GIGABYTE™

R161-R13

1U Intel® X299 Server System

Service Guide

Rev. 1.0

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Disclaimer

Documentation Classifications

In order to assist in the use of this product, GIGABYTE provides the following types of documentations:

- For detailed product information, carefully read the User's Manual.

For More Information

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Conventions

The following conventions are used in this user's guide:

	**NOTE!** Gives bits and pieces of additional information related to the current topic.
	**CAUTION!** Gives precautionary measures to avoid possible hardware or software problems.
	**WARNING!** Alerts you to any damage that might result from doing or not doing specific actions.

Server Warnings and Cautions

Before installing a server, be sure that you understand the following warnings and cautions.

WARNING!

To reduce the risk of electric shock or damage to the equipment:

- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
- Unplug the power cord from the power supply to disconnect power to the equipment.
- Do not route the power cord where it can be walked on or pinched by items placed against it. Pay particular attention to the plug, electrical outlet, and the point where the cord extends from the server.

WARNING!

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

WARNING!

This server is equipped with high speed fans. Keep away from hazardous moving fan blades during servicing.

CAUTION!

- Do not operate the server for long periods with the access panel open or removed. Operating the server in this manner results in improper airflow and improper cooling that can lead to thermal damage.
- Danger of explosion if battery is incorrectly replaced.
- Replace only with the same or equivalent type recommended by the manufacturer.
- Dispose of used batteries according to the manufacturer's instructions.

Electrostatic Discharge (ESD)

CAUTION!

ESD CAN DAMAGE DRIVES, BOARDS, AND OTHER PARTS. WE RECOMMEND THAT YOU PERFORM ALL PROCEDURES AT AN ESD WORKSTATION. IF ONE IS NOT AVAILABLE, PROVIDE SOME ESD PROTECTION BY WEARING AN ANTI-STATIC WRIST STRAP ATTACHED TO CHASSIS GROUND -- ANY UNPAINTED METAL SURFACE -- ON YOUR SERVER WHEN HANDLING PARTS.

Always handle boards carefully. They can be extremely sensitive to ESD. Hold boards only by their edges without any component and pin touching. After removing a board from its protective wrapper or from the system, place the board component side up on a grounded, static free surface. Use a conductive foam pad if available but not the board wrapper. Do not slide board over any surface.

System power on/off: To remove power from system, you must remove the system from rack. Make sure the system is removed from the rack before opening the chassis, adding, or removing any non hot-plug components.

Hazardous conditions, devices and cables: Hazardous electrical conditions may be present on power, telephone, and communication cables. Turn off the system and discon-nect the cables attached to the system before servicing it. Otherwise, personal injury or equipment damage can result.

Electrostatic discharge (ESD) and ESD protection: ESD can damage drives, boards, and other parts. We recommend that you perform all procedures in this chapter only at an ESD workstation. If one is not available, provide some ESD protection by wearing an antistatic wrist strap attached to chassis ground (any unpainted metal surface on the server) when handling parts.

ESD and handling boards: Always handle boards carefully. They can be extremely sensi-tive to electrostatic discharge (ESD). Hold boards only by their edges. After removing a board from its protective wrapper or from the system, place the board component side up on a grounded, static free surface. Use a conductive foam pad if available but not the board wrapper. Do not slide board over any surface.

Installing or removing jumpers: A jumper is a small plastic encased conductor that slips over two jumper pins. Some jumpers have a small tab on top that can be gripped with fin-gertips or with a pair of fine needle nosed pliers. If the jumpers do not have such a tab, take care when using needle nosed pliers to remove or install a jumper; grip the narrow sides of the jumper with the pliers, never the wide sides. Gripping the wide sides can dam-age the contacts inside the jumper, causing intermittent problems with the function con-trolled by that jumper. Take care to grip with, but not squeeze, the pliers or other tool used to remove a jumper, or the pins on the board may bend or break.

CAUTION!

Risk of explosion if battery is replaced incorrectly or with an incorrect type. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

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Chapter 1 Hardware Installation

1-1 Installation Precautions

The motherboard/system contain numerous delicate electronic circuits and components which can become damaged as a result of electrostatic discharge (ESD). Prior to installation, carefully read the service guide and follow these procedures:

- Prior to installation, do not remove or break motherboard S/N (Serial Number) sticker or warranty sticker provided by your dealer. These stickers are required for warranty validation.
- Always remove the AC power by unplugging the power cord from the power outlet before installing or removing the motherboard or other hardware components.
- When connecting hardware components to the internal connectors on the motherboard, make sure they are connected tightly and securely.
- When handling the motherboard, avoid touching any metal leads or connectors.
- It is best to wear an electrostatic discharge (ESD) wrist strap when handling electronic components such as a motherboard, CPU or memory. If you do not have an ESD wrist strap, keep your hands dry and first touch a metal object to eliminate static electricity.
- Prior to installing the motherboard, please have it on top of an antistatic pad or within an electrostatic shielding container.
- Before unplugging the power supply cable from the motherboard, make sure the power supply has been turned off.
- Before turning on the power, make sure the power supply voltage has been set according to the local voltage standard.
- Before using the product, please verify that all cables and power connectors of your hardware components are connected.
- To prevent damage to the motherboard, do not allow screws to come in contact with the motherboard circuit or its components.
- Make sure there are no leftover screws or metal components placed on the motherboard or within the computer casing.
- Do not place the computer system on an uneven surface.
- Do not place the computer system in a high-temperature environment.
- Turning on the computer power during the installation process can lead to damage to system components as well as physical harm to the user.
- If you are uncertain about any installation steps or have a problem related to the use of the product, please consult a certified computer technician.

