE</p> <p>The above information is for reference only, see 7.2 Hardware Compatibility for details.</p>
Memory	<p>Supports 4 DIMM slots</p> <ul style="list-style-type: none">• Supports up to 4 DDR4 DIMMs<ul style="list-style-type: none">- Supports RDIMM or LRDIMM- Maximum transmit rate is 2,666 MT/s- Mixed use of DDR4 DIMMs of different types (RDIMM and LRDIMM) and specifications (capacity, bit width, rank, and height) is not supported- The server must use DDR4 DIMMs of the same Part No. (P/N code) <p> NOTE</p> <p>The above information is for reference only, see 7.2 Hardware Compatibility for details.</p>
Storage Drive	<ul style="list-style-type: none">• Supports up to 4 × 2.5-inch SAS/SATA drive• Supports 1 × SATA/PCIe M.2 SSD <p> NOTE</p> <ul style="list-style-type: none">• The M.2 SSD is only used as a boot device for installing the operating system.• The M.2 SSD has low endurance and cannot be used as a data storage device, especially in scenarios with frequent data erase and write,


Item	Description
	<p>because it may have write risk within a short period of time, resulting in damage and unavailability.</p> <ul style="list-style-type: none"> • If it is used as a data storage device, please replace it with an enterprise-grade SSD or HDD with higher DWPD. • Write-intensive service software will cause the M.2 SSD to run out of write endurance and then become permanently damaged; therefore, the M.2 SSD is not recommended for such service scenarios. • Do not use the M.2 SSD for caching. • Supports 2.5-inch hot-swap SAS/SATA/NVMe drives. <p> NOTE</p> <ul style="list-style-type: none"> • Supports RAID controller cards, see 7.2 Hardware Compatibility for details. <ul style="list-style-type: none"> - Supports functions such as RAID configuration, RAID level migration, and disk roaming. - A RAID controller card occupies one PCIe slot.
Network	<p>Supports multiple types of network expansion</p> <ul style="list-style-type: none"> • Supports 4 onboard 10 GbE optical module ports • Supports 2 onboard 1 GbE RJ45 ports <p> NOTE</p> <p>Supports multiple models of NICs, see 7.2 Hardware Compatibility for details.</p>
I/O Expansion	<p>Supports PCIe expansion slots</p> <ul style="list-style-type: none"> • Supports 2 front PCIe 3.0 x16 75 W expansion slots <p> NOTE</p> <p>The above information is for reference only, see 7.2 Hardware Compatibility for details.</p>
Port	<p>Supports multiple ports</p> <ul style="list-style-type: none"> • Front panel: <ul style="list-style-type: none"> - 2 × USB 3.0 port - 1 × RJ45 IPMI management port - 1 × DB15 VGA port - 1 × 3.5 mm jack - 2 × clock synchronization cascading RJ45 port - 4 × onboard 10 GbE SFP+ optical module port - 2 × onboard 1 GbE RJ45 port <p> NOTE</p> <p>Installation of operating system on USB mobile storage media is not recommended.</p>
Display Controller	<ul style="list-style-type: none"> • Internally integrated ASPEED AST2500 • Up to a resolution of 1,900 × 1,200 <p> NOTE</p> <ul style="list-style-type: none"> • The integrated display controller can support a maximum resolution of 1,900 × 1,200 only when the graphics card driver matching the OS version is installed; otherwise only the default resolution of the OS is supported.

Item	Description
System Management	<ul style="list-style-type: none"> • UEFI • ISBMC • InManage
Security Features	<ul style="list-style-type: none"> • Trusted Platform Module (TPM) 2.0 • Firmware update mechanism based on digital signature • UEFI Secure Boot • Hierarchical BIOS password protection • BIOS Secure Flash and BIOS Lock Enable (BLE) • BMC and BIOS dual mirroring mechanism • Chassis intrusion detection

6.2 Environmental Specifications

Table 6-2 Environmental Specifications

Temperature ⁽¹⁾	<ul style="list-style-type: none"> • Operating temperature: -5°C to +55°C (23°F to 131°F) • Storage temperature (packed): -40°C to +70°C (-40°F to +158°F) • Storage temperature (unpacked): -40°C to +70°C (-40°F to +158°F)
Relative humidity (RH, non-condensing)	<ul style="list-style-type: none"> • Operating humidity: 5% - 95% RH • Storage humidity (packed): 5% - 95% RH • Storage humidity (unpacked): 5% - 95% RH
Operating altitude	<p>≤ 3,048 m (10,000 ft)</p> <ul style="list-style-type: none"> • Operating temperature: -5°C to +55°C (23°F to 131°F) at 0 - 950 m (0 - 3,117 ft). • Above 950 m (3,117 ft): Every 125 m increase in the altitude above sea level reduces the operating temperature range by 1.0°C (a 1.8°F drop per 410 ft).
Corrosive airborne contaminants	<p>Maximum growth rate of corrosion product thickness:</p> <ul style="list-style-type: none"> • Copper test piece: 300 Å/month (compliant with the gaseous corrosivity level of G1 defined in ANSI/ISA-71.04-2013) • Silver test piece: 200 Å/month

