



Inspur Server NF5280M6

User Manual

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- When servers are to be repurposed or retired, it is recommended to restore 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 third-party erasing tools.
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Abstract

This manual describes NF5280M6 server's specifications, features, hardware setup, warranty information and troubleshooting, which will help users to understand how best to utilize the server and all its functionalities.

Intended Audience

This manual is intended for:

- Technical support engineers
- Product maintenance engineers

It is recommended that server installation, configuration, and maintenance is performed only by experienced technicians who know Inspur servers inside and out.






Safety Precautions

- If your purchases do not include Inspur on-site installation service, make sure that you inspect the shipping cartons before unpacking the equipment. If a shipping carton appears severely damaged, water immersed, or the seal or pressure-sensitive adhesive tape (PSA) is broken, report this based on your purchase channel. If you purchased from a third-party supplier, contact your supplier directly; if you purchased through Inspur direct sales stores, call Inspur service hotline 1-844-860-0011/1-760-769-1847 for technical support.
- For your safety, please do not disassemble the server's components, extend configuration or connect other peripherals arbitrarily. You can contact Inspur for our support and guidance.
- Before disassembling the server's components, please be sure to disconnect all the cables connected to the server.
- Please install a product-compatible operating system and use the driver coming with the server or provided by Inspur. You can go to our official site <https://en.inspur.com>, on the Top Navigator, click on **Support > Product Support > Drivers**, then find the correct driver of your product based on the prompt. An incompatible operating system or a non-Inspur driver may cause compatibility issues and affect the normal use of the product. Inspur will not assume any responsibility or liability for this.
- BIOS and BMC setup is a significant factor in correctly configuring your server. If

there are no special requirements, it is suggested to use the Default Values and not alter the parameter settings arbitrarily. After the first login, please change the BMC user password in time.

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 manual information

Revision History

Version	Date	Description of Changes
V1.0	2021/03/20	Initial release
V1.1	2021/05/20	<ol style="list-style-type: none">1. Added notes for Gen4 PCIe expansion cards2. Added troubleshooting for HCA card installation3. Updated thermal restrictions
V1.2	2021/07/01	Updated the Inspur logo

Version	Date	Description of Changes
V1.3	2021/09/22	Added Erp Lot 9 tables and Appendix A.3 Backplane DIP Switch
V1.4	2022/04/12	<ol style="list-style-type: none"> 1. Added cable routing figures for some configurations 2. Updated DC Power Supply Requirement 3. Added 9560 RAID controller card problem in 7.1 Hardware Problems 4. Deleted relevant contents on expansion operation temperature in 8.5 and 8.6 5. Added GPU/Graphics Card Replacement Procedure in 4.4.9
V1.5	2022/05/12	Updated Table 2.5 Erp Lot9-2

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1 Safety Instructions

1.1 Warnings

Please be advised to follow the instructions below for safety. Failure to do so could result in potential dangers that may cause property loss, personal injury or death.

- The power supplies in the system may produce high voltages and energy hazards that may cause personal injury. For your safety, please do not attempt to remove the cover of the system to disassemble or replace any component on your own. Unless informed by Inspur, only service technicians trained by Inspur are authorized to do so.
- Please connect the equipment to an appropriate power supply. Use only the external power supplies indicated on the rated input label to power the system. To protect your equipment from damages caused by a momentary spike or plunge of the voltage, please use voltage stabilizing equipment or uninterruptible power supplies.
- Please do not lengthen a power cord by connecting two or more power cords. If you need a longer power cord, please contact Inspur Customer Service.
- Please be sure to use the power supply components that come with the server, such as power cords, power socket (if provided with the server) etc. For your safety and safety of the equipment, please do not replace power cords or plugs randomly.
- To prevent electric shocks caused by leakage in the system, please make sure that the power cables of the system and peripherals are correctly connected to the earthed/grounded outlet. Insert the three-prong plug into a properly grounded and easily accessible three-prong AC power socket. Be sure to use the ground pin of the cable, and do not use a prong adapter or remove the ground pin. Do not operate the system without a grounding conductor installed. If you are not sure whether grounding protection is in place, contact an electrician.
- Please do not push any objects into the openings of the system. Doing so may cause short circuit of internal components and then lead to fire or electric shock.
- Please keep the system far away from radiators and heat sources, and be sure not to block the air vents.
- Please be sure not to scatter food or spill liquid into the system or onto other components. Do not use the product in high humid or dusty environments.
- Using an incompatible battery may cause explosion. When battery replacement is required, please consult the manufacturer first, and choose

batteries of the same or equivalent type suggested by them. Do not disassemble, crush, puncture the batteries or short circuit the external connection point, and do not expose them in the environment over 60°C. Never throw batteries into fire or water. Please do not attempt to open or repair the batteries. Dispose of used batteries properly. Do not put waste batteries, circuit boards or other components that may contain batteries with other wastes. For battery recycling, please contact the local waste recycling center.

- For independent cabinets, please install front and side stabilizers before installing the equipment into the cabinet. For cabinets connected with other cabinets, please install front stabilizers first. Failure to install the corresponding stabilizers before installing the equipment into the cabinet may cause the cabinet to tip over, possibly leading to personal injury. Hence, please do make sure to install stabilizers before installing the equipment into the cabinet. After installing the equipment and other components into the cabinet, only one component can be pulled out from the cabinet through its sliding part at one time. Pulling out several components at the same time may cause the cabinet to turn over, resulting in serious personal injury.
- Please do not move the cabinet on your own. Considering the height and weight of the cabinet, the moving of the cabinet should be completed by at least two people. Moving it without adequate, trained personnel could result in severe injury or death.
- It is prohibited to directly short-circuit the copper busbar. Please do not touch the copper busbar when the cabinet is powered on.

1.2 Precautions

The following considerations may help avoid problems that could damage the components or cause data loss, etc.

- In the event of the following, please unplug the power plug from the outlet and contact Inspur Customer Service:
 - The power cords or power plugs are damaged.
 - The products get wet.
 - The products have fallen or have been damaged.
 - Other objects have fallen into the products.
 - The products do not or cannot function normally even when you operate according to the instructions.
- If the system gets wet or damp, please follow steps below:

- a. Power off the equipment, disconnect them with the outlet, wait for 10 to 20 seconds, and then open the top cover.
 - b. Move the equipment to a well-ventilated place to dry the system for at least 24 hours and make sure that the system is fully dried.
 - c. Close the top cover, reconnect the system to the power outlet, and then power on.
 - d. In case of operation failure or other abnormal situations, please contact Inspur for technical support.
- Avoid cabling system cables and power cords in high foot traffic locations. Please do not place objects on the cables.
 - Before removing the top cover or accessing the internal components, please let the equipment cool down first. To avoid damaging the motherboard, please power off the system and wait for 5 seconds, and then remove components from the motherboard or disconnect the peripherals from the system.
 - If there are modem, telecom or LAN options installed in the equipment, please pay attention to the followings:
 - In case of lightning, please do not connect or use the modem. Otherwise, there's risk of lightning stroke.
 - Never connect or use the modem in a damp environment.
 - Never insert the modem or telephone cables into the socket of network interface controller (NIC).
 - Before opening the system cover, accessing or installing internal components, or touching uninsulated cables or jacks of the modem, please disconnect the modem cables.
 - In order to avoid damages of electronic components in the equipment caused by electrostatic discharge, please pay attention to the followings:
 - a. Please remove any static electricity on your body before dismounting or accessing any electronic component in the equipment, to prevent the static electricity from conducting itself to the sensitive components. You may remove the static electricity on your body by touching the metal earthing objects (such as the unpainted metal surface on the rack).
 - b. Please do not take static sensitive components that are not ready to be installed or used out of the anti-static packages.
 - c. During operation, please touch the earthing conductor or the unpainted metal surface on the cabinet regularly to remove any static electricity from your body that may damage the internal components.

- When dismantling internal components upon receiving proper authorization from Inspur, please pay attention to the followings:
 - a. Power off the system and disconnect the cables, including all connections of the system. When disconnecting the cables, please hold the connector of the cables to slowly pull them out. Never pull the cables.
 - b. Only after the products completely cool down can you dismount the top cover or access the internal components.
 - c. Please remove any static electricity on your body by touching metal earthing objects before dismantling or accessing any electronic component in the equipment.
 - d. When dismantling, avoid making large movement to prevent damage to the components or scratching arms.
 - e. Handle components and plug-in cards with care. Please do not touch the components or connectors on the plug-in cards. When handling the plug-in cards or components, firmly grab the edges of the plug-in cards or those of components, or their metal retaining brackets.
- During cabinet installation and application, please pay attention to the followings:
 - a. After the cabinet has been installed, please ensure that the stabilizer feet have been fixed into the cabinet and supported to ground, and the full weight of the cabinet is on the ground.
 - b. Always load from the bottom up, and load the heaviest items first.
 - c. When pulling out components from the rack, apply slight force to keep the rack balanced.
 - d. Please be careful when pressing down the release latch to slide the server in or out as the rail may hurt your fingers.
 - e. Do not overload the AC power branch circuits in the cabinet. The total load of the cabinet should not exceed 80% of the ratings of the branch circuits.
 - f. Ensure that components in the cabinet are well vented.
 - g. When repairing components in the cabinet, never step on any other component.

2 Product Specifications

2.1 Introduction

The Inspur NF5280M6 is a high-end 2-socket rack server that features the 3rd generation Intel® Xeon® scalable processors and is designed for high-end IT applications such as cloud computing, big data, data mining, deep learning. The server maintains high quality and reliability you have come to expect from Inspur servers and achieves innovation and breakthrough in compute performance, scalability, configuration elasticity, intelligent management. Hence, it is perfect for customers with high demands in telecommunications, finance and Internet industry.

Key features:

- 2 Intel® Xeon® scalable processors, TDP up to 270 W
- 3 channels UPI for 11.2 GT/s
- Up to 32 DIMMs with RDIMMs, LRDIMMs, NVDIMMs (BPS), memory mirroring and memory hot spare supported
- Up to 24 × 2.5-inch SAS/SATA/NVMe drive or 12 × 3.5-inch SAS/SATA/NVMe drive or 25 × 2.5-inch SAS/SATA drive at the front
- Up to 10 × 2.5-inch SAS/SATA drive or 4 × 2.5-inch SAS/SATA/NVMe drive and 4 × 3.5-inch SAS/SATA drive at the rear
- Up to 4 × 3.5-inch internal SAS/SATA drive
- 1 OCP 3.0 SFF expansion card
- 4 onboard Slimline x8 connectors to directly attach NVMe drives from CPU
- Up to 14 onboard direct-attached drives from PCH
- Up to 11 standard PCIe expansion cards, including 5 full-height and 6 half-height half-length cards
- Up to 4 double-width GPUs
- Motherboard integrated with an AST2500 BMC chip with KVM functionality as standard
- Hot-swap LCD module and remote monitoring on mobile devices via BMC
- Intel remote BMC debug
- Modular design of drives, PCI expansion cards, PSUs and fans, enabling tool-less maintenance

- Hot-swap and redundant CRPS power supplies of 80 Plus Platinum or higher rank with PMBus and NM 4.0 functionality
- Hot-swap fan/fan cage design; the fan is N+1 redundant and of low noise

2.1.1 24 × 2.5-inch Configuration (Full configuration)

Up to 24 front 2.5-inch SAS/SATA/NVMe drives, as shown in the figure below.

Figure 2-1 24 × 2.5-inch Configuration



2.1.2 12 × 3.5-inch Configuration (Full configuration)

 NOTE

3.5 inch drive trays can accommodate 3.5- or 2.5-inch drives.

Up to 12 front 3.5/2.5-inch SAS/SATA/NVMe drives, as shown in the figure below.

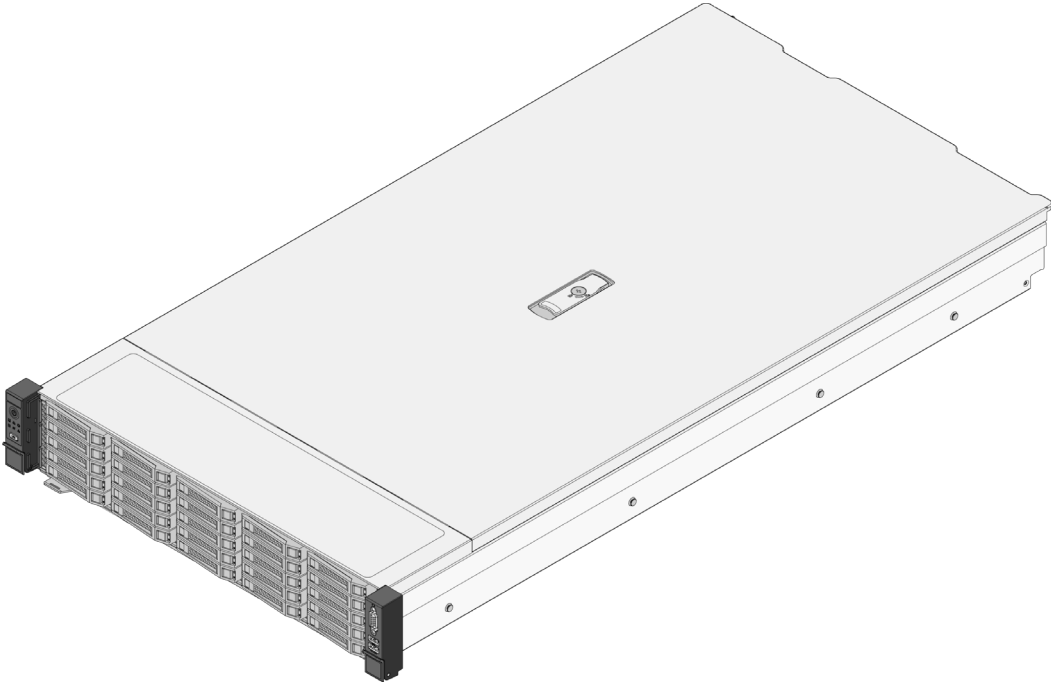
Figure 2-2 12 × 3.5-inch Configuration



2.1.3 25 × 2.5-inch Configuration (Full configuration)

Up to 25 front 2.5-inch SAS/SATA drives, as shown in the figure below.

Figure 2-3 25 × 2.5-inch Configuration



2.2 Features and Specifications

Table 2-1 Features and Specifications

Launch Time	2021/4
Processor	
Processor Type	3rd generation Intel® Xeon® Scalable processors (Up to 2 CPUs with TDP up to 270 W)
Socket	Two
Chipset	
Chipset Type	C621A
Memory	
Memory Type	RDIMM, LRDIMM, NVDIMM (Barlow Pass)
Memory Slot Qty	32 (Refer to DIMM Replacement for DIMM population principles)
Total Memory Capacity	Up to 4.0 TB (128 GB per memory module)
I/O Port	
USB	2 rear USB 3.0 ports, 1 front USB 3.0 port and 1 front USB 2.0 port
VGA	<ul style="list-style-type: none"> 1 front VGA port 1 rear VGA port
Serial Port	1 rear serial port
UID LED	2 UID buttons with LEDs (1 front and 1 rear)
Display	
Controller Type	Integrated in the Aspeed AST2500 chip, resolution up to 1280 × 1024
Backplane	
Backplane	Supports hot-swap SAS/SATA/NVMe drives
NIC	
NIC Controller	1 standard OCP NIC 3.0 card or standard PCIe cards and onboard Intel X710 network supported on the motherboard
Management	
Management Chip	Integrated with 1 independent 1000 Mbps network port, dedicated for IPMI remote management.
PCIe Expansion Slot	<ul style="list-style-type: none"> 3 onboard PCI Express Gen-Z 4.0 x16 slots and 1 PCI Express 4.0 x16 slot (16 lanes) for PCIe riser cards The riser card supports horizontal-inserted full-height or half-height cards 8 PCIe Cards Configuration: Up to 3 riser cards (You can choose left 2 slot riser or left 3 slot riser)

	<ul style="list-style-type: none"> - Right 2 slot riser (PCIe signal routed from CPU0) is populated with a riser card with 2 PCI Express 4.0 x16 slots - Middle 3 slot riser (PCIe signal routed from CPU0/CPU1) is populated with a riser card with 2 PCI Express 3.0 x8 slots and 1 PCI Express 4.0 x16 slot - Left 2 slot riser (PCIe signal routed from CPU1) is populated with a riser card with 2 PCI Express 4.0 x16 slots - Left 3 slot riser (PCIe signal routed from CPU1) is populated with 1 riser card with 1 PCI Express 3.0 x16 slot and 2 PCI Express 3.0 x16 slots • 11 PCIe Configuration <ul style="list-style-type: none"> - Right 5 slot riser (PCIe signal routed from CPU0/1) is populated with a riser card with 1 PCI Express 3.0 x16 slot and 4 PCI Express 3.0 x8 slots - Left 6 slot riser (PCIe signal routed from CPU0/1) is populated with a riser card with 6 PCI Express 3.0 x8 slots • 4-GPU Configuration <ul style="list-style-type: none"> - Left 1 slot riser (PCIe signal routed from CPU1) is populated with 1 riser card with 1 PCI Express 4.0 x16 slot • 1 onboard OCP NIC 3.0 SFF slot for OCP NIC 3.0 card
Drive	
Drive Type	2.5-/3.5-inch SAS/SATA/NVMe drives (Actual configuration may vary depending on the model you purchased)
External Storage Drive	
Optical Drive	External USB optical drives
T-flash Card	Internal TF card
Power Supply	

Specification	<ul style="list-style-type: none"> • Single/dual power supplies with output power at 550 W/800 W/1300 W/1600 W/2000 W or higher • 1+1 redundancy • 2 power supply units • PMBus power and Node Manager 4.0 supported
Power Input	Please refer to the power input on the nameplate label of the chassis
Physical	
Outer Packaging Dimensions (W × H × L)	780-length chassis packaging box: 651 × 295 × 1031 mm (25.63 × 11.61 × 40.59 in.)
Chassis Dimensions (With Mounting Ears) (W × H × D)	780-length chassis: 478.8 × 87 × 811.7 mm (25.63 × 11.61 × 40.59 in.)
Product Weight	<ul style="list-style-type: none"> • Full configuration of 12 × 3.5-inch drive (with 12 drives) Net weight: 31.2 kg (83.59 lbs) Gross weight: 41 kg (109.85 lbs) (Chassis + Packaging Box + Rails + Accessory Box) • Full configuration of 24 × 2.5-inch drive (with 24 drives) Net weight: 25.2 kg (67.52 lbs) Gross weight: 35 kg (93.77 lbs) (Chassis + Packaging Box + Rails + Accessory Box) • Full configuration of 25 × 2.5-inch drive (with 25 drives) Net weight: 25.5 kg (68.32 lbs) Gross weight: 35 kg (93.77 lbs) (Chassis + Packaging Box + Rails + Accessory Box)

2.3 PSU Efficiency

Table 2-2 Platinum PSU Efficiency

Rated Power	@20% Load	@50% Load	@100% Load	PF@50% Load
550 W	90%	94%	91%	0.98
800 W	90%	94%	91%	0.98
1300 W	90%	94%	91%	0.98
1600 W	90%	94%	91%	0.98
2000 W	90%	94%	91%	0.98

Table 2-3 Titanium PSU Efficiency

Rated Power	@10% Load	@20% Load	@50% Load	@100% Load	PF@50% Load
800 W	90%	94%	96%	91%	0.98

Table 2-4 Erp Lot 9-1

EU Regulation 2019/424 Server configurations	High-end performance configuration	Low-end performance configuration
(h) idle state power	187.8 W	166.4 W
(i) list of all components for additional idle power allowances, if any (additional PSU, HDDs or SSDs, additional memory, additional buffered DDR channels, additional I/O devices);	See Table 2-5	See Table 2-5
(j) maximum power, expressed in Watts and rounded to the first decimal place;	855.3 W	580.9 W

EU Regulation 2019/424 Server configurations	High-end performance configuration	Low-end performance configuration
(k) declared operating condition class;	A2	A2
(l) idle state power (Watts) at the higher boundary temperature of the declared operating condition class;	193.2 W	168.7 W
(m) the active state efficiency and the performance in active state of the server;	44 W	31.4 W

