



**OPEN** Industry Standard, Flexible Architecture

**GREEN** Less Heat, Less Power Consumption

**STABLE** Robust Design, Quality Parts

Stable and  
Reliable Solution

**Server/Workstation**

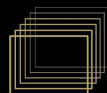
Motherboard

**W480D2I**

**Z490D2I**

User Manual

English



Version 1.0

Published March 2021

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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.

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The Lithium battery adopted on this motherboard contains Perchlorate, a toxic substance controlled in Perchlorate Best Management Practices (BMP) regulations passed by the California Legislature. When you discard the Lithium battery in California, USA, please follow the related regulations in advance.

“Perchlorate Material-special handling may apply, see [www.dtsc.ca.gov/hazardouswaste/perchlorate](http://www.dtsc.ca.gov/hazardouswaste/perchlorate)”

**ASRock Rack's Website: [www.ASRockRack.com](http://www.ASRockRack.com)**

## Contact Information

If you need to contact ASRock Rack or want to know more about ASRock Rack, you're welcome to visit ASRock Rack's website at [www.ASRockRack.com](http://www.ASRockRack.com); or you may contact your dealer for further information.

### **ASRock Rack Incorporation**

6F., No.37, Sec. 2, Jhongyang S. Rd., Beitou District,

Taipei City 112, Taiwan (R.O.C.)

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# Chapter 1 Introduction

Thank you for purchasing ASRock Rack **W480D2I / Z490D2I** 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 Support CD.



*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. You may find the latest memory and CPU support lists on ASRock Rack website as well. ASRock Rack's Website: [www.ASRockRack.com](http://www.ASRockRack.com)*

*If you require technical support related to this motherboard, please visit our website for specific information about the model you are using.  
<http://www.asrockrack.com/support/>*

## 1.1 Package Contents

- ASRock Rack W480D2I / Z490D2I Motherboard  
(Mini ITX Form Factor: 6.7-in x 6.7-in, 17.02 cm x 17.02 cm)
- Support CD
- Quick Installation Guide
- 1 x SATA3 Cable (60cm)
- 1 x SATA Power Cable (80cm)
- 1 x ATX 4P to 24P Power Cable
- 1 x I/O Shield
- 1 x Screw for M.2 Socket



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

## 1.2 Specifications

| W480D2I / Z490D2I    |                                                                                                                                             |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| MB Physical Status   |                                                                                                                                             |
| Form Factor          | Mini ITX                                                                                                                                    |
| Dimension            | 6.7" x 6.7" (17.02cm x17.02 cm)                                                                                                             |
| Processor System     |                                                                                                                                             |
| CPU                  | Supports Intel® 11 <sup>th</sup> /10 <sup>th</sup> Gen. Core™ i9/i7/i5/i3, Pentium, Celeron series                                          |
| Socket               | Single Socket LGA1200                                                                                                                       |
| Chipset              | Intel® W480 / Z490                                                                                                                          |
| Thermal Design Power | 125W                                                                                                                                        |
| System Memory        |                                                                                                                                             |
| Capacity             | 2 x DDR4 DIMM slots                                                                                                                         |
| Type                 | - Single Channel DDR4 memory technology<br>- Supports DDR4 2933*/2666/2400/2133 ECC UDIMM<br><i>*Supported for i5, i3, pentium, celeron</i> |
| DIMM Size Per DIMM   | ECC UDIMM : 32GB, 16GB, 8GB, 4GB                                                                                                            |
| DIMM Frequency       | ECC UDIMM: 2933*/2666/2400/2133 MHz<br><i>*Supported for i5, i3, pentium, celeron</i>                                                       |
| Voltage              | 1.2V                                                                                                                                        |
| Expansion Slot       |                                                                                                                                             |
| PCIe 3.0 x16         | 1 slot                                                                                                                                      |
| Storage              |                                                                                                                                             |
| SATA Controller      | 2x OCULINK (SATA x 6 ports (OCU1: SATA_0,1,2,3; OCU2: SATA_4,5) or 2 x PCIe4))<br><i>*Z490D2I only supports SATA[0:5].</i>                  |
| M.2                  | - 1 x M.2 (Type 2280, PCI-E Gen3 x4 link from PCH or SATA signal*)<br><i>*OCU1 (SATA1) will be disabled when M.2 is SATA signal.</i>        |
| Ethernet             |                                                                                                                                             |
| Interface            | 1000 /100 /10 Mbps                                                                                                                          |
| LAN                  | - 2 x RJ45 GLAN by Intel® i210+Intel® i219LM<br>- Supports Wake-On-LAN<br>- Supports Energy Efficient Ethernet 802.3az<br>- Supports PXE    |
| Graphics             |                                                                                                                                             |
| Controller           | ASPEED AST2500                                                                                                                              |
| VRAM                 | DDR4 16MB                                                                                                                                   |
| Rear Panel I/O       |                                                                                                                                             |
| VGA Port             | 1 x D-Sub                                                                                                                                   |

|                           |                                                                                                                                                         |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| USB 3.2 Port              | 2 (Gen2), 2(Gen1)                                                                                                                                       |
| LAN Port                  | - RJ45: 2x GLAN(by Intel® i210+ Intel® i219LM)<br>- LAN Ports with LED (ACT/LINK LED and SPEED LED)                                                     |
| Management LAN Port       | 1                                                                                                                                                       |
| UID                       | 1                                                                                                                                                       |
| <b>Internal Connector</b> |                                                                                                                                                         |
| Auxiliary Panel Header    | 1 (includes chassis intrusion, front LAN LED)                                                                                                           |
| Thermal Sensor Header     | 1                                                                                                                                                       |
| SPI TPM Header            | 1                                                                                                                                                       |
| Fan Header                | 3 Fans x 4-pin                                                                                                                                          |
| ATX Power                 | 1 x (4-pin) + 1 x (8-pin) support 12V DC-IN                                                                                                             |
| SATA Power                | 1 x (4-pin)                                                                                                                                             |
| OCuLink                   | 2                                                                                                                                                       |
| USB 3.2 Gen1 Header       | 1 (supports 2 USB3.2 Gen1 ports)                                                                                                                        |
| ClearCMOS                 | 1 (short pad)                                                                                                                                           |
| SGPIO                     | 1                                                                                                                                                       |
| Front Panel               | 1                                                                                                                                                       |
| COM Header                | 1                                                                                                                                                       |
| IPMB                      | 1                                                                                                                                                       |
| PWR SMB                   | 1                                                                                                                                                       |
| Smbus from BMC            | 1                                                                                                                                                       |
| OH/FanFail LED            | 3 (only Fan Fail LED)                                                                                                                                   |
| <b>System BIOS</b>        |                                                                                                                                                         |
| BIOS Type                 | 256Mb AMI UEFI Legal BIOS                                                                                                                               |
| BIOS Features             | - Plug and Play (PnP)<br>- ACPI 2.0 Compliance Wake Up Events<br>- SMBIOS 2.8.0 Support<br>- ASRock Rack Instant Flash                                  |
| <b>Hardware Monitor</b>   |                                                                                                                                                         |
| Temperature               | - CPU/PCH/DDR/LAN/Storage Temperature Sensing<br>- MB/Card side/TR1 Temperature Sensing                                                                 |
| Fan                       | - CPU/Rear/Front Fan Tachometer<br>- CPU Quiet Fan (Allow Chassis Fan Speed Auto-Adjust by CPU Temperature)<br>- CPU/Rear/Front Fan Multi-Speed Control |
| Voltage                   | Voltage Monitoring: VCORE,VCCSA,VCCM,3V, 5V, 12V, +1.05V_PCH_AUX,+BAT, 3VSB, 5VSB,VCCIO,+2.5V_VPP                                                       |

| Support OS  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OS          | <p>Microsoft® Windows®</p> <p>-Windows 10 (64 bit)</p> <p>Linux®</p> <p>- RedHat Enterprise Linux Server 7.9 (64 bit) / 8.2 (64 bit)</p> <p>- CentOS 7.9 (64 bit) / 8.2 (64 bit)</p> <p>- SUSE Enterprise Linux Server 12 SP5 (64 bit) / 15 SP2 (64 bit)</p> <p>- Ubuntu 19.04 (64 bit) / 20.04.1 (64 bit)</p> <p>Hypervisor</p> <p>- VMWare® ESXi 7.0 U1/ vSphere 7.0 U1</p> <p><i>* Supports UEFI BOOT only.</i></p> <p><i>* The Intel® RAID mode is not supported on the Linux system.</i></p> <p><i>* Please refer to our website for the latest OS support list.</i></p> |
| Environment |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Temperature | <p>Operation temperature: 10°C ~ 35°C / Non operation temperature: -40°C ~ 70°C</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

NOTE: Please refer to our 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.



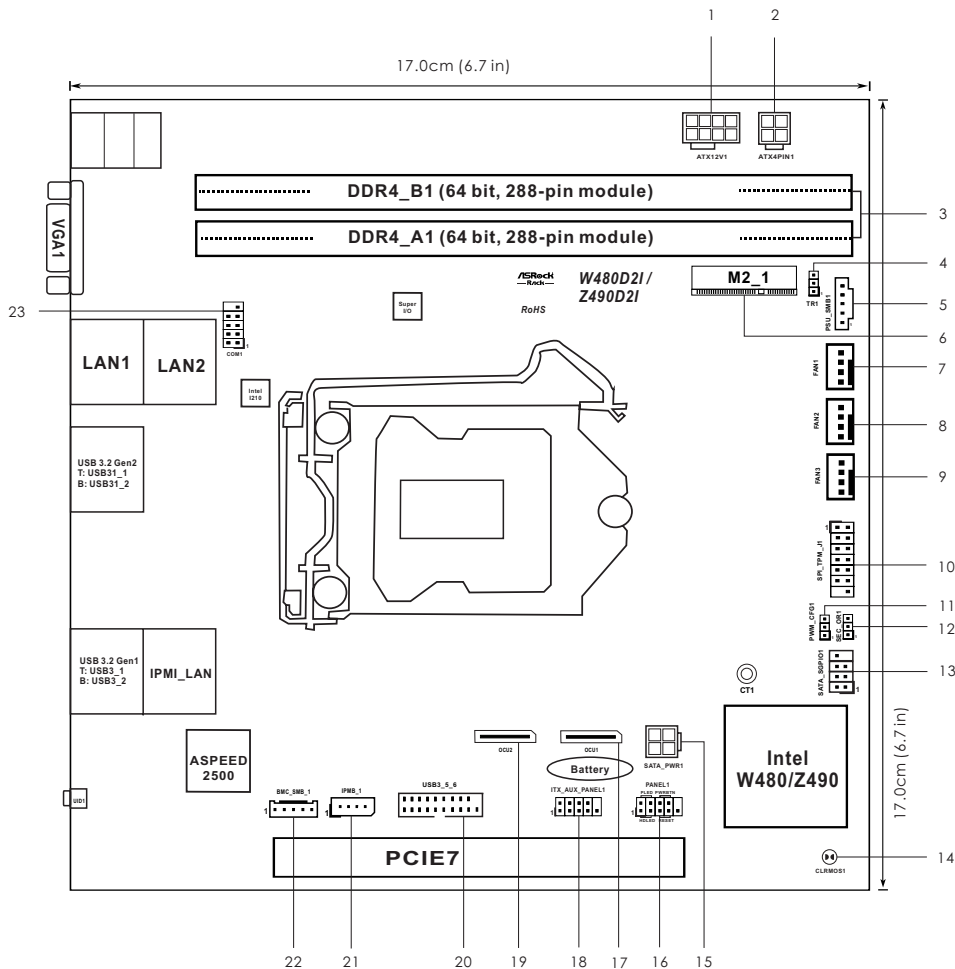
If you install Intel® LAN utility or Marvell SATA utility, this motherboard may fail Windows® Hardware Quality Lab (WHQL) certification tests. If you install the drivers only, it will pass the WHQL tests.

## 1.3 Unique Features

ASRock Rack Instant Flash is a BIOS flash utility embedded in Flash ROM. This convenient BIOS update tool allows you to update system BIOS without entering operating systems first like MS-DOS or Windows<sup>®</sup>. With this utility, you can 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 your USB flash drive, floppy disk or hard drive, then you can update your 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.

