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STABLE Robust Design, Quality Parts

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Server/Workstation
Motherboard

W890D8-2L2T

User Manual

English



Version 1.10
Published Oct. 2026

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WARNING



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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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



ASRock Rack 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: <http://www.asrockrack.com>



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Please refer to <https://www.asrockrack.com/general/about.asp?cat=Responsibility> for information disclosure based on regulation requirements ASRock Rack is complied with.



DO NOT throw the motherboard in municipal waste. This product has been designed to enable proper reuse of parts and recycling. This symbol of the crossed out wheeled bin indicates that the product (electrical and electronic equipment) should not be placed in municipal waste. Check local regulations for disposal of electronic products.

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Chapter 1 Introduction

Thank you for purchasing ASRock Rack **W890D8-2L2T** motherboard, a reliable motherboard produced under ASRock Rack's consistently stringent quality control. It delivers excellent performance with robust design conforming to ASRock Rack's commitment to quality and endurance.

In this manual, chapter 1 and 2 contains introduction of the motherboard and step-by-step guide to the hardware installation. Chapter 3 and 4 contains the configuration guide to BIOS setup and information of the software support.



Because the motherboard specifications and the BIOS software might be updated, the content of this manual will be subject to change without notice. In case any modifications of this manual occur, the updated version will be available on ASRock Rack website without further notice. Find the latest memory and CPU support lists on ASRock Rack website as well. ASRock Rack's Website: www.ASRockRack.com

*Please visit the website for specific information and technical support:
<http://www.asrockrack.com/support/>*

1.1 Package Contents

- ASRock Rack W890D8-2L2T motherboard
(CEB-like form factor: 12 in x 10.9 in, 304.8 mm x 276.9 mm)
- Quick installation guide
- 1 ATX 4P to 24P power cable (8 cm)
- 1 MCIO X4 to 4 SATA cable (63 cm)
- 1 SATA3 cable (60 cm)
- 1 I/O shield
- 2 Screws for M.2 sockets
- 2 CPU non-fabric carriers (1xE2A, 1xE2B)



If any items are missing or appear damaged, contact the authorized dealer.

1.2 Specifications

W890D8-2L2T	
Physical Status	
Form Factor	CEB-like
Dimension	12 in x 10.9 in (304.8 mm x 276.9 mm)
Processor System	
CPU	Supports Intel® Xeon® 600 processors for workstations
Socket	1 Socket E2 (LGA 4710)
Chipset	Intel® W890
System Memory	
Supported DIMM Quantity	8 DIMM slots (1DPC)
Supported Type	DDR5 RDIMM RDIMM-3DS DDR5 MRDIMM (1DPC only)
Max. Capacity per DIMM	RDIMM: 128 GB RDIMM-3DS: 256 GB MRDIMM: 64 GB
Max. DIMM Frequency	RDIMM/RDIMM-3DS: 6400 MT/s MRDIMM: 8000 MT/s
Voltage	1.1V
<i>Note: Memory support is to be validated.</i>	
PCIe Expansion Slots (SLOT7 close to CPU)	
PCIe x16	SLOT7: PCIe 5.0 / CXL 2.0 x16 SLOT6: PCIe 5.0 / CXL 2.0 x16 SLOT5: PCIe 5.0 / CXL 2.0 x16 SLOT4: PCIe 5.0 / CXL 2.0 x16 SLOT3: PCIe 5.0 / CXL 2.0 x16 SLOT2: PCIe 5.0 / CXL 2.0 x16 SLOT1: PCIe 5.0 / CXL 2.0 x16
Other PCIe Expansion Connectors	
M.2	2 M-key (PCIe 4.0 x4), supports 2280/22110 form factor [PCH]
MCIO	2 MCIO (PCIe 5.0 / CXL 2.0 x8) [CPU] 1 MCIO (PCIe 4.0 x4 or 4 SATA 6 Gb/s) [PCH]
SATA/SAS Storage	
PCH Built-in Storage	Intel® W890 (Up to 8 SATA 6 Gb/s; RAID 0/1/5/10): 1 MCIO for 4 SATA, 4 SATA 7-pin
Ethernet	
Additional GbE Controller	2 RJ45 (10 GbE) by Intel® E610 2 RJ45 (1 GbE) by Intel® I210

Server Management	
BMC Controller	ASPEED AST2600: IPMI2.0 with iKVM and vMedia support
Dedicated IPMI LAN	1 RJ45 dedicated IPMI LAN port by Realtek RTL8211F
Graphics	
Controller	ASPEED AST2600: 1 DB15 (VGA), 1 (15-pin) header
Rear I/O	
UID Button/LED	1 UID button w/ LED
Video Port	1 DB15 (VGA)
USB Port	2 Type A (USB 3.2 Gen1)
LAN Port	2 RJ45 (10 GbE), 2 RJ45 (1 GbE), 1 dedicated IPMI
Internal Connectors/Headers	
Power Connector	1 Micro-Fit (4-pin, ATX PSU signal) w/ ATX 24-pin adapter cable, 4 (8-pin, ATX 12V)
Auxiliary Panel Header	1 (18-pin): chassis intrusion, system fault LED, LAN activity LEDs, locate, SMBus
System Panel Header	1 (9-pin): power switch, reset switch, system power LED, HDD activity LED
NMI Header	1
COM Header	1 (9-pin)
VGA Header	1 (15-pin)
Speaker Header	1 (4-pin)
Fan Header	2 (6-pin), 6 (4-pin)
Thermal Sensor Header	2
TPM Header	1 (13-pin, SPI)
Front Lan LED Header	1
VROC Header	1
SGPIO Header	1
SMBus Header	2
PMbus Header	1
IPMB Header	1
USB Header	1 (19-pin, 2 USB 3.2 Gen1)
Clear CMOS	1 (contact pads)
Others	2 TGPIO headers
LED Indicators	
Standby Power LED	1 (5VSB)
80 Debug Port LED	1
Fan Fail LED	8
BMC Heartbeat LED	1
CPU Caterr LED	1

System BIOS	
Type	AMI 512Mb SPI Flash ROM
Features	Plug and Play, ACPI 5.0 (and above) compliance wake-up events, SMBIOS 3.7.0 and above, ASRock Rack Instant Flash
Hardware Monitor	
Temperature	CPU, MB, card side, M.2, RAM, 2 TR temperature sensing
Fan	Fan tachometer CPU quiet fan (Allow chassis fan speed auto-adjust by CPU temperature.) Fan multi-speed control
Voltage	1.8V_PCH, 1.05V_PCH, 0.82V_PCH, +BAT, PVNN_CPU, PVCC3P3_CPU, PVCCFA_CPU, PVCCIN_CPU, FAON_CPU, FIVRA_CPU, PVCCD_CPU 3.3V, 12V, 3.3VSB, 5VSB, +12V
Supported OS	
OS	<p>Microsoft® Windows®</p> <ul style="list-style-type: none"> - Windows 10 (64 bit) - Windows 11 (64 bit) <p>Linux®</p> <ul style="list-style-type: none"> - Red Hat Enterprise Linux Server 9.7 (64 bit) / 10.1 (64 bit) - SUSE SLE 15.7 (64 bit) / 16 (64 bit) - Ubuntu 24.04.4 (64 bit) / 25.04 (64 bit) <p><i>* Please refer to the website for the latest OS support list.</i> <i>* Ubuntu 24.04.4 & 25.04 Raid Mode support Server OS.</i> <i>* M.2 does not support Raid Mode</i></p>
Environment	
Temperature	<p>Operating temperature: 10°C ~ 35°C</p> <p>Non-operating temperature: -40°C ~ 70°C</p>
Humidity	Non-operating humidity: 20% ~ 90% (non-condensing)

NOTE: Please refer to the website for the latest specifications.



This motherboard supports Wake from on Board LAN. To use this function, please make sure that the "Wake on Magic Packet from power off state" is enabled in Device Manager > Intel® Ethernet Connection > Power Management. And the "PCI Devices Power On" is enabled in UEFI SETUP UTILITY > Advanced > ACPI Configuration. After that, onboard LAN1&2 can wake up S5 under OS.

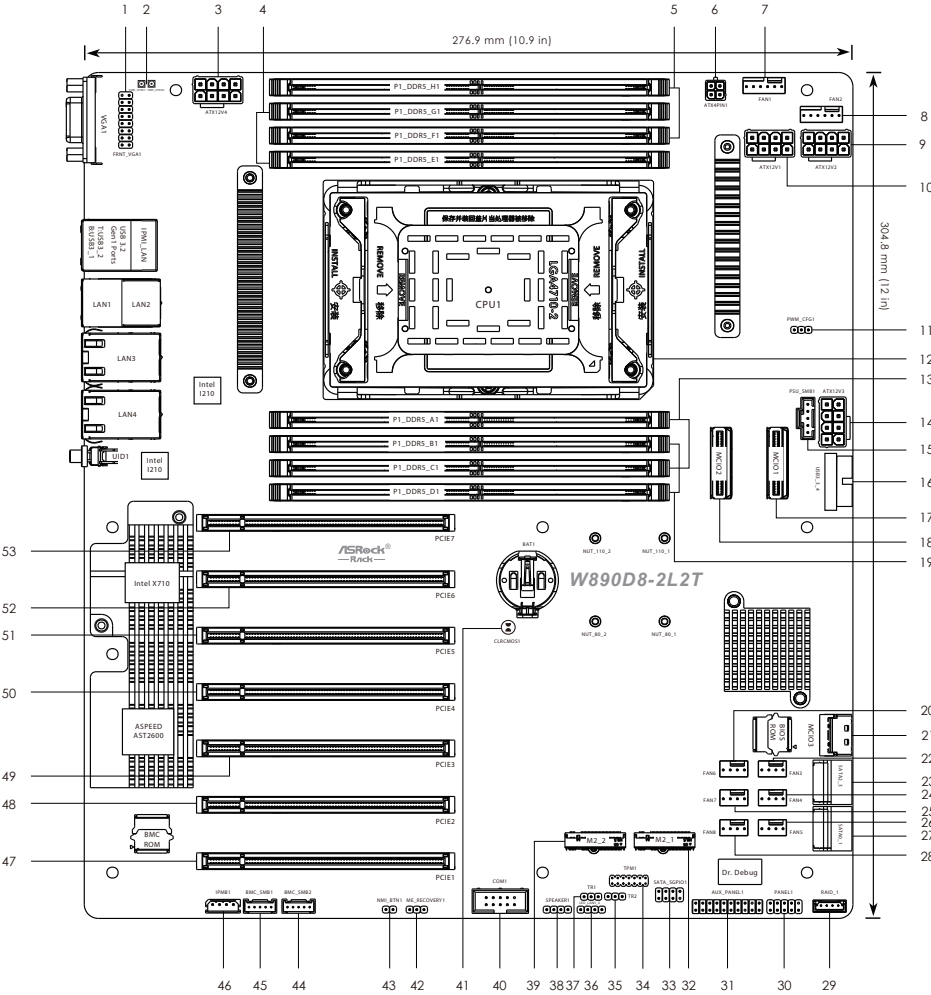


If installing Intel® LAN utility or Marvell SATA utility, this motherboard may fail Windows® Hardware Quality Lab (WHQL) certification tests. If installing the drivers only, it will pass the WHQL tests.

1.3 Unique Features

ASRock Rack Instant Flash is a BIOS flash utility embedded in Flash ROM. This convenient BIOS update tool allows user to update system BIOS without entering operating systems first like MS-DOS or Windows*. With this utility, press the <F6> key during the POST or the <F2> key to enter into the BIOS setup menu to access ASRock Rack Instant Flash. Just launch this tool and save the new BIOS file to the USB flash drive, floppy disk or hard drive, then update the BIOS only in a few clicks without preparing an additional floppy diskette or other complicated flash utility. Please be noted that the USB flash drive or hard drive must use FAT32/16/12 file system.

1.4 Motherboard Layout

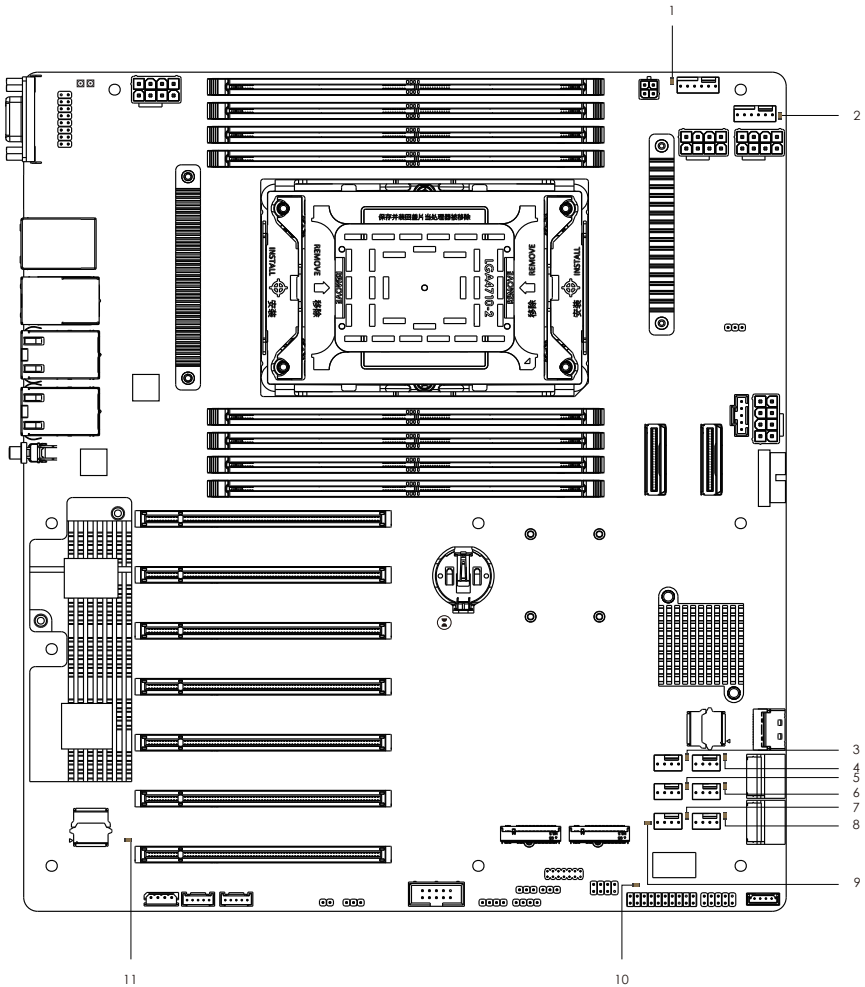


No.	Description
1	Front VGA Header (FRNT_VGA1)
2	TIME-aware SYNC Headers (TIME_SYNC0/1)
3	ATX 12V Power Connector (ATX12V4)
4	2 x 288-pin DDR5 DIMM Slots (P1_DDR5_E1, P1_DDR5_G1)*
5	2 x 288-pin DDR5 DIMM Slots (P1_DDR5_F1, P1_DDR5_H1)*
6	Micro-Fit ATX 4Pin Power Connector (ATX4PIN1)
7	System Fan Header (FAN1)
8	System Fan Header (FAN2)
9	ATX 12V Power Connector (ATX12V2)
10	ATX 12V Power Connector (ATX12V1)
11	PWM Configuration Header (PWM_CFG1)
12	LGA 4710 CPU Socket (CPU1)
13	2 x 288-pin DDR5 DIMM Slots (P1_DDR5_A1, P1_DDR5_C1)*
14	ATX 12V Power Connector (ATX12V3)
15	PSU SMBus Header (PSU_SMB1)
16	USB 3.2 Gen1 Header (USB3_3_4)
17	Mini Cool Edge IO Connector (MCIO1)
18	Mini Cool Edge IO Connector (MCIO2)
19	2 x 288-pin DDR5 DIMM Slots (P1_DDR5_B1, P1_DDR5_D1)*
20	System Fan Header (FAN6)
21	Mini Cool Edge IO Connector (MCIO3)
22	System Fan Header (FAN3)
23	SATA3 Connectors (SATA2)(Lower), (SATA3)(Upper),
24	System Fan Header (FAN4)
25	System Fan Header (FAN7)
26	System Fan Header (FAN5)
27	SATA3 Connectors (SATA0)(Lower), (SATA1)(Upper)
28	System Fan Header (FAN8)
29	Virtual RAID On CPU Header (RAID_1)
30	System Panel Header (PANEL1)
31	Auxiliary Panel Header (AUX_PANEL1)
32	M-key M.2 Socket (M2_1) (Type 2280/22110)
33	SATA SGPIO Connector (SATA_SGPIO1)
34	SPI TPM Header (TPM1)

No.	Description
35	Thermal Sensor Header (TR2)
36	Front LAN LED Header (LED_LAN3_4)
37	Thermal Sensor Header (TR1)
38	Speaker Header (SPEAKER1)
39	M-key M.2 Socket (M2_2) (Type 2280/22110)
40	Serial Port Header (COM1)
41	Clear CMOS Pad (CLRCMOS1)
42	ME Recovery Jumper (ME_RECOVERY1)
43	Non Maskable Interrupt Button (NMI_BTN1)
44	BMC SMBus Header (BMC_SMB2)
45	BMC SMBus Header (BMC_SMB1)
46	Intelligent Platform Management Bus Header (IPMB1)
47	PCIe5.0 x16 Slot (PCIE1)
48	PCIe5.0/CXL 2.0 x16 Slot (PCIE2)
49	PCIe5.0/CXL 2.0 x16 Slot (PCIE3)
50	PCIe5.0/CXL 2.0 x16 Slot (PCIE4)
51	PCIe5.0/CXL 2.0 x16 Slot (PCIE5)
52	PCIe5.0/CXL 2.0 x16 Slot (PCIE6)
53	PCIe5.0/CXL 2.0 x16 Slot (PCIE7)

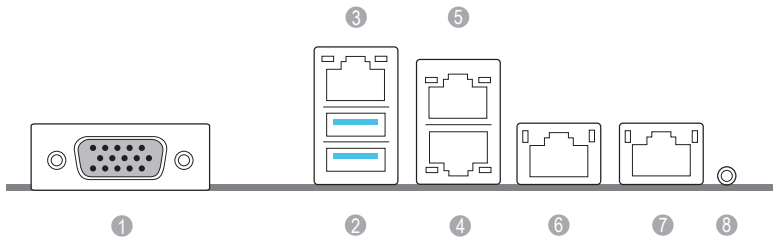
**For DIMM installation and configuration instructions, please see p.22 (Installing the Memory Modules (DIMM)) for more details.*

1.5 Onboard LED Indicators



No.	Item	Status	Description
1	LED_FAN1	Red	FAN1 failed
2	LED_FAN2	Red	FAN2 failed
3	LED_FAN6	Red	FAN6 failed
4	LED_FAN3	Red	FAN3 failed
5	LED_FAN7	Red	FAN7 failed
6	LED_FAN4	Red	FAN4 failed
7	LED_FAN8	Red	FAN8 failed
8	LED_FAN5	Red	FAN5 failed
9	LED_CATERR1	Red	CPU CATERR failed
10	SB_PWR1	Green	STB PWR ready
11	BLED1	Blinking four times and then off	Start initialization after AC power-on or BMC reset
		Blinking at 1Hz	BMC ready
		Steady on	Error
		Steady off	(The actual behavior depends on the state at the time of failure.)
		Other frequency	

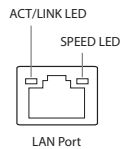
1.6 I/O Panel



No.	Description	No.	Description
1	VGA Port (VGA1)	5	1G LAN RJ45 Port (LAN2)**
2	USB 3.2 Gen1 Ports (USB3_1_2)	6	10G LAN RJ45 Port (LAN3)***
3	LAN RJ45 Port (IPMI_LAN)*	7	10G LAN RJ45 Port (LAN4)***
4	1G LAN RJ45 Port (LAN1, shared NIC)**	8	UID Switch (UID1)

LAN Port LED Indications

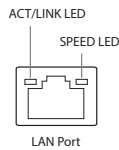
*There are two LEDs on the IPMI LAN port specified for link activity and speed. Please refer to the table below for the LAN port LED indications.



