Z590 AORUS MASTER

User's Manual

Rev. 1002

12ME-Z59MSTR-1002R

For more product details, please visit GIGABYTE's website.

To reduce the impacts on global warming, the packaging materials of this product are recyclable and reusable. GIGABYTE works with you to protect the environment.

Documentation Classifications

In order to assist in the use of this product, GIGABYTE provides the following types of documentations:
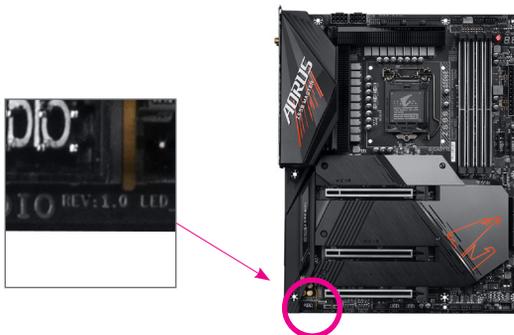
- For quick set-up of the product, read the Quick Installation Guide included with the product.
- For detailed product information, carefully read the User's Manual.

For product-related information, check on our website at: https://www.gigabyte.com

Identifying Your Motherboard Revision

The revision number on your motherboard looks like this: "REV: X.X." For example, "REV: 1.0" means the revision of the motherboard is 1.0. Check your motherboard revision before updating motherboard BIOS, drivers, or when looking for technical information.

Example:

Table of Contents

Box Contents

- ☑ Z590 AORUS MASTER motherboard
- ☑ User's Manual
- ☑ Quick Installation Guide
- ☑ Four SATA cables
- ☑ One antenna
- ☑ M.2 screws
- ☑ One RGB LED strip extension cable
- ☑ One noise detection cable
- ☑ Two thermistor cables
- ☑ One G Connector

The box contents above are for reference only and the actual items shall depend on the product package you obtain. The box contents are subject to change without notice.

Optional Items

- ☐ 2-port USB 2.0 bracket (Part No. 12CR1-1UB030-6*R)
- ☐ eSATA bracket (Part No. 12CF1-3SATPW-4*R)
- ☐ 3.5" Front Panel with 2 USB 3.2 Gen 1 ports (Part No. 12CR1-FPX582-2*R)

Z590 AORUS MASTER Motherboard Layout
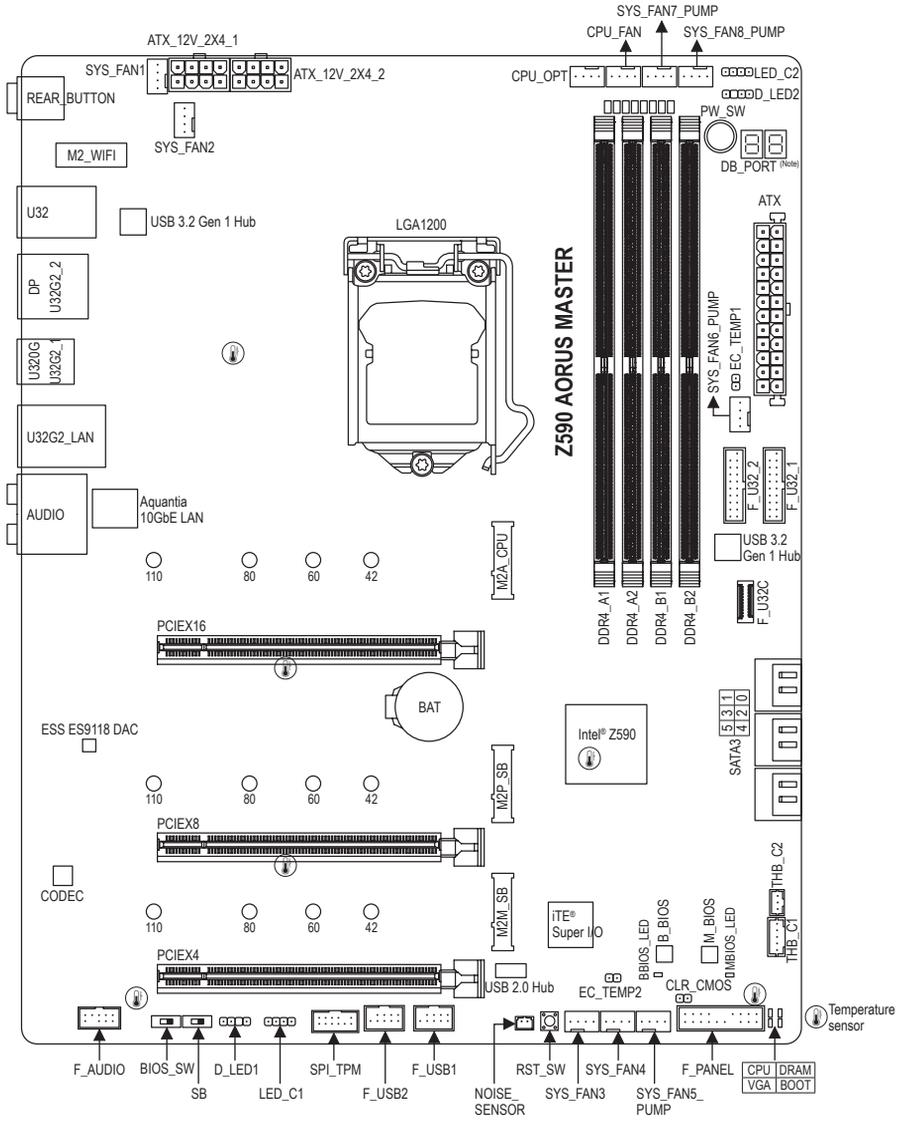
(Note)   For debug code information, please refer to Chapter 6.

Z590 AORUS MASTER Motherboard Block Diagram

PCI Express 4.0 (Note)/3.0 Bus

CPU CLK+/- (100~500 MHz)

Switch

x16　　x16

M.2 Socket 3
(M2A_CPU) (Note)

LGA1200 CPU

DDR4 3200 (Note)/3000 (Note)/2933 (Note)/
2666/2400/2133 MHz

1 PCI Express x16

or

2 PCI Express x8

DDI　　DisplayPort

DMI 3.0

M.2 Socket 3
(M2P_SB)

4 SATA 6Gb/s
(SATA3 0~3)

M.2 WIFI

Intel® Z590

SPI
Bus

Dual BIOS

TPM

eSPI
Bus

iTE®
Super I/O

1 USB Type-C®,
with USB 3.2 Gen 2x2 support

1 USB Type-C®,
with USB 3.2 Gen 2 support

5 USB 3.2 Gen 2 Type A

PCI Express x4

SATA3
4/5

M.2 Socket 3
(M2M_SB)

or

Switch

LAN
RJ45

Aquantia
10GbE LAN

x4　　x4　　x1

PCI Express 3.0 Bus

USB 3.2
Gen 1 Hub

8 USB 3.2 Gen 1

USB 2.0
Hub

4 USB 2.0/1.1

CODEC
+
ESS ES9118 DAC

Rear Speaker Out

Center/Subwoofer
Speaker Out

MIC

Line Out

Line In

S/PDIF Out

(Note)　　Actual support may vary by CPU.

Chapter 1   Hardware Installation

1-1   Installation Precautions

The motherboard contains numerous delicate electronic circuits and components which can become damaged as a result of electrostatic discharge (ESD). Prior to installation, carefully read the user's manual and follow these procedures:

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

1-2   Product Specifications

CPU	◆	LGA1200 package: - 11th Generation Intel® Core™ i9 processors/Intel® Core™ i7 processors/ Intel® Core™ i5 processors - 10th Generation Intel® Core™ i9 processors/Intel® Core™ i7 processors/Intel® Core™ i5 processors/Intel® Core™ i3 processors/Intel® Pentium® processors/ Intel® Celeron® processors* * Limited to processors with 4 MB Intel® Smart Cache, Intel® Celeron® G5xx5 family. (Go to GIGABYTE's website for the latest CPU support list.)
	◆	L3 cache varies with CPU
Chipset	◆	Intel® Z590 Express Chipset
Memory	◆	11th Generation Intel® Core™ i9/i7/i5 processors: - Support for DDR4 3200/3000/2933/2666/2400/2133 MHz memory modules
	◆	10th Generation Intel® Core™ i9/i7 processors: - Support for DDR4 2933/2666/2400/2133 MHz memory modules
	◆	10th Generation Intel® Core™ i5/i3/Pentium®/Celeron® processors: - Support for DDR4 2666/2400/2133 MHz memory modules
	◆	4 x DDR4 DIMM sockets supporting up to 128 GB (32 GB single DIMM capacity) of system memory
	◆	Dual channel memory architecture
	◆	Support for ECC Un-buffered DIMM 1Rx8/2Rx8 memory modules (operate in non-ECC mode)
	◆	Support for non-ECC Un-buffered DIMM 1Rx8/2Rx8/1Rx16 memory modules
	◆	Support for Extreme Memory Profile (XMP) memory modules (Go to GIGABYTE's website for the latest supported memory speeds and memory modules.)
Onboard Graphics	◆	Integrated Graphics Processor-Intel® HD Graphics support: - 1 x DisplayPort, supporting a maximum resolution of 4096x2304@60 Hz * Support for DisplayPort 1.2 version and HDCP 2.3 (Graphics specifications may vary depending on CPU support.)
Audio	◆	Realtek® ALC1220-VB codec * The front panel line out jack supports DSD audio.
	◆	ESS ES9118 DAC chip
	◆	Support for DTS:X® Ultra
	◆	High Definition Audio
	◆	2/4/5.1/7.1-channel
	◆	Support for S/PDIF Out
LAN	◆	Aquantia 10GbE LAN chip (10 Gbit/5 Gbit/2.5 Gbit/1 Gbit/100 Mbit)
Wireless Communication Module	◆	Intel® Wi-Fi 6E AX210 - WIFI a, b, g, n, ac, ax, supporting 2.4/5/6 GHz carrier frequency bands - BLUETOOTH 5.2 - Support for 11ax 160MHz wireless standard and up to 2.4 Gbps data rate * Actual data rate may vary depending on environment and equipment.

Expansion Slots	◆	1 x PCI Express x16 slot, running at x16 (PCIEX16) * For optimum performance, if only one PCI Express graphics card is to be installed, be sure to install it in the PCIEX16 slot.
	◆	1 x PCI Express x16 slot, running at x8 (PCIEX8) * The PCIEX8 slot shares bandwidth with the PCIEX16 slot. When the PCIEX8 slot is populated, the PCIEX16 slot operates at up to x8 mode. (The PCIEX16 and PCIEX8 slots conform to PCI Express 4.0 standard.) (Note)
	◆	1 x PCI Express x16 slot, running at x4 (PCIEX4) (The PCIEX4 slot conforms to PCI Express 3.0 standard.)
Multi-Graphics Technology	◆	Support for AMD Quad-GPU CrossFire™ and 2-Way AMD CrossFire™ technologies
Storage Interface	◆	CPU: - 1 x M.2 connector (Socket 3, M key, type 2242/2260/2280/22110 PCIe 4.0 x4/x2 SSD support) (M2A_CPU) (Note)

	◆	Chipset:
		  - 1 x M.2 connector (Socket 3, M key, type 2242/2260/2280/22110 SATA and PCIe 3.0 x4/x2 SSD support) (M2P_SB)
		  - 1 x M.2 connector (Socket 3, M key, type 2242/2260/2280/22110 SATA and PCIe 3.0 x4/x2 SSD support) (M2M_SB)
		  - 6 x SATA 6Gb/s connectors

	◆	Support for RAID 0, RAID 1, RAID 5, and RAID 10 * Refer to "1-9 Internal Connectors," for the installation notices for the M.2 and SATA connectors.
	◆	Intel® Optane™ Memory Ready

USB	◆	Chipset:
		  - 1 x USB Type-C® port on the back panel, with USB 3.2 Gen 2x2 support
		  - 1 x USB Type-C® port with USB 3.2 Gen 2 support, available through the internal USB header
		  - 5 x USB 3.2 Gen 2 Type-A ports (red) on the back panel

	◆	Chipset+2 USB 3.2 Gen 1 Hubs: - 8 x USB 3.2 Gen 1 ports (4 ports on the back panel, 4 ports available through the internal USB headers)
	◆	Chipset+USB 2.0 Hub: - 4 x USB 2.0/1.1 ports available through the internal USB headers
Internal Connectors	◆	1 x 24-pin ATX main power connector
	◆	2 x 8-pin ATX 12V power connectors
	◆	1 x CPU fan header
	◆	1 x water cooling CPU fan header
	◆	4 x system fan headers
	◆	4 x system fan/water cooling pump headers
	◆	2 x addressable LED strip headers
	◆	2 x RGB LED strip headers
	◆	3 x M.2 Socket 3 connectors
	◆	6 x SATA 6Gb/s connectors

(Note) Supported by 11th Generation processors only.

Internal Connectors	◆ 1 x front panel header ◆ 1 x front panel audio header ◆ 1 x USB Type-C® header, with USB 3.2 Gen 2 support ◆ 2 x USB 3.2 Gen 1 headers ◆ 2 x USB 2.0/1.1 headers ◆ 1 x noise detection header ◆ 2 x Thunderbolt™ add-in card connectors ◆ 1 x Trusted Platform Module header (For the GC-TPM2.0 SPI/GC-TPM2.0 SPI 2.0 module only) ◆ 1 x power button ◆ 1 x reset button ◆ 2 x temperature sensor headers ◆ 1 x Clear CMOS jumper ◆ 2 x BIOS switches ◆ Voltage Measurement Points
Back Panel Connectors	◆ 1 x Q-Flash Plus button ◆ 1 x Clear CMOS button ◆ 2 x SMA antenna connectors (2T2R) ◆ 1 x DisplayPort ◆ 1 x USB Type-C® port, with USB 3.2 Gen 2x2 support ◆ 5 x USB 3.2 Gen 2 Type-A ports (red) ◆ 4 x USB 3.2 Gen 1 ports ◆ 1 x RJ-45 port ◆ 1 x optical S/PDIF Out connector ◆ 5 x audio jacks
I/O Controller	◆ iTE® I/O Controller Chip
Hardware Monitor	◆ Voltage detection ◆ Temperature detection ◆ Fan speed detection ◆ Water cooling flow rate detection ◆ Fan fail warning ◆ Fan speed control * Whether the fan (pump) speed control function is supported will depend on the fan (pump) you install. ◆ Noise detection
BIOS	◆ 2 x 256 Mbit flash ◆ Use of licensed AMI UEFI BIOS ◆ Support for DualBIOS™ ◆ PnP 1.0a, DMI 2.7, WfM 2.0, SM BIOS 2.7, ACPI 5.0

Unique Features	◆	Support for APP Center
		    * Available applications in APP Center may vary by motherboard model. Supported
		      functions of each application may also vary depending on motherboard specifications.
		- @BIOS
		- EasyTune
		- Fast Boot
		- Game Boost
		- ON/OFF Charge
		- RGB Fusion
		- Smart Backup
		- System Information Viewer

	◆	Support for Q-Flash Plus
	◆	Support for Q-Flash
	◆	Support for Xpress Install
Bundled Software	◆ ◆	Norton® Internet Security (OEM version) cFosSpeed
Operating System	◆	Support for Windows 10 64-bit
Form Factor	◆	ATX Form Factor; 30.5cm x 24.4cm

* GIGABYTE reserves the right to make any changes to the product specifications and product-related information without prior notice.

Please visit GIGABYTE's website for support lists of CPU, memory modules, SSDs, and M.2 devices.

Please visit the **Support\Utility List** page on GIGABYTE's website to download the latest version of apps.

1-3   Installing the CPU and CPU Cooler

Read the following guidelines before you begin to install the CPU:
- Make sure that the motherboard supports the CPU.
  (Go to GIGABYTE's website for the latest CPU support list.)
- Always turn off the computer and unplug the power cord from the power outlet before installing the CPU to prevent hardware damage.
- Locate the pin one of the CPU. The CPU cannot be inserted if oriented incorrectly. (Or you may locate the notches on both sides of the CPU and alignment keys on the CPU socket.)
- Apply an even and thin layer of thermal grease on the surface of the CPU.
- Do not turn on the computer if the CPU cooler is not installed, otherwise overheating and damage of the CPU may occur.
- Set the CPU host frequency in accordance with the CPU specifications. It is not recommended that the system bus frequency be set beyond hardware specifications since it does not meet the standard requirements for the peripherals. If you wish to set the frequency beyond the standard specifications, please do so according to your hardware specifications including the CPU, graphics card, memory, hard drive, etc.

1-3-1   Installing the CPU
A.   Locate the alignment keys on the motherboard CPU socket and the notches on the CPU.