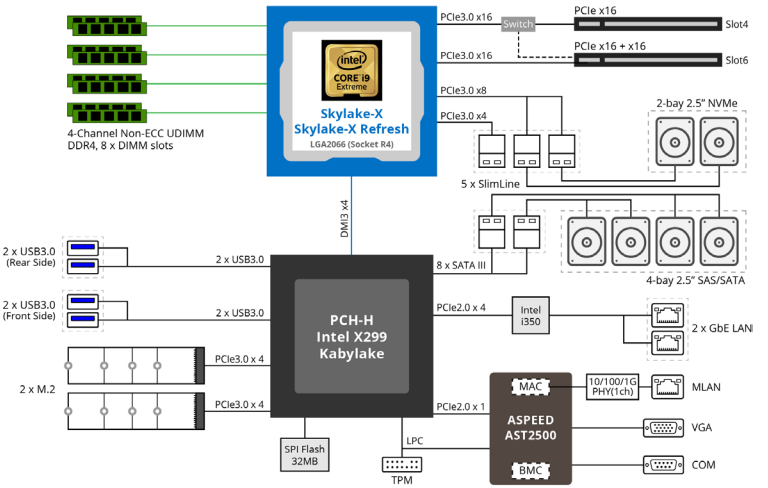
1-2 Product Specifications

CPU	◆ Intel® Core™ X series 44-lane/28-lane processors
Socket	◆ 1 x LGA 2066 ◆ Mounting pitch: square ILM (80x80mm)
Chipset	◆ Intel® X299 Express Chipset
Memory	◆ 8 x DIMM slots ◆ DDR4 memory modules supported only ◆ Quad channel memory architecture ◆ Support for non-ECC Un-buffered DIMM ◆ DDR4 modules: 2667/2400/2133 MHz
LAN	◆ 2 x 1Gb/s LAN ports (Intel® I350-AM2) ◆ 1 x 10/100/1000 management LAN
Expansion Slot	◆ 1 x PCIe x16 slots (Gen3 x16), Low profile half-length* ◆ * The PCIe slot is unavailable for system level ◆ * The PCIe slot is shared with riser card 1 x PCIe x16 signal **Riser Card CRS1027:** ◆ - 1 x PCIe x16 slots (Gen3 x16), Low profile half-length ◆ - 1 x PCIe x16 slots (Gen3 x16), Low profile half-length **2 x M.2 slots:** ◆ - M-key ◆ - PCIe Gen3 x4 ◆ - Supports NGFF-2242/2260/2280 cards
Video	◆ Integrated in Aspeed® AST2500 ◆ 2D Video Graphic Adapter with PCIe bus interface ◆ 1920x1200@60Hz 32bpp, DDR4 SDRAM
Storage	◆ 2 x U.2, 4 x SATA/SAS or 6 x SATA/SAS hot-swappable HDD/SSD bays ◆ 2.5" HDD supported only
SATA	◆ Supported
SAS	◆ Supported via add-on SAS Card

Internal Connectors	◆ 3 x Power supply connectors ◆ 5 x SlimSAS connectors ◆ 2 x fan headers ◆ 1 x USB 3.0 header ◆ 1 x TPM header ◆ 1 x VROC connector ◆ 1 x Front panel header ◆ 1 x HDD back plane board header ◆ 1 x IPMB connector ◆ 1 x Clear CMOS jumper ◆ 1 x BIOS recovery jumper
Front Panel LED/Buttons	◆ 2 x USB 3.0 ◆ 1 x Power button with LED ◆ 1 x ID button with LED ◆ 1 x Reset button ◆ 1 x NMI button ◆ 1 x System status LED ◆ 1 x HDD activity LED ◆ 2 x LAN activity LEDs
Rear Panel I/O	◆ 2 x USB 3.0 ◆ 1 x Power button with LED ◆ 1 x ID button with LED ◆ 1 x Reset button ◆ 1 x NMI button ◆ 1 x System status LED ◆ 1 x HDD activity LED ◆ 2 x LAN activity LEDs
Rear I/O Port	◆ 2 x USB 3.0 ◆ 1 x VGA ◆ 1 x COM ◆ 2 x RJ45 ◆ 1 x MLAN
Backplane I/O	◆ Bandwidth: SATAIII 6Gb/s or SAS 12Gb/s or U.2 PCIe Gen3 x4 per port
TPM	◆ 1 x TPM header with LPC interface ◆ Optional TPM2.0 kit: CTM000

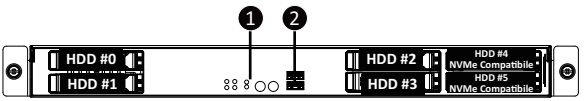
System Management	◆ Aspeed® AST2500 management controller ◆ Avocent® MergePoint IPMI 2.0 web interface: ◆ Network settings ◆ Network security settings ◆ Hardware information ◆ Users control ◆ Services settings ◆ IPMI settings ◆ Sessions control ◆ LDAP settings ◆ Power control ◆ Fan profiles ◆ Voltages, fans and temperatures monitoring ◆ System event log ◆ Events management (platform events, trap settings, email settings) ◆ Serial Over LAN ◆ vKVM & vMedia (HTML5)
Power Supply	◆ 1 x 850W redundant PSUs ◆ 80 PLUS Platinum ◆ AC Input: ◆ - 100-240V~/ 12-6A, 50-60Hz ◆ - 200-240V~/ 8A, 50-60Hz ◆ DC Output: ◆ - Max 850W ◆ +12V/ 70.5A ◆ +5V/ 20A ◆ +3.3V/ 20A ◆ -12V/ 0.5A ◆ +5Vsb/ 3.0A
Environment Ambient Temperature Relative Humidity	◆ Operating temperature: 10°C to 35°C ◆ Non-operating temperature: -40°C to 60°C ◆ Operating humidity: 8-80% (non-condensing) ◆ Non-operating humidity: 20%-95% (non-condensing)
System Dimension	◆ 1U ◆ 438mm (W) x 43.5mm (H) x 730mm (D)
* We reserves the right to make any changes to the product specifications and product-related information without prior notice.	

