IN SEARCH OF INCREDIBLE

RS720-E11 Series

RS720-E11-RS24U

2U Rackmount Server User Guide



E28175
Revised Edition V10
May 2026

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Safety information

Electrical Safety

- Before installing or removing signal cables, ensure that the power cables for the system unit and all attached devices are unplugged.
- To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.
- When adding or removing any additional devices to or from the system, ensure that the power cables for the devices are unplugged before the signal cables are connected. If possible, disconnect all power cables from the existing system before you add a device.
- If the power supply is broken, do not try to fix it by yourself. Contact a qualified service technician or your dealer.

Operation Safety

- Any mechanical operation on this server must be conducted by certified or experienced engineers.
- Before operating the server, carefully read all the manuals included with the server package.
- Before using the server, ensure all cables are correctly connected and the power cables are not damaged. If any damage is detected, contact your dealer as soon as possible.
- To avoid short circuits, keep paper clips, screws, and staples away from connectors, slots, sockets and circuitry.
- Avoid dust, humidity, and temperature extremes. Place the server on a stable surface.
- If you encounter technical problems with the product, contact a qualified service technician or your retailer.



This product is equipped with a three-wire power cable and plug for the user's safety. Use the power cable with a properly grounded electrical outlet to avoid electrical shock.

Restricted Access Area

This equipment should only be installed in a Restricted Access Area where both these conditions apply:

- Access can only be gained by skilled or instructed persons who have been instructed about the reasons for the restrictions applied to the area and about any precautions that shall be taken; and
- Access is through the use of a TOOL, or other means of security, and is controlled by the authority responsible for the area.

Shock Hazard

CAUTION! Risk of electric shock.

Disconnect all power supply input plugs before servicing.

Lithium-Ion Battery Warning

CAUTION! 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.

Heavy System

CAUTION! This server system is heavy. Ask for assistance when moving or carrying the system.

Optical Drive Safety Information

Laser Safety Information



To prevent exposure to the optical drive's laser, do not attempt to disassemble or repair the optical drive by yourself. For your safety, contact a professional technician for assistance.

About this guide

Audience

This user guide is intended for system integrators, and experienced users with at least basic knowledge of configuring a server.

Contents

This guide contains the following parts:

1. **Chapter 1: Product Introduction**

   This chapter describes the general features of the server, including sections on front panel and rear panel specifications.

2. **Chapter 2: Hardware Information**

   This chapter lists the hardware setup procedures that you have to perform when installing or removing system components.

3. **Chapter 3: Motherboard Information**

   This chapter gives information about the motherboard that comes with the server. This chapter includes the motherboard layout, jumper settings, and connector locations.

4. **Chapter 4: BIOS Setup**

   This chapter tells how to change system settings through the BIOS Setup menus and describes the BIOS parameters.

Conventions

To ensure that you perform certain tasks properly, take note of the following symbols used throughout this manual.



DANGER/WARNING: Information to prevent injury to yourself when trying to complete a task.



CAUTION: Information to prevent damage to the components when trying to complete a task.



IMPORTANT: Instructions that you MUST follow to complete a task.



NOTE: Tips and additional information to help you complete a task.

Typography

Bold text	Indicates a menu or an item to select.
Italics	Used to emphasize a word or a phrase.
<Key>	Keys enclosed in the less-than and greater-than sign means that you must press the enclosed key. Example: <Enter> means that you must press the Enter or Return key.
<Key1>+<Key2>+<Key3>	If you must press two or more keys simultaneously, the key names are linked with a plus sign (+). Example: <Ctrl>+<Alt>+<Del>
`Command`	Means that you must type the command exactly as shown, then supply the required item or value enclosed in brackets. Example: At the command prompt, type the command line: **`format A:/S`**

References

Refer to the following sources for additional information and for product and software updates.

1. **ASUS Control Center (ACC) user guide**

   This manual tells how to set up and use the proprietary ASUS server management utility. Visit asuscontrolcenter.asus.com for more information.

2. **ASUS websites**

   The ASUS websites provide updated information for all ASUS hardware and software products. Visit https://www.asus.com for more information.

1

Product Introduction

This chapter describes the general features of the chassis kit. It includes sections on front panel and rear panel specifications.

1.1 System package contents

Check your system package for the following items.

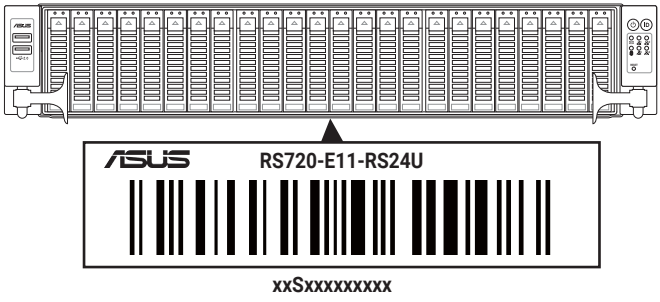
	RS720-E11-RS24U
Chassis	ASUS 2U Rackmount Chassis
Motherboard	ASUS Z13PP-D32 Server Board
Components	1 x 80PLUS Power Supply 1 x 2.5-inch Storage Device Backplane 24 x 2.5-inch Storage Device Trays or Dummy Trays 1 x Front Panel Board 1 x Front USB boards 1 x OCP3.0 Module (Optional) 2 x Riser Cards 4 x System Fans
Accessories	1 x Support DVD 1 x Bag of Screws 2 x CPU Heatsinks 2 x AC Power Cables 1 x External Fan Module (Optional) 1 x LAN Module (Optional) 1 x MB Support DVD
Optional Items	1 x 80PLUS Power Supply (Second PSU) 1 x Friction Rail Kit 1 x Ball Bearing Rail Kit (1000mm) 1 x Ball Bearing Rail Kit (1200mm) 1 x Cable Management Arm (1200m Cabinet only)

- If any of the above items is damaged or missing, contact your retailer.
- Optional items come bundled if you selected them when purchasing the system and cannot be bought separately.

1.2 Serial number label

The product's serial number contains 12 characters, such as xxSxxxxxxxx, and printed on the sticker adhered to the server's front cover.

The correct serial number of the product is required if you need to request for support from the ASUS Technical Support team.



1.3 System specifications

The ASUS RS720-E11 Series features the ASUS Z13PP-D32 server board. The server supports 4th Generation Intel® Xeon® Scalable Processors, plus other latest technologies through the chipsets onboard.

Model Name		RS720-E11-RS24U
Motherboard		Z13PP-D32
Processor Support		2 x Socket E (LGA 4677) 4th Generation Intel® Xeon® Scalable Processors UPI 16 GT/s
Core Logic		Intel® C741 Chipset
Memory	Total Slots	32 (8-channel per CPU, 16 DIMM per CPU)
	Capacity	Maximum up to 4TB (DDR5) + 8TB (Crow Pass)
	Memory Type	DDR5 4800/4400 RDIMM / RDIMM 3DS (2DIMM per Channel) Intel® Optane™ DC persistent memory 300 series (Crow Pass) * **Please refer to www.asus.com for latest memory AVL update**
	Memory Size	64GB, 32GB, 16GB RDIMM 256GB, 128GB RDIMM 3DS 512GB, 256GB, 128GB Intel® Optane™ DC persistent memory 300 Series (Crow Pass) * **Refer to www.asus.com/support for more information**
Expansion Slots	Total PCIe / HBA/RAID Slots	9
	Slot Type	**Up to 3 PCIe Gen5 slots** 2 x PCIe G5 x8 link or 1 x PCIe G5 x16 link (FHFL) 1 x PCIe G5 x16 link (LP) 1 x OCP 3.0 (optional) ** **Maximum limitation length of GPU card: 285mm**
	M.2	2 x M.2 (only supports PCIe mode 2260 or 2280 from CPU1)
	Micro SD Card slot	1 (from BMC)
	Proprietary Slot 1	-
	Proprietary Slot 2	4 x 1GbE RJ45 LAN Module Card (I350-AM4) or 2 x 10GbE RJ45 LAN Module Card (X710-AT2)

(continued on the next page)

Model Name		RS720-E11-RS24U
Disk Controller	SATA Controller	12 x SATA 6Gb/s ports Intel® VROC: Support software RAID 0, 1, 10 & 5
	SAS Controller	Optional kits: Broadcom HBA card 9500-8i Broadcom MegaRAID card 9540-8i Broadcom MegaRAID card 9560-16i
Storage	Storage Bay	24 x 2.5" Hot-Swap Drive Bays: - 12 x NVMe + 12 x SATA/SAS* - 12 x NVme + 12 x NVMe/SATA/SAS* * **PIKE/RAID card is required to support SAS hard drives**
	Motherboard onboard connectors	2 x M.2 connectors 2 x SlimSAS x8 connectors
	NVMe upgrade option	Supports 24 NVMe: via 2 x GenZ cable and 8 MCIO cables Supports 16 NVMe: via 1 x GenZ and 6 MCIO cables Supports 8 NVMe: via 1 x GenZ and 2 MCIO cables
Networking		4 x 1Gbe (Intel® I350-AM4) RJ45 ports **or** 2 x 10Gbe (Intel® X710-AT2) RJ45 ports 1 x Management Port Optional OCP 3.0 Adapter: Up to 200Gb/s Ethernet / InfiniBand Adapter
VGA		Aspeed AST2600 64MB
Graphic		4 double-wide GPUs or 8 single-deck GPUs* * **The fourth card must be used with the external fan** * **Only available for GPU model**
Front I/O Ports		2 x USB 3.2 Gen 1 ports
Rear I/O Ports		2 x USB 3.2 Gen 1 ports 1 x VGA port 2 or 4 x RJ-45 GbE LAN ports 1 x RJ-45 Mgmt LAN port
Switch/LED		**Front Switch/LED:** 1 x Power Switch (w/ LED) 1 x Reset Switch 1 x Location Switch (w/ LED) 1 x Message LED LAN 1-4 LED (on NIC module)* * **The number of LAN LEDs available depends on the LAN Controller card installed.** **Rear Switch/LED:** 1 x Port 80 LED (Q-Code) 1 x Power Switch w/ LED 1 x Location Switch w/ LED
Security Options		TPM-SPI PFR

(continued on the next page)

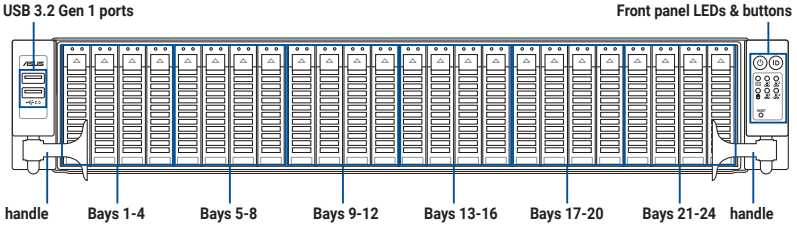
Model Name		RS720-E11-RS24U
OS Support		Windows® Server RedHat® Enterprise Linux SuSE® Linux Enterprise Server CentOS Ubuntu * **Please find the latest OS support from https://servers.asus.com/support/os.**
Management Solution	Software	ASUS Control Center (Classic)
	Out of Band Remote Management	On-Board ASMB11-iKVM for KVM-over-IP
Regulatory Compliance		BSMI, CE, CB, FCC (ClassA)
Dimension		840mm x 447mm x 88mm (2U) 33.07" x 17.60" x 3.46"
Net Weight Kg		25.64 Kg (CPU, DRAM & HDD not included)
Gross Weight Kg		36 Kg (CPU, DRAM & HDD not included, Packing include)
Power Supply (different configuration by region)		1+1 Redundant 2600W 80 PLUS Titanium Power Supply Rating: 100-127Vac, 13.8A (x2), 50-60Hz 220-240Vac, 16A (x2), 50-60Hz 240Vac, 16A **or** 1+1 Redundant 2000W 80 PLUS Platinum Power Supply Rating: 100-127Vac, 13A (x2), 50/60Hz 200-220Vac, 10A (x2), 50/60Hz 220-230Vac, 10A (x2), 50/60Hz 230-240Vac, 10A (x2), 50/60Hz 200-240Vac, 12A (x2), 50/60Hz 240Vac, 10A **or** 1+1 Redundant 1600W 80 PLUS Titanium Power Supply Rating: 100-127Vac, 12A (x2), 50-60Hz 220-240Vac, 10A (x2), 50-60Hz 240Vac, 8A **or** 1+1 Redundant 1600W 80 PLUS Platinum Power Supply Rating: 100-127Vac, 13A (x2), 50-60Hz 200-240Vac, 9.5A (x2), 50-60Hz 240Vac, 9.3A * **240Vdc only for China**
Environment		Operating temperature: 10°C ~ 35°C Non-operating temperature: -40°C ~ 60°C Non-operating humidity: 20% ~ 90% (Non-condensing)

***Specifications are subject to change without notice.**

1.4 Front panel features

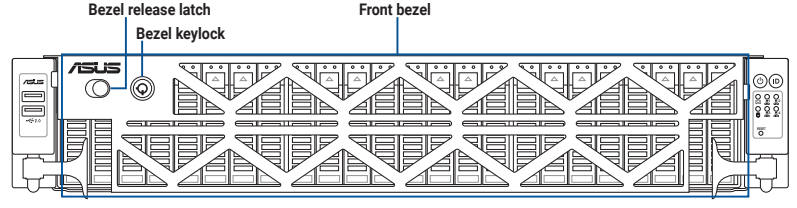
The barebone server displays a simple yet stylish front panel with easily accessible features. The power and reset buttons and LED indicators are located on the front panel.

Refer to section **1.7 LED information** for the LED descriptions.



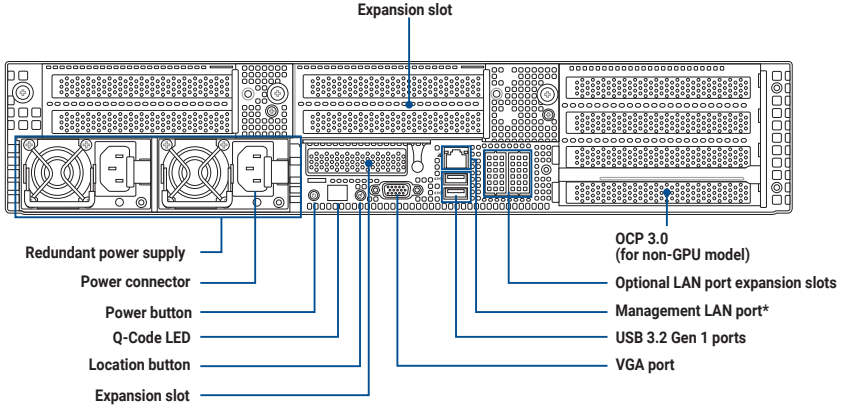
- Bays 1 to 24 supports NVMe.
- Bays 1 to 12 supports SATA.
- Bays 1 to 16 supports SAS. SAS support requires optional HBA/RAID card.

For extra security, a front bezel (purchased separately) can be installed to prevent unauthorized physical access to the hard drives and power button.



1.5 Rear panel features

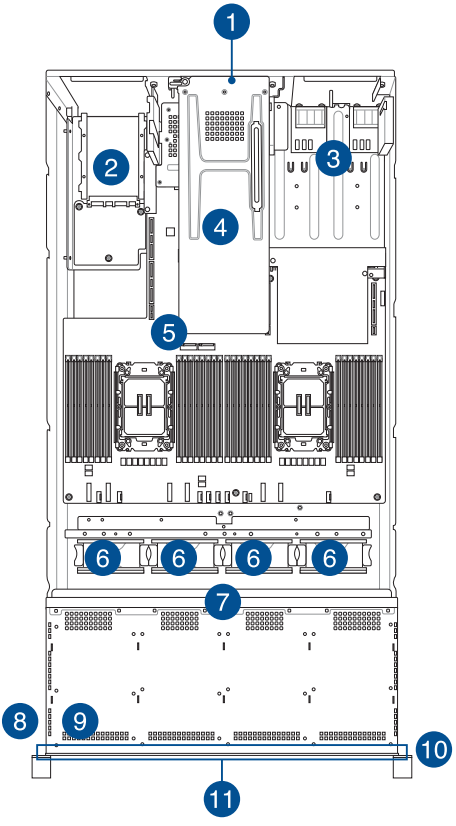
The rear panel includes the expansion slots, system power sockets, and rear fans. The middle part includes the I/O shield with openings for the rear panel connectors on the motherboard.



- Mgmt LAN port is for ASUS ASMB11-iKVM only.
- The Q-Code LED provides the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.
- Refer to the Q-Code table for details.

1.6 Internal features

The barebone server includes the basic components as shown.



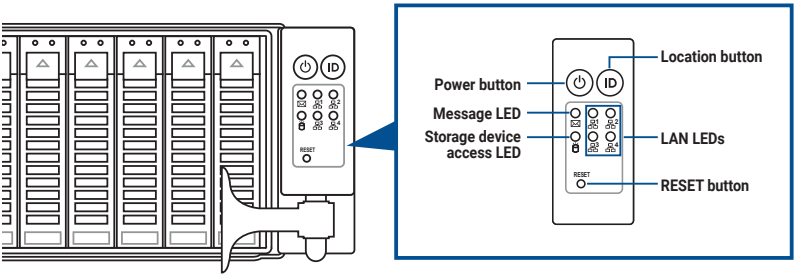
1. Riser card bracket
2. OCP module (optional)
3. Redundant power supply
4. PCIe riser card (hidden)
5. ASUS Z13PP-D32 Server Board
6. System fans
7. NVMe/SATA/SAS back panel
8. Front USB Board
9. Asset tag (hidden)
10. Front panel (hidden)
11. 24 x 2.5” storage device trays

A protection film is pre-attached to the front cover before shipping. Please remove the protection film before turning on the system for proper heat dissipation.

WARNING
HAZARDOUS MOVING PARTS
KEEP FINGERS AND OTHER BODY PARTS AWAY

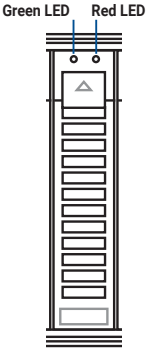
1.7 LED information

1.7.1 Front panel LEDs



LED	Icon	Display status	Description
Power LED	⏻	ON	System power ON
Storage device access LED		OFF	No activity
		Blinking	Read/write data into the storage device
Message LED	✉	OFF	System is normal; no incoming event
		ON	With the onboard ASMB11-iKVM: a hardware monitor event is indicated
LAN LEDs	品	OFF	No LAN connection
		Blinking	LAN is transmitting or receiving data
		ON	LAN connection is present
Location LED	ID	ON	Location switch is pressed
		OFF	Normal status (Press the location switch again to turn off)

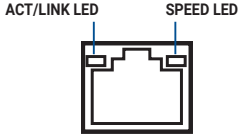
1.7.2 Storage device status LED



Storage Device LED Description		
GREEN	ON	SATA/SAS storage device power ON
RED	ON	Storage device has failed and should be swapped immediately (For RAID card)
GREEN/ RED	Blinking	RAID rebuilding (For RAID card)
GREEN/ RED	Blinking	Locate (For RAID card)
GREEN/ RED	OFF	Storage device not found
GREEN	Blinking	Storage device reading or writing data

1.7.3 LAN (RJ-45) LEDs

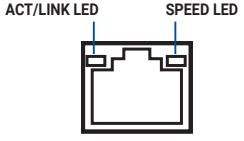
Intel® I350-AM4 1GbE LAN port LEDs



ACT / LINK LED	
Status	Description
OFF	No link
GREEN	Linked
BLINKING	Data activity

SPEED LED	
Status	Description
OFF	10Mbps connection
ORANGE	100 Mbps connection
GREEN	1 Gbps connection

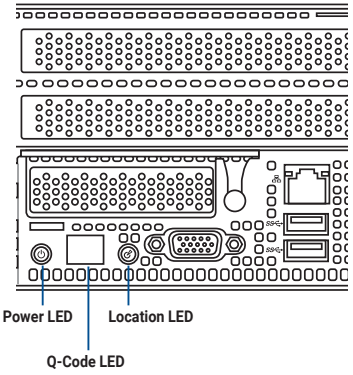
Intel® X710-AT2 10GbE LAN port LEDs



ACT / LINK LED	
Status	Description
OFF	No link
GREEN	Linked
BLINKING	Data activity

SPEED LED	
Status	Description
OFF	10Mbps / 100 Mbps connection
ORANGE	1 Gbps connection
GREEN	10 Gbps connection

1.7.4 Rear panel LEDs



LED	Display status	Description
Power LED	ON	System power ON
Location LED	OFF ON	Normal status Location switch is pressed (Press the location switch again to turn off)

1.7.5 Q-Code table

Action	PHASE	POST CODE	TYPE	DESCRIPTION
SEC Start up	Security Phase	0x01	Progress	Power on post code
		0x02	Progress	Load BSP microcode
		0x03	Progress	Perform early platform cache Initialization
		0x04	Progress	Set cache as ram for PEI phase
		0x05	Progress	Establish Stack
		0x06	Progress	CPU Early Initialization
Quick VGA	PEI(Pre-EFI initialization)phase	0x10	Progress	PEI Core Entry
		0x11		PEI cache as ram CPU initial
		0x15		NB Initialization before installed memory
		0x19		SB Initialization before installed memory
	VR initialization	0xC8	Progress	Infineon Address
		0xCC		
		0xD4		Ti Address
		0xDC		
		0xB8		
		0xBC		
		0xB0		
		0xB4		
	OCMR initialization	0x11	Progress	Enter OCMR Procedures
		0x12		Enter OCMR On S3
		0x13		Check New CPU
		0x14		Check Cmos Fail
		0x16		Check Overclock Fail
		0x18		Prepare Parameters
		0x21		Build Voltage Table
		0x22		Patch Voltage Table
		0x23		Adjust Voltage Table
		0x24		Before Set Voltages
		0x25		Set Voltages
		0x31		Before Set Spread Spectrum
		0x32		SetBclkStrapAndFrequencyPei
		0x33		Set Spread Spectrum
		0x34		After Set Frequency
	KTI initialization	0xA0	Progress	Initialize KTI input structure
		0xA1		Collect info such as SBSP, Boot Mode, Reset type
		0xA3		Setup up minimum path between SBSP & other sockets
		0xA6		Sync up with PBSPs
		0xA7		Topology discovery and route calculation
		0xA8		Program final route
		0xA9		Program final IO SAD setting
		0xAA		Protocol layer and other Uncore settings
		0xAB		Transition links to full speed opeartion
		0xAE		Coherency Settings
		0xAF		KTI Complete
	IIO Early initialization	0xE0	Progress	IIO early init
		0xE1		Early Pre-link training setting
		0xE2		IIO Gen3 EQ programming
		0xE3		IIO Link training
		0xE4		IIO Gen3 override
		0xE5		IIO early init exit
		0xE6		IIO late init
		0xE7		PCIE port init
		0xE8		IOAPIC init
		0xE9		VTD init
		0xEA		IOAT init
		0xEB		IIO DFX init
		0xEC		NTB init
		0xED		Security init
		0xEE		IIO late init exit
		0xEF		IIO On ready to boot

(continued on the next page)

Action	PHASE	POST CODE	TYPE	DESCRIPTION
Quick VGA	MRC Memory initialization	0x70	Progress	High Bandwidth Memory
		0x7E		Pipe Sync AP Boot Mode
		0xB0		Detect DIMM Configuration
		0xB1		Initialize clocks for all MemSs
		0xB2		Gather SPD Data
		0xB3		Early Configuration
		0xB4		Check DIMM Ranks
		0xB5		Parallel Mode Dispatch
		0xB6		DDRIO Initialization
		0xB7		DDR Training
		0xB8		Initialize Throttling
		0xB9		Memory Test
		0xBA		Memory Init
		0xBB		Initialize Memory Map
		0xBC		Set RAS Configuration
		0xBD		Get Margin
		0xBE		BIOS SSA Initialization
		0xBF		MRC Done
		0xC1		Check POR Compatibility
		0xC2		Unlock Memory
		0xC3		Check Status
		0xC4		Check XMP
		0xC5		Initialize Memory
		0xC6		Socket DIMM Information
		0xC7		Prep NVDIMM for Training
		0xC9		Setup SVL and Scrambling
		0xCA		Init CMI Credit Programming
		0xCB		Check Ras Support After MemInit
		0xCC		Initialize ADR
		0xCD		Init Structures Late
		0xCE		Memory Late
		0xCF		Select Boot Mode
	DXE (Driver Execution Environment)phase	0x32	Progress	CPU POST-Memory Initialization
		0x33		CPU Cache Initialization
		0x34		Application Processor(s) (AP) Initialization
		0x35		BSP Selection
		0x36		CPU Initialization
		0x37		Pre-memory NB Initialization
		0x3B		Pre-memory SB Initialization
		0x4F		DXE Initial Program Load(IPL)
		0x60		DXE Core Started
		0x61		DXE NVRAM Initialization
		0x62		SB run-time Initialization
		0x63		CPU DXE Initialization
		0x68		PCI HB Initialization
		0x69		NB DXE Initialization
		0x6A		NB DXE SMM Initialization
		0x70		SB DXE Initialization
		0x71		SB DXE SMM Initialization
		0x72		SB DEVICES Initialization
		0x78		ACPI Module Initialization
		0x79		CSM Initialization
Normal boot	BDS (Boot Device Selection) phase	0x90	Progress	BDS started
		0x91		Connect device event
		0x92		PCI Bus Enumeration
		0x93		PCI Bus Enumeration
		0x94		PCI Bus Enumeration
		0x95		PCI Bus Enumeration
		0x96		PCI Bus Enumeration
		0x97		Console output connect event
		0x98		Console input connect event
		0x99		AMI Super IO start
		0x9A		AMI USB Driver Initialization

(continued on the next page)

Action	PHASE	POST CODE	TYPE	DESCRIPTION
Normal boot	BDS (Boot Device Selection) phase	0x9B	Progress	AMI USB Driver Initialization
		0x9C		AMI USB Driver Initialization
		0x9D		AMI USB Driver Initialization
		0xA0		AHCI Initialization
		0xA1		AHCI Initialization
		0xA2		AHCI Initialization
		0xA3		AHCI Initialization
		0xA8		BIOS Setup password verify
		0xA9		BIOS Setup start
		0xAB		BIOS Setup input wait
		0xAD		Ready to Boot event
		0xAE		Legacy Boot event
		0xAF		Exit Boot Services
		0xB2		Legacy Option ROM Initialization
		0xB3		Reset system
		0xB4		USB Hotplug
		0xB5		PCI Bus Hotplug
		0xB6		NVRAM clean up
		0xB7		NVRAM configuration reset

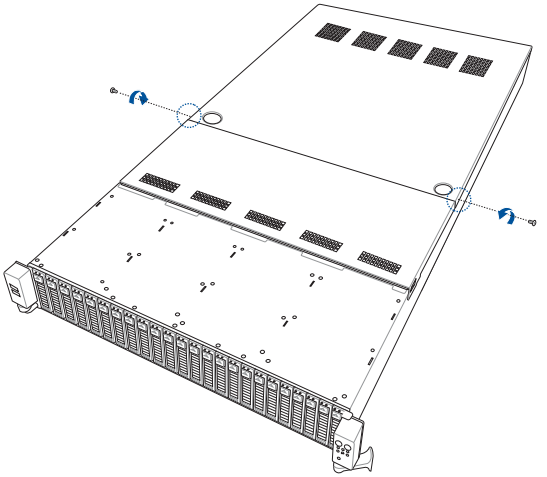
2 Hardware Information

This chapter lists the hardware setup procedures that you have to perform when installing or removing system components.

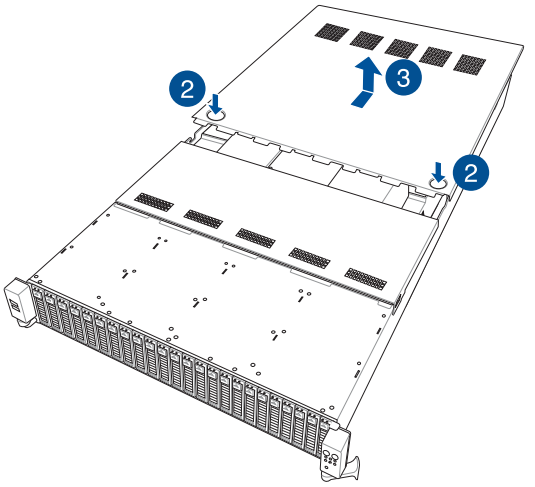
2.1 Chassis cover

2.1.1 Removing the rear cover

1. Remove the two (2) screws on both sides of the rear cover with a Phillips screwdriver.

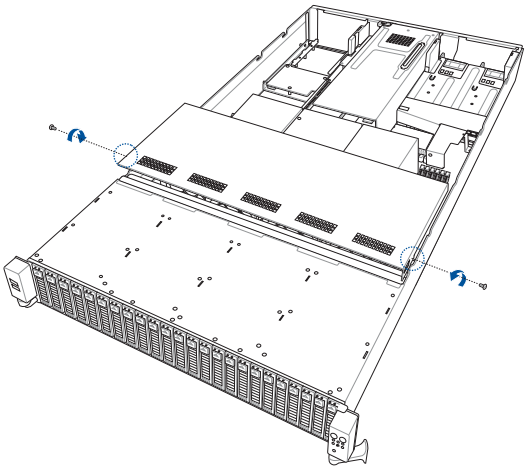


2. Push and hold the cover buttons down on the rear cover.
3. Slide the rear cover towards the rear panel to disengage it from the chassis, then lift the rear cover to completely remove it from the chassis.

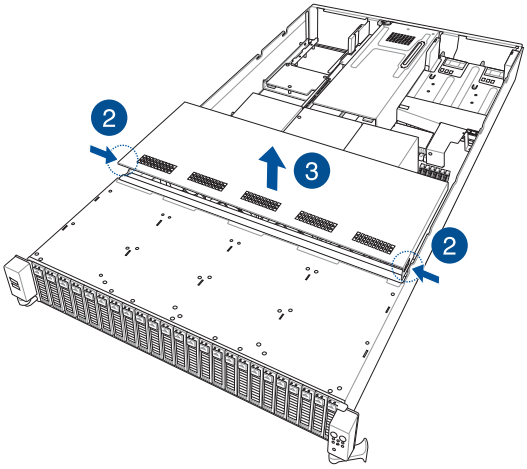


2.1.2 Removing the mid cover

1. Remove the two (2) screws on both sides of the mid cover with a Phillips screwdriver.



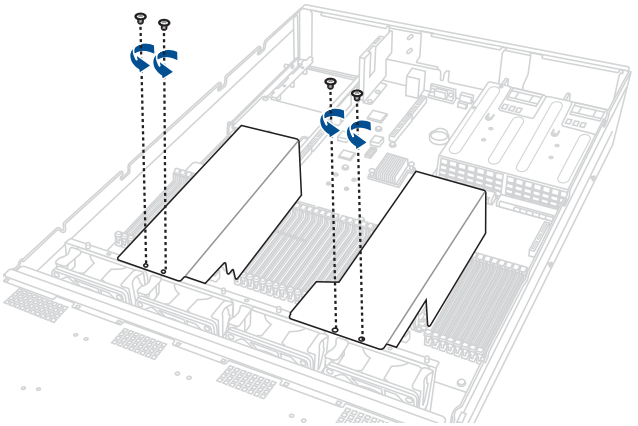
2. Push the buttons on both sides to release the mid cover from the chassis.
3. Lift the mid cover to completely remove it from the chassis.