Table 2-5 Erp Lot 9-2

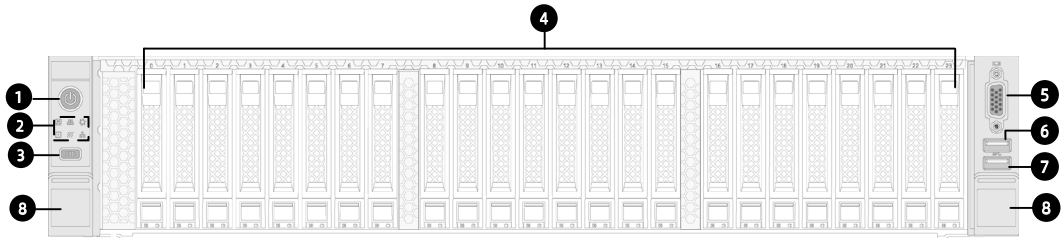
(i) List of components for additional power allowance		High-end performance configuration	Low-end performance configuration
CPU Performance	1 socket: 10 × PerfCPU W 2 socket: 7 × PerfCPU W	175.91 W	93.38 W
Additional PSU	10 W per PSU	10 W	10 W
HDD or SSD	5,0 W per HDD or SSD	10 W	10 W
Additional memory	0,18 W per GB	183.6 W	45.36 W
Additional buffered DDR channel	4,0 W per buffered DDR channel	32 W	32 W
Additional I/O devices	< 1 Gb/s: No Allowance = 1 Gb/s: 2,0 W/Active Port > 1 Gb/s and < 10 Gb/s: 4,0 W/Active Port ≥ 10 Gb/s and < 25 Gb/s: 15,0 W/Active Port ≥ 25 Gb/s and < 50 Gb/s: 20.0 W/Active Port ≥ 50 Gb/s 26,0 W/Active Port	0 W	0 W
Total power		411.51 W	190.74 W

3 Product Overview

3.1 Front Panel

3.1.1 24 × 2.5-inch Drive Bay

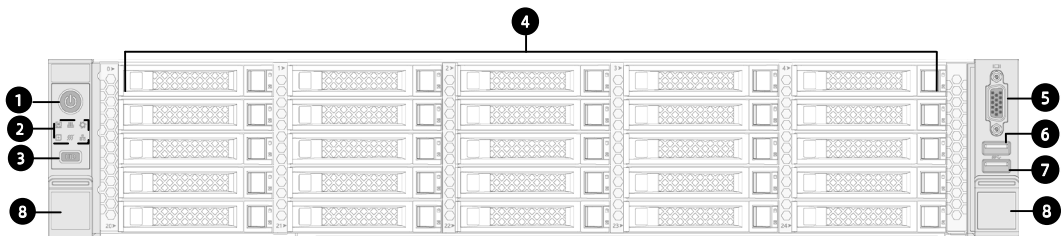
Figure 3-1 Front View of 24 × 2.5-inch Configuration



#	Item
1	Power Button
2	LEDs
3	UID/BMC RST Button
4	Drive Bay × 24
5	VGA Port
6	USB 3.0 Port
7	USB 2.0/LCD Port
8	Quick Release Lever

3.1.2 25 × 2.5-inch Drive Bay

Figure 3-2 Front View of 25 × 2.5-inch Configuration

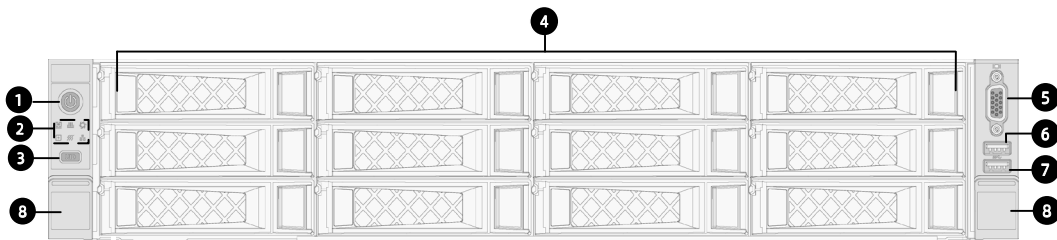


#	Item
1	Power Button
2	LEDs
3	UID/BMC RST button
4	Drive Bay × 25

#	Item
5	VGA Port
6	USB 3.0 Port
7	USB 2.0/LCD port
8	Quick Release Lever

3.1.3 12 × 3.5-inch Drive Bay

Figure 3-3 Front View of 12 × 3.5-inch Configuration




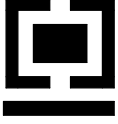




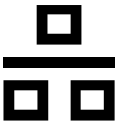
#	Item
1	Power Button
2	LEDs
3	UID/BMC RST button
4	Drive Bay × 12
5	VGA Port
6	USB 3.0 Port
7	USB 2.0/LCD port
8	Quick Release Lever


3.2 Buttons and LEDs

3.2.1 Front Panel Buttons and LEDs

Table 3-1 Front Panel Buttons and LEDs

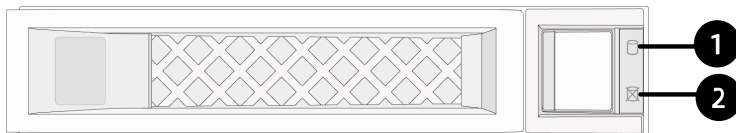
#	Icon	Item	Description
1		Power Button	<ul style="list-style-type: none"> • Solid green = Power on state • Solid orange = Standby state

#	Icon	Item	Description
			<ul style="list-style-type: none"> Long press 4s to force a shutdown
2		System Status LED	<ul style="list-style-type: none"> Off = Normal Solid red = A failure occurs Flashing red = A warning occurs
3		Memory Status LED	<ul style="list-style-type: none"> Off = Normal Solid red = A failure occurs Flashing red = A warning occurs
4		Fan Status LED	<ul style="list-style-type: none"> Off = Normal Solid red = Fail to read the fan speed Flashing red = Speed reading is abnormal
5		Power Status LED	<ul style="list-style-type: none"> Off = Normal Solid red = A power failure occurs Flashing red = Power state is abnormal
6		System Overheat LED	<ul style="list-style-type: none"> Off = Normal Solid red = CPU/Memory overheats
7		Network Status LED	<ul style="list-style-type: none"> Solid/Flashing green = Network connected Off = No network connection <p>Note: It only indicates the working status of LOM (LAN on Motherboard).</p>

#	Icon	Item	Description
8		UID/BMC RST Button	<ul style="list-style-type: none"> • Solid blue = UID is turned on manually or in the OS • Flashing blue = KVM has been launched or firmware update in process • Long press 6 seconds to force BMC to be reset

3.2.2 Drive Tray LEDs

Figure 3-4 Drive Tray LEDs



#	Item	Description
1	Activity LED	<ul style="list-style-type: none"> • Solid green = Drive is present but not in use • Flashing green = Drive is present and in use
2	Error LED	<ul style="list-style-type: none"> • Solid red = Drive error or failed • Solid blue = Drive is being located • Solid pink = RAID rebuilding

3.2.3 PSU LEDs

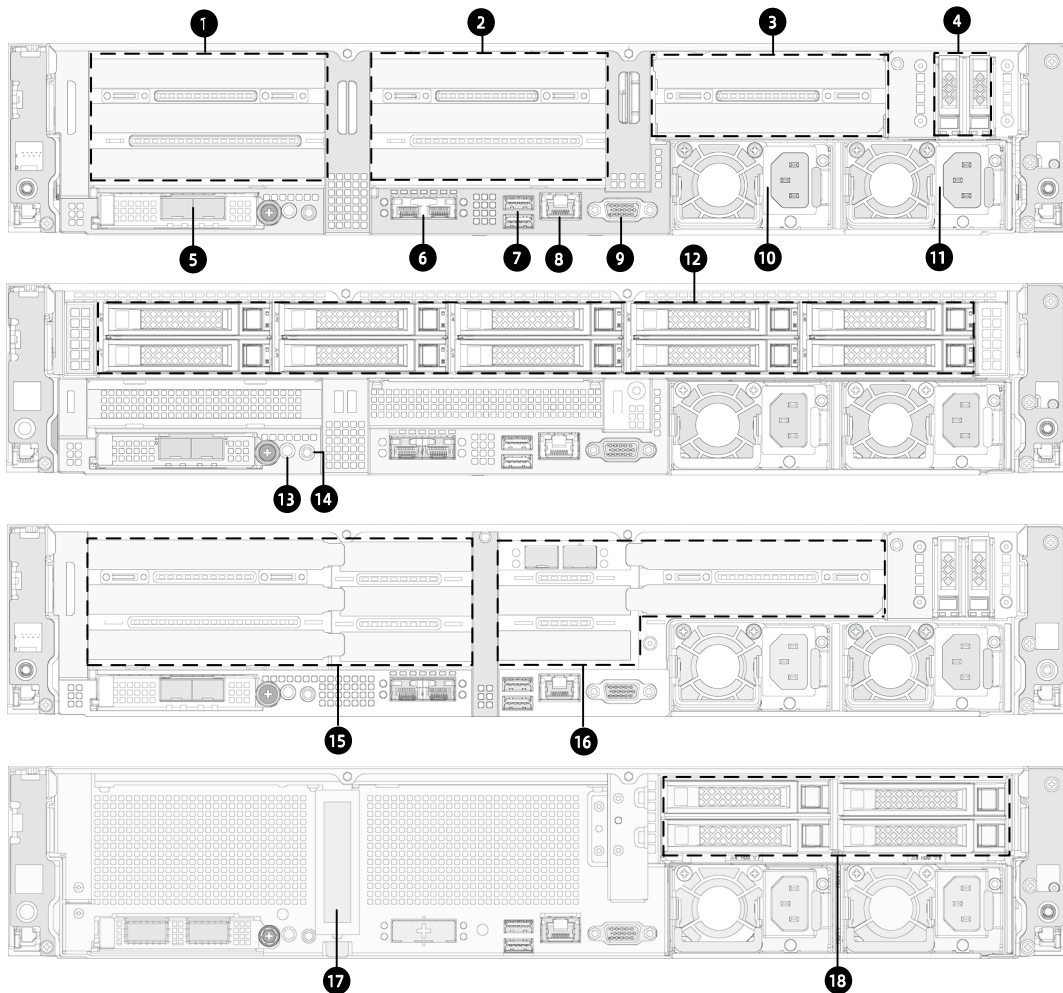
Table 3-2 PSU LEDs

#	PSU LED Status	Description
1	Solid green	Normal
2	Off	No AC power to PSU
3	Solid amber	A shutdown has occurred due to a PSU critical event

4	Flashing amber at 1 Hz	PSU continues operating after a warning event has occurred
5	Flashing green at 1 Hz	PSU removed from the power bay with AC input
6	Flashing green at 0.33 Hz (on for 2 seconds and off for 1 second)	PSU operates in cold redundant and sleep mode
7	Flashing green at 2 Hz	PSU operates in firmware updating mode

3.3 Rear Panel

Figure 3-5 Rear View

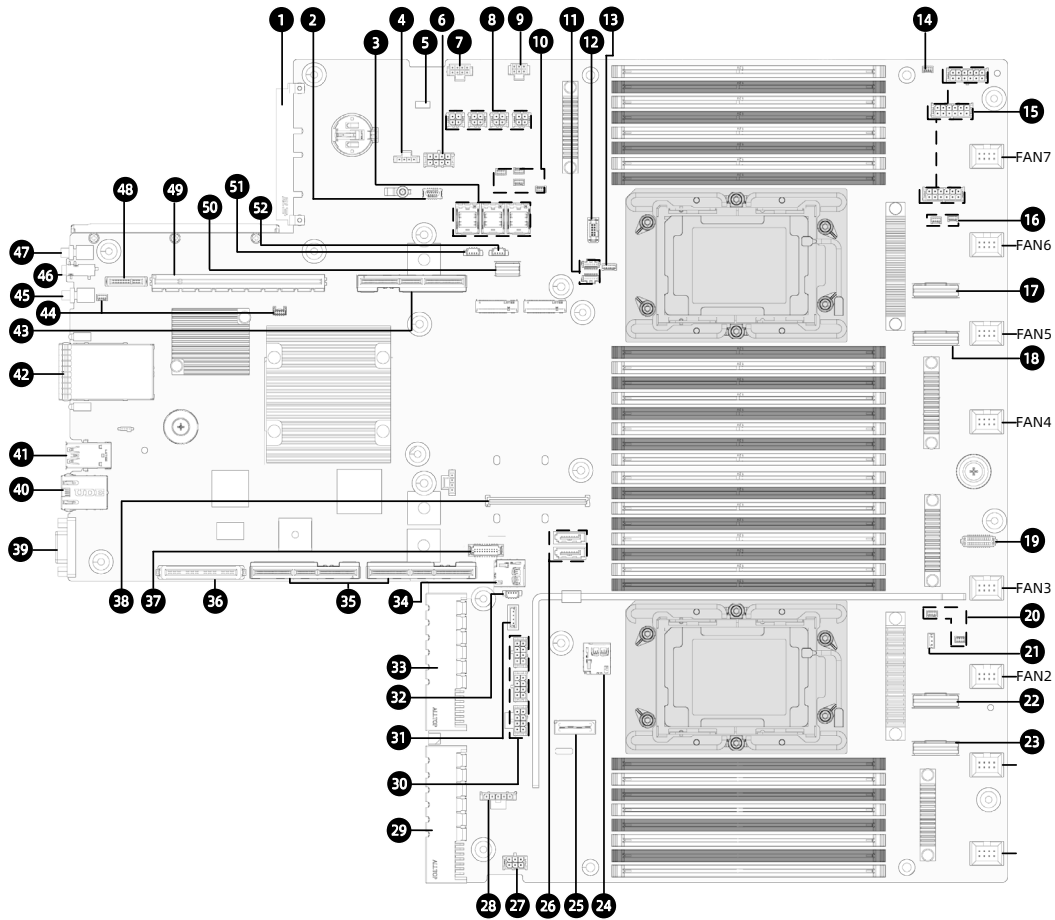


#	Item	#	Item
1	PCIe_Riser2 Slot (Left Riser Slot)	10	PSU0

#	Item	#	Item
2	PCIe_Riser1 Slot (Middle Riser Slot)	11	PSU1
3	PCIe_Riser0 Slot (Right Riser Slot)	12	Rear 2.5-inch Drive Bays
4	Rear M.2 Module	13	UID Button with LED
5	OCP NIC 3.0	14	System/BMC Serial Port
6	Intel X710 SFP+ Port	15	PCIe_Riser1 Slot (Left Riser Slot)
7	USB 3.0 Port × 2	16	PCIe_Riser0 Slot (Right Riser Slot)
8	BMC Management Port	17	PCIe_Riser1 Slot (Vertically-Mounted)
9	VGA Port	18	Rear 2.5-inch Drive Bays

3.4 Motherboard View

Figure 3-6 Motherboard Connectors



#	Item	#	Item
1	OCP 3.0 NIC Card Slot	27	Power Connector (B_M.2&3BP&GPU_RISER3)
2	TPM Slot	28	Capacitor Plate Connector
3	Mini_SAS Connector (3)	29	PSU1 Connector
4	GPU_RISER0 Power Connector	30	GPU Power Connector
5	CLR_CMOS Jumper Cap	31	VROC Key Connector
6	Power Connector (GPU0&MID_PCIE)	32	I ² C Connector

#	Item	#	Item
7	Mid-Backplane Power Connector	33	PSU0 Connector
8	Rear Backplane Power Connector (4)	34	BMC TF Card Slot
9	Power Connector (GPU0_RISER1&MID_PClE)	35	PCle0_CPU0 Slot
10	I ² C Connector (4)	36	PCle0_CPU0 Power Connector
11	CLK Connector (2)	37	NCSI Connector
12	VPP Connector	38	OCPA Slot (CPU0)
13	SGPIO Connector	39	VGA Port
14	Sensor Connector	40	BMC Management Port
15	Front Backplane Power Connector (3)	41	USB 3.0 Port
16	I ² C Connector (2)	42	SFP+ Port
17	Slimline Connector (CPU1)	43	PCle1_CPU1 Slot
18	Slimline Connector (CPU1)	44	Leakage Detect Connector (2)
19	Left Control Panel Connector	45	Power Button/LED
20	I ² C Connector (2)	46	System/BMC Serial Port
21	Intrusion Switch Connector	47	UID Button with LED
22	Slimline Connector (CPU0)	48	PCle1_CPU1 Power Connector
23	Slimline Connector (CPU0)	49	PCle0_CPU1 slot
24	SYS_TF Card Button	50	Right Control Panel Connector

#	Item	#	Item
25	Debug Connector	51	I ² C Connector
26	SATA Connector (2)	52	I ² C Connector

3.5 Motherboard Jumper Introduction

CAUTION

It is required to shut down the system and disconnect the power supply during CMOS clearing.

See [Motherboard View](#) for the jumper location.

Table 3-3 CMOS Jumper Cap

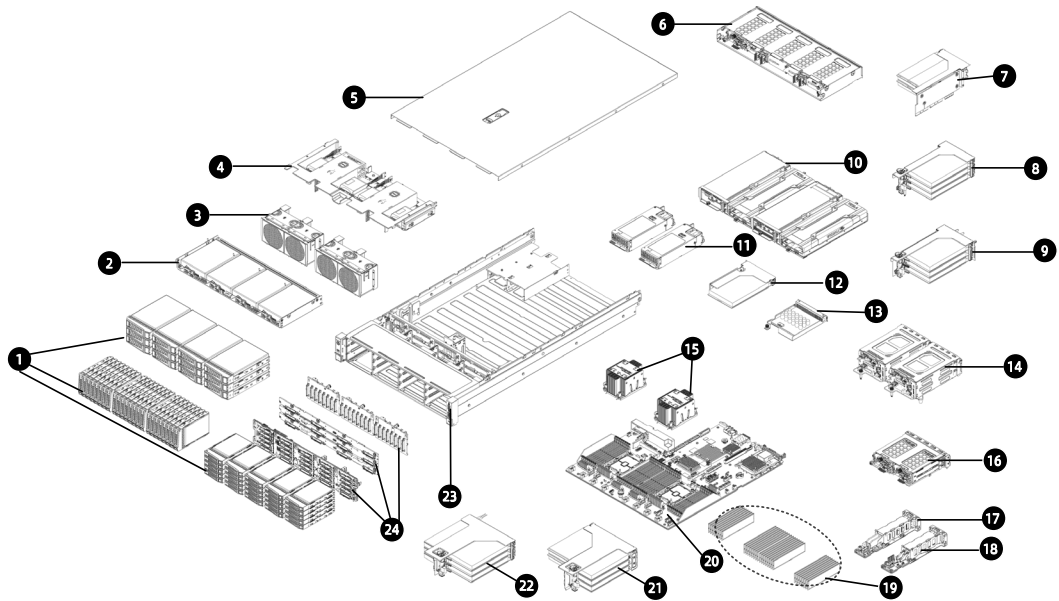
Item	Description	Function
J122 (CLR_CMOS)	CMOS clear jumper	Short-circuit pins 1-2 to restore to normal status; short-circuit pins 2-3 to clear the CMOS setting.

To reset/clear the CMOS setting via a jumper:

1. Power down the server and unplug the power cable from the electrical outlet.
2. Wait for 5 seconds.
3. Locate the CMOS clear jumper on the motherboard.
4. Move the jumper cap from the default pins 1-2 to pins 2-3.
5. Plug in the power cable and power on the server, and then wait for 10 seconds for the CMOS to clear.
6. Power down the server, unplug the power cable, and then wait for 5 seconds again.
7. Move the jumper cap back to the default pins 1-2.
8. Reconnect the power cable and power on the server.

3.6 Layout

Figure 3-7 System Layout




#	Item	#	Item
1	Front Drive Bays	13	Capacitor Plate
2	Internal Drive Bays	14	Rear 3.5-inch Drive Bays
3	Fan Modules	15	Processor Heatsink Modules (PHMs)
4	Air Duct	16	Rear 2.5-inch Drive Bays
5	Top Cover	17	Rear M.2 Modules
6	Rear 2.5-inch Drive Bays	18	Rear E1.S Modules
7	Right Riser Card Module (8-Card Configuration)	19	DIMMs
8	Middle Riser Card Module (8-Card Configuration)	20	Motherboard
9	Left Riser Card Module (8-Card Configuration)	21	Right Riser Card Module (11-Card Configuration)
10	GPU Modules (4-GPU Configuration)	22	Left Riser Card Module (11-Card Configuration)
11	PSUs	23	Chassis
12	Riser Card Module (4-GPU Configuration)	24	Front Drive Backplane


4 Getting Started

4.1 Installing Server into the Rack

For detailed information on installing the server into the rack with rails supplied by Inspur, see *Rack-Mounted Server Installation Guide*.

 CAUTION

If you would like to use non-Inspur rails, please contact Inspur Customer Service first to ensure the server can be installed to the rack safely and properly. The loading-bearing capacity of non-Inspur rails must be higher than 100 kg. If not, you **MUST** use Inspur-supplied rails as using these non-Inspur rails may cause such risks as installation failure. Inspur will not assume any responsibility or liability for any damage or injury caused by this.

 WARNING

To reduce the risk of personal injury or damage to the equipment, **DO** secure the mounting ears to the posts firmly to prevent server from moving or sliding out from the cabinet.