1-3 System Block Diagram



Chapter 2 System Appearance

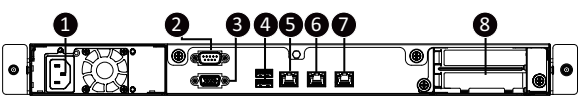
2-1 Front View



No.	Description
1.	Front Panel LEDs and Buttons
2.	USB 3.0 Port x 2
	Orange HDD Latches Support NVMe

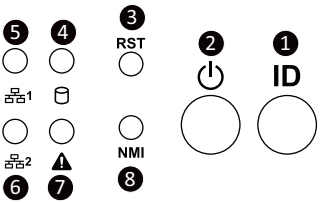
- Please Go to Chapter **2-3 Front Panel LED** and Buttons for detail description of function LEDs.

2-2 Rear View



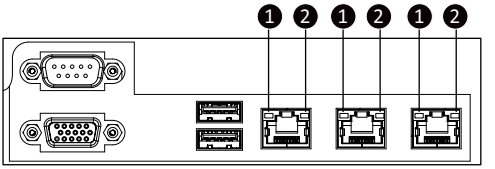
No.	Description
1.	Power Supply Module Cord Socket
2.	Serial Port
3.	VGA Port
4.	USB 3.0 Port x 2
5.	10/100/1000 Server management LAN port
6.	GbE LAN Port #1
7.	GbE LAN Port #2
8.	PCIe Card Bay x 2

2-3 Front Panel LED and Buttons



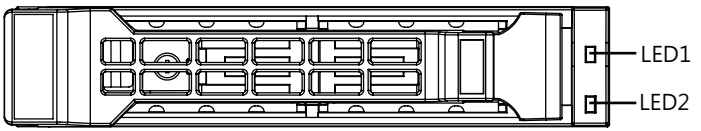
No.	Name	Color	Status	Description
1.	ID Button			Press the button to activate system identification
2.	Power button with LED	Green	On	System is powered on
		Green	Blink	System is in ACPI S1 state (sleep mode)
		N/A	Off	• System is not powered on or in ACPI S5 state (power off) • System is in ACPI S4 state (hibernate mode)
3.	Reset Button			Press the button to reset the system.
4.	HDD Status LED	Green	On	HDD locate
			Blink	HDD access
		Amber	On	HDD fault
		Green/ Amber	Blink	HDD rebuilding
		N/A	Off	No HDD access or no HDD fault.
5/6	LAN 1/2 Active/Link LEDs	Green	Solid On	Link between system and network or no access.
		Green	Blink	Data trasmission or receiving is occuring
		N/A	Off	No data transmission or receiving is occuring
7.	System Status LED	Green	Solid On	System is operating normally.
		Amber	Solid On	Critical condition, may indicate: System fan failure System temperature
			Blink	Non-critical condition, may indicate: Redundant power module failure Temperature and voltage issue Chassis intrusion
		N/A	Off	System is not ready, may indicate: POST error NMI error Processor or terminator missing
8.	NMI button			Press the button server generates a NMI to the processor if the multiple-bit ECC errors occur, which effectively halt the server.

2-4 Rear System LAN LEDs



No.	Name	Color	Status	Description
1.	1GbE Speed LED	Yellow	On	1 Gbps data rate
		Green	On	100 Mbps data rate
		N/A	Off	10 Mbps data rate
2.	1GbE Link/ Activity LED	Green	On	Link between system and network or no access
			Blink	Data transmission or receiving is occurring
		N/A	Off	No data transmission or receiving is occurring

2-5 Hard Disk Drive LEDs



RAID SKU	LED1	Locate	HDD Fault	Rebuilding	HDD Access	HDD Present (No Access)
No RAID configuration (via HBA, ICH)	Disk LED (LED on Back Panel)	Green	ON(*1)	OFF	Green	OFF
		Amber	OFF	OFF	Amber	OFF
	Removed HDD Slot (LED on Back Panel)	Green	ON(*1)	OFF	Green	--
		Amber	OFF	OFF	Amber	--
RAID configuration (via HW RAID Card or SW RAID Card)	Disk LED	Green	ON	OFF	Alternately	OFF
		Amber	OFF	ON	(Low Speed: 2 Hz)	OFF
	Removed HDD Slot	Green	ON(*1)	OFF	(*3)	--
		Amber	OFF	ON	(*3)	--

LED 2	HDD Present	No HDD
Green	ON	OFF

NOTE:

*1: Depends on HBA/Utility Spec.

*2: Blink cycle depends on HDD's activity signal.

*3: If HDD is pulled out during rebuilding, the disk status of this HDD is regarded as faulty.

Chapter 3 System Hardware Installation

Pre-installation Instructions

Computer components and electronic circuit boards can be damaged by discharges of static electricity. Working on computers that are still connected to a power supply can be extremely dangerous. Follow the simple guidelines below to avoid damage to your computer or injury to yourself.

- Always disconnect the computer from the power outlet whenever you are working inside the computer case.
- If possible, wear a grounded wrist strap when you are working inside the computer case. Alternatively, discharge any static electricity by touching the bare metal system of the computer case, or the bare metal body of any other grounded appliance.
- Hold electronic circuit boards by the edges only. Do not touch the components on the board unless it is necessary to do so. Do not flex or stress the circuit board.
- Leave all components inside the static-proof packaging until you are ready to use the component for the installation.