Particulate contaminants	<ul style="list-style-type: none"> Comply with the data center cleanliness classification of Class 8 provided in ISO 14664-1 The server room must be free of explosive, conductive, magnetic, and corrosive dust  NOTE It is recommended to hire a professional organization to monitor the particulate contaminants in the server room.
Noise ^(2,3,4,5)	<p>At an operating temperature of 23°C (73.4°F), the declared A-weighted sound power levels (LWAd) and the declared average bystander position A-weighted sound pressure levels (LpAm) are as follows in accordance with ISO 7779 (ECMA-74) and ISO 9296 (ECMA-109):</p> <ul style="list-style-type: none"> Idle: <ul style="list-style-type: none"> LWAd: 4.9 B LpAm: 36.3 dBA Operating: <ul style="list-style-type: none"> LWAd: 5.6B LpAm: 44.4 dBA



CAUTION

- Standard operating temperature: -5°C to +55°C (23°F to 131°F) at sea level. At an altitude above 950 m (3,117 ft), 125 m increase in the altitude above sea level reduces the operating temperature range by 1.0°C (a 1.8°F drop per 410 ft). The maximum operating altitude is 3,048 m (10,000 ft). The altitude and maximum temperature change rate vary with different system configurations. Any fan failure or operations above 30°C (86°F) may lead to system performance degradation.
- This document lists the weighted sound power level (LWAd) of the product at an operating temperature of 23°C (73.4°F). The values were reported according to the ISO 7779 (ECMA-74) noise measurement standards and ISO 9296 (ECMA-109). The listed sound levels are applicable to general shipping configurations and other options may increase the volume. Please contact your sales representative for more information.
- The sound levels shown here were measured based on specific test configurations. The sound level will vary with different system configurations. Values are subject to change without notice and are for reference only.
- The sample (model) test assessments meet the referenced product specifications. This product or product series is eligible to have appropriate compliance labels and declarations.
- All sound levels listed are for standard shipping configurations and other

system configurations may increase the volume.

6.3 Physical Specifications

Table 6-3 Physical Specifications

Indicator	Description
Dimensions (W × H × D)	<ul style="list-style-type: none">• With mounting ears: 482 × 43.4 × 420 mm (18.98 × 1.71 × 16.54 in.)• Without mounting ears: 448 × 43.4 × 420 mm (17.64 × 1.71 × 16.54 in.)• Including package: 729 × 248 × 654 mm (28.70 × 9.76 × 25.75 in.)
Installation dimension requirements	<ul style="list-style-type: none">• Installation requirements for the cabinet are as follows:<ul style="list-style-type: none">- 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:<ul style="list-style-type: none">- L-shaped slide rails: Only applicable to our cabinets- Static slide rail kit: The distance between the mounting bars at the front and rear of the cabinet ranges between 711 - 910 mm (27.99 - 35.83 in.)
Weight	Gross weight (packed): 14.9 kg (32.85 lbs) (including chassis + packaging box + rails + accessory box)

7 Software and Hardware Compatibility

This section describes the compatibility information of OSs and hardware. For the latest compatibility configuration and the parts and models not listed in this document, please contact your local sales representative.



IMPORTANT

- Use of non-compatible components may cause equipment abnormality, and such kind of failures is not covered by technical support or warranty.
- The performance of a server is strongly related to application software, middleware basic software, and hardware. Some subtle differences in application software, middleware foundation software and hardware may cause inconsistent performance at the application level and test software level.
 - If you have performance-related requirements on specific application software, contact your local sales representative to request for the proof of concept (POC) to confirm the detailed hardware and software configurations before procurement.
 - If you have requirements on consistency of hardware performance, specific configuration requirements (such as specific drive models, specific RAID controller cards, and specific firmware versions) need to be identified before procurement.