4.2 Power On/Off

To power on and off the server, press the power button.

To completely shut down the server, press the power button and disconnect the power cable from the server.

 DANGER

To reduce the risk of personal injury, electric shock, or damage to the equipment, remove the power cord to disconnect power from the server. The Power button does not shut off the system power completely. Portions of the power supply and some internal circuitry remain active until the AC power is removed.

4.3 Pre-Disassembly Instructions

Read the installation instructions for all the hardware operations before disassembling or re-assembling the components. All prerequisites must be completed prior to starting installation or maintenance.



WARNING

To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching.



CAUTION

To prevent damage to electrical components, properly ground the server before installation. Improper grounding can cause electrostatic discharge.

Do the following prior to installation or maintenance:

1. Shut down the server
2. Remove all cables from the system

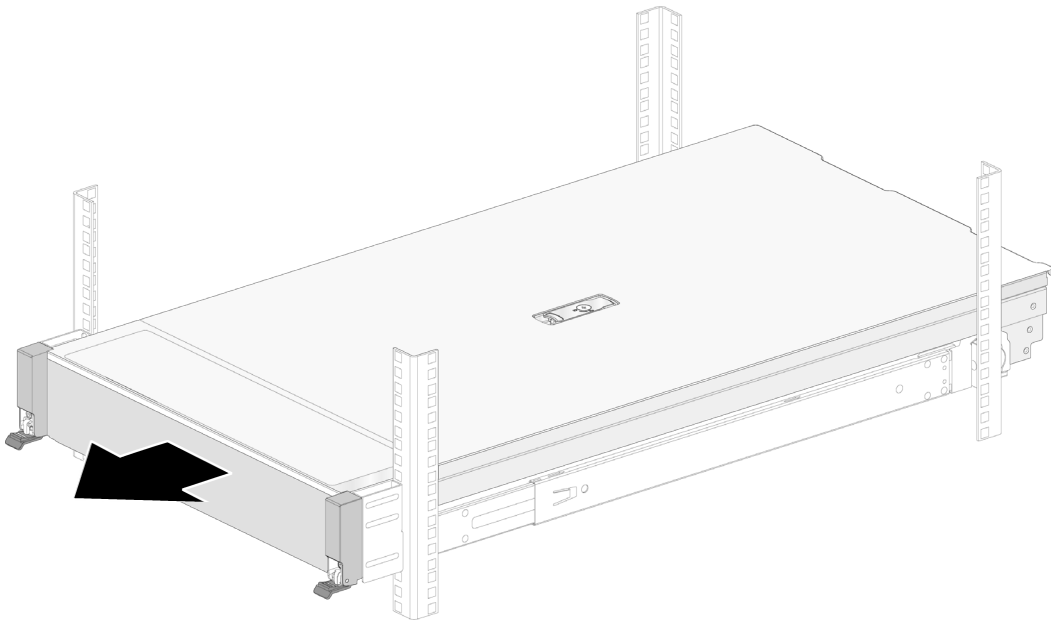


WARNING

- To reduce the risk of personal injury or equipment damage, be sure that the rack is adequately stabilized before you extend a component from the rack.
 - To reduce the risk of personal injury, be careful when sliding the server into the rack. The sliding rails could pinch your fingers.
-

3. Open the quick release levers on the front panel of the server, and then loosen the two captive screws securing the server in place.
4. Gently slide and remove the server out of the rack.

Figure 4-1 Removing the Server from the Rack



5. After performing installation or maintenance, slide the server all the way back into the rack and secure it in place.

4.4 Disassembly/Reassembly Process

NOTE

- Before installation or removal of any hardware, always ensure all data is backed up properly.
 - Disconnect the server and all attached devices from their electrical outlets.
 - There is no need to remove power from the server when replacing hot-swap components.
 - If more than one option is to be installed, read the installation instructions for all the hardware options and identify similar steps to streamline the installation process.
-

Item appearance may be different on actual models.

4.4.1 Top Cover Replacement

WARNING

To reduce the risk of personal injury from hot surfaces, allow the drives and the

internal system components to cool before touching.

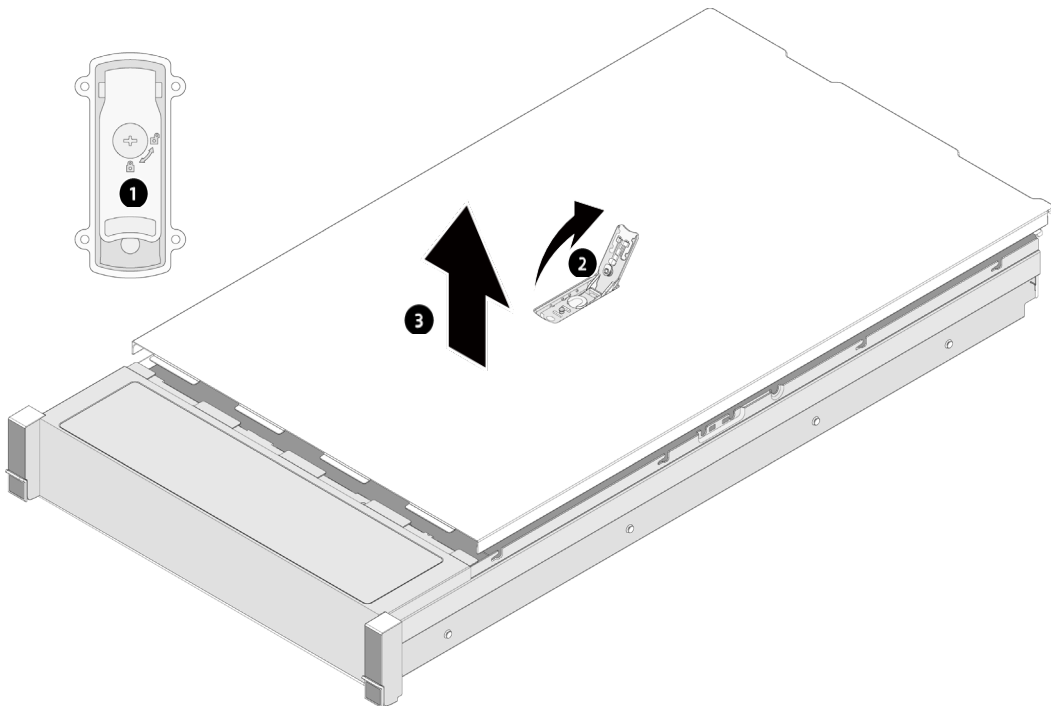
 **CAUTION**

For proper cooling, do not operate the server without the top cover, air duct, or fan installed. If the server supports hot-swap components, minimize the amount of time the top cover is open.

To remove the top cover:

1. Loosen the screw on the hood latch counterclockwise to the unlocked position with a Phillips screwdriver
2. Lift up the hood latch handle to the unlocked position until the top cover slides back and the tabs on the top cover disengage from the guide slots on the chassis.
3. Hold the top cover on both sides and remove it.

Figure 4-2 Removing the Top Cover



To install the top cover:

1. Align the standoffs on the top cover with the J-slots on the server and lower down the top cover with the hood latch open.

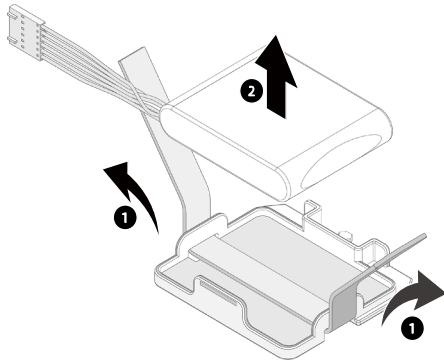
2. Press down the hood latch until it locks into place. Make sure the top cover snaps into place.
3. Tighten the screw on the hood latch clockwise to the locked position with a Phillips screwdriver.

4.4.2 Super-Capacitor Replacement

To remove the super-capacitor:

1. Remove the top cover (Refer to [Top Cover Replacement](#)).
2. Disconnect the cable of the super-capacitor.
3. Undo the velcro of the super-capacitor.
4. Remove and put the super-capacitor into an antistatic bag.

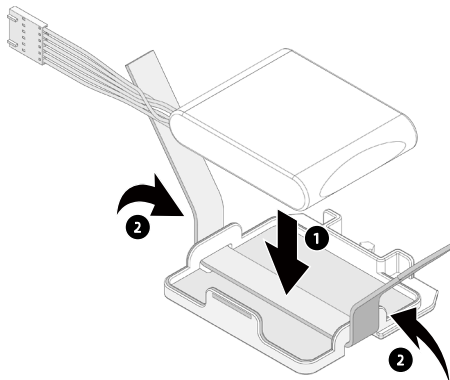
Figure 4-3 Removing the Super-Capacitor



To install the super-capacitor:

1. Take the new super-capacitor out from the antistatic bag and position it in place.
2. Secure the super-capacitor with velcro.

Figure 4-4 Installing the Super-Capacitor



3. Connect the cable of the super-capacitor.
4. Install the top cover.

4.4.3 Air Duct Replacement

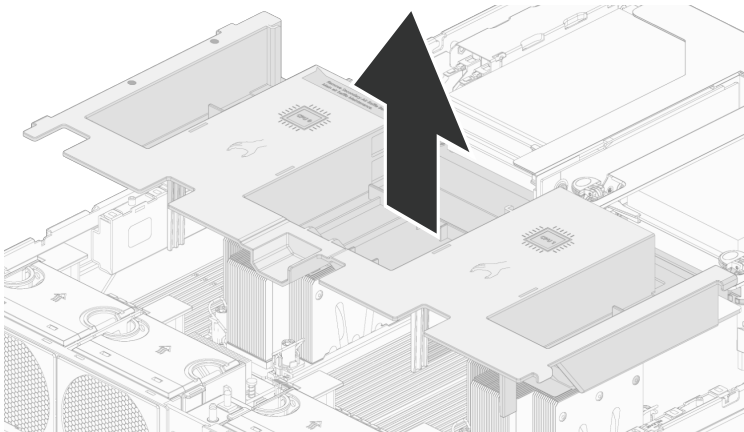
 CAUTION

For proper cooling, do not operate the server without the top cover, air ducts, expansion slot blanks, or other blanks installed. If the server supports hot-swap components, minimize the amount of time the top cover is open.

To remove the air duct:

1. Remove the top cover (Refer to the [Top Cover Replacement](#)).
2. Remove the super-capacitor on the air duct (Refer to [Super-Capacitor Replacement](#)).
3. Hold the air duct with both hands to remove it.

Figure 4-5 Removing the Air Duct



To install the air duct:

1. Lower down the air duct into the chassis until it snaps into place.
2. Install the super-capacitor.
3. Install the top cover.

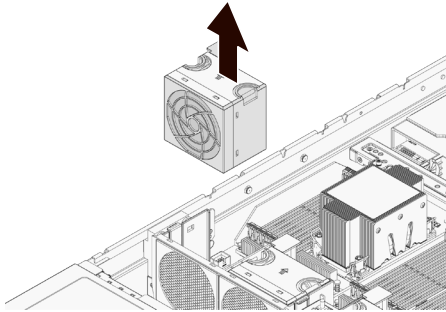
4.4.4 Hot-Swap Fan Module Replacement

To remove the fan module:

1. Remove the top cover (Refer to [Top Cover Replacement](#)).

2. Hold and press the release tab on one side of the fan module, and lift up the fan module slowly out of the fan bay.
3. Put the fan module into an antistatic bag.

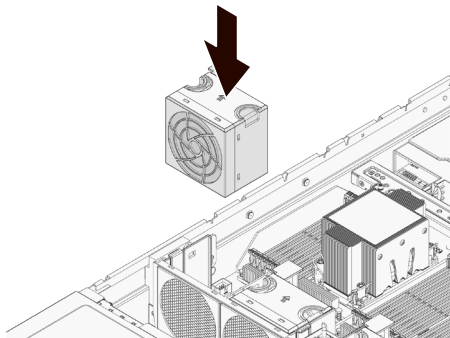
Figure 4-6 Removing the Fan Module



To install the fan module:

1. Take the new fan module out from the antistatic bag.
2. Align the fan power connector with the power connector on the motherboard, and install the fan module vertically to the motherboard.

Figure 4-7 Installing the Fan Module



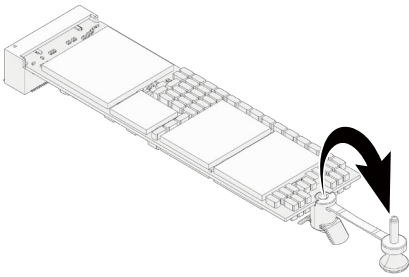
3. Install the top cover.
4. Verify that the fan status LED is off after powering on the server.

4.4.5 Onboard M.2 Drive Replacement

To remove the M.2 drive:

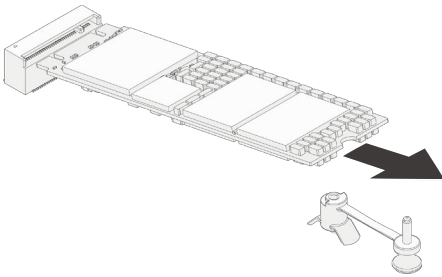
1. Remove the top cover (Refer to [Top Cover Replacement](#)).
2. Disconnect the cable of the super-capacitor.
3. Remove the air duct.
4. Open the snap clip of the M.2 drive. One side of the M.2 drive pops up.

Figure 4-8 Opening the Snap Clip of M.2



5. Tilt to pull the M.2 drive out from the drive slot on the motherboard, and put it into an antistatic bag.

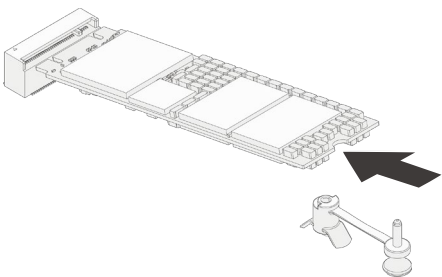
Figure 4-9 Removing the M.2 Drive



To install the M.2 drive:

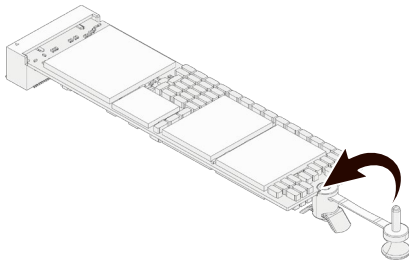
1. Take the new M.2 drive out from the antistatic bag.
2. Tilt the M.2 drive to insert it into the drive slot on the motherboard.

Figure 4-10 Installing the M.2 Drive



3. Close the snap clip to secure the M.2 drive in place.

Figure 4-11 Closing the Snap Clip



4. Install the air duct.
5. Connect the cable of the super-capacitor.
6. Install the top cover.

4.4.6 DIMM Replacement

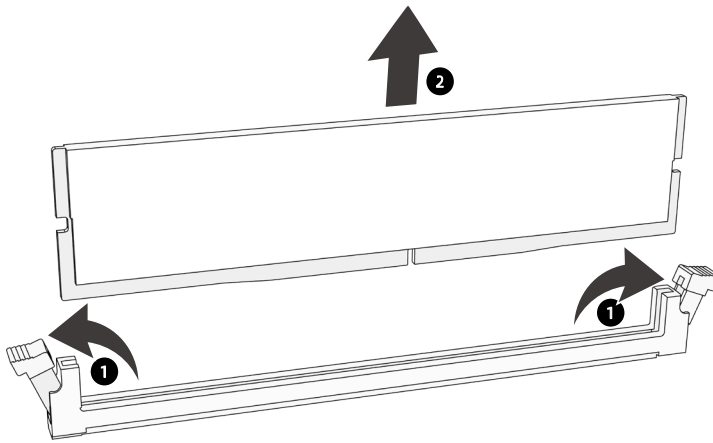
i IMPORTANT

- Mixing of RDIMMs and LRDIMMs is not supported.
 - Using BPS DIMMs alone is not allowed.
 - Mixing of BPS with RDIMMs or LRDIMMs is supported.
-

To remove the DIMM:

1. Remove the top cover (Refer to [Top Cover Replacement](#)).
2. Disconnect the cable of the super-capacitor.
3. Remove the air duct (Refer to [Air Duct Replacement](#)).
4. Locate the DIMM you want to replace.
5. Push the release tabs on both ends of the DIMM slot outward to unlock it.
6. Gently lift and remove the DIMM from the slot.

Figure 4-12 Removing the DIMM



7. Put the DIMM into the memory box.

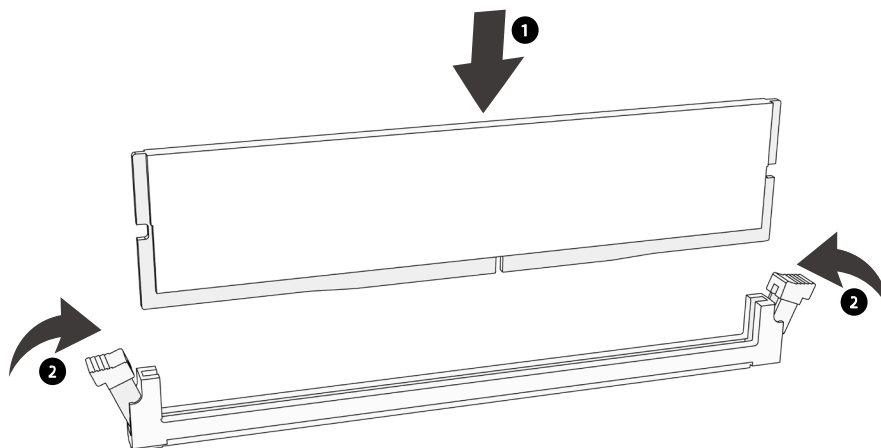
To install the DIMM:

 NOTE

Make sure the release tabs on both ends of the DIMM slot are fully opened.

1. Take the new DIMM out from the memory box.
2. Align the bottom notch with the receptive point on the slot. Use two thumbs together to press both ends of the DIMM straight down into the slot until it snaps into place.

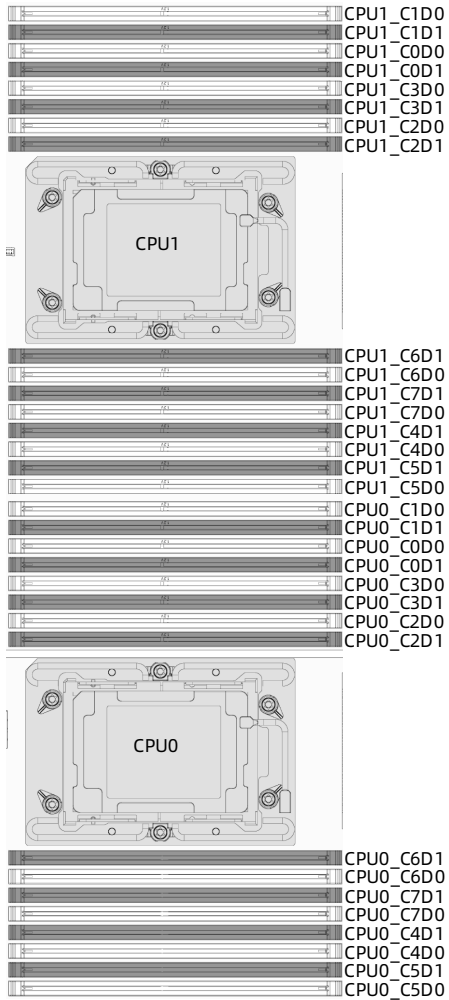
Figure 4-13 Installing the DIMM



3. Install the air duct.

4. Connect the cable of the super-capacitor.
5. Install the top cover.

Figure 4-14 DIMM Slot Layout



Detailed DIMM population principles are as follows:

DDR4 Population Sequence under Single-CPU Configuration

Table 4-1 DDR4 Population Sequence under Single-CPU Configuration

DDR4 Qty	CPU0															
	C0		C1		C2		C3		C4		C5		C6		C7	
	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1
1	v															
2	v								v							
4	v				v				v				v			
6	v		v		v				v		v		v			
8	v		v		v		v		v		v		v		v	
12	v	v	v	v	v	v			v	v	v	v	v	v		
16	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v

DDR4 Population Sequence under Dual-CPU Configuration

Table 4-2 DDR4 Population Sequence under Dual-CPU Configuration

DDR4 Qty	CPU0														CPU1																	
	C0		C1		C2		C3		C4		C5		C6		C7		C0		C1		C2		C3		C4		C5		C6		C7	
	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1
2	v																	v														
4	v							v										v								v						
8	v			v				v					v					v		v				v			v			v		
12	v	v	v	v	v	v		v	v	v	v		v	v	v		v	v	v	v	v	v		v	v	v	v	v	v	v		
16	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v
24	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v
32	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v

NOTE

BPS need to be used with DDR4. In the following images, “D” stands for DDR4, and B for BPS.