IPMI LAN Port LED Indications

Activity / Link LED		Speed LED	
Status	Description	Status	Description
Off	No link	Off	10 Mbps connection or no link
Blinking Yellow	Data activity	Yellow	100 Mbps connection
On	Link	Green	1 Gbps connection

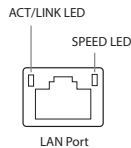
**There are two LEDs on the 1G LAN port specified for link activity and speed. Please refer to the table below for the LAN port LED indications.



1G LAN Port LED Indications

Activity / Link LED		Speed LED	
Status	Description	Status	Description
Off	No link	Off	10 Mbps connection or no link
Blinking Orange	Data activity	Yellow	100 Mbps connection
On	Link	Green	1 Gbps connection

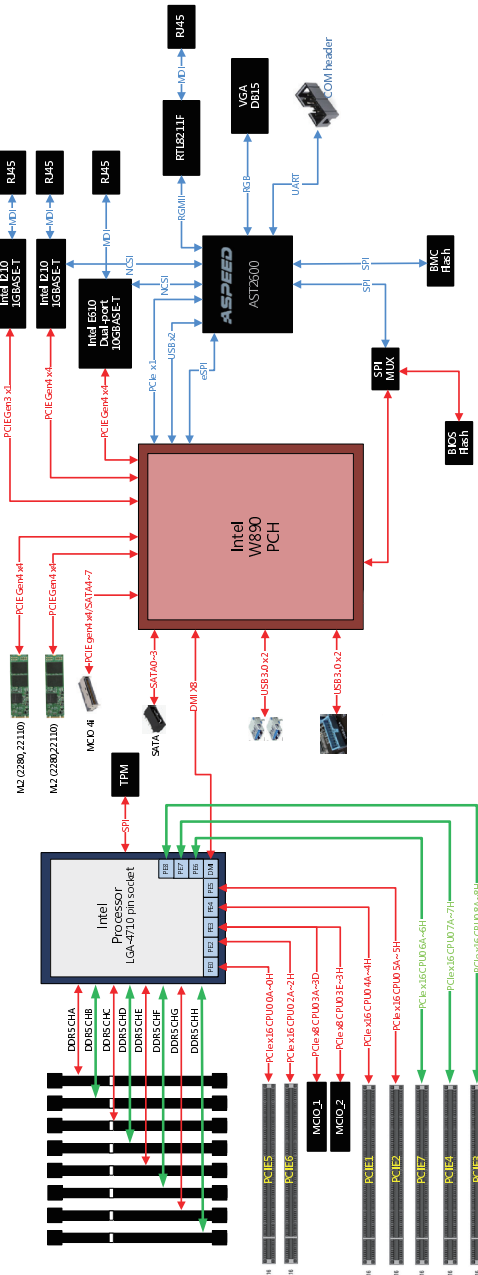
***There are two LEDs on the 10G LAN port specified for link activity and speed. Please refer to the table below for the LAN port LED indications.



10G LAN Port LED Indications

Activity / Link LED		Speed LED	
Status	Description	Status	Description
Off	No link	Off	100 Mbps connection or no link
Blinking Green	Data activity	Yellow	1 Gbps connection
On	Link	Green	10 Gbps connection

1.7 Block Diagram



Chapter 2 Installation

This is a CEB-like form factor (304.8 mm x 276.9 mm) motherboard. Before installing the motherboard, study the configuration of the chassis to ensure that the motherboard fits into it.



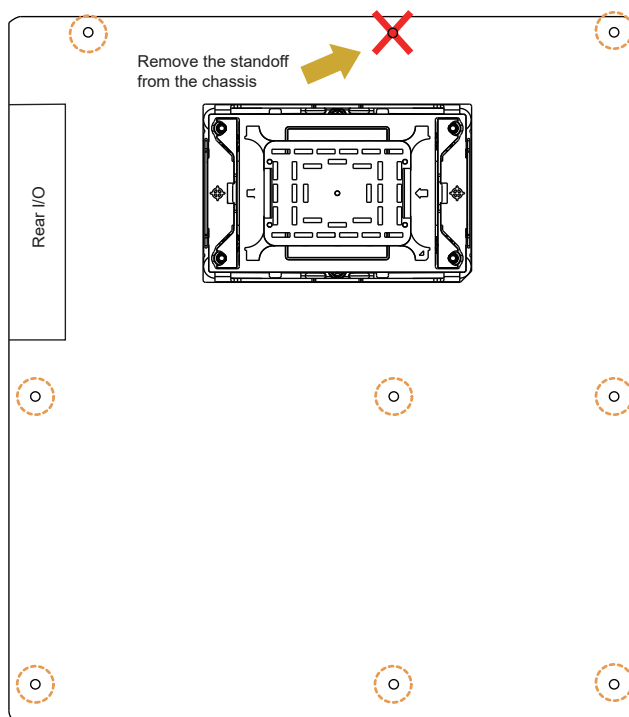
1. Ensure the motherboard battery is installed before unplugging the power cord or installing/removing the motherboard.
2. Before installing or removing any component, ensure that the power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, and/or components.

2.1 Screw Holes

Place screws into the holes indicated by circles to secure the motherboard to the chassis.



Attention! Before installing this motherboard, be sure to unscrew and remove the standoff at the marked location, under the motherboard, from the chassis, in order to avoid electrical short circuit and motherboard damages.



2.2 Pre-installation Precautions

Take note of the following precautions before installing motherboard components or change any motherboard settings.

1. Unplug the power cord from the wall socket before touching any components.
2. To avoid damaging the motherboard's components due to static electricity, NEVER place the motherboard directly on the carpet or the like. Also remember to use a grounded wrist strap or touch a safety grounded object before handling the components.
3. Hold components by the edges and do not touch the ICs.
4. Whenever uninstall any component, place it on a grounded anti-static pad or in the bag that comes with the component.
5. When placing screws into the screw holes to secure the motherboard to the chassis, please do not over-tighten the screws! Doing so may damage the motherboard.

2.3 Installing the CPU and Heatsink

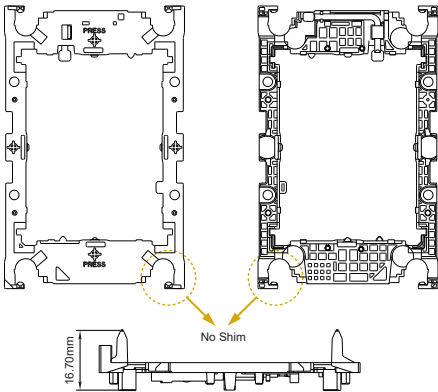


1. Unplug all power cables before installing the CPU.
2. Illustration in this documentation are examples only.

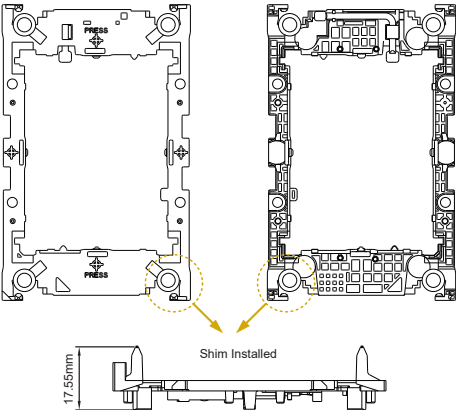
Carrier Used

Carrier Type	Xeon® SP XCC	Xeon® SP HCC/LCC/HDCC
Carrier Code	E2A	E2B
Shim	No	Yes
Carrier Height	16.70 mm	17.55 mm

XCC Carrier



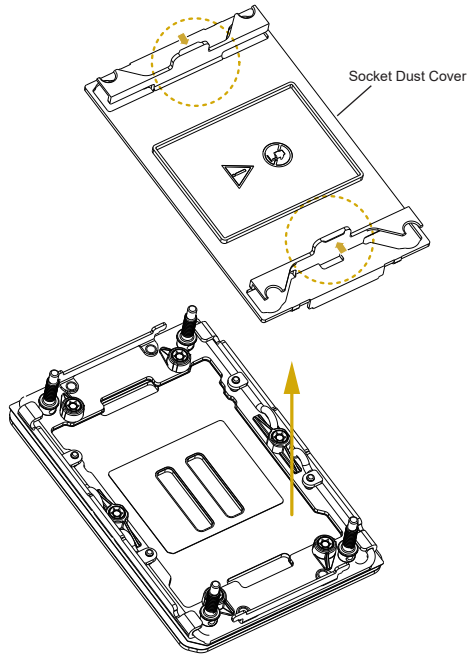
HCC/LCC/HDCC Carrier





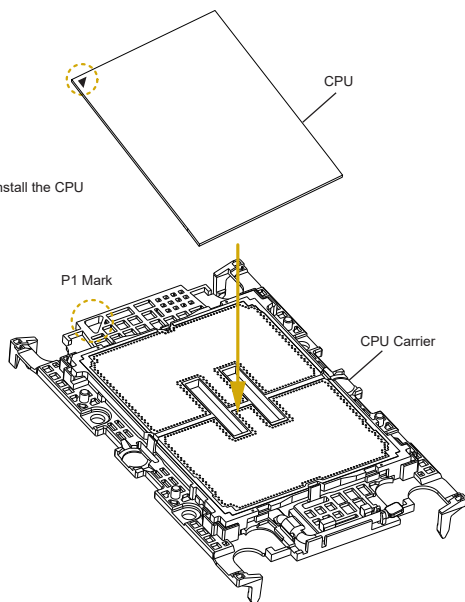
1. Before inserting the CPU into the socket, please check if the PnP cap is on the socket, if the CPU surface is unclean, or if there are any bent pins in the socket. Do not force to insert the CPU into the socket if above situation is found. Otherwise, the CPU will be seriously damaged.
2. Unplug all power cables before installing the CPU.

1

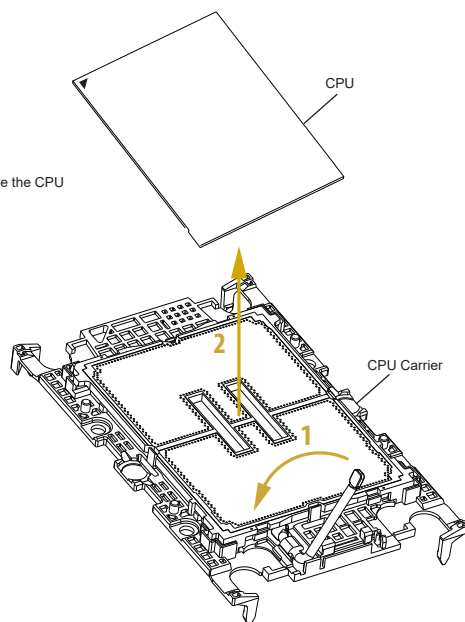


2

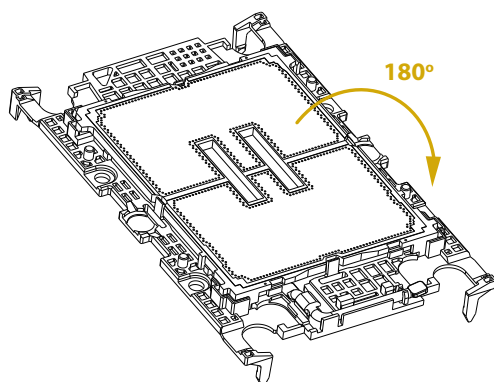
Installing CPU:
Align the Pin1 mark to install the CPU



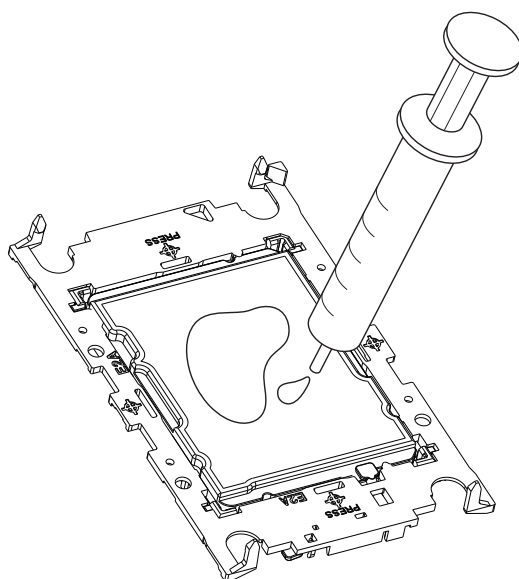
Removing CPU:
Press the lever to remove the CPU



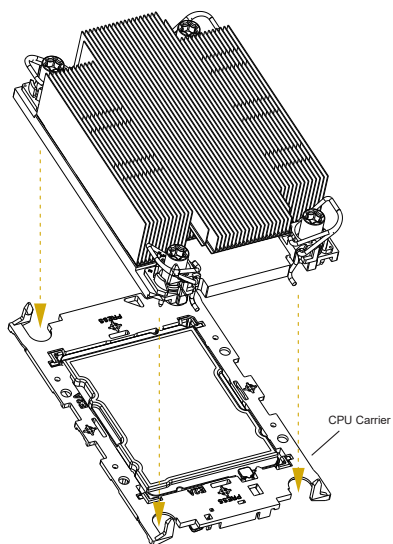
3



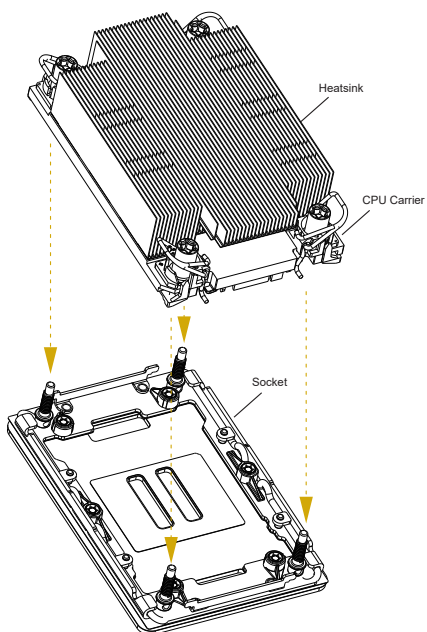
4

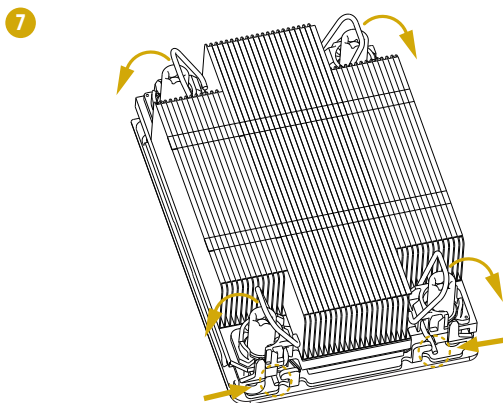
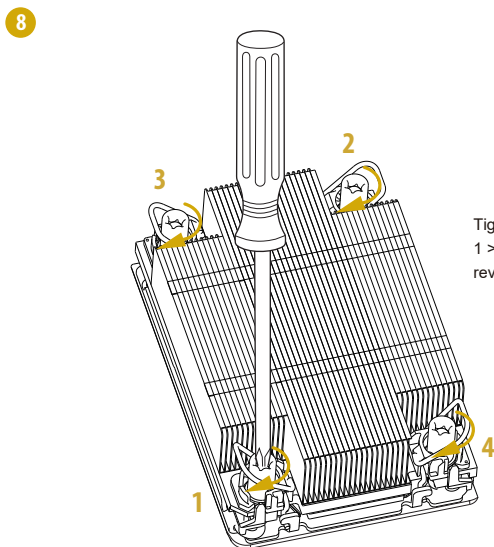


5



6





Tighten the screws in a sequential order
 $1 > 2 > 3 > 4$. Loosen the screws in a
 reverse order.



Please avoid using push-pin type CPU coolers, as the PCB thickness may prevent proper installation. A screw-based mounting system is recommended for a secure and reliable fit.

2.4 Installing the Memory Modules (DIMM)

This motherboard provides eight 288-pin DDR5 (Double Data Rate 5) DIMM slots in two groups, and supports Single Channel Memory Technology.

CPU1							
P1_DDR5_A1, B1, C1, D1				P1_DDR5_E1, F1, G1, H1			



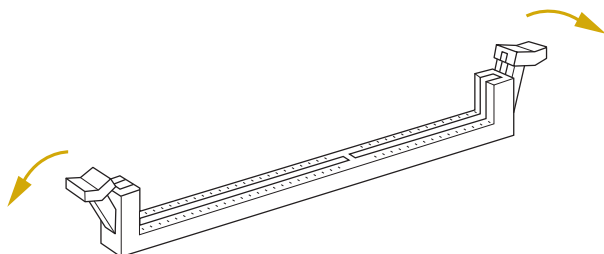
1. Before installing a memory module, make sure to turn off the computer and unplug the powercord from the power outlet to prevent damage to the memory module.
2. For the memory configuration, it always needs to install identical (the same brand, speed, size and chip-type) DDR5 DIMM groups.
3. It is not allowed to install a DDR, DDR2, DDR3 or DDR4 memory module into a DDR5 slot; otherwise, this motherboard and DIMM may be damaged.

Recommended Memory Configurations

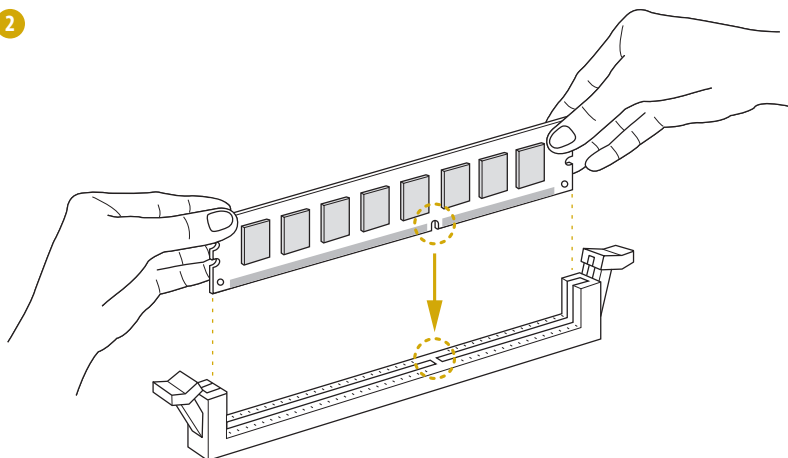
	CPU1							
	A1	B1	C1	D1	E1	F1	G1	H1
1 DIMM	V							
4 DIMMS	V		V		V		V	
8 DIMMS	V	V	V	V	V	V	V	V

The symbol V indicates the slot is populated.

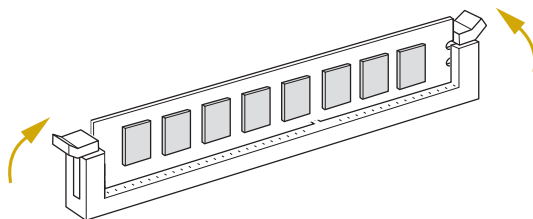
1



2



3



2.5 Expansion Slots (PCI Express Slots)

There are 7 PCI Express slots on this motherboard.

PCIe slots:

PCIE1 (PCIe 5.0/CXL 2.0 x16 slot, from CPU1) is used for PCIe x16 lane width cards.