7.1 Operating System

Table 7-1 Operating System

Manufacturer	Version
Red Hat	Red Hat Enterprise Linux 7.3
Red Hat	Red Hat Enterprise Linux 8.0
CentOS	CentOS Linux 6.9
CentOS	CentOS Linux 8.0
SLES	SLES12SP2
SLES	SLES15
Ubuntu	Ubuntu16.04
Ubuntu	Ubuntu18.04
Windows Server	WS2016

Manufacturer	Version
Windows Server	WS2019
Neokylin	NeoKylin Linux Advanced Server 7.4

7.2 Hardware Compatibility

7.2.1 CPU Specifications

KE1160V1 supports 1 Skylake-D processor.

Table 7-2 CPU Specifications

Model	Cores	Thread Count	Base Frequency	Max Turbo Frequency	Cache	TDP
2177NT	14	28	1.90 GHz	3.00 GHz	19 MB	105 W
2123IT	4	8	2.20 GHz	3.00 GHz	8 MB	60 W
2143IT	8	16	2.20 GHz	3.00 GHz	11 MB	65 W
2163IT	12	24	2.10 GHz	3.00 GHz	17 MB	75 W
2183IT	16	32	2.20 GHz	3.00 GHz	22 MB	100 W

7.2.2 Memory Specifications

KE1160V1 supports up to 4 DDR4 DIMMs. Each processor supports 4 memory channels, and each channel supports 1 DIMM slot. Supports RDIMM/LRDIMM.

Table 7-3 Memory Specifications

Type	Capacity	Frequency	Data Width	Organization
RDIMM	16 GB	3,200 MHz	x72	1R × 4/2R × 8
RDIMM	16 GB	2,933 MHz	x72	2R × 8
RDIMM	32 GB	3,200 MHz	x72	2R × 4
RDIMM	32 GB	2,933 MHz	x72	2R × 4
LRDIMM	64 GB	2,933 MHz	x72	4R × 4

7.2.3 Storage Specifications

Table 7-4 HDD Specifications

Model	Speed in rpm	Capacity	Max. Qty.
2.5-inch SAS HDD	10K	600 GB/900 GB/1.2 TB/1.8 TB/2.4 TB	4

2.5-inch SATA HDD	7.2K	1 TB/2 TB	4
----------------------	------	-----------	---

Table 7-5 SSD Specifications

Model	Capacity	Max. Qty.
M.2 SSD	240 GB	2
M.2 SSD	480 GB	2
SATA SSD	240 GB	4
SATA SSD	480 GB	4
SATA SSD	960 GB	4
SATA SSD	1.92 TB	4
SATA SSD	3.84 TB	4

7.2.4 SAS Card/RAID Controller Card Specifications

Table 7-6 SAS Card/RAID Controller Card Specifications

Type	Model and Description
SAS Card	SAS3008+IT+PCIe3.0
SAS Card	PM8222_PM8222_8_SAS3_PClc
SAS Card	PM8222_SmarHBA_8_SAS3_PClc3
SAS Card	SAS3008+IR+PCIe3.0
SAS Card	SAS3008+IT+PCIe3.0
RAID Controller Card	SAS_3008_8_128Mb_12G_3
RAID Controller Card	SAS3108_2GB_SAS12G_PClc3
RAID Controller Card	SND_2R0_9230_N_M.2_PClc2

7.2.5 NIC Specifications

Table 7-7 NIC Specifications

Type	Model and Description	Speed (Gbps)	Quantity
PCIe	10G_X710DA4FH_LC_PClcx8_4_XR	10	4
PCIe	82599ES_LC_PClcx8_10G_DUAL	10	2
PCIe	Pyxis_X550_10G_RJ_PClcx8_2_XR	10	2
PCIe	10G_X550T2_RJ_PClcx4_2_XR	10	2
PCIe	I350-AM2_RJ_PClcx4_1KM_DUAL	1	4
PCIe	I350AM4_1G_RJ45_PClcx8_TETRAD	1	4
PCIe	5180M5_I350AM4_1G_RJ_PClcx8_4,A.13	1	4

Type	Model and Description	Speed (Gbps)	Quantity
PCIe	25G_MCX512A-ACAT_LC_PClx8_2_XR	25	2

7.2.6 GPU Specifications

Table 7-8 GPU Specifications

Type	Model and Description	Max. Qty.
NVLink	GPU_NV_16GB_Tesla-T4_256b_P	2

7.2.7 Power Supply Specifications

Supports 1+1 redundant hot-swap Intel CRPS PSUs, up to 2 PSUs, meeting general electrical and structural design requirements. The PSUs can be inserted into the power bay and locked automatically, enabling tool-less maintenance. CRPS PSUs are 80 PLUS Platinum and Titanium rated, and offer various output powers, allowing customers to choose based on the actual configuration.

