ASRock

# Z590 OC FORMULA

User Manual

Version 1.0
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## CE Warning

This device complies with directive 2014/53/EU issued by the Commision of the European Community.

This equipment complies with EU radiation exposure limits set forth for an uncontrolled environment.
This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Operations in the 5.15-5.35GHz band are restricted to indoor usage only.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | AT | BE | BG | CH | CY | CZ | DE |
| | DK | EE | EL | ES | FI | FR | HR |
| | HU | IE | IS | IT | LI | LT | LU |
| | LV | MT | NL | NO | PL | PT | RO |
| | SE | SI | SK | TR | UK | | |

CE

Radio transmit power per transceiver type

| Function | Frequency | Maximum Output Power (EIRP) |
|---|---|---|
| WiFi | 2400-2483.5 MHz | 18.5 + / -1.5 dbm |
| | 5150-5250 MHz | 21.5 + / -1.5 dbm |
| | 5250-5350 MHz | 18.5 + / -1.5 dbm (no TPC)<br>21.5 + / -1.5 dbm (TPC) |
| | 5470-5725 MHz | 25.5 + / -1.5 dbm (no TPC)<br>28.5 + / -1.5 dbm (TPC) |
| Bluetooth | 2400-2483.5 MHz | 8.5 + / -1.5 dbm |

# Contents

# Chapter 1 Introduction

Thank you for purchasing ASRock Z590 OC Formula motherboard, a reliable motherboard produced under ASRock's consistently stringent quality control. It delivers excellent performance with robust design conforming to ASRock's commitment to quality and endurance.

In this documentation, Chapter 1 and 2 contains the introduction of the motherboard and step-by-step installation guides. Chapter 3 contains the operation guide of the software and utilities. Chapter 4 contains the configuration guide of the BIOS setup.

*Because the motherboard specifications and the BIOS software might be updated, the content of this documentation will be subject to change without notice. In case any modifications of this documentation occur, the updated version will be available on ASRock's website without further notice. If you require technical support related to this motherboard, please visit our website for specific information about the model you are using. You may find the latest VGA cards and CPU support list on ASRock's website as well. ASRock website http://www.asrock.com.*

## 1.1 Package Contents

- ASRock Z590 OC Formula Motherboard (EATX Form Factor)
- ASRock Z590 OC Formula Quick Installation Guide
- ASRock Z590 OC Formula Support CD
- 4 x Serial ATA (SATA) Data Cables (Optional)
- 2 x ASRock WiFi 2.4/5/6 GHz Antennas (Optional)
- 1 x ASRock Screwdriver (Optional)
- 3 x Screws for M.2 Sockets (Optional)
- 3 x Standoffs for M.2 Sockets (Optional)

## 1.2 Specifications

| | |
|---|---|
| **Platform** | • EATX Form Factor<br>• 12 Layer PCB<br>• 2oz Copper PCB |
| **CPU** | • Supports 10th Gen Intel® Core™ Processors and 11th Gen Intel® Core™ Processors (LGA1200)<br>• Digi Power design<br>• 16 Power Phase design<br>• Supports Intel® Turbo Boost Max 3.0 Technology<br>• Supports Intel® K-Series unlocked CPUs<br>• Supports ASRock Hyper BCLK Engine III |
| **Chipset** | • Intel® Z590 |
| **Memory** | • Dual Channel DDR4 Memory Technology<br>• 2 x DDR4 SMD DIMM Slots<br>• 11th Gen Intel® Core™ Processors support DDR4 non-ECC, un-buffered memory up to 6000+(OC)*<br>• 10th Gen Intel® Core™ Processors support DDR4 non-ECC, un-buffered memory up to 5000+(OC)*<br>* 11th Gen Intel® Core™ (i9/i7/i5) support DDR4 up to 3200; Core™ (i3), Pentium® and Celeron® support DDR4 up to 2666.<br>* 10th Gen Intel® Core™ (i9/i7) support DDR4 up to 2933; Core™ (i5/i3), Pentium® and Celeron® support DDR4 up to 2666.<br>* Please refer to Memory Support List on ASRock's website for more information. (http://www.asrock.com/)<br>• Supports ECC UDIMM memory modules (operate in non-ECC mode)<br>• Max. capacity of system memory: 64GB<br>• Supports Intel® Extreme Memory Profile (XMP) 2.0<br>• 15µ Gold Contact in DIMM Slots |

**Expansion Slot**

**11th Gen Intel® Core™ Processors**

- 3 x PCI Express x16 Slots (PCIE1/PCIE4/PCIE5: single at Gen4x16 (PCIE1); dual at Gen4x8 (PCIE1) / Gen4x8 (PCIE4); triple at Gen4x8 (PCIE1) / Gen4x8 (PCIE4) / Gen3x4 (PCIE5))*

**10th Gen Intel® Core™ Processors**

- 3 x PCI Express x16 Slots (PCIE1/PCIE4/PCIE5: single at Gen3x16 (PCIE1); dual at Gen3x8 (PCIE1) / Gen3x8 (PCIE4); triple at Gen3x8 (PCIE1) / Gen3x8 (PCIE4) / Gen3x4 (PCIE5))*

* Supports NVMe SSD as boot disks

- 2 x PCI Express 2.0 x1 Slots
- Supports AMD Quad CrossFireX™, 3-Way CrossFireX™ and CrossFireX™
- 1 x Vertical M.2 Socket (Key E) with the bundled WiFi-802.11ax PCIe WiFi module (on the rear I/O)
- 15µ Gold Contact in VGA PCIe Slot (PCIE1)

**Audio**

- 7.1 CH HD Audio with Content Protection (Realtek ALC1220 Audio Codec)
- Premium Blu-ray Audio support
- Supports Surge Protection
- WIMA Audio Capacitors (For Front Outputs)
- ESS SABRE9218 DAC for Front Panel Audio (130dB SNR)
- Pure Power-In
- Direct Drive Technology
- PCB Isolate Shielding
- Impedance Sensing on Rear Out port
- Individual PCB Layers for R/L Audio Channel
- Gold Audio Jacks with LED
- 15µ Gold Audio Connector
- Nahimic Audio

**LAN**

**1 x 2.5 Gigabit LAN 10/100/1000/2500 Mb/s (Intel® I225V)**

- Supports Wake-On-LAN
- Supports Lightning/ESD Protection
- Supports Energy Efficient Ethernet 802.3az
- Supports PXE

| | |
|---|---|
| | **1 x Gigabit LAN 10/100/1000 Mb/s (Intel® I219V)**<br>• Supports Wake-On-LAN<br>• Supports Lightning/ESD Protection<br>• Supports Energy Efficient Ethernet 802.3az<br>• Supports PXE |
| **Wireless LAN** | • Intel® 802.11ax Wi-Fi 6E Module<br>• Supports IEEE 802.11a/b/g/n/ax<br>• Supports Dual-Band 2x2 160MHz with extended 6GHz band* support<br>* Wi-Fi 6E (6GHz band) is not currently enabled by default due to the different regulation status of each country. It will be activated (for supported countries) through Windows Update and software update once available. The update is expected to be in the middle of 2021.<br>• 2 antennas to support 2 (Transmit) x 2 (Receive) diversity technology<br>• Supports Bluetooth 5.2 + High speed class II<br>• Supports MU-MIMO |
| **Rear Panel I/O** | • 2 x Antenna Ports<br>• 1 x PS/2 Keyboard Port<br>• 1 x PS/2 Mouse Port<br>• 1 x Optical SPDIF Out Port<br>• 3 x USB 3.2 Gen2 Type-A Ports (10 Gb/s) (ReDriver) (Supports ESD Protection)<br>• 1 x USB 3.2 Gen2 Type-C Port (10 Gb/s) (ReDriver) (Supports ESD Protection)<br>• 4 x USB 3.2 Gen1 Type-A Ports (Supports ESD Protection)<br>* USB3_1 is from Intel® Z590; USB3_234 are from ASMedia ASM1074 hub.<br>* Ultra USB Power is supported on USB3_234 port.<br>* ACPI wake-up function is not supported on USB3_234 port.<br>• 2 x RJ-45 LAN Ports with LED (ACT/LINK LED and SPEED LED)<br>• 1 x BIOS Flashback Button<br>• 1 x BIOS Selection Switch<br>• 1 x Clear CMOS Button |

- HD Audio Jacks: Rear Speaker / Central / Bass / Line in / Front Speaker / Microphone (Gold Audio Jacks with LED)

* This motherboard does not support integrated graphics.

**Storage**

- 6 x SATA3 6.0 Gb/s Connectors*
- 2 x SATA3 6.0 Gb/s Connectors by ASMedia ASM1061

* M2_2, SATA3_0 and SATA3_1 share lanes. If either one of them is in use, the others will be disabled.

* M2_3, SATA3_4 and SATA3_5 share lanes. If either one of them is in use, the others will be disabled.

- 1 x Hyper M.2 Socket (M2_1), supports M Key type 2260/2280 M.2 PCI Express module up to Gen4x4 (64 Gb/s) (with 11th Gen Intel® Core™ Processors) or Gen3x4 (32 Gb/s) (with 10th Gen Intel® Core™ Processors)**
- 1 x Ultra M.2 Socket (M2_2), supports M Key type 2260/2280 M.2 SATA3 6.0 Gb/s module and M.2 PCI Express module up to Gen3 x4 (32 Gb/s)**
- 1 x Ultra M.2 Socket (M2_3), supports M Key type 2260/2280/22110 M.2 SATA3 6.0 Gb/s module and M.2 PCI Express module up to Gen3 x4 (32 Gb/s)**

** Supports Intel® Optane™ Technology

** M2_1 supports Intel® Optane™ Technology only with 10th Gen Intel® Core™ Processors

** Supports NVMe SSD as boot disks

** Supports ASRock U.2 Kit

**RAID**

- Supports RAID 0, RAID 1, RAID 5 and RAID 10 for SATA storage devices
- Supports RAID 0 and RAID 1 for M.2 NVMe storage devices*

* RAID function for PCIe mode SSD in M2_1 is only available with Intel® SSD installed (with 11th Gen Intel® Core™ Processors).

**Connector**

- 1 x Power LED and Speaker Header
- 2 x RGB LED Headers

* Support in total up to 12V/3A, 36W LED Strip

- 2 x Addressable LED Headers

* Support in total up to 5V/3A, 15W LED Strip

- 1 x CPU Fan Connector (4-pin)

* The CPU Fan Connector supports the CPU fan of maximum 1A (12W) fan power.

- 1 x CPU/Water Pump Fan Connector (4-pin) (Smart Fan Speed Control)

* CPU_FAN2/WP_3A supports the water cooler fan of maximum 3A (36W) fan power.

- 6 x Chassis/Water Pump Fan Connectors (4-pin) (Smart Fan Speed Control)

* The Chassis/Water Pump Fan supports the water cooler fan of maximum 2A (24W) fan power.

* CPU_FAN2/WP_3A, CHA_FAN1/WP, CHA_FAN2/WP, CHA_FAN3/WP, CHA_FAN4/WP, CHA_FAN5/WP and CHA_FAN6/WP can auto detect if 3-pin or 4-pin fan is in use.

- 1 x 24 pin ATX Power Connector (Hi-Density Power Connector)
- 2 x 8 pin 12V Power Connectors (Hi-Density Power Connector)
- 1 x Front Panel Audio Connector (15μ Gold Audio Connector)
- 1 x Thunderbolt AIC Connector (5-pin) (Supports ASRock Thunderbolt 4 AIC Card)
- 2 x USB 2.0 Headers (Support 4 USB 2.0 ports) (Supports ESD Protection)

* USB_1 is from ASMedia ASM1074 hub; USB_234 are Intel® Z590.

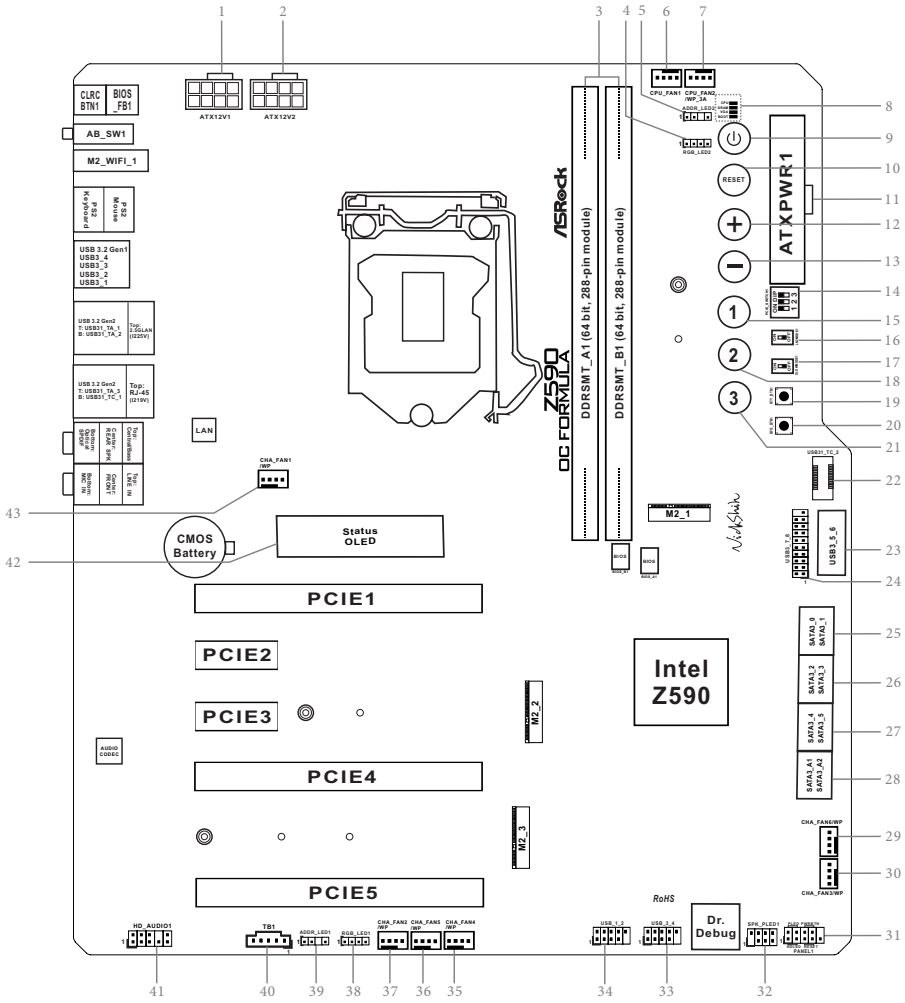
- 2 x USB 3.2 Gen1 Headers (Support 4 USB 3.2 Gen1 ports) (ASMedia ASM1074 hub) (Supports ESD Protection)
- 1 x Front Panel Type C USB 3.2 Gen2x2 Header (20 Gb/s) (Supports ESD Protection)
- 1 x Dr. Debug with LED
- 1 x Power Button with LED
- 1 x Reset Button with LED
- 1 x Retry Button
- 1 x Safe Boot Button
- V-Probe™: 2 x 5-set of onboard voltage measurement points laid
- Rapid OC Buttons: +/- buttons to adjust OC frequency
- 1 x PCIe ON/OFF Switch
- 1 x Post Status Checker (PSC)
- 1 x Slow Mode Switch

| | |
|---|---|
| | • 1 x LN2 Mode Switch<br>• 1 x NickShih's OC Profile 1 Button with LED<br>• 1 x NickShih's OC Profile 2 Button with LED<br>• 1 x NickShih's OC Profile 3 Button with LED |
| **BIOS Feature** | • 2 x AMI UEFI Legal BIOS with multilingual GUI support<br>• ACPI 6.0 Compliant wake up events<br>• SMBIOS 2.7 Support<br>• CPU Vcore, DRAM (VCCM, VPPM, VTT), VCCSA, CPU PLL, VCC PLL, STANDBY1, STANDBY2, STANDBY3, VCCIO, VCCIOMEM, PCH Voltage, CPU Internal PLL, Ring PLL, System Agent PLL, Memory Controller PLL Voltage Multi-adjustment |
| **Hardware Monitor** | • Fan Tachometer: CPU, CPU/Water Pump, Chassis/Water Pump Fans<br>• Quiet Fan (Auto adjust chassis fan speed by CPU temperature): CPU, CPU/Water Pump, Chassis/Water Pump Fans<br>• Fan Multi-Speed Control: CPU, CPU/Water Pump, Chassis/Water Pump Fans<br>• Voltage monitoring: +12V, +5V, +3.3V, CPU Vcore, VCCM, VPPM , VCCSA, CPU PLL, VCC PLL, STANDBY1, STANDBY2, STANDBY3, VCCIO, VCCIOMEM, VCCIN AUX Voltage<br>• 1 x Status OLED |
| **OS** | • Microsoft® Windows® 10 64-bit |
| **Certifications** | • FCC, CE<br>• ErP/EuP ready (ErP/EuP ready power supply is required) |

** For detailed product information, please visit our website: http://www.asrock.com*

*Please realize that there is a certain risk involved with overclocking, including adjusting the setting in the BIOS, applying Untied Overclocking Technology, or using third-party overclocking tools. Overclocking may affect your system's stability, or even cause damage to the components and devices of your system. It should be done at your own risk and expense. We are not responsible for possible damage caused by overclocking.*