PCIE2 (PCIe 5.0/CXL 2.0 x16 slot, from CPU1) is used for PCIe x16 lane width cards.

PCIE3 (PCIe 5.0/CXL 2.0 x16 slot, from CPU1) is used for PCIe x16 lane width cards.

PCIE4 (PCIe 5.0/CXL 2.0 x16 slot, from CPU1) is used for PCIe x16 lane width cards.

PCIE5 (PCIe 5.0/CXL 2.0 x16 slot, from CPU1) is used for PCIe x16 lane width cards.

PCIE6 (PCIe 5.0/CXL 2.0 x16 slot, from CPU1) is used for PCIe x16 lane width cards.

PCIE7 (PCIe 5.0/CXL 2.0 x16 slot, from CPU1) is used for PCIe x16 lane width cards.

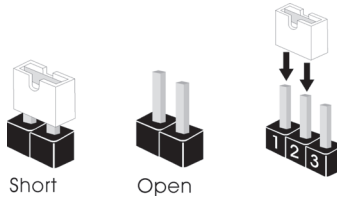
Slot	Generation	Mechanical	Electrical	Source
PCIE1	5.0	x16	x16	CPU1
PCIE2	5.0	x16	x16	CPU1
PCIE3	5.0	x16	x16	CPU1
PCIE4	5.0	x16	x16	CPU1
PCIE5	5.0	x16	x16	CPU1
PCIE6	5.0	x16	x16	CPU1
PCIE7	5.0	x16	x16	CPU1

Installing an expansion card

- Step 1. Before installing an expansion card, please make sure that the power supply is switched off or the power cord is unplugged. Please read the documentation of the expansion card and make necessary hardware settings for the card before starting the installation.
- Step 2. Remove the system unit cover (if the motherboard is already installed in a chassis).
- Step 3. Remove the bracket facing the slot that intending to use. Keep the screws for later use.
- Step 4. Align the card connector with the slot and press firmly until the card is completely seated on the slot.
- Step 5. Fasten the card to the chassis with screws.
- Step 6. Replace the system cover.

2.6 Jumper Setup

The illustration shows how jumpers are setup. When the jumper cap is placed on the pins, the jumper is “Short”. If no jumper cap is placed on the pins, the jumper is “Open”. The illustration shows a 3-pin jumper whose pin1 and pin2 are “Short” when a jumper cap is placed on these 2 pins.



ME Recovery Jumper
(3-pin ME_RECOVERY1)
(see p.6, No. 42)



ME Force Update



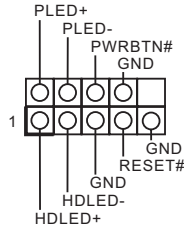
Normal (Default)

2.7 Onboard Headers and Connectors



Onboard headers and connectors are NOT jumpers. Do NOT place jumper caps over these headers and connectors. Placing jumper caps over the headers and connectors will cause permanent damage to the motherboard.

System Panel Header
(9-pin PANEL1)
(see p.6, No. 30)



Connect the power switch, reset switch and system status indicator on the chassis to this header according to the pin assignments. Particularly note the positive and negative pins before connecting the cables.



PWRBTN (Power Switch):
Connect to the power switch on the chassis front panel. Configure the way to turn off the system using the power switch.

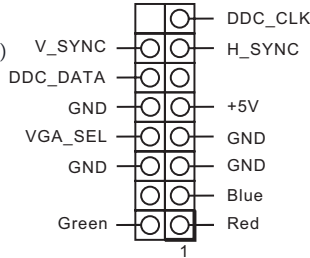
RESET (Reset Switch):
Connect to the reset switch on the chassis front panel. Press the reset switch to restart the computer if the computer freezes and fails to perform a normal restart.

PLED (System Power LED):
Connect to the power status indicator on the chassis front panel. The LED is on when the system is operating. The LED is off when the system is in S4 sleep state or powered off (S5).

HDLED (Hard Drive Activity LED):
Connect to the hard drive activity LED on the chassis front panel. The LED is on when the hard drive is reading or writing data.

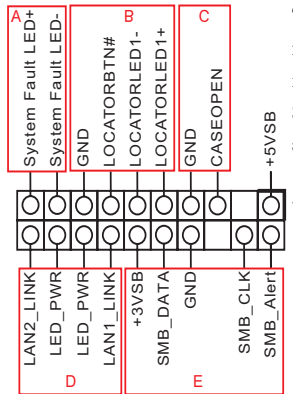
The front panel design may differ by chassis. A front panel module mainly consists of power switch, reset switch, power LED, hard drive activity LED, speaker and etc. When connecting the chassis front panel module to this header, make sure the wire assignments and the pin assignments are matched correctly.

Front VGA Header
(15-pin FRNT_VGA1)
(see p.6, No. 1)



Please connect either end of VGA_2X8 cable to VGA header.

Auxiliary Panel Header
(18-pin AUX_PANEL1)
(see p.6, No. 31)



This header supports multiple functions on the front panel, including the front panel SMB, internet status indicator and chassis intrusion pin.



A. System Fault LED (2-pin SYSTEM STATUS)
This header is for the Fault LED on the system.

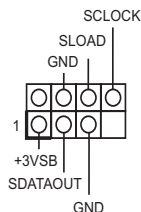
B. Locator LED (4-pin LOCATOR)
This header is for the locator switch and LED on the front panel.

C. Chassis intrusion pin (2-pin CHASSIS)
This header is provided for host computer chassis with chassis intrusion detection designs. In addition, it must also work with external detection equipment, such as a chassis intrusion detection sensor or a microswitch. When this function is activated, if any chassis component movement occurs, the sensor will immediately detect it and send a signal to this header, and the system will then record this chassis intrusion event. The default setting is set to the CASEOPEN and GND pin; this function is off.

D. Internet status indicator (2-pin LAN1_LED, LAN2_LED)
These headers allow user to use the Gigabit internet indicator cable to connect to the LAN status indicator. When this indicator flickers, it means that the internet is properly connected.

E. Front panel SMBus connecting pin (6-1 pin FPSMB)
This header allows user to connect SMBus (System Management Bus) equipment. It can be used for communication between peripheral equipment in the system, which has slower transmission rates, and power management equipment.

SATA SGPIO Connectors
(7-pin SATA_SGPIO1)
(see p.6, No. 33)



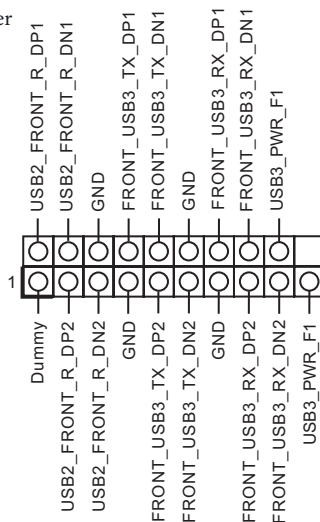
The header supports Serial Link interface for onboard SATA connections.

USB 3.2 Gen1 Header

Right-Angle:

(19-pin USB3_3_4)

(see p.6, No. 16)

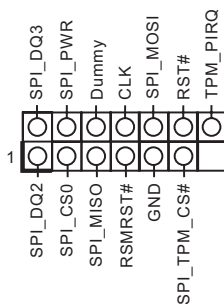


Besides two default USB 3.2 Gen1 ports on the I/O panel, there is one USB 3.2 Gen1 header on this motherboard. This USB 3.2 Gen1 header can support two USB 3.2 Gen1 ports.

SPI TPM Header

(13-pin TPM1)

(see p.6, No. 34)

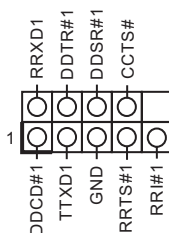


This connector supports Trusted Platform Module (TPM) system for SPI interface, which can securely store keys, digital certificates, passwords, and data. A TPM system also helps enhance network security, protects digital identities, and ensures platform integrity.

Serial Port Header

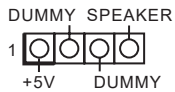
(9-pin COM1)

(see p.6, No. 40)



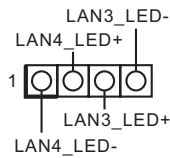
This COM header supports a serial port module.

Chassis Speaker Header
(4-pin SPEAKER1)
(see p.6, No. 38)



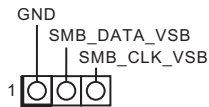
Please connect the chassis speaker to this header.

Front LAN LED Header
(LED_LAN3_4)
(see p.6, No. 36)



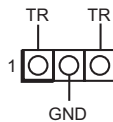
This 4-pin header is used for the front LAN status indicator.

PWM Configuration Header
(3-pin PWM_CFG1)
(see p.6, No. 11)



The header is used for PWM configurations.

Thermal Sensor Headers
(3-pin TR1)
(see p.6, No. 37)
(3-pin TR2)
(see p.6, No. 35)



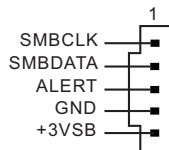
Please connect the thermal sensor cable to either pin 1-2 or pin 2-3 and the other end to the device to monitor the temperature.

Non Maskable Interrupt Button Header
(NMI_BTN1)
(see p.6, No. 43)



Please connect a NMI device to this header.

PSU SMBus Header
(5-pin PSU_SMB1)
(see p.6, No. 15)



PSU SMBus monitors the status of the power supply, fan and system temperature.

ATX 12V Power

Connectors

(8-pin ATX12V1)

(see p.6, No. 9)

(8-pin ATX12V2)

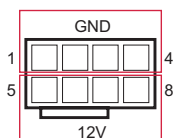
(see p.6, No. 10)

(8-pin ATX12V4)

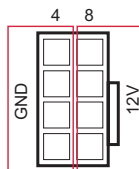
(see p.6, No. 3)

(8-pin ATX12V3)

(see p.6, No. 14)



This motherboard provides four 8-pin ATX 12V power connectors.



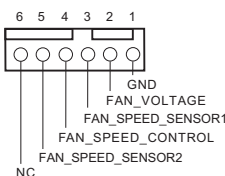
System Fan Headers

(6-pin FAN1)

(see p.6, No. 7)

(6-pin FAN2)

(see p.6, No. 8)



Please connect fan cables to the fan connectors and match the black wire to the ground pin. All fans support Fan Control.

6-PIN FAN: The max. current is 5A and the max. power is 60 Watts.

(4-pin FAN3)

(see p.6, No. 22)

(4-pin FAN4)

(see p.6, No. 24)

(4-pin FAN5)

(see p.6, No. 26)

(4-pin FAN6)

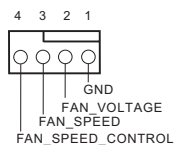
(see p.6, No. 20)

(4-pin FAN7)

(see p.6, No. 25)

(4-pin FAN8)

(see p.6, No. 28)



4-PIN FAN: The max. current is 4A and the max. power is 48 Watts.

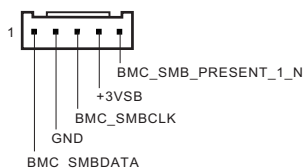
BMC SMB Headers

(5-pin BMC_SMB1)

(see p.6, No. 45)

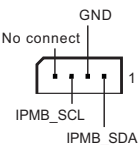
(5-pin BMC_SMB2)

(see p.6, No. 44)



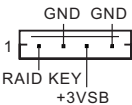
The header is used for the SMBUS devices.

Intelligent Platform
Management Bus Header
(4-pin IPMB1)
(see p.6, No. 46)



This 4-pin connector is used to provide a cabled base-board or front panel connection for value added features and 3rd-party add-in cards, such as Emergency Management cards, that provide management features using the IPMB.

Virtual RAID On CPU
Header
(4-pin RAID_1)
(see p.6, No. 29)



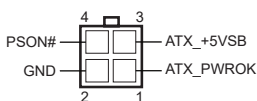
This connector supports Intel® Virtual RAID on CPU and NVME/AHCI RAID on CPU PCIE.

With the introduction of the Intel VROC product, there are three modes of operation:

SKU	HW key required	Key features
Pass-thru	Not needed	<ul style="list-style-type: none">• Pass-thru only (no RAID)• LED Management• Hot Plug Support• RAID 0 support for Intel Fultondale NVMe SSDs
Standard	VROCSTANMOD	<ul style="list-style-type: none">• Pass-thru SKU features• RAID 0, 1, 10
Premium	VROCPREMMOD	<ul style="list-style-type: none">• Standard SKU features• RAID 5
ISS	VROCISSDMOD	<ul style="list-style-type: none">• RAID 5 Write Hole Closure

*Only Intel SSDs are supported.
*For further details on VROC, please refer to the official information released by Intel.

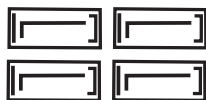
Micro-Fit ATX 4Pin
Power Connector
(4-pin ATX4PIN1
(ATX 24pin-to-4pin))
(see p.6, No. 6)



The motherboard provides one 4-pin power/signal connector which is a required input for ATX power source.

When using ATX power, it is necessary to use a 24pin-to-4pin power cable to connect between the 24pin power connector of PSU and the ATX4PIN1 connector on the motherboard for power supply and signal communication.

Serial ATA3 Connectors
(SATA0_1)
(see p.6, No. 27)
(SATA2_3)
(see p.6, No. 23)



These SATA3 connectors support SATA data cables for internal storage devices with up to 6.0 Gb/s data transfer rate.

Clear CMOS Pad
(CLRCMOS1)
(see p.6, No. 41)



This allows user to clear the data in CMOS. To clear CMOS, take out the CMOS battery and short the Clear CMOS Pad.

Time-aware SYNC
Headers
(TIME_SYNC0)
(see p.6, No. 2)
(TIME_SYNC1)
(see p.6, No. 2)



Time-aware General-Purpose Input/Output header allows user to control time-aware at run time.

Mini Cool Edge IO
Connectors

Vertical:

(MCIO1)

(see p.6, No. 17)

(MCIO2)

(see p.6, No. 18)

Right-Angle:

(MCIO3)

(see p.6, No. 21)



This motherboard supports
2 MCIO PCIe5.0/CXL 2.0 x8
and 1 MCIO PCIe4.0 x4/4
SATA 6 Gb/s Connectors.
Please connect these connec-
tors to the HDD backplane
board.

MCIO1 Pin Definition

Pin	Defeinition	Pin	Defeinition
A1	GND	B1	GND
A2	PE3_RX_DP7	B2	PE3_TX_DP7
A3	PE3_RX_DN7	B3	PE3_TX_DN7
A4	GND	B4	GND
A5	PE3_RX_DP6	B5	PE3_TX_DP6
A6	PE3_RX_DN6	B6	PE3_TX_DN6
A7	GND	B7	GND
A8	BP_TPYE	B8	SCL1
A9	WAKE1	B9	SDA1
A10	GND	B10	GND
A11	CLKP	B11	PERST_BUF1_N
A12	CLKN	B12	PRSNT1_N
A13	GND	B13	GND
A14	PE3_RX_DP5	B14	PE3_TX_DP5
A15	PE3_RX_DN5	B15	PE3_TX_DN5
A16	GND	B16	GND
A17	PE3_RX_DP4	B17	PE3_TX_DP4
A18	PE3_RX_DN4	B18	PE3_TX_DN4
A19	GND	B19	GND
A20	PE3_RX_DP3	B20	PE3_TX_DP3
A21	PE3_RX_DN3	B21	PE3_TX_DN3
A22	GND	B22	GND
A23	PE3_RX_DP2	B23	PE3_TX_DP2
A24	PE3_RX_DN2	B24	PE3_TX_DN2
A25	GND	B25	GND
A26	SPARE	B26	SCL2
A27	WAKE2	B27	SDA2
A28	GND	B28	GND
A29	CLKP	B29	PERST_BUF2_N
A30	CLKN	B30	PRSNT2_N
A31	GND	B31	GND
A32	PE3_RX_DP1	B32	PE3_TX_DP1
A33	PE3_RX_DN1	B33	PE3_TX_DN1
A34	GND	B34	GND
A35	PE3_RX_DP0	B35	PE3_TX_DP0
A36	PE3_RX_DN0	B36	PE3_TX_DN0
A37	GND	B37	GND
75	-	76	-
77	GND	78	GND
79	GND	80	GND

MCIO2 Pin Definition

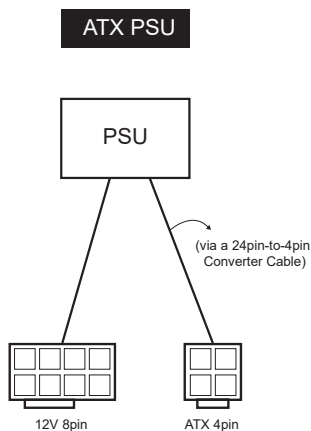
Pin	Definition	Pin	Definition
A1	GND	B1	GND
A2	PE3_RX_DP15	B2	PE3_TX_DP15
A3	PE3_RX_DN15	B3	PE3_TX_DN15
A4	GND	B4	GND
A5	PE3_RX_DP14	B5	PE3_TX_DP14
A6	PE3_RX_DN14	B6	PE3_TX_DN14
A7	GND	B7	GND
A8	BP_TYPE	B8	SCL1
A9	WAKE1	B9	SDA1
A10	GND	B10	GND
A11	CLKP	B11	PERST_BUF1_N
A12	CLKN	B12	PRSENT1_N
A13	GND	B13	GND
A14	PE3_RX_DP13	B14	PE3_TX_DP13
A15	PE3_RX_DN13	B15	PE3_TX_DN13
A16	GND	B16	GND
A17	PE3_RX_DP12	B17	PE3_TX_DP12
A18	PE3_RX_DN12	B18	PE3_TX_DN12
A19	GND	B19	GND
A20	PE3_RX_DP11	B20	PE3_TX_DP11
A21	PE3_RX_DN11	B21	PE3_TX_DN11
A22	GND	B22	GND
A23	PE3_RX_DP10	B23	PE3_TX_DP10
A24	PE3_RX_DN10	B24	PE3_TX_DN10
A25	GND	B25	GND
A26	SPARE	B26	SCL2
A27	WAKE2	B27	SDA2
A28	GND	B28	GND
A29	CLKP	B29	PERST_BUF2_N
A30	CLKN	B30	PRSENT2_N
A31	GND	B31	GND
A32	PE3_RX_DP9	B32	PE3_TX_DP9
A33	PE3_RX_DN9	B33	PE3_TX_DN9
A34	GND	B34	GND
A35	PE3_RX_DP8	B35	PE3_TX_DP8
A36	PE3_RX_DN8	B36	PE3_TX_DN8
A37	GND	B37	GND
75	-	76	-
77	GND	78	GND
79	GND	80	GND

MCIO3 Pin Definition

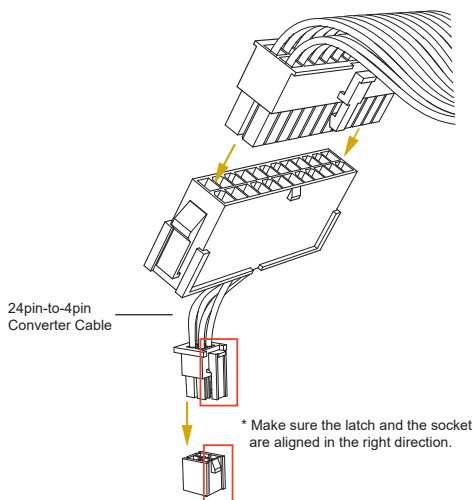
Pin	Defeinition	Pin	Defeinition
A1	GND	B1	GND
A2	PCIE13_RXP	B2	PCIE13_TXP
A3	PCIE13_RXN	B3	PCIE13_TXN
A4	GND	B4	GND
A5	PCIE14_RXP	B5	PCIE14_TXP
A6	PCIE14_RXN	B6	PCIE14_TXN
A7	GND	B7	GND
A8	BP_TYPE	B8	SCL1
A9	WAKE#	B9	SDA1
A10	GND	B10	GND
A11	PCH_CLK_6	B11	PERST_BUF1_N
A12	PCH_CLK_6#	B12	PRSNT1_N
A13	GND	B13	GND
A14	PCIE15_RXP	B14	PCIE15_TXP
A15	PCIE15_RXN	B15	PCIE15_TXN
A16	GND	B16	GND
A17	PCIE16_RXP	B17	PCIE16_TXP
A18	PCIE16_RXN	B18	PCIE16_TXN
A19	GND	B19	GND
1	GND	2	GND
3	-	4	-
5	GND	6	GND

2.8 ATX PSU Power Connections

This motherboard supports ATX power input. Please refer to the table below for the required connections between the motherboard and the power supply.