- The following rated 110 Vac - 230 Vac and 240 Vdc power supplies of 1+1 redundancy are supported:

550 W Platinum level PSU: 550 W (110 Vac), 550 W (230 Vac), 550 W (240 Vdc for China)

550 W Titanium level PSU: 550 W (110 Vac), 550 W (230 Vac), 550 W (240 Vdc for China)

Input voltage range:

110 Vac - 230 Vac: 90 V - 264 V

240 Vdc: 180 V - 320 V

- The following rated -48 Vdc PSUs with 1+1 redundancy are supported:

800 W -48 Vdc PSU: 800 W (-48 Vdc)

Input voltage range:

-48 Vdc: -72 V to -40 V

8 Regulatory Information

8.1 Security

8.1.1 General Statement

- When using the equipment, you must strictly comply with local laws and regulations. The safety precautions in this document are only a supplement to local safety regulations.
- The "Danger," "Warning," and "Important" icons in this document are only a supplement to all safety precautions.
- To protect personal safety and the equipment, please strictly comply with the icons on the equipment and all safety precautions in this document.
- Operators of special equipment, such as electricians and electric forklift operators, must possess qualifications recognized by the local government or authority.

8.1.2 Personal Security

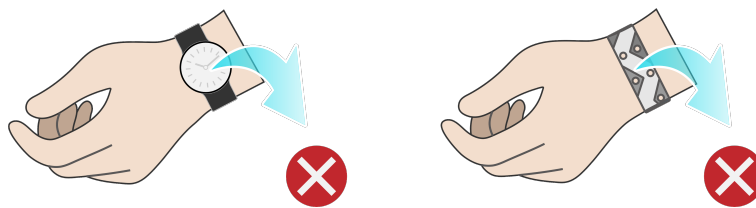
- The entire installation of the equipment must be carried out by a person certified by us or a person authorized by such certified person.
- During the installation, in case of possible personal injury or damage to the equipment, the installation personnel shall stop the operation immediately, report to the project leader and take effective protective measures.
- Do not operate in thunderstorms, including but not limited to handling equipment, installing cabinets and installing power cables.
- Do not exceed the maximum limit for handling by a single person allowed by local laws or regulations. Fully consider the current physical conditions of installation personnel, and do not exceed the weight that installation personnel can bear.
- Installation personnel must wear clean work gloves, work clothes, safety helmet and work shoes, as shown in Figure 8-1.

Figure 8-1 Safety Protection Measures



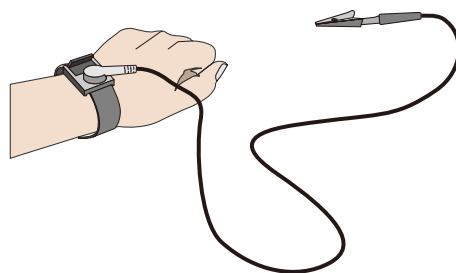
- Before touching the equipment, put on ESD clothing and ESD gloves or wrist strap, and remove conductive objects (such as metal jewelry and wristwatch) carried on the body to avoid electric shock or burns, as shown in Figure 8-2.

Figure 8-2 Removing Conductive Objects



- The method of wearing an ESD wrist strap is shown in Figure 8-3.
 - a. Put your hand into the ESD wrist strap.
 - b. Tighten the latch and make sure the ESD wrist strap is in good contact with the skin.
 - c. Plug the grounding strap of the ESD wrist strap into the jack for the ESD wrist strap in the cabinet (grounded) or chassis (grounded).

Figure 8-3 Wearing an ESD Wrist Strap



- Installation personnel must follow the correct procedures to avoid personal injuries.
- When the installation position of the equipment is above the shoulder of the installation personnel, please use a lifting vehicle and other tools to assist the installation, thus avoiding personnel injury or equipment damage caused by equipment slipping.
- Equipment is powered by high-voltage PSU which may cause fatal danger in case of direct contact or indirect contact through moist objects.
- To ensure personal safety, you must ground the power cord before you connect the power supply to the equipment.
- When installation personnel use ladders, they must be attended by specially-assigned personnel. It is forbidden to work alone in case of a fall.
- When connecting, testing or replacing an optical fiber cable, do not directly look at the optical fiber outlet to prevent the laser beam from burning your eyes.