Mixing Population Sequence of DDR4s and BPS under Single-CPU Configuration

Table 4-3 Mixing Population Sequence of DDR4s and BPS under Single-CPU

Configuration

DDR4 Qty	BPS Qty	CPU0															
		C0		C1		C2		C3		C4		C5		C6		C7	
		D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1
4	4	D		B		D		B		D		B		D		B	
6	1	D		D		D		B		D		D		D			
8	1	D	B	D		D		D		D		D		D			D
8	4	D	B	D		D	B	D		D	B	D		D	B	D	
8	8	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B
12	2	D	D	B		D	D	D	D	D	D	D	B		D	D	D

Mixing Population Sequence of DDR4s and BPS under Dual-CPU Configuration

Table 4-4 Mixing Population Sequence of DDR4s and BPS under Dual-CPU Configuration

DDR4 Qty	BPS Qty	CPU0														CPU1																	
		C0		C1		C2		C3		C4		C5		C6		C7		C0		C1		C2		C3		C4		C5		C6		C7	
		D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1
8	8	D		B		D		B		D		B		D		B		D		B		D		B		D		B		D		B	
12	2	D		D		D		B		D		D		D				D		D		D		B		D		D		D			
16	2	D	B	D		D		D		D		D		D		D		D	B	D		D		D		D		D		D		D	
16	8	D	B	D		D	B	D		D	B	D		D	B	D		D	B	D		D	B	D		D	B	D		D	B	D	
16	16	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B
24	4	D	D	B		D	D	D	D	D	B			D	D	D	D	D	B			D	D	D	D	D	D	B		D	D	D	D

4.4.7 Processor and Heatsink Module (PHM) Replacement

The server supports single- or dual-processor configuration depending on the model you purchased.

CAUTION

- To help avoid damage to the processor and motherboard, do not install the processor without using the processor installation tool.
- To prevent possible server malfunction and damage to the equipment, multiprocessor configurations must contain processors with the same part number.

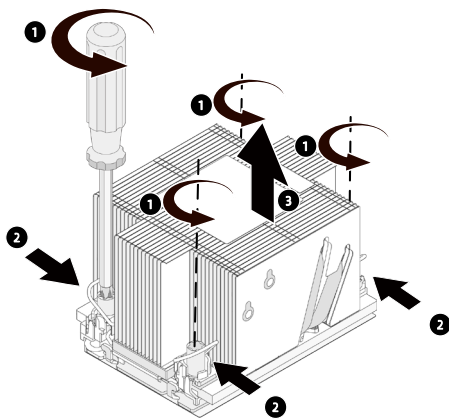
To remove the PHM:

DANGER

The heatsink may be hot after the system has been powered down. Allow the heatsink to cool down for a few minutes before removing it.

1. Remove the top cover (Refer to [Top Cover Replacement](#)).
2. Disconnect the cable of the super-capacitor.
3. Remove the air duct (Refer to [Air Duct Replacement](#)).
4. Use a T30 Torx Screwdriver to loosen the four screws securing the Processor Heatsink Module (PHM) to the CPU socket counterclockwise in the sequence as shown on the heatsink label.
5. Press the lock-in wires inward with both hands to open positions.
6. Gently remove the PHM module from the CPU socket.

Figure 4-15 Removing the PHM

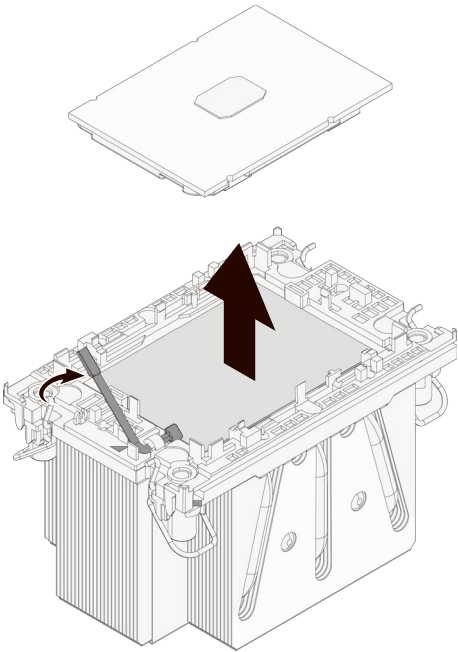


 **CAUTION**

- Use a protective cover to protect the CPU socket to avoid damaging socket pins after removing the PHM.
 - The gold pins on the CPU are fragile and can be easily damaged if touched. During removal and installation, always keep the gold pins up and DO NOT touch the pins when processor dedicated insertion/removal tool (CPU tray) is unavailable.
-

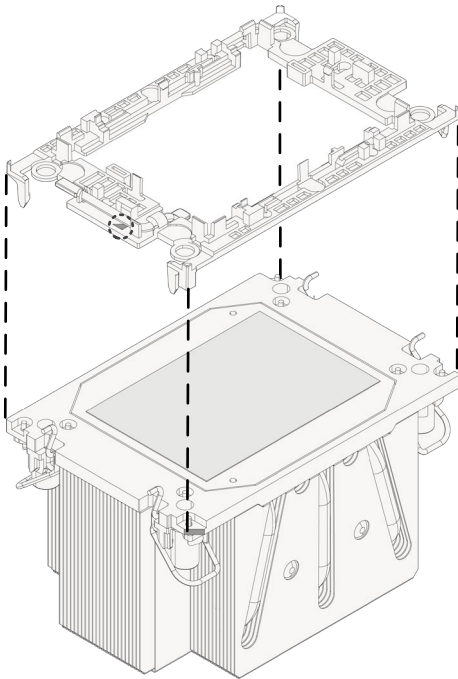
7. Lift up the lever on the Clip to the open position. Release the three tabs securing the CPU to the Clip. Gently remove the CPU from the Clip, and put it into an antistatic bag.

Figure 4-16 Removing the CPU



- 8. Gently open the two tabs on one side of the Clip.
- 9. Remove the Clip from the heatsink.
- 10. Lock the lever on the Clip.

Figure 4-17 Removing CPU Clip



 CAUTION

- Use a clean and lint-free cloth to wipe off the old thermal grease first if the heatsink is to be reused.
 - Coat thermal grease evenly onto the heatsink before reusing the heatsink.
-

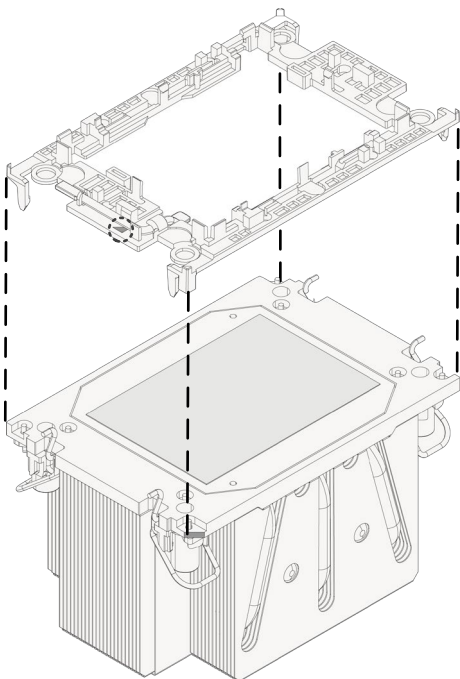
To install the CPU:

 CAUTION

The gold pins on the CPU are fragile and can be easily damaged if touched. During removal and installation, always keep the gold pins up and DO NOT touch the pins when processor dedicated insertion/removal tool (CPU tray) is unavailable.

1. With the heatsink thermal grease side up, align the triangle mark on the Carrier Clip with the number ① on the heatsink label, and then press the Clip straight down onto the heatsink until the four retaining tabs of the Clip snap into place.

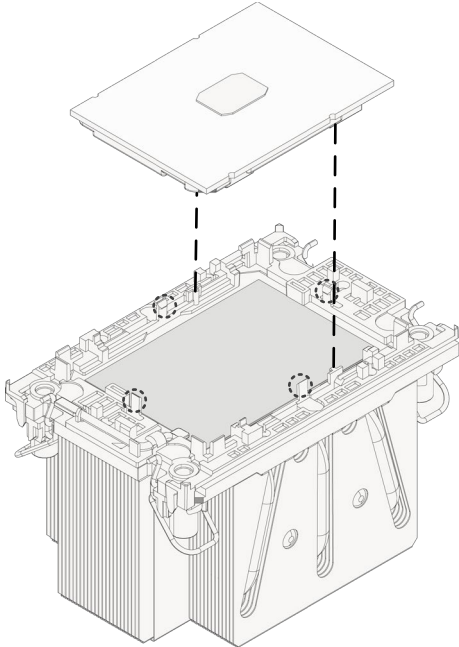
Figure 4-18 Installing the CPU Clip



2. Apply thermal grease evenly across the heatsink in the size of the CPU surface area.


3. With the gold pins up, align the triangle mark on the CPU with that on the Clip. Grasp CPU by its two edges, and install it into the Clip. Make sure the notches of the CPU are aligned with the tabs of the Clip and the CPU is secured in place by the tabs on the four sides of the Clip.

Figure 4-19 Installing the CPU



4. Remove the protective cover if present.
5. With the gold pins down, align the triangle mark on the CPU with that on the heatsink to attach the PHM onto the CPU socket.
6. Press the four lock-in wires outward with both hands simultaneously.
7. Tighten the four screws securing the PHM to the CPU socket clockwise in the sequence as shown on the heatsink label with a T30 Torx screwdriver.
8. Install the air duct.
9. Connect the cable of the super-capacitor.
10. Install the top cover.

4.4.8 PCIe Card Replacement

 CAUTION

- To prevent damage to the server or expansion cards, power down the server and remove all power cables before removing or installing the PCIe card.
 - To prevent damage to the PCIe slot pins, be sure to apply even force and
-

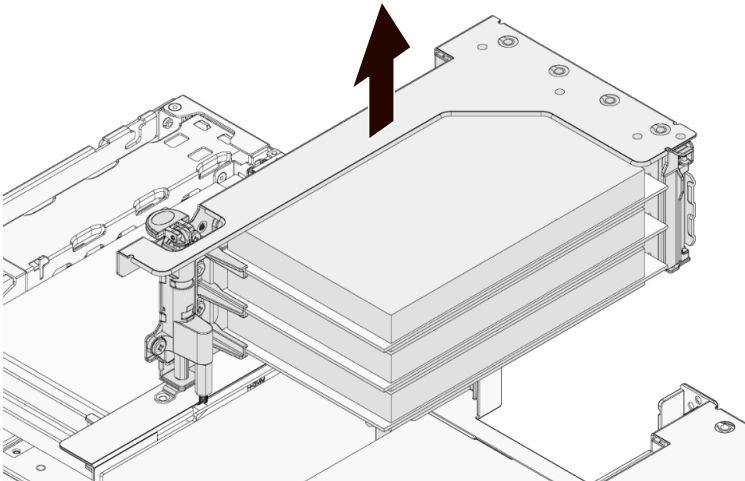
pull and insert the PCIe card vertically.

- If the riser card (the riser card under 4-GPU configuration excluded) is marked with silkscreen "IV", then it supports Gen4 PCIe expansion cards by default; otherwise, it doesn't support Gen4 PCIe expansion cards by default.
 - The riser card under 4-GPU configuration supports Gen4 PCIe GPU by default.
-

To remove the PCIe card:

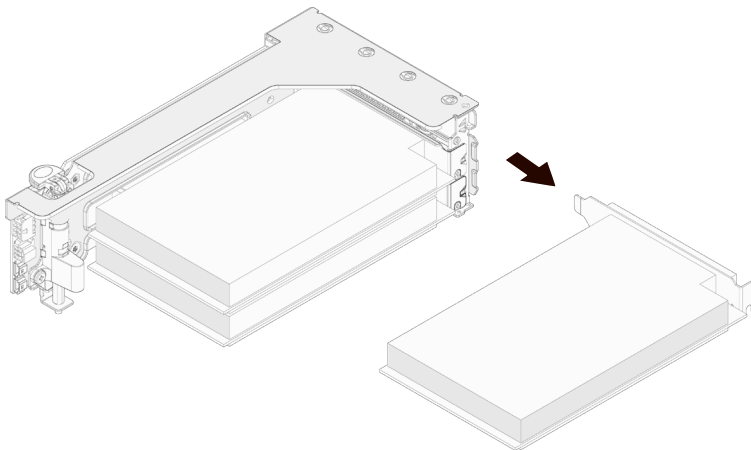
1. Remove the top cover (Refer to [Top Cover Replacement](#)).
2. Disconnect the power cables and clock cables (if available) on the riser card.
3. Lift up the blue latch on the PCIe riser cage. Rotate the latch 180° counterclockwise to unlock it.
4. Gently lift and remove the PCIe riser-card assembly with both hands.

Figure 4-20 Removing PCIe Riser-Card Assembly



5. Disconnect the cables of the riser card. Take a picture of the cables to avoid wrong cabling when installing.
6. Press down on the latch of the cover plate to unlock it.
7. Pull out the PCIe card from the PCIe riser slot.

Figure 4-21 Removing the PCIe Card



To install the PCIe card:

1. Take the new PCIe card from the antistatic bag.
2. Align and insert the PCIe card to the riser card slot.
3. Close the cover plate.
4. Connect the cables of the riser card. Be sure to connect the cables properly.
5. Align and insert the riser card to the slot on the motherboard.
6. Press and rotate the latch 180° clockwise to secure the PCIe riser cage in place.
7. Connect the power cables and clock cables (if available).
8. Install the top cover.

4.4.9 GPU/Graphics Card Replacement

NOTE

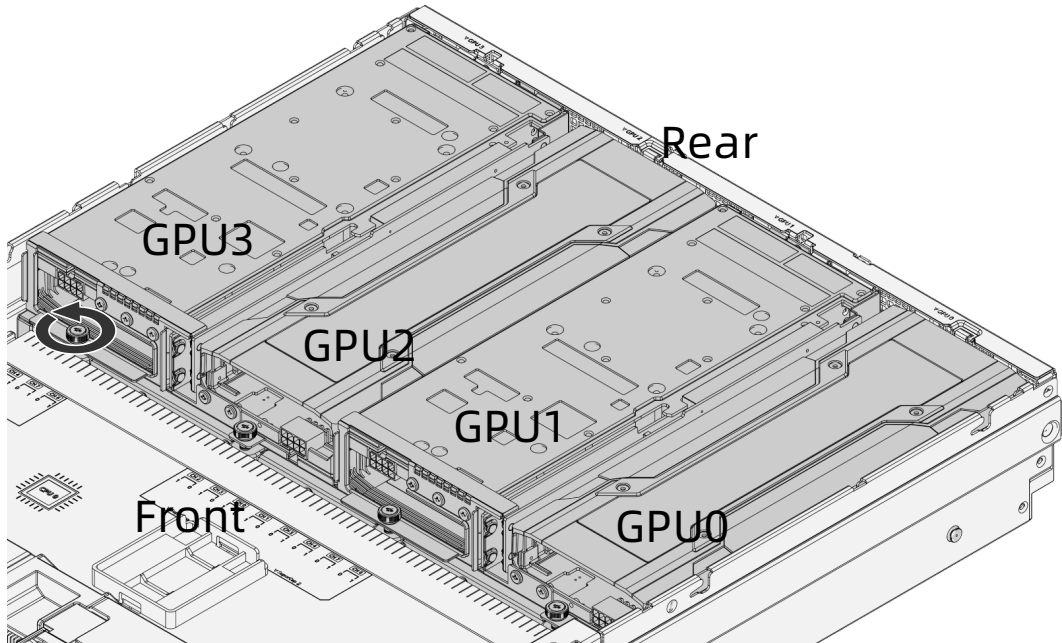
- The procedure to replace the graphics card and the GPU is similar. This section demonstrates with GPU replacement.
 - Figure 4-22 shows the layout of GPUs. To avoid interference, GPU1/GPU3 needs to be removed first in order to remove GPU0/GPU2, and GPU0/GPU2 needs to be installed first in order to install GPU1/GPU3.
 - Keep the removed screws and brackets during GPU removal for later use.
-

To remove a GPU:

1. Remove the top cover.

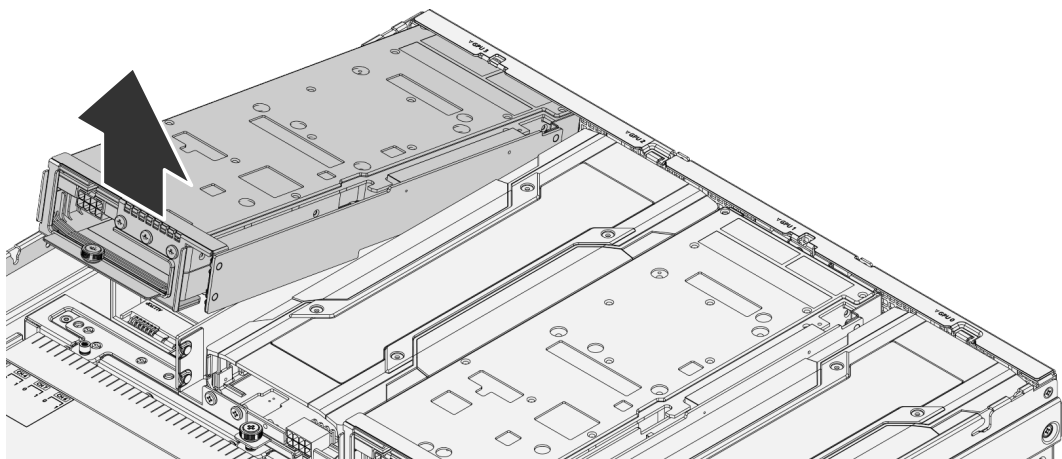
2. Disconnect all the cables from the GPU and note the routing of the cables for GPU installation later.
3. Loosen the thumbscrew securing the GPU module in place counterclockwise.

Figure 4-22 Loosening the Thumbscrew Securing the GPU Module



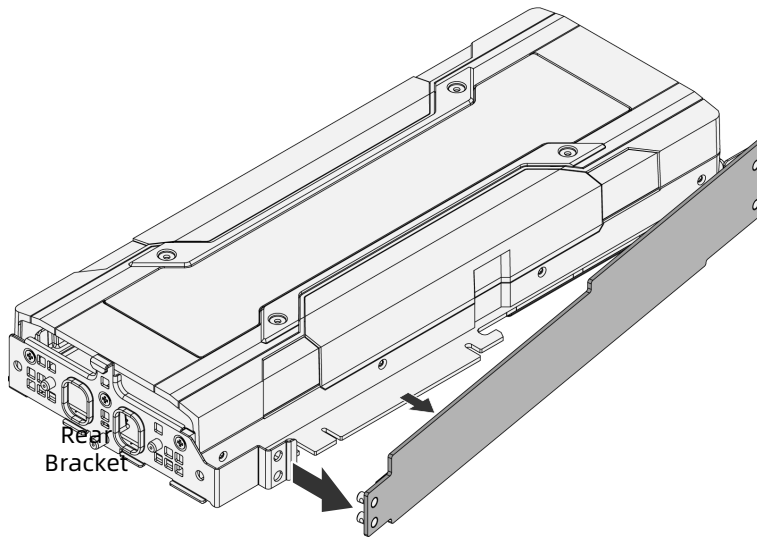
4. Tilt the front end of the GPU module and remove it from the system.

Figure 4-23 Removing the GPU



5. Detach the locating pins from the GPU rear bracket and the gold fingers from the riser slot to disengage the riser from the GPU module.

Figure 4-24 Removing the Riser



6. Remove the screws securing the front bracket with a Phillips screwdriver to detach the front bracket from the GPU.

 NOTE

The front brackets of GPUs/graphics cards may vary.