LGA1200 CPU Socket

Alignment Key   Alignment Key

Pin One Corner of the CPU Socket

LGA1200 CPU

INTEL CONFIDENTIAL
NA
QV1K 3.40GHZ
V030D610

Notch   Notch

Triangle Pin One Marking on the CPU
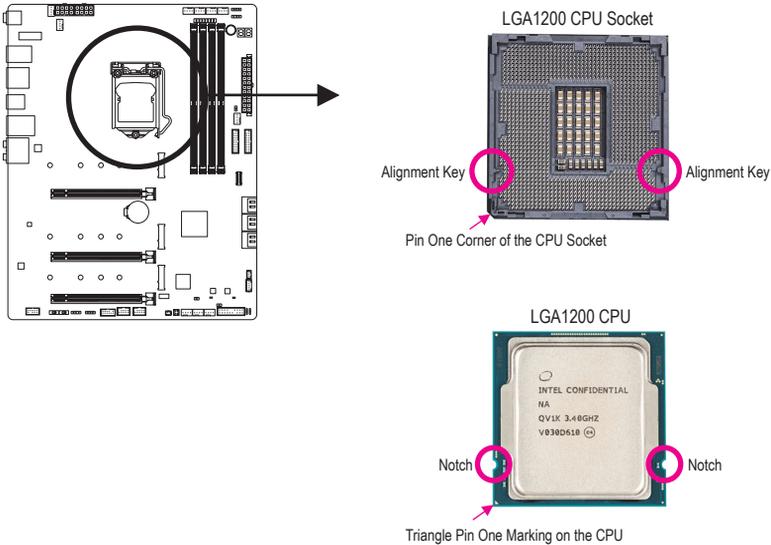
Please visit GIGABYTE's website for details on hardware installation.

B.   Follow the steps below to correctly install the CPU into the motherboard CPU socket.

⚠️ • **Before installing the CPU, make sure to turn off the computer and unplug the power cord from the power outlet to prevent damage to the CPU.**
• **To protect the socket contacts, do not remove the protective plastic cover unless the CPU is inserted into the CPU socket. Save the cover properly and replace it if the CPU is removed.**
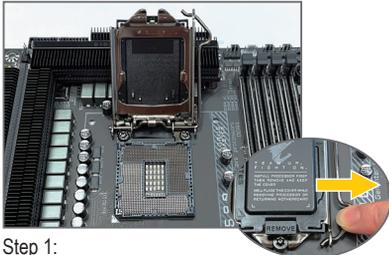
Step 1:
Gently press the CPU socket lever handle down and away from the socket with your finger. Then completely lift the CPU socket lever and the metal load plate/plastic cover will be lifted as well.
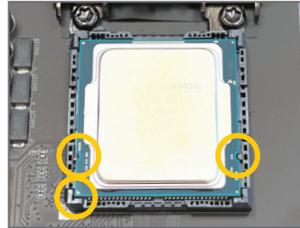
Step 2:
Hold the CPU with your thumb and index fingers. Align the CPU pin one marking (triangle) with the pin one corner of the CPU socket (or you may align the CPU notches with the socket alignment keys) and gently insert the CPU into position.

Step 3:
Once the CPU is properly inserted, carefully replace the load plate. When replacing the load plate, make sure the front end of the load plate is under the shoulder screw. Then press the CPU socket lever. The protective plastic cover may pop off from the load plate during the process of engaging the lever. Remove the cover. (Save the cover properly and always replace it when the CPU is not installed.)

Step 4:
Finally, secure the lever under its retention tab to complete the installation of the CPU.

NOTE:
Hold the CPU socket lever by the handle, not the lever base portion.

1-3-2   Installing the CPU Cooler

Refer to the steps below to correctly install the CPU cooler on the motherboard. (Actual installation process may differ depending the CPU cooler to be used. Refer to the user's manual for your CPU cooler.)

Male
Push Pin

Direction of
the Arrow Sign
on the Male
Push Pin

The Top
of Female
Push Pin

Female
Push Pin

Step 1:
Apply an even and thin layer of thermal grease on the surface of the installed CPU.
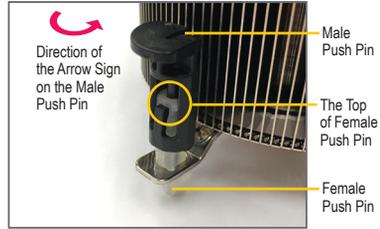
Step 2:
Before installing the cooler, note the direction of the arrow sign ↰ on the male push pin. (Turning the push pin along the direction of arrow is to remove the cooler, on the contrary, is to install.)

Step 3:
Place the cooler atop the CPU, aligning the four push pins through the pin holes on the motherboard. Push down on the push pins diagonally.
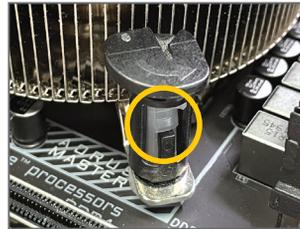
Step 4:
You should hear a "click" when pushing down each push pin. Check that the Male and Female push pins are joined closely.
(Refer to your CPU cooler installation manual for instructions on installing the cooler.)

Step 5:
After the installation, check the back of the motherboard. If the push pin is inserted as the picture above shows, the installation is complete.
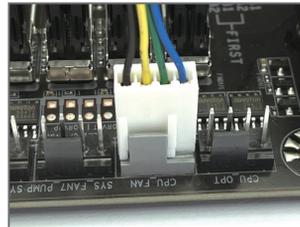
Step 6:
Finally, attach the power connector of the CPU cooler to the CPU fan header (CPU_FAN) on the motherboard.

1-4 Installing the Memory

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

• Make sure that the motherboard supports the memory. It is recommended that memory of the same capacity, brand, speed, and chips be used.
(Go to GIGABYTE's website for the latest supported memory speeds and memory modules.)

• Always turn off the computer and unplug the power cord from the power outlet before installing the memory to prevent hardware damage.

• Memory modules have a foolproof design. A memory module can be installed in only one direction. If you are unable to insert the memory, switch the direction.

1-4-1 Dual Channel Memory Configuration

This motherboard provides four memory sockets and supports Dual Channel Technology. After the memory is installed, the BIOS will automatically detect the specifications and capacity of the memory. Enabling Dual Channel memory mode will double the original memory bandwidth.

The four memory sockets are divided into two channels and each channel has two memory sockets as following:
▶ Channel A: DDR4_A1, DDR4_A2
▶ Channel B: DDR4_B1, DDR4_B2
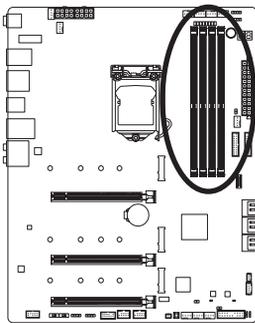
▶Recommanded Dual Channel Memory Configuration:

	DDR4_A1	DDR4_A2	DDR4_B1	DDR4_B2
2 Modules	- -	DS/SS	- -	DS/SS
4 Modules	DS/SS	DS/SS	DS/SS	DS/SS

(SS=Single-Sided, DS=Double-Sided, "- -"=No Memory)

Due to CPU limitations, read the following guidelines before installing the memory in Dual Channel mode.
1. Dual Channel mode cannot be enabled if only one memory module is installed.
2. When enabling Dual Channel mode with two or four memory modules, it is recommended that memory of the same capacity, brand, speed, and chips be used.

1-4-2   Installing a Memory

⚠ **Before installing a memory module, make sure to turn off the computer and unplug the power cord from the power outlet to prevent damage to the memory module. DDR4 and DDR3 DIMMs are not compatible to each other or DDR2 DIMMs. Be sure to install DDR4 DIMMs on this motherboard.**

Notch

DDR4 DIMM
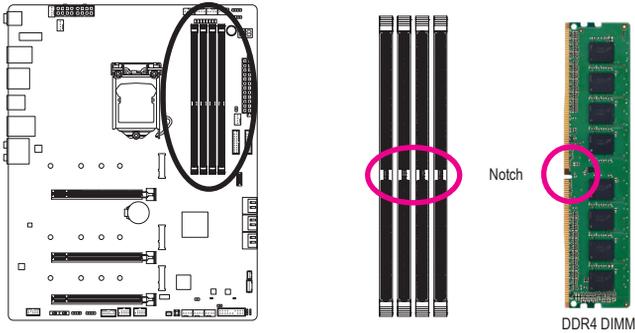
A DDR4 memory module has a notch, so it can only fit in one direction. Follow the steps below to correctly install your memory modules in the memory sockets.
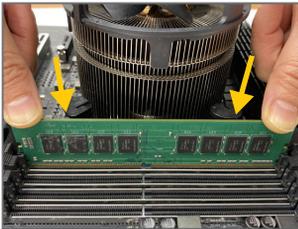
Step 1:
Note the orientation of the memory module. Spread the retaining clips at both ends of the memory socket. Place the memory module on the socket. As indicated in the picture on the left, place your fingers on the top edge of the memory, push down on the memory and insert it vertically into the memory socket.
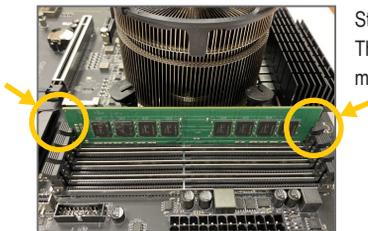
Step 2:
The clips at both ends of the socket will snap into place when the memory module is securely inserted.

1-5 Installing an Expansion Card

Read the following guidelines before you begin to install an expansion card:
- Make sure the motherboard supports the expansion card. Carefully read the manual that came with your expansion card.
- Always turn off the computer and unplug the power cord from the power outlet before installing an expansion card to prevent hardware damage.

PCI Express x16 Slot
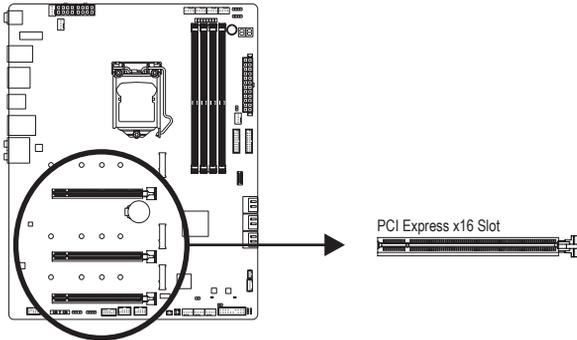
Follow the steps below to correctly install your expansion card in the expansion slot.
1. Locate an expansion slot that supports your card. Remove the metal slot cover from the chassis back panel.
2. Align the card with the slot, and press down on the card until it is fully seated in the slot.
3. Make sure the metal contacts on the card are completely inserted into the slot.
4. Secure the card's metal bracket to the chassis back panel with a screw.
5. After installing all expansion cards, replace the chassis cover(s).
6. Turn on your computer. If necessary, go to BIOS Setup to make any required BIOS changes for your expansion card(s).
7. Install the driver provided with the expansion card in your operating system.

Example: Installing and Removing a PCI Express Graphics Card:

- Installing a Graphics Card:
  Gently push down on the top edge of the card until it is fully inserted into the PCI Express slot. Make sure the card is securely seated in the slot and does not rock.

- Removing the Card:
  Gently push back on the lever on the slot and then lift the card straight out from the slot.

1-6 Setting up an AMD CrossFire™ Configuration

A. System Requirements
- Windows 10 64-bit operating system
- A CrossFire-supported motherboard with two PCI Express x16 slots and correct driver
- CrossFire-ready graphics cards of identical brand and chip and correct driver
- CrossFire [(Note)] bridge connectors
- A power supply with sufficient power is recommended (Refer to the manual of your graphics cards for the power requirement)

B. Connecting the Graphics Cards
Step 1:
Observe the steps in "1-5 Installing an Expansion Card" and install the graphics cards on the PCIEX16 and PCIEX8 slots.
Step 2:
Insert the CrossFire [(Note)] bridge connectors in the CrossFire gold edge connectors on top of the cards.
Step 3:
Plug the display cable into the graphics card on the PCIEX16 slot.

C. Configuring the Graphics Card Driver
After installing the graphics card driver in the operating system, go to the **AMD RADEON SETTINGS** screen. Browse to **Gaming\Global Settings** and ensure **AMD CrossFire** is set to **On**.
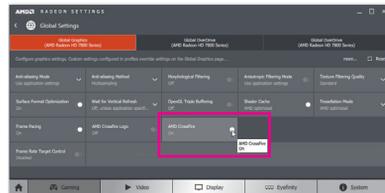
(Note)   The bridge connector(s) may be needed or not depending on your graphics cards.

Procedure and driver screen for enabling CrossFire technology may differ by graphics cards and driver version. Refer to the manual that came with your graphics cards for more information about enabling CrossFire technology.

1-7   Back Panel Connectors
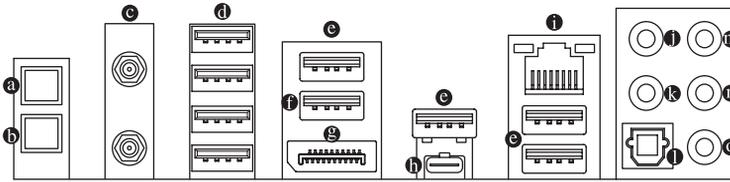
ⓐ **Q-Flash Plus Button** (Note)

This button allows you to update the BIOS when the power connector is connected but the system is not powered on.

ⓑ **Clear CMOS Button**

Use this button to clear the CMOS values (e.g. BIOS configuration) and reset the CMOS values to factory defaults when needed.

⚠️ • Always turn off your computer and unplug the power cord from the power outlet before using the clear CMOS button.
   • Do not use the clear CMOS button when the system is on, or the system may shutdown and data loss or damage may occur.
   • After system restart, go to BIOS Setup to load factory defaults (select Load Optimized Defaults) or manually configure the BIOS settings (refer to Chapter 2, "BIOS Setup," for BIOS configurations).

ⓒ **SMA Antenna Connectors (2T2R)**

Use this connector to connect an antenna.

✎ Tighten the antennas to the antenna connectors and then aim the antennas correctly for better signal reception.

ⓓ **USB 3.2 Gen 1 Port**

The USB 3.2 Gen 1 port supports the USB 3.2 Gen 1 specification and is compatible to the USB 2.0 specification. Use this port for USB devices.

ⓔ **USB 3.2 Gen 2 Type-A Port (Red)**

The USB 3.2 Gen 2 Type-A port supports the USB 3.2 Gen 2 specification and is compatible to the USB 3.2 Gen 1 and USB 2.0 specification. Use this port for USB devices.

ⓕ **USB 3.2 Gen 2 Type-A Port (Q-Flash Plus Port)**

The USB 3.2 Gen 2 Type-A port supports the USB 3.2 Gen 2 specification and is compatible to the USB 3.2 Gen 1 and USB 2.0 specification. Use this port for USB devices. Before using Q-Flash Plus (Note), make sure to insert the USB flash drive into this port first.

ⓖ **DisplayPort**

DisplayPort delivers high quality digital imaging and audio, supporting bi-directional audio transmission. DisplayPort can support HDCP 2.3 content protection mechanism. You can use this port to connect your DisplayPort-supported monitor. Note: The DisplayPort Technology can support a maximum resolution of 4096x2304@60 Hz but the actual resolutions supported depend on the monitor being used.

✎ After installing the DisplayPort device, make sure to set the default sound playback device to DisplayPort. (The item name may differ depending on your operating system.)

(Note)   To enable Q-Flash Plus function, refer to Chapter 5, "Unique Features," for more information.

- **USB Type-C® Port**
  The reversible USB port supports the USB 3.2 Gen 2x2 specification and is compatible to the USB 3.2 Gen 2, USB 3.2 Gen 1, and USB 2.0 specifications. Use this port for USB devices.

- **RJ-45 LAN Port**
  The Gigabit Ethernet LAN port provides Internet connection at up to 10 Gbps data rate. The following describes the states of the LAN port LEDs.

Speed LED:

State	Description
Green	10 Gbps data rate
Orange	5 Gbps/ 2.5 Gbps/ 1 Gbps/ 100 Mbps data rate

Connection/Activity LED:

State	Description
Blinking	Data transmission or receiving is occurring
On	No data transmission or receiving is occurring
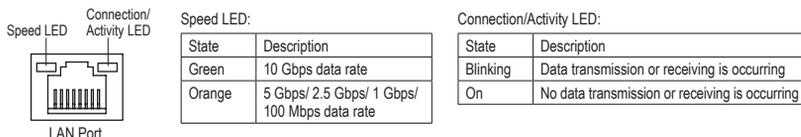
- **Center/Subwoofer Speaker Out**
  Use this audio jack to connect center/subwoofer speakers.

- **Rear Speaker Out**
  Use this audio jack to connect rear speakers.

- **Optical S/PDIF Out Connector**
  This connector provides digital audio out to an external audio system that supports digital optical audio. Before using this feature, ensure that your audio system provides an optical digital audio in connector.

- **Line In/Side Speaker Out**
  The line in jack. Use this audio jack for line in devices such as an optical drive, walkman, etc.

- **Line Out/Front Speaker Out**
  The line out jack.

- **Mic In/Side Speaker Out**
  The Mic in jack.

Audio Jack Configurations:

Jack	Headphone/ 2-channel	4-channel	5.1-channel	7.1-channel
Center/Subwoofer Speaker Out			✔	✔
Rear Speaker Out		✔	✔	✔
Line In/Side Speaker Out				✔
Line Out/Front Speaker Out	✔	✔	✔	✔
Mic In/Side Speaker Out				✔

> If you want to install a Side Speaker, you need to retask either the Line in or Mic in jack to be Side Speaker out through the audio driver.

> • When removing the cable connected to a back panel connector, first remove the cable from your device and then remove it from the motherboard.
> • When removing the cable, pull it straight out from the connector. Do not rock it side to side to prevent an electrical short inside the cable connector.