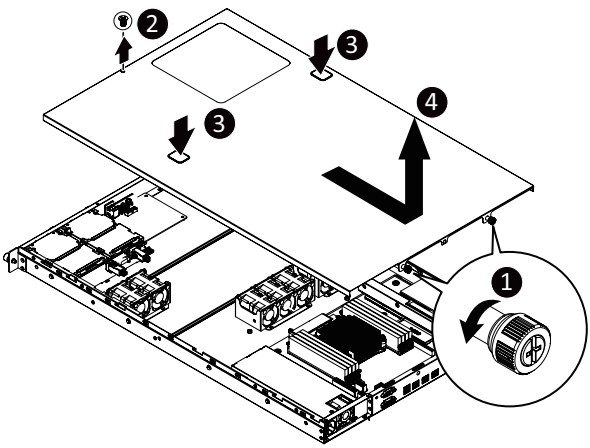
3-1 Removing Chassis Cover

Before you remove or install the system cover

- Make sure the system is not turned on or connected to AC power.

Follow these instructions to remove the system cover:

1. Loosen and the two thumbscrew at the rear of the system.
2. Remove the single secrew at the front of the system.
3. Push down the indentation located at the side of the back chassis
4. Using the grip areas on the top cover and slide the cover horizontally in the direction of the arrow.



3-2 Installing the CPU

Read the following guidelines before you begin to install the CPU:

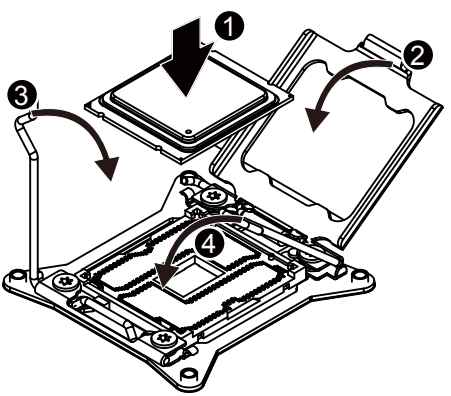
- Make sure that the motherboard supports the CPU.
- Always turn off the computer and unplug the power cord from the power outlet before installing the CPU to prevent hardware damage.
- Unplug all cables from the power outlets.
- Disconnect all telecommunication cables from their ports.
- Place the system unit on a flat and stable surface.
- Open the system according to the instructions.

WARNING!

Failure to properly turn off the server before you start installing components may cause serious damage. Do not attempt the procedures described in the following sections unless you are a qualified service technician.

Follow these instructions to install the CPU:

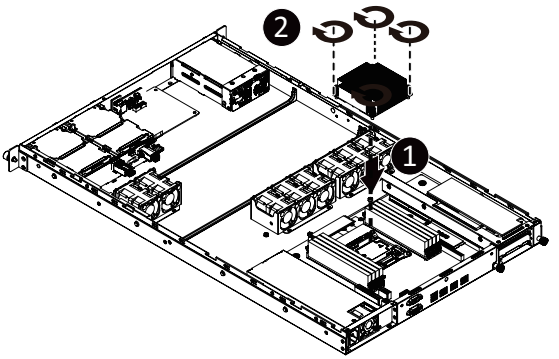
1. Raise the metal locking lever on the socket.
2. Remove the plastic covering on the CPU socket.Insert the CPU with the correct orientation. The CPU only fits in one orientation.
3. Replace the metal cover.
4. Push the metal lever back into locked position.



3-3 2-3 Installing the Heat Sink

Follow these instructions to install the heat sinks:

1. Apply thermal compound evenly on the top of the CPU.
2. Remove the protective cover from the underside of the heat sink.
3. Place the heat sink(s) on top of the CPU and tighten the four positioning screws.



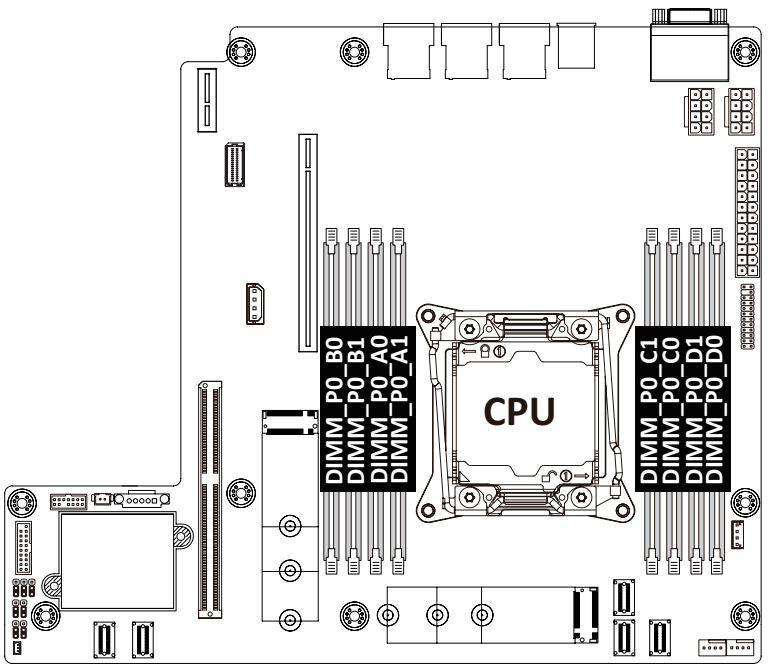
3-4 Installing the Memory

Read the following guidelines before you begin to install the memory:

- Make sure that the motherboard supports the memory. It is recommended that memory of the same capacity, brand, speed, and chips be used.
- Always turn off the computer and unplug the power cord from the power outlet before installing the memory to prevent hardware damage.
- Memory modules have a foolproof design. A memory module can be installed in only one direction. If you are unable to insert the memory, switch the direction.