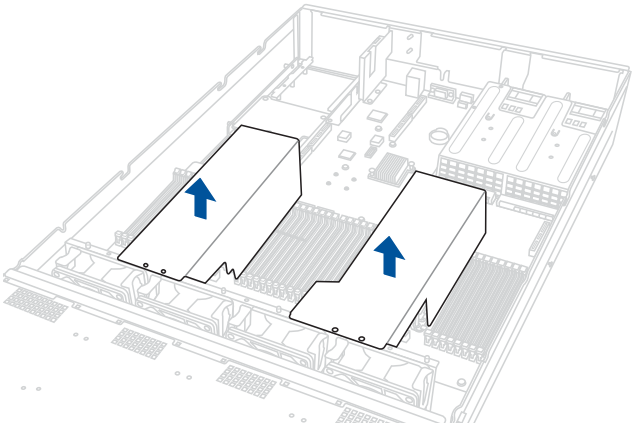
2.2 Air ducts

2.2.1 Removing the air duct

1. Remove the screws securing the air ducts to the chassis.

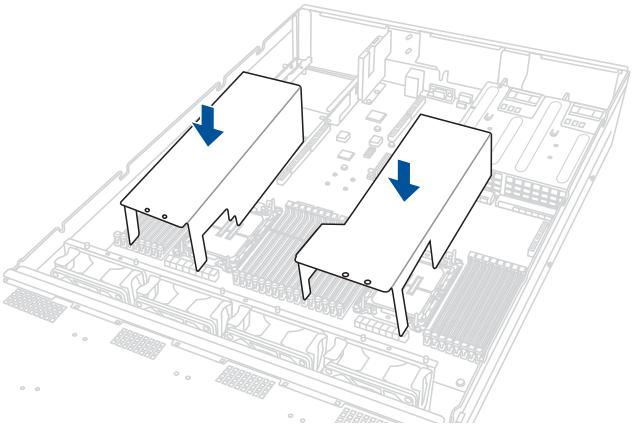


2. Gently lift the air duct vertically out of the chassis.

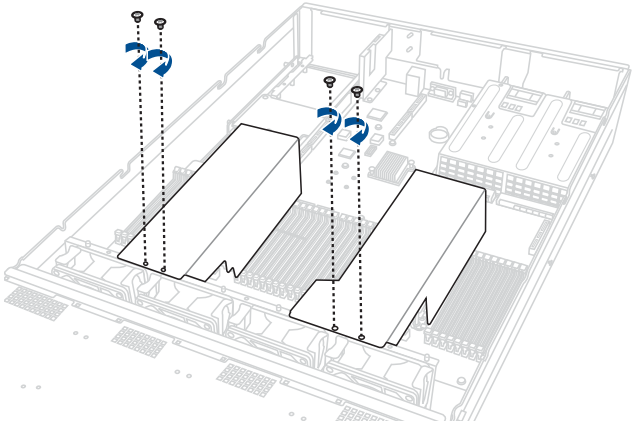


2.2.2 Installing the air duct

1. Align the air ducts along the edges of the DIMM slots, and then place the air ducts in the chassis



2. Secure the air ducts to the chassis using the screws removed previously.



2.3 Central Processing Unit (CPU)

The motherboard comes with a surface mount Socket E designed for the 4th Generation Intel® Xeon® Scalable Processors.

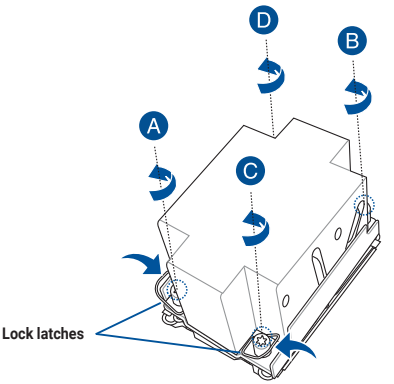
- Upon purchase of the motherboard, ensure that the PnP cap is on the socket and the socket contacts are not bent. Contact your retailer immediately if the PnP cap is missing, or if you see any damage to the PnP cap/socket contacts/motherboard components. ASUS will shoulder the cost of repair only if the damage is shipment/transit-related.
- Keep the cap after installing the motherboard. ASUS will process Return Merchandise Authorization (RMA) requests only if the motherboard comes with the cap on the Socket E+.
- The product warranty does not cover damage to the socket contacts resulting from incorrect CPU installation/removal or misplacement/loss/incorrect removal of the PnP cap.

2.3.1 Removing the CPU and heatsink

To install the CPU and heatsink:

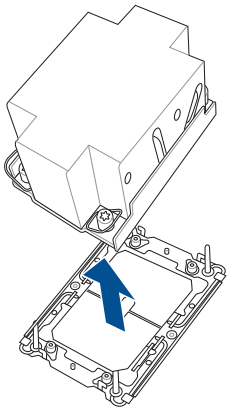
1. Remove the rear cover. For more information, refer to **Chassis cover**.
2. Remove the air ducts. For more information, refer to **Air ducts**.
3. Push the lock latches inwards on all four corners of the heatsink, then slightly twist each of the heatsink screws counterclockwise in the order shown on the illustration to loosen the heatsink.

Intel® recommends a torque value of 8 lbf-in to prolong the longetivity of all PEEK nuts after the quality of the load post is corrected.

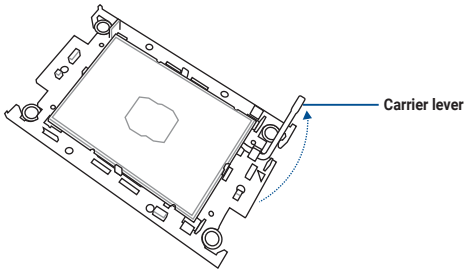


4. Completely loosen all the screws on the heatsink, then lift and remove it from the motherboard.

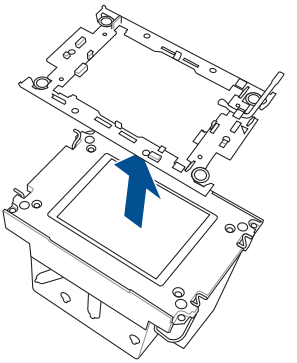
Intel® recommends a torque value of 8 lbf-in to prolong the longetivity of all PEEK nuts after the quality of the load post is corrected.



5. Flip the heatsink over to reveal the CPU and carrier bracket. Flip the carrier lever over to release the CPU, then remove the CPU from the heatsink and carrier assembly.

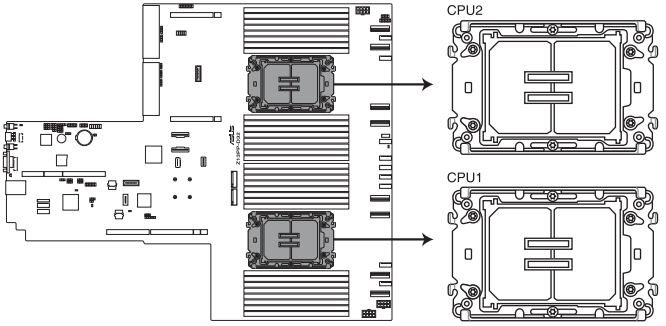


6. Remove the carrier bracket from the heatsink.



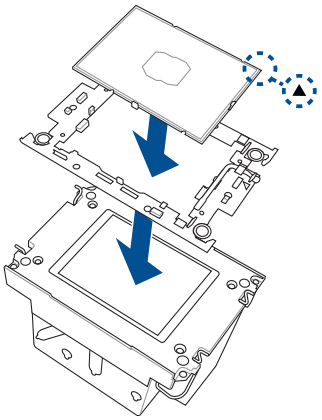
2.3.2 Installing the CPU and heatsink

1. Remove the air duct. For more information, refer to the **Removing the air duct** section
2. Locate the CPU sockets on your motherboard.



Z13PP-D32 CPU TR4 Socket

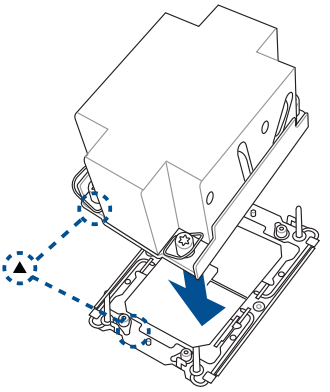
3. Attach the CPU to the carrier bracket, ensure the triangle mark is on the same side as the bracket lever, then attach the CPU and carrier to the heatsink.



4. Remove the PNP cap from the CPU socket.

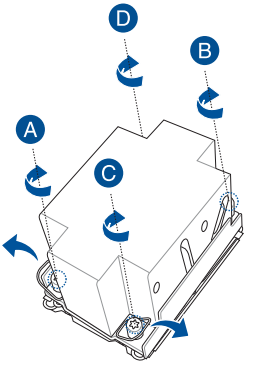
5. Align the heatsink and CPU assembly to the CPU socket, then place the heatsink on top of the CPU socket.

Ensure the triangle mark on the CPU is located in the same corner as the CPU socket.



6. Push the lock latches outwards on all four corners of the heatsink, then do two (2) clockwise turns on each of the heatsink screws in the cross order pattern shown on the illustration until the heatsink screws are tightened and the heatsink is secured onto the motherboard.

Intel® recommends a torque value of 8 lbf-in to prolong the longetivity of all PEEK nuts after the quality of the load post is corrected.



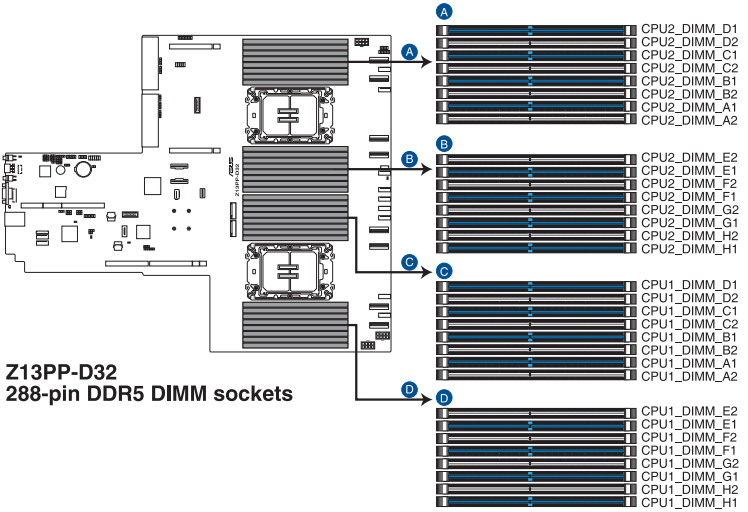
7. Replace the air duct. For more information, refer to the **Air ducts** section.

2.4 System memory

2.4.1 Overview

The motherboard comes with 32 Double Data Rate 5 (DDR5) Dual Inline Memory Modules (DIMM) sockets.

The figure illustrates the location of the DDR5 DIMM sockets:



2.4.2 Memory Configurations

You may install 16GB, 32GB, and 64GB RDIMMs or 64GB, 128GB, 256GB 3DS / 3DS RDIMM into the DIMM sockets. If you are not sure on which slots to install the DIMMs, you can use the recommended memory configuration in this section for reference.

- Refer to ASUS Server AVL for the updated list of compatible DIMMs.
- Always install DIMMs with the same CAS latency. For optimum compatibility, it is recommended that you obtain memory modules from the same vendor.
- Start installing the DIMMs into the second slots (such as CPU1_DIMM_A1 and CPU2_DIMM_A1)

Recommended memory configuration for 1 CPU Configuration

1 CPU Configuration (must be on CPU1)							
	DIMMs						
	1	2	4	6	8	12	16
CPU1_DIMM_A2						•	•
CPU1_DIMM_A1	•	•	•	•	•	•	•
CPU1_DIMM_B2							•
CPU1_DIMM_B1					•	•	•
CPU1_DIMM_C2						•	•
CPU1_DIMM_C1			•	•	•	•	•
CPU1_DIMM_D2							•
CPU1_DIMM_D1				•	•	•	•
CPU1_DIMM_H1					•	•	•
CPU1_DIMM_H2							•
CPU1_DIMM_G1		•	•	•	•	•	•
CPU1_DIMM_G2						•	•
CPU1_DIMM_F1				•	•	•	•
CPU1_DIMM_F2							•
CPU1_DIMM_E1			•	•	•	•	•
CPU1_DIMM_E2						•	•

Recommended memory configuration for 2 CPU Configuration

Dual CPU configuration							
	DIMMs						
	2	4	8	12	16	24	32
CPU1_DIMM_A2						•	•
CPU1_DIMM_A1	•	•	•	•	•	•	•
CPU1_DIMM_B2							•
CPU1_DIMM_B1					•	•	•
CPU1_DIMM_C2						•	•
CPU1_DIMM_C1			•	•	•	•	•
CPU1_DIMM_D2							•
CPU1_DIMM_D1				•	•	•	•
CPU1_DIMM_H1					•	•	•
CPU1_DIMM_H2							•
CPU1_DIMM_G1		•	•	•	•	•	•
CPU1_DIMM_G2						•	•
CPU1_DIMM_F1				•	•	•	•
CPU1_DIMM_F2							•
CPU1_DIMM_E1			•	•	•	•	•
CPU1_DIMM_E2						•	•
CPU2_DIMM_A2						•	•
CPU2_DIMM_A1	•	•	•	•	•	•	•
CPU2_DIMM_B2							•
CPU2_DIMM_B1					•	•	•
CPU2_DIMM_C2						•	•
CPU2_DIMM_C1			•	•	•	•	•
CPU2_DIMM_D2							•
CPU2_DIMM_D1				•	•	•	•
CPU2_DIMM_H1					•	•	•
CPU2_DIMM_H2							•
CPU2_DIMM_G1		•	•	•	•	•	•
CPU2_DIMM_G2						•	•
CPU2_DIMM_F1				•	•	•	•
CPU2_DIMM_F2							•
CPU2_DIMM_E1			•	•	•	•	•
CPU2_DIMM_E2						•	•

HBM SKU memory population table

Recommended memory configuration for 1 CPU Configuration

1 CPU Configuration (must be on CPU1, for HBM SKU Only)					
	DIMMs				
	1	2	4	8	16
CPU1_DIMM_A2					•
CPU1_DIMM_A1	•	•	•	•	•
CPU1_DIMM_B2					•
CPU1_DIMM_B1				•	•
CPU1_DIMM_C2					•
CPU1_DIMM_C1			•	•	•
CPU1_DIMM_D2					•
CPU1_DIMM_D1				•	•
CPU1_DIMM_H1				•	•
CPU1_DIMM_H2					•
CPU1_DIMM_G1		•	•	•	•
CPU1_DIMM_G2					•
CPU1_DIMM_F1				•	•
CPU1_DIMM_F2					•
CPU1_DIMM_E1			•	•	•
CPU1_DIMM_E2					•

Recommended memory configuration for 2 CPU Configuration

Dual CPU configuration (for HBM SKU Only)					
	DIMMs				
	2	4	8	16	32
CPU1_DIMM_A2					•
CPU1_DIMM_A1	•	•	•	•	•
CPU1_DIMM_B2					•
CPU1_DIMM_B1				•	•
CPU1_DIMM_C2					•
CPU1_DIMM_C1			•	•	•
CPU1_DIMM_D2					•
CPU1_DIMM_D1				•	•
CPU1_DIMM_H1				•	•
CPU1_DIMM_H2					•
CPU1_DIMM_G1		•	•	•	•
CPU1_DIMM_G2					•
CPU1_DIMM_F1				•	•
CPU1_DIMM_F2					•
CPU1_DIMM_E1			•	•	•
CPU1_DIMM_E2					•
CPU2_DIMM_A2					•
CPU2_DIMM_A1	•	•	•	•	•
CPU2_DIMM_B2					•
CPU2_DIMM_B1				•	•
CPU2_DIMM_C2					•
CPU2_DIMM_C1			•	•	•
CPU2_DIMM_D2					•
CPU2_DIMM_D1				•	•
CPU2_DIMM_H1				•	•
CPU2_DIMM_H2					•
CPU2_DIMM_G1		•	•	•	•
CPU2_DIMM_G2					•
CPU2_DIMM_F1				•	•
CPU2_DIMM_F2					•
CPU2_DIMM_E1			•	•	•
CPU2_DIMM_E2					•

96GB RDIMMs memory population table for 4th Gen Intel Xeon Scalable processors

Recommended memory configuration for 1 CPU Configuration

1 CPU Configuration (must be on CPU1)		
DIMMs		
	8	16
CPU1_DIMM_A2		•
CPU1_DIMM_A1	•	•
CPU1_DIMM_B2		•
CPU1_DIMM_B1	•	•
CPU1_DIMM_C2		•
CPU1_DIMM_C1	•	•
CPU1_DIMM_D2		•
CPU1_DIMM_D1	•	•
CPU1_DIMM_H1	•	•
CPU1_DIMM_H2		•
CPU1_DIMM_G1	•	•
CPU1_DIMM_G2		•
CPU1_DIMM_F1	•	•
CPU1_DIMM_F2		•
CPU1_DIMM_E1	•	•
CPU1_DIMM_E2		•

Recommended memory configuration for 2 CPU Configuration

Dual CPU configuration		
DIMMs		
	16	32
CPU1_DIMM_A2		•
CPU1_DIMM_A1	•	•
CPU1_DIMM_B2		•
CPU1_DIMM_B1	•	•
CPU1_DIMM_C2		•
CPU1_DIMM_C1	•	•
CPU1_DIMM_D2		•
CPU1_DIMM_D1	•	•
CPU1_DIMM_H1	•	•
CPU1_DIMM_H2		•
CPU1_DIMM_G1	•	•
CPU1_DIMM_G2		•
CPU1_DIMM_F1	•	•
CPU1_DIMM_F2		•
CPU1_DIMM_E1	•	•
CPU1_DIMM_E2		•
CPU2_DIMM_A2		•
CPU2_DIMM_A1	•	•
CPU2_DIMM_B2		•
CPU2_DIMM_B1	•	•
CPU2_DIMM_C2		•
CPU2_DIMM_C1	•	•
CPU2_DIMM_D2		•
CPU2_DIMM_D1	•	•
CPU2_DIMM_H1	•	•
CPU2_DIMM_H2		•
CPU2_DIMM_G1	•	•
CPU2_DIMM_G2		•
CPU2_DIMM_F1	•	•
CPU2_DIMM_F2		•
CPU2_DIMM_E1	•	•
CPU2_DIMM_E2		•

96GB RDIMMs memory population table for 5th Gen Intel Xeon Scalable processors

Recommended memory configuration for 1 CPU Configuration

1 CPU Configuration (must be on CPU1)					
	DIMMs				
	1	6	8	12	16
CPU1_DIMM_A2				•	•
CPU1_DIMM_A1	•	•	•	•	•
CPU1_DIMM_B2					•
CPU1_DIMM_B1			•	•	•
CPU1_DIMM_C2				•	•
CPU1_DIMM_C1		•	•	•	•
CPU1_DIMM_D2					•
CPU1_DIMM_D1		•	•	•	•
CPU1_DIMM_H1			•	•	•
CPU1_DIMM_H2					•
CPU1_DIMM_G1		•	•	•	•
CPU1_DIMM_G2				•	•
CPU1_DIMM_F1		•	•	•	•
CPU1_DIMM_F2					•
CPU1_DIMM_E1		•	•	•	•
CPU1_DIMM_E2				•	•

Recommended memory configuration for 2 CPU Configuration

Dual CPU configuration					
	DIMMs				
	2	12	16	24	32
CPU1_DIMM_A2				•	•
CPU1_DIMM_A1	•	•	•	•	•
CPU1_DIMM_B2					•
CPU1_DIMM_B1			•	•	•
CPU1_DIMM_C2				•	•
CPU1_DIMM_C1		•	•	•	•
CPU1_DIMM_D2					•
CPU1_DIMM_D1		•	•	•	•
CPU1_DIMM_H1			•	•	•
CPU1_DIMM_H2					•
CPU1_DIMM_G1		•	•	•	•
CPU1_DIMM_G2				•	•
CPU1_DIMM_F1		•	•	•	•
CPU1_DIMM_F2					•
CPU1_DIMM_E1		•	•	•	•
CPU1_DIMM_E2				•	•
CPU2_DIMM_A2				•	•
CPU2_DIMM_A1	•	•	•	•	•
CPU2_DIMM_B2					•
CPU2_DIMM_B1			•	•	•
CPU2_DIMM_C2				•	•
CPU2_DIMM_C1		•	•	•	•
CPU2_DIMM_D2					•
CPU2_DIMM_D1		•	•	•	•
CPU2_DIMM_H1			•	•	•
CPU2_DIMM_H2					•
CPU2_DIMM_G1		•	•	•	•
CPU2_DIMM_G2				•	•
CPU2_DIMM_F1		•	•	•	•
CPU2_DIMM_F2					•
CPU2_DIMM_E1		•	•	•	•
CPU2_DIMM_E2				•	•

If you wish to install PMem as well, refer to the following tables for configurations

Recommended memory configuration for 1 CPU Configuration

1 CPU Configuration (must be on CPU1)								
Channel	A		B		C		D	
DDR5+CPS	DIMM_A2	DIMM_A1	DIMM_B2	DIMM_B1	DIMM_C2	DIMM_C1	DIMM_D2	DIMM_D1
4+4		CPS		DDR5		CPS		DDR5
6+1		DDR5		CPS		DDR5		DDR5
8+1		DDR5		DDR5		DDR5	CPS	DDR5
8+4	CPS	DDR5		DDR5	CPS	DDR5		DDR5
		DDR5	CPS	DDR5		DDR5	CPS	DDR5
8+8	CPS	DDR5	CPS	DDR5	CPS	DDR5	CPS	DDR5

1 CPU Configuration (must be on CPU1)								
Channel	H		G		F		E	
DDR5+CPS	DIMM_H1	DIMM_H2	DIMM_G1	DIMM_G2	DIMM_F1	DIMM_F2	DIMM_E1	DIMM_E2
4+4	DDR5		CPS		DDR5		CPS	
6+1			DDR5		DDR5		DDR5	
8+1	DDR5		DDR5		DDR5		DDR5	
8+4	DDR5		DDR5	CPS	DDR5		DDR5	CPS
	DDR5	CPS	DDR5		DDR5	CPS	DDR5	
8+8	DDR5	CPS	DDR5	CPS	DDR5	CPS	DDR5	CPS

Recommended memory configuration for 2 CPU Configuration

Channel	A (CPU1)		B (CPU1)		C (CPU1)		D (CPU1)	
DDR5+CPS	DIMM_A2	DIMM_A1	DIMM_B2	DIMM_B1	DIMM_C2	DIMM_C1	DIMM_D2	DIMM_D1
4+4		CPS		DDR5		CPS		DDR5
6+1		DDR5		CPS		DDR5		DDR5
8+1		DDR5		DDR5		DDR5	CPS	DDR5
8+4	CPS	DDR5		DDR5	CPS	DDR5		DDR5
		DDR5	CPS	DDR5		DDR5	CPS	DDR5
8+8	CPS	DDR5	CPS	DDR5	CPS	DDR5	CPS	

Channel	H (CPU1)		G (CPU1)		F (CPU1)		E (CPU1)	
DDR5+CPS	DIMM_H1	DIMM_H2	DIMM_G1	DIMM_G2	DIMM_F1	DIMM_F2	DIMM_E1	DIMM_E2
4+4	DDR5		CPS		DDR5		CPS	
6+1			DDR5		DDR5		DDR5	
8+1	DDR5		DDR5		DDR5		DDR5	
8+4	DDR5		DDR5	CPS	DDR5		DDR5	CPS
	DDR5	CPS	DDR5		DDR5	CPS	DDR5	
8+8	DDR5	CPS	DDR5	CPS	DDR5	CPS	DDR5	CPS

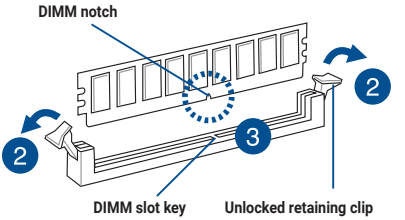
Channel	A (CPU2)		B (CPU2)		C (CPU2)		D (CPU2)	
DDR5+CPS	DIMM_A2	DIMM_A1	DIMM_B2	DIMM_B1	DIMM_C2	DIMM_C1	DIMM_D2	DIMM_D1
4+4		CPS		DDR5		CPS		DDR5
6+1		DDR5		CPS		DDR5		DDR5
8+1		DDR5		DDR5		DDR5	CPS	DDR5
8+4	CPS	DDR5		DDR5	CPS	DDR5		DDR5
		DDR5	CPS	DDR5		DDR5	CPS	DDR5
8+8	CPS	DDR5	CPS	DDR5	CPS	DDR5	CPS	DDR5

Channel	H (CPU2)		G (CPU2)		F (CPU2)		E (CPU2)	
DDR5+CPS	DIMM_H1	DIMM_H2	DIMM_G1	DIMM_G2	DIMM_F1	DIMM_F2	DIMM_E1	DIMM_E2
4+4	DDR5		CPS		DDR5		CPS	
6+1			DDR5		DDR5		DDR5	
8+1	DDR5		DDR5		DDR5		DDR5	
8+4	DDR5		DDR5	CPS	DDR5		DDR5	CPS
	DDR5	CPS	DDR5		DDR5	CPS	DDR5	
8+8	DDR5	CPS	DDR5	CPS	DDR5	CPS	DDR5	CPS

2.4.3 Installing a DIMM

Ensure to unplug the power supply before adding or removing DIMMs or other system components. Failure to do so may cause severe damage to both the motherboard and the components.

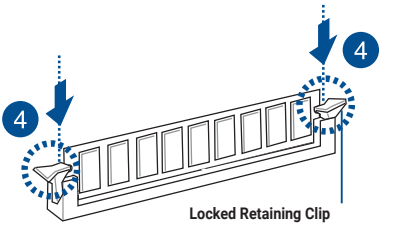
1. Unlock a DIMM socket by pressing the retaining clips outward.
2. Align a DIMM on the socket such that the notch on the DIMM matches the DIMM slot key on the socket.



A DIMM is keyed with a notch so that it fits in only one direction. DO NOT force a DIMM into a socket in the wrong direction to avoid damaging the DIMM.

3. Hold the DIMM by both of its ends then insert the DIMM vertically into the socket. Apply force to both ends of the DIMM simultaneously until the retaining clips snaps back into place.

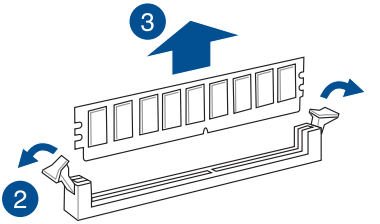
   Ensure that the DIMM is sitting firmly on the DIMM slot.



Always insert the DIMM into the socket VERTICALLY to prevent DIMM notch damage.

2.4.4 Removing a DIMM

1. Remove the chassis cover. For more information, see the section **Chassis cover**.
2. Simultaneously press the retaining clips outward to unlock the DIMM.
3. Remove the DIMM from the socket.



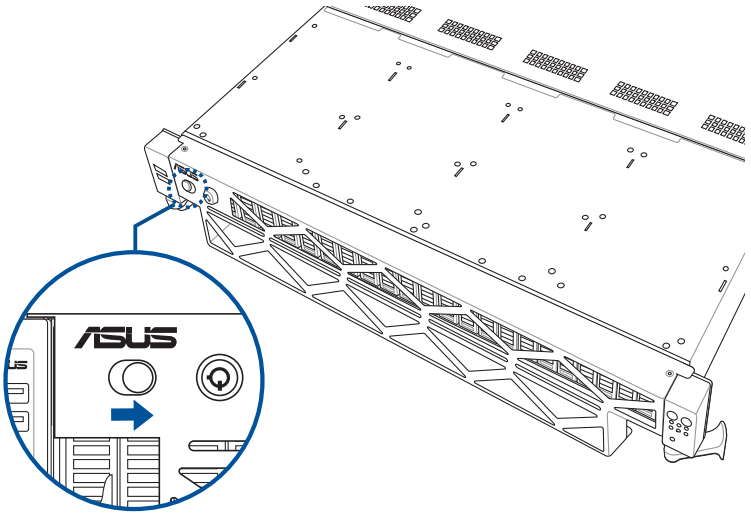
Support the DIMM lightly with your fingers when pressing the retaining clips. The DIMM might get damaged when it flips out with extra force.

2.5 (optional) Front bezel

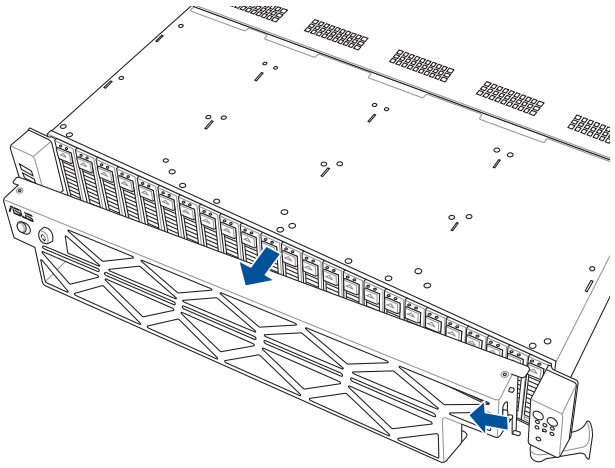
For extra security, a front bezel (purchased separately) can be installed to prevent unauthorized physical access to the hard drives and power button.

2.5.1 Removing the front bezel

1. Push the bezel release latch of the front bezel towards the right to unlock the bezel.

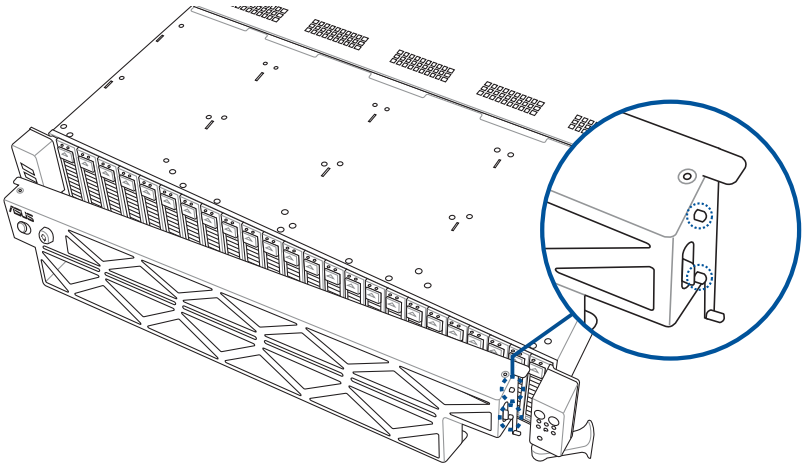


2. Slide the front bezel towards the left of the system to detach the front bezel, then remove it from the system.

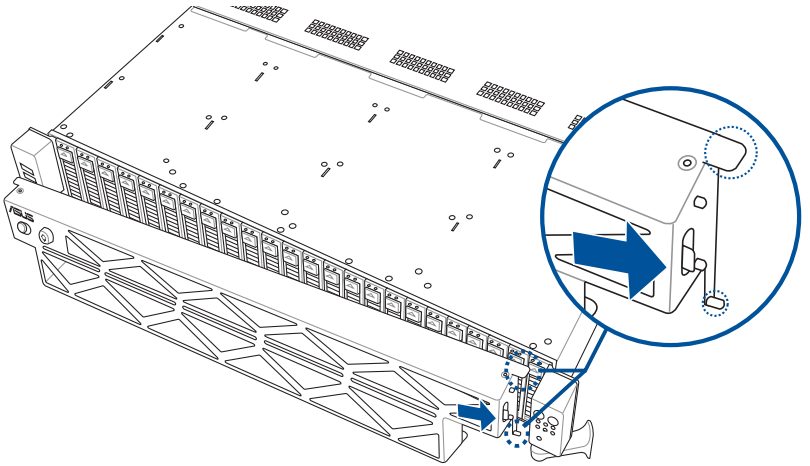


2.5.2 Installing the front bezel

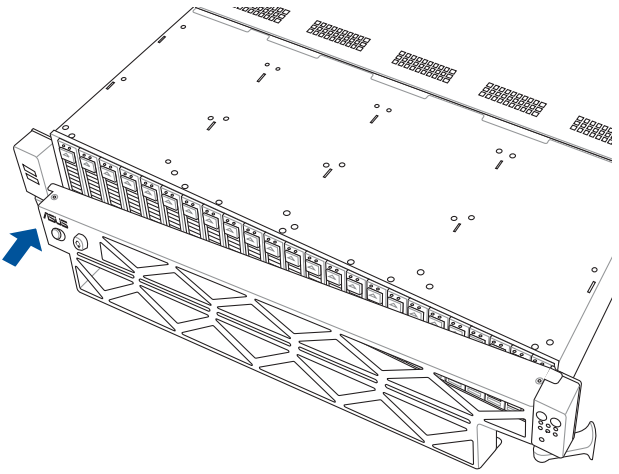
1. Align the two (2) right notches on the front bezel to the notch holes on the right front panel.