Figure 4-25 Front Bracket of GPU0/GPU2

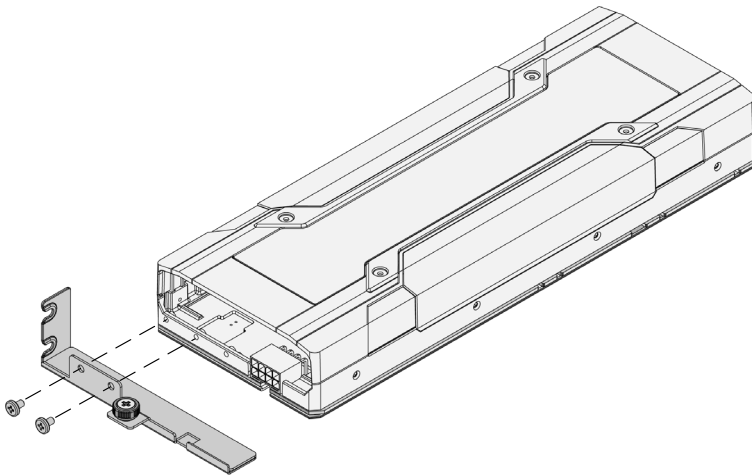
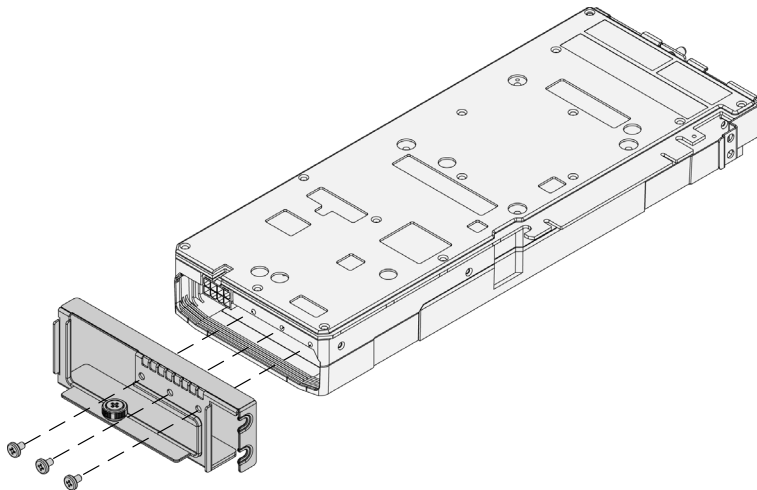


Figure 4-26 Front Bracket of GPU1/GPU3

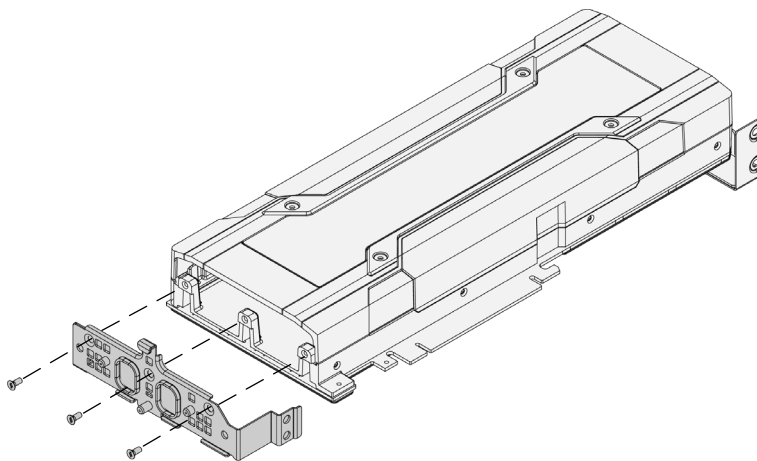


7. Remove the screws securing the rear bracket with a Phillips screwdriver to detach the rear bracket from the GPU.

 NOTE

The rear brackets of GPUs/video cards may vary.

Figure 4-27 Removing the Rear Bracket



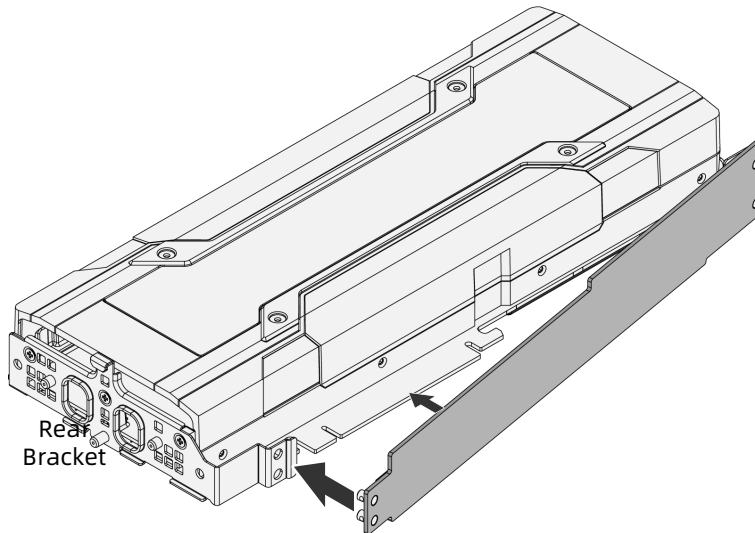
8. Put the removed GPU into an anti-static bag.

To install a GPU:

1. Take the GPU out from its anti-static bag.
2. Remove the bracket of the GPU, if any.
3. Install the rear bracket.

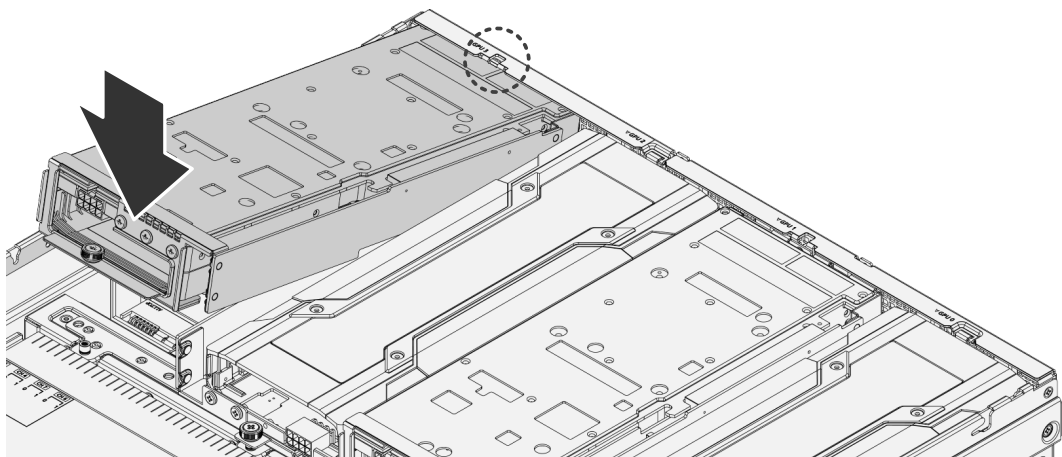
4. Install the front bracket.
5. Attach the riser to the front end of the GPU, and then attach the gold fingers to the riser slot and the bracket to the locating pins.

Figure 4-28 Installing the Riser



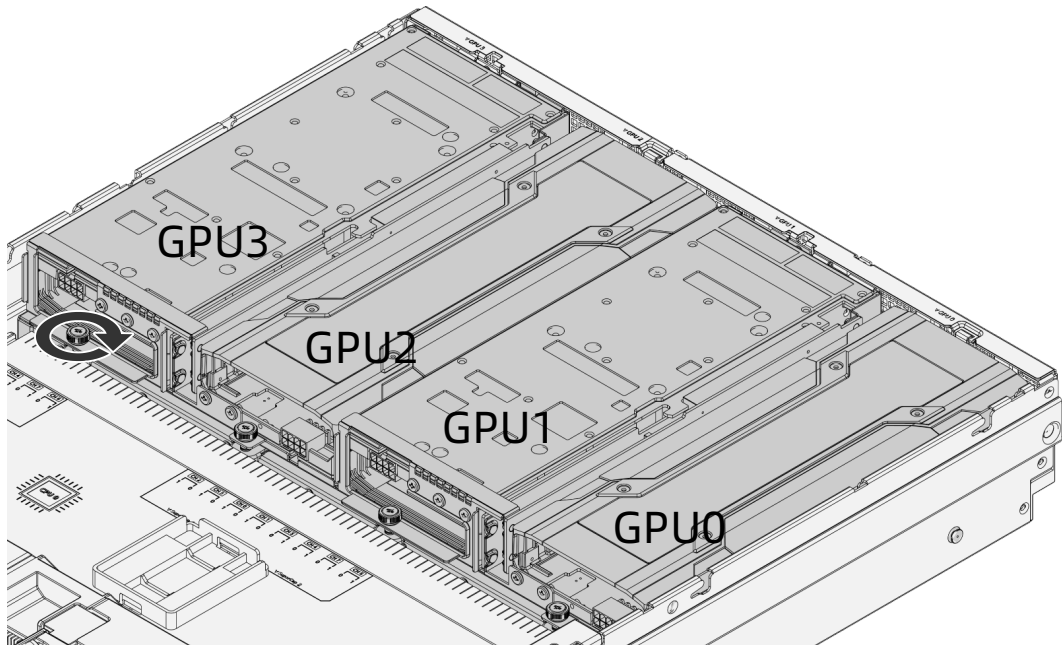
6. Align the rear bracket with the locating slot on the chassis rear to install the rear bracket to the chassis. Then gently rotate down the GPU module until it is firmly seated.

Figure 4-29 Installing the GPU



7. Tighten the thumbscrew clockwise to secure the GPU module in place.

Figure 4-30 Tightening the Thumbscrew



8. Connect the cables of the GPU.
9. Install the top cover.

4.4.10 Hot-Swap Storage Drive Replacement

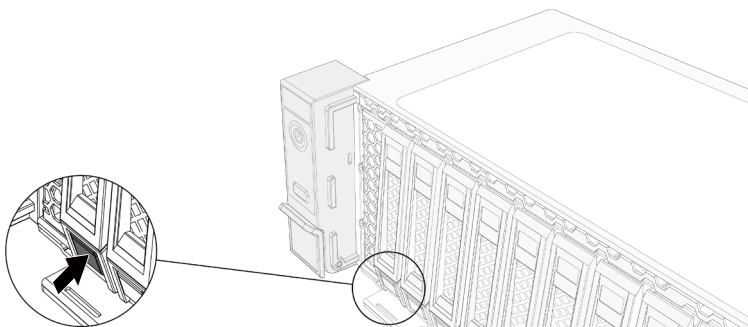
 CAUTION

For proper cooling, do not operate the server without the top cover, air ducts, expansion slot blanks, or other blanks installed. If the server supports hot-swap components, minimize the amount of time the top cover is open.

To remove the drive:

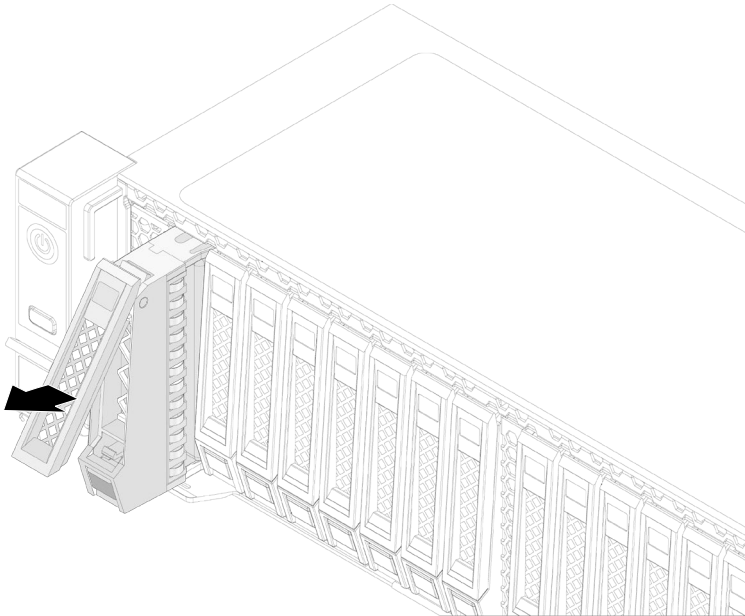
1. Press the release button to release the lever.

Figure 4-31 Pressing the Release Button



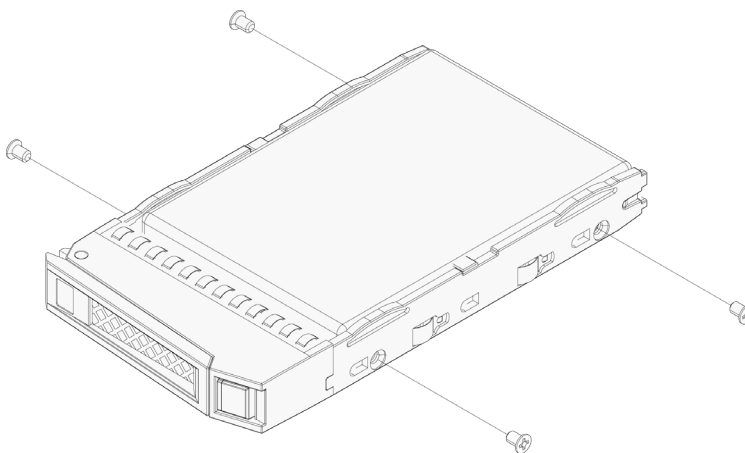
2. The lever will pop up automatically. Hold the lever and pull the drive module out of the drive bay.

Figure 4-32 Pulling Out the Drive Module



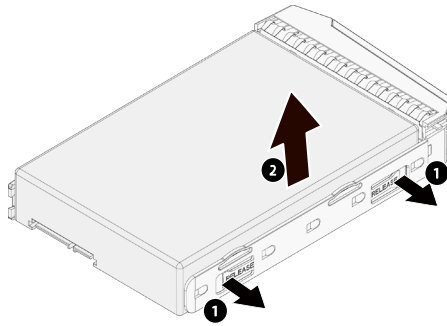
3. Remove the drive from the drive tray and put it into an antistatic bag.
 - For normal drive tray: Remove the four screws securing the drive to the drive tray counterclockwise with a Phillips screwdriver.

Figure 4-33 Removing Screws Securing the Drive



- For tool-less drive tray, pull the two release tabs on one side of the tray, and remove the drive away from the drive tray.

Figure 4-34 Removing the Drive from the Toolless Drive Tray

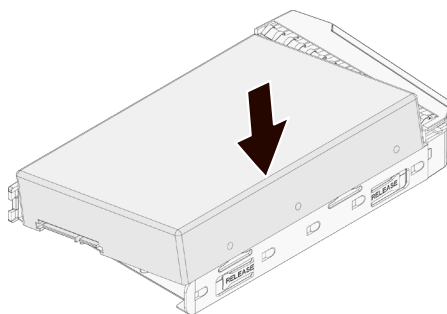


To install the drive:

1. Take the new drive out from the antistatic bag.
2. Install the drive into the drive tray:
 - For normal drive tray:
 - a. Orient the drive into the drive tray with the connector end of the drive toward the back of the drive tray.
 - b. Tighten the four screws securing the drive to the drive tray clockwise with a Phillips screwdriver.
 - For tool-less drive tray:

Align the hole on one side of the drive with the locating post in the drive tray, pull the release tabs and press the drive into place.

Figure 4-35 Installing the Drive



3. Open the release lever, and insert the drive module into the drive bay.
4. Close the release lever to lock the drive module in place.
5. Verify that the activity LED on the drive tray is green after powering on the server.

4.4.11 Hot-Swap PSU Replacement



WARNING

To reduce the risk of personal injury from hot surfaces, allow the power supply or power supply blank to cool before touching.



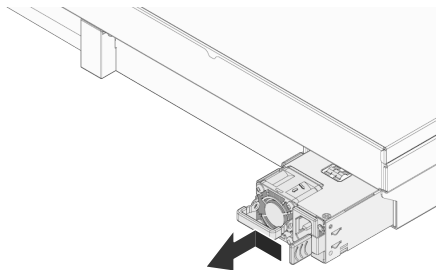
CAUTION

To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

To remove the PSU:

1. Grasp the handle, and press the blue release tab to release the PSU.

Figure 4-36 Removing the PSU



2. Pull the PSU out of the power bay and put it into an antistatic bag.

To install the PSU:

1. Take the new PSU out from the antistatic bag.
2. Make sure the blue release tab is on the right of the PSU. Grasp the handle and push the PSU into the power bay until it snaps into place.

4.4.12 OCP Card Replacement



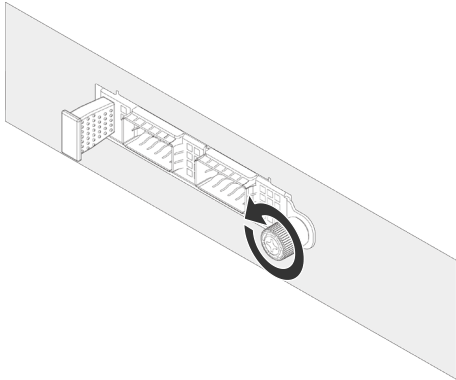
CAUTION

To prevent damage to the server or expansion cards, power down the server and remove all power cables before removing or installing the OCP card.

To remove the OCP card:

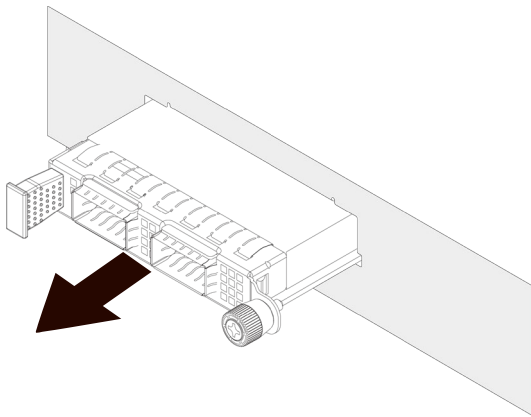
1. Loosen the thumbscrew securing the OCP card to the server counterclockwise.

Figure 4-37 Loosening the Thumbscrew



2. Pull out the OCP card from the server.

Figure 4-38 Pulling Out the OCP Card



3. Put the OCP card into an antistatic bag.

To install the OCP card:

1. Take the new OCP card out from the antistatic bag.
2. Insert the OCP card into the card slot until it snaps into place.
3. Tighten the thumbscrew securing the OCP card to the server clockwise.

4.4.13 Rear M.2 Drive Replacement

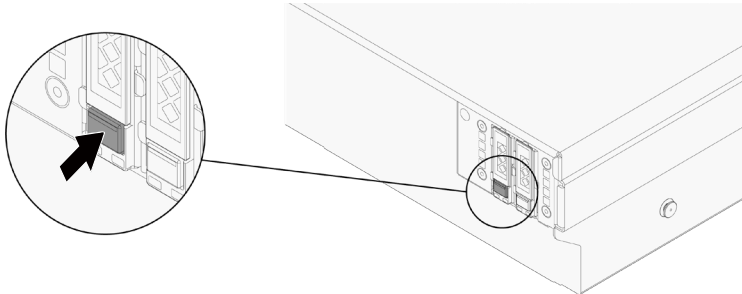
 CAUTION

M.2 drives are not hot-swappable. Power down the server and remove all power cables before removing or installing M.2 drive.

To remove the rear M.2 drive:

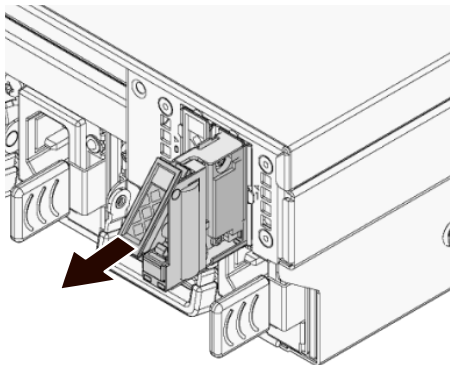
1. Press the release button to release the lever.

Figure 4-39 Pressing Release Button



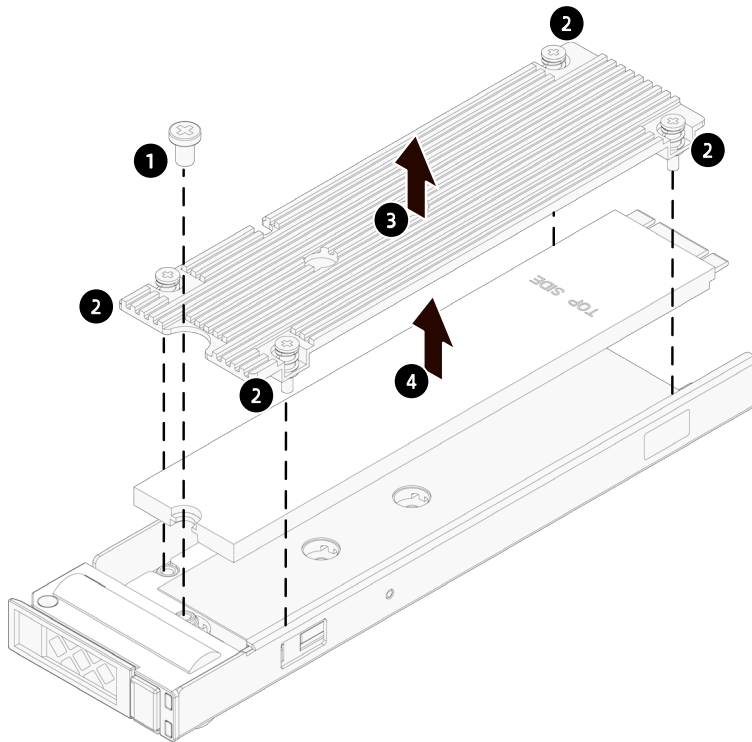
2. The lever will pop up automatically. Hold the lever and pull the drive module out of the drive bay.