3-4-1 Four Channel Memory Configuration

This motherboard provides 8 DDR4 memory sockets and supports Four Channel Technology. After the memory is installed, the BIOS will automatically detect the specifications and capacity of the memory. Enabling Four Channel memory mode will be four times of the original memory bandwidth.



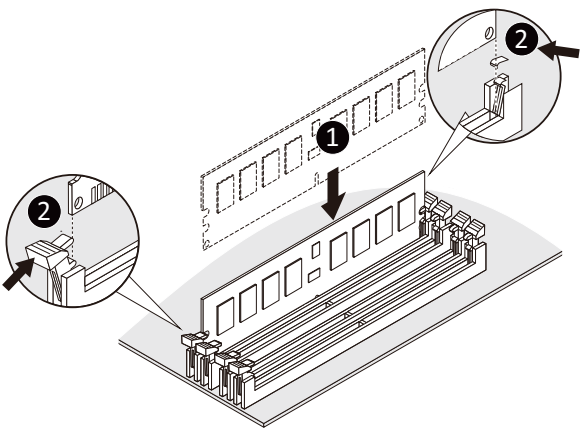
3-4-2 Installing a Memory

Before installing a memory module, make sure to turn off the computer and unplug the power cord from the power outlet to prevent damage to the memory module.

Be sure to install DDR4 DIMMs on this motherboard.

Follow these instructions to install the Memory:

1. Insert the DIMM memory module vertically into the DIMM slot, and push it down.
2. Close the plastic clip at both edges of the DIMM slots to lock the DIMM module.
3. Reverse the installation steps when you want to remove the DIMM module.



3-4-3 DIMM Population Table

Type	Ranks Per DIMM and Data Width	DIMM Capacity (GB)		Speed (MT/s); Voltage (V) Slot Per Channel (SPC) DIMM Per Channel (DPC)		
				1 Slot per Channel	2 Slot per Channel	
		DIMM Density		1DPC	1DPC	2DPC
		4Gb	8Gb	1.2V	1.2V	1.2V
UDIMM	SRx4	4GB	8GB	2666	2666	2666
UDIMM	SRx8	8GB	16GB			
UDIMM	DRx8	8GB	16GB			
UDIMM	DRx8	16GB	32GB			

3-5 Installing the PCI Expansion Card

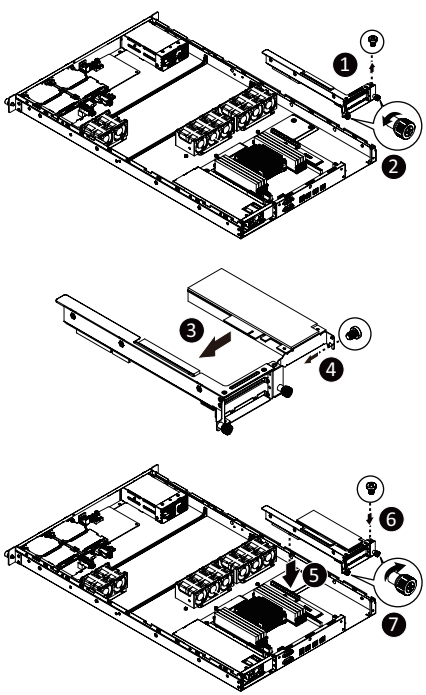
- Voltages can be present within the server whenever an AC power source is connected. This voltage is present even when the main power switch is in the off position. Ensure that the system is powered-down and all power sources have been disconnected from the server prior to installing a PCI card.

Failure to observe these warnings could result in personal injury or damage to equipment.

- The PCI riser assembly does not include a riser card or any cabling as standard. To install a PCI card, a riser card must be installed.

Follow these instructions to PCI Expansion card:

1. Remove the securing special screw on the riser bracket.
2. Loosen the thumbscrew on the riser bracket
3. Lift up the riser bracket out of system.
4. Remove the slot covers from the riser bracket.
5. Orient the PCI-E card with the riser guide slot and push in the direction of the arrow until the PCI-E card sits in the PCI card connector.
6. Secure the PCI-E card with the screw.
7. Reverse the steps 3 - 1 to install the riser bracket.



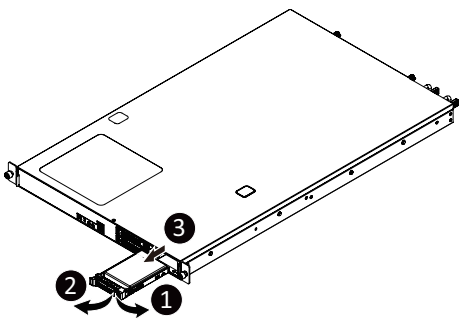
3-6 Installing the Hard Disk Drive

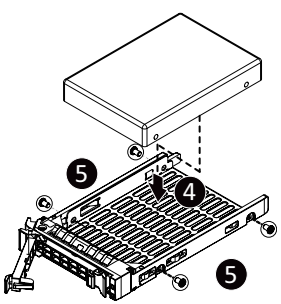
Read the following guidelines before you begin to install the Hard disk drive:

- Take note of the drive tray orientation before sliding it out.
- The tray will not fit back into the bay if inserted incorrectly.
- Make sure that the HDD is connected to the HDD connector on the backplane.

Follow these instructions to install a hard disk drive:

1. Press the release button.
2. Extend the locking lever and pull the locking lever to remove the HDD tray.
3. Place the hard disk drive into the HDD tray.
4. Secure the hard disk drive to the HDD tray with four screws.