2. Attach the right side of the front bezel to the right front panel.

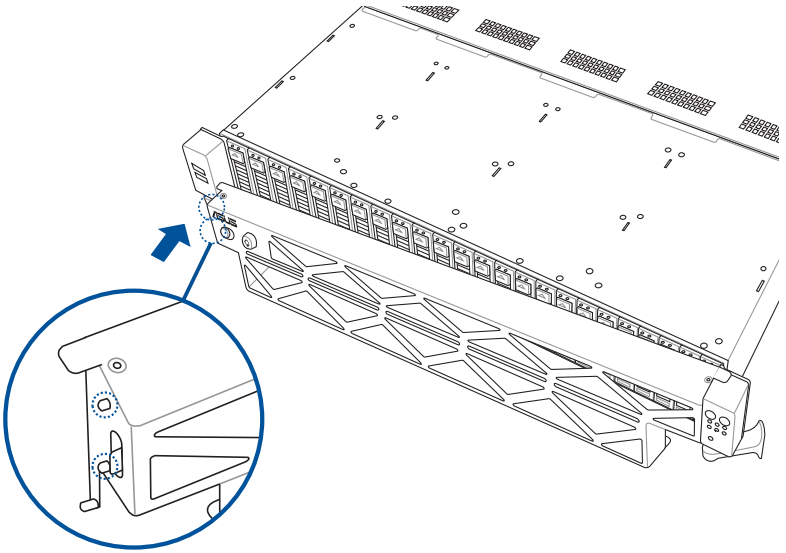


3. Push the left side of the front bezel towards the left USB panel.

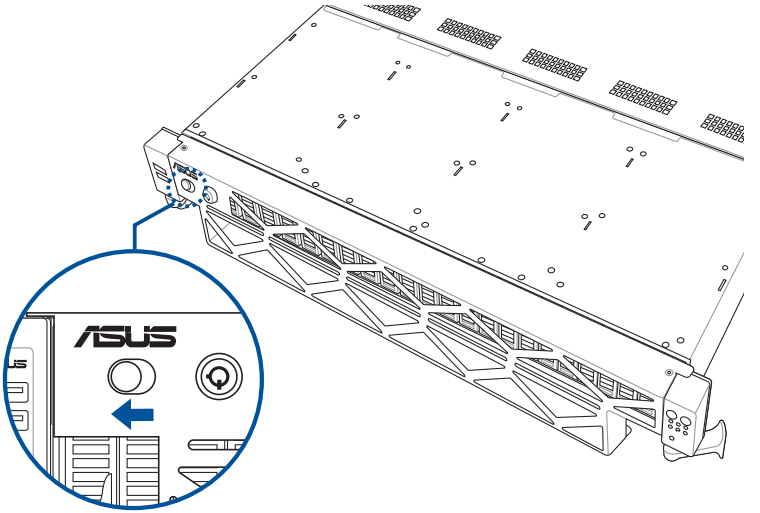


4. Make sure the two (2) left notches on the front bezel are aligned with the notch holes on the left USB panel, then push and attach the front bezel to the left USB panel.

Make sure the bezel release latch is in the unlock state (pushed to the right) before attaching the front bezel to the left USB panel.

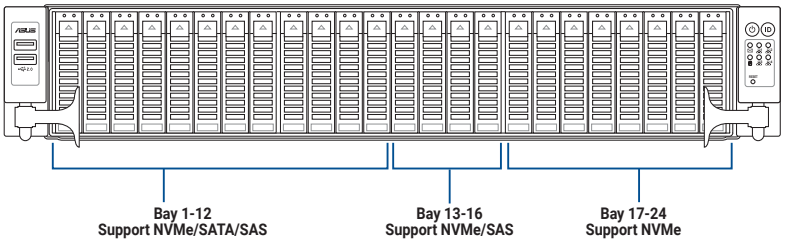


5. Push the bezel release latch of the front bezel towards the left to lock the bezel.



2.6 Storage devices

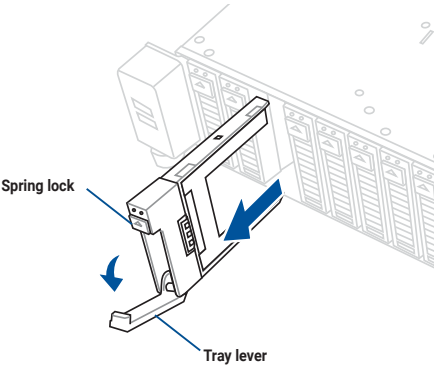
The system supports twenty-four (24) 2.5” hot-swap SATA/SAS/NVMe storage devices (up to 24 x NVMe, 12 x SATA, and 16 x SAS). The storage device installed on the storage device tray connects to the motherboard SATA/SAS/NVMe ports via the SATA/SAS/NVMe backplane.



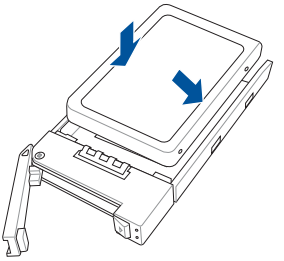
- Bays 1 to 24 supports NVMe.
- Bays 1 to 12 supports SATA.
- Bays 1 to 16 supports SAS. SAS support requires optional HBA/RAID card.

2.6.1 Installing a 2.5” hot-swap SATA/SAS/NVMe storage device

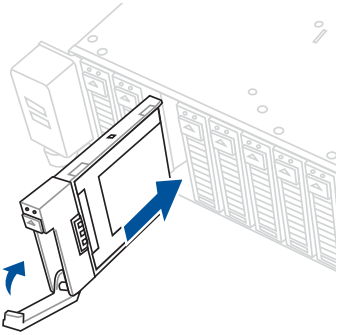
1. Press the spring lock then pull the tray lever outward to release the storage device tray. The storage device tray ejects slightly after you pull out the lever.
2. Firmly hold the tray lever and pull the storage device tray out of the bay.



3. Place the 2.5” storage device into the storage device tray until it clicks into place and is seated securely in the storage device tray.



4. Push the storage device tray and storage device assembly all the way into the depth of the bay until the tray lever and spring lock clicks and secures the storage device tray in place.

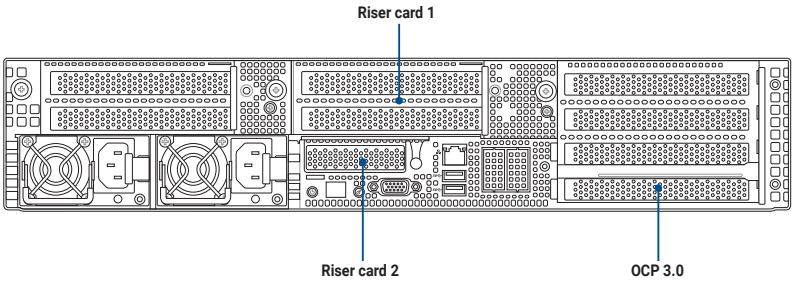


- When installed, the SATA/SAS/NVMe connector on the storage device connects to the SATA/SAS/NVMe interface on the backplane.
- The storage device tray is correctly placed when its front edge aligns with the bay edge.

5. Repeat steps 1 to 4 to install the other SATA/SAS/NVMe storage devices.

2.7 Expansion slot

The barebone server comes with two pre-installed riser cards to support three PCIe slots.



Riser card bracket 1

Riser card bracket 1 supports PCIe Gen5 slots 1-2 top to bottom. Slot 1 can be auto-switch to x16 mode when x16 card is populated whereas slot 2 will be disabled.

PCIe slot	Operation mode	
Slot 1	x8	x16
Slot 2	x8	N/A

Riser card bracket 2

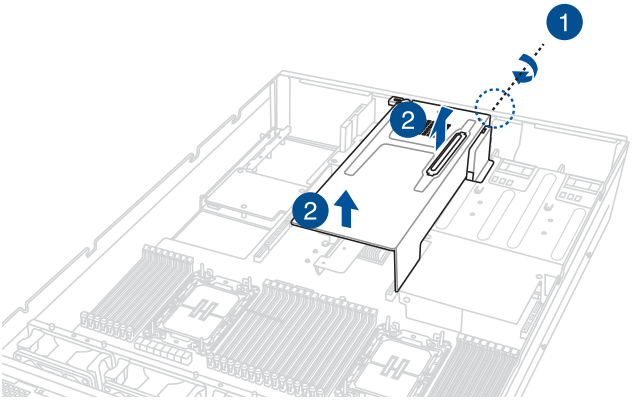
Riser card bracket 2 supports PCIe Gen5 slot 9.

PCIe slot	Operation mode
Slot 3	x16

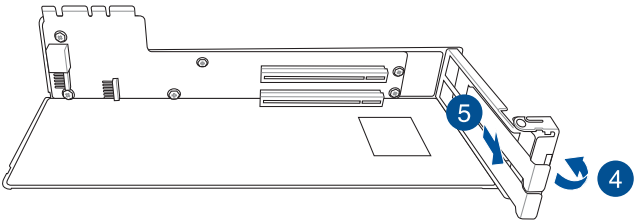
2.7.1 Installing an expansion card to riser card bracket 1

To install an expansion card to the riser card bracket 1:

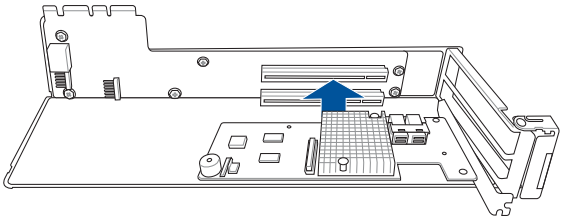
1. Loosen the thumbscrew securing the riser card bracket to the chassis.
2. Lift the riser card out of the chassis by firmly holding it by the tab and pulling it upwards to detach it from the PCIe slot on the motherboard.



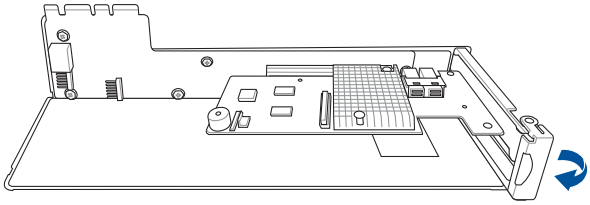
3. Place the riser card bracket on a flat and stable surface.
4. Flip the PCIe lock open.
5. Remove the metal cover(s) of the slot(s) you wish to install a PCIe expansion card to.



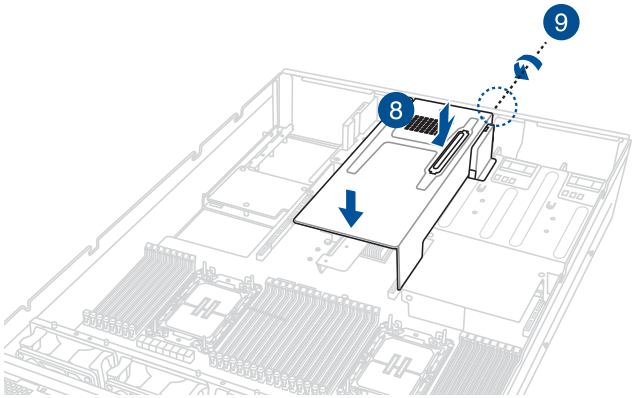
6. Install the PCIe expansion card into the riser card bracket.



7. Flip the metal bracket lock back to secure the PCIe expansion card to the riser card bracket.



8. Install the riser card bracket and expansion card assembly into the PCIe slot on the motherboard. Ensure that the golden connectors of the riser card bracket is firmly seated in place.
9. Secure the riser card bracket to the chassis with the thumbscrew.

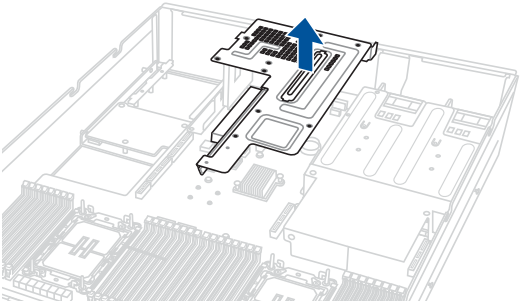


2.7.2 Installing an expansion card to riser bracket 2

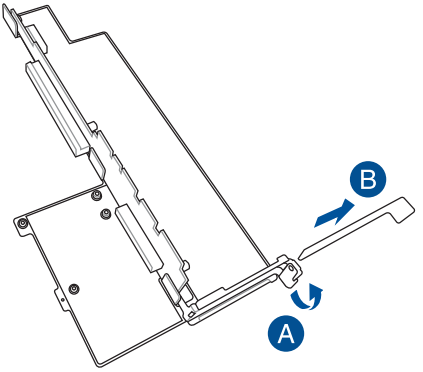
The pre-installed riser card bracket 2 (butterfly riser bracket) supports Low Profile (LP), Half-Length (HL) PCIe x16 expansion cards.

To install a PCIe x16 (Gen5 x16 link) expansion card on the butterfly riser card bracket:

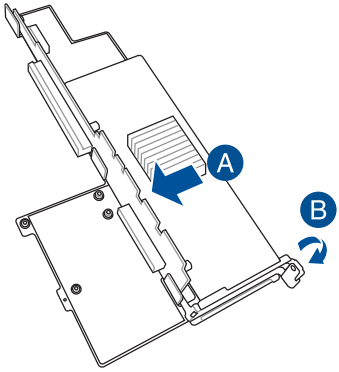
1. Please refer to steps 1 and 2 of **Installing an expansion card to riser card bracket 1** section.
2. Lift the butterfly riser out of the chassis by firmly holding it by the tab and pulling it upwards to detach it from the PCIE x16 slot on the motherboard.



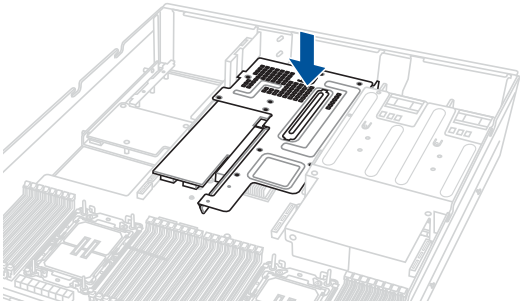
3. Place the riser card bracket on a flat and stable surface.
4. Flip the PCIe lock open (A) then remove the metal bracket (B).



5. Install the expansion card to the **RS2_PCIE1** slot on the riser bracket (A), and then flip the PCIe lock back to secure the card (B).



6. Install the riser card bracket and the expansion cards assembly into the PCIe slot on the motherboard. Ensure that the golden connectors of the riser card bracket is firmly seated in place.



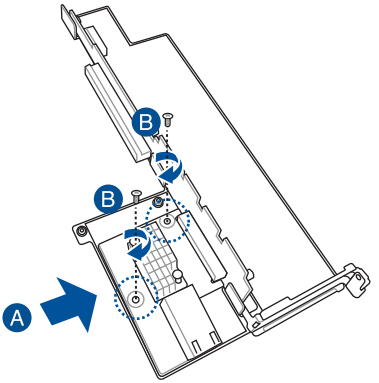
7. Install the riser card brackets on the top section. Please refer to steps 8 and 9 of **Installing an expansion card to riser card bracket 1** section.

2.7.3 Installing an ethernet expansion card to riser bracket 2

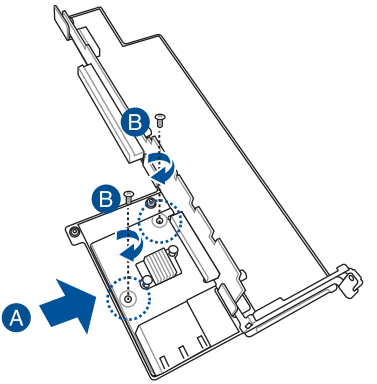
The pre-installed riser card bracket 2 can support a 4-port Intel® I350-AM4 1G LAN controller expansion card or 2-port Intel® X710-AT2 Gigabit 10G LAN controller expansion card.

To install a 4-port or 2-port ethernet expansion card on the riser card bracket:

1. Follow steps 1-3 of **Installing an expansion card to riser bracket 2** to remove riser card bracket 2 from the chassis.
2. Insert the 4-port or 2-port ethernet expansion card to the **RS2_LAN_PCIE1** slot (A) on the riser card bracket, then secure it using two (2) screws (B).



2-port Ethernet expansion card



4-port Ethernet expansion card

3. Follow step 6 of **Installing an expansion card to riser bracket 2** to install riser card bracket 2 into the chassis.

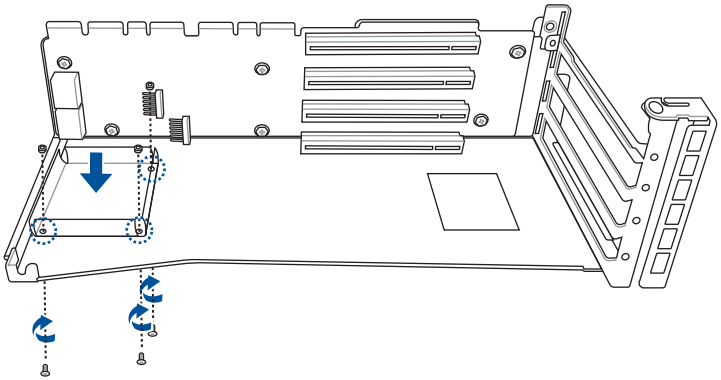
2.7.4 Installing the Cache Vault Power Module

The cache vault power module is required for selected HBA/RAID card models. You may install the cache vault power module to the riser bracket 1 or riser bracket 4. Please refer to the steps below to install the cache vault power module to your server system.

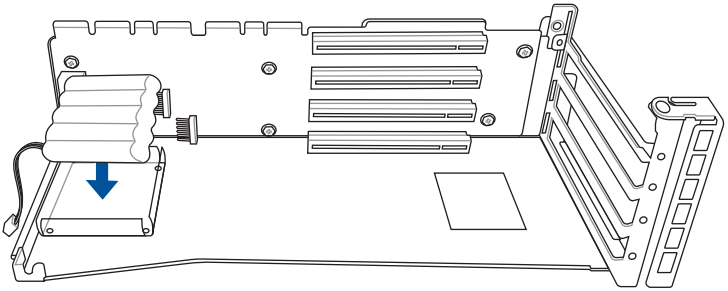
The cache vault power module can only be installed to riser bracket 1 of the standard model or standard model with rear storage bay.

To install the cache vault power module to riser bracket 1:

1. Follow steps 1 and 2 of the **Installing an expansion card to riser card bracket 1 (for standard model)** section to remove riser bracket 1 from the chassis.
2. Align the three screw holes on the Cache Vault Power Module clip with the three screw holes on the riser bracket, then secure the clip with the three bundled screws and hex nuts.



3. Align and install the Cache Vault Power Module into the Cache Vault Power Module clip.



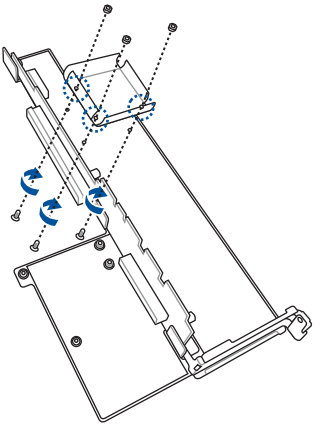
4. Connect the Cache Vault Power Module to the **S-CAP** connector on the PIKE II card or HBA/RAID card.

5. Follow steps 8 and 9 of the **Installing an expansion card to riser card bracket 1 (for standard model)** section to install riser bracket 1 to the chassis.

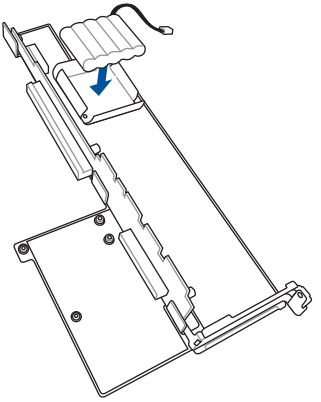
To install the cache vault power module to riser bracket 4:

1. Follow steps 1-3 of **Installing an expansion card to riser bracket 4** to remove riser card bracket 4 from the chassis.

2. Align the three screw holes on the Cache Vault Power Module clip with the three screw holes on the riser bracket, then secure the clip with the three bundled screws and hex nuts.



3. Align and install the Cache Vault Power Module into the Cache Vault Power Module clip.

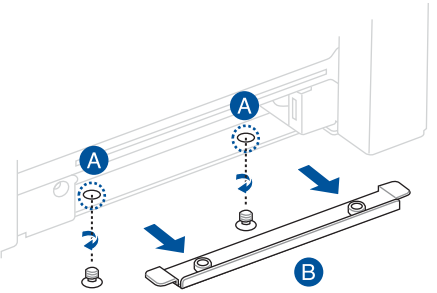


4. Connect the Cache Vault Power Module to the **S-CAP** connector on the PIKE II card or HBA/RAID card.
5. Follow step 6 of **Installing an expansion card to riser bracket 4** to install riser card bracket 4 into the chassis.

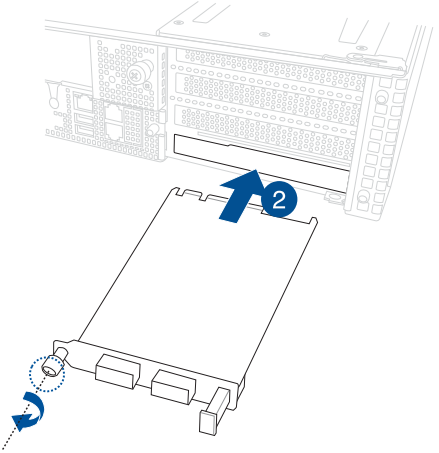
2.7.5 Installing an OCP 3.0 card (optional)

To install an OCP 3.0 card to the system:

1. (optional) Remove two (2) screws from the bottom of the chassis securing the OCP metal bracket (A) in the rear of the system, then remove the OCP metal bracket (B).



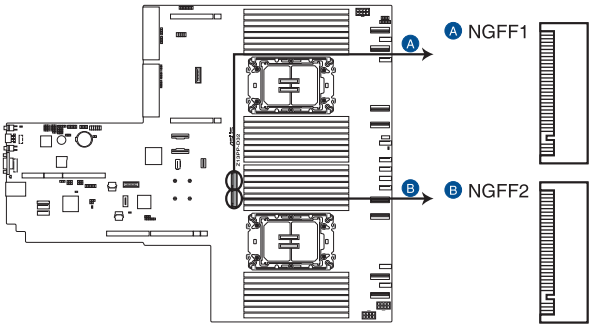
2. Insert the OCP 3.0 card into the OCP 3.0 slot from the rear of the system.
3. Make sure the OCP 3.0 card is seated securely in the OCP 3.0 slot, and then secure it using the thumbscrew.



2.7.6 Installing an M.2 (NGFF) card

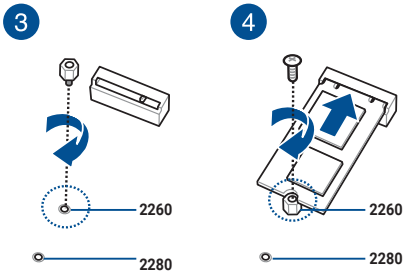
You may install M.2 cards (supports 2260, 2280) to the onboard M.2 (NGFF) slots on the motherboard.

1. Remove the riser card bracket. Please refer to **Installing an expansion card to the butterfly riser card bracket** for more information.
2. Locate the M.2 connectors (NGFF1 / NGFF2) on the motherboard.



Z13PP-D32 NGFF connectors

3. Select the appropriate screw hole on the motherboard for your M.2 card, then secure the bundled standoff to the motherboard.
4. Insert the M.2 card into the M.2 (NGFF) slot, and then secure the card using the bundled screw(s).



5. Repeat steps 3 and 4, if you have another M.2 card to install.

2.7.7 Configuring an expansion card

After installing an expansion card, configure it by adjusting the software settings.

1. Turn on the system and change the necessary BIOS settings, if any. Refer to the **BIOS Setup** chapter for more information on BIOS setup.
2. Assign an IRQ to the card. Refer to the following tables.
3. Install the software drivers for the expansion card.

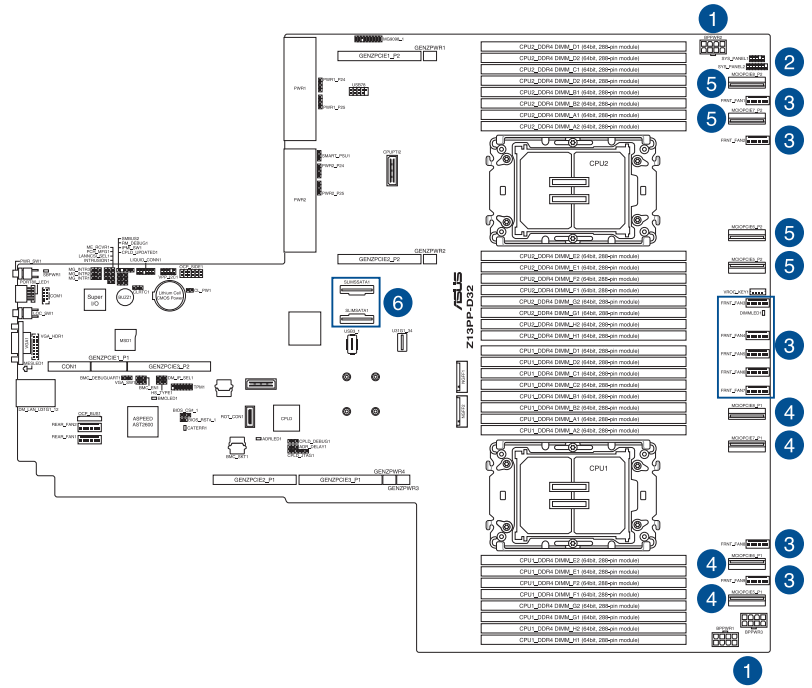
Standard Interrupt assignments

IRQ	Priority	Standard function
0	1	System Timer
1	2	Keyboard Controller
2	-	Programmable Interrupt
3*	11	Communications Port (COM2)
4*	12	Communications Port (COM1)
5*	13	--
6	14	Floppy Disk Controller
7*	15	--
8	3	System CMOS/Real Time Clock
9*	4	ACPI Mode when used
10*	5	IRQ Holder for PCI Steering
11*	6	IRQ Holder for PCI Steering
12*	7	PS/2 Compatible Mouse Port
13	8	Numeric Data Processor
14*	9	Primary IDE Channel
15*	10	Secondary IDE Channel

*** These IRQs are usually available for ISA or PCI devices.**

2.8 Cable connections

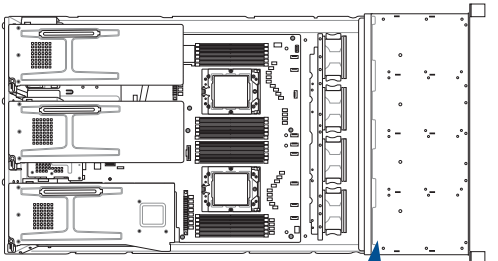
- The bundled system cables are pre-connected before shipment. You do not need to disconnect these cables unless you are going to remove pre-installed components to install additional devices.
- Refer to Chapter 4 for detailed information on the connectors.



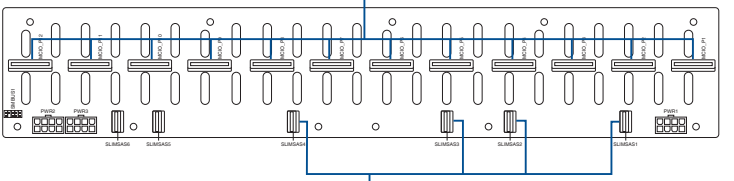
Pre-connected system cables

1. 8-pin BPPWR1 and BPPWR3 power connectors (connected to backplane)
2. Panel connector (connected to front I/O board)
3. System fan connectors
4. MCIOPCIE5_P1, MCIOPCIE6_P1, MCIOPCIE7_P1, and MCIOPCIE8_P1 MCIO PCIe connectors (connected to backplane, supported by CPU1)
5. MCIOPCIE5_P2, MCIOPCIE6_P2, MCIOPCIE7_P2, and MCIOPCIE8_P2 MCIO PCIe connectors (connected to backplane, supported by CPU2)
6. SLIMSATA1 and SLIMSATA2 connectors

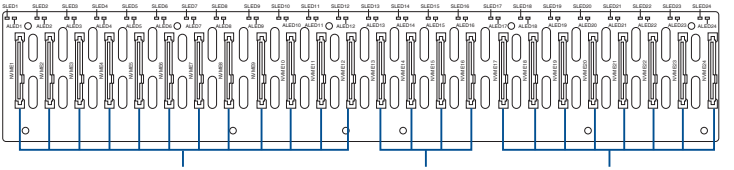
2.9 Backplane cabling



Connects to MCIO or GENZ connectors on the motherboard or connects to HBA/RAID card for NVMe support on Bay 1 to Bay 24 depending on your storage device configuration. For more information on storage device configurations, please refer to Storage device configuration and cabling section.



Connects to HBA/RAID card or to the SLIMSAS connectors on the motherboard for SAS/SATA support on Bay 1 to Bay 16 depending on your storage device configuration. For more information on storage device configurations, please refer to Storage device configuration and cabling section.



Connects to NVMe/SATA/SAS storage devices (SAS support requires an optional HBA/RAID card)

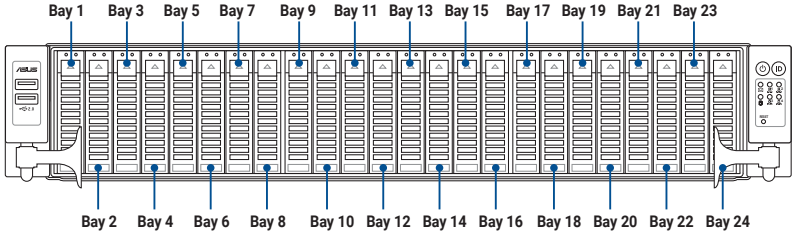
Connects to NVMe/SAS storage devices (SAS support requires an optional HBA/RAID card)

Connects to NVMe storage devices

2.10 Storage device configuration and cabling

This section illustrates some storage configurations that are recommended for your server system. Before you start installing or removing the storage device cables, ensure that you have installed the correct storage devices into the supported bays.

Refer to **Storage Devices** for details on how to install storage devices.