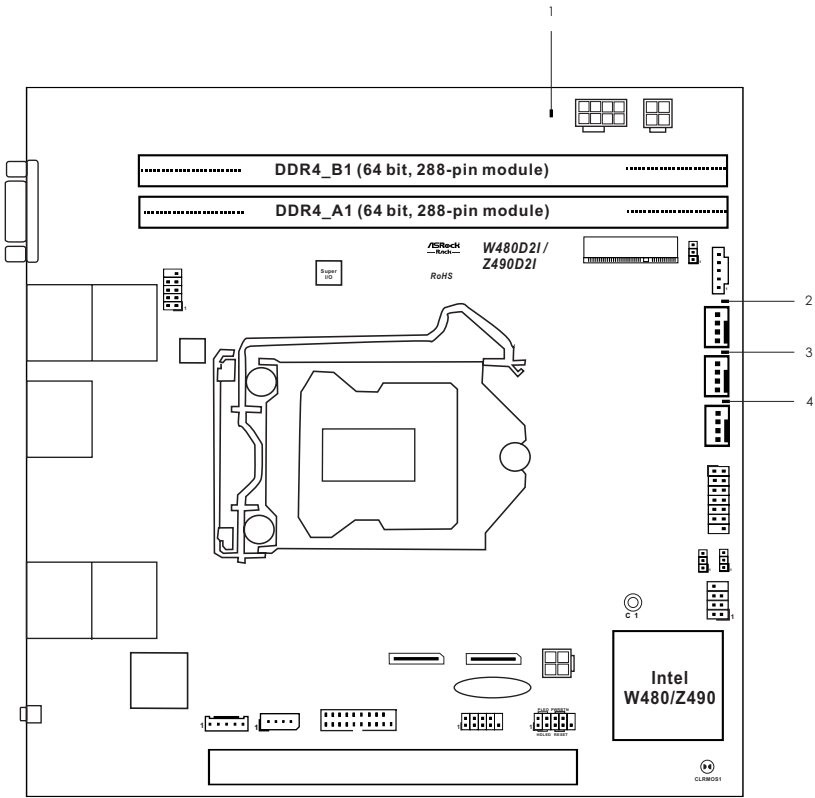
# 1.4 Motherboard Layout

## W480D2I / Z490D2I



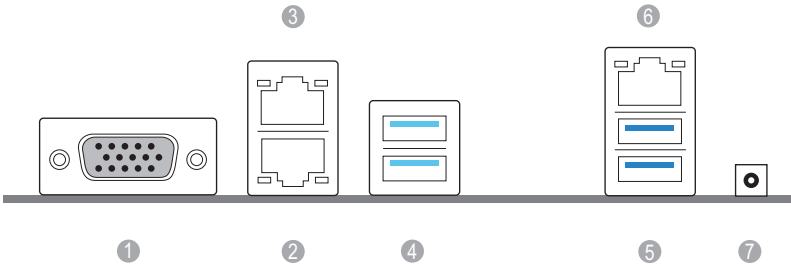
| No. | Description                                         |
|-----|-----------------------------------------------------|
| 1   | ATX 12V Power Connector (ATX12V1)                   |
| 2   | ATX 4-PIN Power Connector (ATX4PIN1)                |
| 3   | 2 x 288-pin DDR4 DIMM Slots (DDR4_A1, DDR4_B1)      |
| 4   | Thermal Sensor Header (TR1)                         |
| 5   | PSU SMBus (PSU_SMB1)                                |
| 6   | M.2 Socket (M2_1) (Type 2280)                       |
| 7   | System Fan Connector (FAN1)                         |
| 8   | System Fan Connector (FAN2)                         |
| 9   | System Fan Connector (FAN3)                         |
| 10  | SPI TPM Header (SPI_TPM_J1)                         |
| 11  | PWM Configuration Header (PWM_CFG1)                 |
| 12  | Security Override Jumper (SEC_OR1)                  |
| 13  | SATA SGPIO Connector (SATA_SGPIO1)                  |
| 14  | Clear CMOS Pad (CLRMOS1)                            |
| 15  | SATA Power Connector (SATA_PWR1)                    |
| 16  | System Panel Header (PANEL1)                        |
| 17  | OCuLink x4 Connector (OCU1)                         |
| 18  | Auxiliary Panel Header (ITX_AUX_PANEL1)             |
| 19  | OCuLink x4 Connector (OCU2)                         |
| 20  | USB 3.2 Gen1 Header (USB3_5_6)                      |
| 21  | Intelligent Platform Management Bus Header (IPMB_1) |
| 22  | BMC SMBus Header (BMC_SMB_1)                        |
| 23  | COM Port Header (COM1)                              |

# 1.5 Onboard LED Indicators



| No. | Item     | Status | Description   |
|-----|----------|--------|---------------|
| 1   | SB_PWR1  | Green  | STB PWR ready |
| 2   | FAN_LED1 | Amber  | FAN1 failed   |
| 3   | FAN_LED2 | Amber  | FAN2 failed   |
| 4   | FAN_LED3 | Amber  | FAN3 failed   |

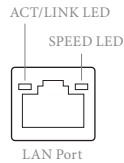
## 1.6 I/O Panel



| No. | Description                    | No. | Description                   |
|-----|--------------------------------|-----|-------------------------------|
| 1   | VGA Port (VGA1)                | 5   | USB 3.2 Gen1 Ports (USB3_1_2) |
| 2   | LAN RJ-45 Port (LAN1)**        | 6   | LAN RJ-45 Port (IPMI_LAN1)*   |
| 3   | LAN RJ-45 Port (LAN2)**        | 7   | UID Switch (UID1)             |
| 4   | USB 3.2 Gen2 Ports (USB31_1_2) |     |                               |

### LAN Port LED Indications

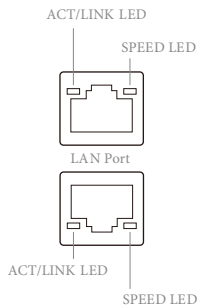
\*There are two LEDs on each LAN port. Please refer to the table below for the LAN port LED indications.



### Dedicated IPMI LAN Port LED Indications

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

\*\*There are two LEDs on each LAN port. Please refer to the table below for the LAN port LED indications.

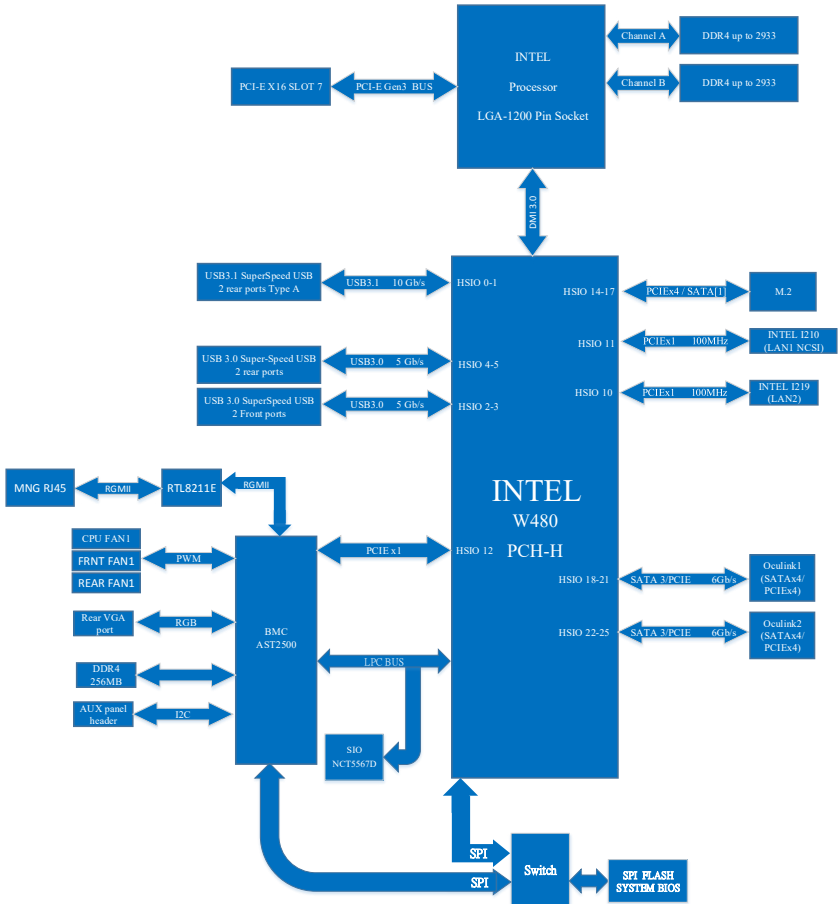


**LAN Port LED Indications**

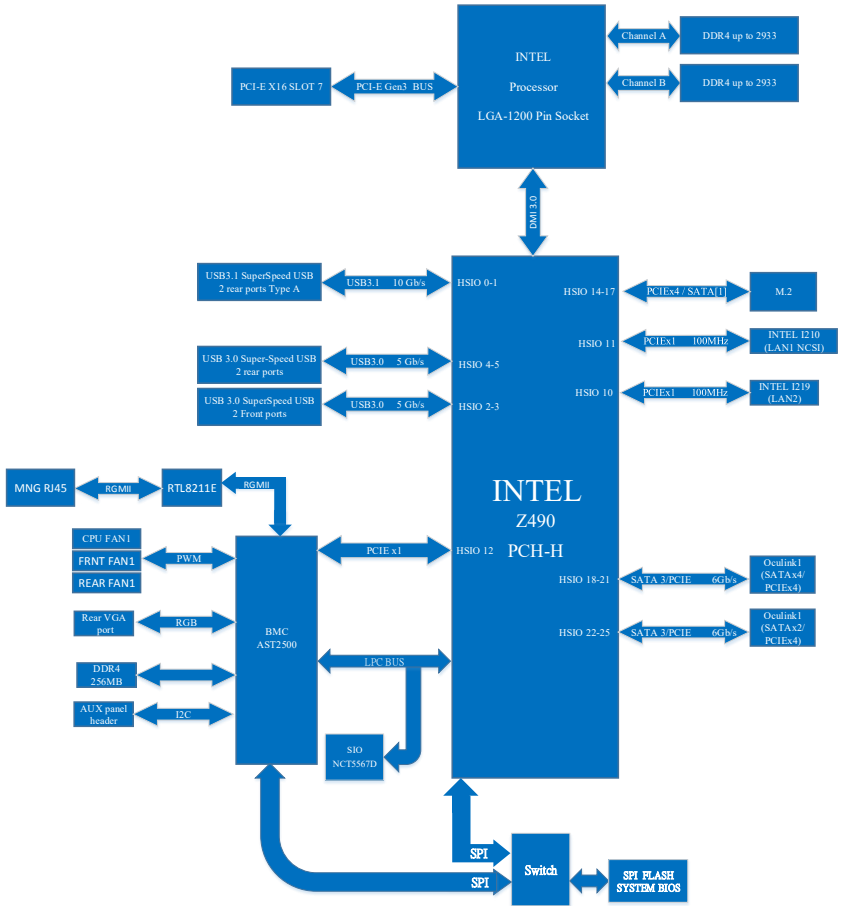
| Activity / Link LED |               | Speed LED |                              |
|---------------------|---------------|-----------|------------------------------|
| Status              | Description   | Status    | Description                  |
| Off                 | No Link       | Off       |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

## 1.7 Block Diagram

### W480D2I



Z490D2I



## Chapter 2 Installation

This is a mini ITX form factor (6.7" x 6.7", 17.02 cm x 17.02 cm) motherboard. Before you install the motherboard, study the configuration of your chassis to ensure that the motherboard fits into it.



*Make sure to unplug the power cord before installing or removing the motherboard. Failure to do so may cause physical injuries to you and damages to motherboard components.*

### 2.1 Screw Holes

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



*Do not over-tighten the screws! Doing so may damage the motherboard.*

### 2.2 Pre-installation Precautions

Take note of the following precautions before you install 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 your motherboard directly on the carpet or the like. Also remember to use a grounded wrist strap or touch a safety grounded object before you handle the components.
3. Hold components by the edges and do not touch the ICs.
4. Whenever you 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.



*Before you install or remove any component, ensure that the power 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.*

## 2.3 Installing the CPU

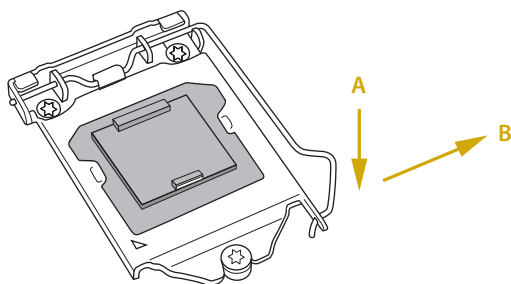


1. Before you insert the 1151-Pin CPU into the socket, please check if the PnP cap is on the socket, if the CPU surface is unclean, or if there are any bent pins in the socket. Do not force to insert the CPU into the socket if above situation is found. Otherwise, the CPU will be seriously damaged.
2. Unplug all power cables before installing the CPU.