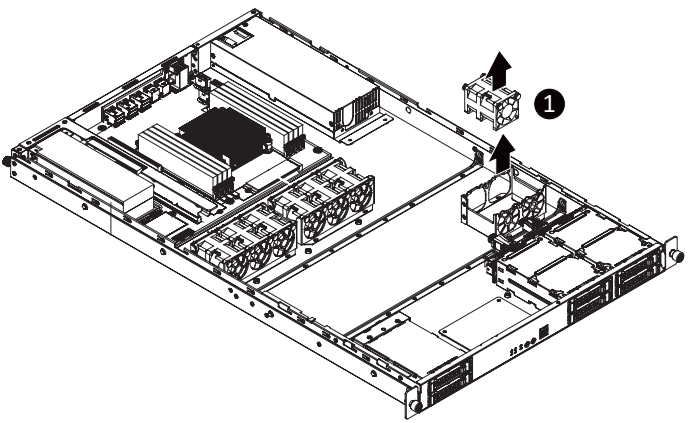




3-7 Replacing the FAN Assemblly

Follow these instructions to replace the fan assembly:

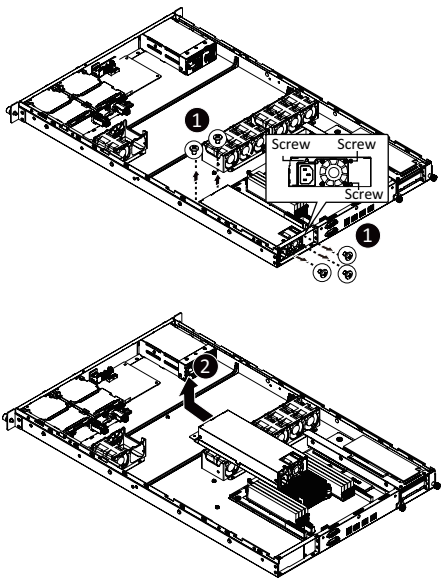
1. Lift up the fan assembly from the chassis.
2. Reverse the previous steps to install the replacement fan assembly.



3-8 Replacing the Power Supply

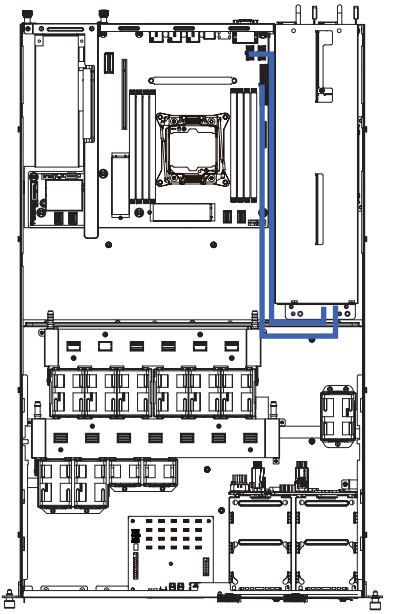
Follow these instructions to replace the power supply:

1. Remove the screws securing power supply.
2. Slide the power supply inward to remove the power supply from the system.
3. Insert the replacement power supply firmly into the chassis. Connect the AC power cord to the replacement power supply.