8.1.3 Equipment Safety

- To protect the equipment and personal safety, use the power cable included.
- The power cable can only be used with the server it was packaged with. Do not use the power cable with other equipment.
- Before touching the equipment, put on ESD clothing and ESD gloves to prevent static electricity from damaging the equipment.
- When moving the equipment, support the bottom edge of the equipment. Do not hold the equipment by the handles of a module mounted to the equipment, such as the PSU, fan module, drive module, or motherboard. Pay attention to handle the equipment gently. Do not throw it heavily.
- Installation personnel must follow the correct procedures to avoid damage to the equipment.
- To ensure equipment availability, you must connect the power cable to different power distribution units (PDUs) in the active-passive mode.
- To ensure equipment safety, you must ground the power cord before you connect the power supply to the equipment.

8.1.4 Precautions for Moving the Equipment

To prevent accidental damage to the equipment while moving it, contact the original manufacturer for specific precautions before moving the equipment. Note the following precautions before moving the equipment:

- Engage a bona fide logistics company to move the equipment. The transportation process must comply with international transportation standards for electronic equipment, to prevent the equipment from being placed in an inverted position, and subject to impact, moisture, and corrosion, as well as to avoid damage to its packaging or contamination.
- The equipment should be moved in its original manufacturer's packaging.
- If there is no original manufacturer's packaging, heavy and bulky components, such as the chassis and blade-shaped devices, should be packed separately from fragile components, such as the optical modules and PCIe cards.
- During moving, the equipment must be powered off.

8.1.5 Weight Limit for Handling by a Single Person



CAUTION

The weight limit for handling by a single person is subject to local laws and regulations. The icons on the equipment and descriptions in this document are recommendations.

Table 8-1 lists the weight limits for handling by an adult provided by some organizations, as a reference.

Table 8-1 Weight Limits for Handling by an Adult Provided by Some Organizations

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 (GAQSIQ)	<ul style="list-style-type: none"> • 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 x 7 remote technical support, RMA (Return Material Authorization) Service, ARMA (Advanced Return Material Authorization) Service, 9 x 5 x NBD (Next Business Day) Onsite Service and 24 x 7 x 4 Onsite Service.

9.1.1 Remote Technical Support

The 24 x 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 their 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 their 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.



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.



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 ISBMC

ISBMC, a remote server management system, supports mainstream management specifications in the industry such as IPMI 2.0 and Redfish 1.8. ISBMC features high operational reliability, serviceability for customer scenarios, accurate and comprehensive fault diagnosis capabilities, and industry-leading security reinforcement capabilities.

ISBMC supports the following key features:

- Intelligent platform management interface (IPMI).
- Redirection of KVM and text console.
- Remote virtual media.
- Redfish protocol.
- Simple network management protocol (SNMP).
- BMC login through web browsers.
- Server log query and fault screen record.
- Power monitoring and dynamic power consumption control.

Table 10-1 ISBMC Specifications

Item	Description
Management Interfaces	<p>A variety of management interfaces are supported for integration with any standard management system, including:</p> <ul style="list-style-type: none">• IPMI• CLI• SNMP• HTTPS• Redfish
Fault Detection	Provides rich fault detection functions.

Item	Description
Alarm Management	<ul style="list-style-type: none"> Supports alarm management and various alarm mechanisms such as SNMP Traps (v1/v2c/v3), email alerts, and syslog alarms to ensure 24 × 7 device reliability Provides functions such as server health management and screenshotting
Virtual KVM	Remote maintenance is made possible to eliminate the need for on-site operation in case of system faults
Virtual Media	Local media devices or images, USB devices, and folders are virtualized as media devices of remote servers to simplify operating system installation
Web GUI	A graphical user interface to enable quick setup and queries by simply clicking on the interface
Dual Mirroring Backup for Software	Rebooting from a backup image is allowed in case of a software crash
IPv6	A full IPv6 environment can be built with abundant IP resources
NC-SI	Supports network controller sideband interface (NC-SI), enabling easy access to BMC through service network port
Hardware Monitoring Timer	Full-speed protection is activated for fans when BMC is unresponsive beyond the preset timeout period
Power Control	Supports on/off/cycle/status and provides power supply monitoring
UID Remote Control	Turn on the UID LED of a server manually to easily identify it in the server room
Firmware Upgrade	BMC/BIOS upgrade is available
Storage Information Display	The information of the RAID logical array and drives is displayed

10.2 InManage

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

Built on cutting-edge O&M concepts, InManage 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. InManage 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 10-1 InManage Features

Feature	Description
Home	<ul style="list-style-type: none"> • Display of basic information (data centers, server rooms, cabinets, assets and alerts), quick addition of devices and custom home page
Assets	<ul style="list-style-type: none"> • 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