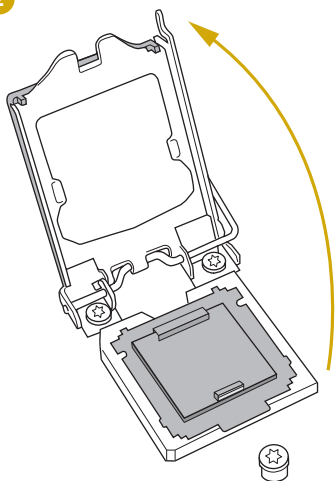


Illustrations in this User Manual are provided for reference only and may slightly differ from actual product appearances.

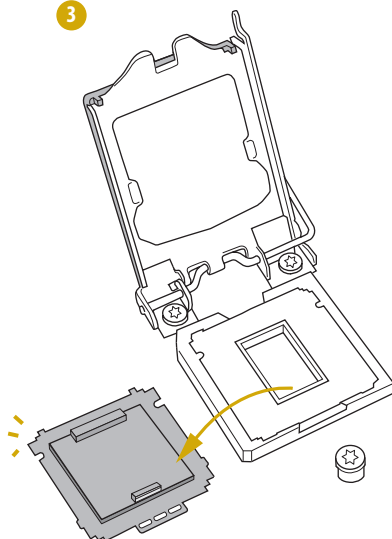
1



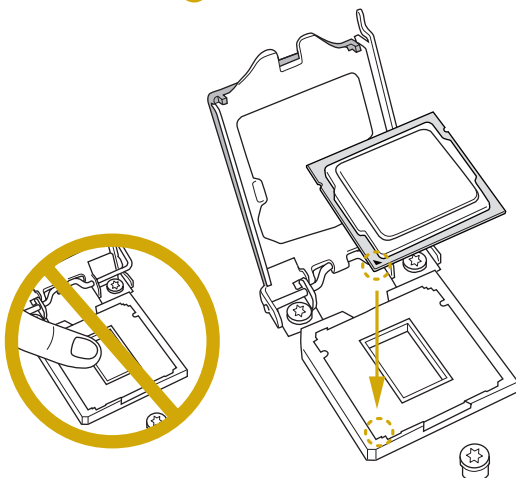
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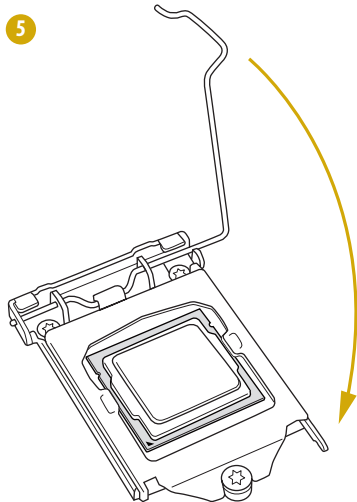
3



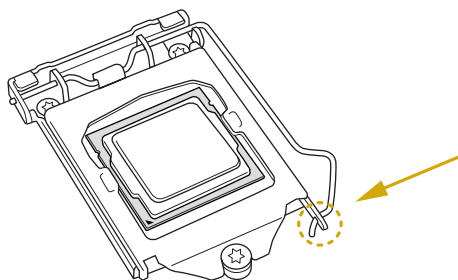
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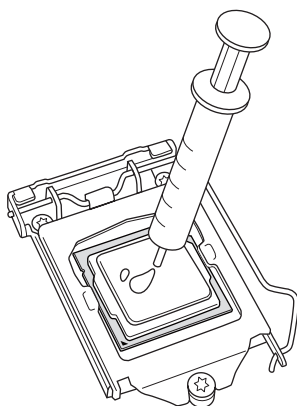


6

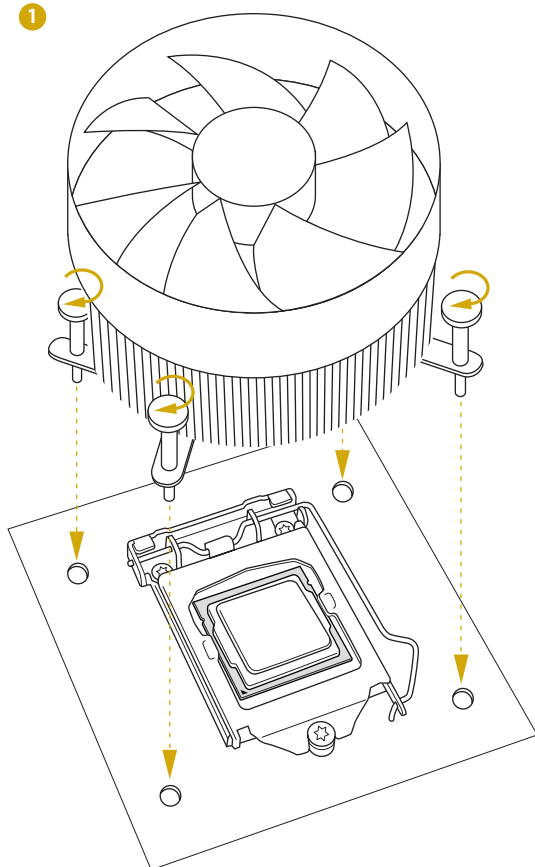


Please save and replace the cover if the processor is removed. The cover must be placed if you wish to return the motherboard for after service.

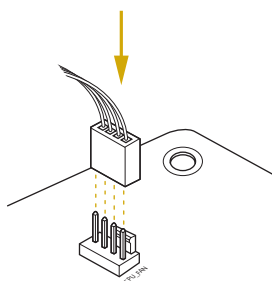
## 2.4 Installing the CPU Fan and Heatsink



1



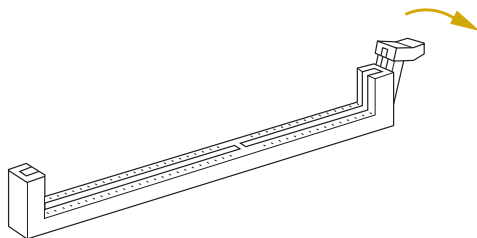
2



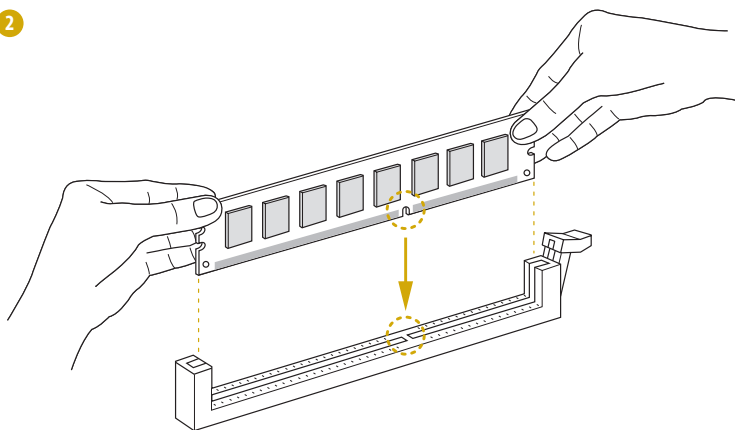
## 2.5 Installation of Memory Modules (DIMM)

This motherboard provides two 288-pin DDR4 (Double Data Rate 4) DIMM slots.

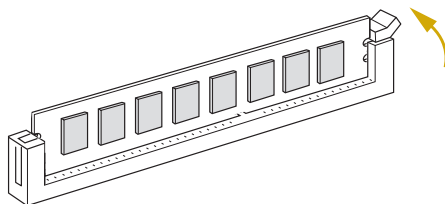
1



2



3



The DIMM only fits in one correct orientation. It will cause permanent damage to the motherboard and the DIMM if you force the DIMM into the slot at incorrect orientation.

## 2.6 Expansion Slot (PCI Express Slot)

There is a PCI Express slot on this motherboard.

### PCIe slot:

PCIe7 (PCIe 3.0 x16 slot) is used for PCI Express x16 lane width cards.

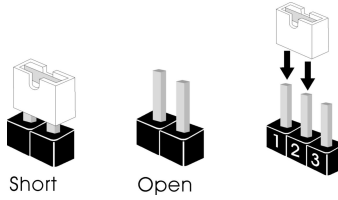
| Slot   | Generation | Mechanical | Electrical | Source |
|--------|------------|------------|------------|--------|
| PCIe 7 | 3.0        | x16        | x16        | CPU    |

### 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 you start the installation.
- Step 2. Remove the system unit cover (if your motherboard is already installed in a chassis).
- Step 3. Remove the bracket facing the slot that you intend 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.

## 2.7 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.



Security Override Jumper  
(3-pin SEC\_OR1)  
(see p.6, No. 12)



Descriptor Security  
Override



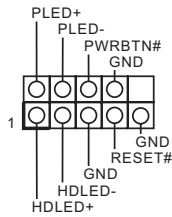
Not override (Default)

## 2.8 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. 16)



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. You may configure the way to turn off your 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):**

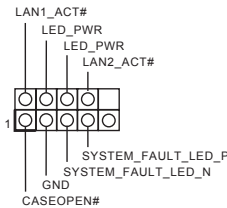
Connect to the power status indicator on the chassis front panel. The LED is on when the system is operating. The LED is off when the system is in S4 sleep state or powered off (S5).

**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.

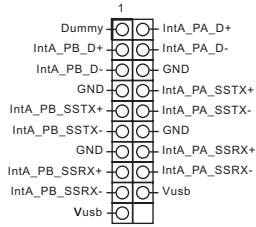
The front panel design may differ by chassis. A front panel module mainly consists of power switch, reset switch, power LED, hard drive activity LED, speaker and etc. When connecting your chassis front panel module to this header, make sure the wire assignments and the pin assignments are matched correctly.

Auxiliary Panel Header  
(9-pin  
ITX\_AUX\_PANEL1)  
(see p.6, No. 18)



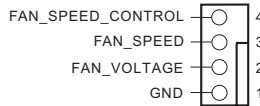
This header supports multiple functions on the front panel, including front panel SMB, internet status indicator.

USB 3.2 Gen1 Header  
(19-pin USB3\_5\_6)  
(see p.6, No. 20)



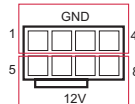
Besides two default USB 3.2 Gen1 ports on the I/O panel, there is one USB 3.2 Gen1 header on this motherboard. This USB 3.2 Gen1 header can support two USB 3.2 Gen1 ports.

System Fan Connectors  
(4-pin FAN2)  
(see p.6, No. 7)  
(4-pin FAN2)  
(see p.6, No. 8)  
(4-pin FAN3)  
(see p.6, No. 9)



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

ATX 12V Power Connector  
(8-pin ATX12V1)  
(see p.6, No. 1)

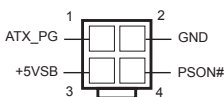


The motherboard provides one 8-pin 12V power connector which is a required input for either DC-IN 12V or ATX +12V power source.

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.

---

ATX 4-PIN Power  
Connector  
(4-pin ATX4PIN1  
(ATX 24pin-to-4pin))  
(see p.6, No. 2)



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

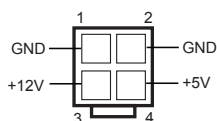
When using ATX power, it is necessary to use a 24pin-to-4pin power cable to connect between the 24pin power connector of PSU and the ATX\_4PIN connector on the motherboard for power supply and signal communication.

For DC-IN 12V application, it is not necessary to use this ATX 4-PIN power connector.

*\*Caution: Misconnection between the ATX4PIN1 and the SATA\_PWR1 connectors may permanently damage the motherboard.*

---

SATA Power Connector  
(DC-IN Mode)  
(4-pin SATA\_PWR1)  
(see p.6, No. 15)



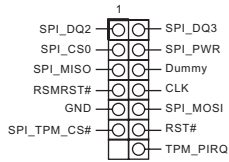
Please use a SATA power cable to connect this SATA Power Connector and your SATA HDD for supplying power from the motherboard, when using DC-IN mode without SATA power supply.

*\*Caution: Misconnection between the ATX4PIN1 and the SATA\_PWR1 connectors may permanently damage the motherboard.*

**SPI TPM Header**

(13-pin SPI\_TPM\_I1)

(see p.6, No. 18)

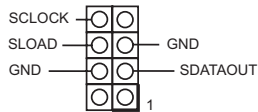


This connector supports SPI Trusted Platform Module (TPM) system, which can securely store keys, digital certificates, passwords, and data. A TPM system also helps enhance network security, protects digital identities, and ensures platform integrity.

**Serial General Purpose****Input/Output Headers**

(7-pin SATA\_SGPIO1)

(see p.6, No. 13)

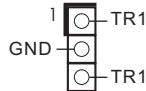


The headers support Serial Link interface for onboard SATA connections.