Figure 4-40 Pulling Out the M.2 Drive Module



3. Remove the screw avoiding the M.2 drive from moving with a Phillips screwdriver.
4. Loosen the four captive screws securing the top and bottom heatsink and the M.2 drive to the drive tray with a Phillips screwdriver, and remove the top and bottom heatsink and the M.2 drive away from the drive tray.
5. Remove the top heatsink away from the M.2 drive.
6. Remove the M.2 drive.

Figure 4-41 Removing M.2 Drive



7. Put it into an antistatic bag.

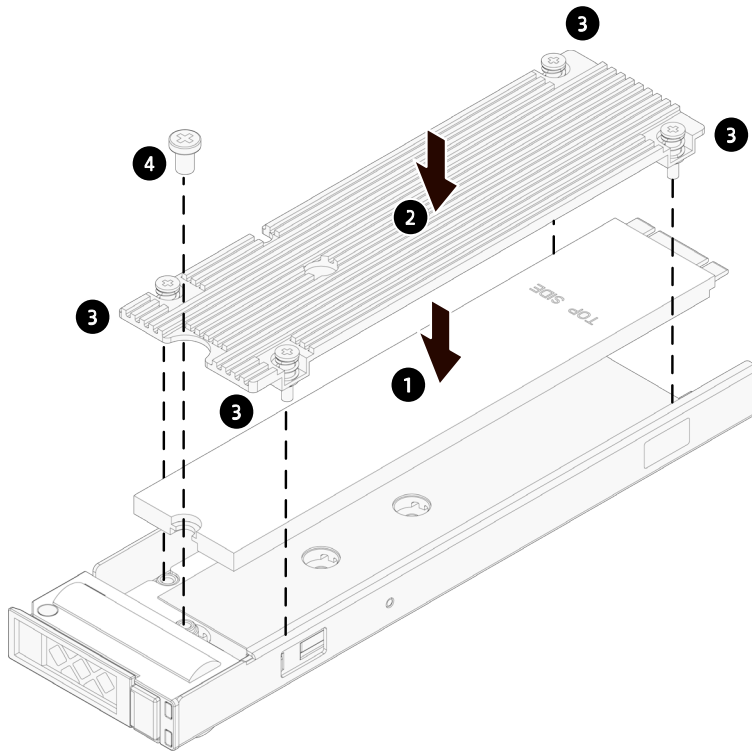
To install the rear M.2 drive:

i IMPORTANT

It is recommended to replace the thermal grease on the top and bottom heatsink to ensure good performance.

1. Take the new M.2 drive out from the antistatic bag.
2. Position the M.2 drive on the drive tray.
3. Install the top heatsink, and tighten the four captive screws.
4. Install and tighten the screw avoiding the M.2 drive from moving.

Figure 4-42 Installing M.2 to the Drive Tray



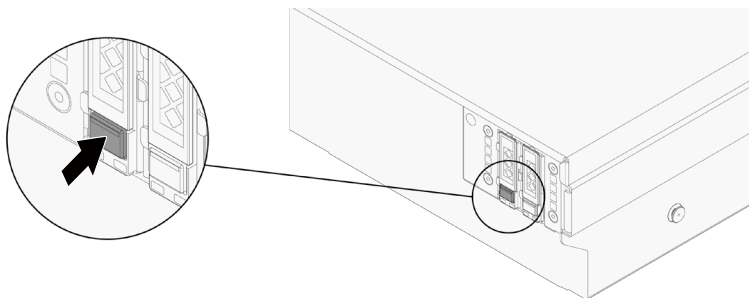
5. Open the release lever, and insert the drive module into the drive bay.
6. Close the release lever to lock the drive module in place.

4.4.14 E1.S Drive Replacement

To remove E1.S drive:

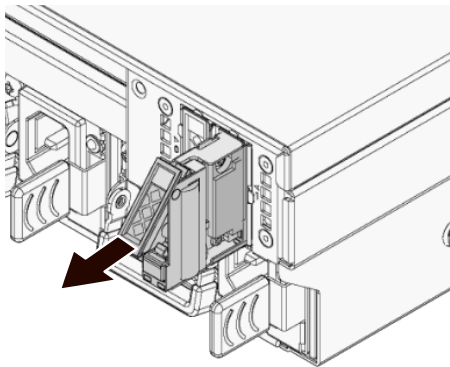
1. Press the release button to release the lever.

Figure 4-43 Pressing the Release Button



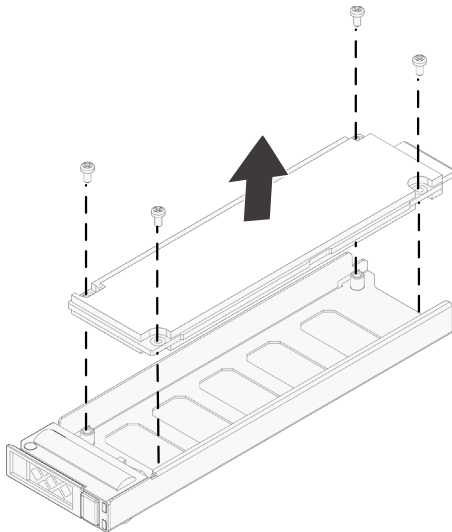
2. The lever will pop up automatically. Hold the lever and pull the drive module out of the drive bay.

Figure 4-44 Pulling out the E1.S Module



3. Remove the four screws on the corners of E1.S
4. Remove the E1.S and put it into an antistatic bag.

Figure 4-45 Removing E1.S



To install E1.S:

1. Align and install the four screws securing the E1.S onto the drive tray.
2. Open the release lever, and insert the drive module into the drive bay.
3. Close the release lever to lock the drive module in place.

4.5 Firmware Update and Configuration

For firmware update and configuration, refer to:

- BMC Update Manual
- BMC Configuration Manual

- BMC User Manual
- BIOS Update Manual
- BIOS User Manual

4.6 Cable Routing

Blue indicates the data cable routing between the backplane and SAS/RAID card;

Red indicates the drive power cable routing between the backplane and the motherboard.

 CAUTION

- To prevent damage to electrical components, properly ground the server before installation. Improper grounding can cause electrostatic discharge.
 - Please route the cables based on the actual machine configuration.
-

Figure 4-46 Cable Routing of 12 × 3.5-inch Configuration

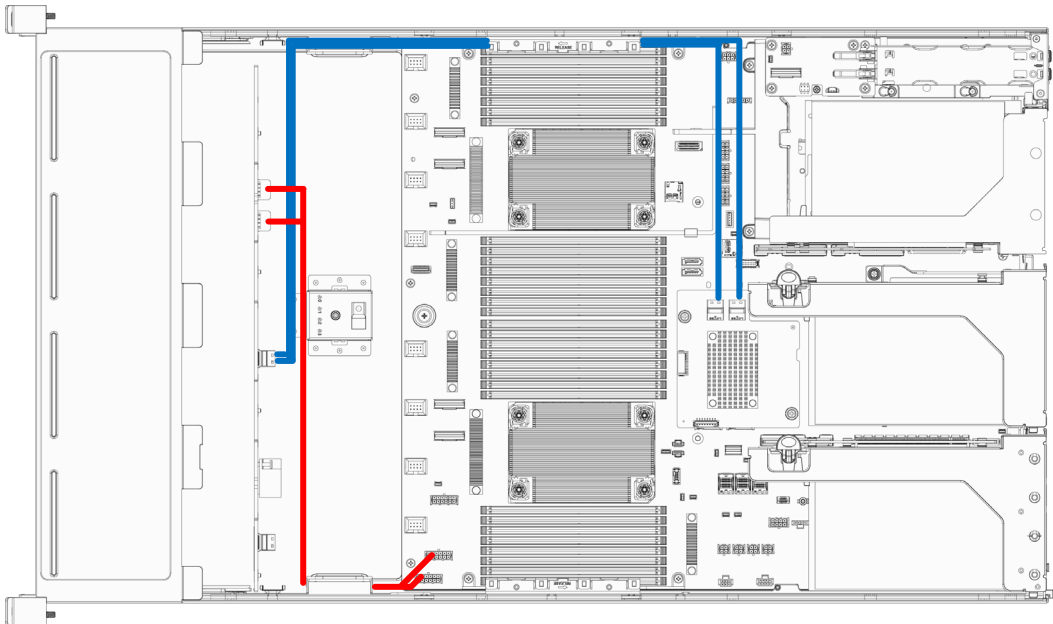


Figure 4-47 Cable Routing of 25 × 2.5-inch Configuration

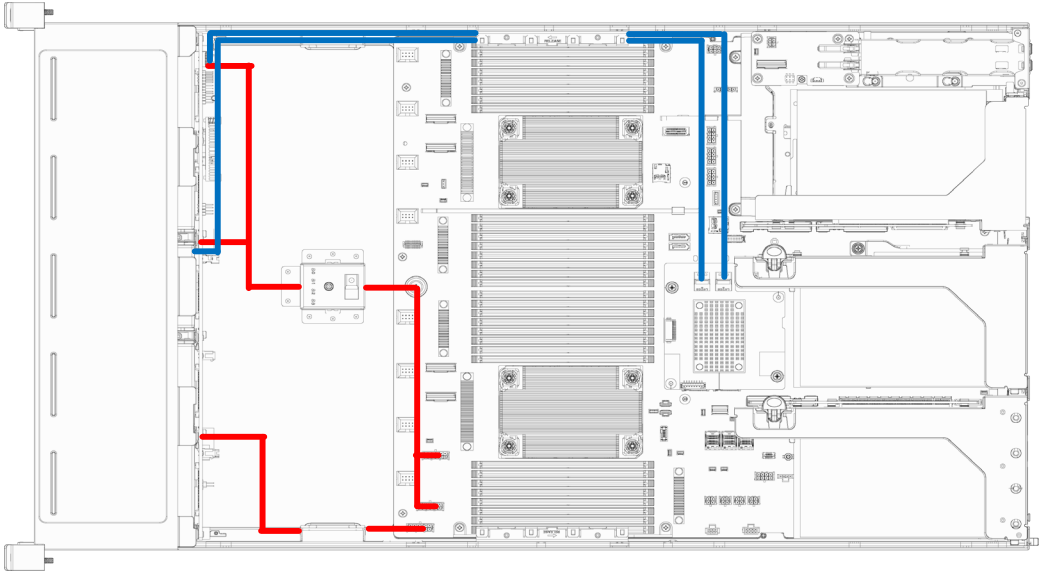


Figure 4-48 Cable Routing of 24 × 2.5-inch Configuration

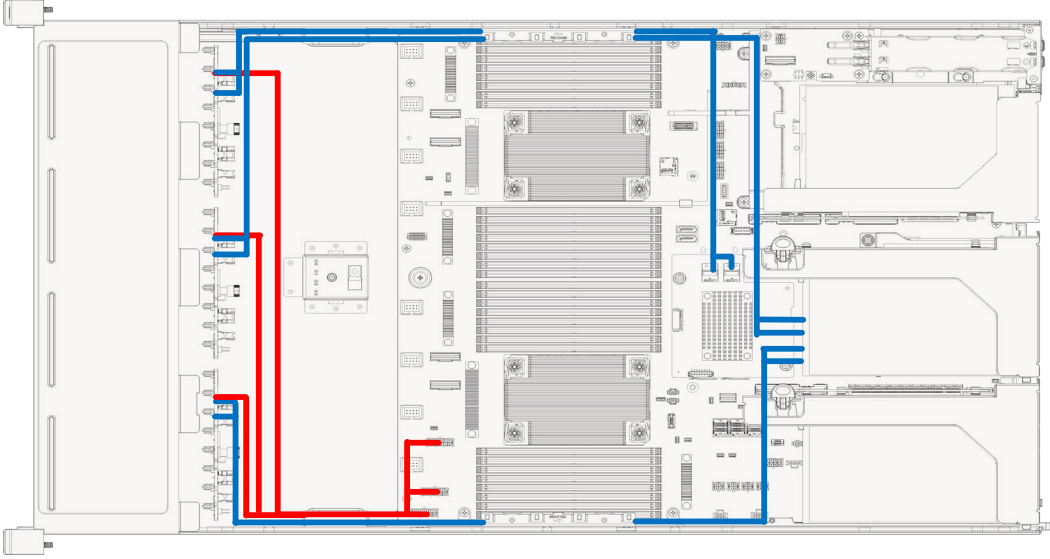


Figure 4-49 Cable Routing of 2 × E1.S (rear) Configuration

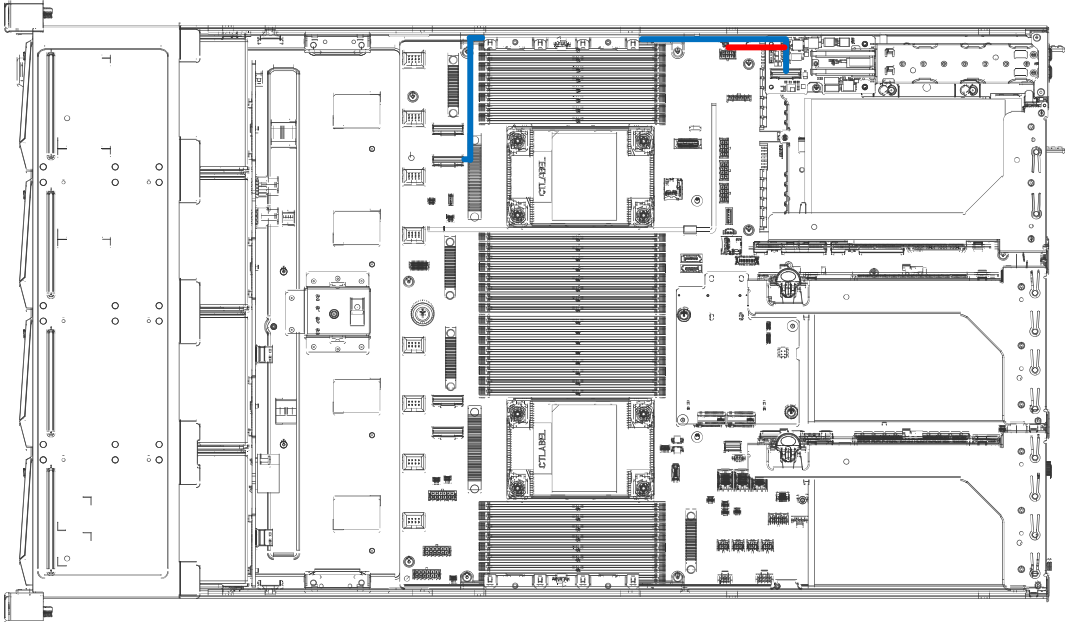


Figure 4-50 Cable Routing of 24 × NVMe Drive (front) + 4 × Retimer Card Configuration

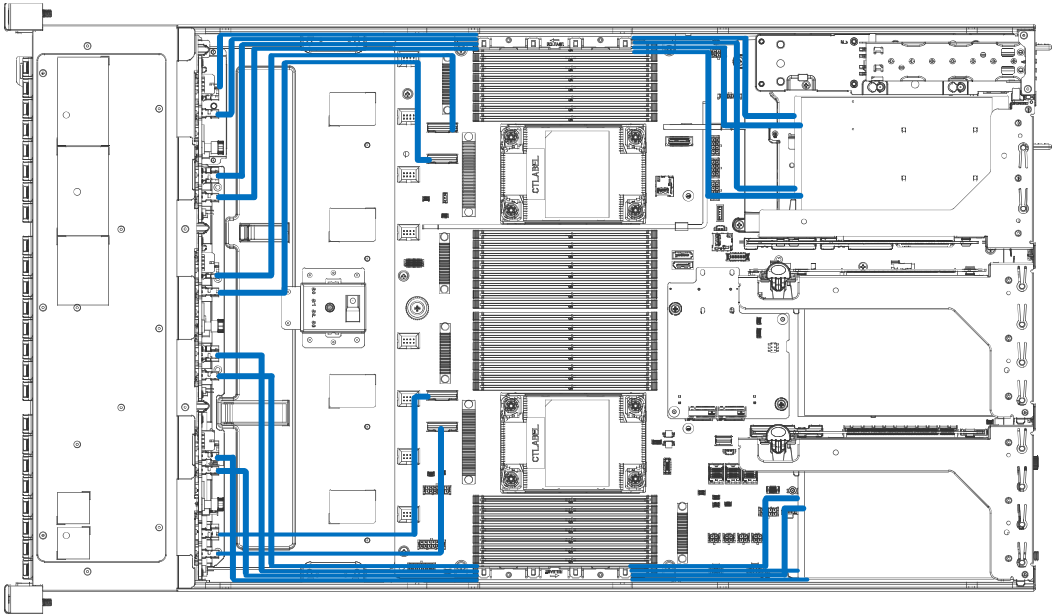
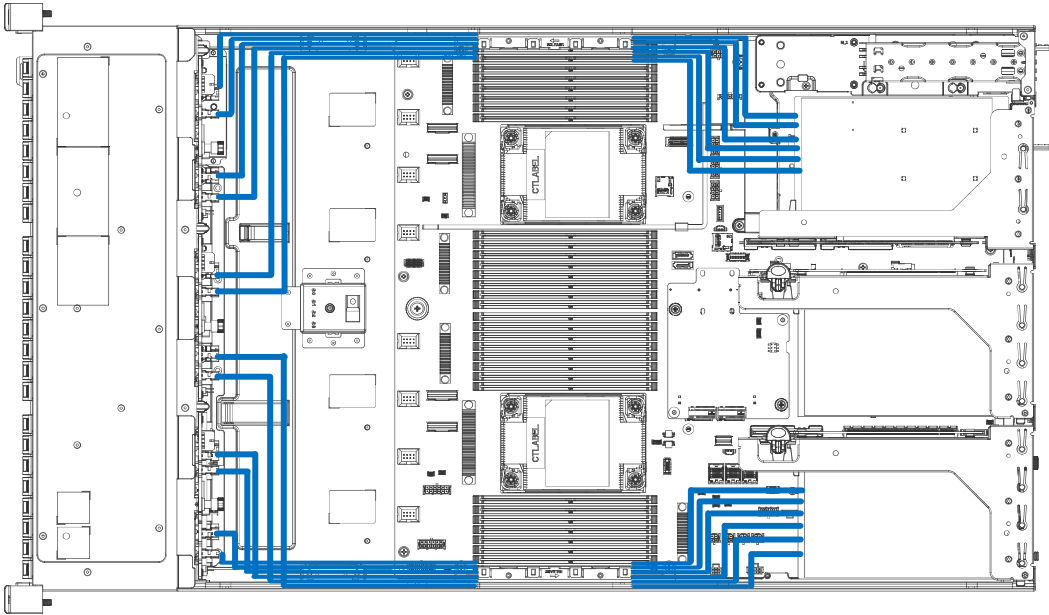


Figure 4-51 Cable Routing of 24 × NVMe Drive (front) + 4 × Switchboard Configuration



5 Battery Replacement

WARNING

The server contains an internal lithium cell. A risk of fire and burns exists if the battery is not properly handled. To reduce the risk of personal injury:

- DO NOT recharge the battery.
 - DO NOT expose the battery to temperatures higher than 60°C (140°F).
 - Do not disassemble, crush, puncture, short external contacts, or dispose of the battery in fire or water.
 - Replace only with the spare designated for this product.
 - After replacing the battery, you must reconfigure the server and reset the system date and time.
-

To remove the battery:

1. Power down the server and disconnect the power cables from the server.
 2. Gently slide and remove the server out of the rack.
 3. Remove the top cover (Refer to [Top Cover Replacement](#)).
 4. Disconnect the cable of the super-capacitor.
 5. Remove the air duct (Refer to [Air Duct Replacement](#)).
 6. Locate the battery on the motherboard.
 7. Gently press the clip on the battery socket until the battery pops up from the socket. Remove the battery.
-

CAUTION

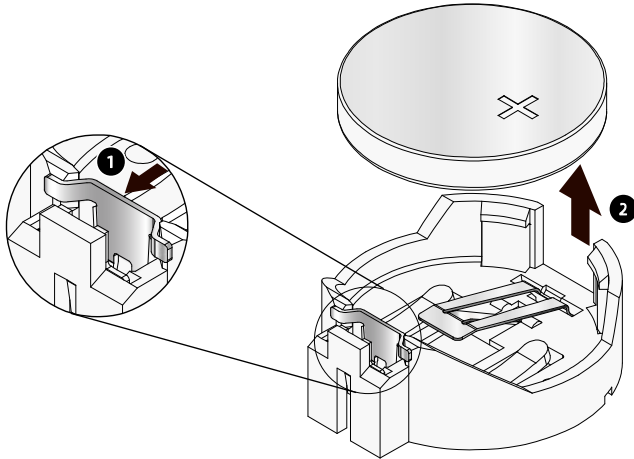
- DO NOT pry or press the battery using excessive force.
 - Failing to remove the battery properly might damage the socket on the motherboard.
-

NOTE

The figure shown below is for reference only The location and orientation of the cell

may differ depending on the model you purchased.