Feature	Description
	inventory reports for server acceptance, asset attribute expansion, etc.
Monitor	<ul style="list-style-type: none"> • 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 rules, compression rules and fault reporting rules, and redefinition of the above rules.
Control	<ul style="list-style-type: none"> • 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












Feature	Description
	<ul style="list-style-type: none"> • CPU and memory stress test • Automatic firmware baseline management • BMC and BIOS snapshot management • Repositories for update files
Energy Efficiency	<ul style="list-style-type: none"> • 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 • Server temperature optimization, utilization optimization, power consumption characteristics analysis, power consumption prediction, load distribution, etc. • Carbon asset and carbon emission management
Log	<ul style="list-style-type: none"> • Fault log record management • Diagnosis record and diagnosis rule management
Topologies	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Management of warranty information reports, alert reports, asset reports, hardware reports and performance reports • Export of reports in .xlsx format
System	<ul style="list-style-type: none"> • Password management, alert forwarding and data dump • Customized InManage parameters
Security	Security control of InManage via a set of security policies such as user management, role management, authentication management (local authentication and LDAP authentication) and certificate management.

10.3 InManage Tools

Table 10-2 Features of InManage Tools

Feature	Description
InManage Kits	A lightweight automatic batch O&M tool for servers, mainly used for server deployment, routine maintenance, firmware update, fault handling, etc.
InManage 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
InManage Server CLI	Fast integration with third-party management platforms, delivering a new O&M mode of Infrastructure as Code (IaC)
InManage 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
InManage 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 Certification

Country/ Region	Item	Certification Logo	Compulsory/ Voluntary	Description
China	CCC		Mandatory	
	China Environmental Label		Voluntary	
	CECP		Voluntary	
International Mutual Recognition	CB		Voluntary	
EU	CE		Mandatory	
US	FCC		Mandatory	
	UL		Voluntary	
	Energy Star		Voluntary	
EAEU	EAC		Mandatory	
	FSS	/	Mandatory	
South Korea	E-Standby		Mandatory	
	KC		Mandatory	

12 Appendix A

12.1 Operating Temperature and Specification Limits

Table 12-1 Operating Temperature and Specification Limits

Configuration	Typical Configuration	High-end configuration
Maximum operating temperature: 30°C (86°F)	<ul style="list-style-type: none"> • 4028 fan • 4 × 16 GB RDIMM/LRDIMM • CPU TDP up to 95 W • 1 × HHHL PCIe x8 card • 1 × 2.5-inch SAS/SATA drive 	<ul style="list-style-type: none"> • 4028 fan • 4 × 32 GB RDIMM/LRDIMM • CPU TDP up to 95 W • 2 × HHHL PCIe x8 card • 2 × SSD or 4 × HDD
Maximum Operating Temperature: 35°C (95°F)	<ul style="list-style-type: none"> • 4028 Fan • 4 × 16 GB RDIMM/LRDIMM • CPU TDP up to 95 W • 1 × HHHL PCIe x8 card • 1 × 2.5-inch SAS/SATA drive 	<ul style="list-style-type: none"> • 4028 Fan • 4 × 32 GB RDIMM/LRDIMM • CPU TDP up to 95 W • 2 × HHHL PCIe x8 card • 2 × SSD or 4 × HDD
Maximum Operating Temperature: 40°C (104°F)	<ul style="list-style-type: none"> • 4028 Fan • 4 × 16 GB RDIMM/LRDIMM • CPU TDP up to 95 W • 1 × HHHL PCIe x8 card • 1 × 2.5-inch SAS/SATA drive 	<ul style="list-style-type: none"> • 4028 Fan • 4 × 32 GB RDIMM/LRDIMM • CPU TDP up to 95 W • 2 × HHHL PCIe x8 card • 2 × SSD or 4 × HDD
Maximum Operating Temperature: 45°C (113°F)	<ul style="list-style-type: none"> • 4028 Fan • 4 × 16 GB RDIMM/LRDIMM • CPU TDP up to 95 W 	<ul style="list-style-type: none"> • 4028 Fan • 4 × 32 GB RDIMM/LRDIMM • CPU TDP up to 95 W

	<ul style="list-style-type: none"> 1 × HHHL PCIe x8 card 1 × 2.5-inch SAS/SATA drive 	<ul style="list-style-type: none"> 2 × HHHL PCIe x8 card 2 × SSD or 4 × HDD
--	--	---



NOTE

- The maximum operating temperature supported when a single fan fails is 5°C (9°F) below the normal operating temperature.
- Single fan failure may affect system performance.
- It is recommended to deploy your servers at an interval of a 1U space to reduce server noise and improve server energy efficiency.