1-8 Onboard Buttons, Switches and LEDs

BIOS Switches and BIOS LED Indicators

The BIOS switch (BIOS_SW) allows users to easily select a different BIOS for boot up or overclocking, helping to reduce BIOS failure during overclocking. The SB switch allows enabling or disabling of the Dual BIOS function. The LED indicator (MBIOS_LED/BBIOS_LED) shows which BIOS is active.
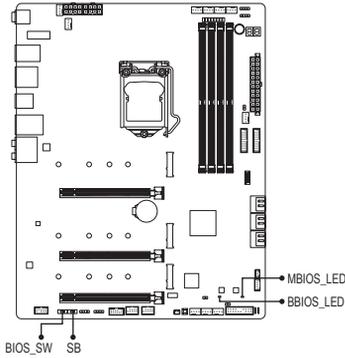
BIOS_SW

2 □ 1   1: Main BIOS (Boot from the main BIOS)

2 □ 1   2: Backup BIOS (Boot from the backup BIOS)

SB

2 □ 1   1: Dual BIOS

2 □ 1   2: Single BIOS

BIOS LED Indicators:

MBIOS_LED (The main BIOS is active)

BBIOS_LED (The backup BIOS is active)

MBIOS_LED
BBIOS_LED

BIOS_SW   SB

⚠ Before setting the SB switch, be sure to turn off your computer and power supply.

Status LEDs

The status LEDs show whether the CPU, memory, graphics card, and operating system are working properly after system power-on. If the CPU/DRAM/VGA LED is on, that means the corresponding device is not working normally; if the BOOT LED is on, that means you haven't entered the operating system yet.
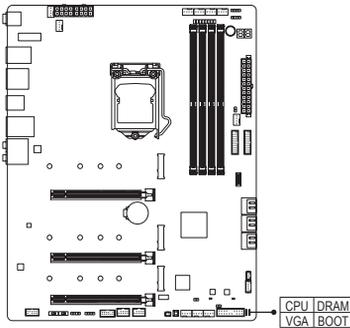
CPU: CPU status LED
DRAM: Memory status LED
VGA: Graphics card status LED
BOOT: Operating system status LED

CPU	DRAM
VGA	BOOT

Quick Button

This motherboard has 2 quick buttons: power button and reset button. The power button and reset button allow users to quickly turn on/off or reset the computer in an open-case environment when they want to change hardware components or conduct hardware testing.
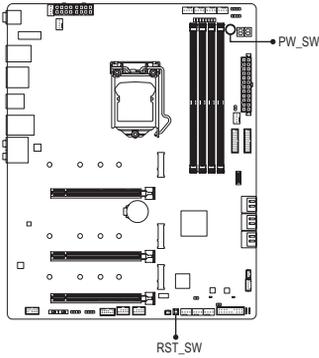
PW_SW

PW_SW: Power Button
RST_SW: Reset Button

RST_SW

The reset button provides you with several functions to use. To remap the button to perform different tasks, refer to Chapter 2, "BIOS Setup," "Settings\Miscellaneous\RST_SW," for more information).

Voltage Measurement Points

Use a multimeter to measure the following motherboard voltages.
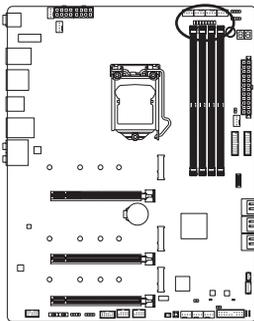
VAXG
VCCIO
VCCSA
VCORE
DDRVTT
VCC1V8P
DDRVPP
VDDR

1-9 Internal Connectors
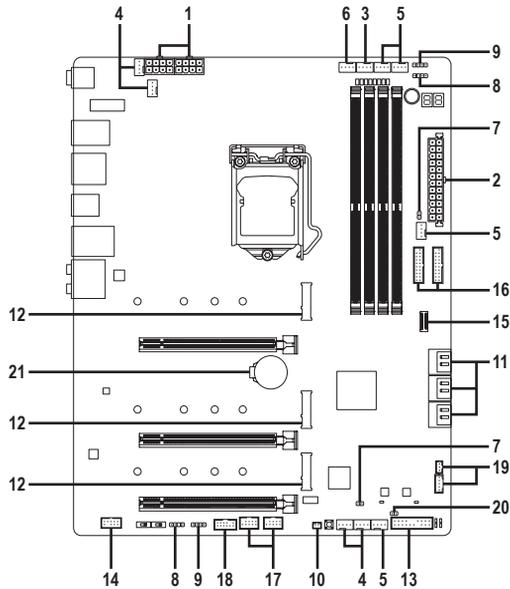
1)	ATX_12V_2X4_1/ATX_12V_2X4_2	12)	M2A_CPU/M2P_SB/M2M_SB
2)	ATX	13)	F_PANEL
3)	CPU_FAN	14)	F_AUDIO
4)	SYS_FAN1/2/3/4	15)	F_U32C
5)	SYS_FAN5/6/7/8_PUMP	16)	F_U32_1/F_U32_2
6)	CPU_OPT	17)	F_USB1/F_USB2
7)	EC_TEMP1/EC_TEMP2	18)	SPI_TPM
8)	D_LED1/D_LED2	19)	THB_C1/THB_C2
9)	LED_C1/LED_C2	20)	CLR_CMOS
10)	NOISE_SENSOR	21)	BAT
11)	SATA3 0/1/2/3/4/5		

Read the following guidelines before connecting external devices:
• First make sure your devices are compliant with the connectors you wish to connect.
• Before installing the devices, be sure to turn off the devices and your computer. Unplug the power cord from the power outlet to prevent damage to the devices.
• After installing the device and before turning on the computer, make sure the device cable has been securely attached to the connector on the motherboard.

1/2) ATX_12V_2X4_1/ATX_12V_2X4_2/ATX (2x4 12V Power Connectors and 2x12 Main Power Connector)

With the use of the power connector, the power supply can supply enough stable power to all the components on the motherboard. Before connecting the power connector, first make sure the power supply is turned off and all devices are properly installed. The power connector possesses a foolproof design. Connect the power supply cable to the power connector in the correct orientation.

The 12V power connector mainly supplies power to the CPU. If the 12V power connector is not connected, the computer will not start.

To meet expansion requirements, it is recommended that a power supply that can withstand high power consumption be used (500W or greater). If a power supply is used that does not provide the required power, the result can lead to an unstable or unbootable system.

ATX_12V_2X4_1/ATX_12V_2X4_2
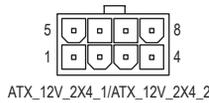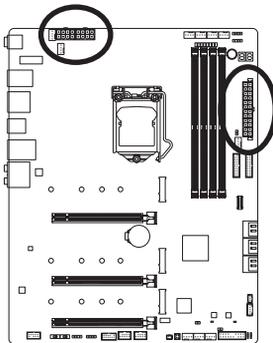
ATX_12V_2X4_1/ATX_12V_2X4_2:

Pin No.	Definition
1	GND (Only for 2x4-pin 12V)
2	GND (Only for 2x4-pin 12V)
3	GND
4	GND
5	+12V (Only for 2x4-pin 12V)
6	+12V (Only for 2x4-pin 12V)
7	+12V
8	+12V

ATX
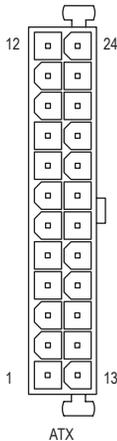
ATX:

Pin No.	Definition	Pin No.	Definition
1	3.3V	13	3.3V
2	3.3V	14	-12V
3	GND	15	GND
4	+5V	16	PS_ON (soft On/Off)
5	GND	17	GND
6	+5V	18	GND
7	GND	19	GND
8	Power Good	20	NC
9	5VSB (stand by +5V)	21	+5V
10	+12V	22	+5V
11	+12V (Only for 2x12-pin ATX)	23	+5V (Only for 2x12-pin ATX)
12	3.3V (Only for 2x12-pin ATX)	24	GND (Only for 2x12-pin ATX)

3/4) CPU_FAN/SYS_FAN1/2/3/4 (Fan Headers)

All fan headers on this motherboard are 4-pin. Most fan headers possess a foolproof insertion design. When connecting a fan cable, be sure to connect it in the correct orientation (the black connector wire is the ground wire). The speed control function requires the use of a fan with fan speed control design. For optimum heat dissipation, it is recommended that a system fan be installed inside the chassis.

CPU_FAN

SYS_FAN1/SYS_FAN2

SYS_FAN3/SYS_FAN4

Pin No.	Definition
1	GND
2	Voltage Speed Control
3	Sense
4	PWM Speed Control
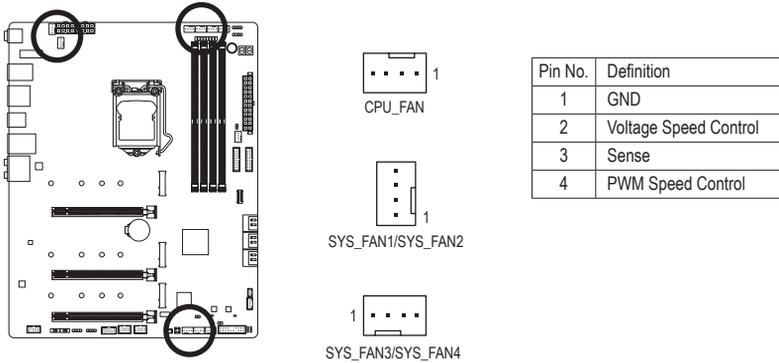
5) SYS_FAN5/6/7/8_PUMP (System Fan/Water Cooling Pump Headers)

The fan/pump headers are 4-pin. Most fan headers possess a foolproof insertion design. When connecting a fan cable, be sure to connect it in the correct orientation (the black connector wire is the ground wire). The speed control function requires the use of a fan with fan speed control design. For optimum heat dissipation, it is recommended that a system fan be installed inside the chassis. The header also provides speed control for a water cooling pump, refer to Chapter 2, "BIOS Setup," "Smart Fan 6," for more information.

SYS_FAN5_PUMP

SYS_FAN6_PUMP

SYS_FAN7_PUMP/
SYS_FAN8_PUMP

Pin No.	Definition
1	GND
2	Voltage Speed Control
3	Sense
4	PWM Speed Control
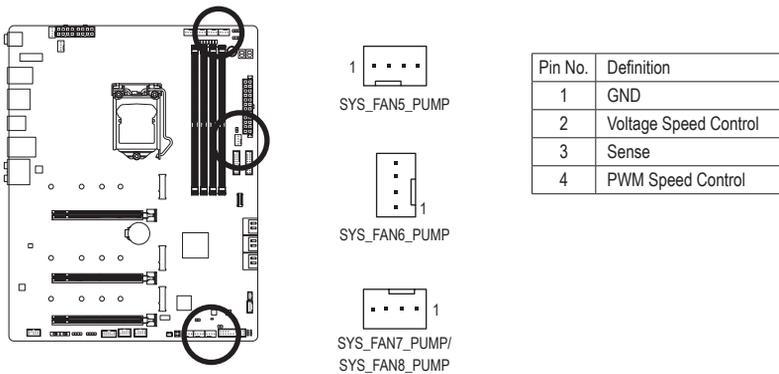
• Be sure to connect fan cables to the fan headers to prevent your CPU and system from overheating. Overheating may result in damage to the CPU or the system may hang.
• These fan headers are not configuration jumper blocks. Do not place a jumper cap on the headers.

6) CPU_OPT (Water Cooling CPU Fan Header)

The fan header is 4-pin and possesses a foolproof insertion design. Most fan headers possess a foolproof insertion design. When connecting a fan cable, be sure to connect it in the correct orientation (the black connector wire is the ground wire). The speed control function requires the use of a fan with fan speed control design.
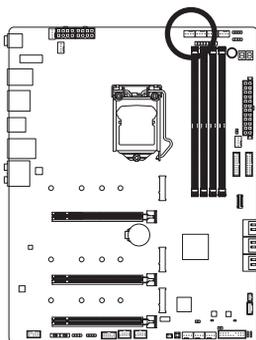
Pin No.	Definition
1	GND
2	Voltage Speed Control
3	Sense
4	PWM Speed Control

Connector	CPU_FAN	SYS_FAN1~4	SYS_FAN5~8_PUMP	CPU_OPT
Maximum Current	2A	2A	2A	2A
Maximum Power	24W	24W	24W	24W

7) EC_TEMP1/EC_TEMP2 (Temperature Sensor Headers)

Connect the thermistor cables to the headers for temperature detection.

EC_TEMP1

EC_TEMP2
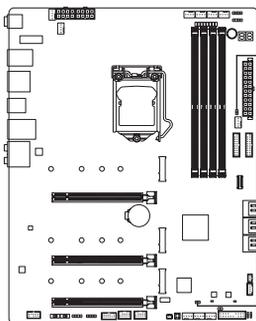
Pin No.	Definition
1	SENSOR IN
2	GND

8) D_LED1/D_LED2 (Addressable LED Strip Headers)

The headers can be used to connect a standard 5050 addressable LED strip, with maximum power rating of 5A (5V) and maximum number of 1000 LEDs.

1 D_LED1

D_LED2 1
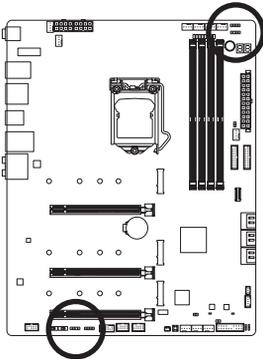
Pin No.	Definition
1	V (5V)
2	Data
3	No Pin
4	GND

Connect your addressable LED strip to the header. The power pin (marked with a triangle on the plug) of the LED strip must be connected to Pin 1 of the addressable LED strip header. Incorrect connection may lead to the damage of the LED strip.

Addressable LED Strip

1
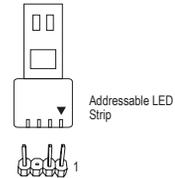
9) LED_C1/LED_C2 (RGB LED Strip Headers)

The headers can be used to connect a standard 5050 RGB LED strip (12V/G/R/B), with maximum power rating of 2A (12V) and maximum length of 2m.

1 LED_C1

LED_C2 1
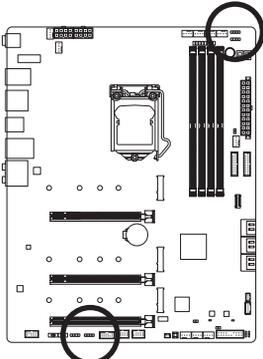
Pin No.	Definition
1	12V
2	G
3	R
4	B

Connect one end of the RGB LED strip extension cable to the header and the other end to your RGB LED strip. The black wire (marked with a triangle on the plug) of the extension cable must be connected to Pin 1 (12V) of this header. The 12V pin (marked with an arrow) on the other end of the extension cable must be lined up with the 12V of the LED strip. Be careful with the connection orientation of the LED strip; incorrect connection may lead to the damage of the LED strip.

1 12V
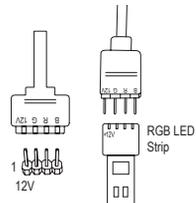
RGB LED Strip

For how to turn on/off the lights of the LED strip, refer to the instructions on in Chapter 5, "Unique Features," "APP Center\RGB Fusion."

Before installing the devices, be sure to turn off the devices and your computer. Unplug the power cord from the power outlet to prevent damage to the devices.

10) NOISE_SENSOR (Noise Detection Header)

This header can be used to connect a noise detection cable to detect the noise inside the case.

Pin No.	Definition
1	Noise Detection
2	GND

Noise Detection Cable
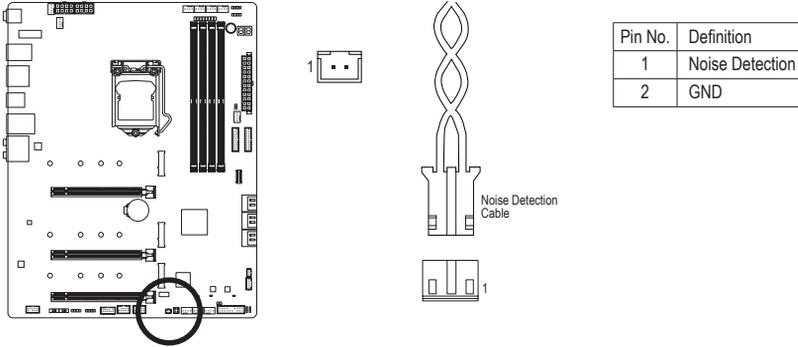
For more information on the noise detection function, refer to the instructions in Chapter 5, "Unique Features," "APP Center\System Information Viewer"

Before connecting the cable to the header, make sure to remove the jumper cap; re-place the jumper cap if the header is not in use.

11) SATA3 0/1/2/3/4/5 (SATA 6Gb/s Connectors)

The SATA connectors conform to SATA 6Gb/s standard and are compatible with SATA 3Gb/s and SATA 1.5Gb/s standard. Each SATA connector supports a single SATA device. The Intel® Chipset supports RAID 0, RAID 1, RAID 5, and RAID 10. Refer to Chapter 3, "Configuring a RAID Set," for instructions on configuring a RAID array.