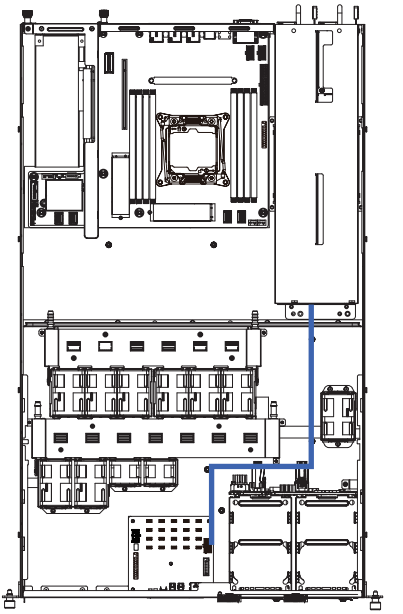


3-9 Cable Routing

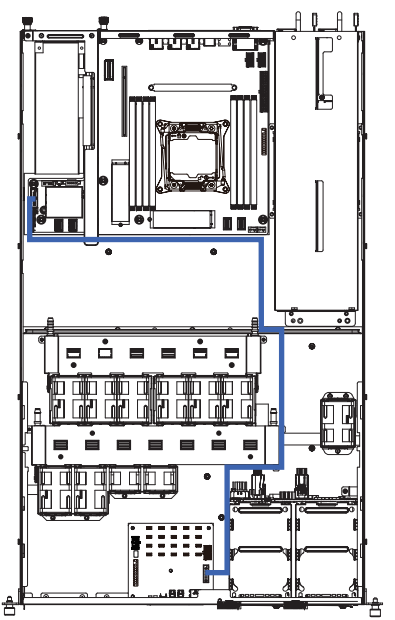
System Power Cable



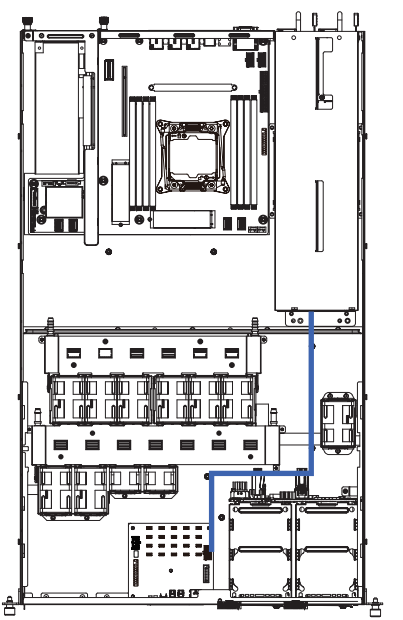
Front IO Board Power Cable



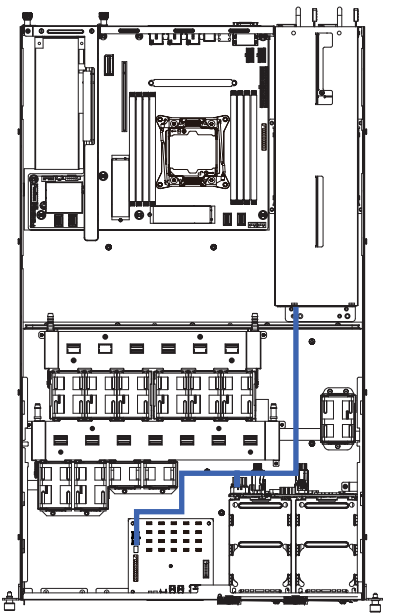
Front Panel USB 3.0 Cable



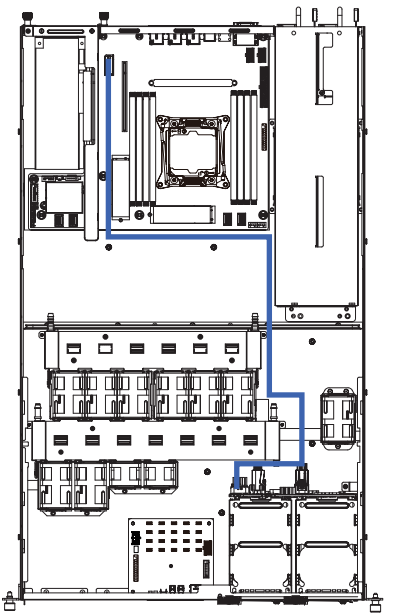
Front IO Board Power Cable



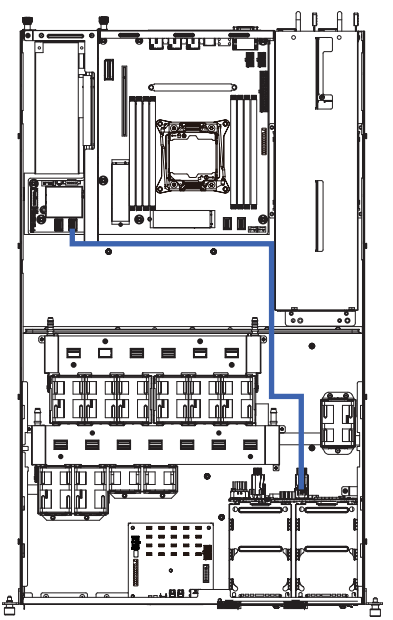
HDD Back Plane Board Power Cable



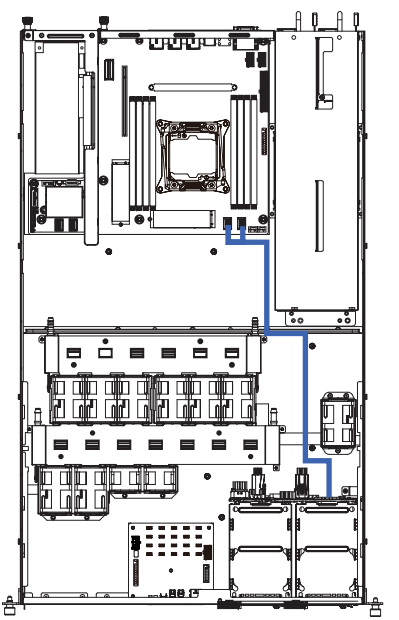
HDD Back Plane Board Signal Cable



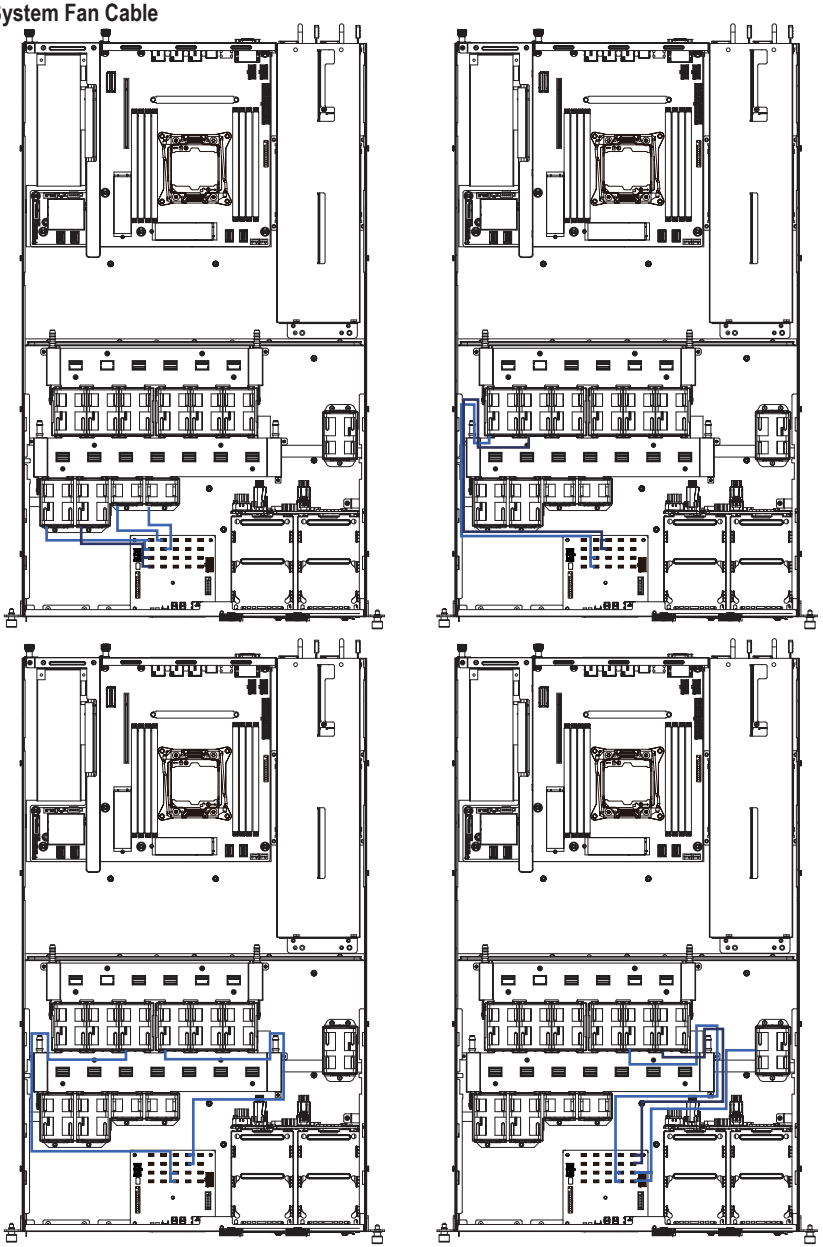
On-Board SATA to HDD Back Plane Board Cable