The following diagram illustrates how to connect the bundled ATX 24pin-to-4pin converter cable.



2.9 Dr. Debug

Dr. Debug is used to provide code information, which makes troubleshooting even easier. Please see the diagrams below for reading the Dr. Debug codes.

Code	Description
0x10	PEI_CORE_STARTED
0x11	PEI_CAR_CPU_INIT
0x15	PEI_CAR_NB_INIT
0x19	PEI_CAR_SB_INIT
0x31	PEI_MEMORY_INSTALLED
0x32	PEI_CPU_INIT
0x33	PEI_CPU_CACHE_INIT
0x34	PEI_CPU_AP_INIT
0x35	PEI_CPU_BSP_SELECT
0x36	PEI_CPU_SMM_INIT
0x37	PEI_MEM_NB_INIT
0x3B	PEI_MEM_SB_INIT
0x4F	PEI_DXE_IPL_STARTED
0x60	DXE_CORE_STARTED
0x61	DXE_NVRAM_INIT
0x62	DXE_SBRUN_INIT

0x63	DXE_CPU_INIT
0x68	DXE_NB_HB_INIT
0x69	DXE_NB_INIT
0x6A	DXE_NB_SMM_INIT
0x70	DXE_SB_INIT
0x71	DXE_SB_SMM_INIT
0x72	DXE_SB_DEVICES_INIT
0x78	DXE_ACPI_INIT
0x79	DXE_CSM_INIT
0x90	DXE_BDS_STARTED
0x91	DXE_BDS_CONNECT_DRIVERS
0x92	DXE_PCI_BUS_BEGIN
0x93	DXE_PCI_BUS_HPC_INIT
0x94	DXE_PCI_BUS_ENUM
0x95	DXE_PCI_BUS_REQUEST_RESOURCES
0x96	DXE_PCI_BUS_ASSIGN_RESOURCES
0x97	DXE_CON_OUT_CONNECT
0x98	DXE_CON_IN_CONNECT

0x99 DXE_SIO_INIT

0x9A DXE_USB_BEGIN

0x9B DXE_USB_RESET

0x9C DXE_USB_DETECT

0x9D DXE_USB_ENABLE

0xA0 DXE_IDE_BEGIN

0xA1 DXE_IDE_RESET

0xA2 DXE_IDE_DETECT

0xA3 DXE_IDE_ENABLE

0xA4 DXE_SCSI_BEGIN

0xA5 DXE_SCSI_RESET

0xA6 DXE_SCSI_DETECT

0xA7 DXE_SCSI_ENABLE

0xA8 DXE_SETUP_VERIFYING_PASSWORD

0xA9 DXE_SETUP_START

0xAB DXE_SETUP_INPUT_WAIT

0xAD DXE_READY_TO_BOOT

0xAE DXE_LEGACY_BOOT

0xAF	DXE_EXIT_BOOT_SERVICES
0xB0	RT_SET_VIRTUAL_ADDRESS_MAP_BEGIN
0xB1	RT_SET_VIRTUAL_ADDRESS_MAP_END
0xB2	DXE_LEGACY_OPMOM_INIT
0xB3	DXE_RESET_SYSTEM
0xB4	DXE_USB_HOTPLUG
0xB5	DXE_PCI_BUS_HOTPLUG
0xB6	DXE_NVRAM_CLEANUP
0xB7	DXE_CONFIGURATION_RESET
0xF0	PEI_RECOVERY_AUTO
0xF1	PEI_RECOVERY_USER
0xF2	PEI_RECOVERY_STARTED
0xF3	PEI_RECOVERY_CAPSULE_FOUND
0xF4	PEI_RECOVERY_CAPSULE_LOADED
0xE0	PEI_S3_STARTED
0xE1	PEI_S3_BOOT_SCRIPT
0xE2	PEI_S3_VIDEO_REPOST

0xE3 PEI_S3_OS_WAKE

0x50 PEI_MEMORY_INVALID_TYPE

0x53 PEI_MEMORY_NOT_DETECTED

0x55 PEI_MEMORY_NOT_INSTALLED

0x57 PEI_CPU_MISMATCH

0x58 PEI_CPU_SELF_TEST_FAILED

0x59 PEI_CPU_NO_MICROCODE

0x5A PEI_CPU_ERROR

0x5B PEI_RESET_NOT_AVAILABLE

0xD0 DXE_CPU_ERROR

0xD1 DXE_NB_ERROR

0xD2 DXE_SB_ERROR

0xD3 DXE_ARCH_PROTOCOL_NOT_AVAILABLE

0xD4 DXE_PCI_BUS_OUT_OF_RESOURCES

0xD5 DXE_LEGACY_OPROM_NO_SPACE

0xD6 DXE_NO_CON_OUT

0xD7 DXE_NO_CON_IN

0xD8	DXE_INVALID_PASSWORD
0xD9	DXE_BOOT_OPTION_LOAD_ERROR
0xDA	DXE_BOOT_OPTION_FAILED
0xDB	DXE_FLASH_UPDATE_FAILED
0xDC	DXE_RESET_NOT_AVAILABLE
0xE8	PEI_MEMORY_S3_RESUME_FAILED
0xE9	PEI_S3_RESUME_PPI_NOT_FOUND
0xEA	PEI_S3_BOOT_SCRIPT_ERROR
0xEB	PEI_S3_OS_WAKE_ERROR

2.10 Unit Identification purpose LED/Switch

Use the UID button to locate the specific server working on a rack.

Unit Identification
purpose LED/Switch
(UID1)



When the UID button on the front or rear panel is pressed, the front/rear UID blue LED indicator will be turned on. Press the UID button again to turn off the indicator.



1. Press and hold the UID button for 4 seconds, the BMC will trigger an external reset.
2. Press and hold the UID button for 10 seconds, the BMC will reset and load default values.

2.11 Replacing the CMOS Battery



1. Ensure the battery is installed before unplugging the power cord or installing/removing the motherboard.
2. Always turn off the computer and unplug the power cord before replacing the battery.
3. For safety, please replace the battery with the same or equivalent type recommended by the manufacturer.
4. Dispose of the used batteries in accordance with local regulations.

Refer to the section **1.4 Motherboard Layout** to locate the battery.

**The illustration is for reference only. The actual installation may be slightly different by socket design.*

Step 1

Shut down and unplug the computer.

Flat: Gently press the socket clip.

Upright: Gently push the socket clip away from the battery.

Step 2

Flat: Remove the battery when it pops up. Or press down on one end of the battery to pop it up and remove it.

Upright: Remove the battery.

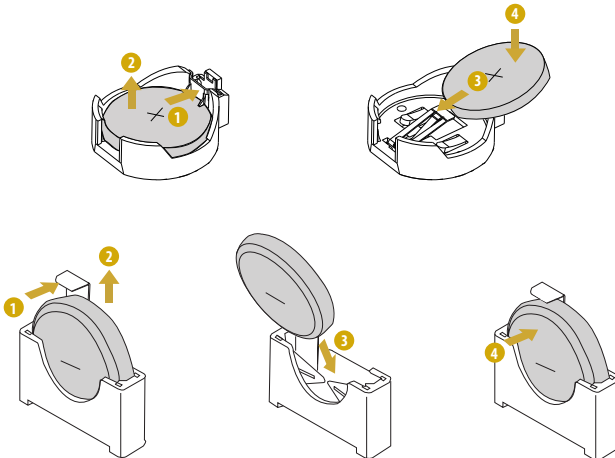
Step 3

Flat: Insert a new battery into the socket with the positive side (+ sign) facing up.

Upright: Insert a new battery into the socket with the positive side (+ sign) facing the open side of the socket clip.

Step 4

Press the battery down until it clicks into place.



Replacing the Wired CMOS Battery

Replace a wired CMOS battery, completely power down the computer and unplug it from the power source. Locate the old battery, carefully trace its wires to the small connector on the motherboard, and unplug it. Install a new battery in its place and connect it to the motherboard.



2.12 Dual LAN and Teaming Operation Guide

Dual LAN with Teaming enabled on this motherboard allows two single connections to act as one single connection(s) for twice the transmission bandwidth, making data transmission more effective and improving the quality of transmission of distant images. Fault tolerance on the dual LAN network prevents network downtime by transferring the workload from a failed port to a working port.



The speed of transmission is subject to the actual network environment or status even with Teaming enabled.

Before setting up Teaming, please make sure whether Switch (or Router) supports Teaming (IEEE 802.3ad Link Aggregation). Specify a preferred adapter in Intel PROSet. Under normal conditions, the Primary adapter handles all non-TCP/IP traffic. The Secondary adapter will receive fallback traffic if the primary fails. If the Preferred Primary adapter fails, but is later restored to an active status, control is automatically switched back to the Preferred Primary adapter.

Step 1

From **Device Manager**, open the properties of a team.

Step 2

Click the **Settings** tab.

Step 3

Click the **Modify Team** button.

Step 4

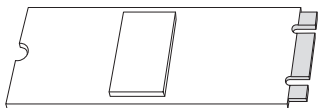
Select the adapter that want to be the primary adapter and click the **Set Primary** button.

If do not specify a preferred primary adapter, the software will choose an adapter of the highest capability (model and speed) to act as the default primary. If a failover occurs, another adapter becomes the primary. The adapter will, however, rejoin the team as a non-primary.

2.13 M.2 SSD Module Installation Guide

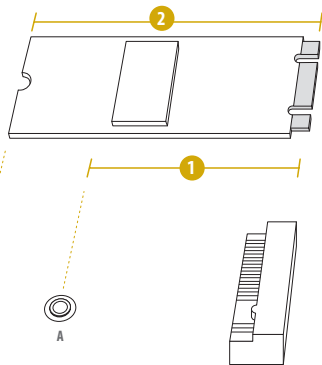
The M.2 Socket (M2_1/M2_2, Key M) supports type 2280/22110 M.2 PCI Express module up to Gen4 x4.

Installing the M.2 SSD Module



Step 1

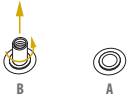
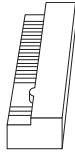
Prepare a M.2 SSD module and the screw.



Step 2

Depending on the PCB type and length of the M.2 SSD module, find the corresponding nut location to be used.

No.	1 (M2_1/M2_2)	2 (M2_1/M2_2)
Nut Location	A (NUT_80_1/NUT_80_2)	B (NUT_110_1/NUT_110_2)
PCB Length	8 cm	11 cm
Module Type	Type 2280	Type 22110

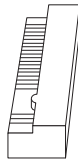


Step 3

Move the standoff based on the module type and length.

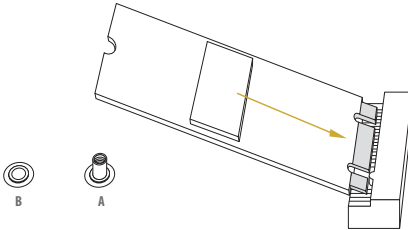
Skip Step 3 and 4 and go straight to Step 5 if using the default nut.

Otherwise, release the standoff by hand.



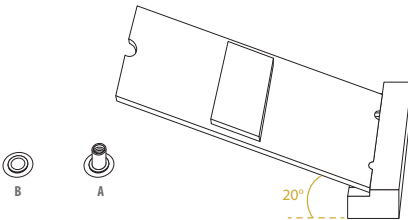
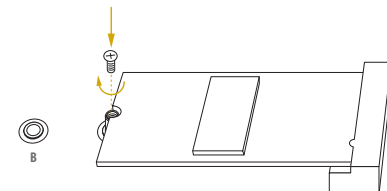
Step 4

Peel off the yellow protective film on the nut to be used. Hand tighten the standoff into the desired nut location on the motherboard.



Step 5

Align and gently insert the M.2 SSD module into the M.2 slot. Please be aware that the M.2 SSD module only fits in one orientation.



Step 6

Tighten the screw with a screwdriver to secure the module into place.

Please do not overtighten the screw as this might damage the module.

Chapter 3 UEFI Setup Utility

3.1 Introduction

This section explains how to use the UEFI SETUP UTILITY to configure the system. The UEFI chip on the motherboard stores the UEFI SETUP UTILITY. Run the UEFI SETUP UTILITY when starting up the computer. Please press <F2> or during the Power-On-Self-Test (POST) to enter the UEFI SETUP UTILITY; otherwise, POST will continue with its test routines.

Restart the system by pressing <Ctrl> + <Alt> + <Delete> upon entering the UEFI SETUP UTILITY after POST, , or by pressing the reset button on the system chassis. It can be also restart by turning the system off and then back on.



Because the UEFI software is constantly being updated, the following UEFI setup screens and descriptions are for reference purpose only.

3.1.1 UEFI Menu Bar

The top of the screen has a menu bar with the following selections:

Item	Description
Main	To set up the system time/date information
OC Tweaker	For overclocking configurations
Advanced	To set up the advanced UEFI features
Server Mgmt	To manage the server
Event Logs	For event log configuration
Security	To set up the security features
Boot	To set up the default system device to locate and load the Operating System
Exit	To exit the current screen or the UEFI SETUP UTILITY

Use <←> key or <→> key to choose among the selections on the menu bar, and then press <Enter> to get into the sub screen.

3.1.2 Navigation Keys

Please check the following table for the function description of each navigation key.

Navigation Key(s)	Function Description
← / →	Moves cursor left or right to select Screens
↑ / ↓	Moves cursor up or down to select items
+ / -	To change option for the selected items
<Tab>	Switch to next function
<Enter>	To bring up the selected screen
<PGUP>	Go to the previous page
<PGDN>	Go to the next page
<HOME>	Go to the top of the screen
<END>	Go to the bottom of the screen
<F1>	To display the General Help Screen
<F7>	Discard changes and exit the UEFI SETUP UTILITY
<F9>	Load optimal default values for all the settings
<F10>	Save changes and exit the UEFI SETUP UTILITY
<F12>	Print screen
<ESC>	Jump to the Exit Screen or exit the current screen

3.2 Main Screen

Entering the UEFI SETUP UTILITY, the Main screen displays the system overview. The Main screen provides system overview information and allows user to set the system time and date.



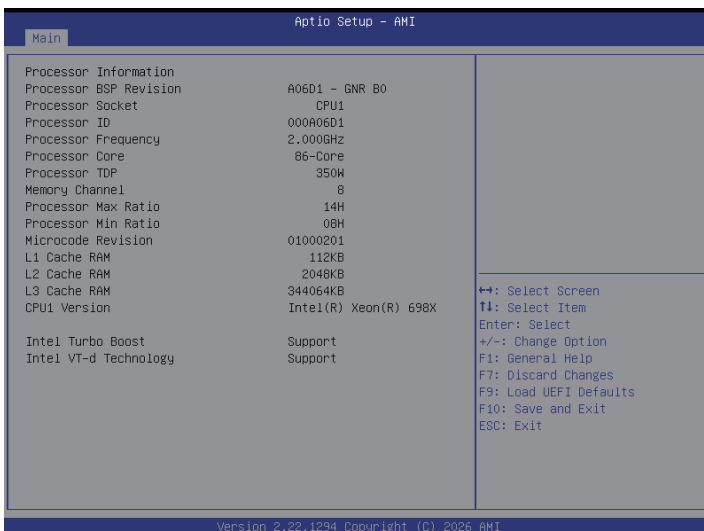
3.2.1 Motherboard Information

Press [Enter] to view the information of the motherboard.



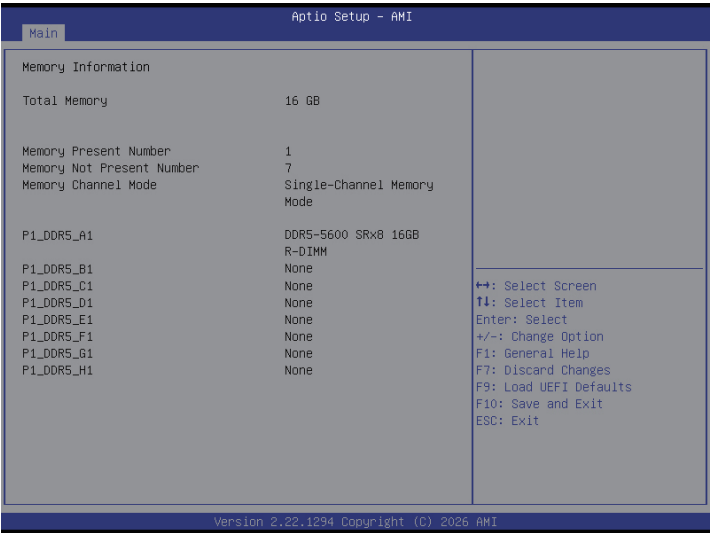
3.2.2 Processor Information

Press [Enter] to view the information of the processor.



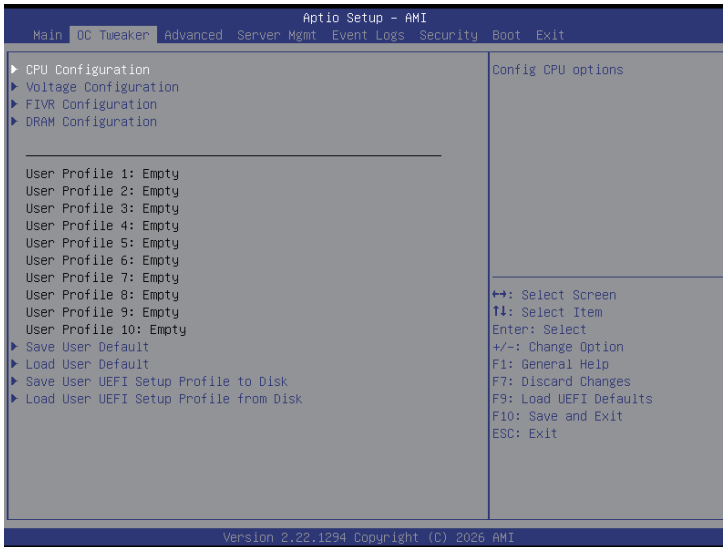
3.2.3 Memory Information

Press [Enter] to view the information of the memory.



3.3 OC Tweaker

In the OC Tweaker screen allowing user to set up overclocking features.



Because the UEFI software is constantly being updated, the following UEFI setup screens and descriptions are for reference purpose only, and may not exactly match what seeing on the screen.

CPU Configuration

Configure CPU options.

Voltage Configuration

Configure Voltage options.

FIVR Configuration

Configure FIVR options.

DRAM Configuration

Configure DRAM Timing.

Save User Default

Type a profile name and press enter to save the settings as user default.

Load User Default

Load previously saved user defaults.