SATA3

Pin No.	Definition
1	GND
2	TXP
3	TXN
4	GND
5	RXN
6	RXP
7	GND
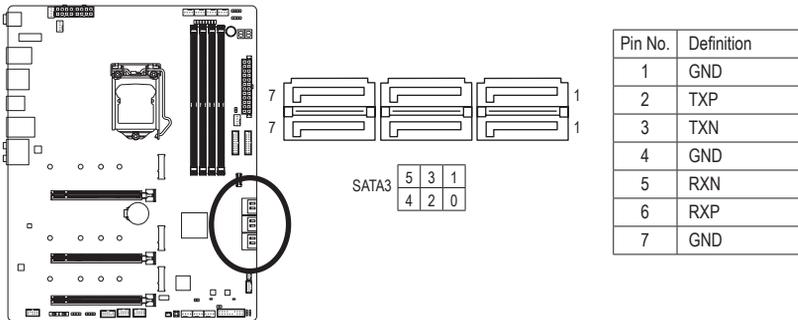
To enable hot-plugging for the SATA ports, refer to Chapter 2, "BIOS Setup," "Settings\IO Ports\ SATA And RST Configuration," for more information.

12) M2A_CPU (Note)/M2P_SB/M2M_SB (M.2 Socket 3 Connectors)

The M.2 connectors support M.2 SATA SSDs or M.2 PCIe SSDs and support RAID configuration. Please note that an M.2 PCIe SSD cannot be used to create a RAID set either with an M.2 SATA SSD or a SATA hard drive. Refer to Chapter 3, "Configuring a RAID Set," for instructions on configuring a RAID array.
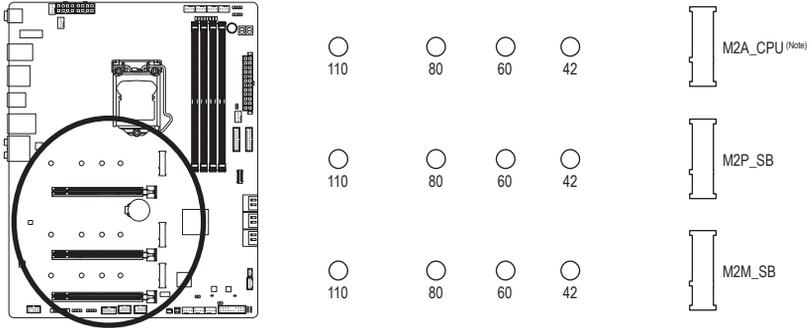
Follow the steps below to correctly install an M.2 SSD in the M.2 connector.

Step 1:
Locate the M.2 connector where you will install the M.2 SSD, use a screwdriver to unfasten the screw on the heatsink and then remove the heatsink. Remove the protective film from the thermal pad on the M.2 connector.

Step 2:
Locate the proper mounting hole based on the length of your M.2 SSD drive. If needed, move the standoff to the desired mounting hole. Insert the M.2 SSD into the M.2 connector at an angle.

Step 3:
Press the M.2 SSD down and then use the included screw to secure it in the connector. Replace the heatsink and secure it to the original hole. Remove the protective film from the bottom of the heatsink before replacing the heatsink.

(Note)   Supported by 11th Generation processors only. Be sure to use Intel® SSDs if you want to set up a RAID configuration on the M2A_CPU connector.

Installation Notices for the M.2 and SATA Connectors:
The availability of the SATA connectors may be affected by the type of device installed in the M.2 sockets. The M2P_SB connector shares bandwidth with the SATA3 1 connector. The M2M_SB connector shares bandwidth with the SATA3 4, 5 connectors. Refer to the following tables for details.

- M2A_CPU [(Note)]:

Type of M.2 SSD \ Connector	SATA3 0	SATA3 1	SATA3 2	SATA3 3	SATA3 4	SATA3 5
M.2 PCIe SSD *	✔	✔	✔	✔	✔	✔
No M.2 SSD Installed	✔	✔	✔	✔	✔	✔

✔ : Available, ✖ : Not available

* The M2A_CPU connector supports only PCIe SSDs.

- M2P_SB:

Type of M.2 SSD \ Connector	SATA3 0	SATA3 1	SATA3 2	SATA3 3	SATA3 4	SATA3 5
M.2 SATA SSD	✔	✖	✔	✔	✔	✔
M.2 PCIe SSD	✔	✔	✔	✔	✔	✔
No M.2 SSD Installed	✔	✔	✔	✔	✔	✔

✔ : Available, ✖ : Not available

- M2M_SB:

Type of M.2 SSD \ Connector	SATA3 0	SATA3 1	SATA3 2	SATA3 3	SATA3 4	SATA3 5
M.2 SATA SSD	✔	✔	✔	✔	✖	✖
M.2 PCIe SSD	✔	✔	✔	✔	✖	✖
No M.2 SSD Installed	✔	✔	✔	✔	✔	✔

✔ : Available, ✖ : Not available

(Note)   Supported by 11th Generation processors only.

13) F_PANEL (Front Panel Header)

Connect the power switch, reset switch, speaker, chassis intrusion switch/sensor 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.
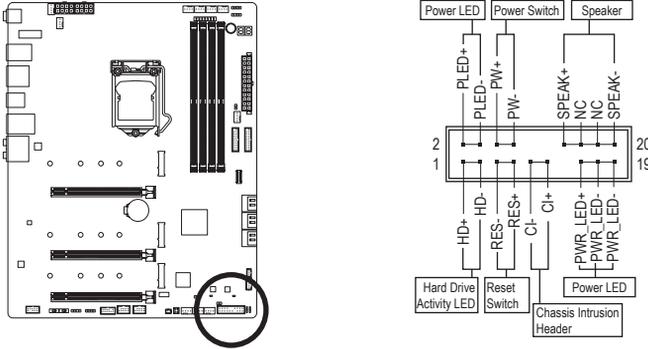
- **PLED/PWR_LED** (Power LED):

System Status	LED
S0	On
S3/S4/S5	Off

Connects to the power status indicator on the chassis front panel. The LED is on when the system is operating. The LED is off when the system is in S3/S4 sleep state or powered off (S5).

- **PW** (Power Switch):
  Connects to the power switch on the chassis front panel. You may configure the way to turn off your system using the power switch (refer to Chapter 2, "BIOS Setup," "Settings\Platform Power," for more information).

- **SPEAK** (Speaker):
  Connects to the speaker on the chassis front panel. The system reports system startup status by issuing a beep code. One single short beep will be heard if no problem is detected at system startup.

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

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

- **CI** (Chassis Intrusion Header):
  Connects to the chassis intrusion switch/sensor on the chassis that can detect if the chassis cover has been removed. This function requires a chassis with a chassis intrusion switch/sensor.

- **NC:** No connection.

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

14) F_AUDIO (Front Panel Audio Header)

The front panel audio header supports High Definition audio (HD). You may connect your chassis front panel audio module to this header. Make sure the wire assignments of the module connector match the pin assignments of the motherboard header. Incorrect connection between the module connector and the motherboard header will make the device unable to work or even damage it.
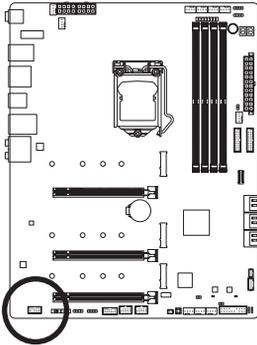
Pin No.	Definition
1	MIC2_L
2	GND
3	MIC2_R
4	NC
5	LINE2_R
6	Sense
7	GND
8	No Pin
9	LINE2_L
10	Sense

Some chassis provide a front panel audio module that has separated connectors on each wire instead of a single plug. For information about connecting the front panel audio module that has different wire assignments, please contact the chassis manufacturer.

15) F_U32C (USB Type-C® Header with USB 3.2 Gen 2 Support)

The header conforms to USB 3.2 Gen 2 specification and can provide one USB port.
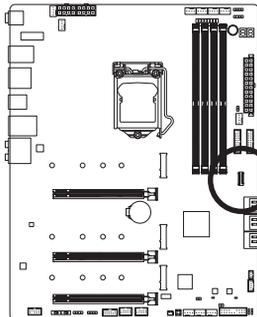
Pin No.	Definition	Pin No.	Definition
1	VBUS	11	VBUS
2	TX1+	12	TX2+
3	TX1-	13	TX2-
4	GND	14	GND
5	RX1+	15	RX2+
6	RX1-	16	RX2-
7	VBUS	17	GND
8	CC1	18	D-
9	SBU1	19	D+
10	SBU2	20	CC2

16) F_U32_1/F_U32_2 (USB 3.2 Gen 1 Headers)

The headers conform to USB 3.2 Gen 1 and USB 2.0 specification and each header can provide two USB ports. For purchasing the optional 3.5" front panel that provides two USB 3.2 Gen 1 ports, please contact the local dealer.
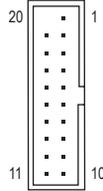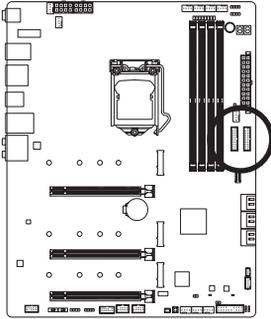
Pin No.	Definition	Pin No.	Definition
1	VBUS	11	D2+
2	SSRX1-	12	D2-
3	SSRX1+	13	GND
4	GND	14	SSTX2+
5	SSTX1-	15	SSTX2-
6	SSTX1+	16	GND
7	GND	17	SSRX2+
8	D1-	18	SSRX2-
9	D1+	19	VBUS
10	NC	20	No Pin

17) F_USB1/F_USB2 (USB 2.0/1.1 Headers)

The headers conform to USB 2.0/1.1 specification. Each USB header can provide two USB ports via an optional USB bracket. For purchasing the optional USB bracket, please contact the local dealer.
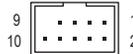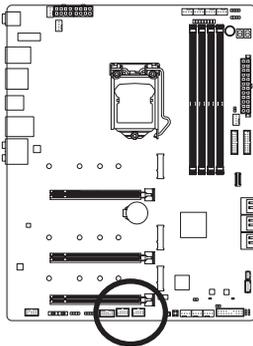
Pin No.	Definition
1	Power (5V)
2	Power (5V)
3	USB DX-
4	USB DY-
5	USB DX+
6	USB DY+
7	GND
8	GND
9	No Pin
10	NC

⚠ • Do not plug the IEEE 1394 bracket (2x5-pin) cable into the USB 2.0/1.1 header.
   • Prior to installing the USB bracket, be sure to turn off your computer and unplug the power cord from the power outlet to prevent damage to the USB bracket.

18) SPI_TPM (Trusted Platform Module Header)

You may connect an SPI TPM (Trusted Platform Module) to this header.
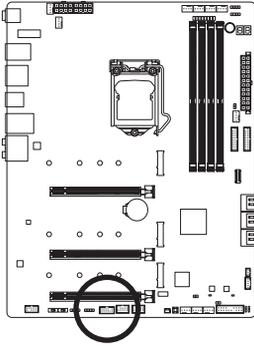
Pin No.	Definition
1	Data Output
2	Power (3.3V)
3	No Pin
4	NC
5	Data Input
6	CLK
7	Chip Select
8	GND
9	IRQ
10	NC
11	NC
12	RST

19) THB_C1/THB_C2 (Thunderbolt™ Add-in Card Connectors)

The connectors are used to connect to a GIGABYTE Thunderbolt™ add-in card.
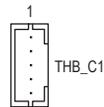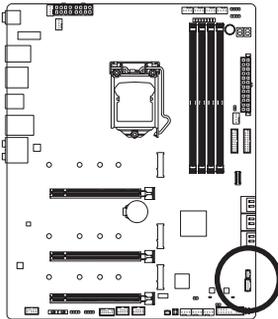
Supports a Thunderbolt™ add-in card.

20) CLR_CMOS (Clear CMOS Jumper)

Use this jumper to clear the BIOS configuration and reset the CMOS values to factory defaults. To clear the CMOS values, use a metal object like a screwdriver to touch the two pins for a few seconds.
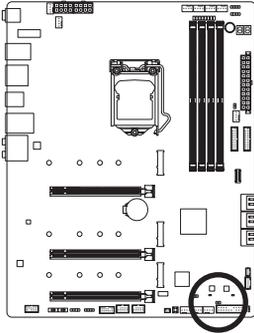
Open: Normal

Short: Clear CMOS Values

- • Always turn off your computer and unplug the power cord from the power outlet before clearing the CMOS values.
- • After system restart, go to BIOS Setup to load factory defaults (select Load Optimized Defaults) or manually configure the BIOS settings (refer to Chapter 2, "BIOS Setup," for BIOS configurations).

21) BAT (Battery)

The battery provides power to keep the values (such as BIOS configurations, date, and time information) in the CMOS when the computer is turned off. Replace the battery when the battery voltage drops to a low level, or the CMOS values may not be accurate or may be lost.
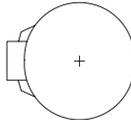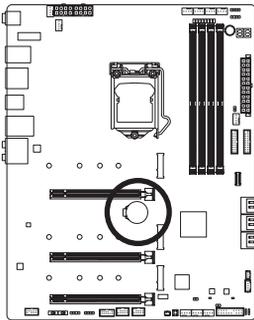
You may clear the CMOS values by removing the battery:
1. Turn off your computer and unplug the power cord.
2. Gently remove the battery from the battery holder and wait for one minute. (Or use a metal object like a screwdriver to touch the positive and negative terminals of the battery holder, making them short for 5 seconds.)
3. Replace the battery.
4. Plug in the power cord and restart your computer.

- • Always turn off your computer and unplug the power cord before replacing the battery.
- • Replace the battery with an equivalent one. Damage to your devices may occur if the battery is replaced with an incorrect model.
- • Contact the place of purchase or local dealer if you are not able to replace the battery by yourself or uncertain about the battery model.
- • When installing the battery, note the orientation of the positive side (+) and the negative side (-) of the battery (the positive side should face up).
- • Used batteries must be handled in accordance with local environmental regulations.

Chapter 2   BIOS Setup

BIOS (Basic Input and Output System) records hardware parameters of the system in the CMOS on the motherboard. Its major functions include conducting the Power-On Self-Test (POST) during system startup, saving system parameters and loading operating system, etc. BIOS includes a BIOS Setup program that allows the user to modify basic system configuration settings or to activate certain system features.

When the power is turned off, the battery on the motherboard supplies the necessary power to the CMOS to keep the configuration values in the CMOS.

To access the BIOS Setup program, press the <Delete> key during the POST when the power is turned on.

To upgrade the BIOS, use either the GIGABYTE Q-Flash or @BIOS utility.
• Q-Flash allows the user to quickly and easily upgrade or back up BIOS without entering the operating system.
• @BIOS is a Windows-based utility that searches and downloads the latest version of BIOS from the Internet and updates the BIOS.
For instructions on using the Q-Flash and @BIOS utilities, refer to Chapter 5, "BIOS Update Utilities."

> • Because BIOS flashing is potentially risky, if you do not encounter problems using the current version of BIOS, it is recommended that you not flash the BIOS. To flash the BIOS, do it with caution. Inadequate BIOS flashing may result in system malfunction.
> • It is recommended that you not alter the default settings (unless you need to) to prevent system instability or other unexpected results. Inadequately altering the settings may result in system's failure to boot. If this occurs, try to clear the CMOS values and reset the board to default values. (Refer to the "Load Optimized Defaults" section in this chapter or introductions of the battery or the clear CMOS jumper/button in Chapter 1 for how to clear the CMOS values.)

2-1 Startup Screen

The following startup Logo screen will appear when the computer boots.

DEL：BIOS SETUP\Q-FLASH   F12：BOOT MENU   END：Q-FLASH — Function Keys
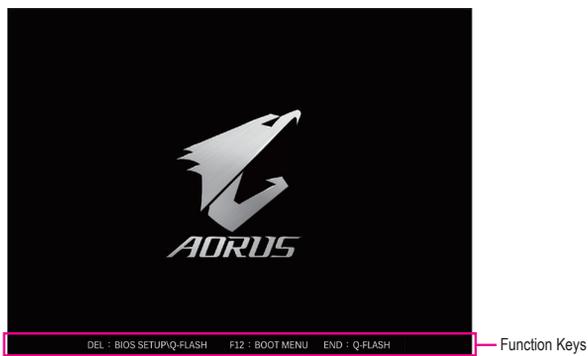
Function Keys:

<DEL>: BIOS SETUP\Q-FLASH

  Press the <Delete> key to enter BIOS Setup or to access the Q-Flash utility in BIOS Setup.

<F12>: BOOT MENU

  Boot Menu allows you to set the first boot device without entering BIOS Setup. In Boot Menu, use the up arrow key <↑> or the down arrow key <↓> to select the first boot device, then press <Enter> to accept. The system will boot from the device immediately.

  Note: The setting in Boot Menu is effective for one time only. After system restart, the device boot order will still be based on BIOS Setup settings.

<END>: Q-FLASH

  Press the <End> key to access the Q-Flash utility directly without having to enter BIOS Setup first.

2-2 The Main Menu

Advanced Mode
The Advanced Mode provides detailed BIOS settings. You can press the arrow keys on your keyboard to move among the items and press <Enter> to accept or enter a sub-menu. Or you can use your mouse to select the item you want.

Setup Menus
Configuration Items
Configuration Items   Current Settings
System Time
Hardware Information
Quick Access Bar allows you to quickly move to the General Help, Easy Mode, Smart Fan 6, or Q-Flash screen.