**Thermal Sensor Header**

(3-pin TR1)

(see p.6, No. 4)

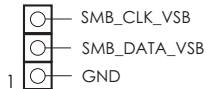


Please connect the thermal sensor cable to either pin 1-2 or pin 2-3 and the other end to the device which you wish to monitor its temperature.

**PWM Configuration Header**

(3-pin PWM\_CFG1)

(see p.6, No. 11)



This header is used for PWM configurations.

**OCuLink Connectors**

(OCU1)

(see p.6, No. 17)

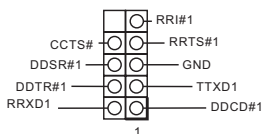
(OCU2)

(see p.6, No. 19)



Please connect PCIE SSDs or OCuLink to SATA x4 cable to the connector.

Serial Port Header  
(9-pin COM1)  
(see p.6, No. 23)



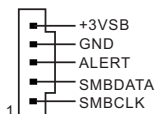
This COM header supports a serial port module.

Clear CMOS Pad  
(CLRMOS1)  
(see p.6, No. 14)



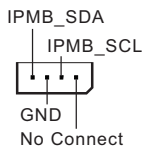
CLRMOS1 allows you to clear the data in CMOS. To clear CMOS, take out the CMOS battery and short the Clear CMOS Pad.

PSU SMBus  
(PSU\_SMB1)  
(see p.6, No. 5)



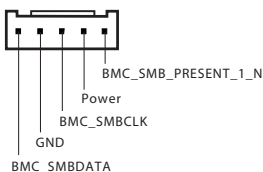
PSU SMBus monitors the status of the power supply, fan and system temperature.

Intelligent Platform  
Management Bus Header  
(4-pin IPMB\_1)  
(see p.6, No. 21)



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.

Baseboard Management  
Controller SMBus Header  
(5-pin BMC\_SMB1)  
(see p.6, No. 22)

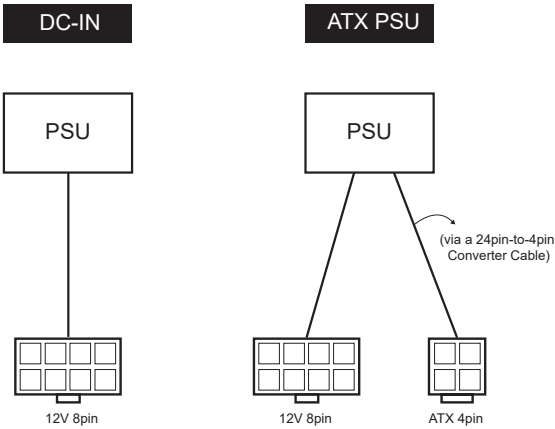


The header is used for the SMBUS devices.

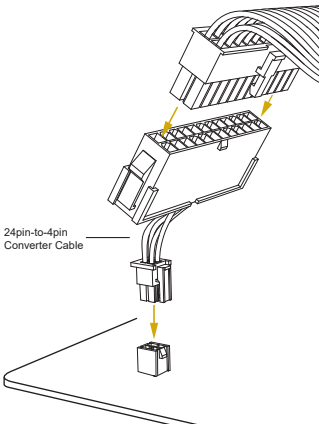
## 2.9 ATX PSU / DC-IN Power Connections

This motherboard supports both +12V DC and ATX power input. Please refer to the table below for the required connections between the motherboard and the power supply.

| Connector | DC-IN | ATX PSU                                                          |
|-----------|-------|------------------------------------------------------------------|
| 12V 8pin  | O     | O                                                                |
| ATX 4pin  | X     | O<br><i>(with the bundled ATX 24pin-to-4pin converter cable)</i> |



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



## 2.10 Unit Identification purpose LED/Switch

With the UID button, You are able to locate the server you're working on from behind a rack of servers.

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.

## 2.11 Driver Installation Guide

To install the drivers to your system, please insert the support CD to your optical drive first. Then, the drivers compatible to your system can be auto-detected and listed on the support CD driver page. Please follow the order from top to bottom to install those required drivers. Therefore, the drivers you install can work properly.

## 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 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 your Switch (or Router) supports Teaming (IEEE 802.3ad Link Aggregation). You can 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 you want to be the primary adapter and click the **Set Primary** button.

If you 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.

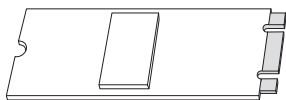
## 2.13 M.2\_SSD (NGFF) Module Installation Guide (M2\_1)

The M.2, also known as the Next Generation Form Factor (NGFF), is a small size and versatile card edge connector that aims to replace mPCIe and mSATA. This M.2\_SSD (NGFF) Socket 3 can accommodate a M.2 PCI Express module up to Gen3 x4 (32 Gb/s) only.

### Installing the M.2\_SSD (NGFF) Module

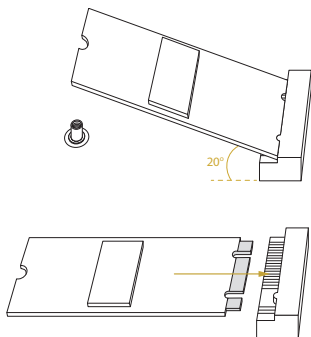
#### Step 1

Prepare a M.2\_SSD (NGFF) module and the screw.



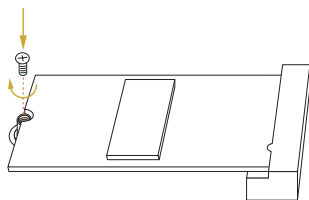
#### Step 2

Gently insert the M.2 (NGFF) SSD module into the M.2 slot. Please be aware that the M.2 (NGFF) SSD module only fits in one orientation.



#### Step 3

Tighten the screw with a screwdriver to secure the module into place. Please do not overtighten the screw as this might damage the module.



### M.2\_SSD (NGFF) Module Support List

For the latest updates of M.2\_SSD (NFGG) module support list, please visit our website for details: <http://www.asrockrack.com>

## Chapter 3 UEFI Setup Utility

### 3.1 Introduction

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

If you wish to enter the UEFI SETUP UTILITY after POST, restart the system by pressing <Ctrl> + <Alt> + <Delete>, or by pressing the reset button on the system chassis. You may 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, and they may not exactly match what you see on your screen.*

#### 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                                        |
| Security    | To set up the security features                                             |
| Boot        | To set up the default system device to locate and load the Operating System |
| Server Mgmt | To manage the server                                                        |
| Event Logs  | For event log configuration                                                 |
| 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.

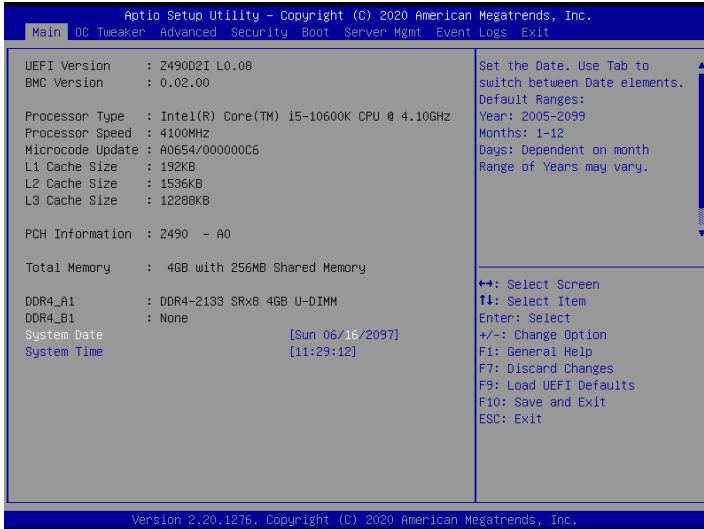
### 3.1.2 Navigation Keys

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

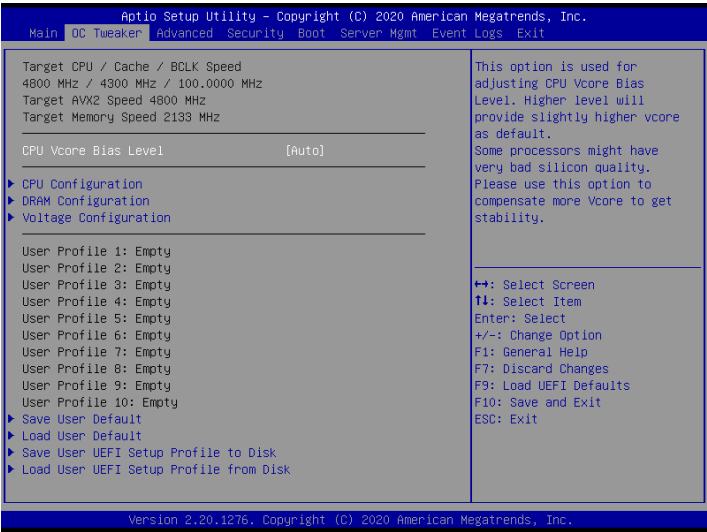
| Navigation Key(s) | Function Description                               |
|-------------------|----------------------------------------------------|
| ← / →             | Moves cursor left or right to select Screens       |
| ↑ / ↓             | Moves cursor up or down to select items            |
| + / -             | 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

Once you enter the UEFI SETUP UTILITY, the Main screen will appear and display the system overview. The Main screen provides system overview information and allows you to set the system time and date.



### 3.3 OC Tweaker Screen



#### CPU Configuration

##### CPU Ratio

The CPU speed is determined by the CPU Ratio multiplied with the BCLK. Increasing the CPU 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.

##### GT Frequency

Configure the frequency of the integrated GPU.

## BCLK Frequency

The CPU speed is determined by the CPU Ratio multiplied with the BCLK. Increasing the BCLK will increase the internal CPU clock speed but also affect the clock speed of other components.

## BCLK PCIE/DMI Frequency

The CPU speed is determined by the CPU Ratio multiplied with the BCLK. Increasing the BCLK will increase the internal CPU clock speed but also affect the clock speed of other components.

## CPU PLL Spread Spectrum

Select CPU PLL Spread Spectrum.

## PCIE/DMI PLL Spread Spectrum

Select PCIE/DMI PLL Spread Spectrum.

## BCLK Advanced Setting

Configure BCLK Advanced Setting.

When you enter this item, you see the followings:

### CPU BCLK Amplitude

Select BCLK Amplitude for CPU.

### PCIE/DMI BCLK Amplitude

Select BCLK Amplitude for PCIE/DMI.

### 100MHz BCLK Amplitude

Select BCLK Amplitude for SATA.

### CPU1 Slew Rate

Adjust the BCLK signal by defining the maximum change rate of the output voltage. Higher values will result in a shorter signal rising time.

### PCIE/DMI Slew Rate

Adjust the BCLK signal by defining the maximum change rate of the output voltage. Higher values will result in a shorter signal rising time.

## **100MHz Slew Rate**

Adjust the BCLK signal by defining the maximum change rate of the output voltage. Higher values will result in a shorter signal rising time.

## **CPU PLL ORT**

Overshoot Reduction Technology improves the BCLK signal to decrease overshoot/undershoot. Default is Level 3.

## **PCIE PLL ORT**

Overshoot Reduction Technology improves the BCLK signal to decrease overshoot/undershoot. Default is Level 1.

## **CPU Output Divider**

The default is set to 2 where the max BCLK is 1000 MHz, while divider 4 lowers the max BCLK to 500 MHz, while divider 10 lowers the max BCLK to 200 MHz, and divider 1 turns it into 2000 MHz.

## **SRC0 Source**

Choose to select the SRC0 source from CPU PLL or PCIE PLL.

## **CPU2/SRC1 Source**

Choose to select the CPU2/SRC1 source from CPUPLL or PCIE PLL.

## **BCLK Aware Adaptive Voltage**

BCLK Aware Adaptive Voltage enable/disable. When enabled, pcode will be aware of the BCLK frequency when calculating the CPU V/F curves. This is ideal for BCLK OC to avoid high voltage overrides.

## **Boot Performance Mode**

Select the performance state that the BIOS will set before OS handoff.

## **FCLK Frequency**

Configure the FCLK Frequency.

## **Ring to Core Ratio Offset**

Disable Ring to Core Ratio Offset so the ring and core can run at the same frequency.

## Intel SpeedStep Technology

Intel SpeedStep technology allows processors to switch between multiple frequencies and voltage points for better power saving and heat dissipation.

## 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 Speed Shift Technology

Enable/Disable Intel Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states.