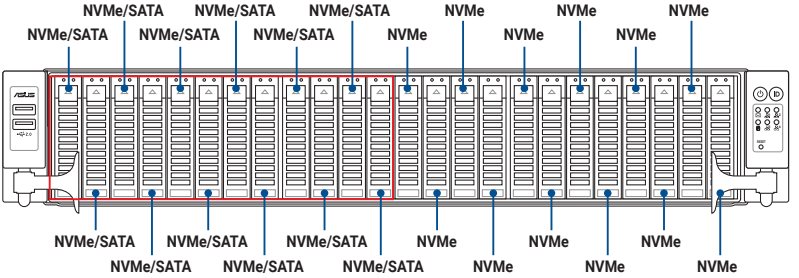
- Bays 1 to 24 supports NVMe.
- Bays 1 to 12 supports SATA.
- Bays 1 to 16 supports SAS. SAS support requires optional HBA/RAID card.

2.10.1 24 x NVMe + 12 x SATA storage device configuration and cabling

The illustrations in this section are for reference only and may vary between models.

1. Install the storage devices into the supported bays.

Refer to **Storage Devices** for details on how to install storage devices.



2. Remove the chassis covers. For more information, refer to **Chassis cover** section.
3. Locate the backplane, and then cut the cable tie(s).
4. Connect the cables to the motherboard and the backplane according to the table below:

Bays	Backplane connector	Cable	Connect to
Bays 1 - 4 (NVMe)	MCIO_P1	GENZ to MCIO	GENZPCIE3_P1 on motherboard
	MCIO_P2		
Bays 5 - 8 (NVMe)	MCIO_P3	MCIO to MCIO	MCIOPCIE7_P1 on motherboard
	MCIO_P4	MCIO to MCIO	MCIOPCIE8_P1 on motherboard
Bays 9 - 12 (NVMe)	MCIO_P5	MCIO to MCIO	MCIOPCIE5_P1 on motherboard
	MCIO_P6	MCIO to MCIO	MCIOPCIE6_P1 on motherboard
Bays 13 - 16 (NVMe)	MCIO_P7	MCIO to MCIO	MCIOPCIE7_P2 on motherboard
	MCIO_P8	MCIO to MCIO	MCIOPCIE8_P2 on motherboard
Bays 17 - 20 (NVMe)	MCIO_P9	MCIO to MCIO	MCIOPCIE5_P2 on motherboard
	MCIO_P10	MCIO to MCIO	MCIOPCIE6_P2 on motherboard
Bays 21 - 24 (NVMe)	MCIO_P11	GENZ to MCIO	GENZPCIE1_P2 on motherboard
	MCIO_P12		
Bays 1 - 8 (SATA)	SLIMSAS1	SlimSAS to SlimSAS	SLIMSATA1 on motherboard
	SLIMSAS2		
Bays 9 - 12 (SATA)	SLIMSAS3	SlimSAS to SlimSAS	SLIMSSATA1 on motherboard

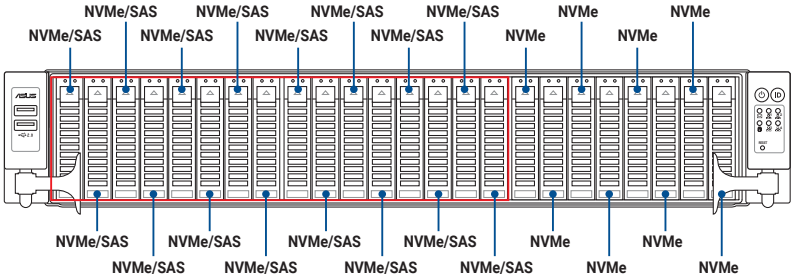
5. Tie the cables with cable tie(s), then reinstall the backplane cover to the chassis.

2.10.2 24 x NVMe + 16 x SAS storage device configuration and cabling

- The illustrations in this section are for reference only and may vary between models.
- This configuration requires an HBA/RAID card.

1. Install the storage devices into the supported bays.

Refer to **Storage Devices** for details on how to install storage devices.



2. Remove the chassis covers. For more information, refer to **Chassis cover** section.
3. Install the HBA/RAID card to your system. For more information, refer to **Replacing an HBA/RAID expansion card to riser bracket 4**.
4. Locate the backplane, and then cut the cable tie(s).

5. Connect the cables to the motherboard, backplane, and HBA/RAID card according to the table below:

Bays	Backplane connector	Cable	Connect to
Bays 1 - 4 (NVMe)	MCIO_P1	GENZ to MCIO	GENZPCIE3_P1 on motherboard
	MCIO_P2		
Bays 5 - 8 (NVMe)	MCIO_P3	MCIO to MCIO	MCIOPCIE7_P1 on motherboard
	MCIO_P4	MCIO to MCIO	MCIOPCIE8_P1 on motherboard
Bays 9 - 12 (NVMe)	MCIO_P5	MCIO to MCIO	MCIOPCIE5_P1 on motherboard
	MCIO_P6	MCIO to MCIO	MCIOPCIE6_P1 on motherboard
Bays 13 - 16 (NVMe)	MCIO_P7	MCIO to MCIO	MCIOPCIE7_P2 on motherboard
	MCIO_P8	MCIO to MCIO	MCIOPCIE8_P2 on motherboard
Bays 17 - 20 (NVMe)	MCIO_P9	MCIO to MCIO	MCIOPCIE5_P2 on motherboard
	MCIO_P10	MCIO to MCIO	MCIOPCIE6_P2 on motherboard
Bays 21 - 24 (NVMe)	MCIO_P11	GENZ to MCIO	GENZPCIE1_P2 on motherboard
	MCIO_P12		
Bays 1 - 8 (SAS)	SLIMSAS1	SlimSAS to SlimSAS	P0 on HBA/RAID card
	SLIMSAS2		
Bays 9 - 16 (SAS)	SLIMSAS3	SlimSAS to SlimSAS	P1 on HBA/RAID card
	SLIMSAS4		

6. Tie the cables with cable tie(s), then reinstall the backplane cover to the chassis.

2.11 Motherboard

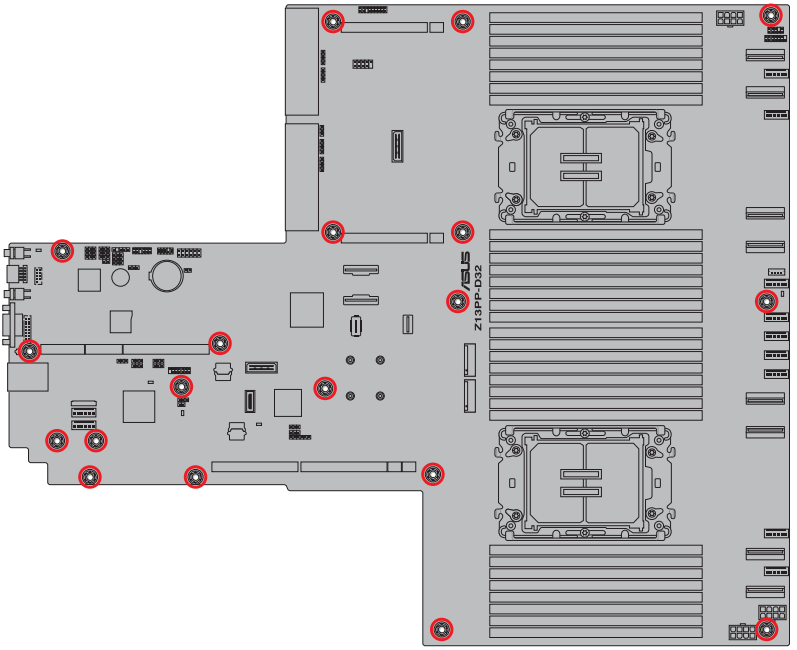
2.11.1 Removing the motherboard

To remove the system motherboard:

1. Disconnect the cables from the motherboard and remove any installed components on the motherboard.

Take a photo or make a note of which components are removed, which cables are disconnected, and which connectors the cables were connected to.

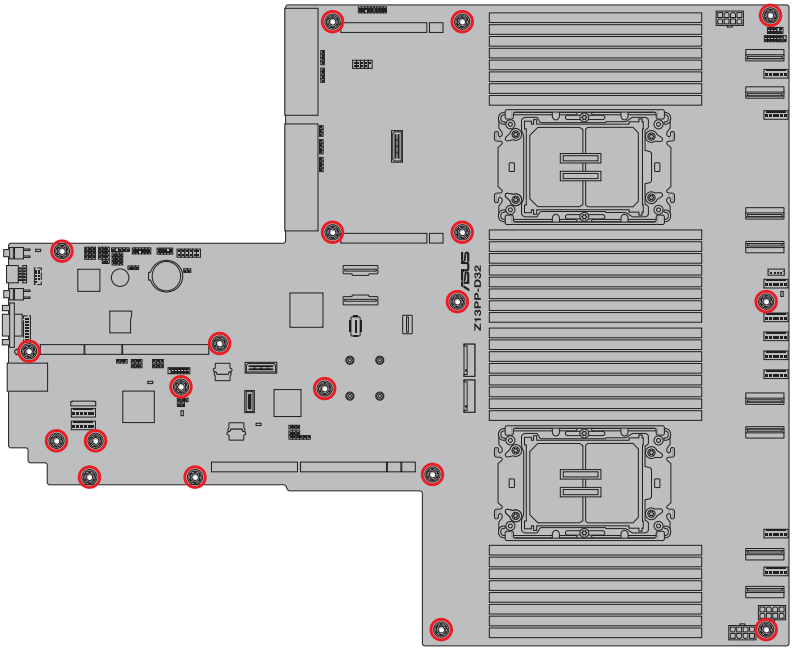
2. Remove the screws, then remove the motherboard.



2.11.2 Installing the motherboard

To install the system motherboard:

1. Place the motherboard into the chassis and ensure the screw holes on the motherboard are aligned to the screw holes in the chassis, then secure the motherboard to the chassis using the screws removed previously.



2. Reinstall removed components and reconnect the cables to the motherboard.

2.12 Removable/optional components

The following sections describe the installation or removal instructions for the following removable/optional components:

1. System fans
2. Redundant power supply module
3. CMOS battery

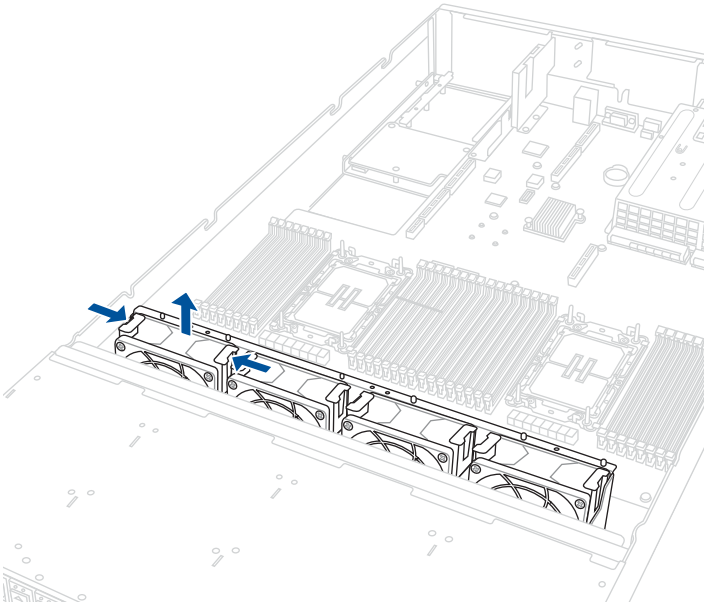
Ensure that the system is turned off before removing any components.

You may need to remove previously installed component or factory shipped components when installing optional components.

2.12.1 System fans

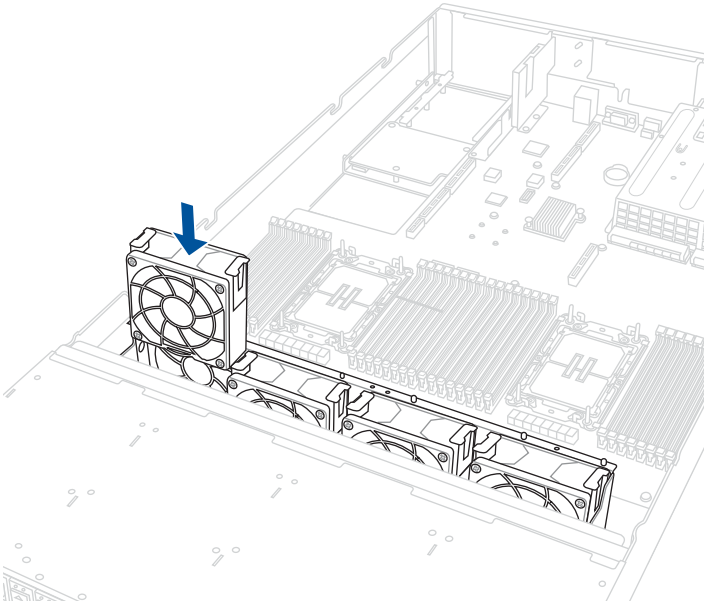
To remove the system fans:

1. Locate the fan you want to replace.
2. Press the retaining clip (A) and lift upward (B) to remove the fan.



To reinstall the system fans:

1. Prepare the fan with the same model and size.
2. Install the fan to the fan cage.

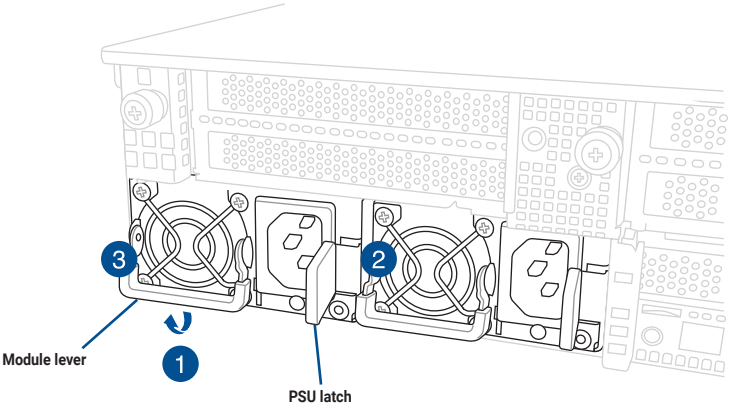


The fan can only be installed in one direction. If the fan cannot be installed, turn it around and try again.

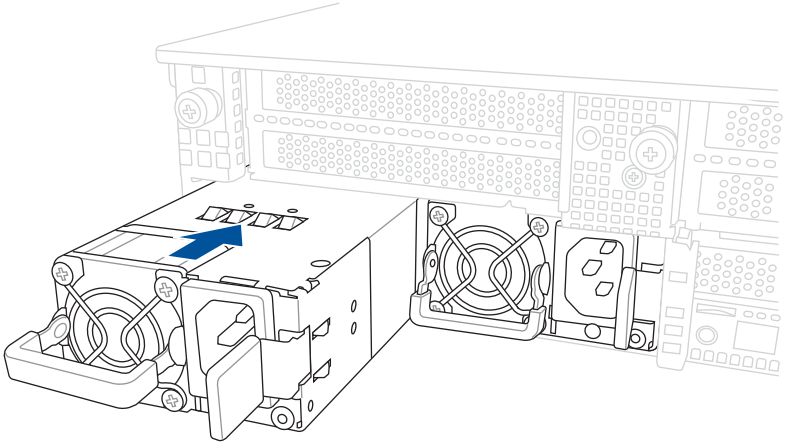
2.12.2 Redundant power supply module

To replace a failed redundant power supply module:

1. Lift up the power supply module lever.
2. Hold the power supply module lever and press the PSU latch.
3. Pull the power supply module out of the system chassis.



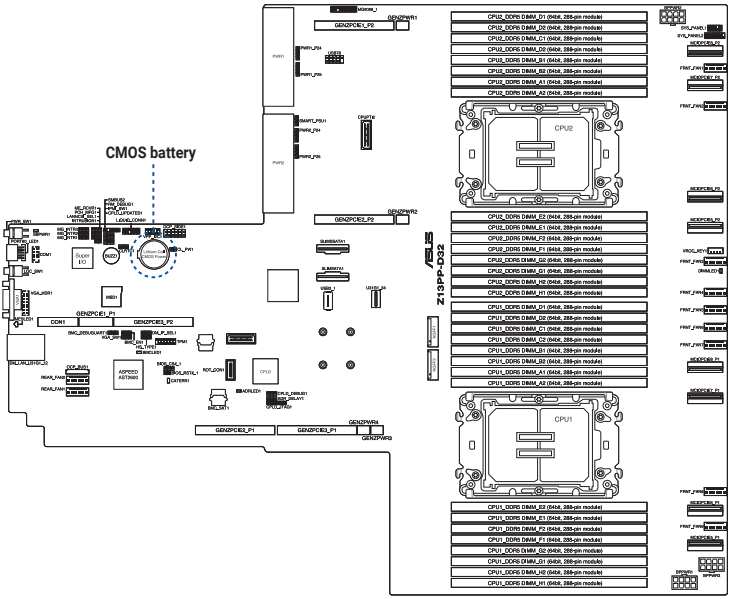
4. Prepare the replacement power supply module.
5. Insert the replacement power supply module into the chassis then push it inwards until the latch locks into place.



2.12.3 CMOS battery

To replace a CMOS battery:

1. Locate and remove the CMOS battery.



2. Place the replacement CMOS battery into the battery compartment.

2.13 Rail Kit Options

This server system supports the rail kit options listed below. For more information on rail kit installation, refer to corresponding documentation on the ASUS support site or on the official product site for this server system.

- We strongly recommend that at least two able-bodied persons perform the installation of the rail kit.
- We recommend the use of an appropriate lifting tool or device, if necessary.

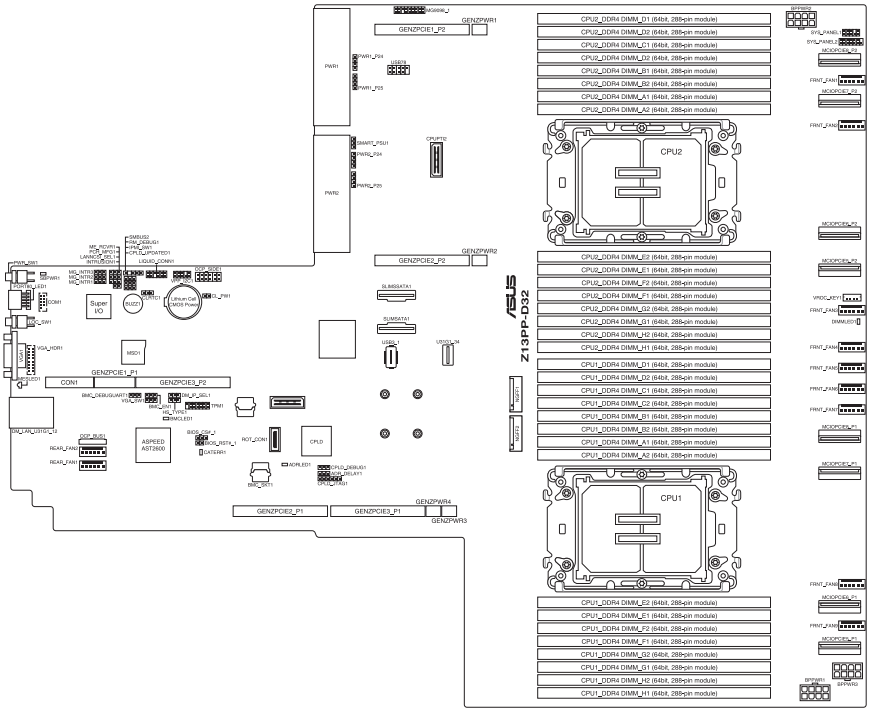
- Friction rail kit
- 1.5U full extension ball bearing rail kit

3

Motherboard Information

This chapter includes the motherboard layout and brief descriptions of the jumpers and internal connectors.

3.1 Motherboard layout



Layout contents

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8.	TPM connector (14-1 pin TPM1)	3-18
9.	M.2 (NGFF) connector (NGFF1-2)	3-19
10.	Backplane Power connector (8-pin 12V+5V BPPWR1, BPPWR3; 8-pin 12V BPPWR2)	3-19

(continued on the next page)

Internal connectors		Page
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15.	BMC Debug UART connector (3-pin BMC_DEBUGUART1)	3-23
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19.	OCP Side connector (12-pin OCP_SIDE1)	3-25
20.	OCP Bus connector (OCP_BUS1)	3-25
21.	Platform Firmware Resilience (PFR) module connector (ROT_CON)	3-26

3.2 Jumpers

1. Clear RTC RAM (3-pin CLRTC1)

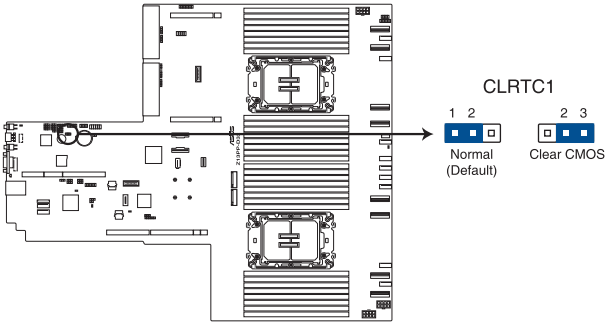
This jumper allows you to clear the Real Time Clock (RTC) RAM in CMOS. You can clear the CMOS memory of date, time, and system setup parameters by erasing the CMOS RTC RAM data. The onboard button cell battery powers the RAM data in CMOS, which include system setup information such as system passwords.

To erase the RTC RAM:

1. Turn OFF the computer and unplug the power cord.
2. Move the jumper cap from pins 1–2 (default) to pins 2–3. Keep the cap on pins 2–3 for about 5–10 seconds, then move the cap back to pins 1–2.
3. Plug the power cord and turn ON the computer.
4. Hold down the <Del> key during the boot process and enter BIOS setup to re-enter data.

Except when clearing the RTC RAM, never remove the cap on CLRTC jumper default position. Removing the cap will cause system boot failure!

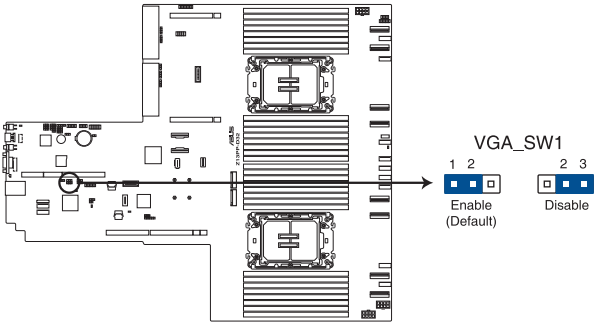
If the steps above do not help, remove the onboard battery and move the jumper again to clear the CMOS RTC RAM data. After the CMOS clearance, reinstall the battery.



Z13PP-D32 Clear RTC RAM

2. VGA Controller setting (3-pin VGA_SW1)

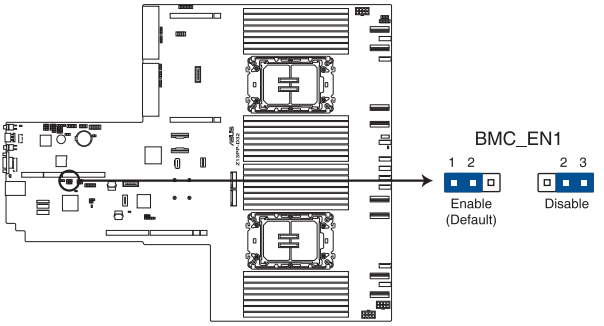
This jumper allows you to enable or disable the onboard VGA controller. Set to pins 1–2 to activate the VGA feature.



Z13PP-D32 VGA setting

3. Baseboard Management Controller setting (3-pin BMC_EN1)

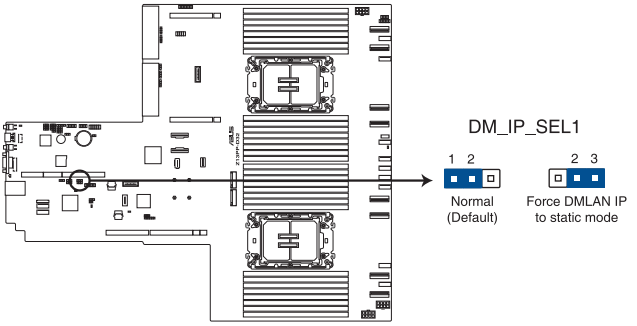
This jumper allows you to enable (default) or disable on-board BMC. Ensure to set this BMC jumper to enabled to avoid system fan control and hardware monitor error.



Z13PP-D32 BMC setting

4. DMLAN setting (3-pin DM_IP_SEL1)

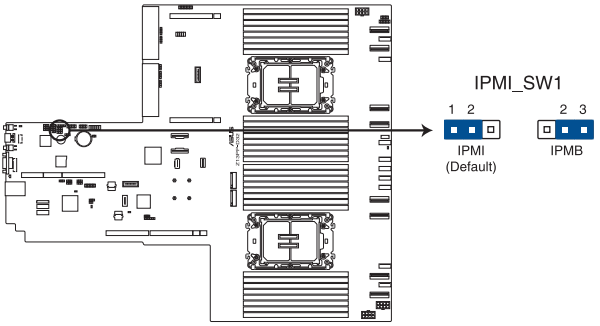
This jumper allows you to select the DMLAN setting. Set to pins 2-3 to force the DMLAN IP to static mode (IP=10.10.10.10, submask=255.255.255.0).



Z13PP-D32 DM_IP_SEL1 setting

5. IPMI SW setting (3-pin IPMI_SW1)

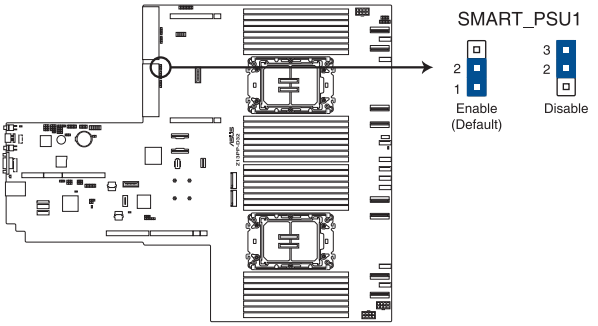
This jumper allows you to select which protocol in the GPU sensor to function.



Z13PP-D32 IPMI_SW1 setting

6. Smart Ride Through (SmaRT) setting (3-pin SMART_PSU1)

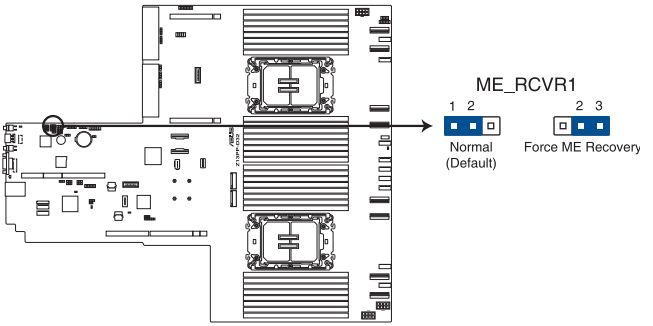
This jumper allows you to enable or disable the Smart Ride Through (SmaRT) function. This feature is enabled by default. Set to pins 2-3 to disable it. When enabled, SmaRT allows uninterrupted operation of the system during an AC loss event.



Z13PP-D32 Smart Ride Through setting

7. ME Firmware Force Recovery setting (3-pin ME_RCVR1)

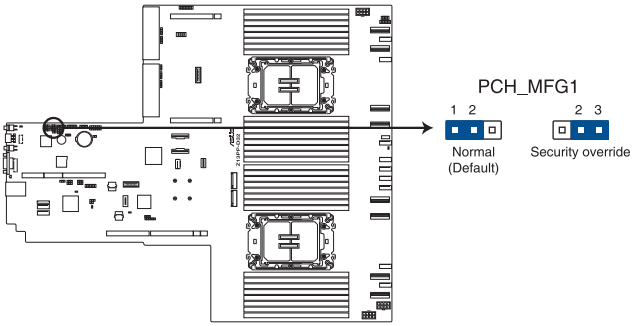
This jumper allows you to quickly recover the Intel Management Engine (ME) firmware if it becomes corrupted.



Z13PP-D32 ME recovery setting

8. PCH_MFG1 setting (3-pin PCH_MFG1)

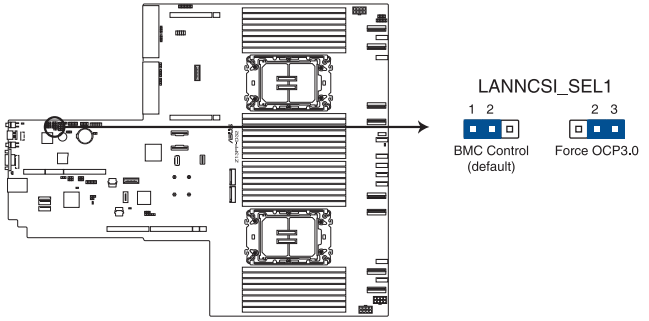
This jumper allows you to update the BIOS ME block select.



Z13PP-D32 PCH_MFG1 setting

9. LANNCSI setting (3-pin LANNCSI_SEL1)

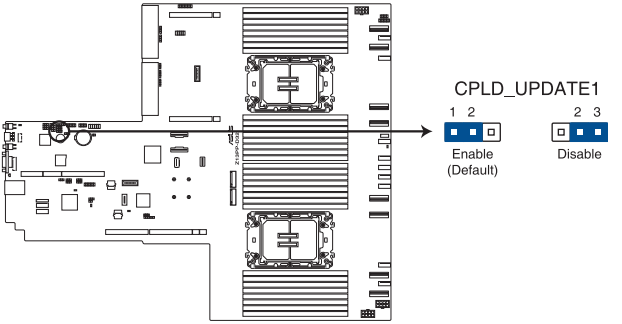
This jumper allows you to select which LAN NCSI to enable.



Z13PP-D32 LANNCSI_SEL1 setting

10. CPLD setting (3-pin CPLD_UPDATE1)

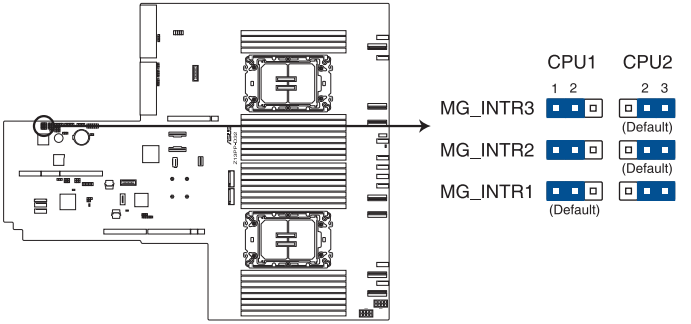
This jumper allows you to enable or disable Complex Programmable Logic Devices (CPLD) updates.



Z13PP-D32 CPLD_UPDATE1 setting

11. MG INTR setting (3-pin MG_INTR1-3)

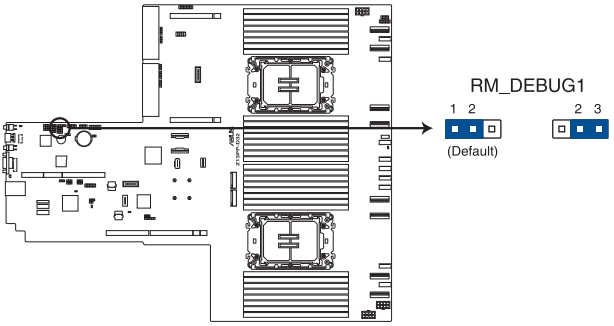
This jumper allows you to choose CPU1 PEHP ALERT# or CPU2 PEHP ALERT# interrupt from the system backplane.



Z13PP-D32 MG_INTR setting

12. RM Debug setting (3-pin RM_DEBUG1)

This jumper allows you to enable or disable BMC remote debug feature RM_DEBUG1 default is 1-2 (disable) and 2-3 is enable.