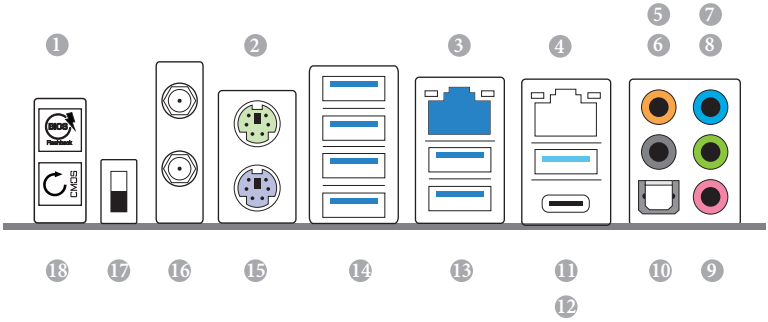
## 1.3 Motherboard Layout



| No. | Description |
|---|---|
| 1 | 8 pin 12V Power Connector (ATX12V1) |
| 2 | 8 pin 12V Power Connector (ATX12V2) |
| 3 | 2 x 288-pin DDR4 SMD DIMM Slots (DDRSMT_A1, DDRSMT_B1) |
| 4 | RGB LED Header (RGB_LED2) |
| 5 | Addressable LED Header (ADDR_LED2) |
| 6 | CPU Fan Connector (CPU_FAN1) |
| 7 | CPU/Water Pump Fan Connector (CPU_FAN2/WP_3A) |
| 8 | POST Status Checker (PSC) |
| 9 | Power Button (PWRBTN1) |
| 10 | Reset Button (RSTBTN1) |
| 11 | ATX Power Connector (ATXPWR1) |
| 12 | Rapid OC Button (+) (PLUS1) |
| 13 | Rapid OC Button (–) (MINUS1) |
| 14 | PCIe ON/OFF Switch (PCIE_SWITCH1) |
| 15 | NickShih's OC Profile 1 Button with LED (ONE1) |
| 16 | LN2 Mode Switch (LN2MODE1) |
| 17 | Slow Mode Switch (SLOWMODE1) |
| 18 | NickShih's OC Profile 2 Button with LED (TWO1) |
| 19 | Retry Button (RTY_BTN1) |
| 20 | Safe Boot Button (BFG_BTN1) |
| 21 | NickShih's OC Profile 3 Button with LED (THREE1) |
| 22 | Front Panel Type C USB 3.2 Gen2x2 Header (USB31_TC_2) |
| 23 | USB 3.1 Gen1 Header (USB3_5_6) |
| 24 | USB 3.1 Gen1 Header (USB3_7_8) |
| 25 | SATA3 Connector (SATA3_0) (Upper), SATA3 Connector (SATA3_1) (Lower) |
| 26 | SATA3 Connector (SATA3_2) (Upper), SATA3 Connector (SATA3_3) (Lower) |
| 27 | SATA3 Connector (SATA3_4) (Upper), SATA3 Connector (SATA3_5) (Lower) |
| 28 | SATA3 Connector (SATA3_A1) (Upper), SATA3 Connector (SATA3_A2) (Lower) |
| 29 | Chassis/Water Pump Fan Connector (CHA_FAN6/WP) |
| 30 | Chassis/Water Pump Fan Connector (CHA_FAN3/WP) |
| 31 | System Panel Header (PANEL1) |
| 32 | Power LED and Speaker Header (SPK_PLED1) |
| 33 | USB 2.0 Header (USB_3_4) |
| 34 | USB 2.0 Header (USB_1_2) |

| No. | Description |
|---|---|
| 35 | Chassis/Water Pump Fan Connector (CHA_FAN4/WP) |
| 36 | Chassis/Water Pump Fan Connector (CHA_FAN5/WP) |
| 37 | Chassis/Water Pump Fan Connector (CHA_FAN2/WP) |
| 38 | RGB LED Header (RGB_LED1) |
| 39 | Addressable LED Header (ADDR_LED1) |
| 40 | Thunderbolt AIC Connector (TB1) |
| 41 | Front Panel Audio Header (HD_AUDIO1) |
| 42 | Status OLED |
| 43 | Chassis/Water Pump Fan Connector (CHA_FAN1/WP) |

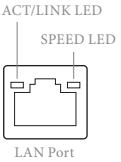
## 1.4 I/O Panel




| No. | Description | No. | Description |
|---|---|---|---|
| 1 | BIOS Flashback Button | 12 | USB 3.2 Gen2 Type-C Port (USB31_TC_1) |
| 2 | PS/2 Mouse Port | 13 | USB 3.2 Gen2 Type-A Ports (USB31_TA_12) |
| 3 | 2.5G LAN RJ-45 Port (Intel® I225V)* | 14 | USB 3.2 Gen1 Ports (USB3_1234)**** |
| 4 | LAN RJ-45 Port (Intel® I219V)** | 15 | PS/2 Keyboard Port |
| 5 | Central / Bass (Orange) | 16 | Antenna Ports |
| 6 | Rear Speaker (Black) | 17 | BIOS Selection Switch (AB_SW1) |
| 7 | Line In (Light Blue) | 18 | Clear CMOS Button |
| 8 | Front Speaker (Lime)*** | | |
| 9 | Microphone (Pink) | | |
| 10 | Optical SPDIF Out Port | | |
| 11 | USB 3.2 Gen2 Type-A Port (USB31_TA_3) | | |

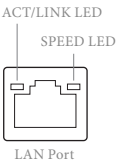
English

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




| Activity / Link LED | | Speed LED | |
|---|---|---|---|
| Status | Description | Status | Description |
| Off | No Link | Off | 10Mbps connection |
| Blinking | Data Activity | Orange | 100Mbps/1Gbps connection |
| On | Link | Green | 2.5Gbps connection |

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




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

**** If you use a 2-channel speaker, please connect the speaker's plug into "Front Speaker Jack". See the table below for connection details in accordance with the type of speaker you use.*

| Audio Output Channels | Front Speaker (No. 8) | Rear Speaker (No. 6) | Central / Bass (No. 5) | Line In (No. 7) |
|---|---|---|---|---|
| 2 | V | -- | -- | -- |
| 4 | V | V | -- | -- |
| 6 | V | V | V | -- |
| 8 | V | V | V | V |

***** Ultra USB Power is supported on USB3_234 ports. ACPI wake-up function is not supported on USB3_234 ports.*

## 1.5 802.11ax Wi-Fi 6E Module and ASRock WiFi 2.4/5/6 GHz Antennas

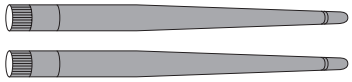
### 802.11ax Wi-Fi 6E + BT Module

This motherboard comes with an exclusive 802.11 a/b/g/n/ax Wi-Fi 6E + BT v5.2 module (pre-installed on the rear I/O panel) that offers support for 802.11 a/b/g/n/ax Wi-Fi 6E connectivity standards and Bluetooth v5.2. Wi-Fi 6E + BT module is an easy-to-use wireless local area network (WLAN) adapter to support Wi-Fi 6E + BT. Bluetooth v5.2 standard features Smart Ready technology that adds a whole new class of functionality into the mobile devices. BT 5.2 also includes Low Energy Technology and ensures extraordinary low power consumption for PCs.

* The transmission speed may vary according to the environment.

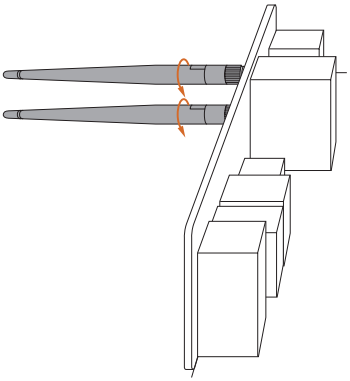
* Wi-Fi 6E (6GHz band) is not currently enabled by default due to the different regulation status of each country. It will be activated (for supported countries) through Windows Update and software update once available. The update is expected to be in the middle of 2021.

## WiFi Antennas Installation Guide



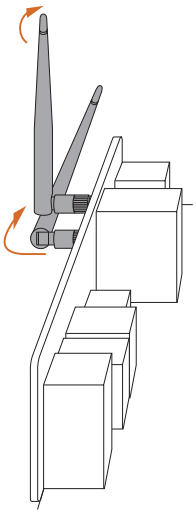
***Step 1***

Prepare the WiFi 2.4/5/6 GHz Antennas that come with the package.



***Step 2***

Connect the two WiFi 2.4/5/6 GHz Antennas to the antenna connectors. Turn the antenna clockwise until it is securely connected.



***Step 3***

Set the WiFi 2.4/5/6 GHz Antenna as shown in the illustration.

*You may need to adjust the direction of the antenna for a stronger signal.

# Chapter 2 Installation

This is an EATX form factor motherboard. Before you install the motherboard, study the configuration of your chassis to ensure that the motherboard fits into it.

## Pre-installation Precautions

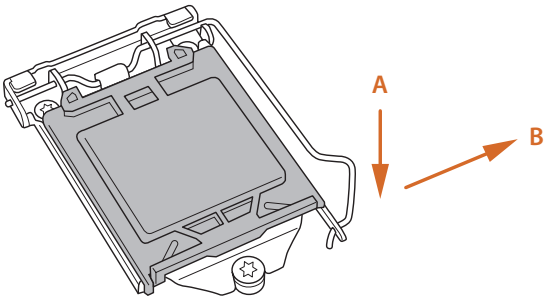
Take note of the following precautions before you install motherboard components or change any motherboard settings.

- Make sure to unplug the power cord before installing or removing the motherboard components. Failure to do so may cause physical injuries and damages to motherboard components.
- In order to avoid damage from static electricity to the motherboard's components, NEVER place your motherboard directly on a carpet. Also remember to use a grounded wrist strap or touch a safety grounded object before you handle the components.
- Hold components by the edges and do not touch the ICs.
- Whenever you uninstall any components, place them on a grounded anti-static pad or in the bag that comes with the components.
- When placing screws to secure the motherboard to the chassis, please do not over-tighten the screws! Doing so may damage the motherboard.

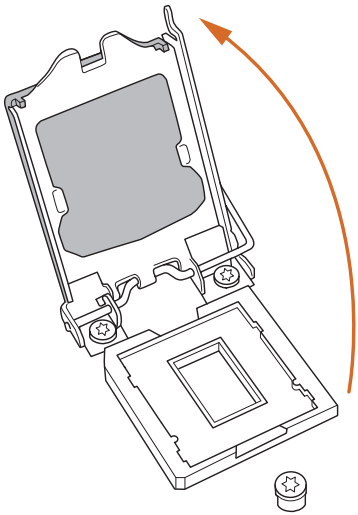
## 2.1 Installing the CPU

1. *Before you insert the 1200-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.*

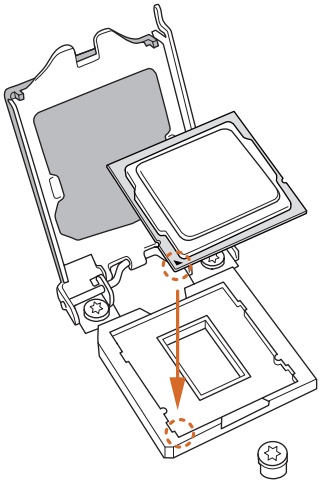
1



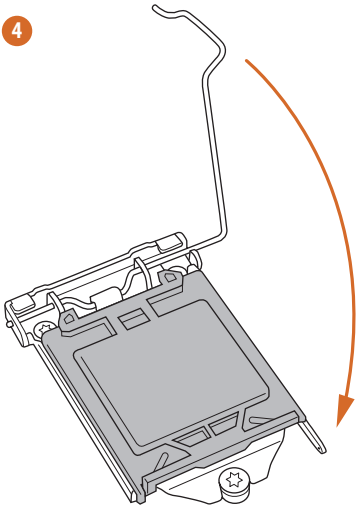

2



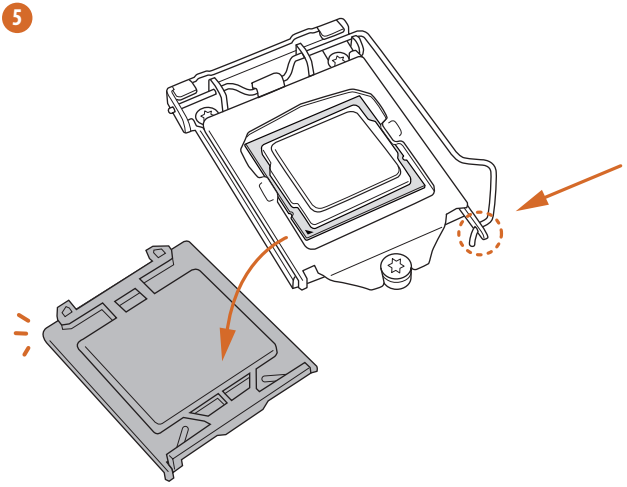
3



4

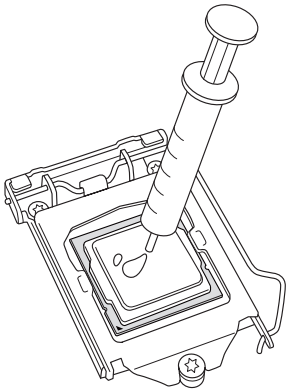


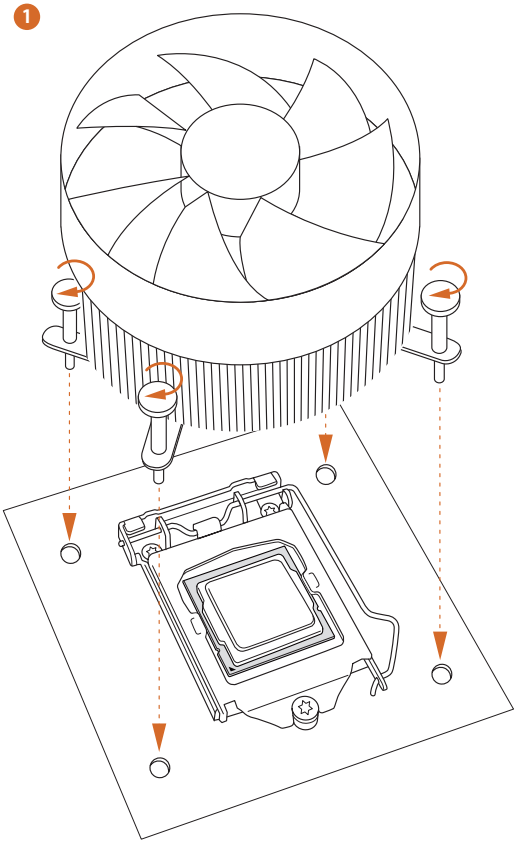
5

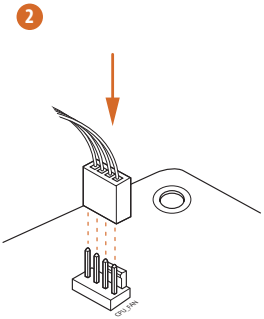


*Please save and replace the cover if the processor is removed. The cover must be placed if you wish to return the motherboard for after service.*

## 2.2 Installing the CPU Fan and Heatsink





## 2.3 Installing Memory Modules (DIMM)

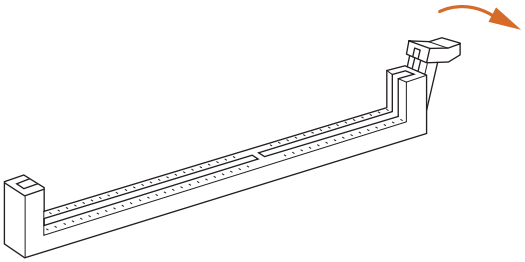
This motherboard provides two 288-pin DDR4 (Double Data Rate 4) SMD DIMM slots, and supports Dual Channel Memory Technology.

1. *For dual channel configuration, you always need to install identical (the same brand, speed, size and chip-type) DDR4 SMD DIMM pairs.*
2. *It is unable to activate Dual Channel Memory Technology with only one memory module installed.*
3. *It is not allowed to install a DDR, DDR2 or DDR3 memory module into a DDR4 slot; otherwise, this motherboard and DIMM may be damaged.*

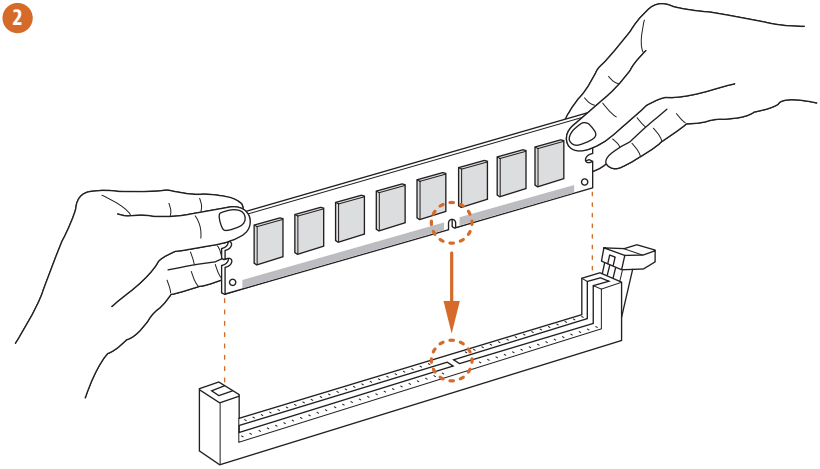
*The DIMM only fits in one correct orientation. It will cause permanent damage to the motherboard and the DIMM if you force the DIMM into the slot at incorrect orientation.*

English

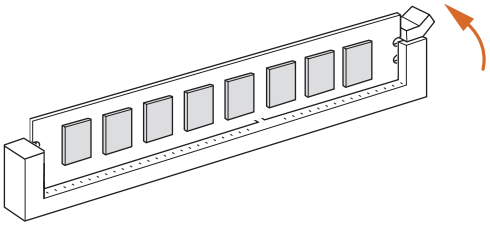
1



2



3



## 2.4 Expansion Slots (PCI Express Slots)

There are 5 PCI Express slots on the motherboard.