Advanced Mode Function Keys

<←><→>	Move the selection bar to select a setup menu
<↑><↓>	Move the selection bar to select an configuration item on a menu
<Enter>/Double Click	Execute command or enter a menu
<+>/<Page Up>	Increase the numeric value or make changes
<->/<Page Down>	Decrease the numeric value or make changes
<F1>	Show descriptions of the function keys
<F2>	Switch to Easy Mode
<F3>	Save the current BIOS settings to a profile
<F4>	Load the BIOS settings from a profile created before
<F5>	Restore the previous BIOS settings for the current submenus
<F6>	Display the Smart Fan 6 screen
<F7>	Load the Optimized BIOS default settings for the current submenus
<F8>	Access the Q-Flash utility
<F10>	Save all the changes and exit the BIOS Setup program
<F11>	Switch to the Favorites submenu
<F12>	Capture the current screen as an image and save it to your USB drive
<Insert>	Add or remove a favorite option
<Ctrl>+<S>	Display information on the installed memory
<Esc>	Main Menu: Exit the BIOS Setup program Submenus: Exit current submenu

B. Easy Mode

Easy Mode allows users to quickly view their current system information or to make adjustments for optimum performance. In Easy Mode, you can use your mouse to move through configuration items or press <F2> to switch to the Advanced Mode screen.
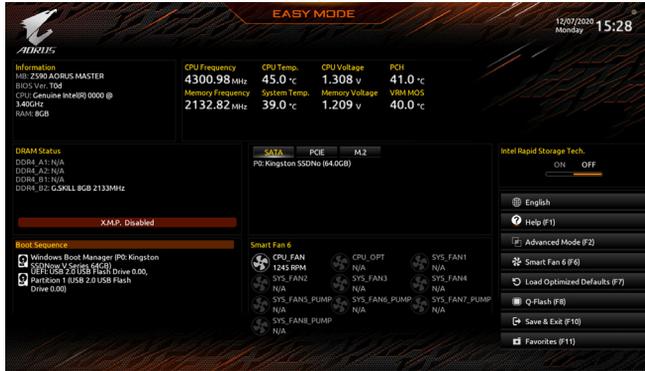
2-3   Smart Fan 6
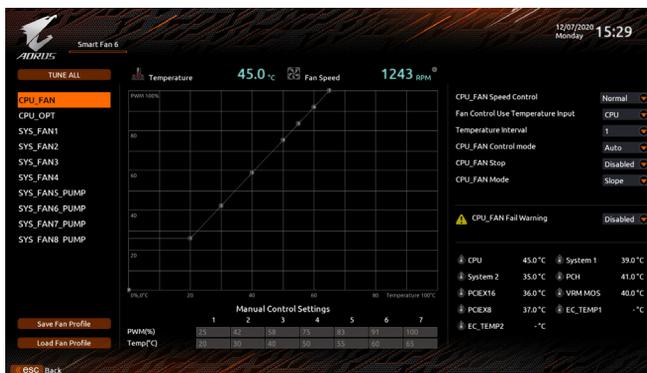
Use the <F6> function key to quickly switch to this screen. This screen allows you to configure fan speed related settings for each fan header or monitor your system/CPU temperature.

☞ **TUNE ALL**
Allows you to apply the current settings to all fan headers.

☞ **Temperature**
Displays the current temperature of the selected target area.

☞ **Fan Speed**
Displays current fan/pump speeds.

☞ **Flow Rate**
Displays the flow rate of your water cooling system. Press <Enter> on **Fan Speed** to switch to this function.

☞ **Fan Speed Control**
Allows you to determine whether to enable the fan speed control function and adjust the fan speed.
- ▸ Normal   Allows the fan to run at different speeds according to the temperature. You can adjust the fan speed with System Information Viewer based on your system requirements. (Default)
- ▸ Silent   Allows the fan to run at slow speeds.
- ▸ Manual   Allows you to drag the curve nodes to adjust fan speed. Or you can use the **EZ Tuning** feature. After adjusting the node position, press **Apply** to automatically calculate the slope of the curve.
- ▸ Full Speed   Allows the fan to run at full speeds.

☞ **Fan Control Use Temperature Input**
Allows you to select the reference temperature for fan speed control.

☞ **Temperature Interval**
Allows you to select the temperature interval for fan speed change.

☞ **FAN/PUMP Control Mode**
- ▸ Auto   Lets the BIOS automatically detect the type of fan installed and sets the optimal control mode. (Default)
- ▸ Voltage   Voltage mode is recommended for a 3-pin fan/pump.
- ▸ PWM   PWM mode is recommended for a 4-pin fan/pump.

- **FAN/PUMP Stop**
  Enables or disables the fan/pump stop function. You can set the temperature limit using the temperature curve. The fan or pump stops operation when the temperature is lower than the limit. (Default: Disabled)

- **FAN/PUMP Mode**
  Allows you to set the operating mode for the fan.
  - ▶ Slope   Adjusts the fan speed linearly based on the temperature. (Default)
  - ▶ Stair   Adjusts the fan speed stepwise based on the temperature.

- **FAN/PUMP Fail Warning**
  Allows the system to emit warning sound if the fan/pump is not connected or fails. Check the fan/pump condition or fan/pump connection when this occurs. (Default: Disabled)

- **Save Fan Profile**
  This function allows you to save the current settings to a profile. You can save the profile in the BIOS or select **Select File in HDD/FDD/USB** to save the profile to your storage device.

- **Load Fan Profile**
  This function allows you to load a previously saved BIOS profile without the hassles of reconfiguring the BIOS settings. Or you can select **Select File in HDD/FDD/USB** to load a profile from your storage device.

2-4 Favorites (F11)

Set your frequently used options as your favorites and use the <F11> key to quickly switch to the page where all of your favorite options are located. To add or remove a favorite option, go to its original page and press <Insert> on the option. The option is marked with a star sign if set as a "favorite."

2-5   Tweaker
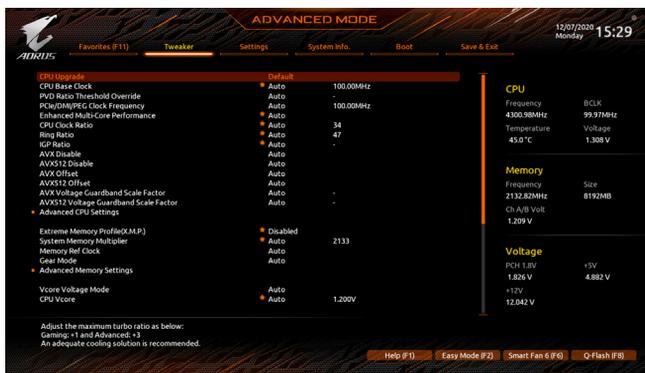
⚠️ Whether the system will work stably with the overclock/overvoltage settings you made is dependent on your overall system configurations. Incorrectly doing overclock/overvoltage may result in damage to CPU, chipset, or memory and reduce the useful life of these components. This page is for advanced users only and we recommend you not to alter the default settings to prevent system instability or other unexpected results. (Inadequately altering the settings may result in system's failure to boot. If this occurs, clear the CMOS values and reset the board to default values.)

  CPU Upgrade
Allows you to set the CPU frequency. The final result may vary depending on the CPU used. Options are: Default, Gaming Profile, Advanced Profile. (Default: Default)

  CPU Base Clock
Allows you to manually set the CPU base clock in 0.01 MHz increments. (Default: Auto)
Important: It is highly recommended that the CPU frequency be set in accordance with the CPU specifications.

  PVD Ratio Threshold Override (Note)
Allows you to determine whether to improve performance under extreme BCLK OC by reducing a "PLL Banding" condition caused in part by a very high DCO frequency. (Default: Auto)

  PCIe/DMI/PEG Clock Frequency
Allows you to manually set the PCIe/DMI/PEG frequencies in 0.01 MHz increments.

  Enhanced Multi-Core Performance
Determines whether to allow the CPU to run at Turbo 1C speed. (Default: Auto)

  CPU Clock Ratio
Allows you to alter the clock ratio for the installed CPU. The adjustable range is dependent on the CPU being installed.

  Ring Ratio
Allows you to set the CPU Uncore ratio. The adjustable range is dependent on the CPU being used. (Default: Auto)

(Note)   This item is present only when you install a CPU that supports this feature. For more information about Intel® CPUs' unique features, please visit Intel's website.

- **IGP Ratio** (Note)

   Allows you to set the Graphics Ratio. (Default: Auto)

- **AVX Disable** (Note)

   Allows you to disable the AVX instruction sets on a CPU that supports AVX. (Default: Auto)

- **AVX512 Disable** (Note)

   Allows you to disable the AVX-512 instruction sets on a CPU that supports AVX-512. (Default: Auto)

- **AVX Offset** (Note)

   When the processor runs AVX workloads, the CPU Clock Ratio will be reduced by the desired AVX offset value. For example, if the value is set to 3, the CPU Clock Ratio will be reduced by 3 when executing AVX instructions. (Default: Auto)

- **AVX512 Offset** (Note)

   When the processor runs AVX-512 workloads, the CPU Clock Ratio will be reduced by the desired AVX-512 offset value. For example, if the value is set to 3 (the value must be larger than or equal to the AVX Offset value), the CPU Clock Ratio will be reduced by 3 when executing AVX-512 instructions. (Default: Auto)

- **AVX Voltage Guardband Scale Factor** (Note)

   Allows you to lower the standard AVX voltage. (Default: Auto)

- **AVX512 Voltage Guardband Scale Factor** (Note)

   Allows you to lower the standard AVX-512 voltage. (Default: Auto)

- ■ **Advanced CPU Settings**

- **Core Fused Max Core Ratio** (Note)

   Displays the highest frequency of each core.

- **CPU Over Temperature Protection** (Note)

   Allows you to fine-tune the TJ Max offset value. (Default: Auto)

- **FCLK Frequency for Early Power On** (Note)

   Allows you to set the FCLK frequency. Options are: Normal(800Mhz), 1GHz, 400MHz. (Default: 1GHz)

- **Hyper-Threading Technology**

   Allows you to determine whether to enable multi-threading technology when using an Intel® CPU that supports this function. This feature only works for operating systems that support multi-processor mode. **Auto** lets the BIOS automatically configure this setting. (Default: Auto)

(Note)   This item is present only when you install a CPU that supports this feature. For more information about Intel® CPUs' unique features, please visit Intel's website.

- **No. of CPU Cores Enabled**
  Allows you to select the number of CPU cores to enable in an Intel® multi-core CPU (the number of CPU cores may vary by CPU). **Auto** lets the BIOS automatically configure this setting. (Default: Auto)

- **Intel(R) Speed Shift Technology (Intel® Speed Shift Technology)** (Note)
  Enables or disables Intel® Speed Shift Technology. Enabling this feature allows the processor to ramp up its operating frequency more quickly and then improves the system responsiveness. (Default: Enabled)

- **CPU Thermal Monitor** (Note)
  Enables or disables Intel® Thermal Monitor function, a CPU overheating protection function. When enabled, the CPU core frequency and voltage will be reduced when the CPU is overheated. **Auto** lets the BIOS automatically configure this setting. (Default: Auto)

- **Ring to Core offset (Down Bin)**
  Allows you to determine whether to disable the CPU Ring ratio auto-down function. **Auto** lets the BIOS automatically configure this setting. (Default: Auto)

- **CPU EIST Function** (Note)
  Enables or disables Enhanced Intel® Speed Step Technology (EIST). Depending on CPU loading, Intel® EIST technology can dynamically and effectively lower the CPU voltage and core frequency to decrease average power consumption and heat production. **Auto** lets the BIOS automatically configure this setting. (Default: Auto)

- **Race To Halt (RTH)** (Note)**/Energy Efficient Turbo** (Note)
  Enables or disables the CPU power saving related settings. (Default: Auto)

- **Intel(R) Turbo Boost Technology** (Note)
  Allows you to determine whether to enable the Intel® CPU Turbo Boost technology. **Auto** lets the BIOS automatically configure this setting. (Default: Auto)

- **Intel(R) Turbo Boost Max Technology 3.0** (Note)
  Enables or disables Intel® Turbo Boost Max Technology 3.0. Intel® Turbo Boost Max Technology 3.0 allows the system to identify the processor's best performance core and lets you manually direct the most critical workloads to it. You can even adjust the frequency of each core individually for performance optimization. (Default: Enabled)

- **CPU Flex Ratio Override**
  Enables or disables the CPU Flex Ratio. The maximum CPU clock ratio will be based on the **CPU Flex Ratio Settings** value if **CPU Clock Ratio** is set to **Auto**. (Default: Disabled)

- **CPU Flex Ratio Settings**
  Allows you to set the CPU Flex Ratio. The adjustable range may vary by CPU.

- **Frequency Clipping TVB** (Note)
  Allows you to enable or disable automatic CPU frequency reduction initiated by Thermal Velocity Boost. **Auto** lets the BIOS automatically configure this setting. (Default: Auto)

- **Voltage reduction initiated TVB** (Note)
  Allows you to enable or disable automatic CPU voltage reduction initiated by Thermal Velocity Boost. **Auto** lets the BIOS automatically configure this setting. (Default: Auto)

- ▼ **Active Turbo Ratios**

- **Turbo Ratio (Core Active)**
  Allows you to set the CPU Turbo ratios for different number of active cores. **Auto** sets the CPU Turbo ratios according to the CPU specifications. This item is configurable only when **Active Turbo Ratios** is set to **Manual**. (Default: Auto)

(Note)   This item is present only when you install a CPU that supports this feature. For more information about Intel® CPUs' unique features, please visit Intel's website.

▼ **Per Core HT Disable Setting**

  HT Disable (Note)
Allows you to determine whether to disable the HT feature for each CPU core. This item is configurable only when **Per Core HT Disable Setting** is set to **Manual**. (Default: Disabled)

▼ **C-States Control**

  CPU Enhanced Halt (C1E)
Enables or disables Intel® CPU Enhanced Halt (C1E) function, a CPU power-saving function in system halt state. When enabled, the CPU core frequency and voltage will be reduced during system halt state to decrease power consumption. **Auto** lets the BIOS automatically configure this setting. This item is configurable only when **C-States Control** is set to **Enabled**. (Default: Auto)

  C3 State Support (Note)
Allows you to determine whether to let the CPU enter C3 mode in system halt state. When enabled, the CPU core frequency and voltage will be reduced during system halt state to decrease power consumption. The C3 state is a more enhanced power-saving state than C1. **Auto** lets the BIOS automatically configure this setting. This item is configurable only when **C-States Control** is set to **Enabled**. (Default: Auto)

  C6/C7 State Support
Allows you to determine whether to let the CPU enter C6/C7 mode in system halt state. When enabled, the CPU core frequency and voltage will be reduced during system halt state to decrease power consumption. The C6/C7 state is a more enhanced power-saving state than C3. **Auto** lets the BIOS automatically configure this setting. This item is configurable only when **C-States Control** is set to **Enabled**. (Default: Auto)

  C8 State Support (Note)
Allows you to determine whether to let the CPU enter C8 mode in system halt state. When enabled, the CPU core frequency and voltage will be reduced during system halt state to decrease power consumption. The C8 state is a more enhanced power-saving state than C6/C7. **Auto** lets the BIOS automatically configure this setting. This item is configurable only when **C-States Control** is set to **Enabled**. (Default: Auto)

  C10 State Support (Note)
Allows you to determine whether to let the CPU enter C10 mode in system halt state. When enabled, the CPU core frequency and voltage will be reduced during system halt state to decrease power consumption. The C10 state is a more enhanced power-saving state than C8. **Auto** lets the BIOS automatically configure this setting. This item is configurable only when **C-States Control** is set to **Enabled**. (Default: Auto)

  Package C State limit (Note)
Allows you to specify the C-state limit for the processor. **Auto** lets the BIOS automatically configure this setting. This item is configurable only when **C-States Control** is set to **Enabled**. (Default: Auto)

▼ **Turbo Power Limits**
Allows you to set a power limit for CPU Turbo mode. When the CPU power consumption exceeds the specified power limit, the CPU will automatically reduce the core frequency in order to reduce the power. **Auto** sets the power limit according to the CPU specifications. (Default: Auto)

  Power Limit TDP (Watts) / Power Limit Time
Allows you to set the power limit for CPU/platform/memory Turbo mode and how long it takes to operate at the specified power limit. **Auto** sets the power limit according to the CPU specifications. This item is configurable only when **Turbo Power Limits** is set to **Enabled**. (Default: Auto)

(Note)   This item is present only when you install a CPU that supports this feature. For more information about Intel® CPUs' unique features, please visit Intel's website.

◯ **Core Current Limit (Amps)**
Allows you to set a current limit for CPU Turbo mode. When the CPU current exceeds the specified current limit, the CPU will automatically reduce the core frequency in order to reduce the current. **Auto** sets the power limit according to the CPU specifications. This item is configurable only when **Turbo Power Limits** is set to **Enabled**. (Default: Auto)

▼ **Turbo Per Core Limit Control** (Note)
Allows you to control each CPU core limit separately. (Default: Auto)

◯ **Extreme Memory Profile (X.M.P.)** (Note)
Allows the BIOS to read the SPD data on XMP memory module(s) to enhance memory performance when enabled.
   ▶▶ Disabled   Disables this function. (Default)
   ▶▶ Profile1   Uses Profile 1 settings.
   ▶▶ Profile2 (Note)   Uses Profile 2 settings.

◯ **System Memory Multiplier**
Allows you to set the system memory multiplier. **Auto** sets memory multiplier according to memory SPD data. (Default: Auto)

◯ **Memory Ref Clock**
Allows you to manually adjust the memory reference clock. (Default: Auto)

◯ **Memory Odd Ratio (100/133 or 200/266)** (Note)
Enabled allows Qclk to run in odd frequency. (Default: Auto)

◯ **Gear Mode** (Note)
Allows you to improve the maximum OC frequency potential. (Default: Auto)

■ **Advanced Memory Settings**

◯ **Memory Multiplier Tweaker**
Provides different levels of memory auto-tuning. (Default: Auto)

(Note)   This item is present only when you install a CPU and a memory module that support this feature.