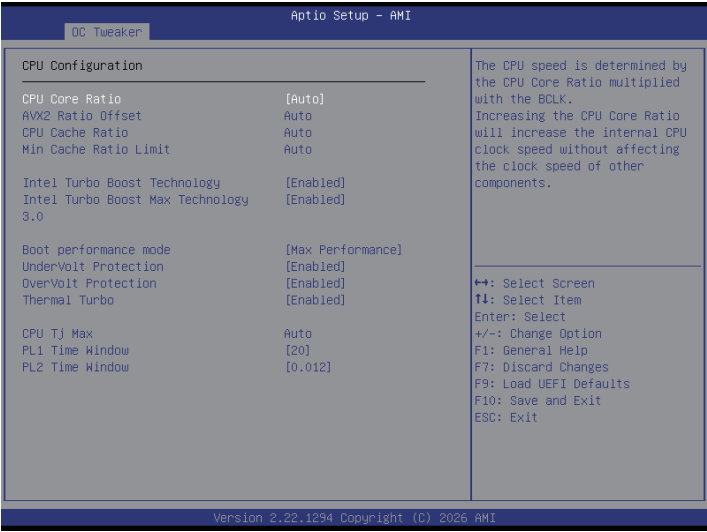
Save User UEFI Setup Profile to Disk

This helps user to save current UEFI settings as an user profile to disk.

Load User UEFI Setup Profile from Disk

This helps user to load previous saved profile from the disk.

3.3.1 CPU Configuration



CPU Core Ratio

Configure the CPU Core Ratio, the CPU speed is determined by the CPU Core Ratio multiplied with the BCLK. Increasing the CPU Core Ratio will increase the internal CPU clock speed without affecting the clock speed of other components.

AVX2 Ratio Offset

AVX2 Ratio Offset specifies a negative offset from the CPU Ratio for AVX workloads. AVX is a more stressful workload that lower the AVX ratio to ensure maximum possible ratio for SSE workloads.

CPU Cache Ratio

The CPU Internal Bus Speed Ratio. The maximum should be the same as the CPU Ratio.

Min Cache Ratio Limit

The CPU Internal Bus Speed minimum ratio.

Intel Turbo Boost Technology

Intel Turbo Boost Technology enables the processor to run above its base operating frequency when the operating system requests the highest performance state.

Intel Turbo Boost Max Technology 3.0

Enable or disable Intel Turbo Boost Technology 3.0 (ITBMT 3.0) support. Disabling will report the maximum ratio of the slowest core in _CPC object. Processors supporting the ITBMT 3.0 feature contain at least one processor core whose maximum ratio is higher than the others.

Boot Performance Mode

Select the performance state that the BIOS will set before OS hand off.

UnderVolt Protection

When UnderVolt Protection is enabled, user will not be able to program under voltage in OS runtime. Recommended to keep it enabled by default.

[Enable] - Allow Boot-time undervolting, but enable UnderVolt Protection in OS Runtime.

[Disable] - No UnderVolt Protection in OS Runtime.

OverVolt Protection

When Over Voltage Protection is enabled, user will not be able to program over voltage in OS runtime. Recommended to keep it enabled by default.

Thermal Turbo

This service controls the Intel Thermal Turbo feature enabling.

CPU Tj Max

Set CPU Tj Max to adjust TCC Target Temperature. Support Tj Max in the range of 105 to 115 deg Celsius.

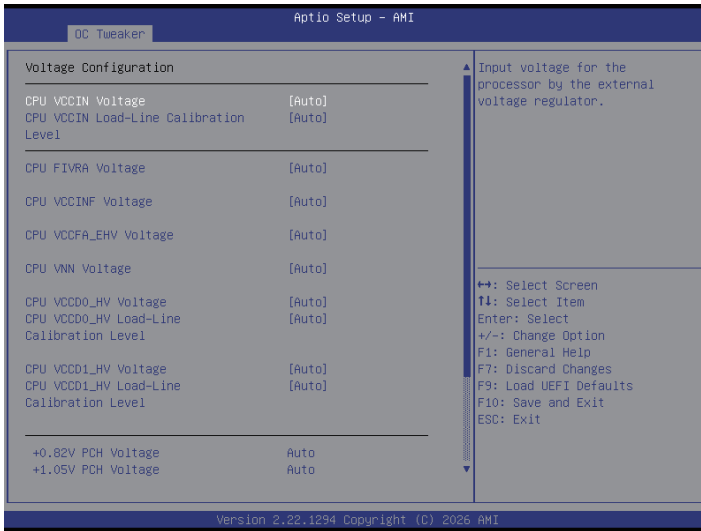
PL1 Time Window

PL1 value in seconds. The value may vary from 1 to 5. Indicates the time window over which TDP value should be maintained.

PL2 Time Window

PL2 value in seconds. The value may vary from 0.012 to 0.039. Indicates the time window over which TDP value should be maintained.

3.3.2 Voltage Configuration



CPU VCCIN Voltage

Input voltage for the processor by the external voltage regulator.

CPU VCCIN Load-Line Calibration Level1

CPU VCCIN Load-Line Calibration helps prevent VCCIN voltage droop when the system is under heavy loading.

CPU FIVRA Voltage

Input voltage for the processor by the external voltage regulator.

CPU VCCFA_EHV Voltage

Input voltage for the processor by the external voltage regulator.

CPU VNN Voltage

Input voltage for the processor by the external voltage regulator.

CPU VCCD0_HV Voltage

Input voltage for the processor by the external voltage regulator.

CPU VCCD0_HV Load-Line Calibration Level1

CPU VCCD0_HV Load-Line Calibration helps prevent VCCD0_HV voltage droop when the system is under heavy loading.

CPU VCCD1_HV Voltage

Input voltage for the processor by the external voltage regulator.

CPU VCCD1_HV Load-Line Calibration Level1

CPU VCCD1_HV Load-Line Calibration helps prevent VCCD1_HV voltage droop when the system is under heavy loading.

+0.82V PCH Voltage

Configure the voltage for the +0.82V PCH.

+1.05 PCH Voltage 1.050V

Configure the voltage for the +1.05 PCH.

Pmic Secure Mode

Select this item to configure secure mode by auto, enable or disable. (need to do AC cycle once changed)

Pmic Vdd Voltage

Select the desired Pmic Vdd voltage.

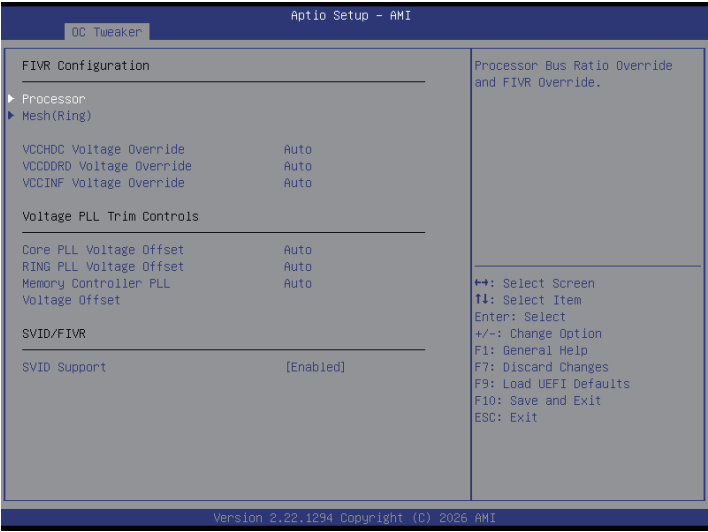
Pmic VddQ Voltage

Select the desired Pmic VddQ voltage.

Pmic Vpp Voltage

Select the desired Pmic Vpp voltage.

3.3.3 FIVR Configuration



FIVR Configuration

Processor

Select this item to configure the Processor Bus Ratio Override and FIVR Override.

VF Configuration Scope

Select this item to configure both all cores VF curve or per-core VF curve.

C-DIE 0/1 Configurations

Max OC Ratio

Sets the maximum OC Ratio for the CPU Core. Uses Mailbox MSR 0x150, cmd 0x10, 0x11. Value can be range in 0-255, BIOS knob will dynamically clip to max value based on cmd 0x1 [7:0].

Voltage Mode

Selects between Adaptive and Override Voltage modes. In Override Mode the voltage selected will be applied over all operating frequencies. In Adaptive Mode the voltage is interpolated only in turbo mode. Uses Mailbox MSR 0x150, cmd 0x10, 0x11.

Adaptive Voltage

Specifies the Adaptive Voltage applied while IA Core is operating in turbo mode. Uses Mailbox MSR 0x150, cmd 0x10, 0x11. Range 450-1600 mV. Type 1200 means 1200mV and default 0 means no override.

Voltage Offset

Specifies the Offset Voltage applied to the IA Core domain. This voltage is specified in millivolts. Uses Mailbox MSR 0x150, cmd 0x11. Range -500 to 500mV.

Offset Prefix

Sets the offset value as positive or negative.

Mesh(Ring)

Select this item to configure the Mesh(Ring) Overclocking Menu.

C-DIE 0/1 Configurations

Max OC Ratio

Sets the maximum OC Ratio for the Mesh(Ring) Domain. Uses Mailbox MSR 0x150, cmd 0x10, 0x11. Value can be range in 0-80, BIOS knob will dynamically clip to max value based on cmd 0x1 [7:0].

Voltage Mode

Selects between Adaptive and Override Voltage modes. In Override Mode the voltage selected will be applied over all operating frequencies. In Adaptive Mode the voltage is interpolated only in turbo mode. Uses Mailbox MSR 0x150, cmd 0x11.

Adaptive Voltage

Specifies the Adaptive Voltage applied while Mesh(Ring) is operating in turbo mode. Unit is in millivolts. Uses Mailbox MSR 0x150, cmd 0x11. Range 0-2050 mV. Type 1200 means 1200mV and default 0 means no override.

Voltage Offset

Specifies the Offset Voltage applied to the Mesh(Ring) domain. This voltage is specified in millivolts. Uses Mailbox MSR 0x150, cmd 0x11. Range -1000 to 1000mV.

Offset Prefix

Sets the offset value as positive or negative.

CCHDC Voltage Override

Specifies the Override Voltage applied to the VCCHDE domain. This voltage is specified in millivolts. Uses Mailbox MSR 0x150, cmd 0x11. Range 500-1395 mV. Type 1200 means 1200mV and default 0 means no override.

VCCDDRDR Voltage Override

Specifies the Override Voltage applied to the VCCDDRDR domain. This voltage is specified in millivolts. Uses Mailbox MSR 0x150, cmd 0x11. Range 0-2050 mV. Type 1200 means 1200mV and default 0 means no override.

VCCINF Voltage Override

Specifies the Override Voltage applied to the VCCINF domain. This voltage is specified in millivolts. Uses Mailbox MSR 0x150, cmd 0x11. Range 550-1235 mV. Type 1200 means 1200mV and default 0 means no override.

Voltage PLL Trim Controls

Core PLL Voltage Offset

PLL Voltage Offset. Range 0-63. Units are in 17.5mV. Default is 0. This control can be used to increase the range of this domain frequency in extreme overclocking conditions.

Ring PLL Voltage Offset

PLL Voltage Offset. Range 0-63. Units are in 17.5mV. Default is 0. This control can be used to increase the range of this domain frequency in extreme overclocking conditions.

Memory Controller PLL Voltage Offset

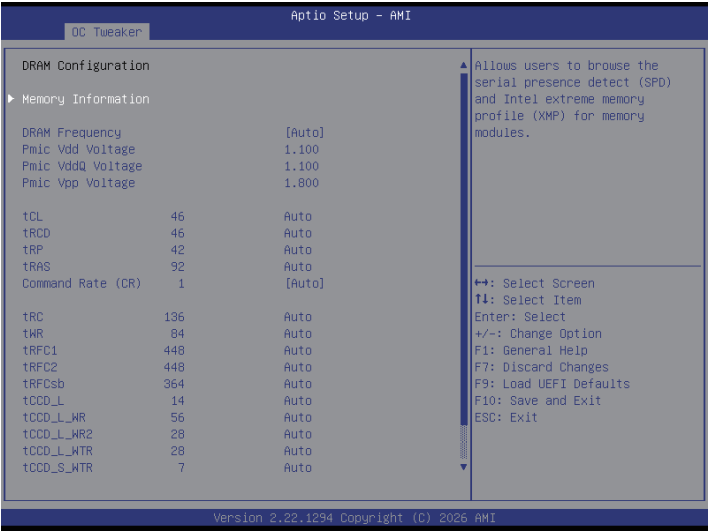
PLL Voltage Offset. Range 0-63. Units are in 17.5mV. Default is 0. This control can be used to increase the range of this domain frequency in extreme overclocking conditions.

SVID/FIVR

SVID Support

Select this item to enable or disable SVID. Disabling SVID disables input voltage overrides. Use Mailbox MSR 0x150, cmd 0x13.

3.3.4 DRAM Configuration



Memory Information

Allows users to browse the serial presence detect (SPD) and Intel extreme memory profile (XMP) for DDR modules.

DRAM Frequency

Maximum Host DDR Memory Frequency Selections in MT/s. If the [Auto] is selected, a frequency is chosen automatically based on the minimum tCK given by the SPD. If enforce POR is disabled, user fwill be able to run at higher frequencies than the memory support (limited by processor support).

Pmic Vdd Voltage

Select the desired Pmic Vdd voltage.

Pmic VddQ Voltage

Select the desired Pmic VddQ voltage.

Pmic Vpp Voltage

Select the desired Pmic Vpp voltage.

DRAM CAS# Latency (tCL)

The time between sending a column address to the memory and the beginning of the data in response.

DRAM RAS# to CAS# Delay (tRCD)

The number of clock cycles required between the opening of a row of memory and accessing columns within it.

DRAM Row Precharge Time (tRP)

The number of clock cycles required between the issuing of the precharge command and opening the next row.

DRAM RAS# Activate to Precharge Delay (tRAS)

The number of clock cycles required between a bank active command and issuing the precharge command.

Command Rate (CR)

The delay between when a memory chip is selected and when the first active command can be issued.

DRAM Active to Active/Refresh Time (tRC)

Configure the minimum active to active/Refresh Time.

DRAM Write Recovery Time (tWR)

The amount of delay that must elapse after the completion of a valid write operation, before an active bank can be precharged.

DRAM Refresh Cycle Time (tRFC1)

The number of clocks from a Refresh command until the first Activate command to the same rank. MRC will decide which tRFC to adopt!

DRAM Refresh Cycle Time (tRFC2)

The number of clocks from a Refresh command until the first Activate command to the same rank. MRC will decide which tRFC to adopt!

DRAM Refresh Cycle Time Same Bank (tRFCsb)

The number of clocks that a same bank Refresh command takes to complete.

tCDD_L

0 = Auto else Desired tCCD_Lmin (nCK).

tCDD_L_WR

0 = Auto else Desired tCCD_L_WRmin (nCK).

tCDD_L_WR2

0 = Auto else Desired tCCD_L_WR2min (nCK).

tCDD_L_WTR

0 = Auto else Desired tCCD_L_WTRmin (nCK).

tCDD_S_WTR

0 = Auto else Desired tCCD_S_WTRmin (nCK).

RAS to RAS Delay (tRRD_L)

The number of clocks between two rows activated in different banks of the same rank.

0 = Auto else Desired tRRD_Lmin (nCK).

Read to Precharge (tRTP)

The number of clocks that are inserted between a read command to a row pre-charge command to the same rank.

0 = Auto else Desired tRTP (nCK).

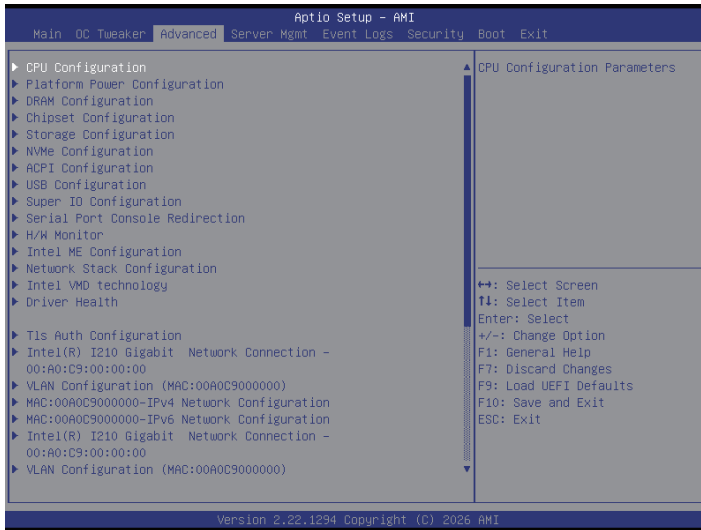
Four Activate Window (tFAW)

The time window in which four activates are allowed the same rank.

0 = Auto else Desired tFAW (nCK).

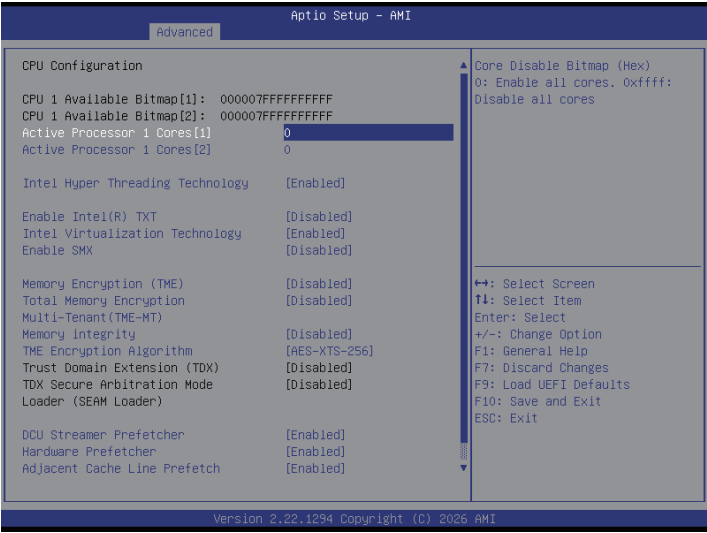
3.4 Advanced Screen

In this section, it allows user to configure and view the following items: CPU Configuration, Platform Power Configuration, DRAM Configuration, Chipset Configuration, Storage Configuration, NVMe Configuration, ACPI Configuration, USB Configuration, Super IO Configuration, Serial Port Console Redirection, H/W Monitor, Intel ME Configuration, Network Stack Configuration, Intel VMD Technology, Driver Health, Tls Auth Configuration and Instant Flash.



Setting wrong values in this section may cause the system to malfunction.

3.4.1 CPU Configuration



Active Processor 1 Cores [1]/[2]

Core Disable Bitmap (Hex)

0: Enable all cores.

0xffff: Disable all cores.

Intel Hyper Threading Technology

Enables Logical processor (software method to enable or disable logical processor threads).

Enable Intel(R) TXT

Enables Intel Trusted Execution Technology Configuration.

Intel Virtualization Technology

Intel Virtualization Technology allows a platform to run multiple operating systems and applications in independent partitions, so that one computer system can function as multiple virtual systems.

Enable SMX

Use this item to enable Safer Mode Extensions.

Memory Encryption (TME)

Use this item to enable or disable Memory Encryption (TME).

Total Memory Encryption Multi-Tenant (TME-MT)

Use this item to enable or disable Total Memory Encryption - Multi - Tenant (TME-MT). Can be enabled only if Socket Configuration -> Processor Configuration -> Limit CPU PA to 46 bit = Disable.

Memory Integrity

Use this item to enable or disable memory Integrity.

TME Encryption Algorithm

Choose Encryption Algorithm to be used for Total Memory Encryption (TME).

Trust Domain Extensions (TDX)

Use this item to enable or disable Trust Domain Extensions (TDX).