## Intel Turbo Boost Max Technology 3.0

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

## Intel Thermal Velocity Boost Voltage Optimizations

This service controls thermal based voltage optimizations for processors that implement the Intel Thermal Velocity Boost (TVB) feature.

## CPU Tj Max

Set CPU Tj Max to adjust TCC Target Temperature. Default setting is 105°C.

## Dual Tau Boost

Enable Dual Tau Boost feature. This is only applicable for CMLS 35W/65W/125W skus. This item is only supported with processors with Config TDP support.

## Long Duration Power Limit

Configure Package Power Limit 1 in watts. When the limit is exceeded, the CPU ratio will be lowered after a period of time. A lower limit can protect the CPU and save power, while a higher limit may improve performance.

## Long Duration Maintained

Configure the period of time until the CPU ratio is lowered when the Long Duration Power Limit is exceeded.

## Short Duration Power Limit

Configure Package Power Limit 2 in watts. When the limit is exceeded, the CPU

ratio will be lowered immediately. A lower limit can protect the CPU and save power, while a higher limit may improve performance.

### CPU Core Limit

Configure the limit of the CPU core. A lower limit can protect the CPU and save power, while a higher limit may improve performance.

### GT Current Limit

Configure the current limit of the GT slice. A lower limit can protect the CPU and save power, while a higher limit may improve performance.

### DRAM Configuration

#### Memory Information

Allows users to browse the serial presence detect (SPD) and Intel extreme memory profile (XMP) for DDR4 modules.

#### DRAM Timing Configuration

##### BCLK Frequency

Configure the BCLK Frequency.

##### DRAM Reference Clock

Select Auto for optimized settings.

##### DRAM Frequency

If [Auto] is selected, the motherboard will detect the memory module(s) inserted and assign the appropriate frequency automatically.

##### Boot Failure Guard Count

Configure the number of attempts to boot until the system automatically restores the default settings.

#### Primary Timing

##### CAS# Latency (tCL)

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

## RAS# to CAS# Delay and Row Precharge (tRCDtRP)

**RAS# to CAS# Delay :** The number of clock cycles required between the opening of a row of memory and accessing columns within it.

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

## RAS# Active Time (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.

## Secondary Timing

### 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.

### Refresh Cycle Time (tRFC)

The number of clocks from a Refresh command until the first Activate command to the same rank.

### RAS to RAS Delay (tRRD\_L)

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

### RAS to RAS Delay (tRRD\_S)

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

### Write to Read Delay (tWTR\_L)

The number of clocks between the last valid write operation and the next read command to the same internal bank.

## Write to Read Delay (tWTR\_S)

The number of clocks between the last valid write operation and the next read command to the same internal bank.

## 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.

## Four Activate Window (tFAW)

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

## CAS Write Latency (tCWL)

Configure CAS Write Latency.

## Third Timing

### tREFI

Configure refresh cycles at an average periodic interval.

### tCKE

Configure the period of time the DDR4 initiates a minimum of one refresh command internally once it enters Self-Refresh mode.

## Turn Around Timing

## Turn Around Timing Training

Auto is enabled in general case.

### tRDRD\_sg

Configure between module read to read delay.

### tRDRD\_dg

Configure between module read to read delay.

### tRDRD\_dr

Configure between module read to read delay.

**tRDRD\_dd**

Configure between module read to read delay.

**tRDWR\_sg**

Configure between module read to write delay.

**tRDWR\_dg**

Configure between module read to write delay.

**tRDWR\_dr**

Configure between module read to write delay.

**tRDWR\_dd**

Configure between module read to write delay.

**tWRRD\_sg**

Configure between module write to read delay.

**tWRRD\_dg**

Configure between module write to read delay.

**tWRRD\_dr**

Configure between module write to read delay.

**tWRRD\_dd**

Configure between module write to read delay.

**tWRWR\_sg**

Configure between module write to write delay.

**tWRWR\_dg**

Configure between module write to write delay.

**tWRWR\_dr**

Configure between module write to write delay.

## **tWRWR\_dd**

Configure between module write to write delay.

## **Round Trip Timing**

### **Round Trip Timing Optimization**

Auto is enabled in general case.

### **RTL Init Value**

Configure round trip latency init value for round trip latency training.

### **IOL Init Value**

Configure IO latency init value for IO latency training.

### **RTL (CH A)**

Configure round trip latency for Channel A.

### **RTL (CH B)**

Configure round trip latency for Channel B.

### **IOL (CH A)**

Configure IO latency for Channel A.

### **IOL (CH B)**

Configure IO latency for Channel B.

### **IOL Offset (CH A)**

Configure IO latency offset for Channel A.

### **IOL Offset (CH B)**

Configure IO latency offset for Channel B.

### **RFR Delay (CH A)**

Configure RFR Delay for Channel A.

### **RFR Delay (CH B)**

Configure RFR Delay for Channel B.

## ODT WR (A1)

Configure the memory on die termination resistors' WR for channel A1.

## ODT WR (B1)

Configure the memory on die termination resistors' WR for channel B1.

## ODT NOM (A1)

Use this to change ODT (CH A1) Auto/Manual settings. The default is [Auto].

## ODT NOM (B1)

Use this to change ODT (CH B1) Auto/Manual settings. The default is [Auto].

## ODT PARK (A1)

Configure the memory on die termination resistors' PARK for channel A1.

## ODT PARK (B1)

Configure the memory on die termination resistors' PARK for channel B1

## COMP Setting

### Dll Bandwidth 0

Configure Dll Bandwidth 0 (1067 MHz) to maximize the performance of intergrated memory controller.

### Dll Bandwidth 1

Configure Dll Bandwidth 1 (1333 MHz) to maximize the performance of intergrated memory controller.

### Dll Bandwidth 2

Configure Dll Bandwidth 2 (1600 MHz) to maximize the performance of intergrated memory controller.

### Dll Bandwidth 3

Configure Dll Bandwidth 3 (1867 MHz) to maximize the performance of intergrated memory controller.

## Advanced Setting

## ASRock Timing Optimization

Configure the fast path through the MRC.

## ASRock Second Timing Optimization

Configure the second fast path through the MRC.

## Realtime Memory Timing

Configure the realtime memory timings.

[Enabled] The system will allow performing realtime memory timing changes after MRC\_DONE.

## Command Tristate

Enable or Disable the Command Tristate Support.

## Exit on Failure

Enable or Disable the Exit on Failure feature.

## Reset on Failure

Enable or Disable the Reset on Failure feature.

## MRC Fast Boot

Enable Memory Fast Boot to skip DRAM memory training for booting faster.

## Voltage Configuration

### CPU V/F Curve

If PCI Express g

## Voltage Configuration

### CPU Core/Cache Voltage

Input voltage for the processor by the external voltage regulator.

### CPU Core/Cache Load-Line Calibration

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

## CPU CORE/Cache Over Current Protection

Use this item to configure CPU CORE/Cache Over Current Protection.

## CPU CORE/Cache Over Voltage Protection

Use this item to configure CPU CORE/Cache Over Voltage Protection.

## CPU CORE/Cache Under Voltage Protection

Use this item to configure CPU CORE/Cache Under Current Protection.

## CPU CORE/Cache Over Temperature Protection

Use this item to configure CPU CORE/Cache Over Temperature Protection.

## CPU CORE/Cache Auto Phase

Use this item to configure CPU CORE/Cache Auto Phase.

## CPU GT Voltage

Input voltage for the processor by the external voltage regulator.

## CPU GT Load-Line Calibration

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

## CPU GT Over Current Protection

Use this item to configure CPU GT Over Current Protection.

## CPU GT Over Voltage Protection

Use this item to configure CPU GT Over Voltage Protection.

## CPU GT Under Voltage Protection

Use this item to configure CPU GT Under Current Protection.

## CPU GT Over Temperature Protection

Use this item to configure CPU GT Over Temperature Protection.

## CPU GT Auto Phase

Use this item to configure CPU GT Auto Phase.

## VCCSA Voltage

Input voltage for the processor by the external voltage regulator.

## VCCSA Load-Line Calibration

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

## VCCSA Over Current Protection

Use this item to configure VCCSA Over Current Protection.

## VCCSA Over Voltage Protection

Use this item to configure VCCSA Over Voltage Protection.

## VCCSA Under Voltage Protection

Use this item to configure VCCSA Under Current Protection.

## VCCSA Over Temperature Protection

Use this item to configure VCCSA Over Temperature Protection.

## DRAM Activating Power Supply

Configure the voltage for the DRAM Activating Power Supply.

## DRAM Voltage

Use this to configure DRAM Voltage. The default value is [Auto].

## VCCIO Voltage

Configure the voltage for the VCCIO.

## PLL Voltage Configuration

### CPU Internal PLL Voltage

Default is 0.900V. Each step is 0.0175V. Adding 9~15 steps will help CPU PLL to lock internal clock during High frequency under Ln2 cooling. For Example: 1.0575V ~ 1.1625V will be proper value. But the voltage level will be different on each processor. User has to find the best value for your own processor. VCCPLL Voltage must be at least 150mV higher than the target PLL voltage, or your system will hang.

## GT PLL Voltage

Default is 0.900V. Each step is 0.0175V. Adding 9~15 steps will help CPU PLL to lock internal clock during High frequency under Ln2 cooling. For Example: 1.0575V ~ 1.1625V will be proper value. But the voltage level will be different on each processor. User has to find the best value for your own processor. VCCPLL Voltage must be at least 150mV higher than the target PLL voltage, or your system will hang.

## Ring PLL Voltage

Default is 0.900V. Each step is 0.0175V. Adding 9~15 steps will help CPU PLL to lock internal clock during High frequency under Ln2 cooling. For Example: 1.0575V ~ 1.1625V will be proper value. But the voltage level will be different on each processor. User has to find the best value for your own processor. VCCPLL Voltage must be at least 150mV higher than the target PLL voltage, or your system will hang.

## System Agent PLL Voltage

Default is 0.900V. Each step is 0.0175V. Adding 9~15 steps will help CPU PLL to lock internal clock during High frequency under Ln2 cooling. For Example: 1.0575V ~ 1.1625V will be proper value. But the voltage level will be different on each processor. User has to find the best value for your own processor. VCCPLL Voltage must be at least 150mV higher than the target PLL voltage, or your system will hang.

## Memory Controller PLL Voltage

Default is 0.900V. Each step is 0.0175V. Adding 9~15 steps will help CPU PLL to lock internal clock during High frequency under Ln2 cooling. For Example: 1.0575V ~ 1.1625V will be proper value. But the voltage level will be different on each processor. User has to find the best value for your own processor. VCCPLL Voltage must be at least 150mV higher than the target PLL voltage, or your system will hang.

## Save User Default

Typ

### Save User Default

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

### Load User Default

Load previously saved user defaults.

### Save User UEFI Setup Profile to Disk

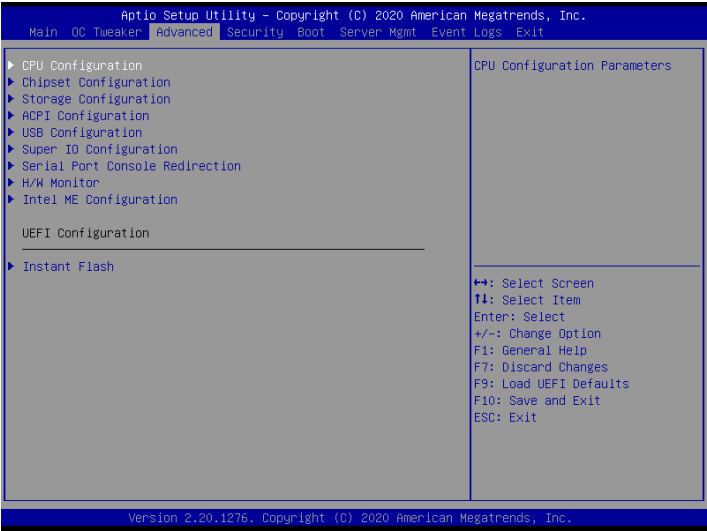
Save current UEFI settings as an user default profile to disk.

### Load User UEFI Setup Profile to Disk

Load previously saved user defaults from the disk.