*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.*

**PCIe slots:**

**11th Gen Intel® Core™ Processors:**

PCIE1 (PCIe 4.0 x16 slot) is used for PCI Express x16 lane width graphics cards.
PCIE2(PCIe 2.0 x1 slot) is used for PCI Express x1 lane width cards.
PCIE3(PCIe 2.0 x1 slot) is used for PCI Express x1 lane width cards.
PCIE4 (PCIe 4.0 x16 slot) is used for PCI Express x8 lane width graphics cards.
PCIE5(PCIe 3.0 x16 slot) is used for PCI Express x4 lane width cards.

**10th Gen Intel® Core™ Processors:**

PCIE1 (PCIe 3.0 x16 slot) is used for PCI Express x16 lane width graphics cards.
PCIE2(PCIe 2.0 x1 slot) is used for PCI Express x1 lane width cards.
PCIE3(PCIe 2.0 x1 slot) is used for PCI Express x1 lane width cards.
PCIE4 (PCIe 3.0 x16 slot) is used for PCI Express x8 lane width graphics cards.
PCIE5(PCIe 3.0 x16 slot) is used for PCI Express x4 lane width cards.

## PCIe Slot Configurations

11th Gen Intel® Core™ Processors:

| | PCIE1 | PCIE4 | PCIE5 |
|---|---|---|---|
| **Single Graphics Card** | Gen4x16 | N/A | N/A |
| **Two Graphics Cards in CrossFireX™ Mode** | Gen4x8 | Gen4x8 | N/A |
| **Three Graphics Cards in 3-Way CrossFireX™ Mode** | Gen4x8 | Gen4x8 | Gen3x4 |

10th Gen Intel® Core™ Processors:

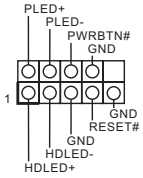
| | PCIE1 | PCIE4 | PCIE5 |
|---|---|---|---|
| **Single Graphics Card** | Gen3x16 | N/A | N/A |
| **Two Graphics Cards in CrossFireX™ Mode** | Gen3x8 | Gen3x8 | N/A |
| **Three Graphics Cards in 3-Way CrossFireX™ Mode** | Gen3x8 | Gen3x8 | Gen3x4 |

*For a better thermal environment, please connect a chassis fan to the motherboard's chassis fan connector (CHA_FAN1~6/WP) when using multiple graphics cards.*

## 2.5 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.8, No. 31)




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

***PWRBTN (Power Button):***
*Connect to the power button on the chassis front panel. You may configure the way to turn off your system using the power button.*

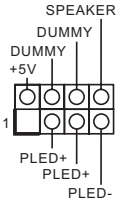
***RESET (Reset Button):***
*Connect to the reset button on the chassis front panel. Press the reset button to restart the computer if the computer freezes and fails to perform a normal restart.*

***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 keeps blinking when the system is in S1/S3 sleep state. 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.*

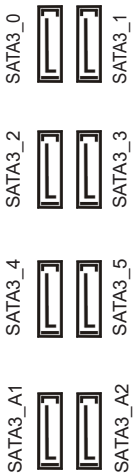
*The front panel design may differ by chassis. A front panel module mainly consists of power button, reset button, power LED, hard drive activity LED, speaker and etc. When connecting your chassis front panel module to this header, make sure the wire assignments and the pin assignments are matched correctly.*

Power LED and Speaker Header
(7-pin SPK_PLED1)
(see p.8, No. 32)




Please connect the chassis power LED and the chassis speaker to this header.

Serial ATA3 Connectors
Right Angle:
(SATA3_0:
see p.8, No. 25)(Upper)
(SATA3_1:
see p.8, No. 25)(Lower)
(SATA3_2:
see p.8, No. 26)(Upper)
(SATA3_3:
see p.8, No. 26)(Lower)
(SATA3_4:
see p.8, No. 27)(Upper)
(SATA3_5:
see p.8, No. 27)(Lower)
(SATA3_A1:
see p.8, No. 28)(Upper)
(SATA3_A2:
see p.8, No. 28)(Lower)



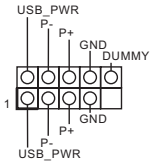

These eight SATA3 connectors support SATA data cables for internal storage devices with up to 6.0 Gb/s data transfer rate.

* M2_2, SATA3_0 and SATA3_1 share lanes. If either one of them is in use, the others will be disabled.

* M2_3, SATA3_4 and SATA3_5 share lanes. If either one of them is in use, the others will be disabled.

*To minimize the boot time, use Intel® Z590 SATA ports (SATA3_0) for your SSDs.

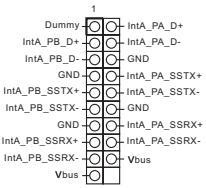
USB 2.0 Headers
(9-pin USB_1_2)
(see p.8, No. 34)
(9-pin USB_3_4)
(see p.8, No. 33)




There are two headers on this motherboard. Each USB 2.0 header can support two ports.

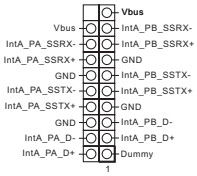
English

USB 3.2 Gen1 Headers
Right Angle:
(19-pin USB3_5_6)
(see p.8, No. 23)

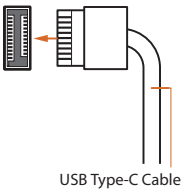



There are two headers on this motherboard. Each USB 3.2 Gen1 header can support two ports.

Vertical:
(19-pin USB3_7_8)
(see p.8, No. 24)

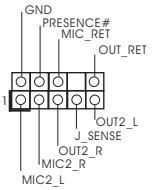



Front Panel Type C USB 3.2 Gen2x2 Header
(20-pin USB31_TC_2)
(see p.8, No. 22)




There is one Front Panel Type C USB 3.2 Gen2x2 Header on this motherboard. This header is used for connecting a USB 3.2 Gen2 module for additional USB 3.2 Gen2 ports.

Front Panel Audio Header
(9-pin HD_AUDIO1)
(see p.8, No. 41)

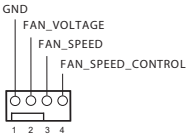



This header is for connecting audio devices to the front audio panel.

*High Definition Audio supports Jack Sensing, but the panel wire on the chassis must support HDA to function correctly. Please follow the instructions in our manual and chassis manual to install your system.*

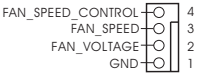
English

Chassis/Water Pump Fan Connectors
(4-pin CHA_FAN1/WP)
(see p.8, No. 43)
(4-pin CHA_FAN2/WP)
(see p.8, No. 37)

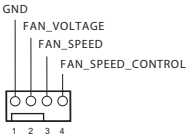



This motherboard provides six 4-Pin water cooling chassis fan connectors. If you plan to connect a 3-Pin chassis water cooler fan, please connect it to Pin 1-3.

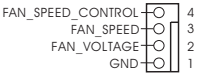
(4-pin CHA_FAN3/WP)
(see p.8, No. 30)



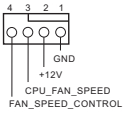

(4-pin CHA_FAN4/WP)
(see p.8, No. 35)
(4-pin CHA_FAN5/WP)
(see p.8, No. 36)




(4-pin CHA_FAN6/WP)
(see p.8, No. 29)

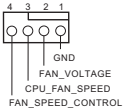



CPU Fan Connector
(4-pin CPU_FAN1)
(see p.8, No. 6)

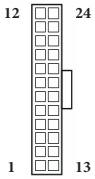
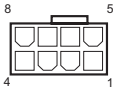



This motherboard provides a 4-Pin CPU fan (Quiet Fan) connector. If you plan to connect a 3-Pin CPU fan, please connect it to Pin 1-3.

CPU/Water Pump Fan Connector
(4-pin CPU_FAN2/WP_3A)
(see p.8, No. 7)



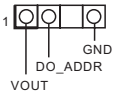

This motherboard provides a 4-Pin water cooling CPU fan connector. If you plan to connect a 3-Pin CPU water cooler fan, please connect it to Pin 1-3.

| | | |
|---|---|---|
| ATX Power Connector<br>(24-pin ATXPWR1)<br>(see p.8, No. 11) |  | This motherboard provides a 24-pin ATX power connector. To use a 20-pin ATX power supply, please plug it along Pin 1 and Pin 13. |
| ATX 12V Power Connectors<br>(8-pin ATX12V1)<br>(see p.8, No. 1)<br>(8-pin ATX12V2)<br>(see p.8, No. 2) |  | This motherboard provides two 8-pin ATX 12V power connectors. To use a 4-pin ATX power supply, please plug it along Pin 1 and Pin 5.<br>*Connecting an ATX 12V 8-pin cable to ATX12V2 is optional.<br>***Warning: Please make sure that the power cable connected is for the CPU and not the graphics card. Do not plug the PCIe power cable to this connector.** |
| Thunderbolt AIC Connectors<br>(5-pin TB1)<br>(see p.8, No. 40) |  | Please connect a Thunderbolt™ add-in card (AIC) to the Thunderbolt AIC connector via the GPIO cable.<br>*Please install the Thunderbolt™ AIC card to PCIE5 (default slot). |

RGB LED Headers
(4-pin RGB_LED1)
(see p.8, No. 38)
(4-pin RGB_LED2)
(see p.8, No. 4)


These two RGB headers are used to connect RGB LED extension cable which allows users to choose from various LED lighting effects.
**Caution: Never install the RGB LED cable in the wrong orientation; otherwise, the cable may be damaged.**
*Please refer to page 71 for further instructions on these two headers.

Addressable LED Headers
(3-pin ADDR_LED1)
(see p.8, No. 39)
(3-pin ADDR_LED2)
(see p.8, No. 5)




These two Addressable headers are used to connect Addressable LED extension cable which allows users to choose from various LED lighting effects.
**Caution: Never install the Addressable LED cable in the wrong orientation; otherwise, the cable may be damaged.**
*Please refer to page 72 for further instructions on this header.

## 2.6 Smart Switches

The motherboard has fifteen smart switches: Power Button, Reset Button, Retry Button, Safe Boot Button, Clear CMOS Button, Rapid OC Buttons, NickShih's OC Profile Buttons, PCIe ON/OFF Switch, Slow Mode Switch, LN2 Mode Switch, BIOS Selection Switch and BIOS Flashback Button.

| | | |
|---|---|---|
| Power Button<br>(PWRBTN1)<br>(see p.8, No. 9) |  | Power Button allows users to quickly turn on/off the system. |
| Reset Button<br>(RSTBTN1)<br>(see p.8 No. 10) |  | Reset Button allows users to quickly reset the system. |
| Retry Button<br>(RTY_BTN1)<br>(see p.8 No. 19) |  | Reset Button allows users to restart system immediately when the system needs to be forced shutdown. |
| Safe Boot Button<br>(BFG_BTN1)<br>(see p.8 No. 20) |  | If press this button, the next boot of the system will use BIOS default setting. |
| Clear CMOS Button<br>(CLRCBTN1)<br>(see p.11, No. 18) |  | Clear CMOS Button allows users to quickly clear the CMOS values. |

*This function is workable only when you power off your computer and unplug the power supply.*

+ / - Rapid OC Buttons

(PLUS: see p.8, No. 12)
(MINUS: see p.8, No. 13)

+ / - Rapid OC Buttons allow users to quickly and easily adjust OC frequency in Rapid OC.

*This overclocking behavior depends on the system configuration, such as memory capability, thermal solution, etc. Overclocking may affect your system stability, or even cause damage to the components and devices. We are not responsible for possible damage caused by overclocking.*

NickShih's OC Profile Buttons with LED

(ONE1: see p.8, No. 15)

(TWO1: see p.8, No. 18)

(THREE1: see p.8, No. 21)


Use NickShih's OC Profile Buttons in Rapid OC to quickly load the preset NickShih's OC Profile 1, 2 or 3.

PCIe ON/OFF Switch (PCIE_SWITCH1) (see p.8, No. 14)


1: PCIE1
2: PCIE4
3: PCIE5

PCIe ON/OFF Switch allows you to enable and disable the corresponding PCIE x16 slots. When one of the installed PCIE x16 cards is out of order, you can use PCIe ON/OFF Switch to find out the faulty one just with a single click without removing the cards.

1. *Make sure that you power off the system before changing the switch.*
2. *When you turn off PCIe ON/OFF switch, your PCIE card could be burnt if it was poorly designed. For more information about your card's specifications please contact the card's vendor.*
3. *PCIe ON/OFF switch is for debug only. If you do not want to use your PCIE card, please remove it from the motherboard.*

| | | |
|---|---|---|
| Slow Mode Switch<br>(SLOWMODE1)<br>(see p.8, No. 17) |  | If Slow Mode is on, the processor runs at lowest frequency. |
| LN2 Mode Switch<br>(LN2MODE1)<br>(see p.8, No. 16) |  | The LN2 mode aids in eliminating the cold-boot bug issues in processors during extreme overclocking with Liquid Nitrogen. |
| BIOS Selection Switch<br>(AB_SW1)<br>(see p.11, No. 17) |  | BIOS Selection Switch allows the system to boot from either BIOS A or BIOS B. |

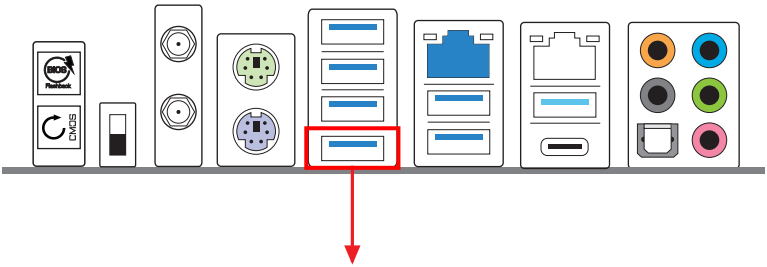
BIOS Flashback Button
(BIOS_FB1)
(see p.11, No. 1)

BIOS Flashback Switch allows users to flash the BIOS.

ASRock BIOS Flashback feature allows you to update BIOS without powering on the system, even without CPU.

To use the USB BIOS Flashback function, Please follow the steps below.

1. Download the latest BIOS file from ASRock's website : http://www.asrock.com.
2. Copy the BIOS file to your USB flash drive. Please make sure the file system of your USB flash drive must be FAT32.
3. Extract BIOS file from the zip file.
4. Rename the file to "**creative.rom**" and save it to the root directory of X: USB flash drive.
5. Plug the 24 pin power connector to the motherboard. Then turn on the power supply's AC switch.
   *There is no need to power on the system.
6. Then plug your USB drive to the USB BIOS Flashback port.
7. Press the BIOS Flashback Switch for about three seconds. Then the LED starts to blink.
8. Wait until the LED stops blinking, indicating that BIOS flashing has been completed.
   *If the LED light turns solid green, this means that the BIOS Flashback is not operating properly. Please make sure that you plug the USB drive to the USB BIOS Flashback port.
   **If the LED does not light up at all then please disconnect power from the system and remove/disconnect the CMOS battery from the motherboard for several minutes. Reconnect power and battery and try again.




USB BIOS Flashback port

## 2.7 Post Status Checker

Post Status Checker (PSC) diagnoses the computer when users power on the machine. It emits a red light to indicate whether the CPU, memory, VGA or storage is dysfunctional. The lights go off if the four mentioned above are functioning normally.