TDX Secure Arbitration Mode Loader (SEAM Loader)

Use this item to enable or disable TDX Secure Arbitraton Mode Loader (SEAM Loader).

DCU Streamer Prefetcher

DCU streamer prefetcher is an L1 data cache prefetcher (MSR 1A4h [2]).

Hardware Prefetcher

Automatically prefetch data and code for the processor. Enable for better performance.

Adjacent Cache Line Prefetch

Automatically prefetch the subsequent cache line while retrieving the currently requested cache line. Enable for better performance.

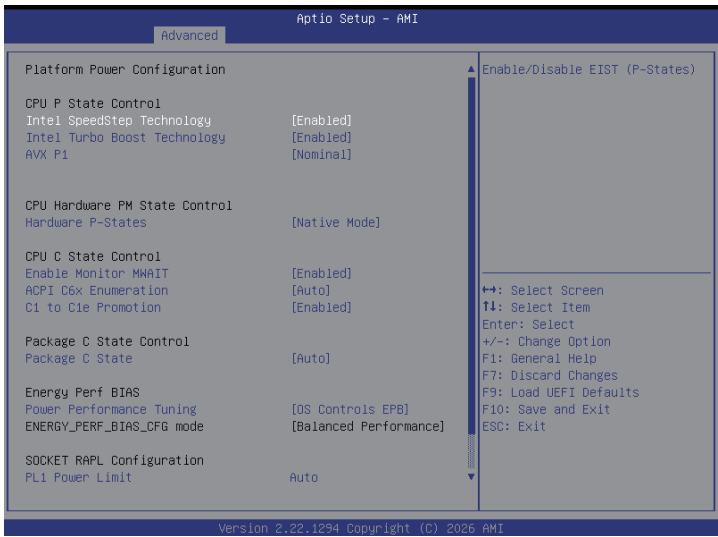
AES-NI

Use this item to enable or disable AES-NI support.

SNC

Use this item to enable or disable SNC mode. Configure this item to Disable, BIOS will enable UMA mode. Number of clusters is determined by BIOS based on detected SKU.

3.4.2 Platform Power Configuration



Intel SpeedStep Technology

Intel SpeedStep technology allows processors to switch between multiple frequencies and voltage points for better power saving and heat dissipation. CPU turbo ratio can be fixed when Intel SpeedStep Technology set Disabled and Intel Turbo Boost Technology set Enabled.



Please note that enabling this function may reduce CPU voltage and lead to system stability or compatibility issues with some power supplies. Please set this item to [Disabled] if above issues occur.

Intel Turbo Boost Technology

Intel Turbo Boost Technology enables the processor to run above its base operating frequency when the operating system requests the highest performance state.

AVX P1

Select this item to configure AVX P1 level.

Hardware P-States

This item supports below selections:

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)

Enable Monitor MWAIT

Select this item to configure Monitor and MWAIT instructions whether Auto maps to enable.

ACPI C6x Enumeration

Auto: Maps to C6-P as ACPI C2.

Disable: Don't enumerate any C6 state in ACPI

C6 as ACPI C2/C3: Enumerate C6 as ACPI C2/C3 state. PkgC6 is not allowed.

C6-P as ACPI C2/C3: Enumerate C6-P as ACPI C2/C3 state. PkgC6 is allowed.

ACPI C1 Enumeration

Use this item to enumerate C1/C1e as ACPI C1.

C1 to Cle Promotion

CPU will promote C1 request to Cle state.

Package C State

Package C State limit, the state Auto maps is program specific.

Power Performance Tuning

Use this item to decides which controls EPB.

OS Controls EPB: Specifies IA32_ENERGY_PERF_BIAS is used.

BIOS Controls EPB: Specifies ENERGY_PERF_BIAS_CONFIG is used.

PECI Controls EPB: Specifies PCS53 is used.

ENERGY_PERF_BIAS_CFG mode

Use this item to use input from ENERGY_PERF_BIAS_CONFIG mode selection. PERF/Balanced, Perf/Balanced or Power/Power.

PL1 Power Limit

PL1 Power Limit is in Watts and the value may vary from 0 to Fused Value. If the value is 0, the fused value will be programmed. A value greater than fused TDP value will not be programmed.

PL1 Time Window

PL1 value in seconds. The value may vary from 1 to 5. Indicates the time window over which TDP value should be maintained.

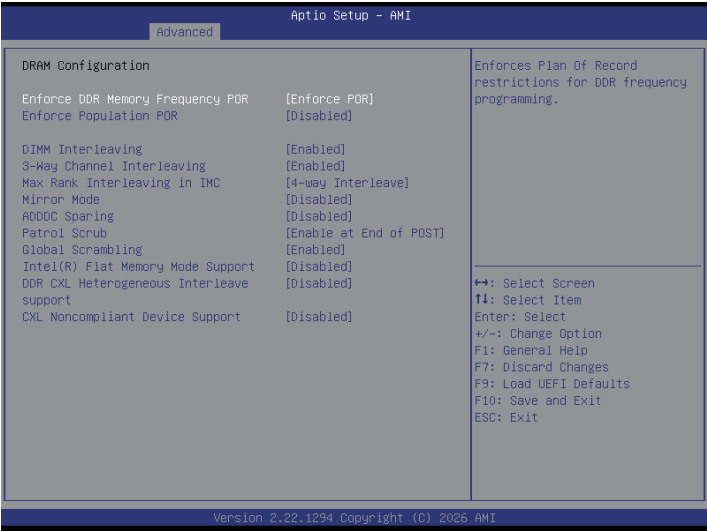
PL2 Power Limit

PL2 Power Limit in Watts. The value may vary from 0 to 120% Fused TDP Value. If the value is 0, BIOS programs 120% * Fused TDP value.

PL2 Time Window

PL2 value in seconds. The value may vary from 0.012 to 0.039. Indicates the time window over which TDP value should be maintained.

3.4.3 DRAM Configuration



Enforce DDR Memory Frequency POR

Select this time to enable or disable the Enforces Plan of Record restrictions for DDR frequency programming.

Enforce Population POR

Enable Memory Population POR Enforcement.

DIMM Interleaving

Enable this item to allow interleaving to be performed at the highest possible MC * Channel interleaving ways or disable it to enforce interleaving to only 1-way.

3-Way Channel Interleaving

Enable this item to allow 3-way channel interleaving or disable it to default to number of channels available per MC when DIMM interleaving is enabled.

Max Rank Interleaving in IMC

Use this item to configure the rank interleaving settings.

Mirror Mode

Full Mirror Mode will set entire 1LM memory in system to be mirrored, consequently reducing the memory capacity by half. Partial Mirror Mode will enable the required size of memory to be mirrored. If rank sparing is enabled partial mirroring will not take effect. Enabling any type of Mirror Mode will disable XPT Prefetch.

ADDDC Sparing

Use this item to enable or disable ADDDC Sparing (ADDDC will be disabled if Mirroring is enabled).

Patrol Scrub

Patrol Scrub is a background activity initiated by the processor to seek out and fix memory errors. The default value is [Enabled].

Global Scrambling

Enable - Enables global data scrambling.

Disable - Disables this feature.

Intel(R) Flat Memory Mode Support

Enable or disable Intel(R) Flat Memory Mode support.

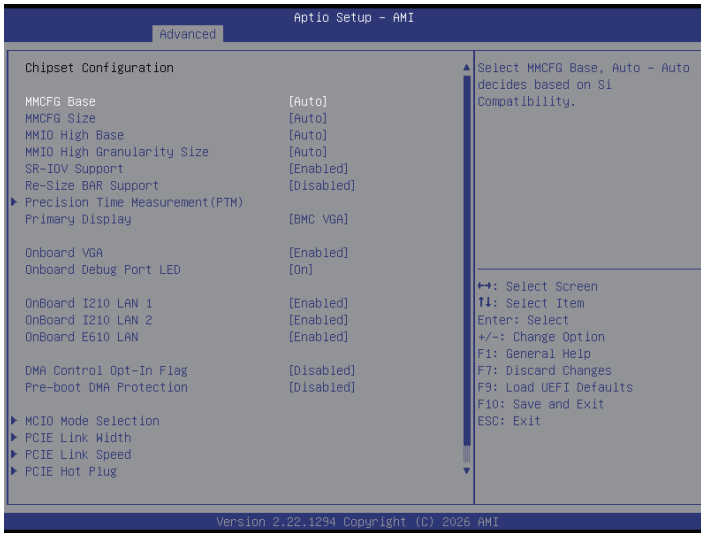
DDR CXL Heterogeneous Interleave support

Use this item to enable DDR CXL Heterogeneous Interleave support.

CXL Noncompliant Device Support

Enables DDR CXL Heterogeneous Interleave support.

3.4.4 Chipset Configuration



MMCFG Base

Use this item to select MMCFG Base. Auto-Auto decides based on Si compatibility.

MMCFG Size

Use this item to select MMCFG Size. Auto-Auto decides based on Si compatibility.

MMIO High Base

Use this item to select MMIO High Base.

MMIO High Granularity Size

Selects the allocation size used to assign mmioh resources. Per stack mmioh resource assignments are multiples of the granularity where 1 unit per stack is the default allocation.

SR-IOV Support

If system has SR-IOV capable PCIe Devices, this option Enables or Disables Single Root IO Virtualization Support.

Re-Size BAR Support

Enable or disable this item to Re-Size BAR supported upon the sysem has resizable BAR capable PCIe Devices.

Precision Time Measurement (PTM)

Select this item to configure Precision Time Measurement.

M2_1 PTM

Select this item to enable or disable M2_1 Precision Time Measurement.

M2_2 PTM

Select this item to enable or disable M2_2 Precision Time Measurement.

PCIe PTM Support

This option can disable Precision Time Management support in PCI hierarchy. 'Auto' keeps hardware default.

Enable Timed GPIO0

Select this item to enable or disable Timed GPIO0. When disabled, it disables cross time stamp time-synchronization as extension of Hammock Harbor time synchronization.

Enable Timed GPIO1

Select this item to enable or disable Timed GPIO1. When disabled, it disables cross time stamp time-synchronization as extension of Hammock Harbor time synchronization.

Primary Display

Select which Graphics device as the Primary Display.

Onboard VGA

Use this to enable or disable the Onboard VGA function.

Onboard Debug Port LED

Enable or disable the onboard Dr. Debug LED.

Onboard I210 LAN 1

Use this to enable or disable the Onboard I210 LAN1 function.

Onboard I210 LAN 2

Use this to enable or disable the Onboard I210 LAN2 function.

Onboard E610 LAN

Use this to enable or disable the Onboard E610 LAN function.

DMA Control Opt-In Flag

Select this item to enable DMA_CTRL_PLATFORM_OPT_IN_FLAG in the DMAR of the ACPI to request OS to enable DMA protection. Not compatible with Direct Device Assignment (DDA).

Pre-boot DMA Protection

Select this item to enable DMA Protection in Pre-boot Environment.

MCIO Mode Selection

Select this item to configure the MCIO Mode.

MCIO3 Mode Selection

Select SATA or PCIE work in MCIO3 port.

PCIE Link Width

Select this item to configure PCIE Link Width.

PCIE1/PCIE2/PCIE3/PCIE4/PCIE5/PCIE6/PCIE7 Link Width

Select PCIE port Bifurcation for PCIE1/PCIE2/PCIE3/PCIE4/PCIE5/PCIE6/PCIE7. The default value is [Auto]-x16. Option items: Auto, x4x4x4x4, x4x4x8, x8x4x4, x8x8 and x16.

MCIO1/MCIO2 Link Width

Select MCIO1/MCIO2 Link Width. The default value is [Auto]-x4x4x4x4. Option items: Auto, x4x4x4x4, x4x4x8, x8x4x4, x8x8 and x16.

PCIE Link Speed

Select this item to configure PCIE Link Speed.

PCIE1/PCIE2/PCIE3/PCIE4/PCIE5/PCIE6/PCIE7 Link Speed

Select Link Speed for PCIE1/PCIE2/PCIE3/PCIE4/PCIE5/PCIE6/PCIE7. The default value is [Auto]-up to Gen5 (32 GT/s).

MCIO1/MCIO2 Link Speed

Select Link Speed for MCIO1/MCIO2. The default value is [Auto]-up to Gen5 (32 GT/s).

M2_1/M2_2 Link Speed

Select Link Speed for M2_1/M2_2. The default value is [Auto]-up to Gen4 (16 GT/s).

MCIO3 Link Speed

Select Link Speed for MCIO3. The default value is [Auto]-up to Gen4 (16 GT/s).

PCIE Hot Plug

Select this item to configure PCIE Hot Plug globally.

PCIE1/PCIE2/PCIE3/PCIE4/PCIE5/PCIE6/PCIE7, MCIO1/MCIO2 Surprise Hot Plug

This item specifies if the link is considered Surprise Hot Plug capable. Select it to enable or disable PCIE and MCIO Surprise Hot Plug.

PCIE ASPM

Select this item to configure the PCIE ASPM.

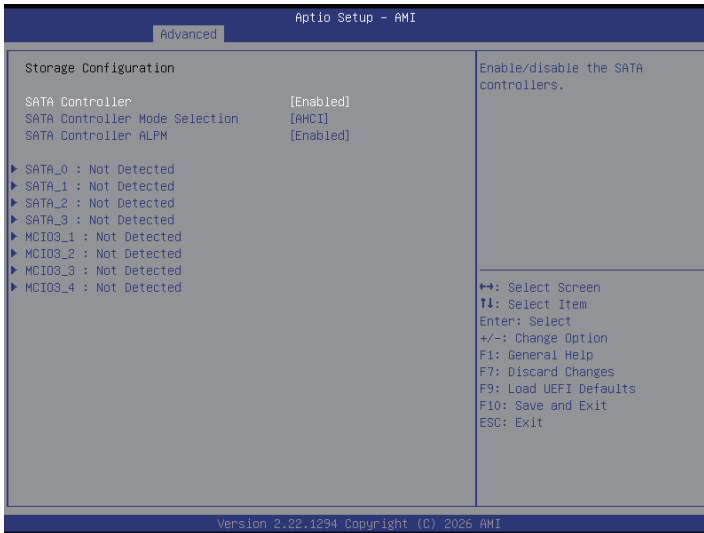
PCI-E ASPM Support (Global)

Set this item to Auto to configure all PCIe root ports.

M2_1/M2_2/MCIO1/MCIO2/MCIO3 ASPM Support

Select this item to enable or disable the ASPM support in PCIe root port. The default value is [Auto].

3.4.5 Storage Configuration



SATA Controller

Enable or disable the SATA controllers.

SATA Controller Mode Selection

This item specifies how SATA controller(s) operate.

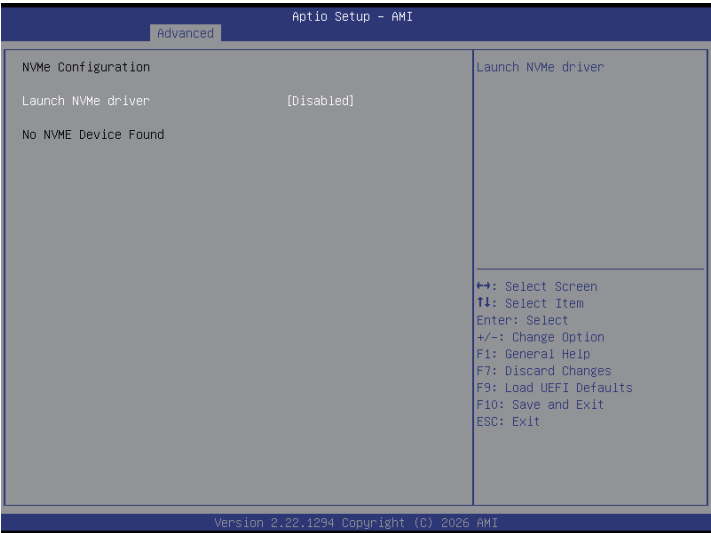
AHCI: Supports new features that improve performance.

RAID: Combine same SATA Controller multiple disk drives into a logical unit.

SATA Controller ALPM

SATA Aggressive Link Power Management allows SATA devices to enter a low power state during periods of inactivity to save power. It is only supported by AHCI mode.

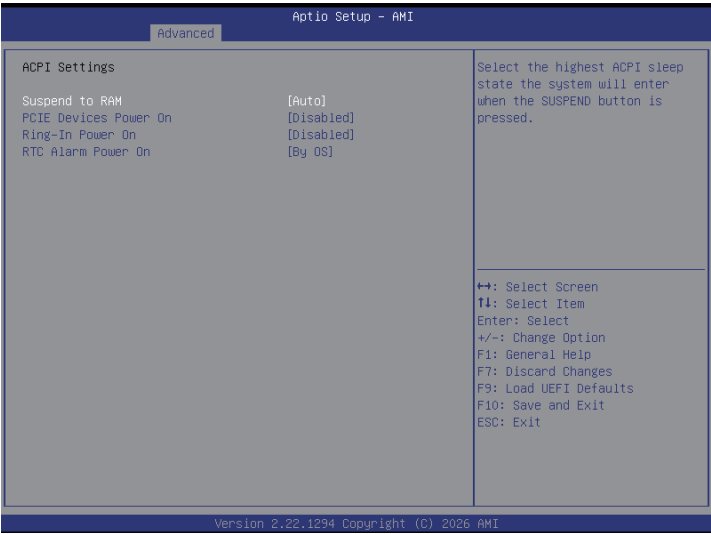
3.4.6 NVMe Configuration



Launch NVMe driver

Select this item to enable or disable launch NVMe driver.

3.4.7 ACPI Configuration



Suspend to RAM

Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.

PCIE Devices Power On

Allow the system to be waked up by a PCIE device and enable wake on LAN.

Ring-In Power On

Allow the system to be waked up by onboard COM port modem Ring-In signals.

RTC Alarm Power On

Allow the system to be waked up by the real time clock alarm. Set it to By OS to let it be handled by operating system.

RTC Alarm Hour

Use this item to set Hour of RTC power on feature.

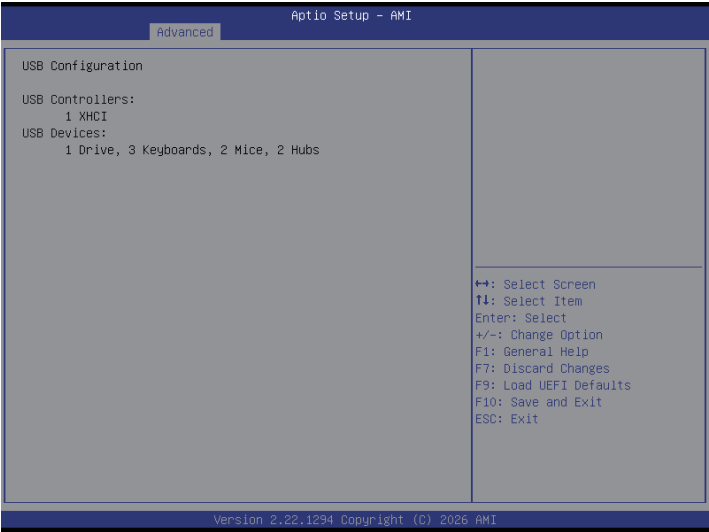
RTC Alarm Minute

Use this item to set Minute of RTC power on feature.

RTC Alarm Second

Use this item to set Second of RTC power on feature.