Figure 5-1 Removing the Battery



8. Dispose of the battery as required by local ordinances or regulations.

To install the battery:

1. Take the new battery out from the anti-static bag.
2. Place the new battery into the socket, being careful to observe the correct polarity. Snap the battery into place. Make sure the battery is secured by the clip within the socket.
3. Install the air duct.
4. Connect the cable of the super-capacitor.
5. Install the top cover.

6 Electrostatic Discharge

6.1 Preventing Electrostatic Discharge

To prevent damage to the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

To prevent electrostatic damage:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers before they arrive at static-free workstations.
- Place parts on a grounded surface before taking them out from their packages.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly.

6.2 Grounding Methods to Prevent Electrostatic Discharge

Several methods are used for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm ± 10 percent resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have an authorized reseller install the part.

For more information on static electricity or assistance with product installation, contact Inspur Customer Service.

7 Troubleshooting

7.1 Hardware Problems

- **Power-On Failure**

Symptoms:

After pressing the power button, the power LED on the power button is orange and the drive activity LED is off. Meanwhile, there is no output on the monitor, and server fans do not rotate.

Solutions:

Check the status of the PSU LEDs on the rear panel.

1. The PSU LEDs are off or amber
 - a. If the PSU LEDs are off or amber, it indicates abnormal power supply. Check if the outlet can function, if the power cords are plugged properly and if the power cables of the faulty PSU can work;
 - b. If all yes: the PSU LEDs are still off or amber, maybe the PSUs are faulty. Please replace the faulty PSUs with PSUs of the same server model and of the same specifications to test whether the PSUs have failed; the PSU LEDs turn green, but the power LED on the power button is still orange, please call Inspur Customer Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com.
2. All the PSU LEDs are green
 - a. If all the PSU LEDs are green, disconnect the power cables, remove and re-insert all the PSUs. Connect the power cables and power on again to test if the problem can be solved;
 - b. If re-inserting the PSUs won't work, please replace the PSUs with PSUs of the same server model and of the same specifications to test whether the PSUs have failed;
 - c. If the instructions above do not resolve the problem, please call Inspur Customer Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com.

- **No Display**

Symptoms:

After pressing the power button, the power LED on the power button changes from orange to green, the system fans work normally, but there's no output on the monitor.

Solutions:

1. Check whether the monitor is powered up normally;

2. If yes, but there is still no output on the monitor, check whether the monitor is connected properly to the server's VGA port;
3. If yes, but there is still no output on the monitor, please replace with another monitor;
4. If the problem still persists, maybe the VGA port is abnormal. Please log into the BMC Web GUI. Launch the BMC remote KVM (For detailed reference document, please see [Firmware Update and Configuration](#)) to see if there is normal output: If yes, maybe the VGA port on the motherboard is abnormal, please contact Inspur Customer Service; if no, please record the detailed warning information;
5. If the instructions above do not resolve the problem, please call Inspur Customer Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com, and inform us of the detailed warning information and failure.

- **Abnormal LED on the Front Panel**

Symptoms:

The status LED on front panel illuminates red.

Solutions:

Identify the abnormal LED based on Front Panel LEDs

1. If the system status LED illuminates red, check whether the server is under normal operation: If yes, log into the BMC Web GUI to view the BMC logs (For detailed reference document, please see [Firmware Update and Configuration](#)) to check whether there are warnings. If yes, please record the detailed warning information;
2. If the power status LED is abnormal, please check if the PSU LEDs on the rear panel are abnormal (amber or off): If the PSU LEDs are normal, please log into the BMC Web GUI to check the BMC logs (For detailed reference document, please see [Firmware Update and Configuration](#)) to see if there are warnings. If yes, please record the detailed warning information; if all the PSU LEDs are abnormal, please refer to [All the PSU LEDs are green](#); if one PSU LED is abnormal, please refer to [PSU LED Off or Illuminates Amber](#);
3. If other status LEDs are abnormal, log into the BMC Web GUI to check the BMC logs to see if there are warnings; if yes, please record the detailed warning information;
4. If the instructions above do not locate or resolve the problem, please call Inspur Customer Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com, and inform us of the detailed warning information and failure.

- **Stuck in POST Interface or Other Interface**

Symptoms:

After pressing the power button, the server gets stuck in the POST interface or other interface and cannot enter the OS.

Solutions:

1. If the server gets stuck in the media test failure interface, please confirm whether the OS has been installed successfully and whether the device where the OS is installed has been selected as Boot Option #1;
2. If the stuck interface includes directional error information of hardware, such as self-test errors of memory and RAID, record the detailed errors;
3. If the stuck interface is the POST interface and there are errors reported in the interface, please record the detailed errors;
4. If the instructions above do not resolve the problem, please call Inspur Customer Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com, and inform us of the detailed errors.

- **PSU LED Off or Illuminates Amber**

Symptoms:

A certain PSU LED on the rear panel is off or illuminates amber when the server is under normal operation.

Solutions:

1. Check if there is normal external power supply. Inspect the server for any abnormal appearance such as burning or vulcanization;
2. Check whether the power cord is plugged in firmly. Re-connect the power cable again.
3. If the fault still exists, remove the power and insert the PSU again.
4. Shut down the server (if shutdown is allowed), switch the positions of the PSUs and cross-check whether the PSU is faulty.
5. If the instructions above do not resolve the problem, please call Inspur Customer Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com.

- **Abnormal Drive Status LED**

Symptoms:

The drive activity LED is off or the drive error LED illuminates red when the server is under normal operation.

Solutions:

1. Check if the drives are installed properly;
2. Check whether the drives are removed and inserted or if there are other manual operations. If yes, restore the array through RAID configuration to ensure the drives are configured properly;

3. If no, run command under the OS to see if all the drives are identified. If the server is configured with a RAID controller card, you can also choose to log into the RAID management interface to check whether there is a drive failure;

4. If there is a drive failure or the instructions above do not resolve the problem, please call Inspur Customer Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com.

 NOTE

- Hot-swap storage drive allows users to remove or replace the drive without shutting down or powering off the system, which improves the system disaster recovery capability, scalability and flexibility. It only means that the hot-swap storage drive can be plugged in and out online without damage.
- Depending on the RAID level, hot-swapping a storage drive in the RAID may cause RAID degradation or failure. When installing a new drive, different RAID controller cards have different policies. You may need to log into the RAID management interface for recovery.
- Do not remove the drive until the drive motor stops completely in order to prevent damage to the motor.

- **Loud System Fan Noise**

Symptoms:

System fans make excessive noise when the server is under normal operation.

Solutions:

1. Check the fan status LED or other status LEDs on the front panel for any warnings. Meanwhile, ensure that the top cover is closed properly and the air duct has not been moved;
2. Check the server temperature by hand or the sensor temperature in the BMC Web GUI for over-temperature;
3. If the temperature of the chassis is too high, check the temperature of the server room. If it is too high, adjust the air conditioner to cool the room;
4. If the temperature of the server room isn't high, check whether the front bezel or chassis interior is jammed with dust. If yes, clean with a soft and dry cloth, or a specialized brush. The environment of the server room needs to be improved to avoid over-temperature running of the server caused by too much dust;
5. Check if the server is operating under heavy load. Log into the BMC Web GUI to see if all the fans are identified and if the fan mode is automatic;
6. If the instructions above do not resolve the problem, please call Inspur Customer

Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com.

- **Alarm Sound from the Server**

Symptoms:

There is an alarm sound during server startup or operation.

Solutions:

Find the source of the alarm sound:

1. If the alarm sound comes from the PSUs, check the status of the PSU LEDs on the rear panel. If the PSU LEDs are abnormal, refer to [PSU LED Off or Illuminates Amber](#) to handle it.
2. If the alarm sound comes from the chassis interior, remove the top cover to find the specific source;
3. If the alarm sound comes from the RAID card, check the drive error LED for any warning or log into the RAID management interface for any drive warning and record the detailed warning information if any.
4. If the instructions above do not resolve the problem, please call Inspur Customer Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com, and inform us of the alarm source and detailed warning information.

- **Keyboard and Mouse Failure**

Symptoms:

Neither keyboard nor mouse can function.

Solutions:

1. Make sure the keyboard and mouse have been connected properly and firmly.
2. Connect the keyboard and mouse to a laptop or a server to test if they can function or not;
3. Power cycle the server and retest;
4. Restart the server and enter BIOS or RAID management interface to test if the keyboard and mouse can function: If the keyboard and mouse can function in non-OS environment, maybe there is something wrong with the USB driver of the OS; if the keyboard and mouse cannot function in non-OS environment, then maybe the connector on the motherboard is faulty. Please call Inspur Customer Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com.

- **USB Port Problem**

Symptoms:

Unable to use devices with a USB port.

Solutions:

1. Make sure the OS of the server supports USB devices;
2. Make sure the server has been installed with the correct USB driver, and try installing the USB driver again;
3. Connect the USB device to another server to test if the device can function;
4. If the USB device cannot function, please replace with a known working USB device;
5. Power cycle the server and retest;
6. If the instructions above do not resolve the problem, please call Inspur Customer Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com.

- **HCA Card Driver Installation Problem**

Symptoms:

For the configuration with HCA cards, the system will reboot when installing Chipset driver under Windows OS

Solutions:

1. Delete the driver that comes with Windows first, and then install the Chipset driver. Or install the IB driver from Mellanox official site (Go to <https://www.mellanox.com/products/adapter-software/ethernet/windows/winof-2>, click on WinOF-2 and choose the corresponding OS version), and then install the Chipset driver.

Figure 7-1 Downloading the Driver from Mellanox Official Site



2. If the instructions above do not resolve the problem, please contact Inspur Customer Service.

- **RAID Array Displayed under BIOS and OS in Reverse Order of Creation**

Symptoms:

When you create RAID arrays using 9560-8i/16i RAID controller cards, the displayed RAID array order (virtual drive ID order) under BIOS and OS are in the reverse order of creation, that is, the first created RAID will be listed last in all RAID arrays, and the last created RAID will be listed first. The drive letters under the OS are also displayed in reverse order.

Solutions:

1. In both BIOS and OS, the reverse orders of RAID arrays (virtual drive IDs) have no impact on functions of 9560-8i/16i RAID controller cards. This is a product design of Broadcom 9560 RAID controller cards;

2. In BIOS, the reverse orders of RAID arrays (virtual drive IDs) cannot be changed. But in OS, there are two methods provided below for you to reverse the orders of RAID arrays (virtual drive IDs) and drive letters:

In BIOS:



Make sure the firmware version and firmware package build run on your system are 5.160.02-3481 and 52.16.0-3952 or higher.

Go to **Main Menu -> Controller Management -> Advanced Controller Properties -> Firmware Device Order**. Set **Firmware Device Order** to **Enabled**. Restart the system to make the change effective.

In OS:

Use storcli tool to set **Firmware based device ordering** to **ON** and restart the system to make the change effective.



In the commands below, x indicates the RAID controller ID. (x = 0 if there is only one RAID card; x = 0 and 1 if there are two RAID controller cards. In this case, you need to run the commands twice, one for c0 and the other for c1).

Setting command: **storcli /cx set deviceorderbyfirmware= ON/OFF**

Checking command: **storcli /cx show deviceorderbyfirmware**

7.2 Software Problems

- **OS Installation Problems**

Symptoms:

Unable to load the RAID driver or create partitions larger than 2 TB during OS installation; C disk usage is too high after OS installation.

Solutions:

1. If it fails to load the driver during OS installation, check the RAID driver version. Go to Inspur website <https://en.inspur.com> to download the correct RAID driver. Some RAID drivers need to be loaded several times.
2. If it fails to create partitions larger than 2 TB during OS installation, select **Advanced>CSM Configuration>Boot option filter>UEFI only** (For detailed reference document, please see [Firmware Update and Configuration](#)) in BIOS, save and exit BIOS interface. Choose UEFI to boot the OS. The server will restart automatically. It needs to enter the CMD command line to change the drive format to GPT, and then partitions larger than 2 TB can be created;
3. If the C disk usage is too high after installing the Windows OS, turn down the virtual memory or allocate the virtual memory to other partitions;
4. If the instructions above do not resolve the problem, please call Inspur Customer Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com.

- **PXE Boot Failure**

Symptoms:

Unable to install OS via PXE.

Solutions:

1. Check if the PXE server can be used to install OS for another server;
2. Check whether there is network link via the network port LED to check if there is a fault in external network;
3. Check whether the NIC can be identified under BMC Web, BIOS or Shell;
4. Check if PXE Function is enabled and if the boot sequence is set to first in BIOS;
5. Check if the target drive for the OS or RAID array can be identified and if there is enough space;
6. If the instructions above do not resolve the problem, please call Inspur Customer Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com.

- **Abnormal Memory Capacity**

Symptoms:

The memory capacity displayed in the OS and the physical memory capacity are inconsistent.

Solutions:

1. Check the OS version. The supported memory capacity varies with the version of Windows OS. Enter BIOS Setup to view the memory capacity. If the memory is identified completely, the OS may be unable to access all the installed memories.

For example, Windows server 2008 x86 supports up to 4 G memory;

2. If the memory is not identified completely in BIOS Setup, confirm that the corresponding slots have been populated with memories of correct type;

3. If the instructions above do not resolve the problem, please call Inspur Customer Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com.

- **Abnormal Network**

Symptoms:

The network is disconnected, or the rate is lower than the actual rate of the network port under the server OS.

Solutions:

1. Check whether the network cable is connected properly and whether the network port LED flashes normally to ensure that the network is configured correctly;

2. Unplug and plug the network cable back to see if the problem can be solved. If not, connect the server with a laptop via a known working network cable: If the network is normal, check the network cable or the switch port; if the network is faulty, go to Inspur Website <https://en.inspur.com> to download the latest NIC driver;

3. Check whether the NIC can be identified under BMC Web, BIOS or Shell and whether the MAC address is correct;

4. If the instructions above do not resolve the problem, please call Inspur Customer Service Hotline (1-844-860-0011/1-760-769-1847) or email to serversupport@inspur.com, and inform us of the detailed warning information and failure.

8 Environmental Requirements

8.1 Ambient Temperature

Table 8-1 Ambient Temperature

Parameter	Condition	Requirement
Temperature	Continuous Operation	5°C - 35°C (41°F - 95°F)
	Transportation (Storage)	-40°C - 70°C (-40°F to 158°F)
	Maximum temperature gradient (Operation and storage)	20°C/h (36°F/h)
Humidity	Operation	Relative humidity is 5% to 90%
	Transportation (Storage)	Relative humidity is 5% to 95%

8.2 Vibration and Shock Resistance

Table 8-2 Vibration and Shock Resistance

Parameter	Condition	Requirement
Vibration	Operation	5 - 500 Hz: 0.21 Grms (X, Y and Z axis and every direction for 15 minutes)
	Transportation (Storage)	1 - 200 HZ: 0.82 Grms (X, Y and Z axis and every direction for 30 minutes)
Shock	Operation	On negative and positive X, Y and Z axis direction, each axis can withstand 100 continuous 2 G shock pulses for up to 11 ms
	Transportation (Storage)	On X, Y and Z axis direction, each axis can withstand 1000 continuous 40 G shock pulses for up to 6 ms

8.3 Altitude and Air Pressure

Table 8-3 Altitude and Air Pressure

Parameter	Condition	Requirement
Altitude	Operation	0 to 3,048 m (0 to 10,000 feet)
	Transportation (Storage)	0 to 12,192 m (0 to 40,000 feet)

8.4 Alternating Temperature and Humidity

Table 8-4 Alternating Temperature and Humidity

Parameter	Condition	Requirement
Humidity	Operation	Relative humidity is 5% to 90%
	Transportation (Storage)	Relative humidity is 5% to 95%

8.5 Thermal Restrictions

Table 8-5 Thermal Restrictions

Configuration	Max. Operating Temperature at 30°C	Max. Operating Temperature at 35°C	Max. Operating Temperature at 40°C	Max. Operating Temperature at 45°C
8 × 2.5-inch drives	All configurations (When GPUs are equipped, CPU power consumption should be ≤ 205W)		<ul style="list-style-type: none"> CPUs with TDP higher than 205 W not supported Passive-cooling GPUs 	<ul style="list-style-type: none"> Passive-cooling GPUs not supported Rear drives not supported

Configuration	Max. Operating Temperature at 30°C	Max. Operating Temperature at 35°C	Max. Operating Temperature at 40°C	Max. Operating Temperature at 45°C
			<ul style="list-style-type: none"> not supported BPS DIMMs not supported 	<ul style="list-style-type: none"> CPUs with TDP higher than 165 W not supported DIMMs (including BPS) higher than 8 W not supported
12 × 3.5-inch EXP drives 12 × 3.5-inch pass-through drives	All configurations (When GPUs are equipped, there are restrictions on drive numbers and CPU power consumption)	<ul style="list-style-type: none"> 8 or less drives and CPUs with TDP at 205 W or lower supported when equipped with GPUs Passive-cooling DIMMs (including BPS) higher than 8 W not supported 	<ul style="list-style-type: none"> Passive-cooling GPUs not supported Rear drives not supported CPUs with TDP higher than 165 W not supported DIMMs (including BPS) higher than 6 W not supported 	Not supported
12 × 3.5-inch NVMe drives 24 × 2.5-inch pass-through drives	All configurations (When GPUs are equipped, there are restrictions on	<ul style="list-style-type: none"> 8 or less drives and CPUs with TDP at 205 W or lower supported 	<ul style="list-style-type: none"> Passive-cooling GPUs not supported 	<ul style="list-style-type: none"> Passive-cooling GPUs not supported

Configuration	Max. Operating Temperature at 30°C	Max. Operating Temperature at 35°C	Max. Operating Temperature at 40°C	Max. Operating Temperature at 45°C
24 × 2.5-inch NVMe drives	drive numbers and CPU power consumption)	<ul style="list-style-type: none"> when equipped with GPUs DIMMs (including BPS) higher than 8 W not supported 	<ul style="list-style-type: none"> CPUs with TDP higher than 205 W not supported DIMMs (including BPS) higher than 8 W not supported 	<ul style="list-style-type: none"> Rear drives not supported CPUs with TDP higher than 165 W not supported DIMMs (including BPS) higher than 6 W not supported

8.6 Operational Requirement

This section specifies the requirements of temperature, humidity, organisms, chemical materials and mechanically active materials in the server room when the server is operating.

- Temperature and humidity

The temperature, dew point and relative humidity in the server room should meet the requirements for operating the server. For specified requirements, see the detailed description in the product documentations.

- Organisms

Plants and animals are not allowed in the server room. Take strict precautions against damage by rats and ants.

To meet these requirements, take the following measures in the server room:

- Ensure safety if there are humidification devices in the server room.
- All the structures and construction gaps of doors, windows, walls, ground (floors) must be sealed.
- If there are water supply and drainage pipes in the server room, anti-

leakage and anti-condensation measures should be taken.

- If there is water equipment in the main server room, measures to prevent water overflow and leakage should be taken.
- Block cable holes and antenna holes.
- Clean and sterilize the server room periodically.

- Corrosive Airborne Contaminants

Generally, a small amount of common corrosive gas pollutants exist in indoor and outdoor atmospheric environments. Chemical reactions may occur due to long-term contact between these mixed corrosive gas pollutants or pollutants of one single corrosive gas and other environmental factors (such as temperature or relative humidity), which may pose a risk of IT equipment failure from corrosion and damage circuit boards of IT equipment and system component units with weak oxidation resistance. This article specifies the limitation on corrosive airborne contaminants with an aim to avoid such risks.

The concentration level of corrosive airborne contaminants in a data center shall meet the requirements listed in the white paper entitled Gaseous and Particulate Contamination Guidelines for Data Centers published in 2011 by American Society of Heating Refrigerating and Air-conditioning Engineers (ASHRAE) Technical Committee (TC) 9.9. According to the Guidelines, corrosive airborne contaminants in a data center shall meet the following requirements:

- Copper coupon corrosion rate less than 300 Å/month per ANSI/ISA-71.04-2013 severity level G1
- Silver corrosion rate less than 200 Å/month per ANSI/ISA-71.04-2013 severity level G1
- According to ANSI/ISA-71.04-2013 Environmental Conditions for Process Measurement and Control Systems: Airborne Contaminants, the gaseous corrosively levels are G1 (mild), G2 (moderate), G3 (harsh), and GX (severe), as described in the table below.