## 2.8 Status OLED

Status OLED shows various information of the system on a new OLED screen. It displays information of the power on self test, fan speed, temperatures, frequencies and voltages on the motherboard. With the Status OLED, you can also check that if your CPU or DRAM is properly installed

## 2.9 Dr. Debug

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

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

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

| | |
|---|---|
| 0x99 | DXE_SIO_INIT |
| 0x9A | DXE_USB_BEGIN |
| 0x9B | DXE_USB_RESET |
| 0x9C | DXE_USB_DETECT |
| 0x9D | DXE_USB_ENABLE |
| 0xA0 | DXE_IDE_BEGIN |
| 0xA1 | DXE_IDE_RESET |
| 0xA2 | DXE_IDE_DETECT |
| 0xA3 | DXE_IDE_ENABLE |
| 0xA4 | DXE_SCSI_BEGIN |
| 0xA5 | DXE_SCSI_RESET |
| 0xA6 | DXE_SCSI_DETECT |
| 0xA7 | DXE_SCSI_ENABLE |
| 0xA8 | DXE_SETUP_VERIFYING_PASSWORD |
| 0xA9 | DXE_SETUP_START |
| 0xAB | DXE_SETUP_INPUT_WAIT |
| 0xAD | DXE_READY_TO_BOOT |
| 0xAE | DXE_LEGACY_BOOT |

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

| | |
|---|---|
| 0xE3 | PEI_S3_OS_WAKE |
| 0x50 | PEI_MEMORY_INVALID_TYPE |
| 0x53 | PEI_MEMORY_NOT_DETECTED |
| 0x55 | PEI_MEMORY_NOT_INSTALLED |
| 0x57 | PEI_CPU_MISMATCH |
| 0x58 | PEI_CPU_SELF_TEST_FAILED |
| 0x59 | PEI_CPU_NO_MICROCODE |
| 0x5A | PEI_CPU_ERROR |
| 0x5B | PEI_RESET_NOT_AVAILABLE |
| 0xD0 | DXE_CPU_ERROR |
| 0xD1 | DXE_NB_ERROR |
| 0xD2 | DXE_SB_ERROR |
| 0xD3 | DXE_ARCH_PROTOCOL_NOT_AVAILABLE |
| 0xD4 | DXE_PCI_BUS_OUT_OF_RESOURCES |
| 0xD5 | DXE_LEGACY_OPROM_NO_SPACE |
| 0xD6 | DXE_NO_CON_OUT |
| 0xD7 | DXE_NO_CON_IN |

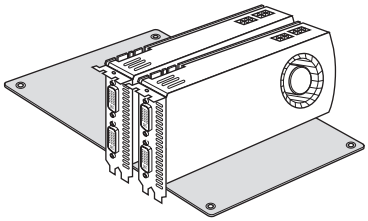
| | |
|---|---|
| 0xD8 | DXE_INVALID_PASSWORD |
| 0xD9 | DXE_BOOT_OPTION_LOAD_ERROR |
| 0xDA | DXE_BOOT_OPTION_FAILED |
| 0xDB | DXE_FLASH_UPDATE_FAILED |
| 0xDC | DXE_RESET_NOT_AVAILABLE |
| 0xE8 | PEI_MEMORY_S3_RESUME_FAILED |
| 0xE9 | PEI_S3_RESUME_PPI_NOT_FOUND |
| 0xEA | PEI_S3_BOOT_SCRIPT_ERROR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

## 2.10 CrossFireX™ , 3-Way CrossFireX™ and Quad CrossFireX™ Operation Guide

This motherboard supports CrossFireX™, 3-way CrossFireX™ and Quad CrossFireX™ that allows you to install up to three identical PCI Express x16 graphics cards.

1. *You should only use identical CrossFireX™-ready graphics cards that are AMD certified.*
2. *Make sure that your graphics card driver supports AMD CrossFireX™ technology. Download the drivers from the AMD's website: www.amd.com*
3. *Make sure that your power supply unit (PSU) can provide at least the minimum power your system requires. It is recommended to use a AMD certified PSU. Please refer to the AMD's website for details.*
4. *If you pair a 12-pipe CrossFireX™ Edition card with a 16-pipe card, both cards will operate as 12-pipe cards while in CrossFireX™ mode.*
5. *Different CrossFireX™ cards may require different methods to enable CrossFireX™. Please refer to AMD graphics card manuals for detailed installation guide.*

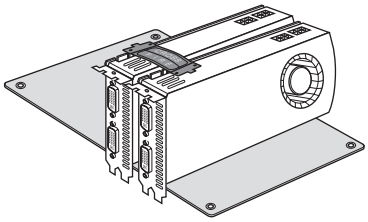
### 2.10.1 Installing Two CrossFireX™-Ready Graphics Cards



***Step 1***

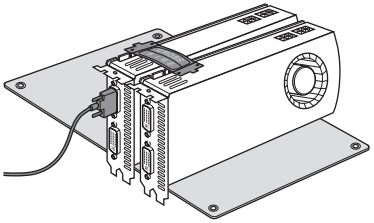
Insert one graphics card into PCIE1 slot and the other graphics card to PCIE4 slot. Make sure that the cards are properly seated on the slots.


CrossFire Bridge



***Step 2***

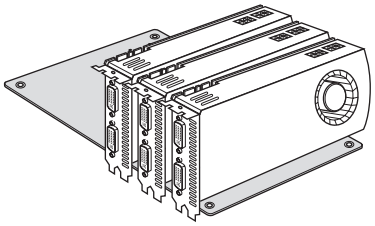
Connect two graphics cards by installing a CrossFire Bridge on the CrossFire Bridge Interconnects on the top of the graphics cards. (The CrossFire Bridge is provided with the graphics card you purchase, not bundled with this motherboard. Please refer to your graphics card vendor for details.)



***Step 3***

Connect a VGA/DVI/DP/HDMI cable from the monitor to the corresponding port on the graphics card installed to the PCIE1 slot.

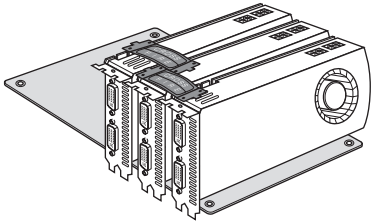
## 2.10.2 Installing Three CrossFireX™-Ready Graphics Cards



***Step 1***

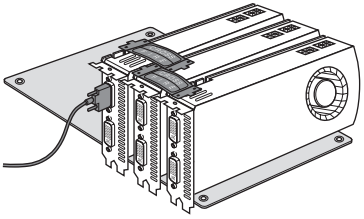
Insert one graphics card into PCIE1 slot, another graphics card to PCIE4 slot, and the other graphics card to PCIE5 slot. Make sure that the cards are properly seated on the slots.


CrossFire Bridge



***Step 2***

Use one CrossFire Bridge to connect the graphics cards on PCIE1 and PCIE4 slots, and use the other CrossFire Bridge to connect the graphics cards on PCIE4 and PCIE5 slots. (The CrossFire Bridge is provided with the graphics card you purchase, not bundled with this motherboard. Please refer to your graphics card vendor for details.)



***Step 3***

Connect a VGA/DVI/DP/HDMI cable from the monitor to the corresponding port on the graphics card installed to the PCIE1 slot.

## 2.10.3 Driver Installation and Setup

***Step 1***

Power on your computer and boot into OS.

***Step 2***

Remove the AMD drivers if you have any VGA drivers installed in your system.

*The Catalyst Uninstaller is an optional download. We recommend using this utility to uninstall any previously installed Catalyst drivers prior to installation. Please check AMD's website for AMD driver updates.*

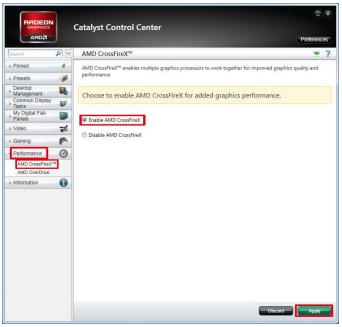
***Step 3***

Install the required drivers and CATALYST Control Center then restart your computer. Please check AMD's website for details.


AMD Catalyst Control Center

***Step 4***

Double-click the **AMD Catalyst Control Center** icon in the Windows® system tray.



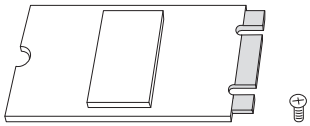

***Step 5***

In the left pane, click **Performance** and then **AMD CrossFireX™**. Then select **Enable AMD CrossFireX** and click **Apply**. Select the GPU number according to your graphics card and click **Apply**.

## 2.11 M.2_SSD (NGFF) Module Installation Guide (M2_1)

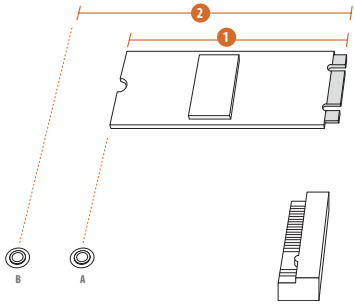
The M.2, also known as the Next Generation Form Factor (NGFF), is a small size and versatile card edge connector that aims to replace mPCIe and mSATA. The Hyper M.2 Socket (M2_1) supports M Key type 2260/2280 M.2 PCI Express module up to Gen4x4 (64 Gb/s) (with 11th Gen Intel® Core™ Processors) or Gen3x4 (32 Gb/s) (with 10th Gen Intel® Core™ Processors).

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



***Step 1***

This motherboard supports M.2_SSD (NGFF) module type 2260 and 2280 only. Prepare a proper PCB lenth of module, the screw and the standoff.

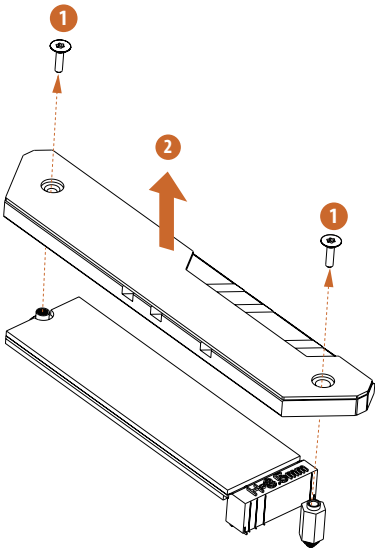



***Step 2***

Depending on the PCB type and length of your M.2_SSD (NGFF) module, find the corresponding nut location to be used.

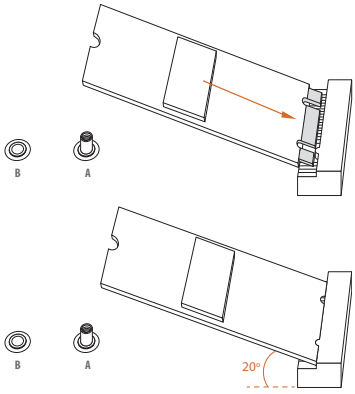
| No. | 1 | 2 |
|---|---|---|
| Nut Location | A | B |
| PCB Length | 6cm | 8cm |
| Module Type | Type2260 | Type 2280 |

English



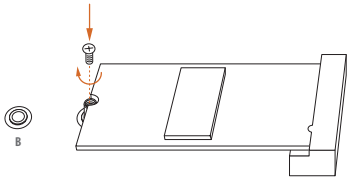

***Step 3***

Before installing a M.2 (NGFF) SSD module, please loosen the screws to remove the M.2 heatsink.
*Please remove the protective films on the bottom side of the M.2 heatsink before you install a M.2 SSD module.



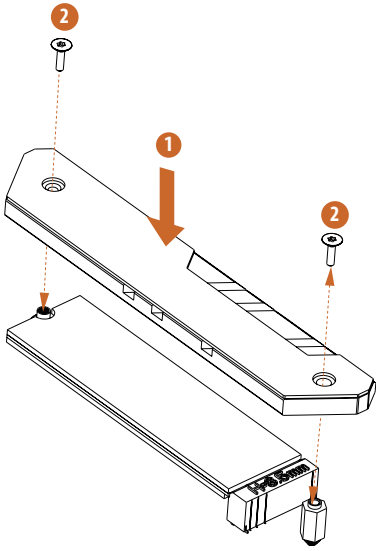

***Step 4***

Prepare the M.2 standoff that comes with the package. Then hand tighten the standoff into the desired nut location on the motherboard. Align and 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 5***

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




***Step 6***

Tighten the screw with a screwdriver to secure the module and M.2 heatsink into place. Please do not overtighten the screw as this might damage the module and M.2 heatsink.

## M.2_SSD (NGFF) Module Support List (M2_1)

| Vendor | Interface | P/N |
|---|---|---|
| ADATA | PCIe3 x4 | ASX7000NP-128GT-C |
| ADATA | PCIe3 x4 | ASX8000NP-256GM-C |
| ADATA | PCIe3 x4 | ASX7000NP-256GT-C |
| ADATA | PCIe3 x4 | ASX8000NP-512GM-C |
| ADATA | PCIe3 x4 | ASX7000NP-512GT-C |
| Apacer | PCIe3 x4 | AP240GZ280 |
| Corsair | PCIe3 x4 | CSSD-F240GBMP500 |
| Intel | PCIe3 x4 | SSDPEKKF256G7 |
| Intel | PCIe3 x4 | SSDPEKKF512G7 |
| Kingston | PCIe3 x4 | SKC1000/480G |
| Kingston | PCIe2 x4 | SH2280S3/480G |
| OCZ | PCIe3 x4 | RVD400 -M2280-512G (NVME) |
| PATRIOT | PCIe3 x4 | PH240GPM280SSDR NVME |
| Plextor | PCIe3 x4 | PX-128M8PeG |
| Plextor | PCIe3 x4 | PX-1TM8PeG |
| Plextor | PCIe3 x4 | PX-256M8PeG |
| Plextor | PCIe3 x4 | PX-512M8PeG |
| Plextor | PCIe | PX-G256M6e |
| Plextor | PCIe | PX-G512M6e |
| Samsung | PCIe3 x4 | SM961 MZVPW128HEGM (NVM) |
| Samsung | PCIe3 x4 | PM961 MZVLW128HEGR (NVME) |
| Samsung | PCIe3 x4 | 960 EVO (MZ-V6E250) (NVME) |
| Samsung | PCIe3 x4 | 960 EVO (MZ-V6E250BW) (NVME) |
| Samsung | PCIe3 x4 | SM951 (NVME) |
| Samsung | PCIe3 x4 | SM951 (MZHPV256HDGL) |
| Samsung | PCIe3 x4 | SM951 (MZHPV512HDGL) |
| Samsung | PCIe3 x4 | SM951 (NVME) |
| Samsung | PCIe x4 | XP941-512G (MZHPU512HCGL) |
| SanDisk | PCIe | SD6PP4M-128G |
| SanDisk | PCIe | SD6PP4M-256G |
| TEAM | PCIe3 x4 | TM8FP2240G0C101 |
| TEAM | PCIe3 x4 | TM8FP2480GC110 |
| WD | PCIe3 x4 | WDS256G1X0C-00ENX0 (NVME) |
| WD | PCIe3 x4 | WDS512G1X0C-00ENX0 (NVME) |

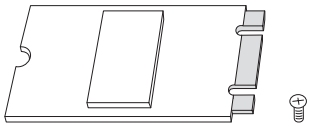
For the latest updates of M.2_SSD (NFGG) module support list, please visit our website for details: http://www.asrock.com

## 2.12 M.2_SSD (NGFF) Module Installation Guide (M2_2)

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. The Ultra M.2 Socket (M2_2) supports M Key type 2260/2280 M.2 SATA3 6.0 Gb/s module and M.2 PCI Express module up to Gen3 x4 (32 Gb/s).

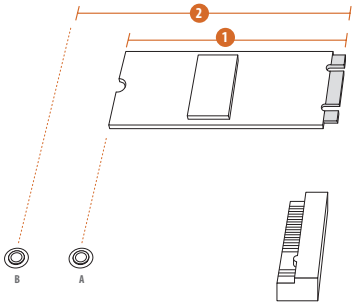
* M2_2, SATA3_0 and SATA3_1 share lanes. If either one of them is in use, the others will be disabled.

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



***Step 1***

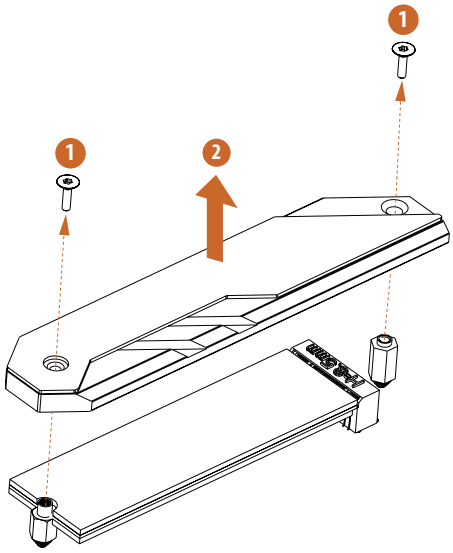
This motherboard supports M.2_SSD (NGFF) module type 2260 and 2280 only. Prepare a proper PCB lenth of module, the screw and the standoff.




***Step 2***

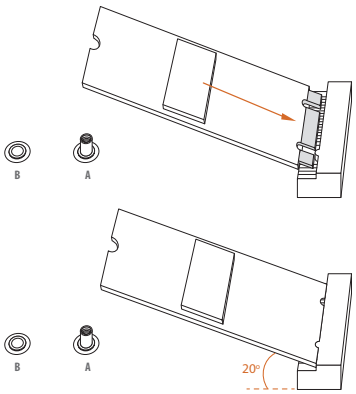
Depending on the PCB type and length of your M.2_SSD (NGFF) module, find the corresponding nut location to be used.

| No. | 1 | 2 |
|---|---|---|
| Nut Location | A | B |
| PCB Length | 6cm | 8cm |
| Module Type | Type2260 | Type 2280 |



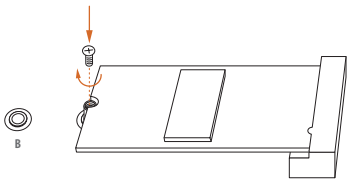

***Step 3***

Before installing a M.2 (NGFF) SSD module, please loosen the screws to remove the M.2 heatsink.
*Please remove the protective films on the bottom side of the M.2 heatsink before you install a M.2 SSD module.