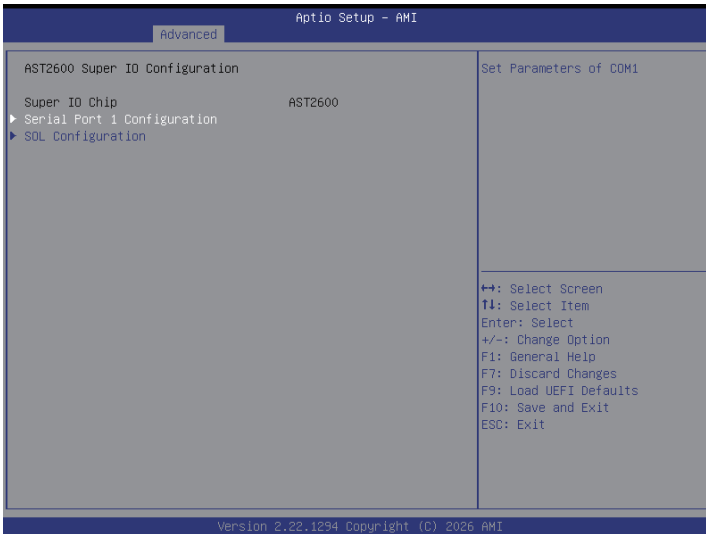
3.4.8 USB Configuration



USB Configuration

The USB Configuration displays the USB Controllers and USB Devices informations.

3.4.9 Super IO Configuration



Serial Port 1 Configuration

Use this item to set parameters of COM1.

Serial Port

Use this item to enable or disable the serial port.

Change Settings

Use this item to select an optimal setting for Super IO device.

SOL Configuration

Use this item to set parameters of SOL.

SOL Port

Use this item to set parameters of SOL.

Change Settings

Use this item to select an optimal setting for Super IO device.

3.4.10 Serial Port Console Redirection



COM1 / SOL

Console Redirection

Use this option to enable or disable Console Redirection. If this item is set to Enabled, it allows user to select a COM Port to be used for Console Redirection.

Console Redirection Settings

Use this option to configure Console Redirection Settings, and specify how the computer and the host computer to which are connected exchange information. Both computers should have the same or compatible settings.

Terminal Type

Use this item to select the preferred terminal emulation type for out-of-band management. It is recommended to select [VT-UTF8].

Option	Description
VT100	ASCII character set
VT100Plus	Extended VT100 that supports color and function keys
VT-UTF8	UTF8 encoding is used to map Unicode chars onto 1 or more bytes
ANSI	Extended ASCII character set

Bits Per Second

Use this item to select the serial port transmission speed. The speed used in the host computer and the client computer must be the same. Long or noisy lines may require lower transmission speed. The options include [9600], [19200], [38400], [57600] and [115200].

Data Bits

Use this item to set the data transmission size. The options include [7] and [8] (Bits).

Parity

Use this item to select the parity bit. The options include [None], [Even], [Odd], [Mark] and [Space].

Stop Bits

The item indicates the end of a serial data packet. The standard setting is [1] Stop Bit. Select [2] Stop Bits for slower devices.

Flow Control

Use this item to set the flow control to 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 restart the flow. Hardware flow uses two wires to send start/stop signals. The options include [None] and [Hardware RTS/CTS].

VT-UTF8 Combo Key Support

Use this item to enable or disable the VT-UTF8 Combo Key Support for ANSI/VT100 terminals.

Recorder Mode

Use this item to enable or disable Recorder Mode to capture terminal data and send it as text messages.

Resolution 100x31

Use this item to enable or disable extended terminal resolution support.

Putty KeyPad

Use this item to select Function Key and Keypad on Putty.

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

Use this option to enable or disable Console Redirection. If this item is set to Enabled, it allows user to select a COM Port to be used for Console Redirection.

Console Redirection Settings

Use this option to configure Console Redirection Settings, and specify how the computer and the host computer to which are connected exchange information.

Out-of-Band Mgmt Port

Microsoft Windows Emergency Management Services (EMS) allows for remote management of a Windows Server OS through a serial port.

Terminal Type EMS

Use this item to select the preferred terminal emulation type for out-of-band management. It is recommended to select [VT-UTF8].

Option	Description
VT100	ASCII character set
VT100+	Extended VT100 that supports color and function keys
VT-UTF8	UTF8 encoding is used to map Unicode chars onto 1 or more bytes
ANSI	Extended ASCII character set

Bits Per Second EMS

Use this item to select the serial port transmission speed. The speed used in the host computer and the client computer must be the same. Long or noisy lines may require lower transmission speed. The options include [9600], [19200], [57600] and [115200].

Flow Control EMS

Use this item to set the flow control to 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 restart the flow. Hardware flow uses two wires to send start/stop signals. The options include [None], [Hardware RTS/CTS], and [Software Xon/Xoff].

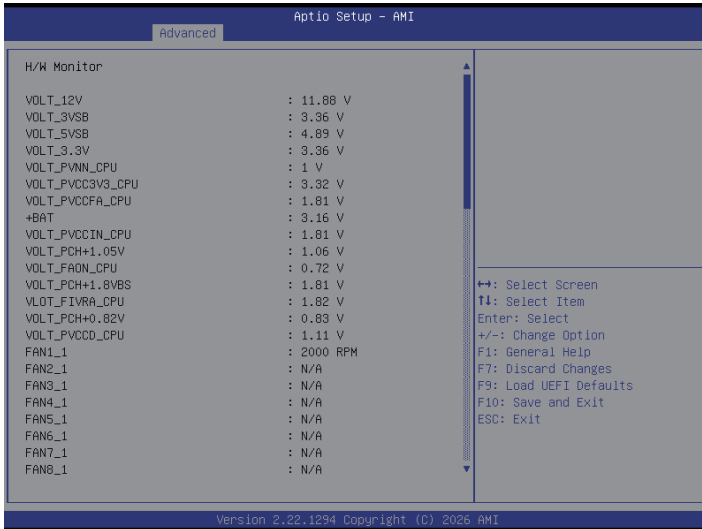
Data Bits EMS

Parity EMS

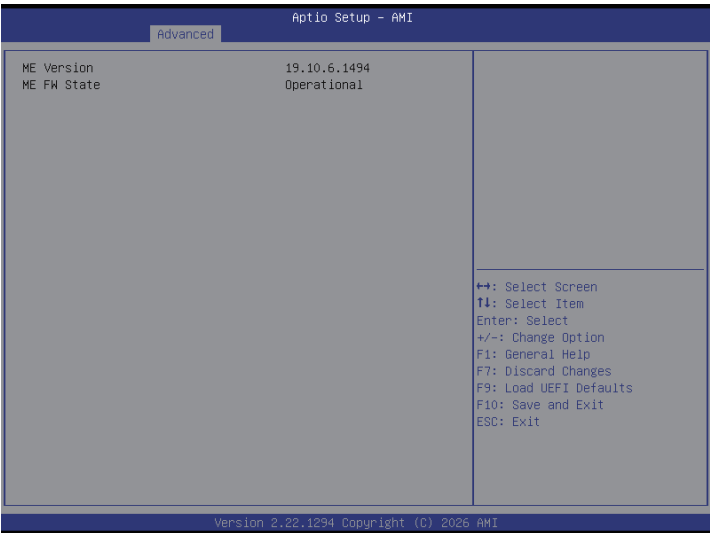
Stop Bits EMS

3.4.11 H/W Monitor

In this section, it allows user to monitor the status of the hardware on the system, including the parameters of the CPU temperature, motherboard temperature, CPU fan speed, chassis fan speed, and the critical voltage.

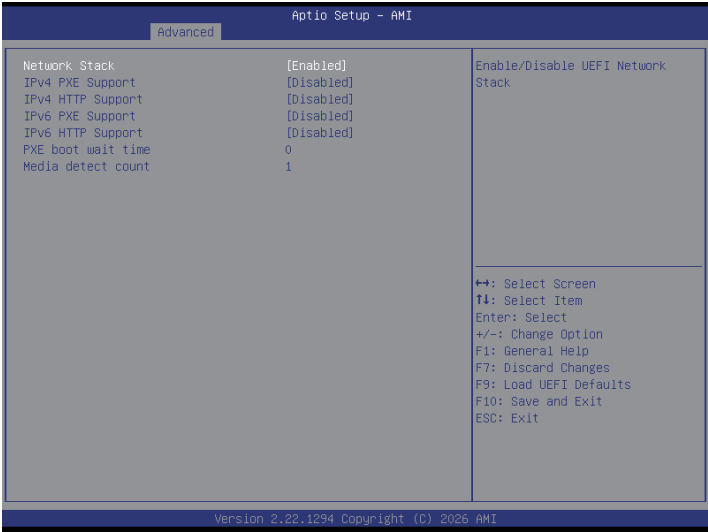


3.4.12 Intel ME Configuration



Select this item to display the ME Version and ME FW State information.

3.4.13 Network Stack Configuration



Network Stack

Enable UEFI network stack can prevents to perform from the single-user network boots and network installation. If disabled, the host does not use the network interface.

IPv4 PXE Support

Enable IPv4 PXE Boot support. If disabled, IPv4 PXE Boot Option is not supported.

IPv4 HTTP Support

Enable IPv4 HTTP Boot support. If disabled, IPv4 HTTP Boot Option is not supported.

IPv6 PXE Support

Enable IPv6 PXE Boot support. If disabled, IPv6 PXE Boot Option is not supported.

IPv6 HTTP Support

Enable IPv6 HTTP Boot support. If disabled, IPv6 HTTP Boot Option is not supported.

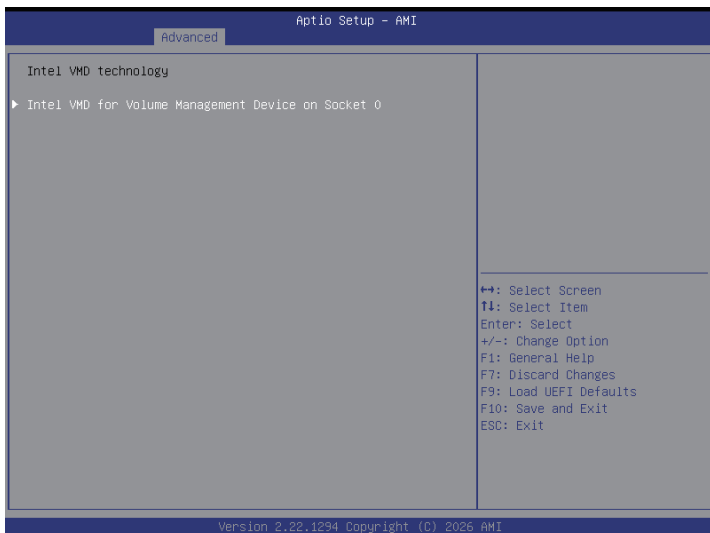
PXE Boot Wait Time

Wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value.

Media detect count

Number of times the presence of media will be checked. Use either +/- or numeric keys to set the value.

3.4.14 Intel VMD Technology



Press <Enter> to bring up the Intel VMD for Volume Management Device Configuration menu.

Intel VMD for Volume Management Device on Socket 0

VMD Config for Stack 0 (PCIE5), Stack 2 (PCIE6), Stack 3 (MCIO2/MCIO1), Stack 4 (PCIE1), Stack5 (PCIE2), Stack6 (PCIE7), Stack7 (PCIE4), Stack 8 (PCIE3)

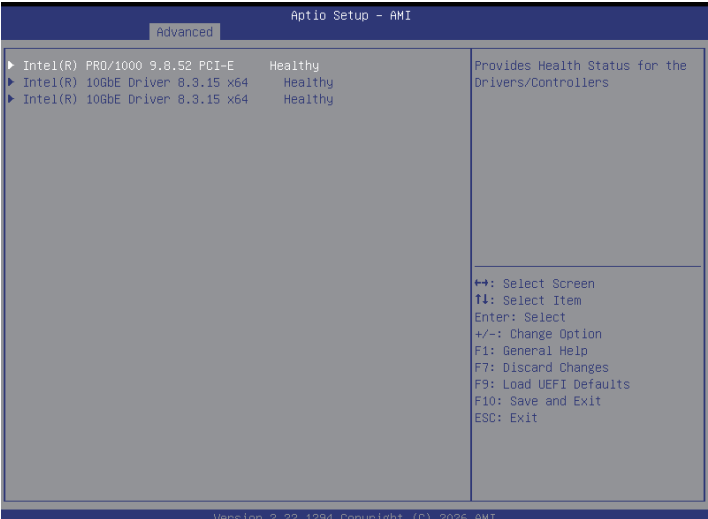
Enable/Disable VMD

Use this item to enable or disable Intel Volume Management Device Technology in the specified Stack.

VMD port X

Use this item to enable or disable Intel Volume Management Device Technology on specific root port.

3.4.15 Driver Health



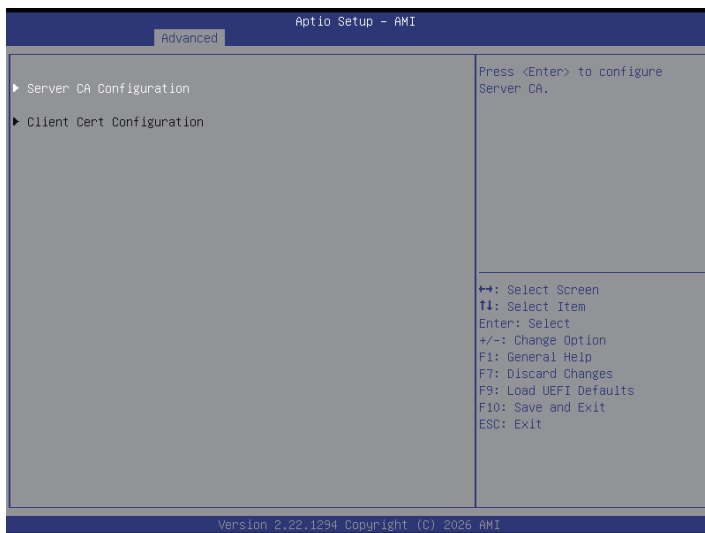
Inter (R) PRO/1000 9.8.52 PCI-E Healthy

Provides Health Status for the Drivers/Controllers.

Inter (R) 10GbE Driver 8.3.15 x64 Healthy

Provides Health Status for the Drivers/Controllers.

3.4.16 Tls Auth Configuration



Server CA Configuration

Press <Enter> to configure Server CA.

Enroll Cert

Press <Enter> to enroll cert.

Delete Cert

Press <Enter> to delete cert.

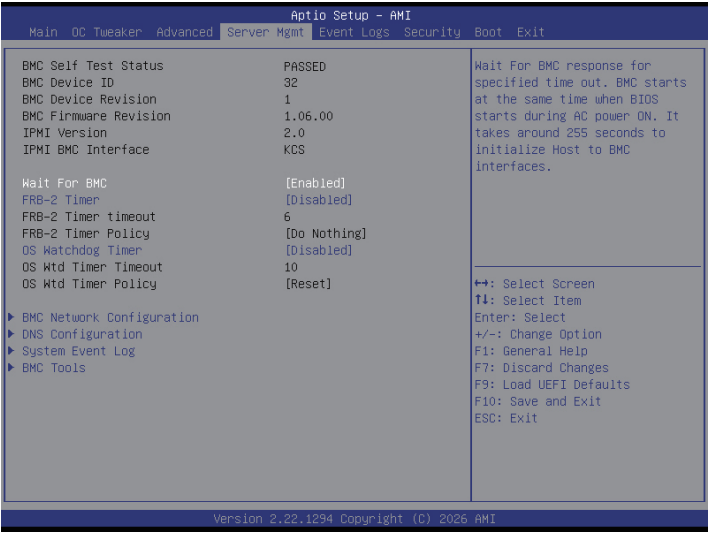
Client Cert Configuration

Press <Enter> to configure Client Cert.

3.4.17 Instant Flash

Instant Flash is a UEFI flash utility embedded in Flash ROM. This convenient UEFI update tool allows user to update system UEFI without entering operating systems first like MS-DOS or Windows. Just save the new UEFI file to the USB flash drive, floppy disk or hard drive and launch this tool, then update the UEFI only in a few clicks without preparing an additional floppy diskette or other complicated flash utility. Please be noted that the USB flash drive or hard drive must use FAT32/16/12 file system. Execute the Instant Flash utility, the utility will show the UEFI files and the respective information. Select the proper UEFI file to update UEFI, and reboot the system after the UEFI update process is completed.

3.5 Server Mgmt



Wait For BMC

Wait For BMC response for specified time out. BMC starts at the same time when BIOS starts during AC power ON. It takes around 90 seconds to initialize Host to BMC interfaces.

FRB-2 Timer

Select this item to enable or disable FRB-2 timer (POST timer)

FRB-2 Timer Timeout

Select this item to define the FRB-2 Time Expiration between 1 to 30 value.

FRB-2 Timer Policy

Configure how the system should respond. If the FRB-2 Timer expires is disabled, this item is not available.

OS Watchdog Timer

Select this item to enable or disable OS Watchdog Timer. If enabled, starts a BIOS timer which can only be shut off by Management Software after the OS loads.

OS Wtd Timer Timeout

Configure the OS Boot Watchdog Timer Expiration between 1 to 30 min value. If the OS Boot Watchdog Timer is disabled, this item is not available.

OS Wtd Timer Policy

Configure how the system should respond if the OS Boot Watchdog Timer expires. If the OS Boot Watchdog Timer is disabled, this item is not available.

BMC Network Configuration

Select this item to configure BMC network parameters.

DNS Configuration

Select this item to configure DNS parameters.

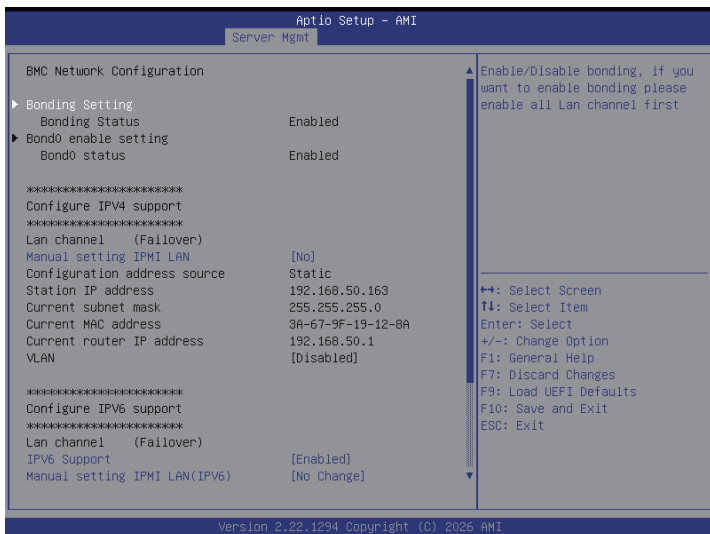
System Event Log

Press <Enter> to change the SEL event log configuration.

BMC Tools

Select this item to configure about KCS control, restore AC power loss and load BMC default settings.

3.5.1 BMC Network Configuration



Bonding Setting

Select this item to enabled or disabled bonding. Please enable all lan channel first when want to enable bonding.

Lan Channel (Failover)

Manual Setting IPMI LAN

If [No] is selected, the IP address is assigned by DHCP. Using a static IP address, toggle to [Yes], and the changes take effect after the system reboots. The default value is [No].

Configuration Address Source

Select to configure BMC network parameters statically or dynamically (by BIOS or BMC). Configuration options: [Static] and [DHCP].

Static: Manually enter the IP Address, Subnet Mask and Gateway Address in the BIOS for BMC LAN channel configuration.

DHCP: IP address, Subnet Mask and Gateway Address are automatically assigned by the network's DHCP server.



When [DHCP] or [Static] is selected, do NOT modify the BMC network settings on the IPMI web page.



The default login information for the IPMI web interface is:

Username: admin

Password: admin

For more instructions on how to set up remote control environment and use the IPMI management platform, please refer to the IPMI Configuration User Guide or go to the Support website at: <http://www.asrockrack.com/support/ipmi.asp>

VLAN

Enable or disable Virtual Local Area Network.