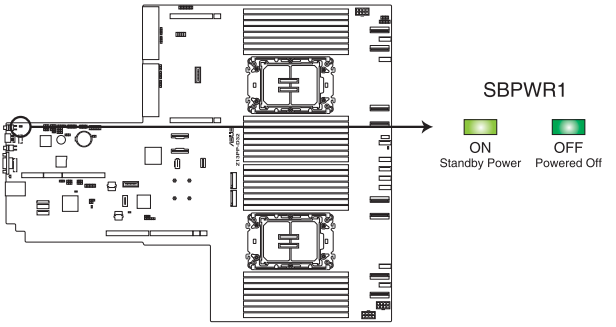


Z13PP-D32 RM_DEBUG1 setting

3.3 Internal LEDs

1. Standby Power LED (SBPWR1)

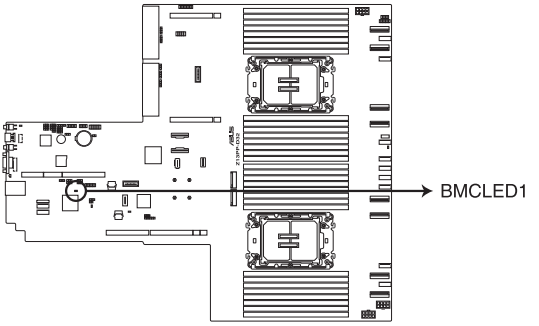
The motherboard comes with a standby power LED. The green LED lights up to indicate that the system is ON, in sleep mode, or in soft-off mode. This is a reminder that you should shut down the system and unplug the power cable before removing or plugging in any motherboard component. The illustration below shows the location of the onboard LED.



Z13PP-D32 Standby Power LED

2. Baseboard Management Controller LED (BMCLED1)

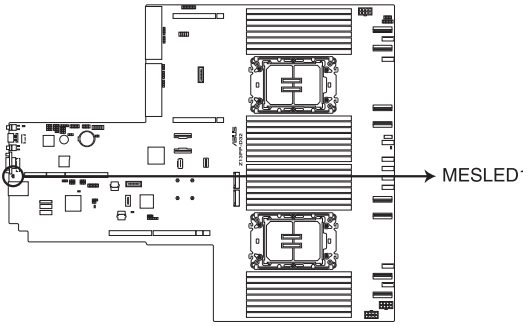
The BMC LED blinks to indicate that the on-board BMC is functional.



Z13PP-D32 BMC LED

3. Message LED (MESLED)

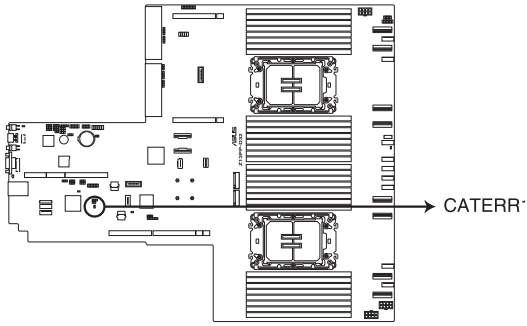
This onboard LED lights up red when there is a BMC event log generated.



Z13PP-D32 MESLED

4. Processor Catastrophic Error LED (CATERR1)

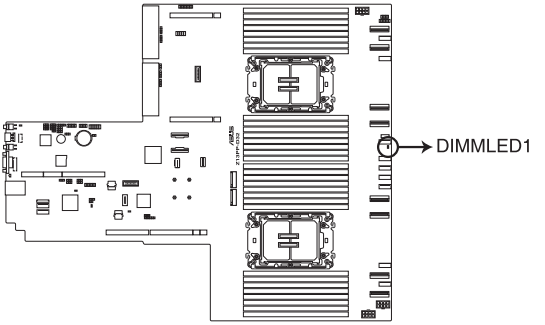
The Processor Catastrophic Error LED indicates that the system has experienced a fatal or catastrophic error and cannot continue to operate.



Z13PP-D32 CATERR1 LED

5. DIMM LED (DIMMLED1)

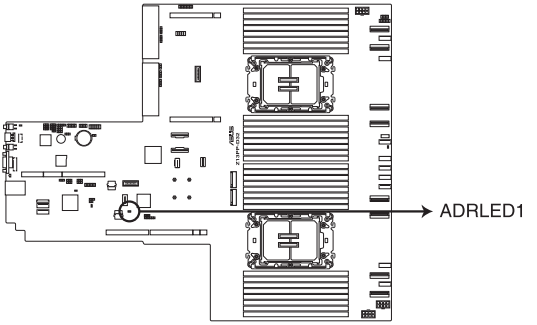
This LED blinks to indicate that there is 12 V power input to the memory.



Z13PP-D32 DIMM LED

6. ADR LED (ADRLED)

This LED blinks to indicate that the system is using asynchronous DRAM Refresh with Crow Pass memory modules.

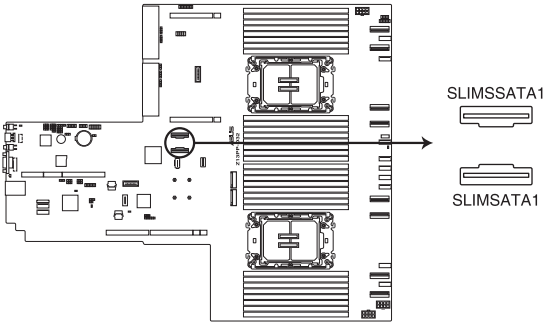


Z13PP-D32 ADRLED1

3.4 Internal connectors

1. Slim SATA connector (SLIMSSATA1;SLIMSATA1)

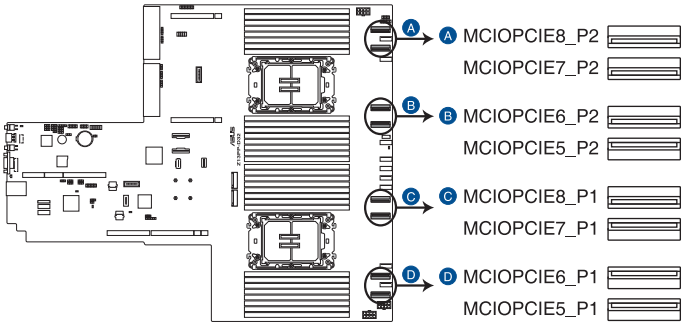
This motherboard comes with Slim SATA connectors, the storage technology that supports Serial ATA. Each connector supports up to two devices.



Z13PP-D32 SLIMSATA connectors

2. MCIO PCIe connector (MCIOPCIE5-8_P1; MCIOPCIE5-8_P2)

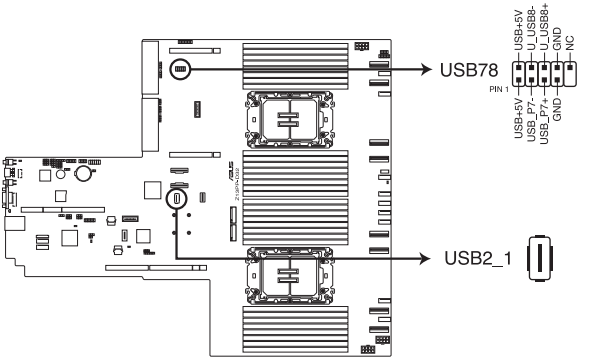
Connects the PCIe signal to the riser card or NVMe port on the backplane.



Z13PP-D32 MCIOPCIE connectors

3. USB 2.0 connector (10-1 pin USB78; Type-A USB2_1)

This connector is for USB 2.0 ports. Connect the USB module cable to the connector, and then install the module to a slot opening at the back of the system chassis. The USB connectors comply with USB 2.0 specification that supports up to 480 Mbps connection speed.

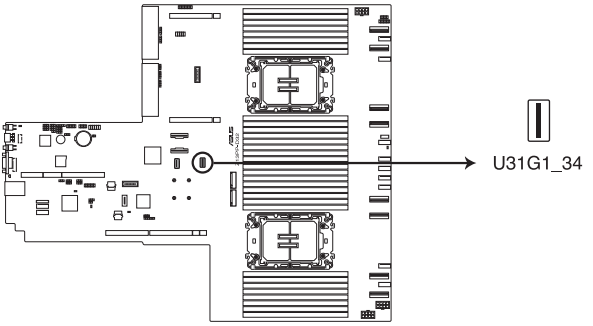


Z13PP-D32 USB 2.0 connectors

The USB port module is purchased separately.

4. USB 3.2 Gen 1 connector (U31G1_34)

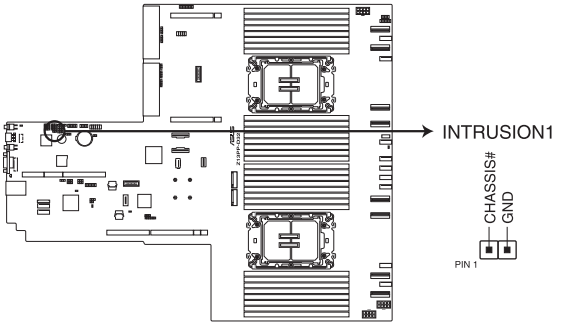
This connector allows you to connect a USB 3.2 Gen 1 module for additional USB 3.2 Gen 1 ports on the front panel. The USB 3.2 Gen 1 connector provides data transfer speeds of up to 5 Gb/s. The Type-A connector allows you to directly connect a USB flash drive.



Z13PP-D32 USB 3.2 Gen 1 connector

5. Chassis Intrusion (2-pin INTRUSION1)

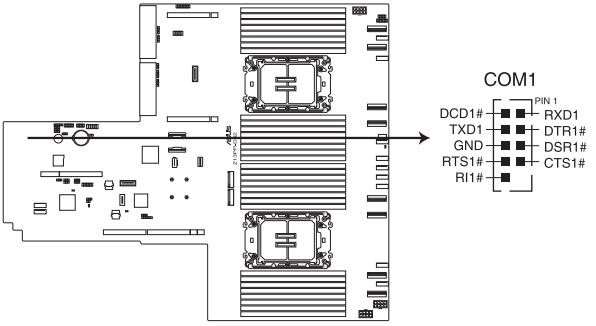
These leads are for the intrusion detection feature for chassis with intrusion sensor or microswitch. When you remove any chassis component, the sensor triggers and sends a high level signal to these leads to record a chassis intrusion event. The default setting is to short the CHASSIS# and the GND pin by a jumper cap to disable the function.



Z13PP-D32 Chassis Intrusion connector

6. Serial Port connector (10-1 pin COM1)

This connector is for a serial (COM) port. Connect the serial port module cable to this connector, then install the module to a slot opening at the back of the system chassis.



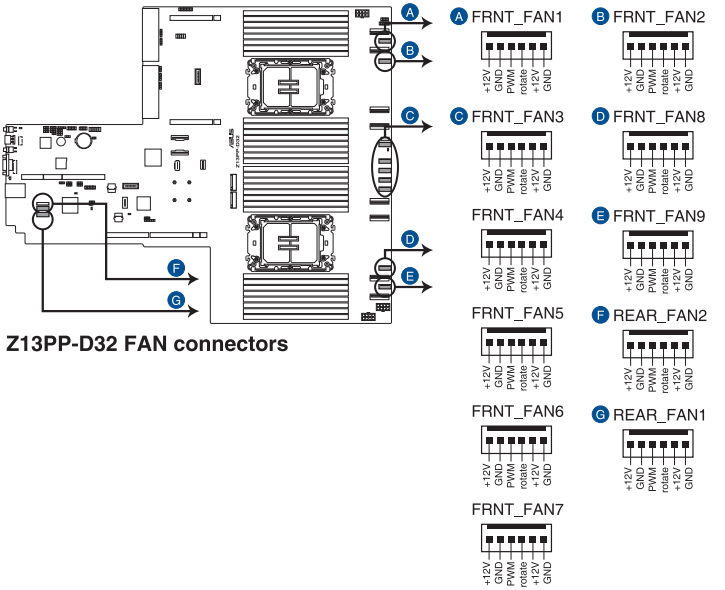
Z13PP-D32 Serial port connector

The COM module is purchased separately.

7. System Fan connectors (6-pin FRNT_FAN1-9; 6-pin REAR_FAN1-2)

The 8-pin FRNT_FAN connectors are connected to the Fan board and supports 9A per pin for the +12V pins. The 6-pin REAR_FAN connectors support 3A per pin for the +12V pins. Connect the fan cables to the fan connectors on the motherboard, making sure that the black wire of each cable matches the ground pin of the connector.

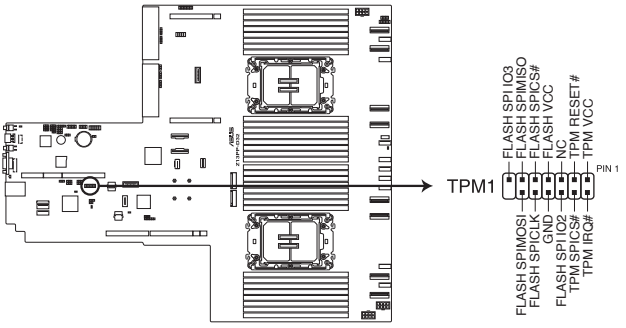
DO NOT forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! DO NOT place jumper caps on the fan connectors!



Z13PP-D32 FAN connectors

8. TPM connector (14-1 pin TPM1)

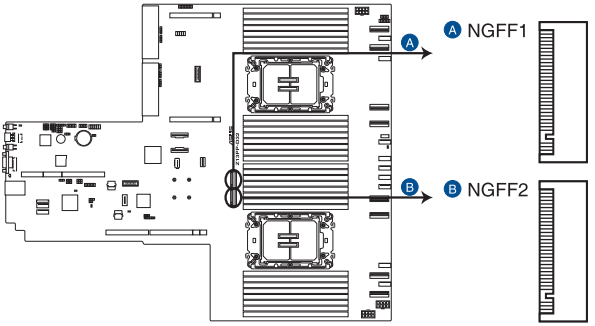
This connector supports a Trusted Platform Module (TPM) system, which can securely store keys, digital certificates, passwords, and data. A TPM system also helps enhance network security, protects digital identities, and ensures platform integrity.



Z13PP-D32 TPM connector

9. M.2 (NGFF) connector (NGFF1-2)

These connectors allow you to install M.2 devices.



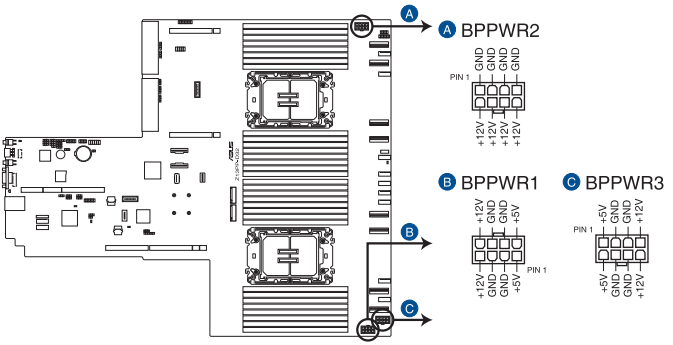
Z13PP-D32 NGFF connectors

This connector supports type 2260 / 2280 devices on PCIe interface.

The M.2 (NGFF) device is purchased separately

10. Backplane Power connector (8-pin BPPWR1-3)

These connectors are for the power supply plugs that connect to the backplane. The power supply plugs are designed to fit these connectors in only one orientation. Find the proper orientation and push down firmly until the connectors completely fit.

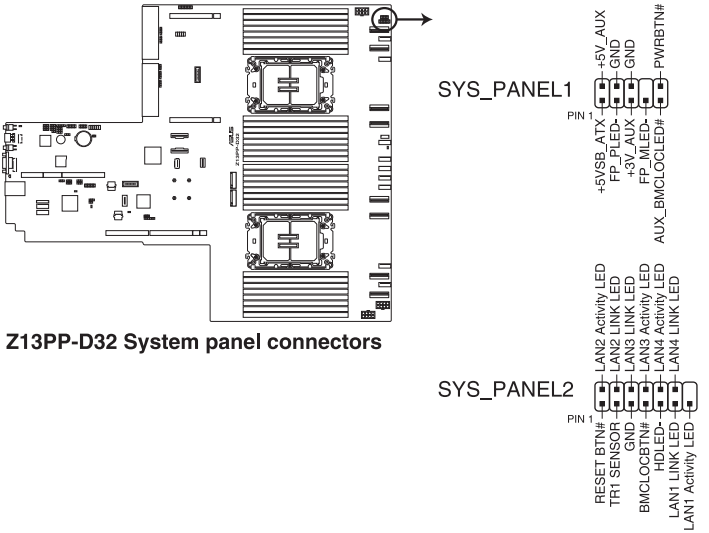


Z13PP-D32 BP power connectors

DO NOT connect VGA cards to these connectors. Doing so may cause system boot errors and permanent damage to your motherboard or device.

11. System Panel connector (10-1 pin SYS_PANEL1; 14-1 pin SYS_PANEL2)

This connector supports several chassis-mounted functions.



Z13PP-D32 System panel connectors

- **System power LED (FP_PLED)**

  This 1-pin connector is for the system power LED. Connect the chassis power LED cable to this connector. The system power LED lights up when you turn on the system power.

- **Message LED (FP_MLED)**

  This 2-pin connector is for the message LED cable that connects to the front message LED. The message LED is controlled by the BMC to indicate an abnormal event occurrence.

- **Locator LED connector (AUX_BMCLOCLED)**

  This connector allows you to connect the Locator LED. The Location LED helps visually locate and identify the server in error on a server rack.

- **Power Button/Soft-off Button connector (PWRBTN)**

  The 3-1 pin connector allows you to connect the system power button. Press the power button to power up the system, or put the system into sleep or soft-off mode (depending on the operating system settings).

- **Reset button connector (RESETBTN)**

  This connector allows you to connect the chassis-mounted reset button. Press the reset button to reboot the system.

- **TR1 Sensor connector (TR1 SENSOR)**

  This connector allows detection of the environmental temperature of the front panel.

- **Locator button connector (BMCLOCBTN#)**

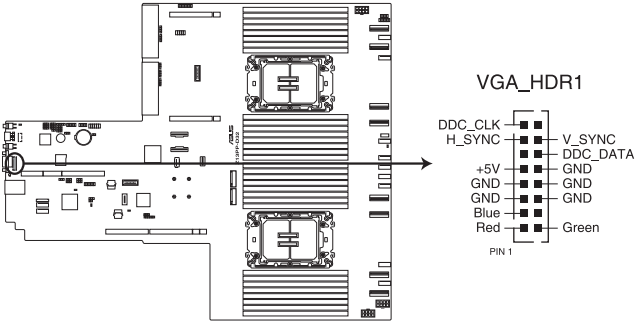
  This connector allows you to connect the Locator button. Press the button to light up the Locator LED.

- **LAN LED connector (LAN1-4 LINK and Activity LED)**

  This 2-pin connector allows you to connect the Gigabit LAN Activity LED.

12. VGA connector (16-pin VGA_HDR1)

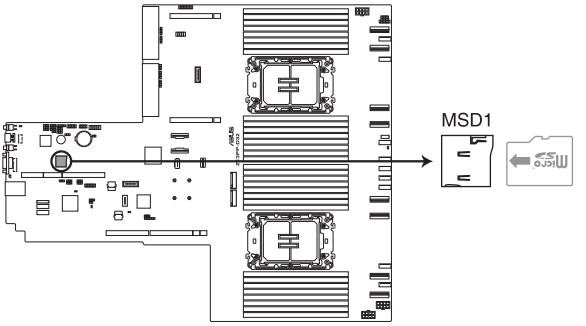
This connector outputs a VGA signal to a connected display device.



Z13PP-D32 Internal VGA connector

13. Micro SD card slot (MSD1)

Your motherboard supports SD Memory Card v2.00 (SDHC) / v3.00 (SDXC).

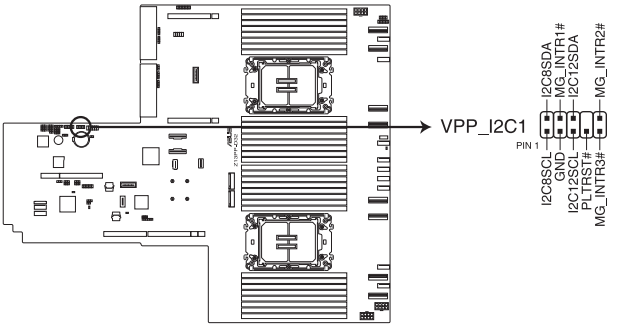


Z13PP-D32 MSD1

Disconnect all power (including redundant PSUs) from the existing system before you add or remove a Memory Card, then reboot the system to access the Memory Card.

14. VPP_I2C connector (10-1 pin VPP_I2C1)

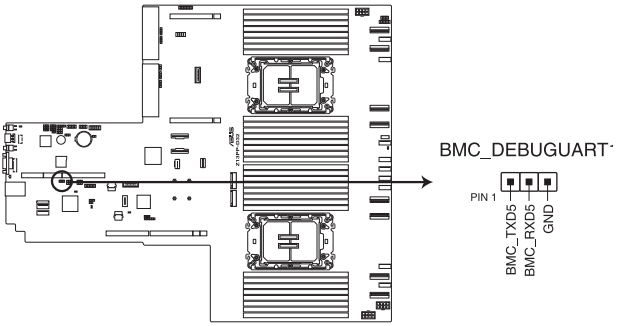
The VPP_I2C connector is used for the storage backplane with sensor readings.



Z13PP-D32 VPP_I2C1 connector

15. BMC Debug UART connector (3-pin BMC_DEBUGUART1)

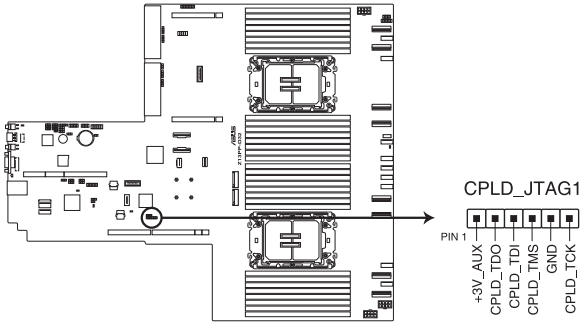
This connector is used for reading the BMC UART Debug log.



Z13PP-D32 BMC_DEBUGUART1 connector

16. CPLD JTAG connector (6-pin CPLD_JTAG1)

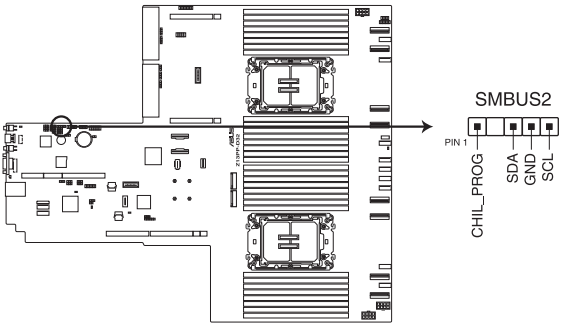
This connector is used for burning the CPLD JTAG.



Z13PP-D32 CPLD_JTAG1 connector

17. System Management Bus (SMBUS) connector (5-1 pin SMBUS2)

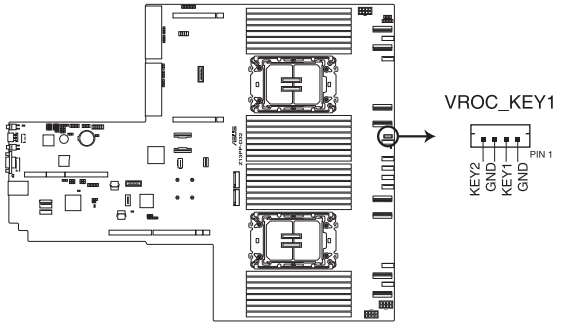
This connector controls the system and power management-related tasks. This connector processes the messages to and from devices rather than tripping the individual control lines.



Z13PP-D32 SMBUS connector

18. VROC Key connector (4-pin VROC_KEY1)

The VROC (Virtual Raid on CPU) Key connector allows you to connect a VROC hardware key to enable additional CPU RAID functions with Intel® CPU RSTe.

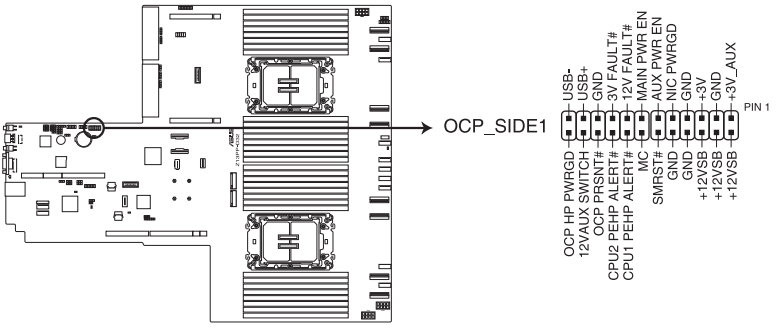


Z13PP-D32 VROC_KEY1

The VROC hardware key is purchased separately.

19. OCP Side connector (24-pin OCP_SIDE1)

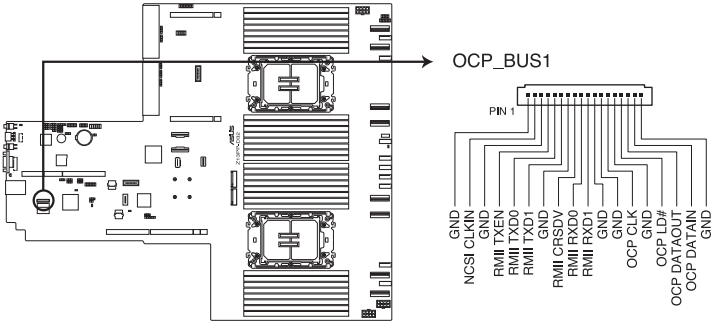
This connector connects the OCP 3.0 Riser card sideband signals to the motherboard



Z13PP-D32 OCP_SIDE1 connector

20. OCP Bus connector (OCP_BUS1)

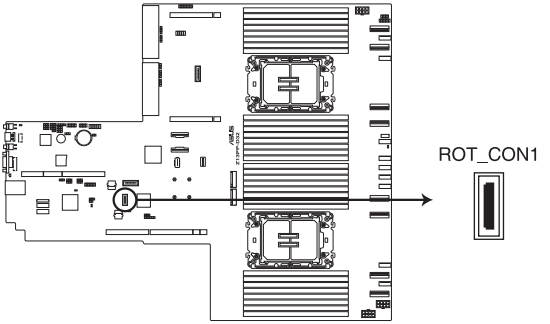
This connector connects the OCP 3.0 Riser card NCSI signals to the motherboard



Z13PP-D32 OCP_BUS1

21. Platform Firmware Resilience (PFR) module connector (ROT_CON)

This connector allows you to connect a PFR module to enable platform firmware resilience functions.



Z13PP-D32 ROT_CON1 connector

BIOS Setup

4

This chapter tells how to change the system settings through the BIOS Setup menus. Detailed descriptions of the BIOS parameters are also provided.

4.1 Managing and updating your BIOS

The following utilities allow you to manage and update the motherboard Basic Input/Output System (BIOS) setup:

1. **ASUS CrashFree BIOS 3**

   To recover the BIOS using a bootable USB flash disk drive when the BIOS file fails or gets corrupted.

2. **ASUS EzFlash**

   Updates the BIOS using a USB flash disk.

Refer to the corresponding sections for details on these utilities.



Save a copy of the original motherboard BIOS file to a bootable USB flash disk drive in case you need to restore the BIOS in the future.

4.1.1 ASUS CrashFree BIOS 3 utility

The ASUS CrashFree BIOS 3 is an auto recovery tool that allows you to restore the BIOS file when it fails or gets corrupted during the updating process. You can update a corrupted BIOS file using a USB flash drive that contains the updated BIOS file.



Prepare a USB flash drive containing the updated motherboard BIOS before using this utility.

Recovering the BIOS from a USB flash drive

To recover the BIOS from a USB flash drive:

1. Insert the USB flash drive with the original or updated BIOS file to one USB port on the system.
2. The utility will automatically recover the BIOS. It resets the system when the BIOS recovery finished.



DO NOT shut down or reset the system while recovering the BIOS! Doing so would cause system boot failure!



The recovered BIOS may not be the latest BIOS version for this motherboard. Visit the ASUS website at www.asus.com to download the latest BIOS file.

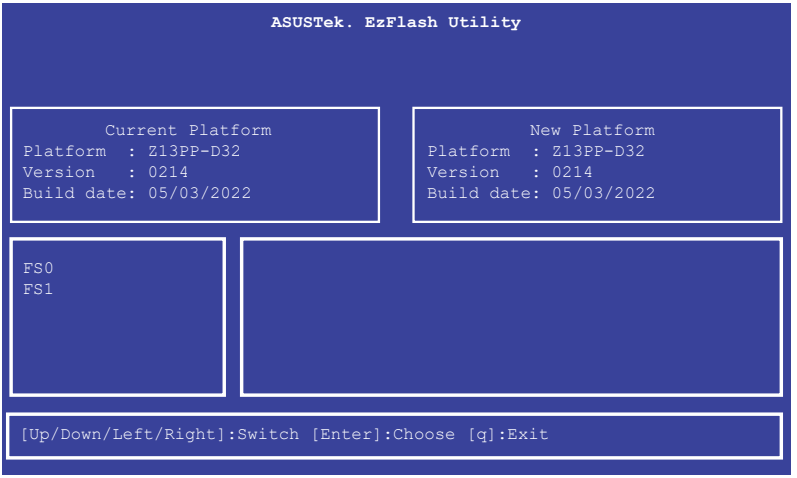
4.1.2 ASUS EZ Flash Utility

The ASUS EZ Flash Utility feature allows you to update the BIOS without having to use a DOS-based utility.

Before you start using this utility, download the latest BIOS from the ASUS website at www.asus.com.

To update the BIOS using EZ Flash Utility:

1. Insert the USB flash disk that contains the latest BIOS file into the USB port.
2. Enter the BIOS setup program. Go to the **Tool** menu then select **Start ASUS EzFlash**. Press <Enter>.



3. Press Left arrow key to switch to the **Drive** field.
4. Press the Up/Down arrow keys to find the USB flash disk that contains the latest BIOS, then press <Enter>.
5. Press Right arrow key to switch to the **Folder Info** field.
6. Press the Up/Down arrow keys to find the BIOS file, and then press <Enter> to perform the BIOS update process. Reboot the system when the update process is done.

- This function can support devices such as a USB flash disk with FAT 32/16 format and single partition only.
- DO NOT shut down or reset the system while updating the BIOS to prevent system boot failure!

Ensure to load the BIOS default settings to ensure system compatibility and stability. Press <F5> and select **Yes** to load the BIOS default settings.

4.2 BIOS setup program

This motherboard supports a programmable firmware chip that you can update using the provided utility described in section **4.1 Managing and updating your BIOS**.

Use the BIOS Setup program when you are installing a motherboard, reconfiguring your system, or prompted to "Run Setup." This section explains how to configure your system using this utility.

Even if you are not prompted to use the Setup program, you can change the configuration of your computer in the future. For example, you can enable the security password feature or change the power management settings. This requires you to reconfigure your system using the BIOS Setup program so that the computer can recognize these changes and record them in the CMOS RAM of the firmware chip.