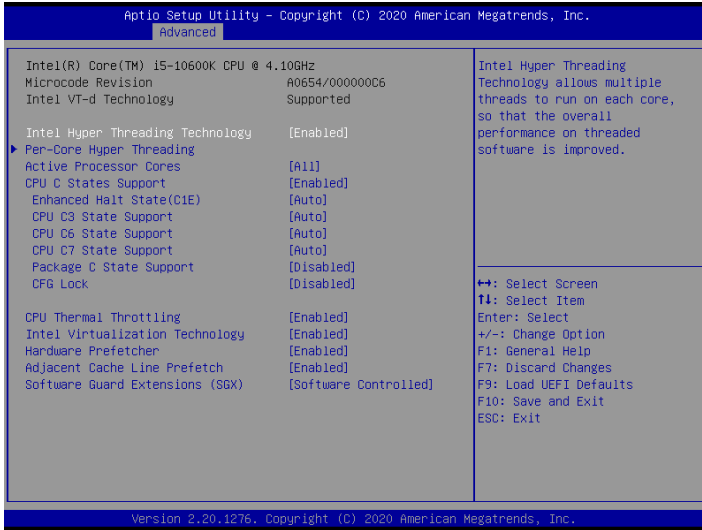
### 3.4 Advanced Screen

In this section, you may set the configurations for the following items: CPU Configuration, Chipset Configuration, Storage Configuration, ACPI Configuration, USB Configuration, Super IO Configuration, Serial Port Console Redirection, H/W Monitor, Intel ME Configuration, and Instant Flash.



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

### 3.4.1 CPU Configuration



#### Intel Hyper Threading Technology

Intel Hyper Threading Technology allows multiple threads to run on each core, so that the overall performance on threaded software is improved.

#### Pre-Core Hyper Threading

The Per-Core Hyper Threading feature allows you to disable Hyper Threading on specific cores.

#### Active Processor Cores

Select the number of cores to enable in each processor package.

#### CPU C States Support

Enable CPU C States Support for power saving. It is recommended to keep C3, C6 and C7 enabled for better power saving.

#### Enhanced Halt State (C1E)

Enable Enhanced Halt State (C1E) for lower power consumption.

## CPU C3 State Support

Enable C3 deep sleep state for lower power consumption.

## CPU C6 State Support

Enable C6 deep sleep state for lower power consumption.

## CPU C7 State Support

Enable C7 deep sleep state for lower power consumption.

## Package C State Support

Enable CPU, PCIe, Memory, Graphics C State Support for power saving.

## CFG Lock

This item allows you to disable or enable the CFG Lock.

## CPU Thermal Throttling

Enable CPU internal thermal control mechanisms to keep the CPU from overheating.

## 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.

## Hardware Prefetcher

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

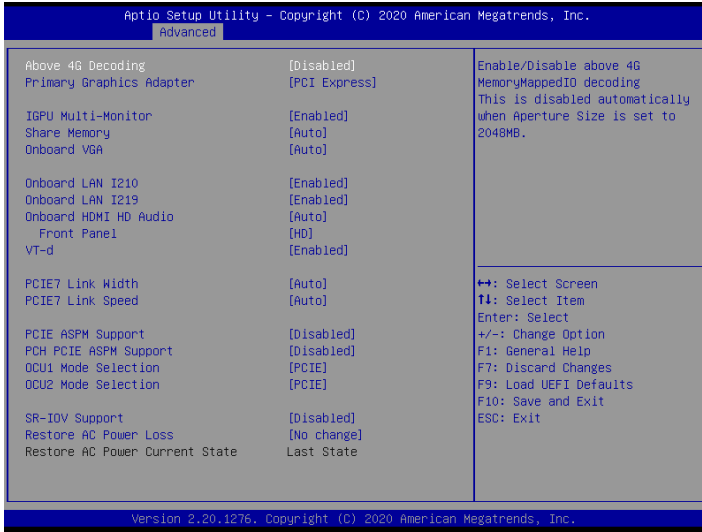
## Adjacent Cache Line Prefetch

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

## Software Guard Extensions (SGX)

Use this item to enable or disable Software Controlled Software Guard Extensions (SGX).

## 3.4.2 Chipset Configuration



### Above 4G Decoding

Enable or disable 64bit capable Devices to be decoded in Above 4G Address Space (only if the system supports 64 bit PCI decoding).

### Primary Graphics Adapter

If PCI Express graphics card is installed on the motherboard, you may use this option to select PCI Express or Onboard as the primary graphics adapter.

### IGPU Multi-Monitor

Select disable to disable the integrated graphics when an external graphics card is installed. Select enable to keep the integrated graphics enabled at all times.

### Share Memory

Configure the size of memory that is allocated to the integrated graphics processor when the system boots up.

### Onboard VGA

Use this to enable or disable the Onboard VGA function. The default value is [Auto].

### Onboard LAN I210

Use this to enable or disable the Onboard LAN1 function. The default value is [Auto].

## Onboard LAN I219

Use this to enable or disable the Onboard LAN2 function. The default value is [Auto].

## Onboard HDMI HD Audio

Enable audio for the onboard digital outputs.

## Front Panel

Enable/disable front panel HD audio.

## VT-d

Intel® Virtualization Technology for Directed I/O helps your virtual machine monitor better utilize hardware by improving application compatibility and reliability, and providing additional levels of manageability, security, isolation, and I/O performance.

## PCIE 7 Link Width

This allows you to select PCIE 7 Link Width. The default value is [x16].

## PCIE 7 Link Speed

This allows you to select PCIE 7 Link Speed. The default value is [Auto].

## PCIE ASPM Support

This option enables/disables the ASPM support for all CPU downstream devices.

## PCH PCIE ASPM Support

This option enables/disables the ASPM support for all PCH PCIE devices.

## OCU1 Mode Selection

Switch the OCULink to PCIE/SATA.

## OCU2 Mode Selection

Switch the OCULink to PCIE/SATA.

## SR-IOV Support

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

## Restore AC Power Loss

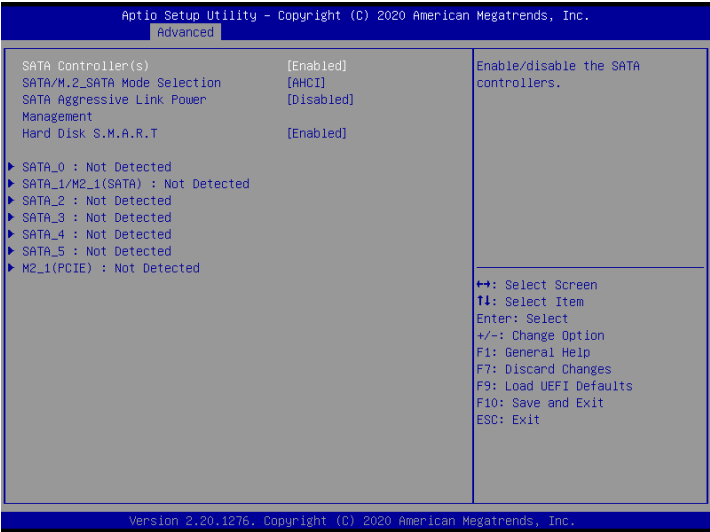
This allows you to set the power state after an unexpected AC/power loss. If [Power Off] is selected, the AC power remains off when the power recovers. If [Power On] is selected, the

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.

### Restore AC Power Current State

This allows you to restore AC Power Current State.

### 3.4.3 Storage Configuration



#### SATA Controller(s)

Use this item to enable or disable SATA Controllers.

#### SATA/M.2\_SATA Mode Selection

Identify the SATA/M.2\_SATA port is connected to Solid State Drive or Hard Disk Drive.  
Press <Ctrl+I> to enter RAID ROM during UEFI POST process.

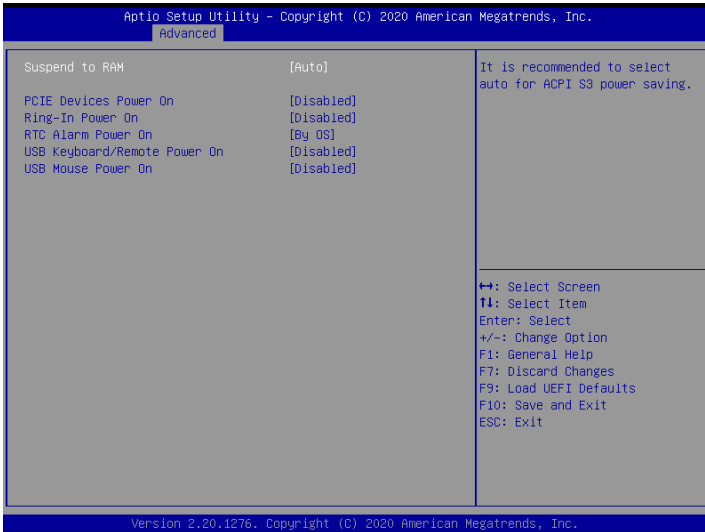
#### Support Aggressive Link Power Management

Use this item to enable or disable SALP.

#### Hard Disk S.M.A.R.T.

S.M.A.R.T. stands for Self-Monitoring, Analysis, and Reporting Technology. It is a monitoring system for computer hard disk drives to detect and report on various indicators or reliability.

### 3.4.4 ACPI Configuration



#### Suspend to RAM

Select disable for ACPI suspend type S1. It is recommended to select auto for ACPI S3 power saving.

#### PCIE Devices Power On

Use this item to enable or disable PCIE devices to turn on the system from the power-soft-off mode.

#### Ring-In Power On

Use this item to enable or disable Ring-In signals to turn on the system from the power-soft-off mode.

#### RTC Alarm Power On

Use this item to enable or disable RTC (Real Time Clock) to power on the system.

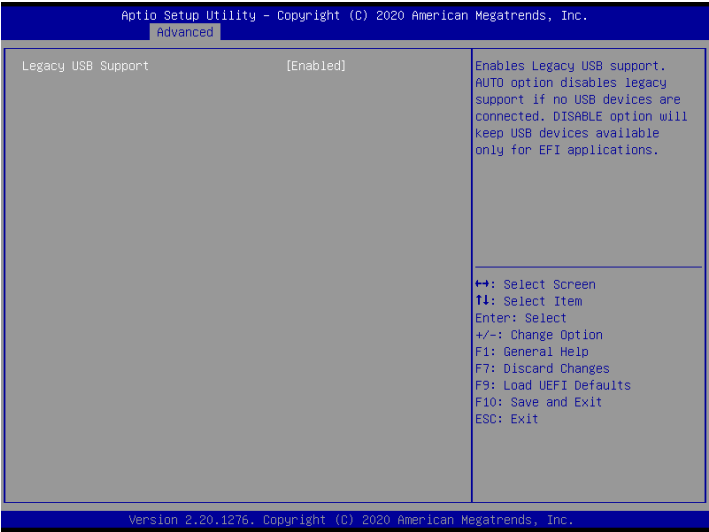
#### USB Keyboard/Remote Power On

Allow the system to be waked up by an USB keyboard or remote controller.

#### USB Mouse Power On

Allow the system to be waked up by an USB mouse.

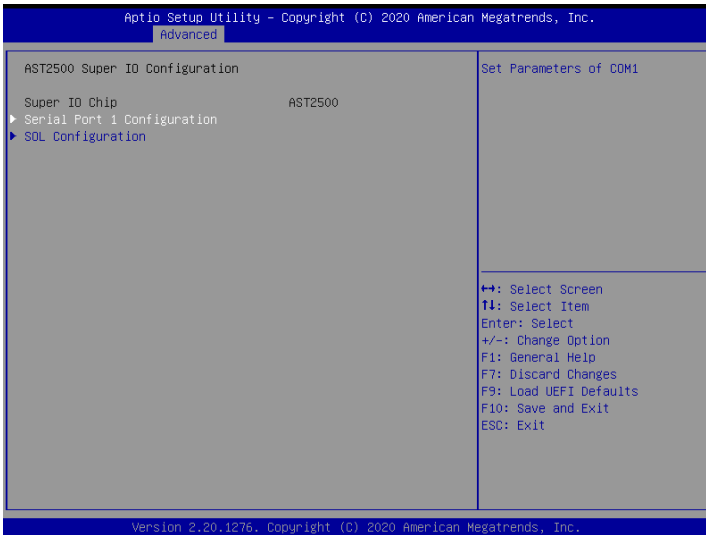
### 3.4.5 USB Configuration



#### Legacy USB Support

Use this option to enable or disable legacy support for USB devices. The default value is [Enabled].

### 3.4.6 Super IO Configuration



#### Serial Port 1 Configuration

Use this item to set parameters of Serial Port 1 (COM1).

#### Serial Port

Use this item to enable or disable the onboard 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.