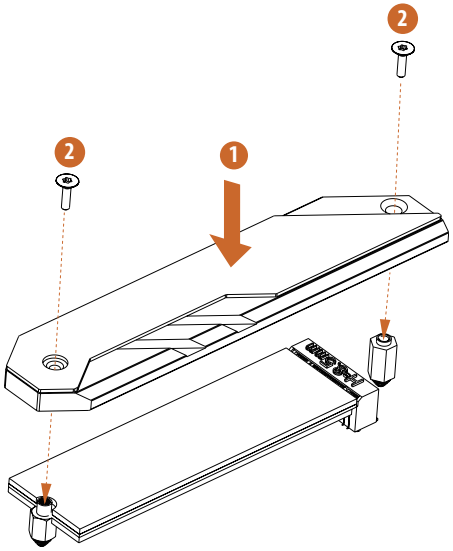

***Step 4***

Prepare the M.2 standoff that comes with the package. Then hand tighten the standoff into the desired nut location on the motherboard. Align and 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 5***

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




***Step 6***

Tighten the screw with a screwdriver to secure the module and M.2 heatsink into place. Please do not overtighten the screw as this might damage the module and M.2 heatsink.

## M.2_SSD (NGFF) Module Support List (M2_2)

| Vendor | Interface | P/N |
|---|---|---|
| ADATA | SATA3 | AXNS381E-128GM-B |
| ADATA | SATA3 | AXNS381E-256GM-B |
| ADATA | SATA3 | ASU800NS38-256GT-C |
| ADATA | SATA3 | ASU800NS38-512GT-C |
| ADATA | PCIe3 x4 | ASX7000NP-128GT-C |
| ADATA | PCIe3 x4 | ASX8000NP-256GM-C |
| ADATA | PCIe3 x4 | ASX7000NP-256GT-C |
| ADATA | PCIe3 x4 | ASX8000NP-512GM-C |
| ADATA | PCIe3 x4 | ASX7000NP-512GT-C |
| Apacer | PCIe3 x4 | AP240GZ280 |
| Corsair | PCIe3 x4 | CSSD-F240GBMP500 |
| Crucial | SATA3 | CT120M500SSD4 |
| Crucial | SATA3 | CT240M500SSD4 |
| Intel | SATA3 | Intel SSDSCKGW080A401/80G |
| Intel | PCIe3 x4 | SSDPEKKF256G7 |
| Intel | PCIe3 x4 | SSDPEKKF512G7 |
| Kingston | SATA3 | SM2280S3 |
| Kingston | PCIe3 x4 | SKC1000/480G |
| Kingston | PCIe2 x4 | SH2280S3/480G |
| OCZ | PCIe3 x4 | RVD400 -M2280-512G (NVME) |
| PATRIOT | PCIe3 x4 | PH240GPM280SSDR NVME |
| Plextor | PCIe3 x4 | PX-128M8PeG |
| Plextor | PCIe3 x4 | PX-1TM8PeG |
| Plextor | PCIe3 x4 | PX-256M8PeG |
| Plextor | PCIe3 x4 | PX-512M8PeG |
| Plextor | PCIe | PX-G256M6e |
| Plextor | PCIe | PX-G512M6e |
| Samsung | PCIe3 x4 | SM961 MZVPW128HEGM (NVM) |
| Samsung | PCIe3 x4 | PM961 MZVLW128HEGR (NVME) |
| Samsung | PCIe3 x4 | 960 EVO (MZ-V6E250) (NVME) |
| Samsung | PCIe3 x4 | 960 EVO (MZ-V6E250BW) (NVME) |
| Samsung | PCIe3 x4 | SM951 (NVME) |
| Samsung | PCIe3 x4 | SM951 (MZHPV256HDGL) |
| Samsung | PCIe3 x4 | SM951 (MZHPV512HDGL) |
| Samsung | PCIe3 x4 | SM951 (NVME) |
| Samsung | PCIe x4 | XP941-512G (MZHPU512HCGL) |
| SanDisk | PCIe | SD6PP4M-128G |
| SanDisk | PCIe | SD6PP4M-256G |
| Team | SATA3 | TM8PS4128GMC105 |
| Team | SATA3 | TM8PS4256GMC105 |

| | | |
|---|---|---|
| TEAM | PCIe3 x4 | TM8FP2240G0C101 |
| TEAM | PCIe3 x4 | TM8FP2480GC110 |
| Transcend | SATA3 | TS512GMTS600 |
| Transcend | SATA3 | TS512GMTS800 |
| V-Color | SATA3 | VLM100-120G-2280B-RD |
| V-Color | SATA3 | VLM100-240G-2280RGB |
| V-Color | SATA3 | VSM100-240G-2280 |
| V-Color | SATA3 | VLM100-240G-2280B-RD |
| WD | SATA3 | WDS100T1B0B-00AS40 |
| WD | SATA3 | WDS240G1G0B-00RC30 |
| WD | PCIe3 x4 | WDS256G1X0C-00ENX0 (NVME) |
| WD | PCIe3 x4 | WDS512G1X0C-00ENX0 (NVME) |

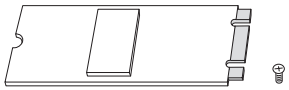
For the latest updates of M.2_SSD (NFGG) module support list, please visit our website for details: http://www.asrock.com

## 2.13 M.2_SSD (NGFF) Module Installation Guide (M2_3)

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. The Ultra M.2 Socket (M2_3) supports M Key type 2260/2280/22110 M.2 SATA3 6.0 Gb/s module and M.2 PCI Express module up to Gen3 x4 (32 Gb/s).

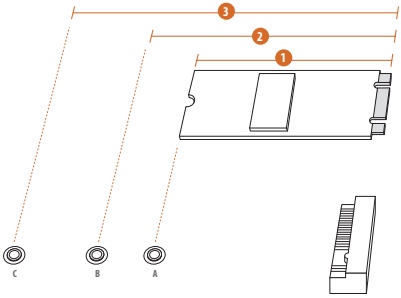
* M2_3, SATA3_4 and SATA3_5 share lanes. If either one of them is in use, the others will be disabled.

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



***Step 1***

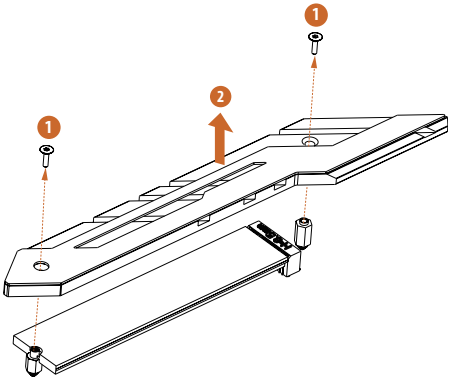
Prepare a M.2_SSD (NGFF) module and the screw.




***Step 2***

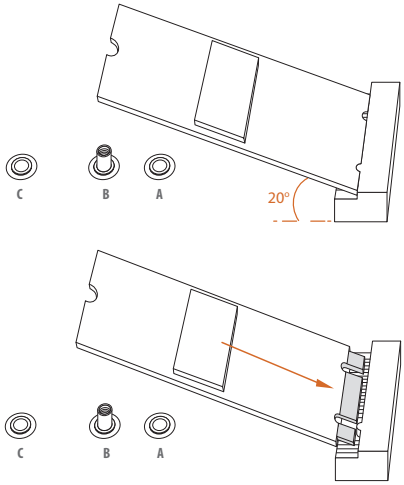
Depending on the PCB type and length of your M.2_SSD (NGFF) module, find the corresponding nut location to be used.

| No. | 1 | 2 | 3 |
|---|---|---|---|
| Nut Location | A | B | C |
| PCB Length | 6cm | 8cm | 11cm |
| Module Type | Type2260 | Type 2280 | Type 22110 |



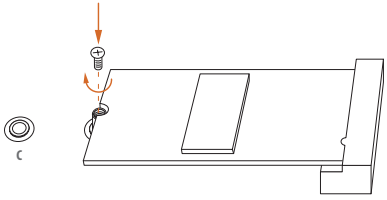

***Step 3***

Before installing a M.2 (NGFF) SSD module, please loosen the screws to remove the M.2 heatsink.
*Please remove the protective films on the bottom side of the M.2 heatsink before you install a M.2 SSD module.



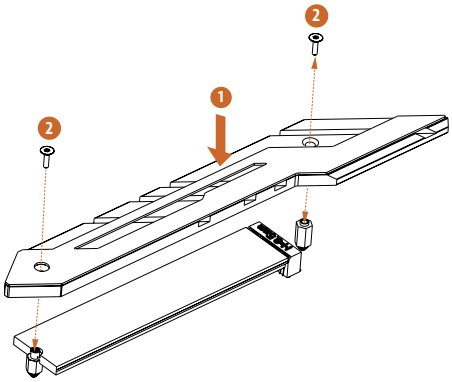

***Step 4***

Prepare the M.2 standoff that comes with the package. Then hand tighten the standoff into the desired nut location on the motherboard. Align and 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. modules into place.




***Step 5***

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




***Step 6***

Tighten the screw with a screwdriver to secure the module and M.2 heatsink into place. Please do not overtighten the screw as this might damage the module and M.2 heatsink.

## M.2_SSD (NGFF) Module Support List (M2_3)

| Vendor | Interface | P/N |
|---|---|---|
| ADATA | SATA3 | AXNS330E-32GM-B |
| ADATA | SATA3 | AXNS381E-128GM-B |
| ADATA | SATA3 | AXNS381E-256GM-B |
| ADATA | SATA3 | ASU800NS38-256GT-C |
| ADATA | SATA3 | ASU800NS38-512GT-C |
| ADATA | PCIe3 x4 | ASX7000NP-128GT-C |
| ADATA | PCIe3 x4 | ASX8000NP-256GM-C |
| ADATA | PCIe3 x4 | ASX7000NP-256GT-C |
| ADATA | PCIe3 x4 | ASX8000NP-512GM-C |
| ADATA | PCIe3 x4 | ASX7000NP-512GT-C |
| Apacer | PCIe3 x4 | AP240GZ280 |
| Corsair | PCIe3 x4 | CSSD-F240GBMP500 |
| Crucial | SATA3 | CT120M500SSD4 |
| Crucial | SATA3 | CT240M500SSD4 |
| Intel | SATA3 | Intel SSDSCKGW080A401/80G |
| Intel | PCIe3 x4 | SSDPEKKF256G7 |
| Intel | PCIe3 x4 | SSDPEKKF512G7 |
| Kingston | SATA3 | SM2280S3 |
| Kingston | PCIe3 x4 | SKC1000/480G |
| Kingston | PCIe2 x4 | SH2280S3/480G |
| OCZ | PCIe3 x4 | RVD400 -M2280-512G (NVME) |
| PATRIOT | PCIe3 x4 | PH240GPM280SSDR NVME |
| Plextor | PCIe3 x4 | PX-128M8PeG |
| Plextor | PCIe3 x4 | PX-1TM8PeG |
| Plextor | PCIe3 x4 | PX-256M8PeG |
| Plextor | PCIe3 x4 | PX-512M8PeG |
| Plextor | PCIe | PX-G256M6e |
| Plextor | PCIe | PX-G512M6e |
| Samsung | PCIe3 x4 | SM961 MZVPW128HEGM (NVM) |
| Samsung | PCIe3 x4 | PM961 MZVLW128HEGR (NVME) |
| Samsung | PCIe3 x4 | 960 EVO (MZ-V6E250) (NVME) |
| Samsung | PCIe3 x4 | 960 EVO (MZ-V6E250BW) (NVME) |
| Samsung | PCIe3 x4 | SM951 (NVME) |
| Samsung | PCIe3 x4 | SM951 (MZHPV256HDGL) |
| Samsung | PCIe3 x4 | SM951 (MZHPV512HDGL) |
| Samsung | PCIe3 x4 | SM951 (NVME) |
| Samsung | PCIe x4 | XP941-512G (MZHPU512HCGL) |
| SanDisk | PCIe | SD6PP4M-128G |
| SanDisk | PCIe | SD6PP4M-256G |
| Team | SATA3 | TM4PS4128GMC105 |
| Team | SATA3 | TM4PS4256GMC105 |
| Team | SATA3 | TM8PS4128GMC105 |
| Team | SATA3 | TM8PS4256GMC105 |

| | | |
|---|---|---|
| TEAM | PCIe3 x4 | TM8FP2240G0C101 |
| TEAM | PCIe3 x4 | TM8FP2480GC110 |
| Transcend | SATA3 | TS256GMTS400 |
| Transcend | SATA3 | TS512GMTS600 |
| Transcend | SATA3 | TS512GMTS800 |
| V-Color | SATA3 | VLM100-120G-2280B-RD |
| V-Color | SATA3 | VLM100-240G-2280RGB |
| V-Color | SATA3 | VSM100-240G-2280 |
| V-Color | SATA3 | VLM100-240G-2280B-RD |
| WD | SATA3 | WDS100T1B0B-00AS40 |
| WD | SATA3 | WDS240G1G0B-00RC30 |
| WD | PCIe3 x4 | WDS256G1X0C-00ENX0 (NVME) |
| WD | PCIe3 x4 | WDS512G1X0C-00ENX0 (NVME) |

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

# Chapter 3 Software and Utilities Operation

## 3.1 Installing Drivers

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

### 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" in the Support CD to display the menu.

### Drivers Menu

The drivers compatible to your system will be auto-detected and listed on the support CD driver page. Please click **Install All** or follow the order from top to bottom to install those required drivers. Therefore, the drivers you install can work properly.

### Utilities Menu

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

## 3.2 ASRock Motherboard Utility (Formula Drive)

ASRock Motherboard Utility (Formula Drive) is ASRock's multi purpose software suite with a new interface, more new features and improved utilities.

### 3.2.1 Installing ASRock Motherboard Utility (Formula Drive)

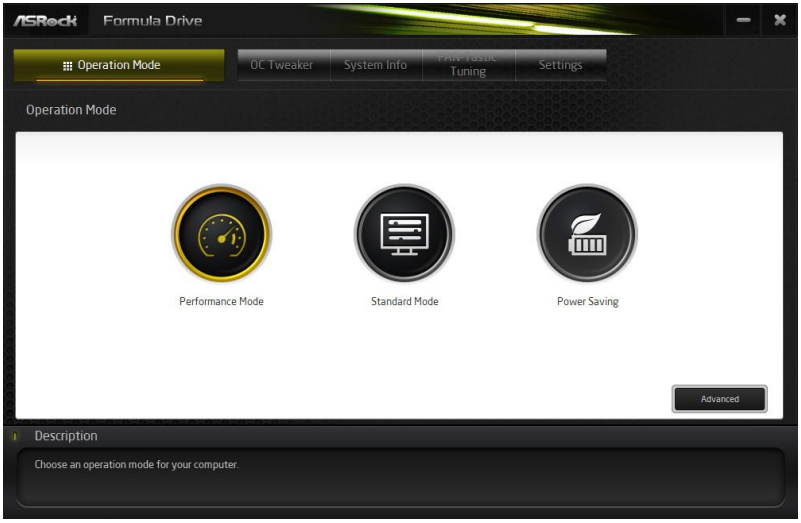
ASRock Motherboard Utility (Formula Drive) can be downloaded from ASRock Live Update & APP Shop. After the installation, you will find the icon "ASRock Motherboard Utility (Formula Drive)" on your desktop. Double-click the "ASRock Motherboard Utility (Formula Drive)" icon, ASRock Motherboard Utility (Formula Drive) main menu will pop up.

### 3.2.2 Using ASRock Motherboard Utility (Formula Drive)

There are five sections in ASRock Motherboard Utility (Formula Drive) main menu: Operation Mode, OC Tweaker, System Info, FAN-Tastic Tuning and Settings.

#### Operation Mode

Choose an operation mode for your computer.



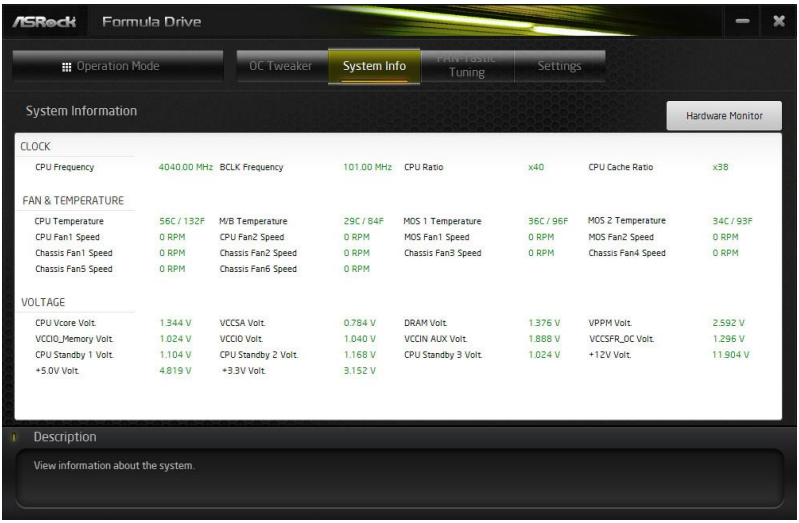
## OC Tweaker

Configurations for overclocking the system.


## System Info

View information about the system.

*The System Browser tab may not appear for certain models.