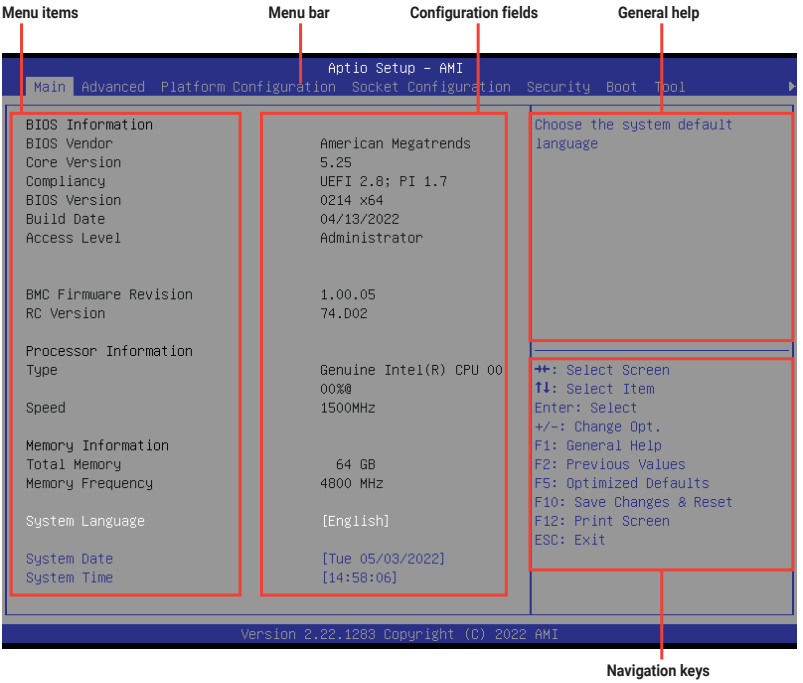
The firmware chip on the motherboard stores the Setup utility. When you start up the computer, the system provides you with the opportunity to run this program. Press <Del> during the Power-On Self-Test (POST) to enter the Setup utility; otherwise, POST continues with its test routines.

If you wish to enter Setup after POST, restart the system by pressing <Ctrl>+<Alt>+<Delete>, or by pressing the reset button on the system chassis. You can also restart by turning the system off and then back on. Do this last option only if the first two failed.

The Setup program is designed to make it as easy to use as possible. Being a menu-driven program, it lets you scroll through the various sub-menus and make your selections from the available options using the navigation keys.

- The default BIOS settings for this motherboard apply for most conditions to ensure optimum performance. If the system becomes unstable after changing any BIOS settings, load the default settings to ensure system compatibility and stability. Press <F5> and select **Yes** to load the BIOS default settings.
- Support for BIOS functions and options may vary based on AVL testing progress. Please contact your sales representative for more information.
- The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.
- Visit the ASUS website (www.asus.com) to download the latest BIOS file for this motherboard.

4.2.1 BIOS menu screen



4.2.2 Menu bar

The menu bar on top of the screen has the following main items:

Main	For changing the basic system configuration
Advanced	For changing the advanced system settings
Platform Configuration	For configuring the platform settings
Socket Configuration	For configuring the socket settings
Security	For changing the security settings
Boot	For changing the system boot configuration
Tool	For configuring options for special functions
Save & Exit	For selecting the exit options

To select an item on the menu bar, press the right or left arrow key on the keyboard until the desired item is highlighted.

4.2.3 Menu items

The highlighted item on the menu bar displays the specific items for that menu. For example, selecting **Main** shows the Main menu items.

The other items (such as Advanced) on the menu bar have their respective menu items.

4.2.4 Submenu items

A solid triangle before each item on any menu screen means that the item has a submenu. To display the submenu, select the item then press <Enter>.

4.2.5 Navigation keys

At the bottom right corner of a menu screen are the navigation keys for the BIOS setup program. Use the navigation keys to select items in the menu and change the settings.

4.2.6 General help

At the top right corner of the menu screen is a brief description of the selected item.

4.2.7 Configuration fields

These fields show the values for the menu items. If an item is user-configurable, you can change the value of the field opposite the item. You cannot select an item that is not user-configurable.

A configurable field is enclosed in brackets, and is highlighted when selected. To change the value of a field, select it and press <Enter> to display a list of options.

4.2.8 Pop-up window

Select a menu item and press <Enter> to display a pop-up window with the configuration options for that item.

4.2.9 Scroll bar

A scroll bar appears on the right side of a menu screen when there are items that do not fit on the screen. Press the Up / Down arrow keys or <Page Up> / <Page Down> keys to display the other items on the screen.

4.3 Main menu

When you enter the BIOS Setup program, the Main menu screen appears. The Main menu provides you an overview of the basic system information, and allows you to set the system date, time, and language settings.



System Language [English]

Allows you to select the system default language.

System Date [Day xx/xx/xxxx]

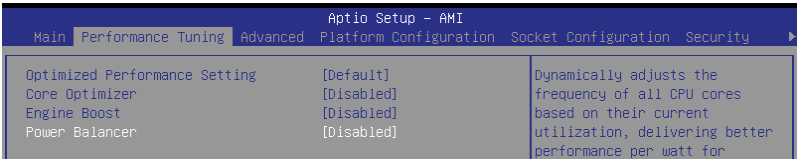
Allows you to set the system date.

System Time [xx:xx:xx]

Allows you to set the system time.

4.4 Performance Tuning menu

The Performance Tuning menu items allow you to change performance related settings for different scenarios.



Optimized Performance Setting [Default]

Allows you to select performance settings for different scenarios.

[Default] Default settings.

[By Benchmark] Optimize for different kinds of benchmarks. Select this option, then select a benchmark type from the >> list.

[By Workload] Optimize for different kinds of workloads. Select this option, then select a workload type from the >> list.

This function will reset some BIOS settings that you have changed back to their default values. Please check your BIOS settings again.

Core Optimizer [Disabled]

Allows you to keep the processor operating at the turbo highest frequency for the maximum performance.
Configuration options: [Disabled] [Auto] [Manual]

The following item appears only when you set **Core Optimizer** to **[Manual]**.

CPU Max frequency [XXXX]

The default value for this option will be the maximum supported frequency of the CPU installed and may vary between different CPUs.

Engine Boost [Disabled]

Enable this item to boost the CPU's frequency. Recommended operation at an ambient temperature of 25°C or below for optimized performance.
Configuration options: [Disabled] [Normal] [Aggressive]

Operate with an ambient temperature of 25°C or lower for optimized performance.

Power Balancer [Disabled]

Allows you to dynamically adjust the frequency of all CPU cores based on their current utilization, delivering better performance per watt for improved system energy efficiency. Configuration options: [Disabled] [Enabled by BIOS] [Enabled by ACC]



When setting **Power Balancer** to **[Enabled by ACC]**, make sure that you have the latest ASUS Control Center software installed to support Power Balancer. Please see below for recommended software versions:
- ACC: 1.4.3.5 version or above.



The following item appears only when you set **Power Balancer** to **[Enabled by BIOS]** or **[Enabled by ACC]**.

Policy [Auto]

Configuration options: [Auto] [Manual]



The following item appears only when you set **Policy** to **[Manual]**.

CPU Max frequency [XXXX]

The default value for this option will be the maximum supported frequency of the CPU installed and may vary between different CPUs.

4.5 Advanced menu

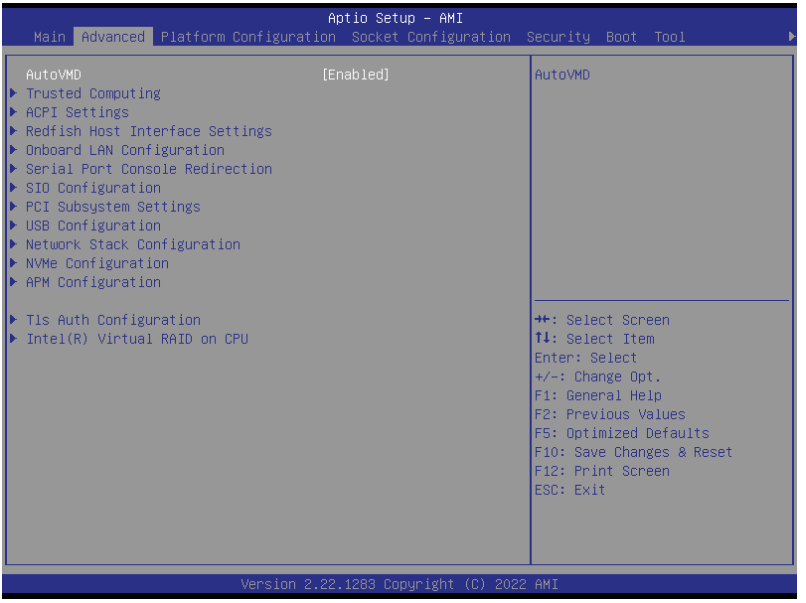
The Advanced menu items allow you to change the settings for the CPU and other system devices.

Take caution when changing the settings of the Advanced menu items. Incorrect field values can cause the system to malfunction.

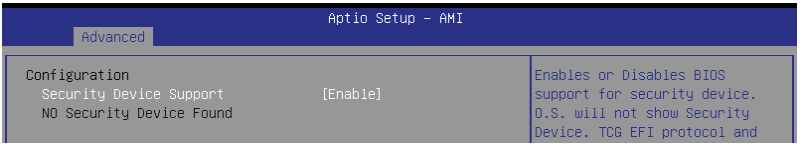
AutoVMD [Enabled]

[Enabled] Enables VROC (NVMe RAID) function if Intel's Volume Management Device (VMD) feature supports it.

[Disabled] Disables VROC (NVMe RAID) function if Intel's VMD feature does not support it.



4.5.1 Trusted Computing



Security Device Support [Enable]

Allows you to enable or disable the BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
Configuration options: [Disable] [Enable]

4.5.2 ACPI Settings



Enable ACPI Auto Configuration [Disabled]

Allows you to enable or disable the BIOS ACPI Auto Configuration.
Configuration options: [Disabled] [Enabled]

4.5.3 Redfish Host Interface Settings



Redfish [Disabled]

Allows you to enable or disable Redfish.
Configuration options: [Disabled] [Enabled]

The following items appear only when **Redfish** is set to **[Enabled]**.

Authentication mode [Basic Authentication]

Allows you to select the authentication mode.
Configuration options: [Basic Authentication] [Session Authentication]

Redfish BMC Settings

IP address

Allows you to enter the IP address.

IP Mask address

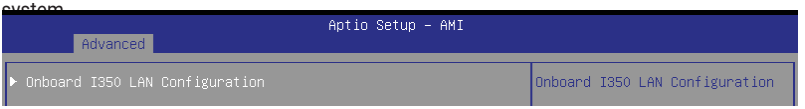
Allows you to enter the IP Mask address.

IP Port

Allows you to enter the IP Port.

4.5.4 Onboard LAN Configuration

The items in this submenu will differ depending on the LAN controller installed on the system.



The following item appears only when an Intel® X710-AT2 LAN controller is installed on the system.

Onboard X710 LAN Configuration

Intel X710 LAN1

LAN Enable [JumperState]

Allows you to enable or disable the Intel LAN.
Configuration options: [Disabled] [JumperState]

The following item appears only when **LAN Enable** is set to **[JumperState]**.

Enable OPROM

Allows you to enable or disable X710 option ROM.
Configuration options: [Disabled] [Enabled]

Intel X710 LAN2

LAN Enable [JumperState]

Allows you to enable or disable the Intel LAN.
Configuration options: [Disabled] [Enabled]

The following item appears only when **LAN Enable** is set to **[JumperState]**.

Enable OPROM

Allows you to enable or disable X710 option ROM.
Configuration options: [Disabled] [Enabled]

The following item appears only when an Intel® I350-AM4 LAN controller is installed on the system.

Onboard I350 LAN Configuration

Intel I350 LAN1

LAN Enable [Enabled]

Allows you to enable or disable the Intel LAN.
Configuration options: [Disabled] [Enabled]

Intel I350 LAN2

LAN Enable [Enabled]

Allows you to enable or disable the Intel LAN.
Configuration options: [Disabled] [Enabled]

Intel I350 LAN3

LAN Enable [Enabled]

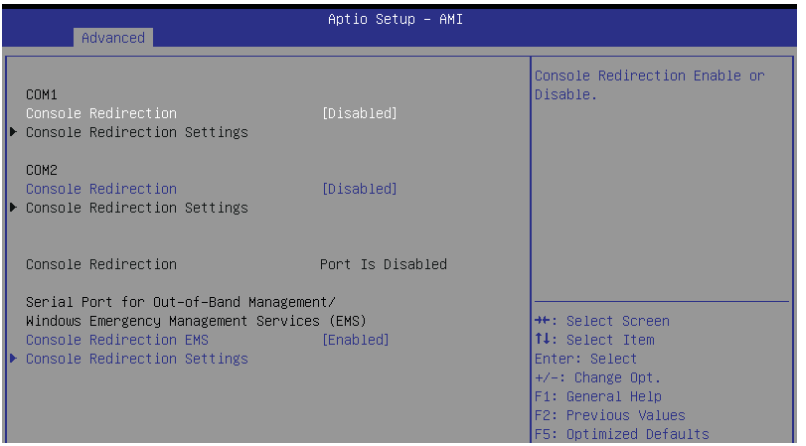
Allows you to enable or disable the Intel LAN.
Configuration options: [Disabled] [Enabled]

Intel I350 LAN4

LAN Enable [Enabled]

Allows you to enable or disable the Intel LAN.
Configuration options: [Disabled] [Enabled]

4.5.5 Serial Port Console Redirection



COM1/COM2

Console Redirection [Disabled]

Allows you to enable or disable the console redirection feature.
Configuration options: [Disabled] [Enabled]

The following item appears only when **Console Redirection** for **COM1** or **COM2** is set to **[Enabled]**.

Console Redirection Settings

These items become configurable only when you enable the **Console Redirection** item. The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.

Terminal Type [ANSI]

Allows you to set the terminal type.

[VT100]	ASCII char set.
[VT100+]	Extends VT100 to support color, function keys, etc.
[VT-UTF8]	Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.
[ANSI]	Extended ASCII char set.

Bits per second [115200]

Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.
Configuration options: [9600] [19200] [38400] [57600] [115200]

Data Bits [8]

Configuration options: [7] [8]

Parity [None]

A parity bit can be sent with the data bits to detect some transmission errors. [Mark] and [Space] parity do not allow for error detection.

[None]	None
[Even]	Parity bit is 0 if the num of 1's in the data bits is even.
[Odd]	Parity bit is 0 if num of 1's in the data bits is odd.
[Mark]	Parity bit is always 1.
[Space]	Parity bit is always 0.

Stop Bits [1]

Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning.) The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit.
Configuration options: [1] [2]

Flow Control [None]

Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a "stop" signal can be sent to stop the data flow. Once the buffers are empty, a "start" signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals.
Configuration options: [None] [Hardware RTS/CTS]

VT -UTF8 Combo Key Support [Enabled]

This allows you to enable the VT -UTF8 Combination Key Support for ANSI/VT100 terminals.
Configuration options: [Disabled] [Enabled]

Recorder Mode [Disabled]

With this mode enabled only text will be sent. This is to capture Terminal data.
Configuration options: [Disabled] [Enabled]

Resolution 100x31 [Enabled]

This allows you enable or disable extended terminal solution.
Configuration options: [Disabled] [Enabled]

Putty Keypad [VT100]

This allows you to select the FunctionKey and Keypad on Putty.
Configuration options: [VT100] [LINUX] [XTERMR6] [SCO] [ESCN] [VT400]

Legacy Console Redirection Settings

Redirection COM Port [COM1]

Allows you to select a COM port to display redirection of Legacy OS and Legacy OPROM Messages.
Configuration options: [COM1] [COM2]

Resolution [80x24]

This allows you to set the number of rows and columns supported on the Legacy OS.
Configuration options: [80x24] [80x25]

Redirection After POST [Always Enable]

The default setting for this option is set to **[Always Enable]**.

[Bootloader] The legacy Console Redirection is disabled before booting to legacy OS.

[Always Enable] Legacy Console Redirection is enabled for legacy OS.

Serial Port for Out-of-Band Management/ Windows Emergency Management Services (EMS)

Console Redirection EMS [Enabled]

Allows you to enable or disable the console redirection feature.
Configuration options: [Disabled] [Enabled]

The following item appears only when **Console Redirection EMS** is set to **[Enabled]**.

Console Redirection Settings

Out-of-Band Mgmt Port [COM1]

Microsoft Windows Emergency Management Services (EMS) allow for remote management of a Windows Server OS through a serial port.
Configuration options: [COM1] [COM2]

Terminal Type EMS [VT-UTF8]

VT-UTF8 is the preferred terminal type for out0of-band management. The next best choice is VT100+, and then VT100. See above, in Console Redirection Settings page for more help with Terminal Type/Emulation.
Configuration options: [VT100] [VT100+] [VT-UTF8] [ANSI]

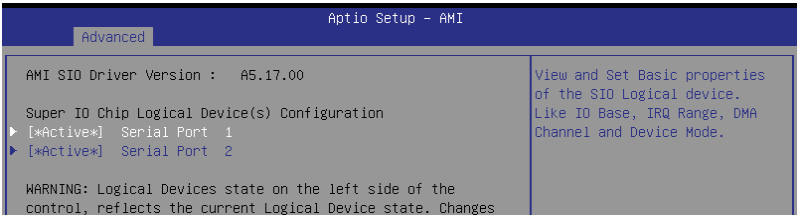
Bits per second EMS [115200]

Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.
Configuration options: [9600] [19200] [57600] [115200]

Flow Control EMS [None]

Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a “stop” signal can be sent to stop the data flow. Once the buffers are empty, a “start” signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals.
Configuration options: [None] [Hardware RTS/CTS] [Software Xon/Xoff]

4.5.6 SIO Configuration



Logical Devices state on the left side of the control, reflects the current Logical Device state. Changes made during Setup Session will be shown after you restart the system.

[*Active*] Serial Port 1 / [*Active*] Serial Port 2

Allows you to view and set basic properties of the SIO Logical device. Like IO Base, IRQ Range, DMA Channel, and Device Mode.

Use This Device [Enabled]

Allows you to enable or disable this Logical Device.
Configuration options: [Disabled] [Enabled]

The following item appears only when **Use This Device** is set to **[Enabled]**.

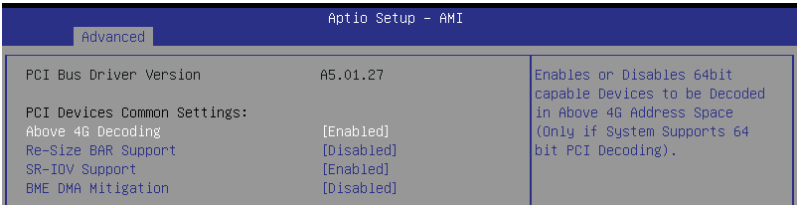
Disabling SIO Logical Devices may have unwanted side effects. PROCEED WITH CAUTION.

Possible: [Use Automatic Settings]

Allows the user to change the device resource settings. New settings will be reflected no this setup page after system restarts.
Configuration options: [Use Automatic Settings] [IO=3F8h; IRQ=4; DMA;] [IO=3F8h; IRQ=3, 4, 5, 7, 9, 10, 11, 12; DMA;] [IO=2F8h; IRQ=3, 4, 5, 7, 9, 10, 11, 12; DMA;] [IO=3E8h; IRQ=3, 4, 5, 7, 9, 10, 11, 12; DMA;] [IO=2E8h; IRQ=3, 4, 5, 7, 9, 10, 11, 12; DMA;]

4.5.7 PCI Subsystem Settings

Allows you to configure PCI, PCI-X, and PCI Express Settings.



Above 4G Decoding [Enabled]

Allows you to enable or disable 64-bit capable devices to be decoded in above 4G address space. It only works if the system supports 64-bit PCI decoding.
Configuration options: [Disabled] [Enabled]

The following items appear only when **Above 4G Decoding** is set to **[Enabled]**.

Re-Size BAR Support [Disabled]

If system has Resizable BAR capable PCIe Devices, this option enables or disables Resizable BAR Support. (Only if system supports 64-bit PCI Decoding).
Configuration options: [Disabled] [Auto]

To enable Re-Size BAR Support for harnessing full GPU memory, please set **CSM (Compatibility Support Module)** to **[Disabled]**.

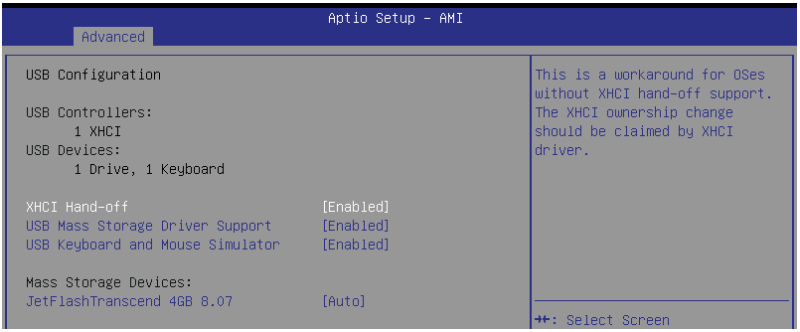
SR-IOV Support [Enabled]

Allows you to enable or disable Single Root IO Virtualization Support if the system has SR-IOV capable PCIe devices.
Configuration options: [Disabled] [Enabled]

BME DMA Mitigation [Disabled]

Allows you to enable or disable BME DMA mitigation.
Configuration options: [Disabled] [Enabled]

4.5.8 USB Configuration



XHCI Hand-off [Enabled]

Allows you to enable or disable workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
Configuration options: [Enabled] [Disabled]

USB Mass Storage Driver Support [Enabled]

Allows you to enable or disable the USB Mass Storage driver support.
Configuration options: [Disabled] [Enabled]

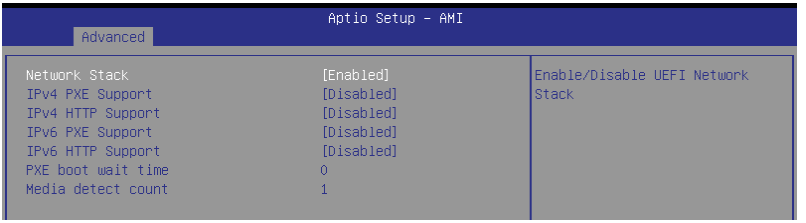
USB Keyboard and Mouse Simulator [Enabled]

Allows you to simulate USB keyboard and mouse to PS/2 module in Windows 7.
Configuration options: [Disabled] [Enabled]

Mass Storage Devices: [Auto]

Allows you to select the mass storage device emulation type for devices connected. **[Auto]** enumerates devices according to their media format. Optical drives are emulated as **[CD-ROM]**, drives with no media will be emulated according to a drive type.
Configuration options: [Auto] [Floppy] [Forced FDD] [Hard Disk] [CD-ROM]

4.5.9 Network Stack Configuration



Network Stack [Enabled]

Enables or disables the UEFI network stack.
Configuration options: [Disabled] [Enabled]

The following items appear only when **Network Stack** is set to **[Enabled]**.

IPv4 PXE Support [Disabled]

Enables or disables the Ipv4 PXE Boot Support. If disabled, Ipv4 PXE boot support will not be available.
Configuration options: [Disabled] [Enabled]

IPv4 HTTP Support [Disabled]

Enables or disables the Ipv4 HTTP Boot Support. If disabled, Ipv4 HTTP boot support will not be available.
Configuration options: [Disabled] [Enabled]

IPv6 PXE Support [Disabled]

Enables or disables the Ipv6 PXE Boot Support. If disabled, Ipv6 PXE boot support will not be available.XD

Configuration options: [Disabled] [Enabled]

IPv6 HTTP Support [Disabled]

Enables or disables the Ipv6 HTTP Boot Support. If disabled, Ipv6 HTTP boot support will not be available.
Configuration options: [Disabled] [Enabled]

PXE boot wait time [0]

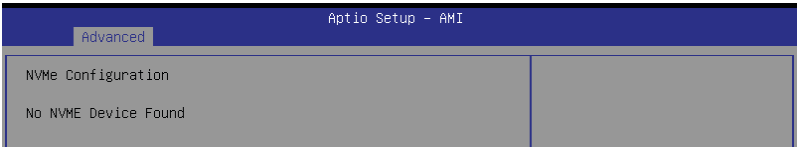
Set the wait time to press ESC key to abort the PXE boot. Use the <+> or <-> to adjust the value. The values range from 0 to 5.

Media detect count [1]

Set the number of times presence of media will be checked. Use the <+> or <-> to adjust the value. The values range from 1 to 50.

4.5.10 NVMe Configuration

This page will display the NVMe controller and drive information.



Device

The devices and names shown in the NVMe configuration list depends on the connected devices. If no devices are connected, **No NVMe Device Found** will be displayed.

Self Test Option [Short]

This option allows you to select either Short or Extended Self Test. Short option will take couple of minutes, and the extended option will take several minutes to complete.
Configuration options: [Short] [Extended]

Self Test Action [Controller Only Test]

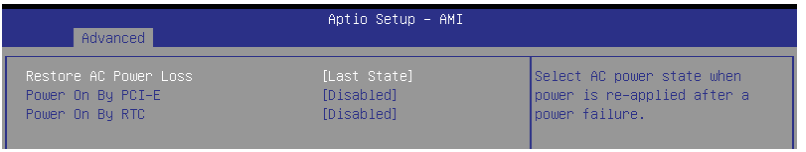
This item allows you to select either to test Controller alone or Controller and NameSpace. Selecting Controller and Namespace option will take a lot longer to complete the test.
Configuration options: [Controller Only Test] [Controller and NameSpace Test]

Run Device Self Test

Press <Enter> to perform device self test for the corresponding Option and Action selected by the user. Pressing the <ESC> key will abort the test. The results shown below is the most recent result logged in the device.

4.5.11 APM Configuration

This page will allow you to configure the Advanced Power Management (APM) settings.



Restore AC Power Loss [Last State]

When set to **[Power Off]**, the system goes into off state after an AC power loss. When set to **[Power On]**, the system will reboot after an AC power loss. When set to **[Last State]**, the system goes into either off or on state, whatever the system state was before the AC power loss.
Configuration options: [Power On] [Power Off] [Last State]

Power On By PCI-E/PCI [Disabled]

[Disabled] Disables the PCI/PCIe devices to generate a wake event.

[Enabled] Enables the PCI/PCIe devices to generate a wake event.

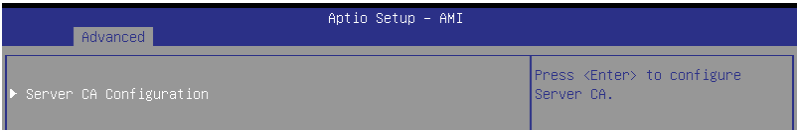
Power On By RTC [Disabled]

[Disabled] Disables RTC to generate a wake event.

[Enabled] When set to [Enabled], the items **RTC Alarm Date (Days)** and **Hour/Minute/Second** will become user-configurable with set values.

4.5.12 Tls Auth Configuration

The items in this menu allows you to set the authentication mode.



Server CA Configuration

This option allows you to configure the server's CA. This allows you to both enroll the required certificate files and also to delete the certicates that are not required.

4.5.13 Intel(R) Virtual RAID on CPU

This page will allow you to manage Intel(R) Virtual RAID on CPU.

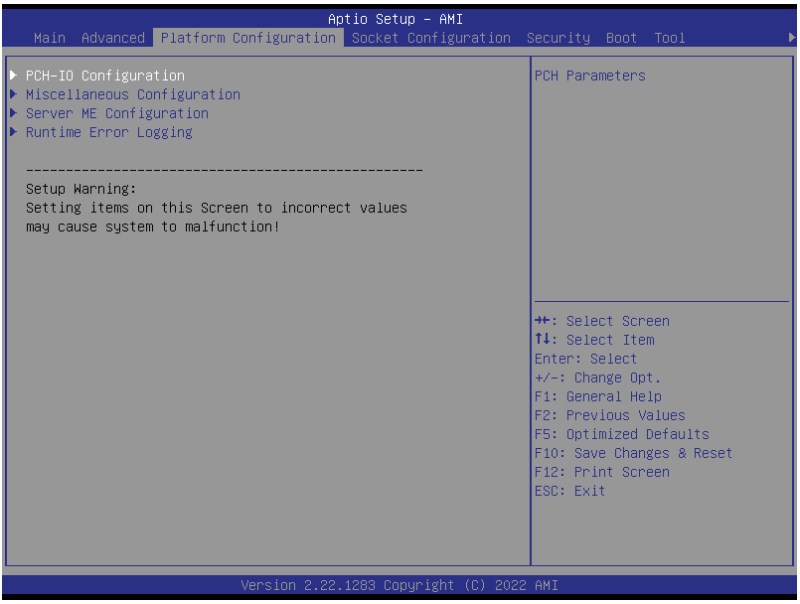
All Intel VMD Controllers

For more information on the Intel VMD controllers, press <Enter>.

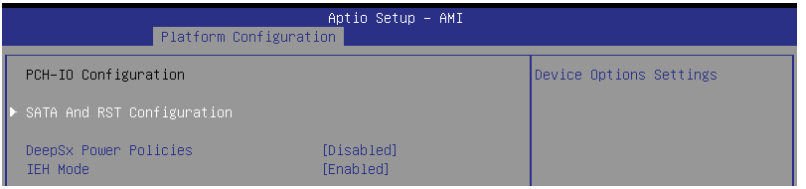
4.6 Platform Configuration menu

The Platform Configuration menu items allow you to change the platform settings.

Setting items in this menu to incorrect values may cause the system to malfunction!



4.6.1 PCH-IO Configuration



SATA And RST Configuration

This option allows you to make device options settings.

Controller 1/2/3 SATA And RST Configuration

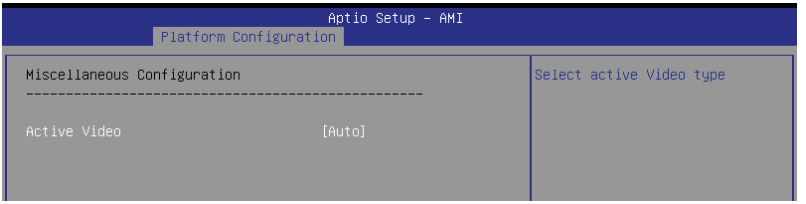
DeepSx Power Policies [Disabled]

This option allows you to enable to disable DeepSx power policies.
Configuration options: [Disabled] [Enabled in S5]

IEH Mode [Enabled]

This option allows you to enable or bypass IEH mode.
Configuration options: [Bypass Mode] [Enabled]

4.6.2 Miscellaneous Configuration

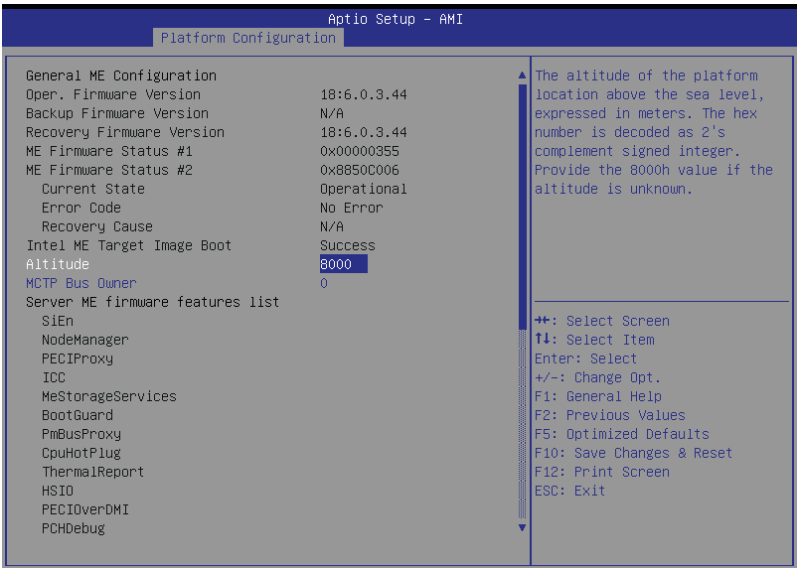


Active Video [Auto]

Allows you to select the active video type.
Configuration options: [Auto] [Onboard Device] [PCIE Device]

4.6.3 Server ME Configuration

Displays the Server ME Technology parameters on your system. Scroll using <Page Up> / <Page Down> keys to see more items.