Table 8-6 Gaseous Corrosively Levels per ANSI/ISA-71.04-2013

Severity Level	Copper Reactivity Level	Silver Reactivity Level	Description
G1 (mild)	< 300 Å/month	< 200 Å/month	An environment sufficiently well-controlled such that corrosion is not a factor in determining equipment reliability.
G2 (moderate)	< 1000 Å/month	< 1000 Å/month	An environment in which the effects of corrosion are

Severity Level	Copper Reactivity Level	Silver Reactivity Level	Description
			measurable and may be a factor in determining equipment reliability.
G3 (harsh)	< 2000 Å/month	< 2000 Å/month	An environment in which there is high probability that corrosive attack will occur.
GX (severe)	≥ 2000 Å/month	≥ 2000 Å/month	An environment in which only specially designed and packaged equipment would be expected to survive.

See the table below for the requirements on the copper and silver corrosion rates.

Table 8-7 Concentration Limitation on Corrosive Airborne Contaminants in a Data Center

Group	Gas	Unit	Concentration
Group A	H ₂ S	ppb ^a	<3
	SO ₂	ppb	<10
	Cl ₂	ppb	<1
	NO ₂	ppb	<50
Group B	HF	ppb	<1
	NH ₃	ppb	<500
	O ₃	ppb	<2
a: Part per billion (ppb) is the number of units of mass of a contaminant per 1000 million units of total mass.			

Group A and group B are common gas groups in a data center. Group A's or group B's concentration limitation values correspond to copper and silver reactivity level G1.

Corrosion is not determined by a single factor, but by comprehensive environmental factors such as temperature, relative humidity and corrosive airborne contaminants. Any change of the environmental factors may affect the gaseous corrosively level. Therefore, the concentration limitation values specified in the previous table are for reference only. If the actual mixed gas concentration is not listed in the table, refer to chemically active substance level in IEC-60721-3-3 or GB/T 4798.3-2007 to choose the concentration range.

- Mechanically Active Materials

The server room should be free from explosive, conductive, magnetism-permeable, and corrosive dust. Table 8-10 lists the requirements for concentration of the mechanically active materials in the server room

Table 8-8 Requirements for Concentration of Mechanically Active Materials

Mechanically Active Materials	Unit	Concentration
Sand	mg/m ³	≤30
Suspending dust	mg/m ³	≤0.2
Dust deposit	mg/(m ² h)	≤1.5

To meet these requirements, take the following measures in the server room:

- Use dustproof materials on the ground, wall, and ceiling of the server room.
- Adopt few or no windows design in the server room, and use dustproof materials for outer windows.
- Clean the server room, especially the air filters periodically.
- Wear shoe covers and ESD clothing before entering the server room.

8.7 Electromagnetic Compatibility Requirements

1. As per GB/T 17626.3 (IEC 61000-4-3) & GB/T 17626.6(IEC 61000-4-6) & GB/T 17626.8 (IEC 61000-4-8), the recommended electromagnetic environment is as follows:

Table 8-9 Electromagnetic Environment

Electromagnetic Phenomenon		Specifications
Power frequency magnetic field	Frequency (Hz)	50
	A/m (rms)	≤1
RF electromagnetic field amplitude modulation	Frequency (MHz)	80 - 1000
	V/m (rms, unmodulated)	≤3
	%AM (1kHz)	80

Electromagnetic Phenomenon		Specifications
RF continuous wave conduction	Frequency (MHz)	0.15 - 80
	V (rms, unmodulated)	≤3
	%AM (1kHz)	80

Meanwhile, we recommend you to take the following measures to suppress interfering signals:

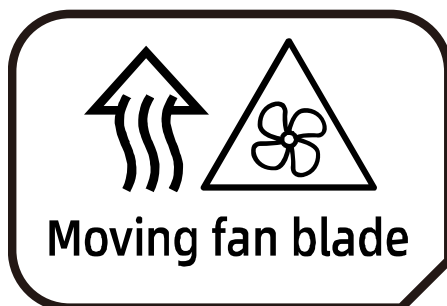
- Take effective measures against power grid interference to the power supply system.
- Keep away from electrical equipment such as medical magnetic resonance device, helium arc welder, radio frequency electric heater, etc.
- Try to avoid the impact of nearby areas with high power emissions (broadcast, radar, mobile communication transmitters), electrified railways, industrial radiation, substations, and high-voltage transmission lines.
- The interference effect of other equipment in the server room must comply with relevant standards and regulations.
- Take measures to shield and isolate natural noise such as atmospheric noise and solar radio noise when necessary.

To avoid damage to the system, take ESD protection measures. For more information on electrostatic protection methods, refer to [Electrostatic Discharge](#).

2. As per the requirements of Appendix F.5 of IEC62368, the server is pasted with safety protection logos. The logos and interpretations are as follows:

- 1) Fan blade safety protection:

Figure 8-1 Fan Blade Safety Protection



Caution: Keep body parts away from fan blades

2) Multi-power safety protection:

Figure 8-2 Multi-power Safety Protection



Caution: Shock Hazard! Disconnect all power supply cords before servicing.

8.8 Power Supply Requirements

8.8.1 AC Power Supply Requirement

An AC power supply that consists of mains supply, uninterruptible power supply (UPS), and self-supplied electric generator set can be used as an integrated power supply. The AC power supply must feature simple connection line, safe operation, flexible scheduling, and easy maintenance in addition to meeting the requirements of site load. Low voltage power supply should adopt three-phase five-wire mode or monophase three-wire mode.

AC power supply system should work under nominal voltage and rated frequency.

Table 8-10 Nominal Voltage and Rated Frequency

Nominal Voltage	Rated Frequency
110 V, 208 V	60 Hz
220 V, 380 V	50 Hz

A UPS is typically used as an AC potential power of network products. A UPS should be in the same phase as the mains supply. The time used for switching between the UPS and the mains supply should be less than 8 ms. Otherwise, the server will reboot or reset.

8.8.2 DC Power Supply Requirement

DC power supply system should work under nominal voltage of -48 V, 240 V and 336 V.

The upstream DC power supply equipment should meet the following requirements:

- YD/T 731 48 V rectifier for telecommunications
- YD/T 2378 240 V DC power supply system for telecommunications
- YD/T 3089 336 V DC power supply system for telecommunications

8.8.3 Recommendations on the AC Power Supply

Recommendations on the AC power supply are as follows:

- Use a voltage stabilizer or voltage-regulator to respond to unstable voltages. Use a voltage-regulator in the following situations:
 - The server is directly powered by the mains supply, and the power supply voltage is not within -10% to +10% of the rated voltage or the voltage range allowed for the server.
 - The server is not directly powered by the mains supply, and the mains voltage is not within -10% to +10% of the rated voltage or the AC input voltage range allowed for the DC power equipment.
- To prevent interruption or surge of AC power supply, use the UPS or inverter.
- The data center should be equipped with self-supplied generator set in case of mains failure to ensure proper function of important load and important power load. All electrical equipment such as IT equipment and refrigeration equipment shall be considered. Check the start-up shock to ensure that the generator can start reliably. The generator performance should meet the requirements of Code for Design of Data Centers (GB50174).
- Connect two storage battery strings in parallel. A second UPS is needed as redundant backup.

8.8.4 HVDC Power Supply

The high-voltage direct current (HVDC) system can eliminate the problems existing in conventional AC and low-voltage DC power supplies. At present, 240 V HVDC standards and 336 V HVDC standards are the mainstream HVDC standards used in China.

8.8.5 HVDC Power Supply Requirements

- The requirements for HVDC power supply are as follows:
 - Operating range: 0°C - 45°C
 - Storage and transportation range: -40°C - 85°C

- Relative Humidity:
 - Operating range: $\leq 90\%$ RH ($40 \pm 2^\circ\text{C}$)
 - Storage and transportation range: $\leq 95\%$ RH ($40 \pm 2^\circ\text{C}$)
- Vibration performance: ability to withstand sinusoidal frequencies between 10 Hz to 55 Hz and amplitude of 0.35 mm.
- Battery capacity configuration: ensure continuous operation of servers at full loads when the power supplies are unavailable. The battery backup time should be 15 minutes when a diesel generator is available as backup power source.
- Determination of cell voltage and pack number: Depending on the system capacity and backup time, the cell voltage can be selected from 2 V, 6 V or 12 V.
- The insulation monitoring device acts properly if a ground fault occurs or the insulation resistance is lower than the set value 28 k Ω . The HVDC system is protected against overcurrent and short circuits and can be manually or automatically restored after overcurrent or short circuits are rectified.
- Over- and under-voltage protection for AC power supplies: The power supply system can monitor the input voltage changes. When detecting that the AC input voltage is higher or lower than the specified threshold, which may pose safety risk on the operation of the power supply system, the system automatically shuts down. The system automatically restores when the input voltage is normal.
- The site is free from explosive materials, conductive media and hazardous gases that erode metals and affect insulation, and mold.
- Protection against high temperature: When the temperature in the power supply system reaches the specified threshold, the power supply system automatically reduces the power or shuts down the power amplifier. When the temperature falls below the threshold, the power supply system restores the normal power output.
- The system provides alarm records and query, and the alarm display can be updated on a real-time basis. The alarm information is protected against loss when the system is out of power.

8.8.6 HVDC Power Supply Suggestions

- Terminal equipment can be connected to power sockets or wiring terminals. Wiring terminals are recommended.
- Do not use a shunt circuit breaker to connect to or control multiple power modules through a multi-purpose power socket.

- Choose DC circuit breakers based on the rated current of the equipment. The 10 A or 16 A DC breakers are recommended.
- Recommended standards for equipment power wiring: Connect the DC output positive pole to terminal N of the equipment power cable. Connect the DC output negative pole to terminal L of the equipment power cable. DC system is strictly forbidden to be grounded.
- The upstream input terminal of the power supply system is equipped with a surge protection device to protect the system against a minimal voltage surge of 10/700 us, 5 kV and a minimal current surge of 8/20 us, 20 kA.
- All cables in the power distribution frame (PDF) comply with YD/T 1173 specifications, and the diameters of all power cables meet the requirements for wire ampacity.

8.8.7 DC Power Supply

The DC power supply should be stable and reliable. The power equipment should be deployed near the server. The standard DC voltage is -48 VDC with a fluctuation range of server power between -40 V to -72 V.

9 Warranty

Inspur warrants that all Inspur-branded hardware products shall be free from material malfunctioning and material defects under conditions of normal use for a period of three (3) years from the Date of Invoice.

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

9.1 Warranty Service

Remote Technical Support

Inspur warranty service includes 24/7 remote technical support and 3 years parts replacement throughout the warranty period. Warranty Service are Advance Replacement Service in the first year and Standard Replacement Service in the second and third years.

Table 9-1 Warranty Service Type and Duration

Type	Duration
Remote Technical Support	3 years
RMA Services	3 years

The 24/7 remote technical support can be obtained through hotline, e-mail, and Service Portal*¹. Through hotline and e-mail support, Inspur engineers help customers diagnose the cause of malfunction and provide solution. Service Portal*¹ provides access to firmware, customized update files, and related manuals for Inspur products. Customer may also access the Service Portal*¹ to submit Return Material Authorization (RMA) for parts replacement or repair.

Information needed when requesting for 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 (sel and blackbox, and any other related logs from OS), screenshot of issue, pictures of damaged/questions parts, etc.

Table 9-2 Support Contact Information

Type	Description	Support Window
Global Hotline	Global: 1-844-860-0011/1-760-769-1847 (English) China: 400-860-0011 (Chinese)	24 × 7 × 365
Email	Global: serversupport@inspur.com China: lckf@inspur.com	24 × 7 × 365
	US**: serversupportusa@inspur.com Korea: serversupport_kr@inspur.com Japan: serversupport_jp@inspur.com	Local business hours 9AM to 6PM Monday to Friday **US: PST (GMT -8)
Service Portal*1	US**: http://service.inspursystems.com/login.htm EU: http://eurportal.inspur.com/	Local business hours 9AM to 6PM Monday to Friday **US: PST (GMT -8)

RMA Services

Inspur may, at its discretion, repair or replace the defective parts. Repair or Replacement parts may be new, used, or equivalent to new in performance and reliability. Repaired or replaced 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.

Advance Replacement: Under the terms of Advance Replacement Service, if a problem with customer product cannot be resolved via hotline and e-mail support and a replacement part is required, Inspur 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). Inspur will cover one-way shipment via ground.

Standard Replacement: When a hardware failure happens, customer may submit RMA request to Inspur via e-mail or Service Portal*¹. Inspur will review and approve RMA submission, and provide an RMA number and return information that customer may use to return for RMA service. Inspur will ship out replacement part(s) within one (1) business day after receiving the defective part(s) and cover one-way shipment via ground.

9.2 Inspur Service SLA

Inspur offers a variety of Service Level Agreements (SLA)*² to meet customer requirements with different service components and service level targets.

- Base Warranty Services
- Advance Replacement
- 9 × 5 NBD Onsite Service
- 24 × 7 × 4 Onsite Service
- Onsite Deployment Service
- Data Media Retention
- Global Service
- Customized Service

9.3 Warranty Exclusions

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

The Warranty Terms & Conditions do not apply to consumable parts, as well as any products that the serial number missed, damaged or obscured for the following reasons:

- Accident, misuse, abuse, defiling, improper maintenance or calibration or other external causes
- Operating beyond the parameters as stipulated in the user documentation
- Use of the software, interface, parts or supplies not provided by Inspur
- Improper staging, usage, or maintenance
- Virus infection
- Loss or damage in transit which is not arranged by Inspur

- The product has 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 Inspur when the product is manufactured
- Any consumable parts, such as, but not limited to, battery or protective coating that is diminished over time, unless the failure has occurred during DOA period, such failure caused by Inspur's material or workmanship
- Any cosmetic damage, such as, but not limited to, scratches, dents, broken plastics, metal corrosion, or mechanical damage, unless the failure has occurred during DOA period due to defect in Inspur's material or workmanship
- Any engineering sample, evaluation unit, or non-mass production product is not covered under warranty service
- Any solid-state drive (SSD) with the usages of which has reached its write endurance limit
- In no event will Inspur 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 Inspur has 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 Inspur 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 Inspur representative to learn more.

Appendix

A.1 Drive Neodymium Content Reference Table

Table A.1-1 Seagate Drive Neodymium Content Reference

Product Series Name	Neodymium Content Range		
	< 5 g	5 g - 25 g	> 25 g
Cimarron (2T/4T)	√		
Cimarron (6T/8T)		√	
Evans		√	
Kestrel	√		
MakaraBP		√	
MakaraPLUS		√	
Mobula		√	
MobulaBP		√	
Skybolt	√		
Tatsu		√	

Table A.1-2 WD Drive Neodymium Content Reference Range

Product Series Name	Neodymium Content Range		
	< 5 g	5 g - 25 g	> 25 g
Rainier	√		
Libra He10		√	
Leo A		√	
Vela-A		√	
Vela-AP		√	
Hs14		√	
Leo-B		√	

Table A.1-3 Toshiba Drive Neodymium Content Reference Range

Product Series Name	Neodymium Content Range		
	< 5 g	5 g - 25 g	> 25 g
AL14SE-Lite	√		
AL15SE	√		
AL14SX	√		
MG04 Tomcat-R SAS		√	
MG04 Tomcat-R SATA		√	
MG04 Tomcat SATA		√	
MG06 SAS		√	
MG06 SATA		√	
MG07 SAS		√	
MG07 SATA		√	

A.2 Acronyms and Abbreviations

A

AC	Alternating Current
ACPI	Advanced Configuration and Power Management Interface
AES	Advanced Encryption Standard New Instruction Set
AI	Artificial Intelligence
AOC	Active Optical Cables
API	Application Program Interface
ARP	Address Resolution Protocol

B

BIOS	Basic Input Output System
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BMC	Baseboard Management Controller
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C

CE	Conformite Europeenne
CLI	Command-Line Interface
CMOS	Complementary Metal-Oxide-Semiconductor Transistor
CPLD	Complex Programming Logic Device
CPU	Central Processing Unit
CRPS	Common Redundant Power Supplies
CRU	Customer-Replaceable Unit
CSA	Canadian Standards Association
CSM	Compatibility Support Module

D

DC	Direct Current
DDR4	Double Date Rate 4
DHCP	Dynamic Host Configuration Protocol
DIMM	Dual-Inline-Memory-Modules
DNS	Domain Name System
DVD	Digital Video Disc

F

FMA	Failure Mode Analysis
FRU	Field-Replaceable Unit
FTP	File Transfer Protocol
FW	Firmware

G

GPU	Graphics Processing Unit
GUI	Graphical User Interface

H

HBA	Host Bus Adapter
HCA	Host Channel Adapter
HDD	Hard Disk Drive
HTML	Hyper Text Markup Language
HWRAID	Hardware Redundant Arrays of Independent Drives

I

I/O	Input/Output
IEC	International Electrotechnical Commission
IOPS	Input/Output Operations Per Second
IP	Internet Protocol
IPMB	Intelligent Platform Management Bus

IPMI	Intelligent Platform Management Interface
iSCSI	Internet Small Computer System Interface

J

JTAG	Joint Test Action Group
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K

KVM	Keyboard Video Mouse
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L

LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LRDIMM	Load Reduced Dual In-Lane Memory Module

M

MLAN	Management Local Area Network
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N

NCSI	National Communication System Instructions
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIC	Network Interface Controller

NM	Node Manager
NPU	Network Processing Unit
NTP	Network Time Protocol
NVDIMM	Non-Volatile Dual In-Line Memory Module
NVMe	Non-Volatile Memory Express

O

OCP	Open Compute Project
OS	Operating System

P

PCH	Platform Controller Hub
PCI	Peripheral Component Interconnect
PCIe	Peripheral Component Interconnect express
PDU	Power Distribution Unit
PFR	Platform Firmware Resilience
PHM	Processor Heatsink Module
PHY	Physical
PMBus	Power Management Bus
POST	Power On Self Test
PSU	Power Supply Unit
PXE	Pre-boot Execution Environment

R

RAM	Random-Access Memory
RAID	Redundant Arrays of Independent Drives
RDIMM	Registered Dual In-line Memory Module
RH	Relative Humidity
ROM	Read-Only Memory
RTA	Real Time Clock

S

SAS	Serial Attached Small Computer System Interface
SATA	Serial Advanced Technology Attachment
SFP	Small Form-factor Pluggable
SIC	Smart Interface Card
SKU	Stock Keeping Unit
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SOL	Serial Over LAN
SSD	Solid State Disk
SSH	Secure Shell
SWRAID	Software Redundant Arrays of Independent Drives

T

TCG	Trusted Computing Group
TCM	Trusted Cryptography Module
TCO	Total Cost of Ownership
TDP	Thermal Design Power
TPCM	Trusted Platform Control Module
TPM	Trusted Platform Module

U

UEFI	Unified Extensible Firmware Interface
UID	User Identification
UPI	Ultra Path Interconnect
UPS	Uninterruptible Power Supply
USB	Universal Serial Bus

V

VGA	Video Graphics Array
VLAN	Virtual Local Area Network

X

XDP	eXtend Debug Port
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A.3 Backplane DIP Switch

Table A.3-1 Backplane DIP Switch

BP Part Number	BP Location (seen from the rear of the server)	Value	Condition
YZBB-01918-101	Backplane 1 (right, away from the left chassis side wall)	4678	Cascading from the front 12-drive backplane YZBB-01962-101/YZBB-01955-101
		4628	Cascading from the 25-drive backplane
		5671	Cascading from the front 12-drive backplane YZBB-01962-102/YZBB-01955-102, or connecting to the RAID controller card or RAID mezz card
	Backplane 2 (left, near the left chassis side wall)	5628	Cascading from the front 12-drive backplane YZBB-01962-102/YZBB-01955-102, or connecting to the RAID controller card or RAID mezz card
		4621	Cascading from the 25-drive backplane
		4671	Cascading from the front 12-drive backplane YZBB-01962-101/YZBB-01955-101
YZBB-02515-101	Backplane 1 (right)	4678	Cascading from the front 12-drive backplane YZBB-01962-101/YZBB-01955-101
		5671	Cascading from the front 12-drive backplane YZBB-01962-102/YZBB-01955-102, or connecting to the RAID controller card or RAID mezz card

BP Part Number	BP Location (seen from the rear of the server)	Value	Condition
	Backplane 2 (left, near the left chassis side wall)	5628	Cascading from the front 12-drive backplane YZBB-01962-102/YZBB-01955-102, or connecting to the RAID controller card or RAID mezz card
		4671	Cascading from the front 12-drive backplane YZBB-01962-101/YZBB-01955-101
YZBB-01379-103	Backplane	5671	Connecting to the motherboard
		5628	Cascading from the front 12-drive backplane YZBB-01962-102/YZBB-01955-102, or connecting to the RAID controller card or RAID mezz card
		5328	Cascading from the 25-drive backplane