● **Channel Interleaving**
Enables or disables memory channel interleaving. **Enabled** allows the system to simultaneously access different channels of the memory to increase memory performance and stability. **Auto** lets the BIOS automatically configure this setting. (Default: Auto)

● **Rank Interleaving**
Enables or disables memory rank interleaving. **Enabled** allows the system to simultaneously access different ranks of the memory to increase memory performance and stability. **Auto** lets the BIOS automatically configure this setting. (Default: Auto)

● **Memory Boot Mode**
Provides memory detection and training methods.
▸ Auto   Lets the BIOS automatically configure this setting. (Default)
▸ Normal   The BIOS automatically performs memory training. Please note that if the system becomes unstable or unbootable, try to clear the CMOS values and reset the board to default values. (Refer to the introductions of the battery/clear CMOS jumper in Chapter 1 for how to clear the CMOS values.)
▸ Enable Fast Boot Skip memory detection and training in some specific criteria for faster memory boot.
▸ Disable Fast Boot Detect and train memory at every single boot.

● **Realtime Memory Timing**
Allows you to fine-tune memory timings after the BIOS stage. (Default: Auto)

● **Memory Enhancement Settings**
Provides several memory performance enhancement settings: Auto, Relax OC, Enhanced Stability, Normal (basic performance), Enhanced Performance, High Frequency, High Density, and DDR-4500+. (Default: Auto)

● **Memory Channel Detection Message**
Allows you to determine whether to show an alert message when the memory is not installed in the optimal memory channel. (Default: Enabled)

■ **SPD Info**
Displays information on the installed memory.

■ **Memory Channels Timings**

▼ **Channels Standard Timing Control, Channels Advanced Timing Control, Channels Misc Timing Control**
These sections provide memory timing settings. Note: Your system may become unstable or fail to boot after you make changes on the memory timings. If this occurs, please reset the board to default values by loading optimized defaults or clearing the CMOS values.

● **Vcore Volatge Mode/CPU Vcore/Dynamic Vcore(DVID)/BCLK Adaptive Voltage/CPU Graphics Voltage (VAXG)/DRAM Voltage (CH A/B)/CPU VCCIO/CPU VCCIO2/CPU System Agent Voltage/VCC Substained/VCCPLL OC/VCCVTT/ VCC STG/ VCC18 PCH/VCC1V8P**
These items allow you to adjust the CPU Vcore and memory voltages.

■ **Advanced Voltage Settings**

This submenu allows you to configure Load-Line Calibration level, over-voltage protection level, and over-current protection level.

2-6 Settings
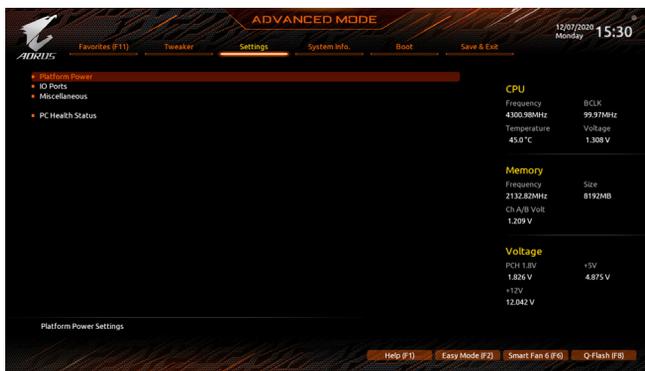
■ **Platform Power**

⟜ **Platform Power Management**
Enables or disables the Active State Power Management function (ASPM). (Default: Disabled)

⟜ **PEG ASPM**
Allows you to configure the ASPM mode for the device connected to the CPU PEG bus. This item is configurable only when **Platform Power Management** is set to **Enabled**. (Default: Disabled)

⟜ **PCH ASPM**
Allows you to configure the ASPM mode for the device connected to Chipset's PCI Express bus. This item is configurable only when **Platform Power Management** is set to **Enabled**. (Default: Disabled)

⟜ **DMI ASPM**
Allows you to configure the ASPM mode for both CPU side and Chipset side of the DMI link. This item is configurable only when **Platform Power Management** is set to **Enabled**. (Default: Disabled)

⟜ **S3 Save Mode**
Allows you to determine whether to let the system enter power-saving mode in system S3 state. (Default: Disabled)

ErP
   Determines whether to let the system consume least power in S5 (shutdown) state. (Default: Disabled)
   Note: When this item is set to **Enabled**, the Resume by Alarm function becomes unavailable.

 Soft-Off by PWR-BTTN
   Configures the way to turn off the computer in MS-DOS mode using the power button.
   ▶▶ Instant-Off   Press the power button and then the system will be turned off instantly. (Default)
   ▶▶ Delay 4 Sec.   Press and hold the power button for 4 seconds to turn off the system. If the power
                       button is pressed for less than 4 seconds, the system will enter suspend mode.

 Resume by Alarm
   Determines whether to power on the system at a desired time. (Default: Disabled)
   If enabled, set the date and time as following:
   ▶▶ Wake up day: Turn on the system at a specific time on each day or on a specific day in a month.
   ▶▶ Wake up hour/minute/second: Set the time at which the system will be powered on automatically.
   Note: When using this function, avoid inadequate shutdown from the operating system or removal of the
   AC power, or the settings may not be effective.

 Power Loading
   Enables or disables dummy load. When the power supply is at low load, a self-protection will activate causing
   it to shutdown or fail. If this occurs, please set to **Enabled**. **Auto** lets the BIOS automatically configure this
   setting. (Default: Auto)

 RC6(Render Standby)
   Allows you to determine whether to let the onboard graphics enter standby mode to decrease power
   consumption. (Default: Enabled)

 AC BACK
   Determines the state of the system after the return of power from an AC power loss.
   ▶▶ Memory   The system returns to its last known awake state upon the return of the AC power.
   ▶▶ Always On   The system is turned on upon the return of the AC power.
   ▶▶ Always Off   The system stays off upon the return of the AC power. (Default)

■ **IO Ports**
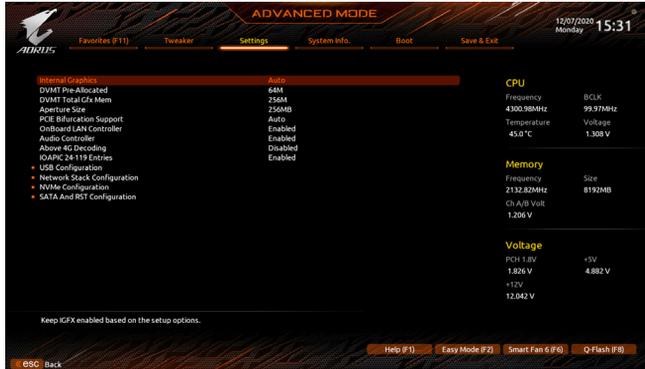
∟ **Initial Display Output**
Specifies the first initiation of the monitor display from the installed PCI Express graphics card or the onboard graphics.
- ▶ IGFX (Note)   Sets the onboard graphics as the first display.
- ▶ PCIe 1 Slot   Sets the graphics card on the PCIEX16 slot as the first display. (Default)
- ▶ PCIe 2 Slot   Sets the graphics card on the PCIEX8 slot as the first display.
- ▶ PCIe 3 Slot   Sets the graphics card on the PCIEX4 slot as the first display.

This item is configurable only when **CSM Support** is set to **Enabled**.

∟ **Internal Graphics**
Enables or disables the onboard graphics function. (Default: Auto)

∟ **DVMT Pre-Allocated**
Allows you to set the onboard graphics memory size. (Default: 64M)

∟ **DVMT Total Gfx Mem**
Allows you to allocate the DVMT memory size of the onboard graphics. Options are: 128M, 256M, MAX. (Default: 256M)

∟ **Aperture Size**
Allows you to set the maximum amount of system memory that can be allocated to the graphics card. Options are: 128MB, 256MB, 512MB, 1024MB, and 2048MB. (Default: 256MB)

∟ **PCIE Bifurcation Support**
Allows you to determine how the bandwidth of the PCIEX16 slot is divided. Options: Auto, PCIE x8/x8, PCIE x8/x4/x4. (Default: Auto)

∟ **OnBoard LAN Controller**
Enables or disables the onboard LAN function. (Default: Enabled)
If you wish to install a 3rd party add-in network card instead of using the onboard LAN, set this item to **Disabled**.

∟ **Audio Controller**
Enables or disables the onboard audio function. (Default: Enabled)
If you wish to install a 3rd party add-in audio card instead of using the onboard audio, set this item to **Disabled**.

(Note)   This item is present only when you install a CPU that supports this feature.

- **Above 4G Decoding**
  Enables or disables 64-bit capable devices to be decoded in above 4 GB address space (only if your system supports 64-bit PCI decoding). Set to **Enabled** if more than one advanced graphics card are installed and their drivers are not able to be launched when entering the operating system (because of the limited 4 GB memory address space). (Default: Disabled)

- **IOAPIC 24-119 Entries**
  Enables or disables this function. (Default: Enabled)

■ **APP Center Download & Install Configuration**

- **APP Center Download & Install**
  Allows you to determine whether to automatically download and install GIGABYTE APP Center after entering the operating system. Before installing APP Center, make sure the system is connected to the Internet. (Default: Enabled)

■ **USB Configuration**

- **Legacy USB Support**
  Allows USB keyboard/mouse to be used in MS-DOS. (Default: Enabled)

- **XHCI Hand-off**
  Determines whether to enable XHCI Hand-off feature for an operating system without XHCI Hand-off support. (Default: Enabled)

- **USB Mass Storage Driver Support**
  Enables or disables support for USB storage devices. (Default: Enabled)

- **Mass Storage Devices**
  Displays a list of connected USB mass storage devices. This item appears only when a USB storage device is installed.

■ **Network Stack Configuration**

- **Network Stack**
  Disables or enables booting from the network to install a GPT format OS, such as installing the OS from the Windows Deployment Services server. (Default: Disabled)

- **IPv4 PXE Support**
  Enables or disables IPv4 PXE Support. This item is configurable only when **Network Stack** is enabled.

- **IPv4 HTTP Support**
  Enables or disables HTTP boot support for IPv4. This item is configurable only when **Network Stack** is enabled.

- **IPv6 PXE Support**
  Enables or disables IPv6 PXE Support. This item is configurable only when **Network Stack** is enabled.

- **IPv6 HTTP Support**
  Enables or disables HTTP boot support for IPv6. This item is configurable only when **Network Stack** is enabled.

- **PXE boot wait time**
  Allows you to configure how long to wait before you can press <Esc> to abort the PXE boot. This item is configurable only when **Network Stack** is enabled. (Default: 0)

- **Media detect count**
  Allows you to set the number of times to check the presence of media. This item is configurable only when **Network Stack** is enabled. (Default: 1)

- ■ **NVMe Configuration**
  Displays information on your M.2 NVME PCIe SSD if installed.

- ■ **SATA And RST Configuration**
- **SATA Controller(s)**
  Enables or disables the integrated SATA controllers. (Default: Enabled)
- **SATA Mode Selection**
  Enables or disables RAID for the SATA controllers integrated in the Chipset or configures the SATA controllers to AHCI mode.
  ▶ Intel RST Premium With Intel Optane System Acceleration   Enables RAID for the SATA controller.
  ▶ AHCI   Configures the SATA controllers to AHCI mode. Advanced Host Controller Interface (AHCI) is an interface specification that allows the storage driver to enable advanced Serial ATA features such as Native Command Queuing and hot plug. (Default)
- **Aggressive LPM Support**
  Enables or disables the power saving feature, ALPM (Aggressive Link Power Management), for the Chipset SATA controllers. (Default: Disabled)
- **Port 0/1/2/3/4/5**
  Enables or disables each SATA port. (Default: Enabled)
- **SATA Port 0/1/2/3/4/5 DevSlp**
  Allows you to determine whether to let the connected SATA device go into sleep mode. (Default: Disabled)
- **Hot plug**
  Enables or disable the hot plug capability for each SATA port. (Default: Disabled)
- **Configured as eSATA**
  Enables or disables support for external SATA devices.

■ **Miscellaneous**

 LEDs in System Power On State
Allows you to enable or disable motherboard LED lighting when the system is on.
 Off Disables the selected lighting mode when the system is on.
 On Enables the selected lighting mode when the system is on. (Default)

 LEDs in Sleep, Hibernation, and Soft Off States
Allows you to set the lighting mode of the motherboard LEDs in system S3/S4/S5 state.
This item is configurable when **LEDs in System Power On State** is set to **On**.
 Off Disables the selected lighting mode when the system enters S3/S4/S5 state. (Default)
 On Enables the selected lighting mode when the system enters S3/S4/S5 state.

 RST_SW (MULTIKEY) (Functionality of the RST_SW Button)
 Set this button to HW Reset Use the button to reset your system. (Default)
 Set this button to Switch LED On/Off Use the button to turn on/off the motherboard LEDs.
 Set this button to Enter BIOS Setup Use the button to enter the BIOS Setup.
 Set this button to Boot on Safe Mode Use the button to boot the system in safe mode.

 Onboard DB Port LED
Allows you to enable or disable the LED lighting of the motherboard debug LEDs when the system is on.
(Default: On)

 Intel Platform Trust Technology (PTT)
Enables or disables Intel® PTT Technology. (Default: Disabled)

 3DMark01 Enhancement
Allows you to determine whether to enhance some legacy benchmark performance. (Default: Disabled)

 CPU PCIe Link Speed
Allows you to set the operation mode of the CPU-controlled PCI Express slots to Gen 1, Gen 2, Gen 3, or
Gen 4 (Note). Actual operation mode is subject to the hardware specification of each slot. **Auto** lets the BIOS
automatically configure this setting. (Default: Auto)

 PCH PCIe Link Speed
Allows you to set the operation mode of the Chipset-controlled PCI Express slots to Gen 1, Gen 2, or
Gen 3. Actual operation mode is subject to the hardware specification of each slot. **Auto** lets the BIOS
automatically configure this setting. (Default: Auto)

(Note) This item is present only when you install a CPU that supports this feature.

☞ **VT-d**
  Enables or disables Intel® Virtualization Technology for Directed I/O. (Default: Enabled)

▪ **Trusted Computing**
  Enables or disables Trusted Platform Module (TPM).

▪ **PC Health Status**
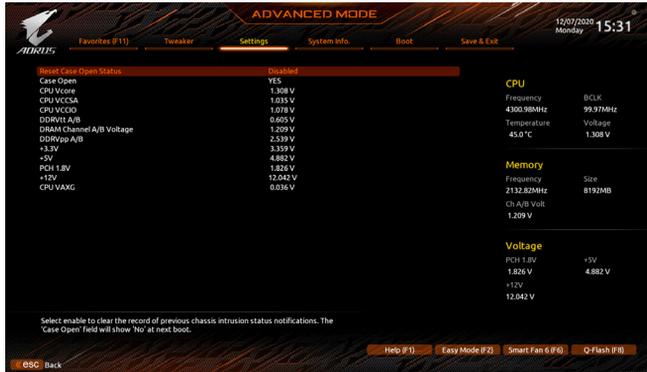
☞ **Reset Case Open Status**
  ▶▶ Disabled   Keeps or clears the record of previous chassis intrusion status. (Default)
  ▶▶ Enabled   Clears the record of previous chassis intrusion status and the **Case Open** field will show "No" at next boot.

☞ **Case Open**
  Displays the detection status of the chassis intrusion detection device attached to the motherboard CI header. If the system chassis cover is removed, this field will show "Yes", otherwise it will show "No". To clear the chassis intrusion status record, set **Reset Case Open Status** to **Enabled**, save the settings to the CMOS, and then restart your system.

☞ **CPU Vcore/CPU VCCSA/CPU VCCIO/DDRVtt A/B/DRAM Channel A/B Voltage/DDRVpp A/B/+3.3V/+5V/PCH 1.8V/+12V/CPU VAXG**
  Displays the current system voltages.

2-7   System Info.
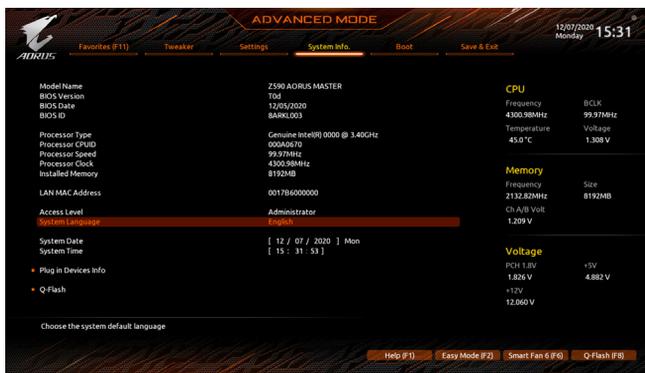
This section provides information on your motherboard model and BIOS version. You can also select the default language used by the BIOS and manually set the system time.

☞ **Access Level**
Displays the current access level depending on the type of password protection used. (If no password is set, the default will display as **Administrator**.) The Administrator level allows you to make changes to all BIOS settings; the User level only allows you to make changes to certain BIOS settings but not all.

☞ **System Language**
Selects the default language used by the BIOS.