If [Enabled] is selected, configure the items below.

VLAN ID: Select this item to configure the VLAN ID setting, the Maximum value is 4094 and the Minimum value is 1.

VLAN Priority: Select this item to configure the VLAN Priority setting, the Maximum value is 7 and the Minimum value is 0.

IPV6 Support

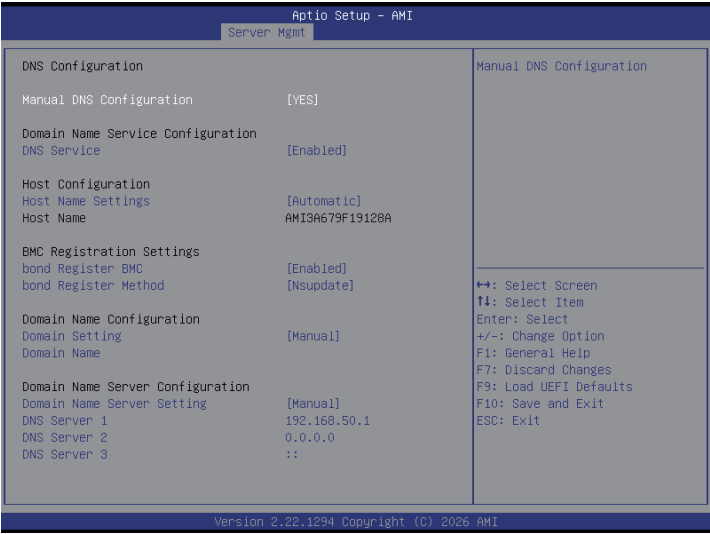
Enable or disable LAN1 IPV6 Support.

Manual Setting IPMI LAN(IPV6)

Select to configure LAN channel parameters statically or dynamically(by BIOS or BMC).

Unspecified option will not modify any BMC network parameters during BIOS phase.

3.5.2 DNS Configuration



Manual DNS Configuration

Use this item to manual configure DNS.

If [YES] is selected, configure the items below.

DNS Service

Use this item to enable or disable DNS Service Configuration.

Host Name Settings

Use this item to automatic or manual Host Name Settings.

Bond Register BMC

Use this item to enable or disable Bond Register BMC.

Bond Register Method

Use this item to configure Bond Register Method with Nsupdate or DHCP client FQDN/Hostname..

Domain Setting

This item supports Manual, Bond0_v4 and Bond0_v6 Domain Settings.

Domain Name

Domain Name setting.

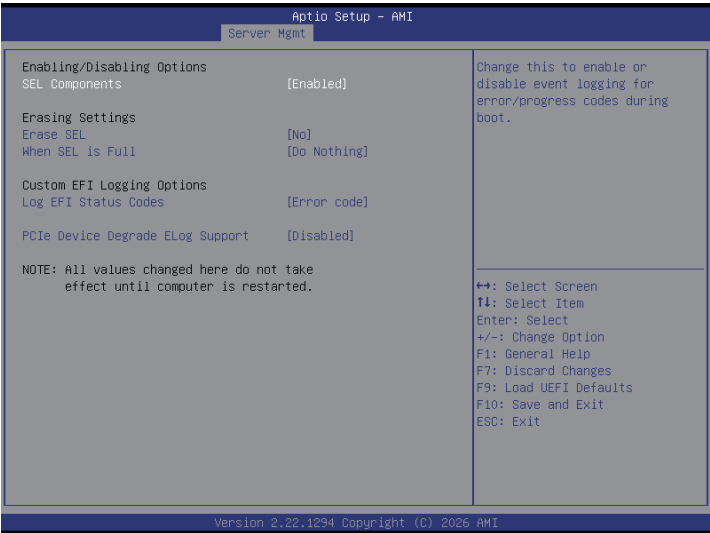
Domain Name Server Setting

This item supports Manual and Bond0 DNS Server Settings.

DNS Server X

This item displays the DNS Server address information.

3.5.3 System Event Log



SEL Components

Change this to enable or disable event logging for error/progress codes during boot.

Erase SEL

Use this to choose options for erasing SEL.

When SEL is Full

Use this to choose options for reactions to a full SEL.

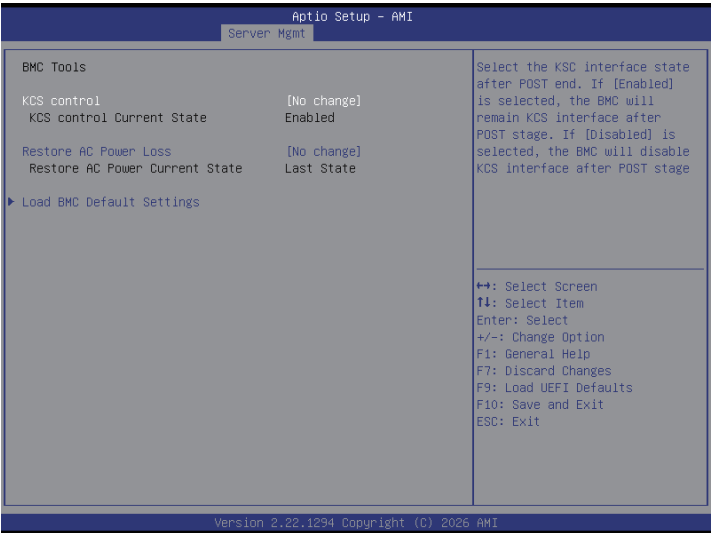
Log EFI Status Codes

Use this item to disable the logging of EFI Status Codes or log only error code or only progress code or both.

PCIe Device Degrade ELog Support

Use this item to enable or disable PCIe Device Degrade Error Logging Support.

3.5.4 BMC Tools



KCS control

Select the KSC interface state after POST end. If [Enabled] is selected, the BMC will remain KCS interface after POST stage. If [Disabled] is selected, the BMC will disable KCS interface after POST stage.

Restore AC Power Loss

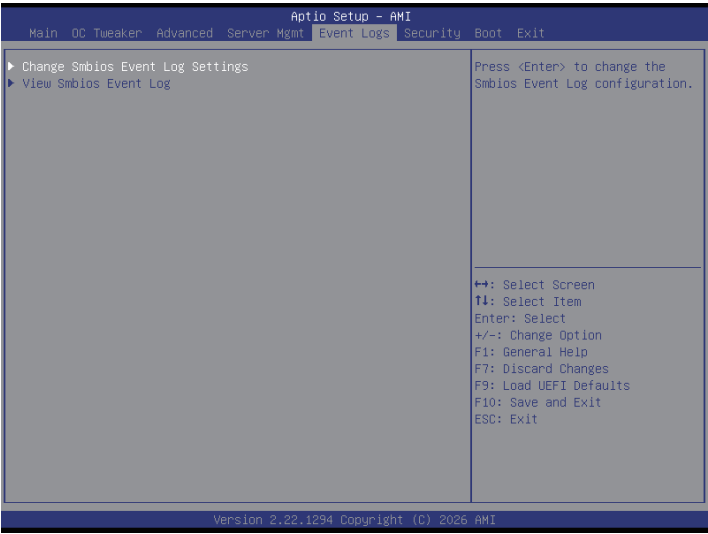
This allows user to set the power state after an unexpected AC/power loss. If [Power Off] is selected, the AC/power remains off when the power recovers. If [Power On] is selected, the AC/power resumes and the system starts to boot up when the power recovers. If [Last State] is selected, it will recover to the state before AC/power loss.

Load BMC Default Settings

Use this item to load BMC default settings.

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

3.6 Event Logs



Change Smbios Event Log Settings

Select this item to configure the Smbios Event Log Settings.

When entering the item, the screen displays following sub-items:

Smbios Event Log

Use this item to enable or disable all features of the SMBIOS Event Logging during system boot.

Erase Event Log

The options include [No], [Yes, Next reset] and [Yes, Every reset]. If Yes is selected, all logged events will be erased.

When Log is Full

Use this item to choose options for reactions to a full Smbios Event Log. The options include [Do Nothing] and [Erase Immediately].

Log System Boot Event

Choose option to enable or disable logging of System boot event.

View Smbios Event Log

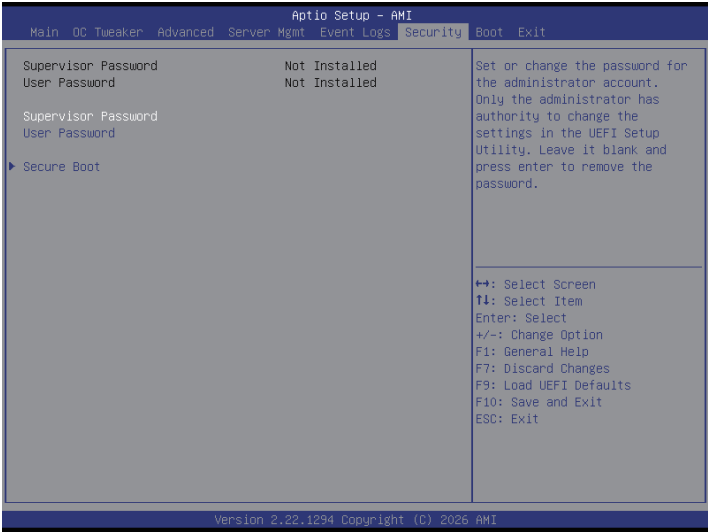
Press <Enter> to view the Smbios Event Log records.



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

3.7 Security

In this section, set or change the supervisor/user password for the system. For the user password, can also clear it.



Supervisor Password

Set or change the password for the administrator account. Only the administrator has authority to change the settings in the UEFI Setup Utility. Leave it blank and press enter to remove the password.

User Password

Set or change the password for the user account. User is unable to change the settings in the UEFI Setup Utility. Leave it blank and press enter to remove the password.

Secure Boot

Select this item to configure the Secure Boot.

Secure Boot

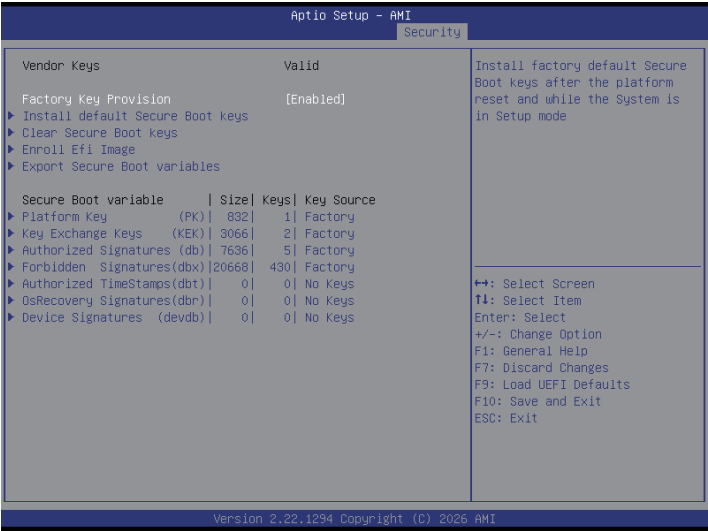
Use this to enable or disable Secure Boot Control. The default value is [Disabled]. Enable to support Windows Server 2012 R2 or later versions Secure Boot.

Secure Boot Mode

Secure Boot mode selector: Standard/Custom. In Custom mode Secure Boot Variables can be configured without authentication.

3.7.1 Expert Key Management

In this section, expert users can modify Secure Boot Policy variables without full authentication.



Factory Key Provision

Install factory default Secure Boot keys after the platform reset and while the System is in Setup mode.

Install Default Secure Boot Keys

Please install default secure boot keys if it's the first time using the secure boot.

Clear Secure Boot Keys

Force System to Setup Mode - clear all Secure Boot Variables. Change takes effect after re-boot.

Enroll Efi Image

Allow the image to run in Secure Boot mode. Enroll SHA256 hash of the binary into Authorized Signature Database (db).

Export Secure Boot Variables

Copy NVRAM content of Secure Boot variables to files in a root folder on a file system device.

Platform Key(PK)

Enroll Factory Defaults or load certificates from a file:

1. Public Key Certificate in:

- a) EFI_SIGNATURE_LIST
- b) EFI_CERT_X509 (DER)
- c) EFI_CERT_RSA2048 (bin)
- d) EFI_CERT_SHAXXX

2. Authenticated UEFI Variable

3. EFI PE/COFF Image(SHA256)

Key Source: Factory, Modified, Mixed

Key Exchange Keys(KEK)

Enroll Factory Defaults or load certificates from a file:

1. Public Key Certificate in:

- a) EFI_SIGNATURE_LIST
- b) EFI_CERT_X509 (DER)
- c) EFI_CERT_RSA2048 (bin)
- d) EFI_CERT_SHAXXX

2. Authenticated UEFI Variable

3. EFI PE/COFF Image(SHA256)

Key Source: Factory, Modified, Mixed

Authorized Signatures(db)

Enroll Factory Defaults or load certificates from a file:

1. Public Key Certificate in:

- a) EFI_SIGNATURE_LIST
- b) EFI_CERT_X509 (DER)
- c) EFI_CERT_RSA2048 (bin)
- d) EFI_CERT_SHAXXX

2. Authenticated UEFI Variable

3. EFI PE/COFF Image(SHA256)

Key Source: Factory, Modified, Mixed

Forbidden Signatures(dbx)

Enroll Factory Defaults or load certificates from a file:

1. Public Key Certificate in:

a) EFI_SIGNATURE_LIST

b) EFI_CERT_X509 (DER)

c) EFI_CERT_RSA2048 (bin)

d) EFI_CERT_SHAXXX

2. Authenticated UEFI Variable

3. EFI PE/COFF Image(SHA256)

Key Source: Factory, Modified, Mixed

Authorized TimeStamps(dbt)

Enroll Factory Defaults or load certificates from a file:

1. Public Key Certificate in:

a) EFI_SIGNATURE_LIST

b) EFI_CERT_X509 (DER)

c) EFI_CERT_RSA2048 (bin)

d) EFI_CERT_SHAXXX

2. Authenticated UEFI Variable

3. EFI PE/COFF Image(SHA256)

Key Source: Factory, Modified, Mixed

OsRecovery Signatures(dbr)

Enroll Factory Defaults or load certificates from a file:

1. Public Key Certificate in:

a) EFI_SIGNATURE_LIST

b) EFI_CERT_X509 (DER)

c) EFI_CERT_RSA2048 (bin)

d) EFI_CERT_SHAXXX

2. Authenticated UEFI Variable

3. EFI PE/COFF Image(SHA256)

Key Source: Factory, Modified, Mixed

Device Signatures(devdb)

Enroll Factory Defaults or load certificates from a file:

1. Public Key Certificate in:

a) EFI_SIGNATURE_LIST

b) EFI_CERT_X509 (DER)

c) EFI_CERT_RSA2048 (bin)

d) EFI_CERT_SHAXXX

2. Authenticated UEFI Variable

3. EFI PE/COFF Image(SHA256)

Key Source: Factory, Modified, Mixed

3.8 Boot Screen

In this section, it will display the available devices on the system for user to configure the boot settings and the boot priority.



Boot Option #1~#6

Use this item to set the system boot order.

UEFI Application Boot Priorities

Specifies the Boot Device Priority sequence from available UEFI Application.

Setup Prompt Timeout

Number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.

Bootup NumLock State

If this item is set to [On], it will automatically activate the Numeric Lock function after boot-up.

Boot Beep

Select whether the Boot Beep should be turned on or off when the system boots up. Please note that a buzzer is needed.

Full Screen Logo

Enable to display the boot logo or disable to show normal POST messages.

Boot Failure Guard Message

If the computer fails to boot for a number of times the system automatically restores the default settings.

Boot Failure Guard Count

Use this item to configure the number of attempts to boot until the system automatically restores the default settings.

3.9 Exit Screen



Save Changes and Exit

Exit system setup after saving the changes.

Discard Changes and Exit

Exit 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 UEFI Defaults

Load UEFI default values for all the setup questions. F9 key can be used for this operation.

Chapter 4 Software Support

After all the hardware has been installed, it suggests to go to the official website at <http://www.ASRockRack.com> and make sure if there are any new updates of the BIOS / BMC firmware for the motherboard.

4.1 Download and Install Operating System

This motherboard supports various Microsoft® Windows® Server / Linux compliant operating systems. Please download the operating system from the OS manufacturer. Please refer to the OS documentation for more instructions.

**Please download the Intel® Rapid Storage Technology driver from the ASRock Rack's website (www.asrockrack.com) to the USB drive while installing OS in SATA RAID mode.*

4.2 Download and Install Software Drivers

This motherboard supports various Microsoft® Windows® compliant drivers. Please download the required drivers from the website at <http://www.ASRockRack.com>.

To download necessary drivers, go to the product page, click on the "Download" tab, choose the operating system that is used, and then download the using driver.

Chapter 5 Troubleshooting

5.1 Troubleshooting Procedures

Follow the procedures below to troubleshoot the system.



Always unplug the power cord before adding, removing or changing any hardware components. Failure to do so may cause physical injuries and damages to motherboard components.

1. Disconnect the power cable and check whether the PWR LED is off.
2. Unplug all cables, connectors and remove all add-on cards from the motherboard.
Make sure that the jumpers are set to default settings.
3. Confirm that there are no short circuits between the motherboard and the chassis.
4. Install a CPU and fan on the motherboard, then connect the chassis speaker and power LED.

If there is no power...

1. Confirm that there are no short circuits between the motherboard and the chassis.
2. Make sure that the jumpers are set to default settings.
3. Check the settings of the 115V/230V switch on the power supply.
4. Verify if the battery on the motherboard provides ~3VDC. Install a new battery if it does not.

If there is no video...

1. Try replugging the monitor cables and power cord.
2. Check for memory errors.

If there are memory errors...

1. Verify that the DIMM modules are properly seated in the slots.
2. Use recommended DDR5 RDIMM/RDIMM-3DS/MRDIMM.
3. Install more than one DIMM modules that should be identical with the same brand, speed, size and chip-type.
4. Try inserting different DIMM modules into different slots to identify faulty ones.
5. Check the settings of the 115V/230V switch on the power supply.

Unable to save system setup configurations...

1. Verify if the battery on the motherboard provides ~3VDC. Install a new battery if it does not.
2. Confirm whether the power supply provides adequate and stable power.

Other problems...

1. Try searching keywords related to the related problem on ASRock Rack's FAQ page:
<http://www.asrockrack.com/support>

5.2 Technical Support Procedures

If the problems are still unsolved, please contact ASRock Rack's technical support with the following information:

1. Contact information
2. Model name, BIOS version and problem type.
3. System configuration.
4. Problem description.

Contact ASRock Rack's technical support at:
<http://www.asrockrack.com/support/tsd.asp>

5.3 Returning Merchandise for Service

For warranty service, the receipt or a copy of the invoice marked with the date of purchase is required. By calling the vendor or going to RMA website (<http://event.asrockrack.com/tsd.asp>) to obtain a Returned Merchandise Authorization (RMA) number.

The RMA number should be displayed on the outside of the shipping carton which is mailed prepaid or hand-carried when returning the motherboard to the manufacturer. Shipping and handling charges will be applied for all orders that must be mailed when service is complete.

This warranty does not cover damages incurred in shipping or from failure due to alteration, misuse, abuse or improper maintenance of products.

Contact the distributor first for any product related problems during the warranty period.

Contact Information

Contact ASRock Rack or want to know more about ASRock Rack, it's welcome to visit ASRock Rack's website at <http://www.asrockrack.com>; or contact the dealer for further information. For technical questions, please submit a support request form at <https://event.asrockrack.com/tsd.asp>

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