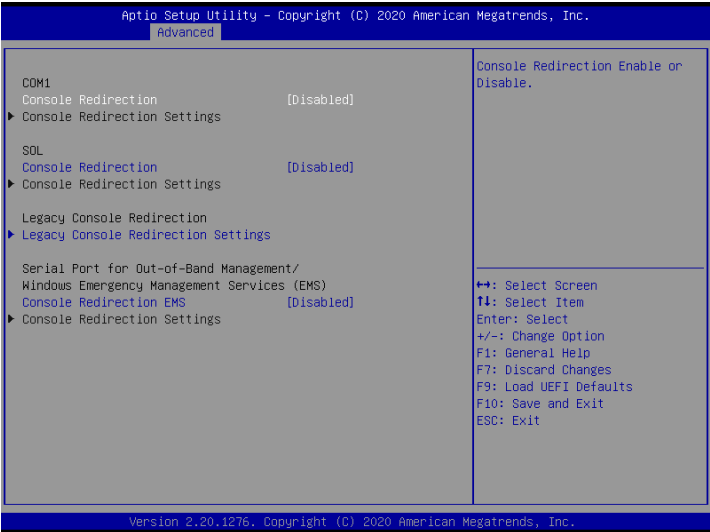
#### Serial Port

Use this item to enable or disable the onboard serial port.

#### Change Settings

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

### 3.4.7 Serial Port Console Redirection



#### COM1 / SOL

#### Console Redirection

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

#### Console Redirection Settings

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

#### 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                                             |
| 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**

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].

**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.

**Legacy Console Redirection****Legacy Console Redirection Settings**

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

**Redirection COM Port**

Select a COM port to display redirection of Legacy OS and Legacy OPROM Messages.

**Resolution**

On Legacy OS, the Number of Rows and Columns supported redirection.

**Redirect After POST**

When Bootloader is selected, then Legacy Console Redirection is disabled before booting to legacy OS. When Always Enable is selected, then Legacy Console Redirection is enabled for legacy OS. Default setting for this option is set to Always Enable.

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

**Console Redirection EMS**

Use this option to enable or disable Console Redirection.

**Console Redirection Settings**

Use this option to configure Console Redirection Settings, and specify how your computer and the host computer to which you 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**

VT-UTF8 is the preferred terminal type for out-of-band management. The next best choice is VT100+ and then VT100. See above, in COnsole Redirection Settings page, for more Help with Terminal Type/Emulation.

| 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].

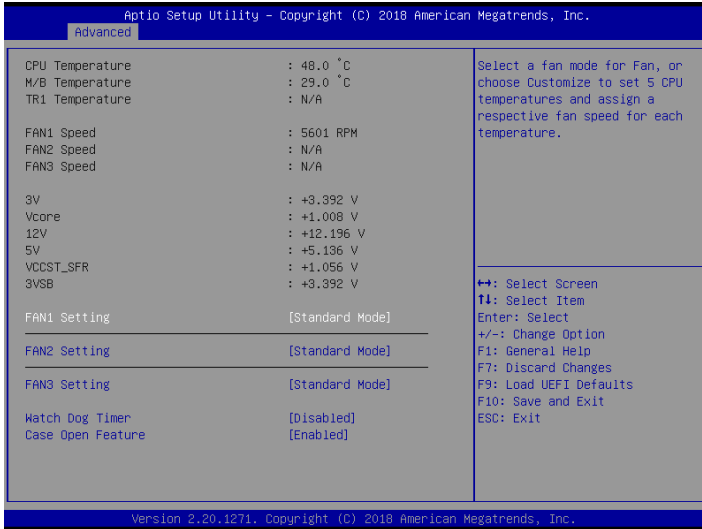
**Data Bits**

**Parity**

**Stop Bits**

### 3.4.8 H/W Monitor

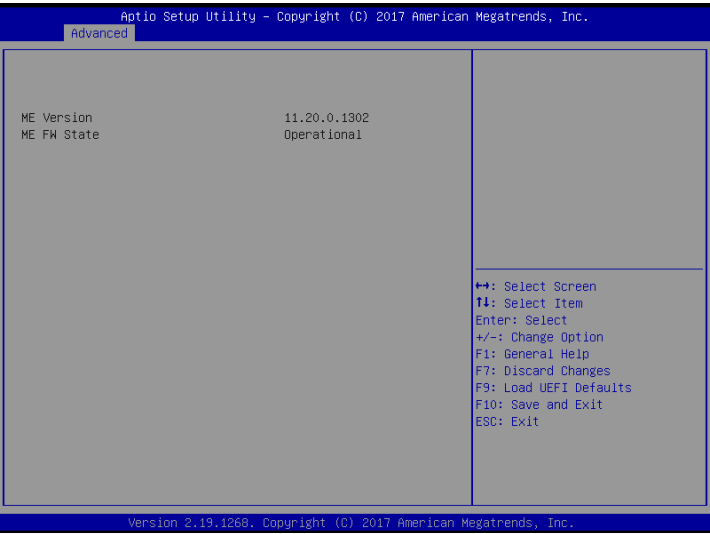
In this section, it allows you to monitor the status of the hardware on your system, including the parameters of the CPU temperature, motherboard temperature, CPU fan speed, chassis fan speed, and the critical voltage.



### Watch Dog Timer

This allows you to enable or disable the Watch Dog Timer. The default value is [Disabled].

### 3.4.9 Intel ME Configuration



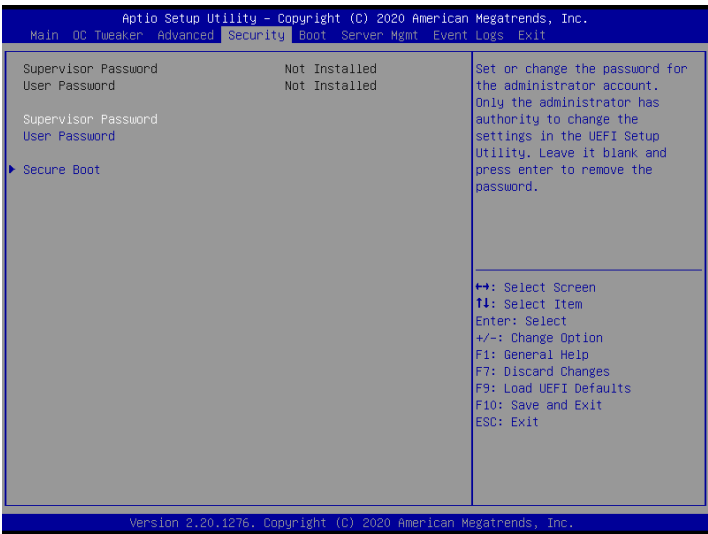
Intel ME Information screen displays the Intel ME Configuration information, such as Operational Firmware Version and Firmware State.

### 3.4.10 Instant Flash

Instant Flash is a UEFI flash utility embedded in Flash ROM. This convenient UEFI update tool allows you to update system UEFI without entering operating systems first like MS-DOS or Windows<sup>®</sup>. Just save the new UEFI file to your USB flash drive, floppy disk or hard drive and launch this tool, then you can update your 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. If you execute Instant Flash utility, the utility will show the UEFI files and their respective information. Select the proper UEFI file to update your UEFI, and reboot your system after the UEFI update process is completed.

### 3.5 Security

In this section, you may set or change the supervisor/user password for the system. For the user password, you may 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. Users are unable to change the settings in the UEFI Setup Utility. Leave it blank and press enter to remove the password.

#### Secure Boot

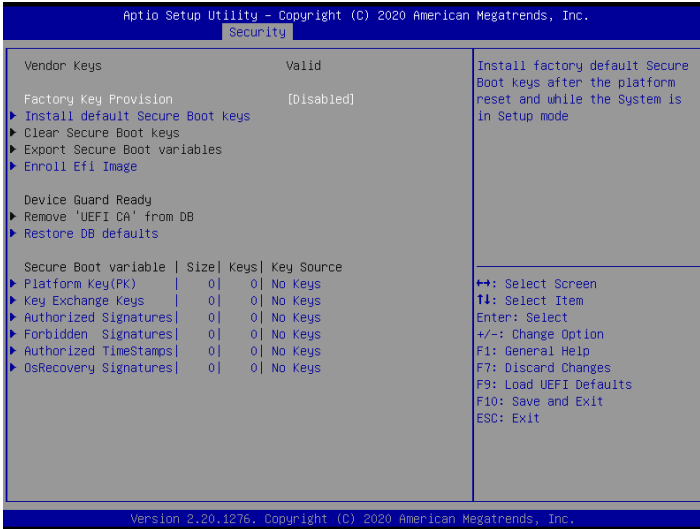
Use this to enable or disable Secure Boot Control. The default value is [Disabled]. Enable to support Windows Server 2012 R2 or later versions Secure Boot.

#### Secure Boot Mode

Secure Boot mode selector: Standard/Custom. In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication.

## 3.5.1 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 you use secure boot.

### Clear Secure Boot Keys

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

### Export Secure Boot Variables

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

### Enroll Efi Image

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

## Remove 'UEFI CA' from DB

Device Guard ready system must not list 'Microsoft UEFI CA' Certificate in Autho

## Restore DB defaults

Restore DB variable to factory defaults.

## 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, External, Mixed

## Key Exchange Keys

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, External, Mixed

## Authorized Signatures

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, External, Mixed

## Forbidden Signatures

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, External, Mixed

## Authorized TimeStamps

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, External, Mixed

## OsRecovery Signatures

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

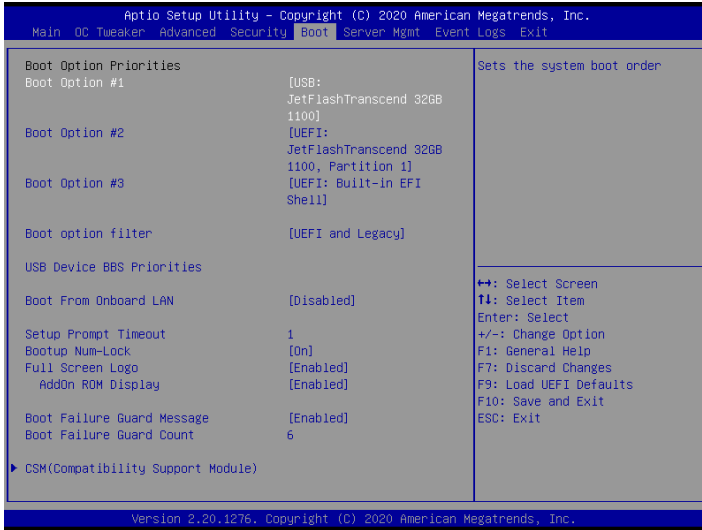
2. Authenticated UEFI Variable

3. EFI PE/COFF Image(SHA256)

Key Source: Factory, External, Mixed

## 3.6 Boot Screen

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



### Boot Option #1

Use this item to set the system boot order.

### Boot Option #2

Use this item to set the system boot order.

### Boot Option #3

Use this item to set the system boot order.

### Boot Option Filter

This option controls Legacy/UEFI ROMs priority.

### USB Device BBS Priorities

This page will show only when system install USB Storage.

### Boot From Onboard LAN

Use this item to enable or disable the Boot From Onboard LAN feature.

## Setup Prompt Timeout

This shows the number of seconds to wait for setup activation key. 65535(0XFFFF) means indefinite waiting.

## Bootup Num-Lock

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

## Full Screen Logo

Use this item to enable or disable OEM Logo. The default value is [Enabled].

## AddOn ROM Display

Use this option to adjust AddOn ROM Display. If you enable the option “Full Screen Logo” but you want to see the AddOn ROM information when the system boots, please select [Enabled]. Configuration options: [Enabled] and [Disabled]. The default value is [Enabled].

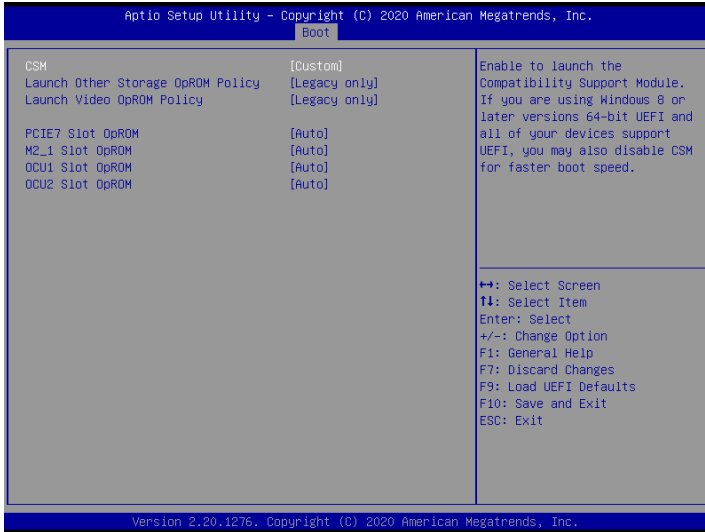
## Boot Failure Guard Message

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

## Boot Failure Guard Count

Configure the number of attempts to boot until the system automatically restores the default settings.