☞ **System Date**
Sets the system date. The date format is week (read-only), month, date, and year. Use <Enter> to switch between the Month, Date, and Year fields and use the <Page Up> or <Page Down> key to set the desired value.

☞ **System Time**
Sets the system time. The time format is hour, minute, and second. For example, 1 p.m. is 13:00:00. Use <Enter> to switch between the Hour, Minute, and Second fields and use the <Page Up> or <Page Down> key to set the desired value.

■ **Plug in Devices Info**
Displays information on your PCI Express and M.2 devices if installed.

■ **Q-Flash**
Allows you to access the Q-Flash utility to update the BIOS or back up the current BIOS configuration.

2-8 Boot
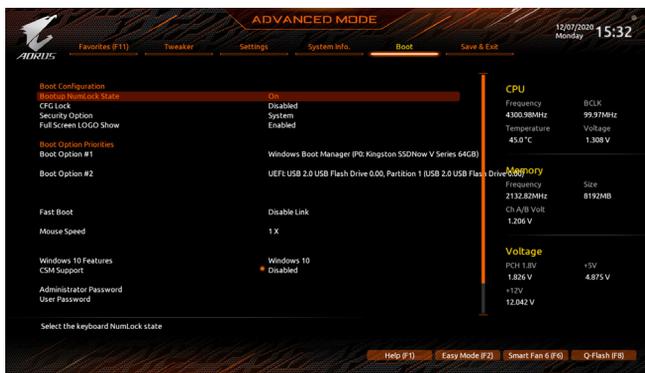
   Bootup NumLock State
Enables or disables Numlock feature on the numeric keypad of the keyboard after the POST. (Default: On)

   CFG Lock
Enables or disables the MSR 0xE2 function. (Default: Disabled)

   Security Option
Specifies whether a password is required every time the system boots, or only when you enter BIOS Setup.
After configuring this item, set the password(s) under the **Administrator Password/User Password** item.
    Setup   A password is only required for entering the BIOS Setup program.
    System   A password is required for booting the system and for entering the BIOS Setup program. (Default)

   Full Screen LOGO Show
Allows you to determine whether to display the GIGABYTE Logo at system startup. **Disabled** skips the GIGABYTE Logo when the system starts up. (Default: Enabled)

   Boot Option Priorities
Specifies the overall boot order from the available devices. Removable storage devices that support GPT format will be prefixed with "UEFI:" string on the boot device list. To boot from an operating system that supports GPT partitioning, select the device prefixed with "UEFI:" string.
Or if you want to install an operating system that supports GPT partitioning such as Windows 10 64-bit, select the optical drive that contains the Windows 10 64-bit installation disc and is prefixed with "UEFI:" string.

   Fast Boot
Enables or disables Fast Boot to shorten the OS boot process. **Ultra Fast** provides the fastest bootup speed. (Default: Disable Link)

   SATA Support
    Last Boot SATA Devices Only   Except for the previous boot drive, all SATA devices are disabled before the OS boot process completes. (Default)
    All SATA Devices   All SATA devices are functional in the operating system and during the POST.
This item is configurable only when **Fast Boot** is set to **Enabled** or **Ultra Fast**.

VGA Support

Allows you to select which type of operating system to boot.

▶▶ Auto   Enables legacy option ROM only.

▶▶ EFI Driver   Enables EFI option ROM. (Default)

This item is configurable only when **Fast Boot** is set to **Enabled** or **Ultra Fast**.

 USB Support

▶▶ Disable Link   All USB devices are disabled before the OS boot process completes.

▶▶ Full Initial   All USB devices are functional in the operating system and during the POST. (Default)

▶▶ Partial Initial   Part of the USB devices are disabled before the OS boot process completes.

This item is configurable only when **Fast Boot** is set to **Enabled** or **Ultra Fast**. This function is disabled when **Fast Boot** is set to **Ultra Fast**.

 NetWork Stack Driver Support

▶▶ Disable Link   Disables booting from the network. (Default)

▶▶ Enabled   Enables booting from the network.

This item is configurable only when **Fast Boot** is set to **Enabled** or **Ultra Fast**.

 Next Boot After AC Power Loss

▶▶ Normal Boot   Enables normal bootup upon the return of the AC power. (Default)

▶▶ Fast Boot   Keeps the Fast Boot settings upon the return of the AC power.

This item is configurable only when **Fast Boot** is set to **Enabled** or **Ultra Fast**.

 Mouse Speed

Allows you to set the mouse cursor movement speed. (Default: 1 X)

 Windows 10 Features

Allows you to select the operating system to be installed. (Default: Windows 10)

 CSM Support

Enables or disables UEFI CSM (Compatibility Support Module) to support a legacy PC boot process.

▶▶ Disabled   Disables UEFI CSM and supports UEFI BIOS boot process only. (Default)

▶▶ Enabled   Enables UEFI CSM.

 LAN PXE Boot Option ROM

Allows you to select whether to enable the legacy option ROM for the LAN controller. (Default: Disabled)

This item is configurable only when **CSM Support** is set to **Enabled**.

 Storage Boot Option Control

Allows you to select whether to enable the UEFI or legacy option ROM for the storage device controller.

▶▶ Do not launch   Disables option ROM.

▶▶ UEFI   Enables UEFI option ROM only.

▶▶ Legacy   Enables legacy option ROM only. (Default)

This item is configurable only when **CSM Support** is set to **Enabled**.

⍜ **Other PCI devices**
　Allows you to select whether to enable the UEFI or Legacy option ROM for the PCI device controller other than the LAN, storage device, and graphics controllers.
　▶Do not launch　　　Disables option ROM.
　▶UEFI　　　　　　Enables UEFI option ROM only. (Default)
　▶Legacy　　　　　　Enables legacy option ROM only.
　This item is configurable only when **CSM Support** is set to **Enabled**.

⍜ **Administrator Password**
　Allows you to configure an administrator password. Press <Enter> on this item, type the password, and then press <Enter>. You will be requested to confirm the password. Type the password again and press <Enter>. You must enter the administrator password (or user password) at system startup and when entering BIOS Setup. Differing from the user password, the administrator password allows you to make changes to all BIOS settings.

⍜ **User Password**
　Allows you to configure a user password. Press <Enter> on this item, type the password, and then press <Enter>. You will be requested to confirm the password. Type the password again and press <Enter>. You must enter the administrator password (or user password) at system startup and when entering BIOS Setup. However, the user password only allows you to make changes to certain BIOS settings but not all. To cancel the password, press <Enter> on the password item and when requested for the password, enter the correct one first. When prompted for a new password, press <Enter> without entering any password. Press <Enter> again when prompted to confirm.
　NOTE: Before setting the User Password, be sure to set the Administrator Password first.

■ **Secure Boot**
　Allows you to enable or disable Secure Boot and configure related settings. This item is configurable only when **CSM Support** is set to **Disabled**.

⍜ **Preferred Operating Mode**
　Allows you to select whether to enter Easy mode or Advanced mode after entering BIOS Setup. **Auto** enters the BIOS mode where it was last time. (Default: Auto)

2-9 Save & Exit
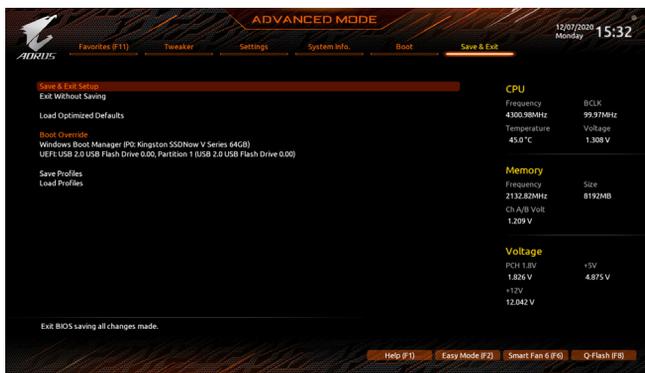
⟳ **Save & Exit Setup**
Press <Enter> on this item and select **Yes**. This saves the changes to the CMOS and exits the BIOS Setup program. Select **No** or press <Esc> to return to the BIOS Setup Main Menu.

⟳ **Exit Without Saving**
Press <Enter> on this item and select **Yes**. This exits the BIOS Setup without saving the changes made in BIOS Setup to the CMOS. Select **No** or press <Esc> to return to the BIOS Setup Main Menu.

⟳ **Load Optimized Defaults**
Press <Enter> on this item and select **Yes** to load the optimal BIOS default settings. The BIOS defaults settings help the system to operate in optimum state. Always load the Optimized defaults after updating the BIOS or after clearing the CMOS values.

⟳ **Boot Override**
Allows you to select a device to boot immediately. Press <Enter> on the device you select and select **Yes** to confirm. Your system will restart automatically and boot from that device.

⟳ **Save Profiles**
This function allows you to save the current BIOS settings to a profile. You can create up to 8 profiles and save as Setup Profile 1~ Setup Profile 8. Press <Enter> to complete. Or you can select **Select File in HDD/FDD/USB** to save the profile to your storage device.

⟳ **Load Profiles**
If your system becomes unstable and you have loaded the BIOS default settings, you can use this function to load the BIOS settings from a profile created before, without the hassles of reconfiguring the BIOS settings. First select the profile you wish to load and then press <Enter> to complete. You can select **Select File in HDD/FDD/USB** to input the profile previously created from your storage device or load the profile automatically created by the BIOS, such as reverting the BIOS settings to the last settings that worked properly (last known good record).

Chapter 3   Configuring a RAID Set

RAID Levels

	RAID 0	RAID 1	RAID 5	RAID 10
Minimum Number of Hard Drives	≥2	2	≥3	4
Array Capacity	Number of hard drives * Size of the smallest drive	Size of the smallest drive	(Number of hard drives -1) * Size of the smallest drive	(Number of hard drives/2) * Size of the smallest drive
Fault Tolerance	No	Yes	Yes	Yes

To create a RAID set, follow the steps below:
  A.   Install SATA hard drive(s) or SSDs in your computer.
  B.   Configure SATA controller mode in BIOS Setup.
  C.   Configure a RAID array in RAID BIOS. (Note 1)
  D.   Install the RAID driver and operating system.

Before you begin, please prepare the following items:
  •   At least two SATA hard drives or SSDs (Note 2) (to ensure optimal performance, it is recommended that you use two hard drives with identical model and capacity). (Note 3)
  •   A Windows setup disc.
  •   A USB thumb drive.

3-1   Configuring SATA Controllers

A. Installing hard drives
Install the hard drives/SSDs in the Intel® Chipset controlled connectors on the motherboard. Then connect the power connectors from your power supply to the hard drives.

(Note 1)   Skip this step if you do not want to create RAID array on the SATA controller.
(Note 2)   An M.2 PCIe SSD cannot be used to set up a RAID set either with an M.2 SATA SSD or a SATA hard drive.
(Note 3) Refer to "Internal Connectors" for the installation notices for the M.2 and SATA connectors.

B. Configuring SATA controller mode in BIOS Setup

Make sure to configure the SATA controller mode correctly in system BIOS Setup.

Step:

Turn on your computer and press <Delete> to enter BIOS Setup during the POST (Power-On Self-Test). Go to **Settings\IO Ports\SATA And RST Configuration**, make sure **SATA Controller(s)** is enabled. To create RAID, set **SATA Mode Selection** to **Intel RST Premium With Intel Optane System Acceleration**. Then save the settings and restart your computer (Figure 1). Note: When using a PCIe SSD, make sure to set the **RST Control PCIe Storage Devices** item under **Settings\IO Ports\SATA And RST Configuration** to **Manual**. Then depending the M.2 connector you use, set the corresponding **PCIe Storage Dev on Port XX** item to **RST Controlled**. Finally, save the settings and exit BIOS Setup.
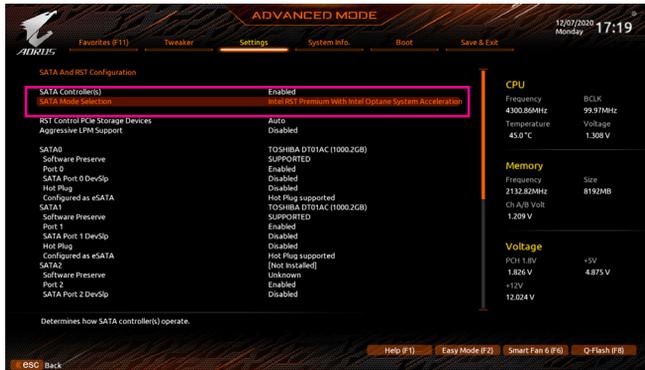
Figure 1

C. UEFI RAID Configuration

Step 1:

After the system reboot, enter BIOS Setup again. Then enter the **Settings\IO Ports\Intel(R) Rapid Storage Technology** sub-menu (Figure 2).
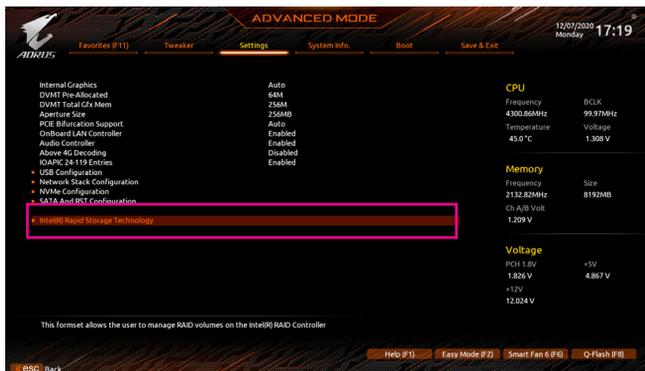
Figure 2

The BIOS Setup menus described in this section may differ from the exact settings for your motherboard. The actual BIOS Setup menu options you will see shall depend on the motherboard you have and the BIOS version.

Step 2:
On the **Intel(R) Rapid Storage Technology** menu, press <Enter> on **Create RAID Volume** to enter the **Create RAID Volume** screen. Enter a volume name with 1~16 letters (letters cannot be special characters) under the **Name** item and press <Enter>. Then, select a RAID level (Figure 3). RAID levels supported include RAID 0, RAID 1, RAID 10, and RAID 5 (the selections available depend on the number of the hard drives being installed). Next, use the down arrow key to move to **Select Disks**.
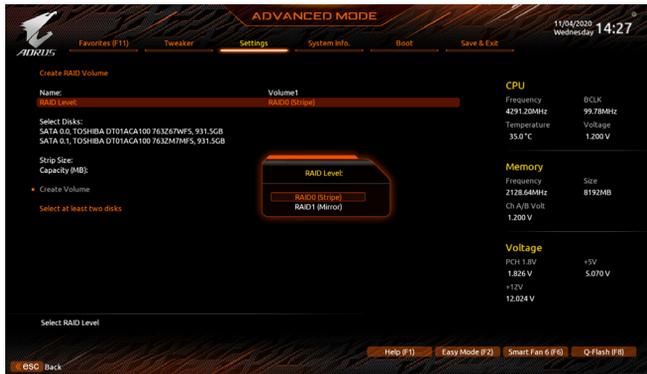
Figure 3

Step 3:
Under **Select Disks** item, select the hard drives to be included in the RAID array. Press the <Space> key on the hard drives to be selected (selected hard drives are marked with "X"). Then set the stripe block size (Figure 4). The stripe block size can be set from 4 KB to 128 KB. Once you have selected the stripe block size, set the volume capacity.
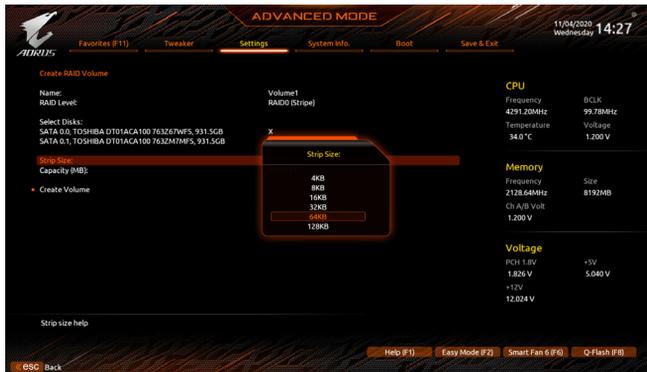
Figure 4

Step 4:
After setting the capacity, move to **Create Volume** and press <Enter> to begin. (Figure 5)
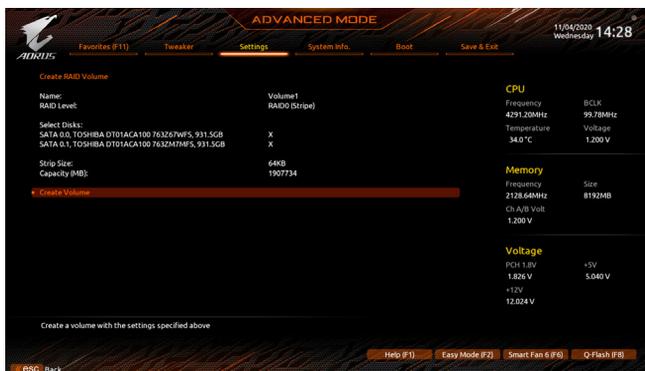
Figure 5

After completing, you'll be brought back to the **Intel(R) Rapid Storage Technology** screen. Under **RAID Volumes** you can see the new RAID volume. To see more detailed information, press <Enter> on the volume to check for information on RAID level, stripe block size, array name, and array capacity, etc. (Figure 6)
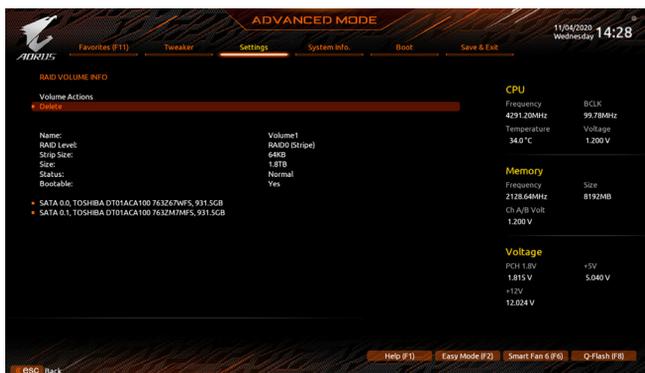
Figure 6

Delete RAID Volume

To delete a RAID array, press <Enter> on the volume to be deleted on the **Intel(R) Rapid Storage Technology** screen. After entering the **RAID VOLUME INFO** screen, press <Enter> on **Delete** to enter the **Delete** screen. Press <Enter> on **Yes** (Figure 7).