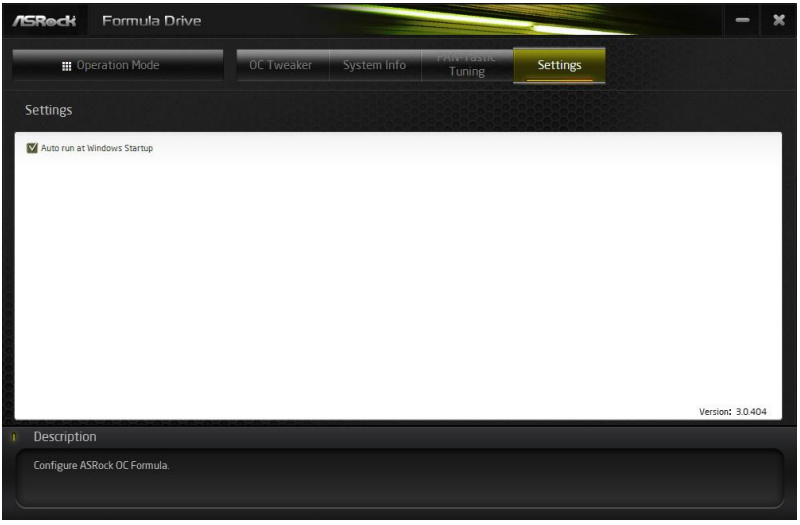


## FAN-Tastic Tuning

Configure up to five different fan speeds using the graph. The fans will automatically shift to the next speed level when the assigned temperature is met.


## Settings

Configure ASRock ASRock Motherboard Utility (Formula Drive). Click to select "Auto run at Windows Startup" if you want ASRock Motherboard Utility (Formula Drive) to be launched when you start up the Windows operating system.



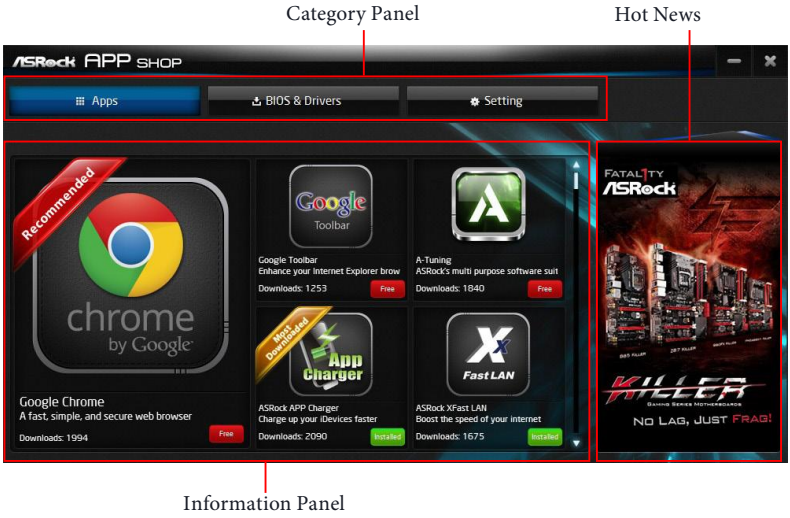
## 3.3 ASRock Live Update & APP Shop

The ASRock Live Update & APP Shop is an online store for purchasing and downloading software applications for your ASRock computer. You can quickly and easily install various apps and support utilities. With ASRock Live Update & APP Shop, you can optimize your system and keep your motherboard up to date simply with a few clicks.

Double-click on your desktop to access ASRock Live Update & APP Shop utility.

**You need to be connected to the Internet to download apps from the ASRock Live Update & APP Shop.*

### 3.3.1 UI Overview




**Category Panel**: The category panel contains several category tabs or buttons that when selected the information panel below displays the relative information.

**Information Panel**: The information panel in the center displays data about the currently selected category and allows users to perform job-related tasks.

**Hot News**: The hot news section displays the various latest news. Click on the image to visit the website of the selected news and know more.

## 3.3.2 Apps

When the "Apps" tab is selected, you will see all the available apps on screen for you to download.

### Installing an App

***Step 1***

Find the app you want to install.


The most recommended app appears on the left side of the screen. The other various apps are shown on the right. Please scroll up and down to see more apps listed.

You can check the price of the app and whether you have already intalled it or not.

Free - The red icon displays the price or "Free" if the app is free of charge.

Installed - The green "Installed" icon means the app is installed on your computer.

***Step 2***

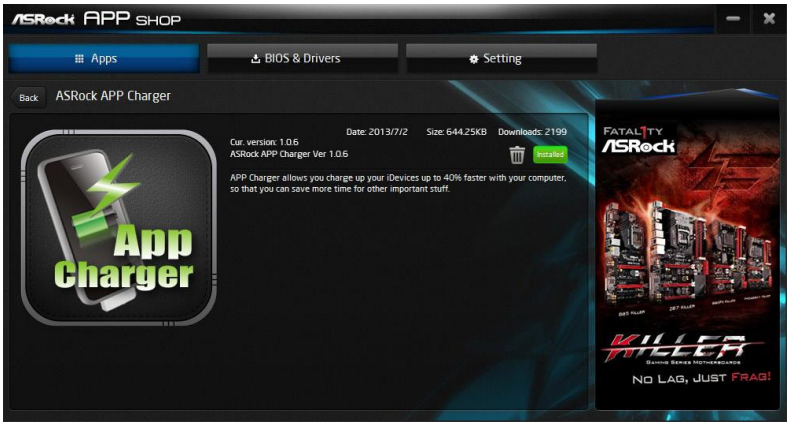
Click on the app icon to see more details about the selected app.

***Step 3***

If you want to install the app, click on the red icon Free to start downloading.


***Step 4***

When installation completes, you can find the green "Installed" icon appears on the upper right corner.




To uninstall it, simply click on the trash can icon .
*The trash icon may not appear for certain apps.

## Upgrading an App

You can only upgrade the apps you have already installed. When there is an available new version for your app, you will find the mark of "New Version" New Version appears below the installed app icon.


***Step 1***

Click on the app icon to see more details.

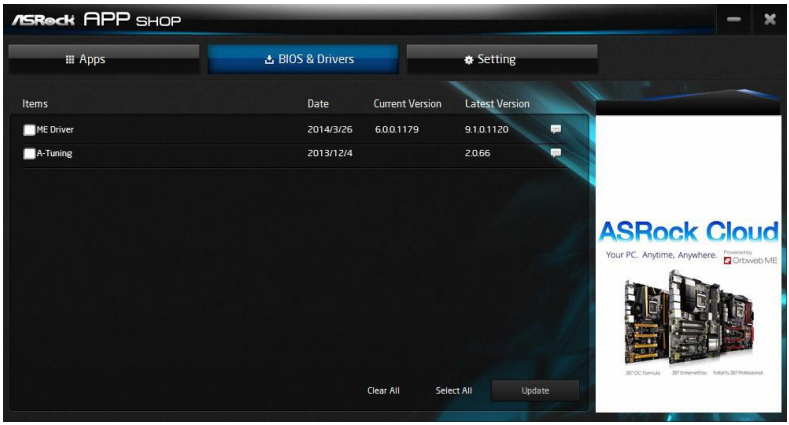
***Step 2***

Click on the yellow icon New Version to start upgrading.

## 3.3.3 BIOS & Drivers

### Installing BIOS or Drivers

When the "BIOS & Drivers" tab is selected, you will see a list of recommended or critical updates for the BIOS or drivers. Please update them all soon.




***Step 1***

Please check the item information before update. Click on to see more details.

***Step 2***

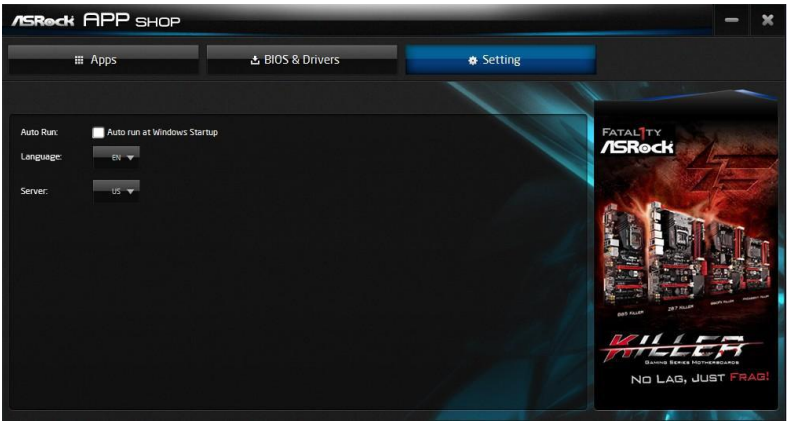
Click to select one or more items you want to update.

***Step 3***

Click Update to start the update process.

## 3.3.4 Setting

In the "Setting" page, you can change the language, select the server location, and determine if you want to automatically run the ASRock Live Update & APP Shop on Windows startup.



## 3.4 Nahimic Audio

Nahimic audio software provides an incredible high definition sound technology which boosts the audio and voice performance of your system. Nahimic Audio interface is composed of four tabs: Audio, Microphone, Sound Tracker and Settings.


There are four functions in Nahimic audio :

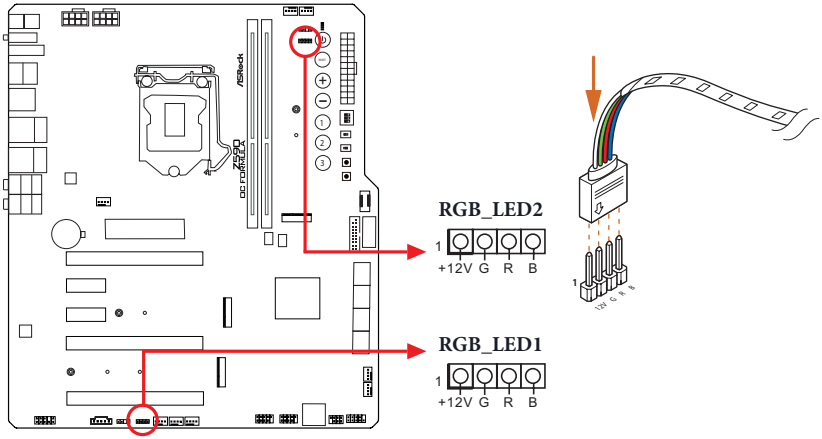
| No. | Function | Description |
|---|---|---|
| **1** | Audio | From this tab, you can mute the current audio device, choose between four factory audio profiles, turn all audio effects on/off, restores the current profile to its default settings and access Surround Sound and various features. |
| **2** | Microphone | From this tab, you can mute the current mic device, choose between two factory mic profiles, turn/off all microphone effects, restore the current profile to its default settings, and access Static Noise Suppression and various features. |
| **3** | Sound Tracker | The Sound Tracker provides a visual indication localizing the sources of the sounds while in a game. These are represented by dynamic segments pointing the direction of the sounds: the more opaque they are, the stronger the sounds are. |
| **4** | Settings | From this tab, you can access all settings and information of the software. |

## 3.5 ASRock Polychrome SYNC

ASRock Polychrome SYNC is a lighting control utility specifically designed for unique individuals with sophisticated tastes to build their own stylish colorful lighting system. Simply by connecting the LED strip, you can customize various lighting schemes and patterns, including Static, Breathing, Strobe, Cycling, Music, Wave and more.

### Connecting the LED Strip

Connect your RGB LED strips to the **RGB LED Headers (RGB_LED1, RGB_LED2)** on the motherboard.



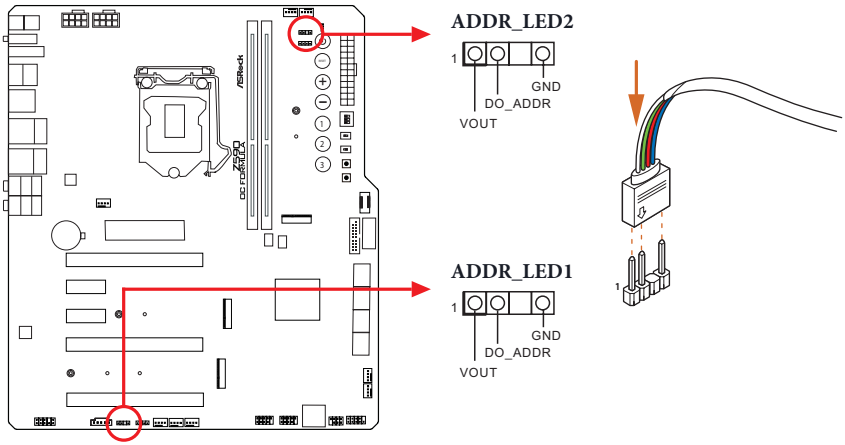

1. *Never install the RGB LED cable in the wrong orientation; otherwise, the cable may be damaged.*
2. *Before installing or removing your RGB LED cable, please power off your system and unplug the power cord from the power supply. Failure to do so may cause damages to motherboard components.*

1. *Please note that the RGB LED strips do not come with the package.*
2. *The RGB LED header supports standard 5050 RGB LED strip (12V/G/R/B), with a maximum power rating of 3A (12V) and length within 2 meters.*

English

## Connecting the Addressable RGB LED Strip

Connect your Addressable RGB LED strips to the **Addressable LED Headers (ADDR_LED1, ADDR_LED2)** on the motherboard.

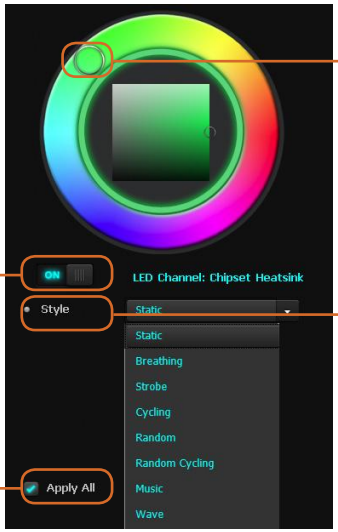



1. *Never install the RGB LED cable in the wrong orientation; otherwise, the cable may be damaged.*
2. *Before installing or removing your RGB LED cable, please power off your system and unplug the power cord from the power supply. Failure to do so may cause damages to motherboard components.*

1. *Please note that the RGB LED strips do not come with the package.*
2. *The RGB LED header supports WS2812B addressable RGB LED strip (5V/Data/GND), with a maximum power rating of 3A (5V) and length within 2 meters.*

## ASRock Polychrome SYNC Utility

Now you can adjust the RGB LED color through the ASRock Polychrome SYNC Utility. Download this utility from the ASRock Live Update & APP Shop and start coloring your PC style your way!



# Chapter 4 UEFI SETUP UTILITY

## 4.1 Introduction

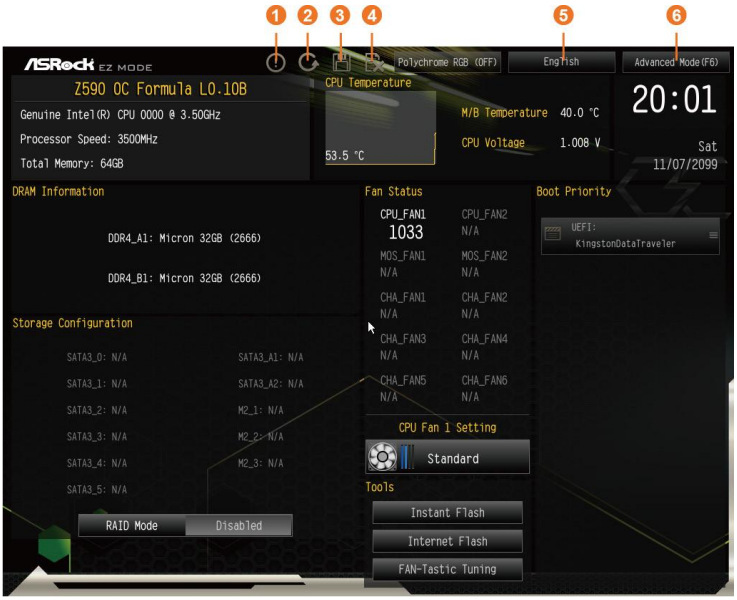
This section explains how to use the UEFI SETUP UTILITY to configure your system. You may run the UEFI SETUP UTILITY by pressing <F2> or <Del> right after you power on the computer, otherwise, the Power-On-Self-Test (POST) will continue with its test routines. If you wish to enter the UEFI SETUP UTILITY after POST, restart the system by pressing <Ctl> + <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.*

## 4.2 EZ Mode

The EZ Mode screen appears when you enter the BIOS setup program by default. EZ mode is a dashboard which contains multiple readings of the system's current status. You can check the most crucial information of your system, such as CPU speed, DRAM frequency, SATA information, fan speed, etc.

Press <F6> or click the "Advanced Mode" button at the upper right corner of the screen to switch to "Advanced Mode" for more options.




| No. | Function |
|---|---|
| 1 | Help |
| 2 | Load UEFI Defaults |
| 3 | Save Changes and Exit |
| 4 | Discard Changes |
| 5 | Change Language |
| 6 | Switch to Advanced Mode |

## 4.3 Advanced Mode

The Advanced Mode provides more options to configure the BIOS settings. Refer to the following sections for the detailed configurations.

To access the EZ Mode, press <F6> or click the "EZ Mode" button at the upper right corner of the screen.

### 4.3.1 UEFI Menu Bar

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

| | |
|---|---|
| **Main** | For setting system time/date information |
| **OC Tweaker** | For overclocking configurations |
| **Advanced** | For advanced system configurations |
| **Tool** | Useful tools |
| **H/W Monitor** | Displays current hardware status |
| **Security** | For security settings |
| **Boot** | For configuring boot settings and boot priority |
| **Exit** | Exit the current screen or the UEFI Setup Utility |

## 4.3.2 Navigation Keys

Use <←> key or <→> key to choose among the selections on the menu bar, and use < ↑ > key or < ↓ > key to move the cursor up or down to select items, then press <Enter> to get into the sub screen. You can also use the mouse to click your required item.