12.2 Model

Table 12-2 Model

Certified Model	Description
KE1160V1	Global

12.3 RAS Features

KE1160V1 supports a variety of RAS (Reliability, Availability, and Serviceability) features. By configuring these features, KE1160V1 can provide greater reliability, availability, and serviceability.

12.4 Sensor List

Table 12-3 Sensor List

Sensor	Description	Component Location
Inlet_Temp	Air inlet temperature	Right mounting ear
Outlet_Temp	Air outlet temperature	BMC card
PCH_Temp	PCH bridge chip temperature	Motherboard
CPU <i>N</i> _Temp	CPU kernel temperature	CPU <i>N</i> <i>N</i> indicates the CPU number with a value of 0
CPU <i>N</i> _DTS	CPU DTS value	CPU <i>N</i> <i>N</i> indicates the CPU number

Sensor	Description	Component Location
		with a value of 0
CPU/ <i>N</i> _DIMM_T	Temperature of the corresponding DIMM for the CPU	The corresponding DIMM for CPU/ <i>N</i> <i>N</i> indicates the CPU number with a value of 0
CPU/ <i>N</i> _Status	CPU status detection	CPU/ <i>N</i> <i>N</i> indicates the CPU number with a value of 0
CPU/ <i>N</i> _C <i>X</i> D <i>Y</i>	Status detection of the corresponding DIMM for the CPU	CPU/ <i>N</i> <ul style="list-style-type: none"> <i>N</i> indicates the CPU number with a value of 0 C <i>X</i> D <i>Y</i> <ul style="list-style-type: none"> <i>X</i> indicates the memory channel number under the CPU with a value of 0 - 4 <i>Y</i> indicates the DIMM number with a value of 0
HDD_MAX_Temp	Maximum temperature of all drives	Drive for the drive backplane
PCIe_Zone_Temp	The maximum temperature of PCIe NIC	Motherboard PCIe NIC
RAID_Temp	The maximum temperature of all RAID controller cards	Motherboard PCIe
GPU_Temp	The maximum temperature of all GPUs	Motherboard PCIe
NVME_M.2_Temp	The maximum temperature of all M.2 drives	M.2 riser card
PSU/ <i>N</i> _Temp	PSU temperature	The corresponding power supply for PSU/ <i>N</i> <i>N</i> indicates the PSU number with a value of 0 - 1
PVNN_VR_Temp	VR temperature	
PVCCIN_VR_Temp		
PVCCIO_VR_Temp		
PVDDQAB_VR_Temp		
PVDDQDE_VR_Temp		
PSU/ <i>N</i> _VIN	PSU input voltage	Motherboard

Sensor	Description	Component Location
		/N indicates the PSU number with a value of 0 - 1
PSU/N_VOUT	PSU output voltage	Motherboard /N indicates the PSU number with a value of 0 - 1
PSU/N_PIN	PSU input power	PSU/N /N indicates the PSU number with a value of 0 - 1
PSU/N_POUT	PSU output power	PSU/N /N indicates the PSU number with a value of 0 - 1
PSU/N_Status	PSU failure status	PSU/N /N indicates the PSU number with a value of 0 - 1
PSUN_Fan_Status	PSU fan status	PSU/N /N indicates the PSU number with a value of 0 - 1
PSU_Redundant	Alarm status for lost PSU redundancy due to unplugging of PSU	PSU
FAN/N_Speed	Fan speed	Fan/N /N indicates the fan module number with a value of 0 - 4
FANN_Present	Fan in use	Fan/N /N indicates the fan module number with a value of 0 - 4
Total_Power	Total input power	PSU
FAN_Power	Total power of fans	Fan
CPU_Power	Total CPU power	Motherboard
Memory_Power	Total memory power	Motherboard
P12V	12 V voltage supplied by motherboard to CPU	Motherboard
P5V	5 V voltage supplied by motherboard to BMC	Motherboard
P3V3	3.3 V voltage supplied by motherboard to BMC	Motherboard
IPMI_Watchdog	Watchdog	Motherboard
ME_FW_Status	System software process, system startup error	
System_Status	Unknown system hardware failure	

Sensor	Description	Component Location
BMC_Boot_Up	Record the BMC startup events	

13 Appendix B Terms

13.1 A - E

B

Baseboard management controller (BMC)	As the core of IPMI, BMC collects, processes, and stores sensor signals, and monitors the running status of components. BMC enables the chassis management module (MM) to manage various objects by providing such information as hardware status and alarms of the managed objects for the MM.
---------------------------------------	---

C

Ejector lever	A component on the panel used to plug in or out a device from a slot.
Ethernet	Ethernet is a baseband LAN specification created by Xerox and jointly developed by Xerox, Intel and DEC. It uses CSMA/CD to transmit data on various cables at 10 Mbps. It is similar to IEEE 802.3 series standards.