Altitude [8000]

Allows you to set the altitude of the platform location above the sea level, expressed in meters. The hex number is decoded as 2's complement signed integer. Provide the 8000h value if the altitude is unknown.

MCTP Bus Owner [0]

Allows you to enter the MCTP bus owner location on PCIe: [15:8] bus, [7:3] device, [2:0] function. If all zeros sending bus owner will be disabled.

Power Supply Units Configuration

PSU #1/2/3/4

Allows you to enter the PMBus address (7-bit) that will be used to retrieve the status of the PSU. Enter zero to disable query.

4.6.4 Runtime Error Logging



System Errors [Enable]

Allows you to enable or disable System Errors setup options.
Configuration options: [Disable] [Enable]

The following items are only available when **System Errors** is set to **[Enable]**.

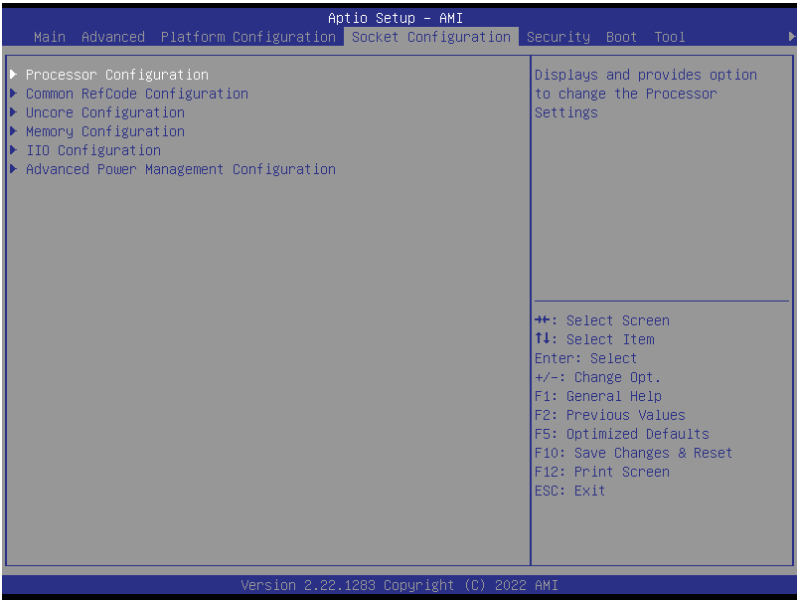
Whea Settings

Whea Support [Enable]

Allows you to enable or disable Whea support.
Configuration options: [Disable] [Enable]

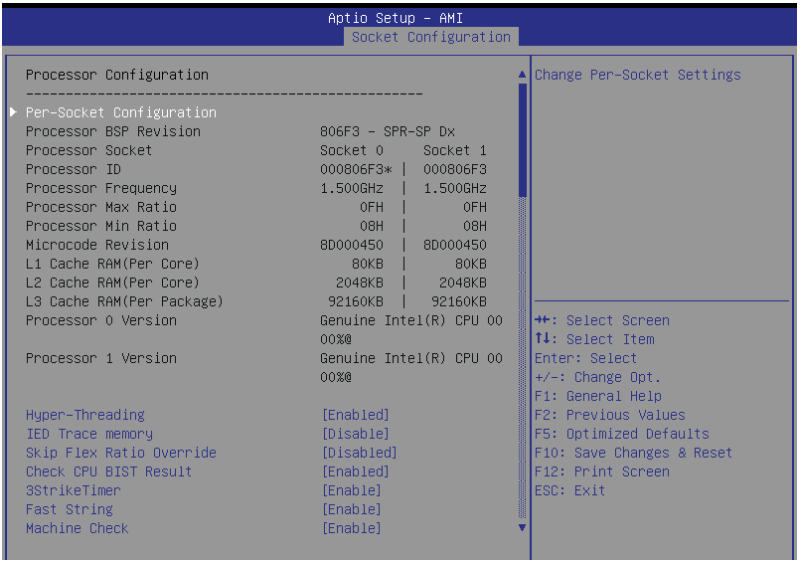
4.7 Socket Configuration menu

The Socket Configuration menu items allow you to change the socket settings.



4.7.1 Processor Configuration

Scroll using the <Page Up> / <Page Down> keys to view more items.



Processor Configuration

Per-Socket Configuration

Allows you to change Per-Socket Settings.

CPU Socket 0/1 Configuration

Core Disable Bitmap(Hex) [0]

Allows you to set the Core Disable Bitmap. Set this item to [0] to enable all cores. Set this item to [FFFFFFFFFF] to disable all cores.

At least one core per CPU must be enabled. Disabling all cores is an invalid configuration.

Hyper Threading [Enable]

Allows you to enable or disable the Hyper-Threading Technology function. When disabled, only one thread per activated core is enabled. This is the software method to enable or disable Logical Processor threads.
Configuration options: [Disabled] [Enabled]

IED Trace memory [Disable]

Allows to enable or disable option to allocate memory for PSMI trace.
Configuration options: [Disable] [4M] [8M] [16M] [32M] [64M] [128M] [256M] [512M] [1G]

Skip Flex Ratio Override [Disable]

Allows you to use power-on default Flex Ratio values. In multi-socket systems, this will allow mixed flex ratio limits.
Configuration options: [Disabled] [Enabled]

Check CPU BIST Result [Enabled]

When enabled, this item disables failed BIST core. Otherwise, it ignores BIST result.
Configuration options: [Disable] [Enable]

3StrikeTimer [Enable]

The 3 strike counter can be turned off by writing into the MISC_FEATURE.
Configuration options: [Enable] [Disable]

Fast String [Enable]

This item allows you to enable or disable fast strings for REP MOVS/STOS.
Configuration options: [Disable] [Enable]

Machine Check [Enable]

This item allows you to enable or disable machine check.
Configuration options: [Disable] [Enable]

Hardware Prefetcher [Enable]

Allows you to enable or disable MLC streamer prefetcher (MSR 1A4h Bit[0]).
Configuration options: [Disable] [Enable]

L2 RFO Prefetch Disable [Disable]

Allows you to enable or disable L2 RFO prefetcher (MSR 6Dh Bit[35]).
Configuration options: [Disable] [Enable]

Adjacent Cache Prefetch [Disable]

Allows you to enable or disable MLC spatial prefetcher (MSR 1A4h Bit[1]).
Configuration options: [Enable] [Disable]

DCU Streamer Prefetcher [Enable]

Allows you to enable or disable DCU streamer prefetcher, which is a L1 data cache prefetcher (MSR 1A4h Bit[2]).
Configuration options: [Enable] [Disable]

DCU IP Prefetcher [Enable]

Allows you to enable or disable DCU IP prefetcher, which is a L1 data cache prefetcher (MSR 1A4h Bit[3]).
Configuration options: [Enable] [Disable]

LLC Prefetch [Disable]

Allows you to enable or disable LLC prefetch on all threads.
Configuration options: [Disable] [Enable]

DCU Mode [Normal]

[Normal] The whole DCU is used for caching.

[Mirror-Mode] The DCU is organized as 2x16KB mirrored copies.

AMP Prefetch [Disable]

Allows you to enable or disable MLC AMP prefetch (MSR 1A4h [4]).
Configuration options: [Enable] [Disable]

Bsp Selection [Auto]

Allows you to choose the method to select BSP.
Configuration options: [Socket 0] [Socket 1] [Auto]

Extended APIC [Disable]

Allows you to enable or disable extended APIC support.
Configuration options: [Disable] [Enable]

Enabling this item will automatically enable VT-d if x2APIC is enabled.

APIC Physical Mode [Disable]

Allows you to enable or disable APIC physical destination mode.
Configuration options: [Disable] [Enable]

PECI Trust Mode [Use per-PECI agent trust mode]

Allows you to set PECI trust configuration.
Configuration options: [All PECI Agents untrusted] [All PECI Agents trusted] [Use per-PECI agent trust mode]

The following item appears only when **PECI Trust Mode** is set to **[Use per-PECI agent trust mode]**.

Legacy Agent [Enable]

Allows you to enable or disable the legacy PECI agent in trust bit enable.
Configuration options: [Disable] [Enable]

SMBus Agent [Disable]

Allows you to enable or disable the SMBus PECI agent in trust bit enable.
Configuration options: [Disable] [Enable]

IE Agent [Enable]

Allows you to enable or disable the IE PECI agent in trust bit enable.
Configuration options: [Disable] [Enable]

Generic Agent [Disable]

Allows you to enable or disable the generic PECI agent in trust bit enable.
Configuration options: [Disable] [Enable]

eSPI Agent [Disable]

Allows you to enable or disable the eSPI PECI agent in trust bit enable.
Configuration options: [Disable] [Enable]

DfxRedManu Agent [Disable]

Allows you to enable or disable the DfxRedManu PECI agent in trust bit enable.
Configuration options: [Disable] [Enable]

DfxOrange Agent [Disable]

Allows you to enable or disable the Orange PECI agent in trust bit enable.
Configuration options: [Disable] [Enable]

DBP-F [Disable]

Allows you to enable or disable DBP-F. DBP-F can be turned off by writing into the MSR 6Dh [2:3].
Configuration options: [Enable] [Disable]

IIO LLC Ways [19:0] (Hex) [0]

Allows you to adjust the LLC value of MSR_IIO_LLC_WAYS bitmask.

eSMM Blocked and Delayed [Disable]

Allows you to enable or disable SMM Blocked and Delayed.
Configuration options: [Disable] [Enable] DBP-F [Disable]

eSMM Save State [Disable]

Allows you to enable or disable the eSMM Save State Feature.
Configuration options: [Disable] [Enable]

SMBus Error Recovery [Enable]

Allows you to enable or disable SMBus Error Recovery.
Configuration options: [Disable] [Enable]

Enable Intel(R) TXT [Disable]

Allows you to enable or disable Intel(R) TXT.
Configuration options: [Disable] [Enable]

VMX [Enable]

Allows you to enable or disable Vanderpool Technology. Changes take effect only after reboot.
Configuration options: [Disable] [Enable]

Enable SMX [Disable]

Allows you to enable or disable Safer Mode Extensions.
Configuration options: [Disable] [Enable]

Lock Chipset [Enable]

Allows you to lock or unlock the chipset.
Configuration options: [Enable] [Disable]

MSR Lock Control [Enable]

Allows you to enable or disable the locking of MSR 3Ah and CSR 80h. Power Good reset is needed to remove lock bits.
Configuration options: [Disable] [Enable]

PPIN Control [Unlock/Enable]

Allows you to unlock and enable or lock and disable the PPIN control.
Configuration options: [Lock/Disable] [Unlock/Enable]

AES-NI [Enable]

Allows you to enable or disable AES-NI support.
Configuration options: [Disable] [Enable]

TME, TME-MT, TDX

Memory Encryption (TME) [Disabled]

Allows you to enable or disable memory encryption (TME).
Configuration options: [Disabled] [Enabled]



The following item appears only when **Memory Encryption (TME)** is set to **[Enabled].**

Total Memory Encryption (TME) Bypass [Disabled]

Allows you to enable or disable Total Memory Encryption (TME).
Configuration options: [Disabled] [Enabled]

Software Guard Extension (SGX)

SGX Factory Reset [Disabled]

Allows you to enable or disable SGX factory reset, which deletes all registration date, on the subsequent boot.
Configuration options: [Disabled] [Enabled]



When enabled, the system will force Initial Platform Establishment flow.

SW Guard Extensions (SGX) [Disabled]

Allows you to enable or disable Software Guard Extensions (SGX).
Configuration options: [Disabled] [Enabled]

SGX Package Info In-Band Access [Disabled]

Allows you to enable or disable Software Guard Extensions (SGX) package info in-band access.
Configuration options: [Disabled] [Enabled]



The following items appear only when **SW Guard Extensions (SGX)** is set to **[Enabled].**

SGX PRM Size [256M]

Allows you to select the SGX PRM size, which may not be equal to the total PRM size.
Configuration options: [256M] [512M] [1G] [2G] [4G] [8G] [16G]

SGX QoS [Enabled]

Allows you to enable or disable SGX Qualtiy of Service.
Configuration options: [Disabled] [Enabled]

Select Owner EPOCK input type [Manual User Defined Owner EPOCHs]

Allows you to select the owner EPOCH input type. Each EPOCH is 64-bit.
Configuration options: [Change to New Randon Owner EPOCHs] [Manual User Defined Owner EPOCHs]

Software Guard Extensions Epoch 0 [67]

Allows you to set Software Guard Extensions Epoch 0.

Software Guard Extensions Epoch 1 [4388E8D3C9E73ADC]

Allows you to set Software Guard Extensions Epoch 1.

SGXLEPUBKEYHASHx Write Enable [Enabled]

Allows you to enable or disable writing to SGXLEPUBKEYHASH [3..0] from PS/SW.
Configuration options: [Disabled] [Enabled]

The following items appear only when **SGXLEPUBKEYHASHx Write Enable** is set to **[Enabled].**

SGXLEPUBKEYHASH0 [0]

Allows you to input SGX launch enclave public key hash byte 7-0.

SGXLEPUBKEYHASH1 [0]

Allows you to input SGX launch enclave public key hash byte 15-8.

SGXLEPUBKEYHASH2 [0]

Allows you to input SGX launch enclave public key hash byte 23-16.

SGXLEPUBKEYHASH3 [0]

Allows you to input SGX launch enclave public key hash byte 31-24.

SGX Auto MP Registration [Disabled]

Allows you to enable or disable automatic registration in OS MPA agent.
Configuration options: [Disabled] [Enabled]

In Field Test (IFT)

Press <Enter> to bring up the In Field Test menu.

Enable SAF [Disabled]

Allows you to enable or disable Scan At Field (SAF)
Configuration options: [Disabled] [Enabled]

The following item appears only when **Enable SAF** is set to **[Enabled].**

SAF size [128M]

Allows you to set the SAF size region inside of PRM.

PSMI Configuration

Press <Enter> to bring up the PSMI Configuration menu.

Global PSMI Enable [Enable]

Allows you to enable or disable Scan At Field (SAF)
Configuration options: [Disabled] [Enabled] [Force setup]

The following items appear only when **Global PSMI Enable** is set to **[Enable] or [Force setup].**

Socket 0/1 Configuration

Press <Enter> to bring up the Socket 0/1 Configuration menu.

PSMI Enable
Allows you to enable or disable PSMI Enable.
Configuration options: [Disabled] [Enabled]

Processor CFR Configuration

Press <Enter> to bring up the Processor CFR Configuration menu that displays and provides options to change the processor CFR settings.

Provision S3M CFR [Enable]

Allows you to enable or disable provision S3M CFR.
Configuration options: [Disabled] [Enabled]

The following item appears only when **Provision S3M CFR** is set to **[Enable].**

Manual Commit S3M FW CFR [Disable]

Allows you to enable or disable manual commit S3M FW CFR.
Configuration options: [Disabled] [Enabled]

Provision PUcode CFR [Enable]

Allows you to enable or disable provision PUcode CFR.
Configuration options: [Disabled] [Enabled]

The following item appears only when **Provision PUcode CFR** is set to **[Enable].**

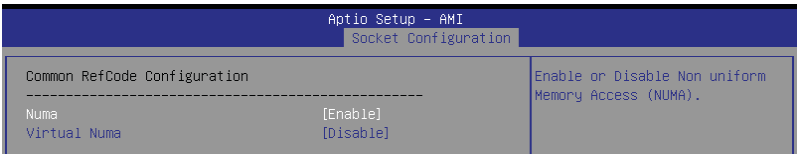
Manual Commit PUcode CFR [Disable]

Allows you to enable or disable manual commit PUcode CFR.
Configuration options: [Disabled] [Enabled]

Socket0/1/2/3 CFR Revision Info

These items display the CFR revision info for each socket.

4.7.2 Common RefCode Configuration



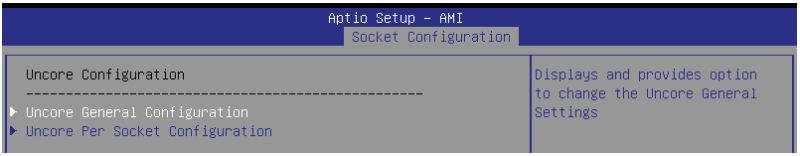
Numa [Enabled]

This item allows you to enable or disable Non uniform Memory Access (NUMA).
Configuration options: [Disable] [Enable]

Virtual Numa [Disable]

Enabling this option divides physical NUMA nodes into evenly sized virtual NUMA modes in ACPI table. This may improve Windows performance on CPUs with more than 64 logical processors.
Configuration options: [Disable] [Enable]

4.7.3 Uncore Configuration



Uncore General Configuration

This item displays and provides options to change the Uncore General Settings.

Uncore Status

Displays uncore status

MMCFG Base [Auto]

Allows you to select the MMCFG base.
Configuration options: [1G] [1.5G] [1.75G] [2G] [2.25G] [3G] [Auto]

MMCFG Size [Auto]

Allows you to select the MMCFG size.
Configuration options: [128M] [256M] [512M] [1G] [2G] [Auto]

MMIO High Base [32T]

Allows you to select the MMIO high base.
Configuration options: [56T] [40T] [32T] [24T] [16T] [4T] [2T] [1T] [512G] [3584T]

MMIO High Granularity Size [256G]

Allows you to select the allocation size used to assign mmioh resources. Total mmioh space can be up to 32xgranularity.
Configuration options: [1G] [4G] [16G] [64G] [256G] [1024G]

Limit CPU PA to 46 bits [Enable]

Allows you to limit CPU physical address to 46 bits to support older Hyper-v. If enabled, automatically disables TME-MT.

Uncore Per Socket Configuration

CPU1/2

CPU 1/2 UPI Port 3 Link Disable [No]

Allows you to set UPI link to disable.

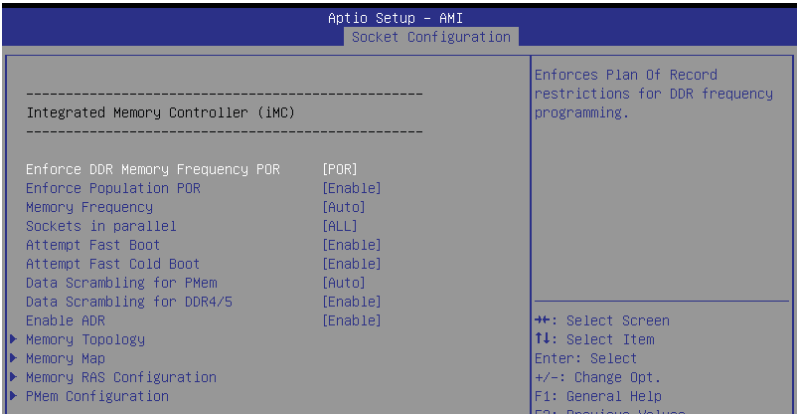
Configuration options: [No] [Yes]

Current UPI Link Speed [Auto]

Allows you to select the UPI link frequency.

Configuration options: [12.8GT/s] [14.4GT/s] [16.0GT/s] [Auto]

4.7.4 Memory Configuration



Enforce DDR Memory Frequency POR [POR]

Allows you to enforce POR restrictions for DDR4 frequency and voltage programming. If this item is set to [Disable], user will be able to run at higher frequencies, specified in the DDR Frequency Limit field (limited by processor support).
Configuration options: [POR] [Disable]

Enforce Population POR [Enable]

Allows you to enable or disable memory population POR enforcement.
Configuration options: [Disable] [Enable]

Memory Frequency [Auto]

Allows you to select the maximum memory frequency setting in Mhz. If Enforce POR is set to [Disable], user will be able to run at higher frequencies than the memory support (limited by processor support). Do not select Reserved.
Configuration options: [Auto] [3200] [3600] [4000] [4400] [4800]

Sockets in parallel [ALL]

Allows you to set how many sockets are executing at any time.
Configuration options: [ALL] [1] [2] [4]

[ALL]	All sockets operate in parallel.
[1]	At any one time, only one socket is executing.
[2]	At any one time, only two sockets are executing.
[4]	At any one time, only four sockets are executing.

Attempt Fast Boot [Enable]

[Enable]	Portions of memory reference code will be skipped when possible to increase boot speed on warm boots.
[Disable]	Disables this feature.
[Auto]	Sets it to the MRC default setting

Attempt Fast Cold Boot [Enable]

[Enable] Portions of memory reference code will be skipped when possible to increase boot speed on cold boots.

[Disable] Disables this feature.

[Auto] Sets it to the MRC default setting

Data Scrambling for PMem [Auto]

[Enable] Enables data scrambling for DDR5 and DDR5.

[Disable] Disables this feature.

[Auto] Sets depending on stepping.

Data Scrambling for DDR5/5 [Enable]

[Disable] Disables this feature.

[Enable] Enables data scrambling for DDR5 and DDR5.

Enable ADR [Enable]

[Disable] This option is not available if fADS is enabled since fADR requires ADR to be enabled.

[Enable] Enables the detecting and enabling of ADR.

Memory Topology

Displays memory topology with DIMM population information.

Memory Map

Allows you to set memory mapping settings.

Volatile Memory Mode [2LM]

Selects 1LM or 2LM mode for volatile memory. For 2LM memory mode, BIOS will try to configure 2LM, but if BIOS is unable to configure 2LM, volatile memory mode will fall beck to 1LM.
Configuration options: [1LM] [2LM]

Memory RAS Configuration

Displays and provides options to change the memory RAS Settings.

Dynamic ECC Mode Selection [Enabled]

Allows you to enable or disable dynamic ECC mode selection.
Configuration options: [Disabled] [Enabled] [Enable + Allow 128b ECC]

Enable Pcode WA for SAI PG [Disabled]

Allows you to enable or disable Pcode Work Around for SAI Policy group for A Step.
Configuration options: [Disabled] [Enabled]

Mirror Mode [Disabled]

Allows you to select the mirror mode.
Configuration options: [Disabled] [Full Mirror Mode] [Partial Mirror Mode]

Mirror TADO [Disabled]

Allows you to enable or disable mirror on entire memory for TADO.
Configuration options: [Enabled] [Disabled]

UEFI ARM Mirror [Disabled]

Allows you to enable or disable the mirrored behavior of UEFI based address range mirror with setup option.
Configuration options: [Disabled] [Enabled]

Memory Correctable Error Flood Policy [Frequency]

Allows you to set when to trigger SMI.
Configuration options: [Disabled] [Once] [Frequency]

Trigger SW Error Threshold [Disabled]

Allows you to enable to disable sparing trigger SW error match threshold.
Configuration options: [Disabled] [Enabled]

Leaky bucket time window based interface [Disabled]

Allows you to enable to disable leaky bucket time window based interface.
Configuration options: [Disabled] [Enabled]

ADDDC Sparing [Disabled]

Allows you to enable to disable ADDDC Sparing.
Configuration options: [Disabled] [Enabled]

The following item appears only when **ADDDC Sparing** is set to **[Enabled]**.

Enable ADDDC Error Injection [Enabled]

Allows you to enable to disable ADDDC error injection, which is required forcing the interleave granularity to 64B for B/L step parts.
Configuration options: [Disabled] [Enabled]

Patrol Scrub [Enable at End of POST]

Allows you to enable to disable patrol scrub.
Configuration options: [Disabled] [Enable at End of POST]

PDDR5 ECS [Disabled]

Allows you to enable to disable DDR5 Error Check and Scrub (ECS).
Configuration options: [Disabled] [Enabled]

PMem Configuration

PMem Secure Erase Unit

Erase All DIMMs [Disable]
Allows you to erase the persistent memory region of all PMem in the system.

S0 CH0-7 [Disable]
Allows you to enable or disable the erasing of the persistent memory region of PMem in channel 0-7 for socket 0.

S1 CH0-7 [Disable]
Allows you to enable or disable the erasing of the persistent memory region of PMem in channel 0-7 for socket 1.

S2 CH0-7 [Disable]
Allows you to enable or disable the erasing of the persistent memory region of PMem in channel 0-7 for socket 2.

S3 CH0-7 [Disable]
Allows you to enable or disable the erasing of the persistent memory region of PMem in channel 0-7 for socket 3.

PMem Factory Reset/Clear [Disabled]

This option allows you to enable or disable factory reset/clear. PMem power policy settings will also be set to default values. This know remains enabled after reset.
Configuration options: [Disabled] [Enabled]

200 Series PMem Average Power Limit (in mW) [0]

This option allows you to set the power limit in mW used for average power. Valid range for power limit starts from 10000mW and must be a multiple of 250mW.

200 Series PMem Turbo/Memory Bandwidth Boost (MBB) Feature [Enabled]

This option allows you to enable or disable Turbo/Memory Bandwidth Boost (MBB) feature on the module.
Configuration options: [Disabled] [Enabled]

200 Series PMem Memory Bandwidth Boost (MBB) Average Power Time Constant (in mSec) [15000]

This option allows you to set the value used as a base time window for power usage measurements. Valid range starts from 1000msec to 120000msec (must be in increments of 1000msec).

200 Series PMem Turbo/Memory Bandwidth Boost (MBB) Power Limit (in mW) [18000]

This option allows you to set the power limit in mW used for limiting the Turbo/Memory Bandwidth Boost (MBB) feature power consumption. Valid range for Turbo Power Limit starts from 15000mW.

Publish ARS capability [Enabled]

This option allows you to enable or disable publishing the Address Range Scrub capability to the OS.
Configuration options: [Disabled] [Enabled]

PMem ECC Read Check [Enable]

This option allows you to enable or disable PMem ECC Read Check.
Configuration options: [Disable] [Enable]

PMem Latch System Shutdown State [Enabled]

This option allows you to enable or disable latch system shutdown state.
Configuration options: [Disabled] [Enabled]

Snoopy mode for 2LM [Disable]

This option allows you to enable or disable new 2LM specific feature to avoid directory updates to far-memory from non-NUMA optimized workloads.
Configuration options: [Enable] [Disable]

Power Cycle on PMem Surprise Clock Stop [Enable]

This option allows you to enable or disable power cycle policy when PMem receive surprise clock stop.
Configuration options: [Enable] [Disable]

Snoopy mode for AD [Disable]

This option allows you to enable or disable new AD specific feature to avoid directory updates to PMem memory from non-NUMA optimized workloads.
Configuration options: [Disable] [Enable]

LSx implementation [ASL]

This option allows you to select LSI/LSR/LSW ACPI method implementation.
Configuration options: [SWSMI] [ASL]

Extended Type 17 Structure [Enabled]

This option allows you to enable or disable the use extended Type 17 SMBIOS Structures.
Configuration options: [Disabled] [Enabled]

SMBus Max Access Time [350]

This option allows you to set the maximum amount of time (ms) UEFI mgmt driver is allowed to use the SMBus.

SMBus Release Delay [150]

This option allows you to set the delay time (ms) before releasing after UEFI mgmt driver requests SMBus release.

NVDIMM Mailbox in NFIT [Disabled]

This option allows you to enable or disable publishing NVDIMM mailbox registers in NFIT structures.
Configuration options: [Disabled] [Enabled]

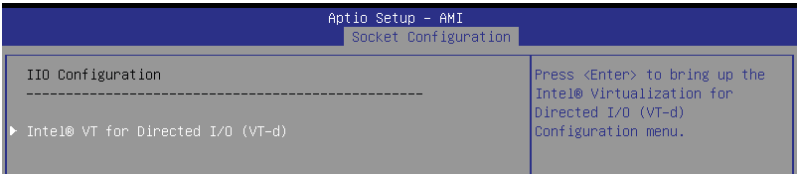
Seamless: Opt-in DIMMs [Keep]

This option allows you to enable opt-in DIMMs, if FW supports it.
Configuration options: [Keep] [Disabled] [Enabled]



FW activation does not update FW digest CSR.

4.7.5 IIO Configuration



Intel® VT for Directed I/O (VT-d)

Press <Enter> to bring up the Intel® Virtualization Technology for Directed I/O (VT-d) configuration menu.

Intel® VT for Directed I/O [Enable]

This item allowsw you to enable or disable Intel® Virtualization Technology for Directed I/O (VT-d) by reporting the I/O device assihnment to VMM through DMAR ACPI Tables.
Configuration options: [Enable] [Disable]

4.7.6 Advanced Power Management Configuration



CPU P State Control

P State Control Configuration Sub Menus, including Turbo, XE, etc.

AVX Licence Pre-Grant Override [Disable]

Enabled AVX ICCP pre-grant level override.
Configuration options: [Disable] [Enable]

The following item appears only when **AVX Licence Pre-Grant Override** is set to **[Enable]**.

AVX ICCP pre-grant level [128 Heavy]

Pre-grants an AVX level to the core. Base frequency is not updated.
Configuration options: [128 Heavy] [256 Light] [256 Heavy] [512 Light] [512 Heavy]

AVX P1 [Normal]

AVX P1 level selection.
Configuration options: [Normal] [Level 1] [Level 2]

Intel SST-PP [Auto]

Intel SST-PP allows user to choose level.
Configuration options: [Auto] [Level 0] [Level 3] [Level 4]

Dynamic SST-PP [Disable]

Enabling Dynamic SST-PP supports dynamic SST-PP selection.
Configuration options: [Disable] [Enable]

Activate SST-BF [Disable]

Allows you to enable or disable SST-BF.
Configuration options: [Disable] [Enable]

Configure SST-BF [Enable]

Allows BIOS to configure SST-BF High Priority Cores so that SW does not have to configure.
Configuration options: [Disable] [Enable]

SpeedStep (Pstates) [Enable]

Allows you to enable or disable EIST (P-States).
Configuration options: [Disable] [Enable]

Boot performance mode [Max Performance]

Allows you to select the performance state that the BIOS will set before OS hand off.
Configuration options: [Max Performance] [Max Efficient] [Set by Intel Node Manager]

Energy Efficient Turbo [Enable]

Allows you to enable or disable Energy Efficient Turbo.
Configuration options: [Disable] [Enable]

Hardware PM State Control

Hardware P-States [Native Mode]

Allows you to switch between Hardware P-States mode.

[Disable]	Hardware chooses a P-state based on OS Request (Legacy P-States).
[Native Mode]	Hardware chooses a P-state based on OS guidance.
[Out of Band Mode]	Hardware autonomously chooses a P-state (no OS guidance).
[Native Mode with no Legacy Support]	Hardware chooses a P-state based on OS guidance (without Legacy support).