NVMe Cable



System Fan Cable

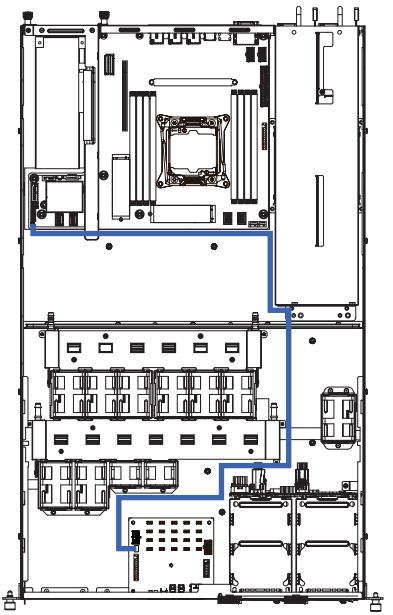


CAUTION!

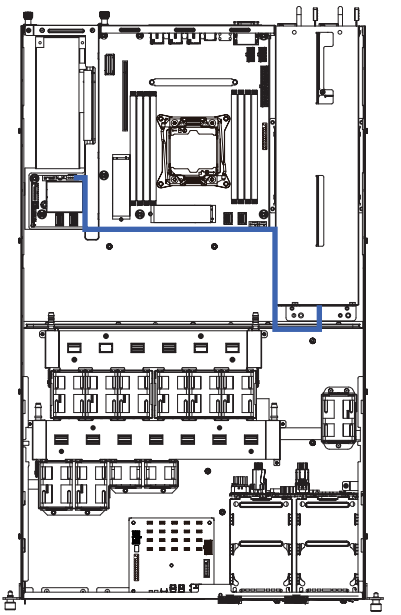
To connect system fan connector, follow the instruction:

- Black/Red cable connect to odd numbered connector.
- White/Amber cable connect to even numbered connector.

SMBus Cable

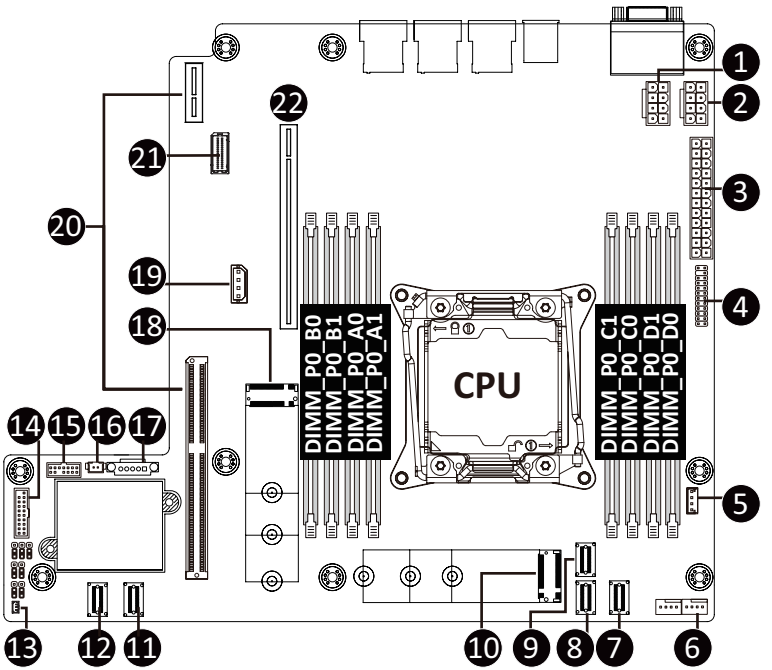


PMBus Cable



Chapter 4 Motherboard Components

4-1 Motherboard Components



Item	Description
1	2 x 4 Pin CPU Power Connector
2	Auxiliary Power Connector for Overclocking
3	2 x 12 Pin System Power Connector
4	Front Panel Header
5	VROC Upgrade Module
6	CPU Fan Connector (for Liquid Cooling Pump)
7	SlimLine 4i Connector (PCIe Signal)
8	SlimLine 4i Connector (PCIe Signal)
9	SlimLine 4i Connector (PCIe Signal)
10	M.2 slot (PCIe Gen3 x4, Support NGFF-2280, M-Key)
11	SlimLine 4i Connector (SATA Signal)
12	SlimLine 4i Connector (SATA Signal)
13	Front Panel Board Power Connector

14	USB 3.0 Connector
15	TPM Connector
16	System Battery Cable Connector
17	PMBus Connector
18	M.2 slot (PCIe Gen3 x4, Support NGFF-2280, M-Key)
19	IPMB Connector
20	Proprietary Riser Slot
21	2 x 15 Pin HDD Back Plane Board Connector
22	PCIe x16 Slot

4-2 Jumper Setting