13.2 F - J

G

Gigabit Ethernet Ethernet (GE)	It is an extension and enhancement of traditional shared media Ethernet standards. It is compatible with 10 Mbps and 100 Mbps Ethernet and complies with IEEE 802.3z standards.
--------------------------------	---

H

Hot swap	A technology that can improve the reliability and maintainability of the system, which can ensure that the plugging or unplugging of functional modules in or from a running system as specified will not affect the normal operation of the system.
----------	--

13.3 K - O

K

KVM	Keyboard, video and mouse.
-----	----------------------------

13.4 P - T

P

Panel	An external component (including but not limited to ejector levers, indicators and ports) that can be seen on the front view and rear view 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, peripheral Component Interconnect express)	A type of PCI computer bus that uses existing PCI programming concepts and communication standards, but is based on a faster serial communication system. PCIe is primarily developed by Intel. It is used only for internal interconnection. A PCI system can be transformed to a PCIe system only by modifying the physical layer instead of software since it is built based on the existing PCI system. The high-speed PCIe can replace almost all existing internal buses, including AGP and PCI.

R

Redundancy	The mechanism of a system to keep functioning normally in the event of a device failure, by automatically having a backup device replace the faulty one.
Redundant array of independent disks (RAID)	A technology that combines multiple independent physical drives into one logical drive group in different ways to provide data redundancy and higher storage performance than a single drive.

S

Server	A special computer that provides various services for clients in the network environment.
--------	---

System event log (SEL)	Event information stored in the system for fault diagnosis and system recovery.
------------------------	---

13.5 U - Z

U

U	A unit of measure to describe the height of cabinet, chassis and sub-rack in IEC 60297-1. 1U = 44.45 mm (1.75 in.).
Ultra Path Interconnect (UPI)	Intel's next generation point-to-point interconnect architecture.

14 Appendix C Abbreviations

14.1 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
DDR4	Double Data Rate 4
DDDC	Double Device Data Correction

DEMT	Dynamic Energy Management Technology
DIMM	Dual In-line Memory Module
DRAM	Dynamic Random-Access Memory
DVD	Digital Video Disc

E

ECC	Error Checking and Correcting
ECMA	European Computer Manufacturer Association
EDB	Execute Disable Bit
ETS	European Telecommunication Standards

14.2 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

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 Management Protocol
IOPS	Input/Output Operations per Second
IP	Internet Protocol
IPC	Intelligent Power Capability
IPMB	Intelligent Platform Management Bus
IPMI	Intelligent Platform Management Interface

14.3 K - O

K

KVM	Keyboard, Video and Mouse
-----	---------------------------

L

LC	Lucent Connector
LRDIMM	Load-Reduced Dual In-line Memory Module
LED	Light Emitting Diode

LOM	LAN on Motherboard
-----	--------------------

M

MAC	Media Access Control
MMC	Module Management Controller

N

NBD	Next Business Day
NC-SI	Network Controller Sideband Interface

O

OCP	Open Compute Project
-----	----------------------

14.4 P - T

P

PCIe	Peripheral Component Interconnect Express
PDU	Power Distribution Unit
PHY	Physical Layer
PMBUS	Power Management Bus
POK	Power OK
PWM	Pulse-width Modulation
PXE	Preboot Execution Environment

R

RAID	Redundant Array of Independent Disks
RAS	Reliability, Availability and Serviceability
RDIMM	Registered Dual In-line Memory Module
REACH	Registration Evaluation and Authorization of Chemicals
RJ45	Registered Jack 45 (RJ45)
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
SSD	Solid-State Drive
SSE	Streaming SIMD Extension

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	Trans Flash Module
TFTP	Trivial File Transfer Protocol
TOE	TCP Offload Engine
TPM	Trusted Platform Module

14.5 U - Z

U

UDIMM	Unbuffered Dual In-line Memory Module
UEFI	Unified Extensible Firmware Interface
UID	Unit Identification Light
UL	Underwriter Laboratories Inc.
UPI	UltraPath Interconnect
USB	Universal Serial Bus

V

VCCI	Voluntary Control Council for Interference by Information Technology Equipment
VGA	Video Graphics Array
VLAN	Virtual Local Area Network
VRD	Voltage Regulator-Down

W

WEEE	Waste Electrical and Electronic Equipment
WSMAN	Web Service Management