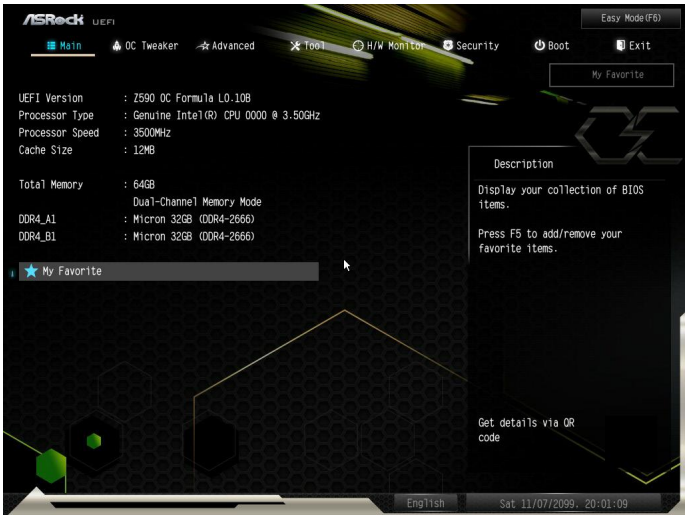
Please check the following table for the descriptions of each navigation key.

| Navigation Key(s) | Description |
|---|---|
| **+ / -** | To change option for the selected items |
| **<Tab>** | Switch to next function |
| **<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 |
| **<F5>** | Add / Remove Favorite |
| **<F7>** | Discard changes and exit the SETUP UTILITY |
| **<F9>** | Load optimal default values for all the settings |
| **<F10>** | Save changes and exit the SETUP UTILITY |
| **<F12>** | Print screen |
| **<ESC>** | Jump to the Exit Screen or exit the current screen |

## 4.4 Main Screen

When you enter the UEFI SETUP UTILITY, the Main screen will appear and display the system overview.

*The availability and location of BIOS settings can be different for different models and BIOS versions.*




### My Favorite

Display your collection of BIOS items. Press F5 to add/remove your favorite items.

## 4.5 OC Tweaker Screen

In the OC Tweaker screen, you can set up overclocking features.


*Because the UEFI software is constantly being updated, the following UEFI setup screens and descriptions are for reference purpose only, and they may not exactly match what you see on your 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.

### 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.

### CPU PLL Spread Spectrum

Enable Spread Spectrum to reduce electromagnetic interference for passing EMI tests. Disable to achieve higher clock speeds when overclocking.

### PCIE/DMI Spread Spectrum

Enable Spread Spectrum to reduce electromagnetic interference for passing EMI tests. Disable to achieve higher clock speeds when overclocking.

### BCLK Advanced Setting

Configure BCLK advanced settings.

### 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 frequency of FCLK.

### Ring to Core Ratio Offset

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

### PVD Ratio Threshold

Select PVD Ratio Threshold Value from Range 1 to 40.

### 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-sates.

### 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 implment 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.

### Unlimited Current Limit

To unlock voltage regulator current limit completely, you can set this option to Enabled.

### CPU Core Current Limit

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

### System Agent Current Limit

Configure the current limit of the system agent. 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

### Load XMP Setting

Load XMP settings to overclock the memory and perform beyond standard specifications.

### 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.

### BCLK Frequency

Configure the BCLK Frequency.

### 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 Optimization

#### 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.

### Initial RTL

Configure round trip latency initial value.

### RTL (A1 Rank1)

Configure round trip latency.

### RTL (A1 Rank2)

Configure round trip latency.

### RTL (B1 Rank1)

Configure round trip latency.

### RTL (B1 Rank2)

Configure round trip latency.

### Initial IOL (A1)

Configure IO latency initial value.

### Initial IOL (A2)

Configure IO latency initial value.

### Initial IOL (B1)

Configure IO latency initial value.

### Initial IOL (B2)

Configure IO latency initial value.

### IOL (A1 Rank1)

Configure IO latency.

### IOL (A1 Rank2)

Configure IO latency.

### IOL (B1 Rank1)

Configure IO latency.

### IOL (B1 Rank2)

Configure IO latency.

### IOL Offset (CH A)

Configure IO latency offset for channel A.

### IOL Offset (CH B)

Configure IO latency offset for channel B.

### ODT Setting

### Dimm ODT Training

ODT values will be optimized by Dimm On-Die Termination Training.

### 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.

### Memory Training Mode

Configure the Training Memory Mode.

### Realtime Memory Timing

Configure the realtime memory timings.

[Enabled] The system will allow performing realtime memory timing changes after

MRC_DONE.

### Reset for MRC Failed

Reset system after MRC training is failed.

### Train on Warm Boot

When enabled, memory training will be executed when warm boot.

### MRC Fast Boot

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

## Voltage Configuration

### Voltage Mode

[OC]: Larger range voltage for overclocking.

[STABLE]: Smaller range voltage for stable system.

### CPU Core/Cache Voltage

Input voltage for the processor by the external voltage regulator.

### Core/Cache V/F Curve

Configure CPU Core/Cache Voltage/Frequency Curve.

### 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.

### VCCSA Voltage

Configure the voltage for the VCCSA.

### VCCSA Load-Line Calibration

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

### DRAM Voltage

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

### VTTDDR Voltage

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

### VCCIO Voltage

Configure the voltage for the VCCIO.

### VCC PLL Voltage

Configure the voltage for the VCC PLL.

### VCCIO_Memory Voltage

Configure the voltage for the VCCIO_Memory.

### DRAM Activating Power Supply

Configure the voltage for the DRAM Activating Power Supply.

### PCH Voltage

Configure the voltage for the PCH.

### CPU Standby 1 Voltage

Configure the voltage for the CPU Standby 1.

### CPU Standby 2 Voltage

Configure the voltage for the CPU Standby 2.

### CPU Standby 3 Voltage

Configure the voltage for the CPU Standby 3.

### 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.

### 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.

### AVX Configuration

### AVX2 Voltage Guardband Scale Factor

AVX2 Voltage Guardband Scale Factor controls the voltage guardband applied to AVX2 workloads. A value > 1.00 will increase the voltage guardband, and < 1.00 will decrease the voltage guardband.

### AVX-512 Voltage Guardband Scale Factor

AVX-512 Voltage Guardband Scale Factor controls the voltage guardband applied to AVX-512 workloads. A value > 1.00 will increase the voltage guardband, and < 1.00 will decrease the voltage guardband.

### 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

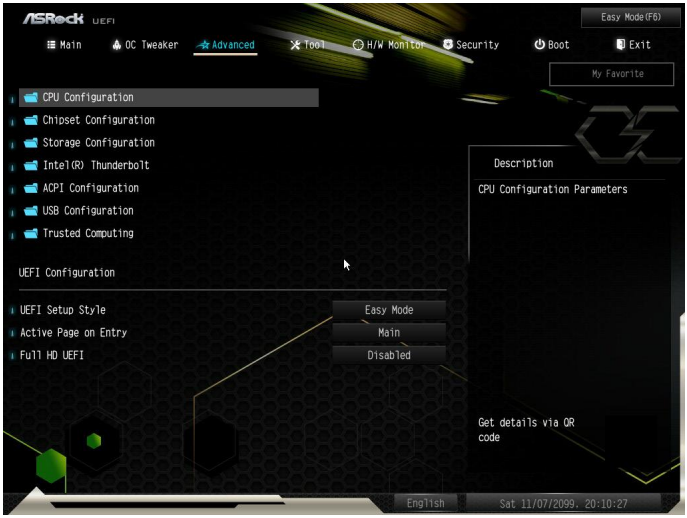
It helps you to save current UEFI settings as an user profile to disk.

### Load User UEFI Setup Profile from Disk

You can load previous saved profile from the disk.

## 4.6 Advanced Screen

In this section, you may set the configurations for the following items: CPU Configuration, Chipset Configuration, Storage Configuration, Intel(R) Thunderbolt, ACPI Configuration, USB Configuration and Trusted Computing.




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

### UEFI Configuration

### UEFI Setup Style

Select the default mode when entering the UEFI setup utility.

### Active Page on Entry

Select the default page when entering the UEFI setup utility.

### Full HD UEFI

When [Auto] is selected, the resolution will be set to 1920 x 1080 if the monitor supports Full HD resolution. If the monitor does not support Full HD resolution, then the resolution will be set to 1024 x 768. When [Disable] is selected, the resolution will be set to 1024 x 768 directly.

## 4.6.1 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 Pre-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 C6 and C7 all 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.

## 4.6.2 Chipset Configuration


### Primary Graphics Adapter

Select a primary VGA.

### 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).

### 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.

### SR-IOV Support

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

### DMI Link Speed

Configure DMI Slot Link Speed. Auto mode is optimizing for overclocking.

### PCIE1 Link Speed

Select the link speed for PCIE1.

### PCIE2 Link Speed

Select the link speed for PCIE2.

### PCIE3 Link Speed

Select the link speed for PCIE3.

### PCIE4 Link Speed

Select the link speed for PCIE4.

### PCIE5 Link Speed

Select the link speed for PCIE5.

### PCI Express Native Control

Select Enable for enhanced PCI Express power saving in OS.

### 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.

### DMI ASPM Support

This option enables/disables the control of ASPM on CPU side of the DMI Link.

### PCH DMI ASPM Support

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

### Inte(R) Ethernet Connection I219-V

Enable or disable the onboard network interface controller (Intel® I219V).

### Inte(R) Ethernet Connection I225

Enable or disable the onboard network interface controller (Intel® I225V).

### Onboard HD Audio

Enable/disable onboard HD audio. Set to Auto to enable onboard HD audio and automatically disable it when a sound card is installed.

### Onboard WAN Device

Use this item to enable or disable the onboard WAN device.

### WAN Radio

Enable/disable the WiFi module's connectivity.

### Bluetooth

Enable/disable the Bluetooth connectivity.

### Deep Sleep

Configure deep sleep mode for power saving when the computer is shut down.

### Restore on AC/Power Loss

Select the power state after a power failure. If [Power Off] is selected, the power will remain off when the power recovers. If [Power On] is selected, the system will start to boot up when the power recovers.

### Turn On Onboard LED in S5

Turn on Onboard LED in the ACPI S5 state.

### Restore Onboard LED Default

Restore Onboard LED default value.

### RGB LED

This option enables/disables the RGB LED.

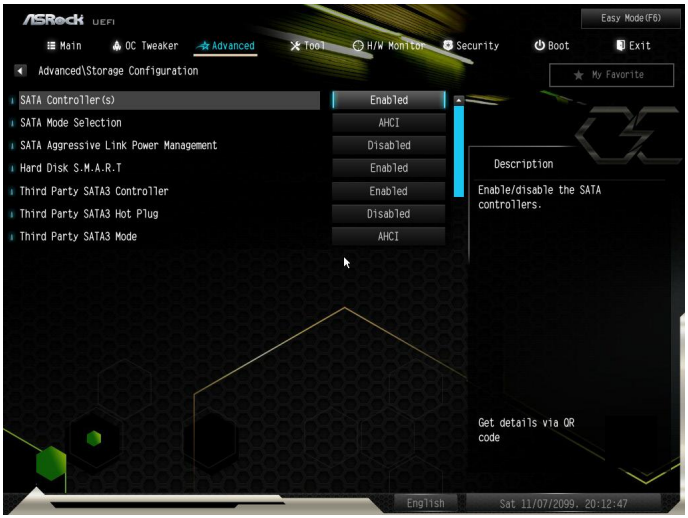
### Onboard Button LED

Enable/disable the onboard button LED.

### Onboard Debug Port LED

Enable/disable the onboard Dr. Debug LED.

## 4.6.3 Storage Configuration




### SATA Controller(s)

Enable/disable the SATA controllers.

### SATA Mode Selection

AHCI: Supports new features that improve performance.

RAID: Combine multiple disk drives into a logical unit.

### SATA Aggressive Link Power Management

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

### 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 of reliability.

### Third Party SATA 3 Controller

Enable or disable the third party SATA3 controller.

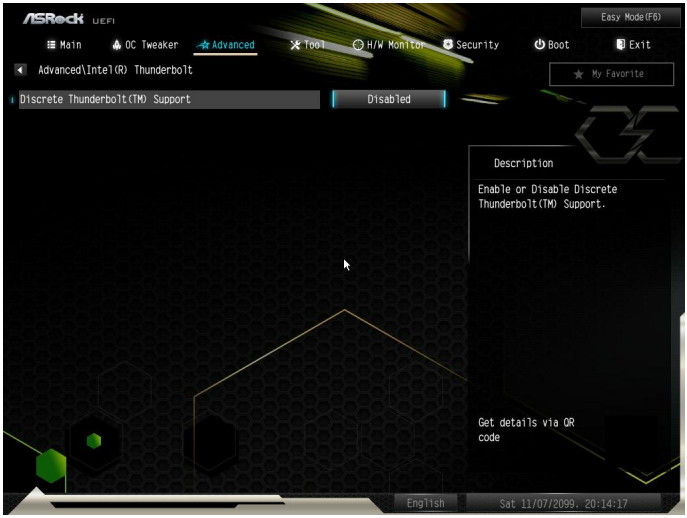
### Third Party SATA3 Hot Plug

Enable or disable the third party SATA3 controller.

### Third Party SATA3 Mode

AHCI: Supports new features that improve performance.

## 4.6.4 Intel(R) Thunderbolt




### Discrete Thunderbolt(TM) Support

Enable or disable the Discrete Thunderbolt(TM) Support.

### Thunderbolt Boot Support

Enabled to allow booting from Bootable devices which are present behind Thunderbolt.

### Thunderbolt Usb Support

Enabled to allow booting from Usb devices which are present behind Thunderbolt.

### Titan Ridge Workaround for OSUP

Enable or disable Titan Ridge Workaround for OSUP.

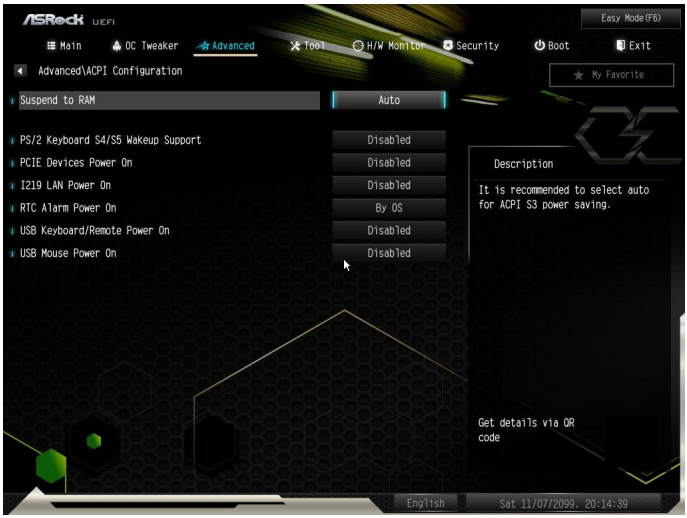
### Windows 10 Thunderbolt support

Specify Windows 10 Thunderbolt support level.

Disabled: No OS native support.

Enabled: OS Native support only. no RTD3.

## 4.6.5 ACPI Configuration




### Suspend to RAM

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

### PS/2 Keyboard S4/S5 Wakeup Support

Allow the system to be waked up by a PS/2 Keyboard in S4/S5.

### PCIE Devices Power On

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

### I219 LAN Power On

Allow the system to be waked up by the Onboard Intel LAN.

### RTC Alarm Power On

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

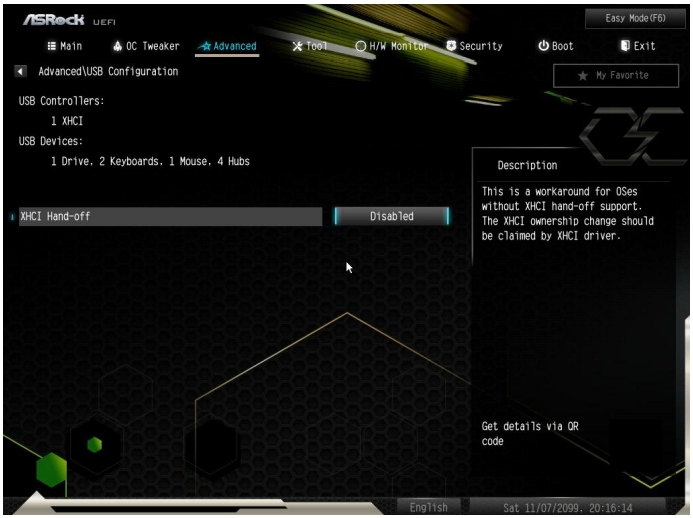
### USB Keyboard/Remote Power On

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.

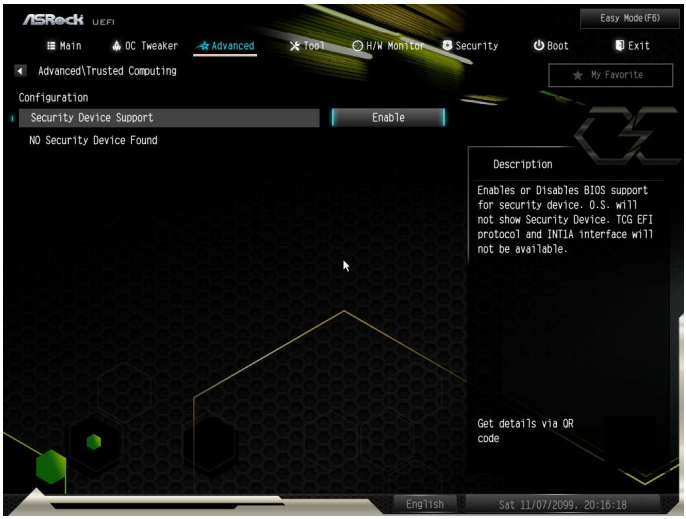
## 4.6.6 USB Configuration




### XHCI Hand-off

This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.