Frequency Prioritization

SST-CP [Enable]

Allows you to enable or disable SST-CP. When enabled, per core power budgeting is activated.
Configuration options: [Enable] [Disable]

CPU C State Control

Enable Monitor MWAIT [Auto]

Allows you to enable or disable Monitor and MWAIT instructions.
Configuration options: [Disable] [Enable] [Auto]

CPU C1 auto demotion [Enable]

Allows CPU to automatically demote to C1. Takes effect after reboot.
Configuration options: [Disable] [Enable]

CPU C1 auto undemotion [Enable]

Allows CPU to automatically undemote from C1. Takes effect after reboot.
Configuration options: [Disable] [Enable]

CPU C6 report [Auto]

Allows you to enable or disable CPU C6 (ACPI C3) report to OS.
Configuration options: [Disable] [Enable] [Auto]

Enhanced Halt State (C1E) [Enable]

Core C1E auto promotion Control. Takes effect after reboot.
Configuration options: [Disable] [Enable]

OS ACPI Cx [ACPI C2]

Allows you to select to report CC3/CC6 to OS ACPI C2 or ACPI C3.
Configuration options: [ACPI C2] [ACPI C3]

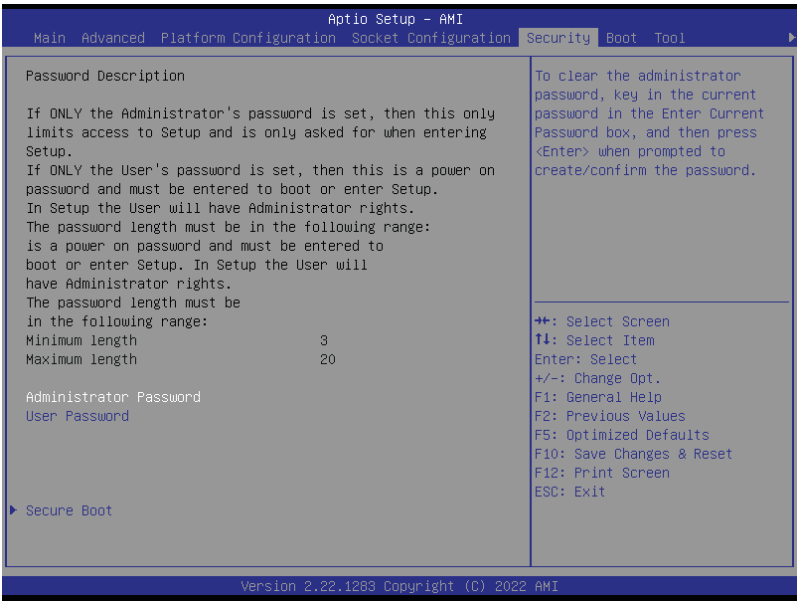
Package C State Control

Package C State [Auto]

Allows you to select Package C State limit.
Configuration options: [C0/C1 state] [C2 state] [C6(non Retention state] [C6(Retention state] [No Limit] [Auto]

4.8 Security menu

This menu allows a new password to be created or a current password to be changed. The menu also enables or disables the Secure Boot state and lets the user configure the System Mode state.



Administrator Password

To set an administrator password:

1. Select the Administrator Password item and press <Enter>.
2. From the Create New Password box, key in a password, then press <Enter>.
3. Confirm the password when prompted.

To change an administrator password:

1. Select the Administrator Password item and press <Enter>.
2. From the Enter Current Password box, key in the current password, then press <Enter>.
3. From the Create New Password box, key in a new password, then press <Enter>.
4. Confirm the password when prompted.

To clear the administrator password, follow the same steps as in changing an administrator password, but press <Enter> when prompted to create/confirm the password.

User Password

To set a user password:

1. Select the User Password item and press <Enter>.
2. From the Create New Password box, key in a password, then press <Enter>.
3. Confirm the password when prompted.

To change a user password:

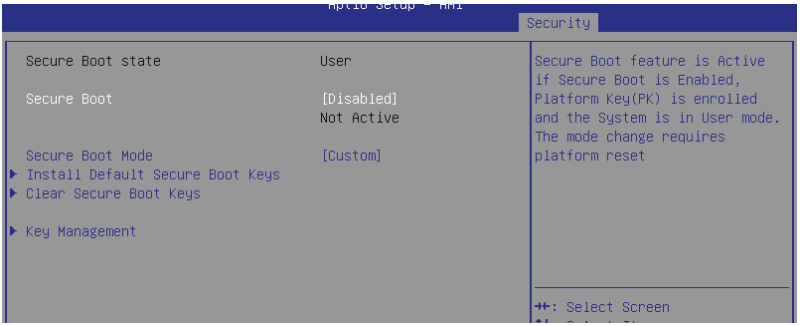
1. Select the User Password item and press <Enter>.
2. From the Enter Current Password box, key in the current password, then press <Enter>.
3. From the Create New Password box, key in a new password, then press <Enter>.
4. Confirm the password when prompted.

To clear a user password:

1. Select the Clear User Password item and press <Enter>.
2. Select **Yes** from the Warning message window then press <Enter>.

4.8.1 Secure Boot

This item allows you to customize the Secure Boot settings.



Secure Boot [Disabled]

Secure Boot feature is active if Secure Boot is Enabled, Platform Key (PK) is enrolled and the system is in User mode. The mode change requires platform reset.
Configuration options: [Disabled] [Enabled]

Secure Boot Mode [Custom]

Allows you to set the Secure Boot selector. In Custom mode, Secure Boot Policy variables can be configured physically by the present user without full authentication.
Configuration options: [Custom] [Standard]

The following items are available only when **Secure Boot Mode** is set to **[Custom]**.

Install Default Secure Boot Keys

This option will load the default secure boot keys, including the PK (Platform key), KEK (key-exchange key), db (signature database), and dbx (revoked signature database). All the secure boot keys states will change from unloaded to loaded. Save changes and reset the system for the changes to take effect.

Clear Secure Boot Keys

This option will delete all previously applied secure boot keys, including the PK (Platform key), KEK (key-exchange key), db (signature database), and dbx (revoked signature database). All the secure boot keys states will change from unloaded to loaded. Save changes and reset the system for the changes to take effect.

Key Management

This item only appears when the item Secure Boot Mode is set to [Custom]. The Key Management item allows you to modify Secure Boot variables and set Key Management page.

Factory Key Provision [Enabled]

Allows you to provision factory default Secure Boot keys when the system is in Setup Mode.
Configuration options: [Disabled] [Enabled]

Install Default Secure Boot Keys

This option will load the default secure boot keys, including the PK (Platform key), KEK (key-exchange key), db (signature database), and dbx (revoked signature database). All the secure boot keys states will change from unloaded to loaded. Save changes and reset the system for the changes to take effect.

Clear Secure Boot Keys

This option will delete all previously applied secure boot keys, including the PK (Platform key), KEK (key-exchange key), db (signature database), and dbx (revoked signature database). All the secure boot keys states will change from unloaded to loaded. Save changes and reset the system for the changes to take effect.

PK Management

Configuration options: [Details] [Save To File] [Set New Key] [Delete key]

KEK Management / DB Management / DBX Management

Configuration options: [Details] [Save To File] [Set New Key] [Append Key] [Delete key]

DB Management / DB Management / DBX Management

Configuration options: [Details] [Save To File] [Set New Key] [Append Key] [Delete key]

DBX Management / DB Management / DBX Management

Configuration options: [Details] [Save To File] [Set New Key] [Append Key] [Delete key]

Authorized TimeStamps / OsRecovery Signatures

Configuration options: [Set New Key] [Append Key]

Save all Secure Boot Variables

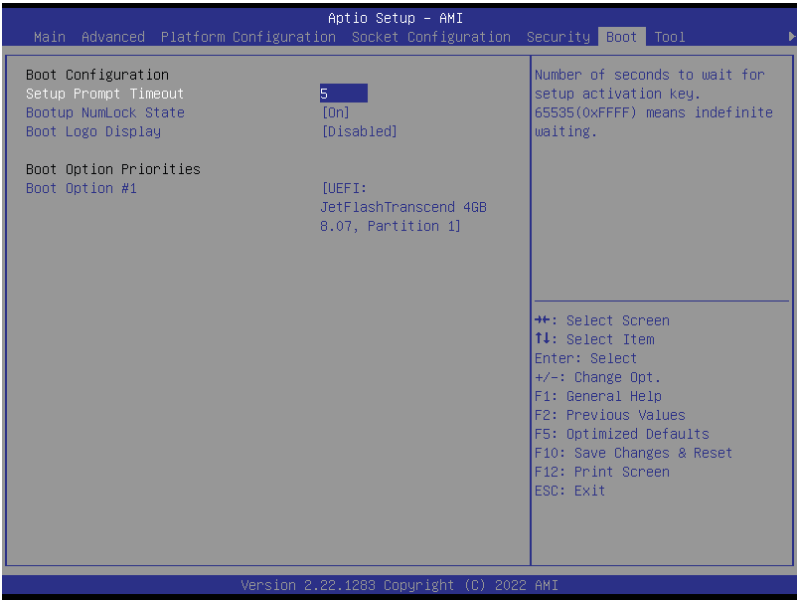
This option will save NVRAM content of Secure Boot policy variables to the file (EFI_SIGNATURE_LIST data format) in root foler on a target file system device.

Enroll Efi Image

This item will allow the image to run in Secure Boot mode. Enroll SHA256 Hash certificate of a PE image into Authorized Signature Database (db).

4.9 Boot menu

The Boot menu items allow you to change the system boot options.



Setup Prompt Timeout [5]

Allows you to set the number of seconds that the firmware waits before initiating the original default boot selection. 65535(0xFFFF) means indefinite waiting. Use the <+> or <-> to adjust the value.

Bootup NumLock State [On]

Allows you to select the power-on state for the NumLock.
Configuration options: [Off] [On]

Boot Logo Display [Disabled]

[Disabled] Hide the logo during POST.

[Enabled] Display the logo during POST.

Boot Option Priorities

These items specify the boot device priority sequence from the available devices. The number of device items that appears on the screen depends on the number of devices installed in the system.

To select the boot device during system startup, press <F11> when logo appears.

4.10 Tool menu

The Tool menu items allow you to configure options for special functions. Select an item then press <Enter> to display the submenu.



Start ASUS EzFlash

Allows you to run ASUS EzFlash BIOS ROM Utility when you press <Enter>. Refer to the ASUS EzFlash Utility section for details.

IPMI Hardware Monitor

Allows you to run the IPMI hardware monitor.

ASUS SMBIOS Viewer

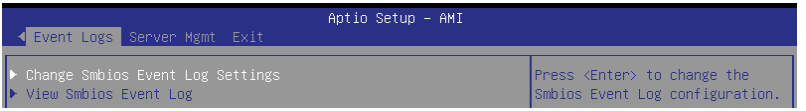
Allows you to start ASUS SMBIOS Viewer when you press <Enter>.

ASUS Storage Viewer

Allows you to start ASUS Storage Viewer when you press <Enter>.

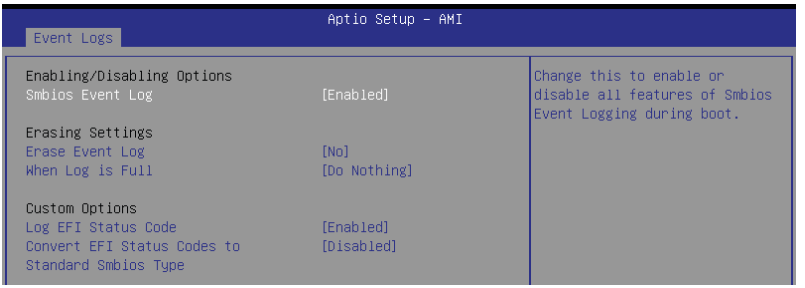
4.11 Event Logs menu

The Event Logs menu items allow you to change the event log settings and view the system event logs.



4.11.1 Change Smbios Event Log Settings

Press <Enter> to view all smbios event logs.



All values changed here do not take effect until computer is restarted.

Enabling/Disabling Options

Smbios Event Log [Enabled]

Change this to enable or disable all features of Smbios Event Logging during boot.
Configuration options: [Disabled] [Enabled]

The following items only appear when **Smbios Event Log** is set to **[Enabled]**.

Erasing Settings

Erase Event Log [No]

Choose options for erasing Smbios Event Log. Erasing is done prior to any logging activation during reset.
Configuration options: [No] [Yes, Next reset] [Yes, Every reset]

When Log is Full [Do Nothing]

Choose options for reactions to a full Smbios Event Log.
Configuration options: [Do Nothing] [Erase Immediately]

Custom Options

Log EFI Status Code [Enabled]

Allows you to enable or disable the logging of EFI Status Codes as OEM reserved type E0 (if not already converted to legacy).
Configuration options: [Disabled] [Enabled]



The following item only appears when **Log EFI Status Code** is set to **[Enabled]**.

Convert EFI Status Codes to Standard Smbios Type [Disabled]

Allows you to enable or disable the converting of EFI Status Codes to Standard Smbios Types (not all may be translated).
Configuration options: [Disabled] [Enabled]

4.11.2 View Smbios Event Log

Press <Enter> to view all smbios event logs.



4.12 Server Mgmt menu

The Server Management menu displays the server management status and allows you to change the settings.



OS Watchdog Timer [Disabled]

This item allows you to start a BIOS timer which can only be shut off by Management Software after the OS loads. Helps determine if the OS successfully loaded or follows the OS Boot Watchdog Timer policy.
Configuration options: [Disabled] [Enabled]

The following items are available only when **OS Watchdog Timer** is set to **[Enabled]**.

OS Wtd Timer Timeout [10]

Allows you to enter a value between 1 to 30 minutes for OS Boot Watchdog Timer Expiration. Not available if OS Boot Watchdog Timer is disabled.
Configuration options: [1] - [30]

OS Wtd Timer Policy [Reset]

This item allows you to configure the how the system should respond if the OS Boot Watch Timer expires. Not available if OS Boot Watchdog Timer is disabled.
Configuration options: [Do Nothing] [Reset] [Power Down] [Power Cycle]

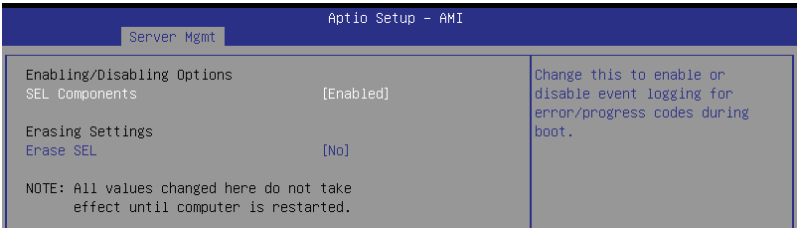
Serial Mux [Disabled]

Allows you to enable or disable Serial Mux configuration.
Configuration options: [Disabled] [Enabled]

4.12.1 System Event Log

Allows you to change the SEL event log configuration.

All values changed here do not take effect until computer is restarted.



SEL Components [Enabled]

Allows you to enable or disable event logging for error/progress codes during boot.
Configuration options: [Disabled] [Enabled]

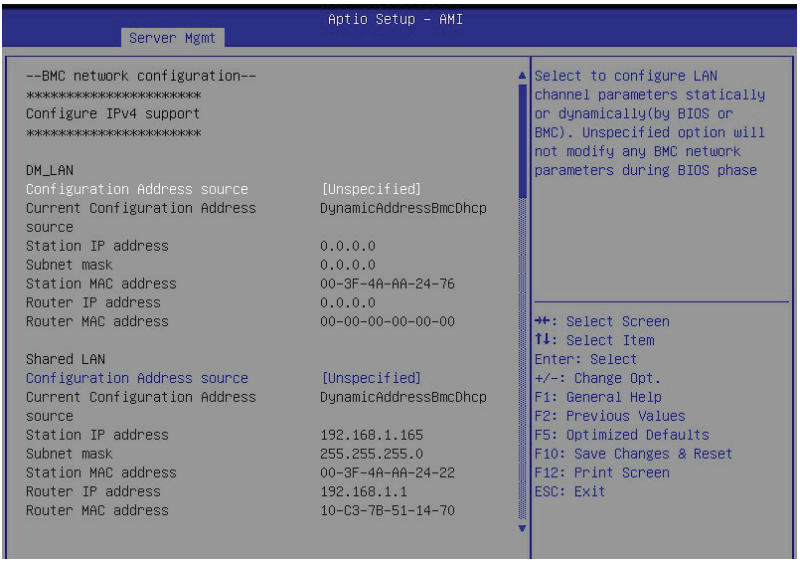
The following item is available only when **SEL Components** is set to **[Enabled]**.

Erase SEL [No]

Allows you to choose options for erasing SEL.
Configuration options: [No] [Yes, On next reset] [Yes, On every reset]

4.12.2 BMC network configuration

The sub-items in this configuration allow you to configure the BMC network parameters. Scroll using <Page Up> / <Page Down> keys to see more items.



Configure IPv4 support

DM_LAN1 / Shared LAN

Configuration Address source [Unspecified]

Allows you to set the LAN channel parameters statically or dynamically (by BIOS or by BMC). **[Previous State]** option will not modify any BMC network parameters during BIOS phase.
Configuration options: [Previous State] [Static] [DynamicBmcDhcp]

The following items are available only when **Configuration Address source** is set to **[Static]**.

Station IP address

Allows you to set the station IP address.

Subnet mask

Allows you to set the subnet mask. We recommend that you use the same Subnet Mask you have specified on the operating system network for the used network card.

Router IP Address

Allows you to set the router IP address.

Router MAC Address

Allows you to set the router MAC address.

Configure IPv6 support

DM_LAN1 / Shared LAN

IPV6 support [Enabled]

Allows you to enable or disable IPV6 support.
Configuration options: [Enabled] [Disabled]

The following items appear only when **IPV6 support** is set to **[Enabled]**.

Configuration Address source [Previous State]

Allows you to set the LAN channel parameters statically or dynamically (by BIOS or by BMC). **[Previous State]** option will not modify any BMC network parameters during BIOS phase.
Configuration options: [Previous State] [Static] [DynamicBmcDhcp]

The following items are available only when **Configuration Address source** is set to **[Static]**.

Station IPV6 address

Allows you to set the station IPV6 address.

Prefix Length

Allows you to set the prefix length (maximum of Prefix Length is 128).

Configuration Router LAN1/2 Address [Previous State]

Allows you to set the LAN channel parameters statically or dynamically (by BIOS or by BMC). Unspecified option will not modify any BMC network parameters during BIOS phase.
Configuration options: [Previous State] [Static] [DynamicBmcDhcp]

The following items are available only when **Configuration Router LAN1/2 Address** is set to **[Static]**.

IPV6 Router1 IP Address

Allows you to set the IPV6 Router1 IP address.

IPV6 Router1 Prefix Length Lan1/2

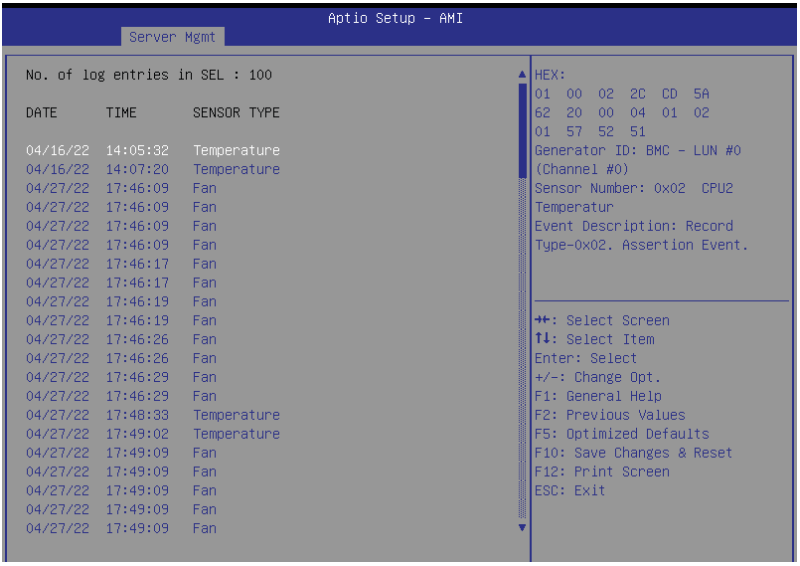
Allows you to set the IPV6 router prefix length (maximum of IPV6 Router Prefix Length is 128).

IPV6 Router1 Prefix Value Lan1/2

Allows you to change the IPV6 router prefix value.

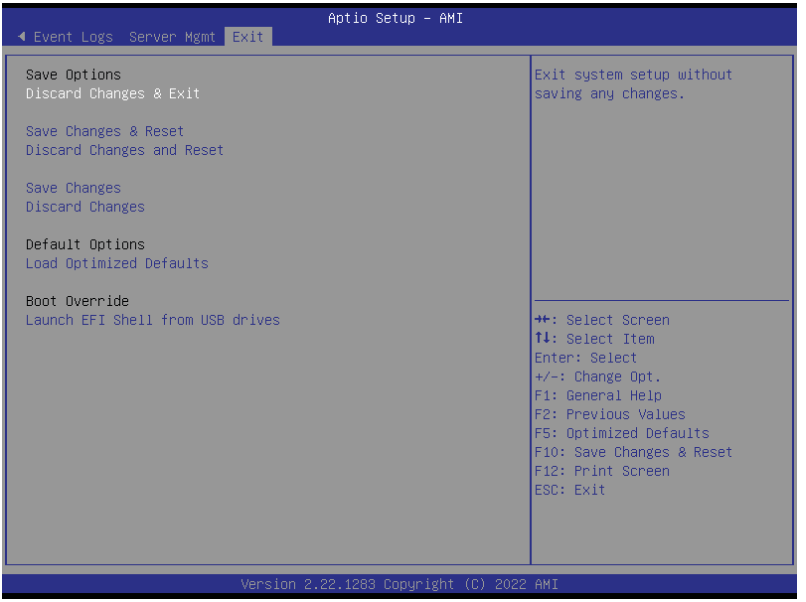
4.12.3 View System Event Log

This item allows you to view the system event log records. Scroll using <Page Up> / <Page Down> keys to see more items.



4.13 Exit menu

The Exit menu items allow you to save or discard your changes to the BIOS items.



Pressing <Esc> does not immediately exit this menu. Select one of the options from this menu or <F10> from the legend bar to exit.

Discard Changes and Exit

Exit system setup without saving any changes.

Save Changes and Reset

Reset system after saving the changes.

Discard Changes and Reset

Reset system setup without saving any changes.

Save Changes

Save changes done so far to any of the setup options.

Discard Changes

Discard changes done so far to any of the setup options.

Load Optimized Defaults

Load optimized default values for all the setup options.

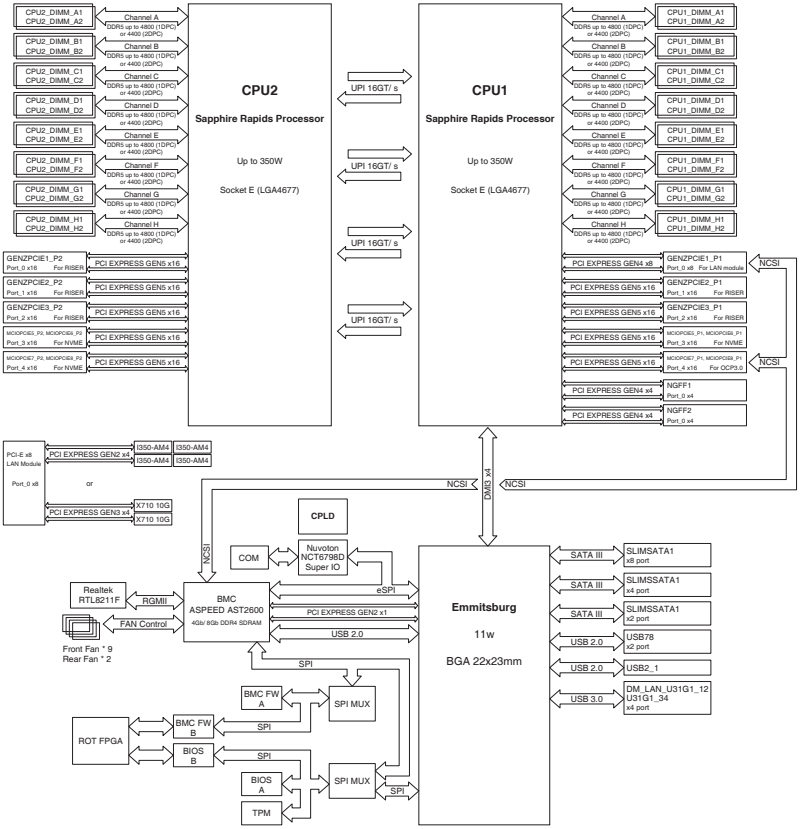
Boot Override

This item displays the available devices. The device items that appears on the screen depends on the number of devices installed in the system. Click an item to start booting from the selected device.

Appendix

This appendix includes additional information that you may refer to when configuring the motherboard.

Z13PP-D32 block diagram



Notices

Federal Communications Commission Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



The use of shielded cables for connection of the monitor to the graphics card is required to assure compliance with FCC regulations. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Compliance Statement of Innovation, Science and Economic Development Canada (ISED)

This device complies with Innovation, Science and Economic Development Canada licence exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

CAN ICES-003(B)/NMB-003(B)

Déclaration de conformité d'Innovation, Sciences et Développement économique Canada (ISED)

Le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CAN ICES-003(B)/NMB-003(B)

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If you require assistance please call ASUS Customer Service 1300 2787 88 or visit us at https://www.asus.com/support/.

Proper disposal



DO NOT throw the mercury-containing button cell battery in municipal waste. This symbol of the crossed out wheeled bin indicates that the battery should not be placed in municipal waste.



The Waste Electrical and Electronic Equipment (WEEE) Directive (Directive 2012/19/EU) is a European Union law that aims to reduce the environmental impact of electrical and electronic equipment. It mandates producers to take responsibility for the end-of-life management of their products, promoting collection, treatment, and recycling to minimize waste and encourage resource recovery.

Do not throw your electrical and electronic equipment in municipal waste.

The symbol of the crossed-out wheeled bin on the product or packaging indicates that this product (including any batteries it contains) must not be disposed of with your household waste.

To prevent potential harm to the environment and human health, a collection framework should be used to return, recycle, and recover waste electrical and electronic equipment (WEEE), and this product has been designed to enable the reuse of parts and facilitate the recycling of certain materials.

Improper disposal may involve risks due to the presence of hazardous substances within electrical and electronic equipment, such as lead and BFR and other harmful components.

Check your local recycling services for electronic products.

(https://esg.asus.com/en/circular-economy/resource-regeneration/global-take-back-service)

Scan or click below for the multi-language update on the WEEE directive:

Declaration of compliance for product environmental regulation

ASUS follows the green design concept to design and manufacture our products, and makes sure that each stage of the product life cycle of ASUS product is in line with global environmental regulations. In addition, ASUS disclose the relevant information based on regulation requirements.

Please refer to https://esg.asus.com/Compliance.htm for information disclosure based on regulation requirements ASUS is complied with:

EU REACH and Article 33

Complying with the REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals) regulatory framework, we publish the chemical substances in our products at ASUS REACH website at https://esg.asus.com/Compliance.htm.

EU RoHS

This product complies with the EU RoHS Directive. For more details, see https://esg.asus.com/Compliance.htm

Japan JIS-C-0950 Material Declarations

Information on Japan RoHS (JIS-C-0950) chemical disclosures is available on https://esg.asus.com/Compliance.htm

India RoHS

This product complies with the "India E-Waste (Management) Rules, 2016" and prohibits use of lead, mercury, hexavalent chromium, polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs) in concentrations exceeding 0.1% by weight in homogenous materials and 0.01% by weight in homogenous materials for cadmium, except for the exemptions listed in Schedule II of the Rule.

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ASUS products sold in Vietnam, on or after September 23, 2011,meet the requirements of the Vietnam Circular 30/2011/TT-BCT.

Các sản phẩm ASUS bán tại Việt Nam, vào ngày 23 tháng 9 năm2011 trở về sau, đều phải đáp ứng các yêu cầu của Thông tư 30/2011/TT-BCT của Việt Nam.

Türkiye RoHS

AEEE Yönetmeliğine Uygundur

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The European Union announced a framework for the setting of ecodesign requirements for energy-related products (2009/125/EC). Specific implementing measures are aimed at improving environmental performance of specific products or across multiple product types. ASUS provides product information at https://esg.asus.com/Compliance.htm.

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Safety Precautions

Accessories that came with this product have been designed and verified for the use in connection with this product. Never use accessories for other products to prevent the risk of electric shock or fire.

安全上のご注意

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HEVC Advance™

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Lietuvių „ASUSTeK Computer Inc.“ šiuo tvirtina, kad šis įrenginys atitinka pagrindinius reikalavimus ir kitas svarbias susijusių direktyvų nuostatas. Visą ES atitikties deklaracijos tekstą galima rasti: www.asus.com/support

Norsk ASUSTeK Computer Inc. erklærer herved at denne enheten er i samsvar med hovedsaklige krav og andre relevante forskrifter i relaterte direktiver. Fullstendig tekst for EU-samsvarserklæringen finnes på: www.asus.com/support

Polski Firma ASUSTeK Computer Inc. niniejszym oświadcza, że urządzenie to jest zgodne z zasadniczymi wymogami i innymi właściwymi postanowieniami powiązanych dyrektyw. Pełny tekst deklaracji zgodności UE jest dostępny pod adresem: www.asus.com/support

Português A ASUSTeK Computer Inc. declara que este dispositivo está em conformidade com os requisitos essenciais e outras disposições relevantes das Diretivas relacionadas. Texto integral da declaração da UE disponível em: www.asus.com/support

Română ASUSTeK Computer Inc. declară că acest dispozitiv se conformează cerinţelor esenţiale şi altor prevederi relevante ale directivelor conexe. Textul complet al declaraţiei de conformitate a Uniunii Europene se găseşte la: www.asus.com/support

Srpski ASUSTeK Computer Inc. ovim izjavljuje da je ovaj uređaj u saglasnosti sa osnovnim zahtevima i drugim relevantnim odredbama povezanih Direktiva. Pun tekst EU deklaracije o usaglašenosti je dostupan da adresi: www.asus.com/support

Slovensky Spoločnosť ASUSTeK Computer Inc. týmto vyhlasuje, že toto zariadenie vyhovuje základným požiadavkám a ostatým príslušným ustanoveniam príslušných smerníc. Celý text vyhlásenia o zhode pre štáty EÚ je dostupný na adrese: www.asus.com/support

Slovenščina ASUSTeK Computer Inc. izjavlja, da je ta naprava skladna z bistvenimi zahtevami in drugimi ustreznimi določbami povezanih direktiv. Celotno besedilo EU-izjave o skladnosti je na voljo na spletnem mestu: www.asus.com/support

Español Por la presente, ASUSTeK Computer Inc. declara que este dispositivo cumple los requisitos básicos y otras disposiciones pertinentes de las directivas relacionadas. El texto completo de la declaración de la UE de conformidad está disponible en: www.asus.com/support

Svenska ASUSTeK Computer Inc. förklarar härmed att denna enhet överensstämmer med de grundläggande kraven och andra relevanta föreskrifter i relaterade direktiv. Fulltext av EU-försäkran om överensstämmelse finns på: www.asus.com/support

Українська ASUSTeK Computer Inc. заявляє, що цей пристрій відповідає основним вимогам та іншим відповідним положенням відповідних Директив. Повний текст декларації відповідності стандартам ЄС доступний на: www.asus.com/support

Türkçe AsusTek Computer Inc., bu aygıtın temel gereksinimlerle ve ilişkili Yönergelerin diğer ilgili koşullarıyla uyumlu olduğunu beyan eder. AB uygunluk bildiriminin tam metni şu adreste bulunabilir: www.asus.com/support

Bosanski ASUSTeK Computer Inc. ovim izjavljuje da je ovaj uređaj usklađen sa bitnim zahtjevima i ostalim odgovarajućim odredbama vezanih direktiva. Cijeli tekst EU izjave o usklađenosti dostupan je na: www.asus.com/support

Simplified UKCA Declaration of Conformity

ASUSTeK Computer Inc. hereby declares that this device is in compliance with the essential requirements and other relevant provisions of related UKCA Directives. Full text of UKCA declaration of conformity is available at: www.asus.com/support

FCC COMPLIANCE INFORMATION

Per FCC Part 2 Section 2.1077

Responsible Party:	**Asus Computer International**
Address:	**48720 Kato Rd., Fremont, CA 94538**
Phone/Fax No:	**(510)739-3777/(510)608-4555**

hereby declares that the product

Product Name :	**Server**
Model Number :	**RS720-E11-RS24U, RS720-E11-RS12U**

compliance statement:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Ver. 180620

Service and Support

Visit our multi-language website at https://www.asus.com/support.

ASUSTeK COMPUTER INC.

Address: 1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112

Phone: +886-2-2894-3447