### 3.6.1 CSM Parameters



#### CSM

Enable to launch the Compatibility Support Module. Please do not disable unless you're running a WHCK test. If you are using Windows 8.1 64-bit and all of your devices support UEFI, you may also disable CSM for faster boot speed.

#### Launch Other Storage OpROM Policy

Select UEFI only to run those that support UEFI option ROM only. Select Legacy only to run those that support legacy option ROM only. Select Do not launch to not execute both legacy and UEFI option ROM.

#### Launch Video OpROM Policy

Select UEFI only to run those that support UEFI option ROM only. Select Legacy only to run those that support legacy option ROM only. Select Do not launch to not execute both legacy and UEFI option ROM.

#### PCIE7 Slot OpROM

This option controls Legacy/UEFI ROMs priority.

#### M2\_1 Slot OpROM

This option controls Legacy/UEFI ROMs priority.

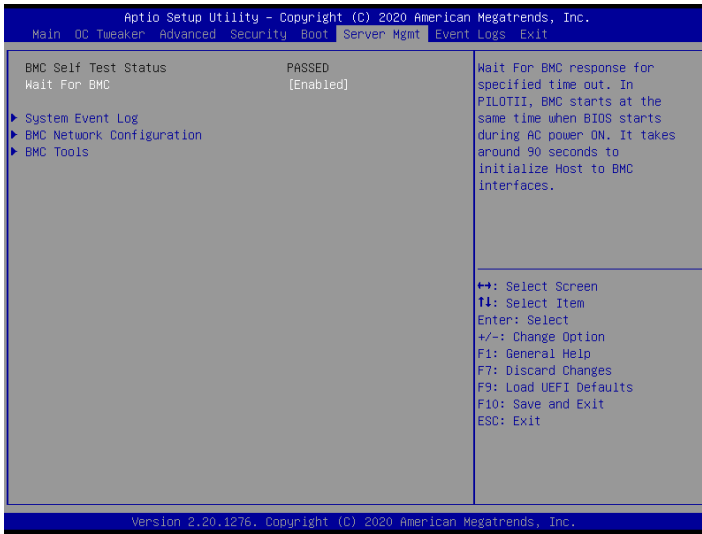
## OCU1 Slot OpROM

This option controls Legacy/UEFI ROMs priority.

## OCU2 Slot OpROM

This option controls Legacy/UEFI ROMs priority.

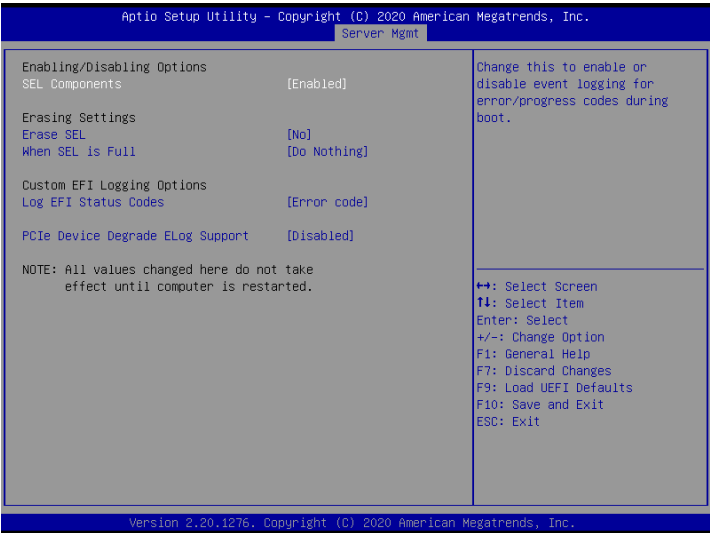
### 3.7 Server Mgmt



#### 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.

### 3.7.1 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.

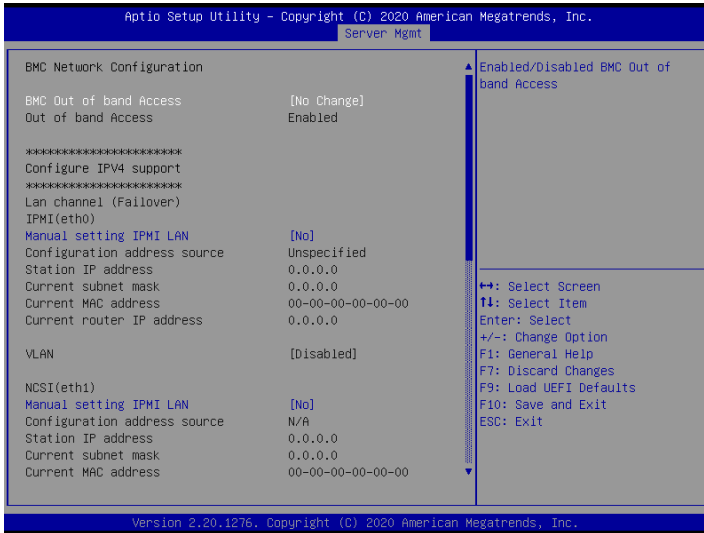
#### Log EFI Status Codes

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 disable the logging of EFI Status Codes or log only error code or only progress

## 3.7.2 BMC Network Configuration



### Lan Channel (Failover)

### IPMI(eth0)

### Manual Setting IPMI LAN

If [No] is selected, the IP address is assigned by DHCP. If you prefer 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

Enabled/Disabled Virtual Local Area Network.

## NCSI(eth0)

### Manual Setting IPMI LAN

If [No] is selected, the IP address is assigned by DHCP. If you prefer 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

### VLAN

Enabled/Disabled Virtual Local Area Network.

### LAN Channel 1 / LAN Channel 2

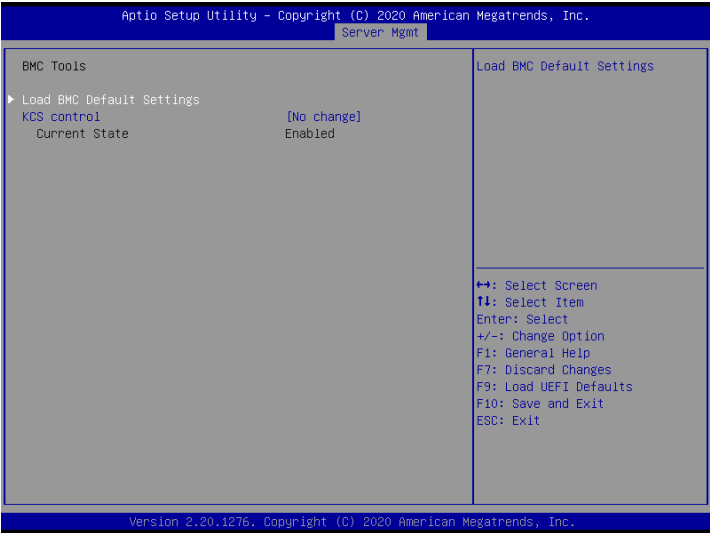
### IPv6 Support

Enable or Disable LAN1 IPv6 Support.

### Manual Setting IPMI LAN(IPV6)

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

### 3.7.3 BMC Tools



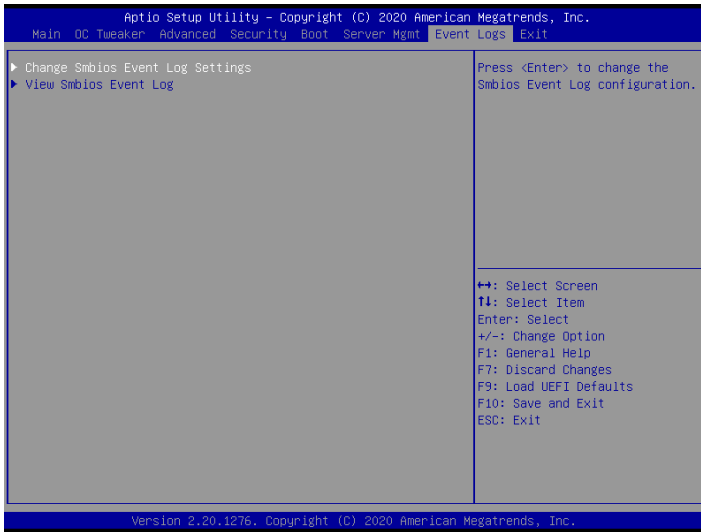
#### Load BMC Default Settings

Use this item to load BMC default settings.

#### 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.

## 3.8 Event Logs



### Change Smbios Event Log Settings

This allows you to configure the Smbios Event Log Settings.

When entering the item, you will see the followings:

#### 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/disable logging of System boot event.

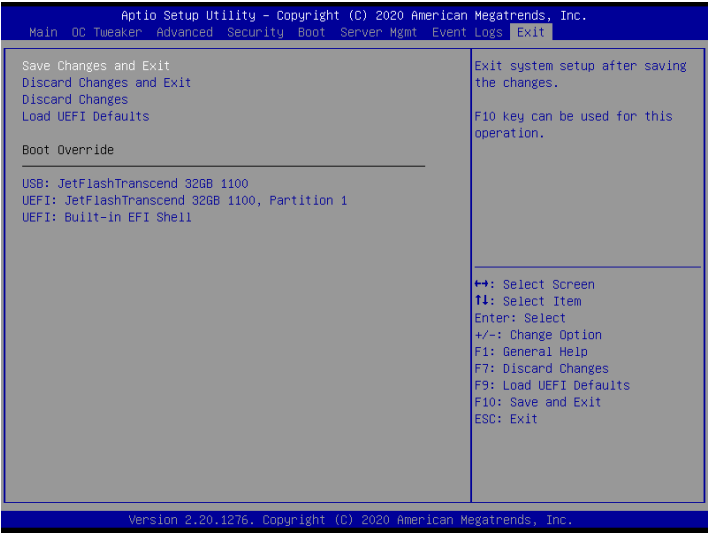
#### View Smbios Event Log

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



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

### 3.9 Exit Screen



#### Save Changes and Exit

When you select this option, the following message “Save configuration changes and exit setup?” will pop-out. Press <F10> key or select [Yes] to save the changes and exit the UEFI SETUP UTILITY.

#### Discard Changes and Exit

When you select this option, the following message “Discard changes and exit setup?” will pop-out. Press <ESC> key or select [Yes] to exit the UEFI SETUP UTILITY without saving any changes.

#### Discard Changes

When you select this option, the following message “Discard changes?” will pop-out. Press <F7> key or select [Yes] to discard all changes.

#### Load UEFI Defaults

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

## Chapter 4 Software Support

### 4.1 Install Operating System

This motherboard supports various Microsoft® Windows® / Linux compliant. Because motherboard settings and hardware options vary, use the setup procedures in this chapter for general reference only. Refer to your OS documentation for more information.

*\*Please download the Intel® SATA Floppy Image driver from the ASRock Rack's website ([www.asrockrack.com](http://www.asrockrack.com)) to your USB drive or simply install the SATA driver from the Support CD while installing OS in SATA RAID mode.*

### 4.2 Support CD Information

The Support CD that came with the motherboard contains necessary drivers and useful utilities that enhance the motherboard's features.

#### 4.2.1 Running The Support CD

To begin using the support CD, insert the CD into your CD-ROM drive. The CD automatically displays the Main Menu if "AUTORUN" is enabled in your computer. If the Main Menu does not appear automatically, locate and double click on the file "ASRSetup.exe" from the root folder in the Support CD to display the menu.

#### 4.2.2 Drivers Menu

The Drivers Menu shows the available device's drivers if the system detects installed devices. Please install the necessary drivers to activate the devices.

#### 4.2.3 Utilities Menu

The Utilities Menu shows the application softwares that the motherboard supports. Click on a specific item then follow the installation wizard to install it.

#### 4.2.4 Contact Information

If you need to contact ASRock Rack or want to know more about ASRock Rack, welcome to visit ASRock Rack's website at <http://www.ASRockRack.com>; or you may contact your dealer for further information.

# Chapter 5 Troubleshooting

## 5.1 Troubleshooting Procedures

Follow the procedures below to troubleshoot your system.



*Always unplug the power cord before adding, removing or changing any hardware components. Failure to do so may cause physical injuries to you 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 DDR4 ECC UDIMMs.
3. If you have installed more than one DIMM modules, they 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 your power supply provides adequate and stable power.

**Other problems...**

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

## 5.2 Technical Support Procedures

If you have tried the troubleshooting procedures mentioned above and the problems are still unsolved, please contact ASRock Rack's technical support with the following information:

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

You may 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 your invoice marked with the date of purchase is required. By calling your vendor or going to our RMA website (<http://event.asrockrack.com/tsd.asp>) you may 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 you return 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 your distributor first for any product related problems during the warranty period.