## 4.6.7 Trusted Computing



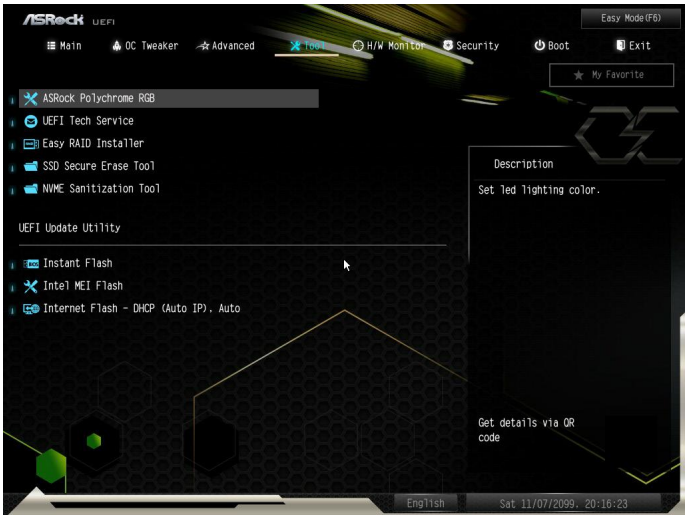

### Security Device Support

Enable or disable BIOS support for security device.

### Disable Block Sid

Override to allow SID authentication in TCG Storage device.

## 4.7 Tools




### ASRock Polychrome RGB

Select LED lighting color.

### UEFI Tech Service

Contact ASRock Tech Service if you are having trouble with your PC. Please setup network configuration before using UEFI Tech Service.

### Easy RAID Installer

Easy RAID Installer helps you to copy the RAID driver from the support CD to your USB storage device. After copying the drivers please change the SATA mode to RAID, then you can start installing the operating system in RAID mode.

### SSD Secure Erase Tool

All the SSD's listed that supports Secure Erase function.

### NVME Sanitization Tool

After you Sanitize SSD, all user data will be permanently destroyed on the SSD and cannot be recovered.

### Instant Flash

Save UEFI files in your USB storage device and run Instant Flash to update your UEFI.

### Intel MEI Flash

Starts BIOS recovery flash.

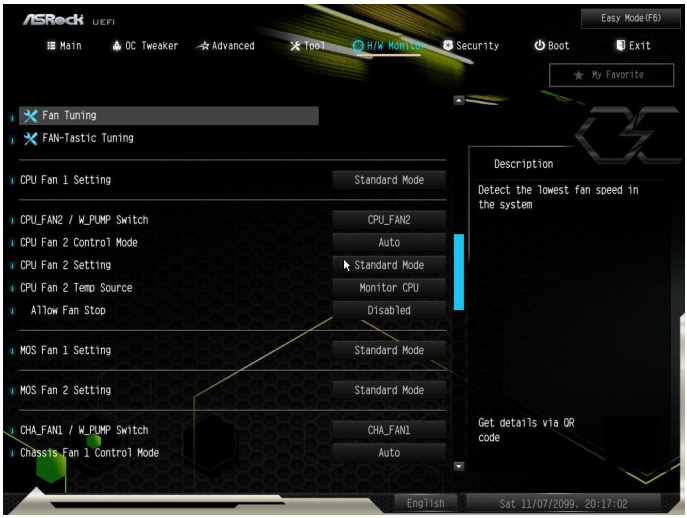
### Internet Flash - DHCP (Auto IP), Auto

ASRock Internet Flash downloads and updates the latest UEFI firmware version from our servers for you. Please setup network configuration before using Internet Flash.

*For BIOS backup and recovery purpose, it is recommended to plug in your USB pen drive before using this function.

## 4.8 Hardware Health Event Monitoring Screen

This section allows you to monitor the status of the hardware on your system, including the parameters of the CPU temperature, motherboard temperature, fan speed and voltage.




### Fan Tuning

Measure Fan Min Duty Cycle.

### Fan-Tastic Tuning

Select a fan mode for CPU Fan, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

### CPU Fan 1 Setting

Select a fan mode for CPU Fan 1, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

### CPU_FAN2 / W_PUMP Switch

Switch CPU_FAN2 / W_PUMP header function.

### CPU Fan 2 Control Mode

Select DC/PWM mode for CPU Fan 2.

### CPU Fan 2 Setting

Select a fan mode for CPU Fan, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

### CPU Fan 2 Temp Source

Select a fan temperature source for CPU Fan 2.

### MOS Fan 1 Setting

Select a fan mode for MOS Fan 1, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

### CHA_FAN1 / W_PUMP Switch

Select Chassis Fan 1 or Water Pump mode.

### Chassis Fan 1 Control Mode

Select PWM mode or DC mode for Chassis Fan 1.

### Chassis Fan 1 Setting

Select a fan mode for Chassis Fan 1, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

### Chassis Fan 1 Temp Source

Select a fan temperature source for Chassis Fan 1.

### Allow Fan Stop

This function allow fan to run at 0% duty cycle when the temperature of source is dropped below temperature 1.

### CHA_FAN2 / W_Pump Switch

Select Chassis Fan 2 or Water Pump mode.

### Chassis Fan 2 Control Mode

Select PWM mode or DC mode for Chassis Fan 2.

### Chassis Fan 2 Setting

Select a fan mode for Chassis Fan 2, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

### Chassis Fan 2 Temp Source

Select a fan temperature source for Chassis Fan 2.

### Allow Fan Stop

This function allow fan to run at 0% duty cycle when the temperature of source is dropped below temperature 1.

### CHA_FAN3 / W_PUMP Switch

Select Chassis Fan 3 or Water Pump mode.

### Chassis Fan 3 Control Mode

Select PWM mode or DC mode for Chassis Fan 3.

### Chassis Fan 3 Setting

Select a fan mode for Chassis Fan 3, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

### Chassis Fan 3 Temp Source

Select a fan temperature source for Chassis Fan 3.

### Allow Fan Stop

This function allow fan to run at 0% duty cycle when the temperature of source is dropped below temperature 1.

### CHA_FAN4 / W_PUMP Switch

Select Chassis Fan 4 or Water Pump mode.

### Chassis Fan 4 Control Mode

Select PWM mode or DC mode for Chassis Fan 4.

### Chassis Fan 4 Setting

Select a fan mode for Chassis Fan 4, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

### Chassis Fan 4 Temp Source

Select a fan temperature source for Chassis Fan 4.

### Allow Fan Stop

This function allow fan to run at 0% duty cycle when the temperature of source is dropped below temperature 1.

### CHA_FAN5 / W_PUMP Switch

Select Chassis Fan 5 or Water Pump mode.

### Chassis Fan 5 Control Mode

Select PWM mode or DC mode for Chassis Fan 5.

### Chassis Fan 5 Setting

Select a fan mode for Chassis Fan 5, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

### Chassis Fan 5 Temp Source

Select a fan temperature source for Chassis Fan 5.

### Allow Fan Stop

This function allow fan to run at 0% duty cycle when the temperature of source is dropped below temperature 1.

### CHA_FAN6 / W_PUMP Switch

Select Chassis Fan 6 or Water Pump mode.

### Chassis Fan 6 Control Mode

Select PWM mode or DC mode for Chassis Fan 6.

### Chassis Fan 6 Setting

Select a fan mode for Chassis Fan 6, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

### Chassis Fan 6 Temp Source

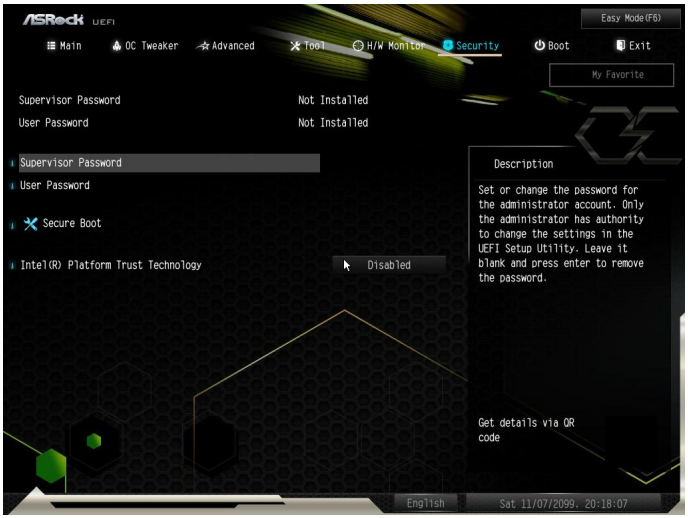
Select a fan temperature source for Chassis Fan 6.

### Allow Fan Stop

This function allow fan to run at 0% duty cycle when the temperature of source is dropped below temperature 1.

## 4.9 Security Screen

In this section you may set or change the supervisor/user password for the system. You may also clear the user password.




### 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

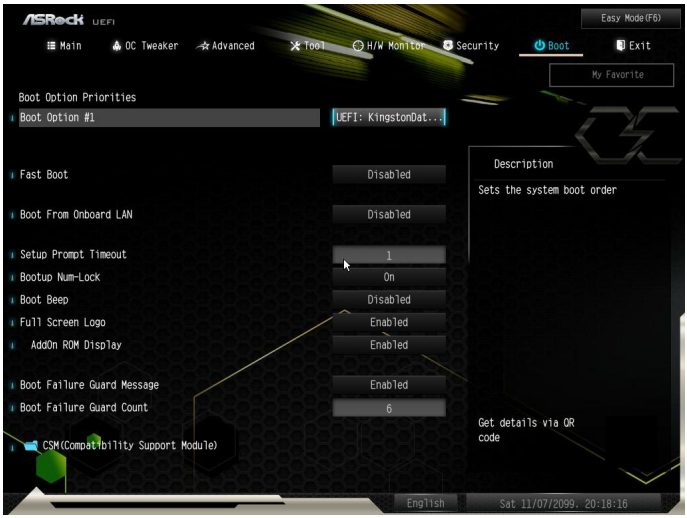
Use this item to enable or disable support for Secure Boot.

### Intel(R) Platform Trust Technology

Enable/disable Intel PTT in ME. Disable this option to use discrete TPM Module.

## 4.10 Boot Screen

This section displays the available devices on your system for you to configure the boot settings and the boot priority.




### Fast Boot

Fast Boot minimizes your computer's boot time. In fast mode you may not boot from an USB storage device. The VBIOS must support UEFI GOP if you are using an external graphics card. Please notice that Ultra Fast mode will boot so fast that the only way to enter this UEFI Setup Utility is to Clear CMOS or run the Restart to UEFI utility in Windows.

### Boot From Onboard LAN

Allow the system to be waked up by the onboard LAN.

### Setup Prompt Timeout

Configure the number of seconds to wait for the setup hot key.

### Bootup Num-Lock

Select whether Num Lock should be turned on or off when the system boots up.

### Boot Beep

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

## Full Screen Logo

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

## AddOn ROM Display

Enable AddOn ROM Display to see the AddOn ROM messages or configure the AddOn ROM if you've enabled Full Screen Logo. Disable for faster boot speed.

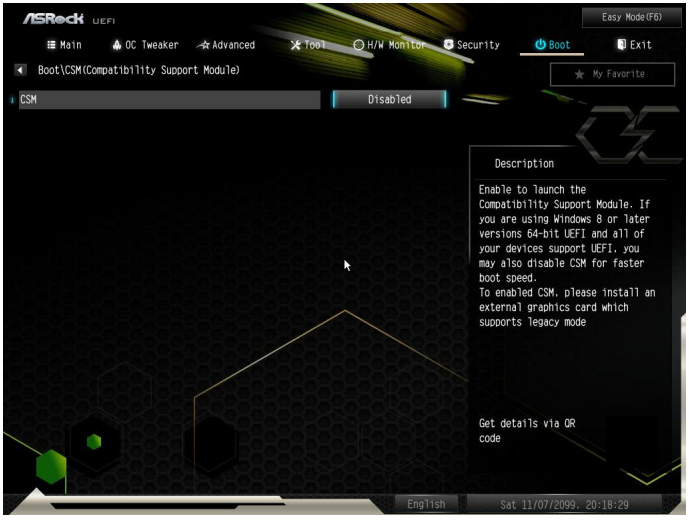
## Boot Failure Guard Message

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.

## CSM (Compatibility Support Module)




## CSM

Enable to launch the Compatibility Support Module. Please do not disable unless you're running a WHCK test.

## Launch PXE 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.

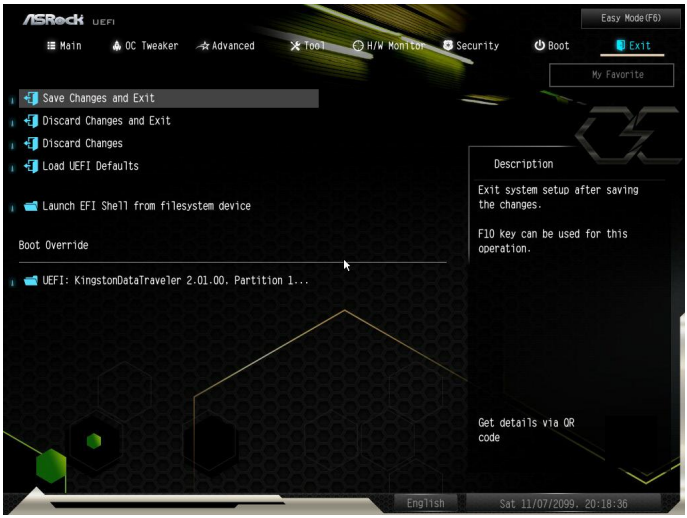
### Launch Storage OpROM Policy

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.

### Other PCI Device ROM Priority

For PCI devices other than Network. Mass storage or Video defines which OpROM to launch.

## 4.11 Exit Screen




### Save Changes and Exit

When you select this option the following message, "Save configuration changes and exit setup?" will pop out. Select [OK] to save 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. Select [OK] 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. Select [OK] to discard all changes.

### Load UEFI Defaults

Load UEFI default values for all options. The F9 key can be used for this operation.

### Launch EFI Shell from filesystem device

Copy shellx64.efi to the root directory to launch EFI Shell.

## Contact Information

If you need to contact ASRock or want to know more about ASRock, you're welcome to visit ASRock's website at http://www.asrock.com; or you may contact your dealer for further information. For technical questions, please submit a support request form at http://www.asrock.com/support/tsd.asp


**ASRock Incorporation**

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

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

**ASRock EUROPE B.V.**

Bijsterhuizen 11-11

6546 AR Nijmegen

The Netherlands

Phone: +31-24-345-44-33

Fax: +31-24-345-44-38

**ASRock America, Inc.**

13848 Magnolia Ave, Chino, CA91710

U.S.A.

Phone: +1-909-590-8308

Fax: +1-909-590-1026

# DECLARATION OF CONFORMITY

Per FCC Part 2 Section 2.1077(a)

**Responsible Party Name:** ASRock Incorporation

**Address:** 13848 Magnolia Ave, Chino, CA91710

**Phone/Fax No:** +1-909-590-8308/+1-909-590-1026

hereby declares that the product

**Product Name : Motherboard**

**Model Number : Z590 OC Formula**

Conforms to the following specifications:

☒ FCC Part 15, Subpart B, Unintentional Radiators

**Supplementary Information:**

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.

Representative Person's Name: **James**

Signature :

Date : **May 12, 2017**

# EU Declaration of Conformity

For the following equipment:

**Motherboard**

(Product Name)

**Z590 OC Formula / ASRock**

(Model Designation / Trade Name)

**ASRock Incorporation**

(Manufacturer Name)

**2F., No.37, Sec. 2, Jhongyang S. Rd., Beitou District, Taipei City 112, Taiwan (R.O.C.)**

(Manufacturer Address)

☒ **EMC —Directive 2014/30/EU (from April 20th, 2016)**

- ☐ EN 55022:2010/AC:2011 Class B
- ☒ EN 55024:2010/A1:2015
- ☒ EN 55032:2012+AC:2013 Class B
- ☒ EN 61000-3-3:2013
- ☒ EN 61000-3-2:2014

☒ **RED—Directive 2014/53/EU**

- ☐ EN 300 328 V2.1.1
- ☒ EN 301 489-17 V3.1.1
- ☐ EN 301 893 V2.1.1
- ☐ EN 301 489-3 V2.1.1
- ☐ EN 300 220 V3.1.1

☐ **LVD —Directive 2014/35/EU (from April 20th, 2016)**

- ☐ EN 60950-1 : 2011+ A2: 2013
- ☐ EN 60950-1 : 2006/A12: 2011

☒ RoHS — Directive 2011/65/EU

☒ CE marking

CE

(EU conformity marking)

**ASRock EUROPE B.V.**

(Company Name)

**Bijsterhuizen 1111 6546 AR Nijmegen The Netherlands**

(Company Address)

Person responsible for making this declaration:

(Name, Surname)

**A.V.P**

(Position / Title)

**March 16, 2021**

(Date)

P/N: 15G062299000AK V1.0