Figure 7

Configuring a RAID Set
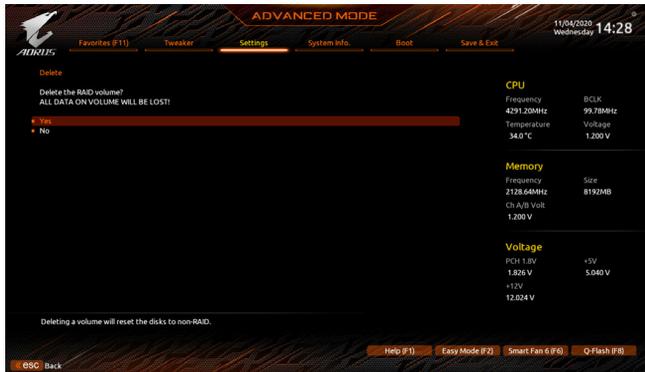
3-2 Installing the RAID Driver and Operating System

With the correct BIOS settings, you are ready to install the operating system.

As some operating systems already include RAID driver, you do not need to install separate RAID driver during the Windows installation process. After the operating system is installed, we recommend that you install all required drivers from the GIGABYTE APP Center to ensure system performance and compatibility. If the operating system to be installed requires that you provide additional RAID driver during the OS installation process, please refer to the steps below:

Step 1:
Go to GIGABYTE's website, browse to the motherboard model's web page, download the **Intel SATA Preinstall driver** file on the **Support\Download\SATA RAID/AHCI** page, unzip the file and copy the files to your USB thumb drive.

Step 2:
Boot from the Windows setup disc and perform standard OS installation steps. When the screen requesting you to load the driver appears, select **Browse**.

Step 3:
Then browse to the USB flash drive and select the location of the driver. Select **Intel(R) Chipset SATA/PCIe RST Premium Controller** and click **Next** to load the driver and continue the OS installation. (Figure 1)
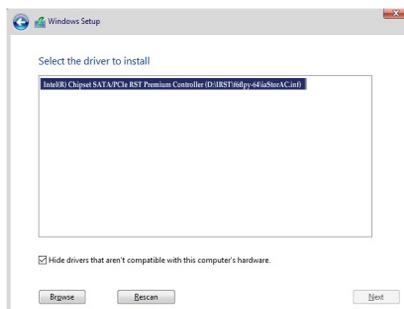
Figure 1

3-3   Installing Intel® Optane™ Memory and Storage Management

Steps:

After entering the operating system, make sure your Internet connection works properly and launch the GIGABYTE APP Center. On the "Not Installed\New Drivers" screen, select **Intel Rapid Storage Technology driver** to install. Follow the on-screen instructions to continue. When completed, restart the system.

A. Enabling an Intel® Optane™ Memory

A-1. System Requirements

1. Intel® Optane™ memory
2. The Optane™ memory must have at least 16 GB capacity, and it must have equal or smaller capacity than the hard drive/SSD to be accelerated.
3. The Optane™ memory cannot be used to accelerate an existing RAID array; the accelerated hard drive/SSD cannot be included in a RAID array.
4. The hard drive/SSD to be accelerated must be a SATA hard drive or M.2 SATA SSD.
5. The hard drive/SSD to be accelerated can be a system drive or data drive. The system drive must be GPT formatted and have Windows 10 64-bit (or later version) installed on it. The data drive must also be GPT formatted.
6. The SATA controller must set in Intel RST Premium With Intel Optane System Acceleration mode.

A-2. Installation Guidelines
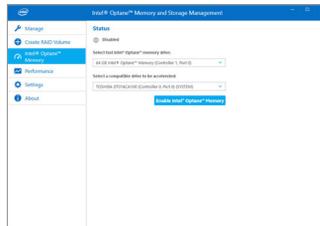
Step 1:

Go to **Settings\IO Ports\SATA And RST Configuration** and make sure **RST Control PCIe Storage Devices** is set to **Manual**. Then depending on which M.2 connector you install the Optane™ memory in, set the corresponding **PCIe Storage Dev on Port XX** item to **RST Controlled**.

Step 2:

After re-entering the operating system, launch the **Intel® Optane™ Memory and Storage Management** application from the Start menu. If you install more than one Optane™ memory, please select which one you are going to use. Then select which drive to be accelerated. Click **Enable Intel® Optane™ Memory**. All data on the Optane™ memory will be erased. Make sure you back up the data before continuing. Follow the on-screen instructions to proceed. When completed, restart the system.
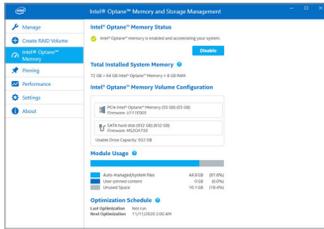
Step 3:
Launch the **Intel® Optane™ Memory and Storage Management** application from the Start menu and make sure the Intel® Optane™ Memory has been enabled.
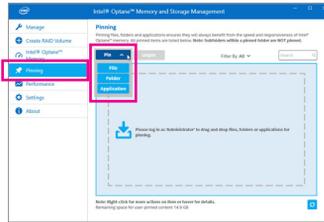
Step 4:
If you want to accelerate the system drive, you can select specific folders, files, or applications to accelerate using the **Intel® Optane™ Memory Pinning** function. (The Optane™ memory used must have at least 32 GB capacity.)

> • An Optane™ memory cannot be used to accelerate an M.2 PCIe SSD.
> • If more than one Optane™ memory is installed, you can select only one of them to accelerate your SATA-based boot drive. The other(s) can only be used as data drive(s).
> • Do not abruptly remove the Optane™ memory. Doing so will cause the operating system to stop functioning correctly.
> • If you want to change/remove the Optane™ memory, you must disable it using the **Intel® Optane™ Memory and Storage Management** application first.
> • After enabling the Optane™ memory, the related BIOS settings will remain even after a BIOS update.

B. Rebuilding an Array

Rebuilding is the process of restoring data to a hard drive from other drives in the array. Rebuilding applies only to fault-tolerant arrays such as RAID 1, RAID 5 or RAID 10 arrays. The procedures below assume a new drive is added to replace a failed drive to rebuild a RAID 1 array. (Note: The new drive must have equal or greater capacity than the old one.)

Turn off your computer and replace the failed hard drive with a new one. Restart your computer.

While in the operating system, launch the Intel® Optane™ Memory and Storage Management utility from the Start menu.
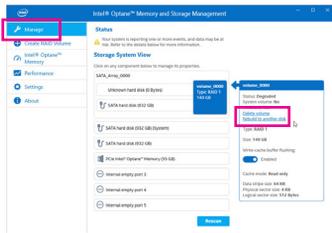
Step 1:
Go to the **Manage** menu and click **Rebuild to another disk** in **Manage Volume**.
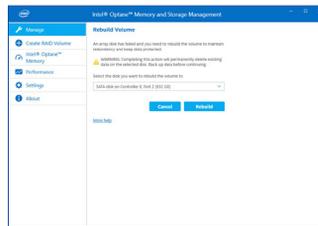
Step 2:
Select a new drive to rebuild the RAID and click **Rebuild**.
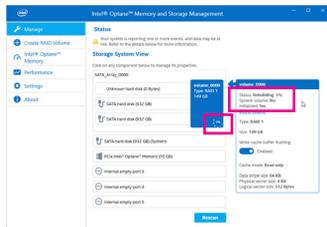
The **Status** item on the right of the screen displays the rebuild progress. After the RAID 1 volume rebuilding, the **Status** will display as **Normal**.

Chapter 4   Drivers Installation

After you install the operating system, a dialog box will appear on the bottom-right corner of the desktop asking if you want to download and install the drivers and GIGABYTE applications via APP Center. Click **Install** to proceed with the installation. (In BIOS Setup, make sure **Settings\IO Ports\APP Center Download & Install Configuration\APP Center Download & Install** is set to **Enabled**.)

When the End User License Agreement dialog box appears, press <Accept> to install APP Center. On the APP Center screen, select the drivers and applications you want to install and click **Install**.

Before the installation, make sure the system is connected to the Internet.

Chapter 5   Unique Features

5-1   BIOS Update Utilities

GIGABYTE motherboards provide two unique BIOS update tools, Q-Flash™ and @BIOS™. GIGABYTE Q-Flash and @BIOS are easy-to-use and allow you to update the BIOS without the need to enter MS-DOS mode. Additionally, this motherboard features the DualBIOS™ design and supports Q-Flash Plus, providing multiple protection for the safety and stability of your computer.

What is DualBIOS™?
Motherboards that support DualBIOS have two BIOS onboard, a main BIOS and a backup BIOS. Normally, the system works on the main BIOS. However, if the main BIOS is corrupted or damaged, the backup BIOS will take over on the next system boot to ensure normal system operation.

What is Q-Flash Plus?
Q-Flash Plus allows you to update the BIOS when your system is off (S5 shutdown state). Save the latest BIOS on a USB thumb drive and plug it into the dedicated port, and then you can now flash the BIOS automatically by simply pressing the Q-Flash Plus button.

What is Q-Flash™?
With Q-Flash you can update the system BIOS without having to enter operating systems like MS-DOS or Window first. Embedded in the BIOS, the Q-Flash tool frees you from the hassles of going through complicated BIOS flashing process.

What is @BIOS™?
@BIOS allows you to update the system BIOS while in the Windows environment. @BIOS will download the latest BIOS file from the nearest @BIOS server site and update the BIOS.

5-1-1   Updating the BIOS with the Q-Flash Utility

A. Before You Begin
1. From GIGABYTE's website, download the latest compressed BIOS update file that matches your motherboard model.
2. Extract the file and save the new BIOS file (e.g. Z590AORUSMASTER.F1) to your USB flash drive, or hard drive. Note: The USB flash drive or hard drive must use FAT32/16/12 file system.
3. Restart the system. During the POST, press the <End> key to enter Q-Flash. Note: You can access Q-Flash by either pressing the <End> key during the POST or click the **Q-Flash** icon (or press the <F8> key) in BIOS Setup. However, if the BIOS update file is saved to a hard drive in RAID/AHCI mode or a hard drive attached to an independent SATA controller, use the <End> key during the POST to access Q-Flash.

⚠ Because BIOS flashing is potentially risky, please do it with caution. Inadequate BIOS flashing may result in system malfunction.
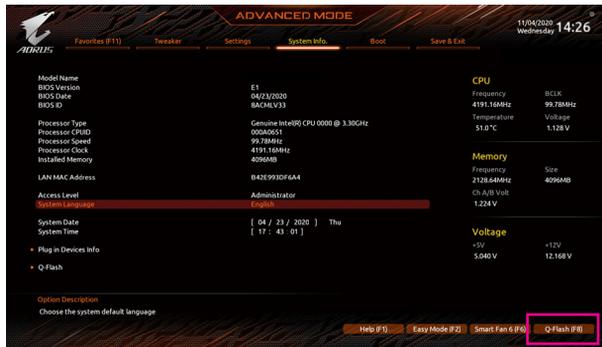
Click **Q-Flash (F8)** or select the Q-Flash item on the System Info menu to access Q-Flash.

B. Updating the BIOS

In the main menu of Q-Flash, use the keyboard or mouse to select an item to execute. When updating the BIOS, choose the location where the BIOS file is saved. The following procedure assumes that you have saved the BIOS file to a USB flash drive.

Step 1:
1. Insert the USB flash drive containing the BIOS file into the computer. In the main screen of Q-Flash, select **Update BIOS**.

- The **Save BIOS** option allows you to save the current BIOS file.
- Q-Flash only supports USB flash drive or hard drives using FAT32/16/12 file system.
- If the BIOS update file is saved to a hard drive in RAID/AHCI mode or a hard drive attached to an independent SATA controller, use the <End> key during the POST to access Q-Flash.

2. Select the BIOS update file.

⚠️ **Make sure the BIOS update file matches your motherboard model.**

Step 2:
The screen will show that the BIOS file is being read from your USB flash drive. Please select **Fast** or **Intact** to begin the BIOS update. The screen will then display the update process.

⚠ • **Do not turn off or restart the system when the system is reading/updating the BIOS.**
• **Do not remove the USB flash drive or hard drive when the system is updating the BIOS.**

Step 3:
The system will restart after the update process is complete.

Step 4:
During the POST, press <Delete> to enter BIOS Setup. Select **Load Optimized Defaults** on the **Save & Exit** screen and press <Enter> to load BIOS defaults. System will re-detect all peripheral devices after a BIOS update, so we recommend that you reload BIOS defaults.
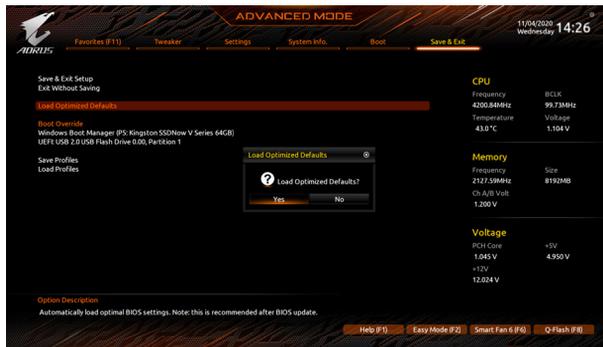
Select **Yes** to load BIOS defaults

Step 5:
Select **Save & Exit Setup** and press <Enter>. And then select **Yes** to save settings to CMOS and exit BIOS Setup. The procedure is complete after the system restarts.

5-1-2   Updating the BIOS with the @BIOS Utility

A. Before You Begin
1. In Windows, close all applications and TSR (Terminate and Stay Resident) programs. This helps prevent unexpected failures when performing a BIOS update.
2. If the BIOS is being updated via the Internet, ensure the Internet connection is stable and do NOT interrupt the Internet connection (for example, avoid a power loss or switching off the Internet). Failure to do so may result in a corrupted BIOS or a system that is unable to start.
3. GIGABYTE product warranty does not cover any BIOS damage or system failure resulting from an inadequate BIOS flashing.

@BIOS

| Bios Information | Update from Server | Update from File | Save to File | Face Wizard |

Flash Memory Type
MXIC 25L/U Series

Flash Memory Size
256M bits

Current BIOS version

BIOS Vendor
AMI UEFI BIOS
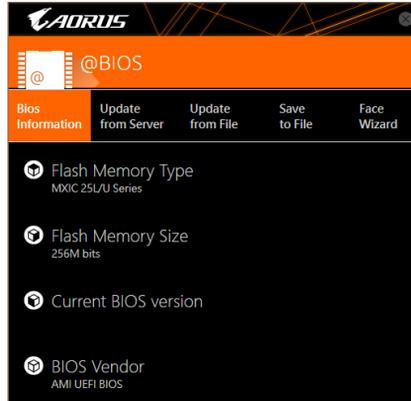
B. Using @BIOS
1. Update the BIOS Using the Internet Update Function:

Update from Server

Click **Update from Server**, select the @BIOS server site closest to your location and then download the BIOS file that matches your motherboard model. Follow the on-screen instructions to complete.

If the BIOS update file for your motherboard is not present on the @BIOS server site, please manually download the BIOS update file from GIGABYTE's website and follow the instructions in "Update the BIOS without Using the Internet Update Function" below.

2. Update the BIOS without Using the Internet Update Function:

Update from File

Click **Update from File**, then select the location where you save the BIOS update file obtained from the Internet or through other source. Follow the on-screen instructions to complete.

3. Save the Current BIOS File:

Save to File

Click **Save to File** to save the current BIOS file.

4. Change the Boot-up Logo:

Face Wizard

Click **Upload new image** in Face-Wizard and you will be able to change the boot-up logo with your own picture, creating a personalized boot-up screen. Click **Backup current image** to save the current boot-up logo.

Supported image formats include jpg, bmp, and gif.

C. After Updating the BIOS
Restart your system after updating the BIOS.

• Make sure that the BIOS file to be flashed matches your motherboard model. Updating the BIOS with an incorrect BIOS file could cause your system not to boot.
• Do not turn off the system or remove the power during the BIOS update process, or the BIOS may corrupt and the system may not boot.

5-1-3   Using Q-Flash Plus

A. Before You Begin
1. From GIGABYTE's website, download the latest compressed BIOS update file that matches your motherboard model.
2. Uncompress the downloaded BIOS file, save it to your USB flash drive, and rename it to **GIGABYTE.bin**.
    Note: The USB flash drive must use the FAT32/16 file system and it must be a USB 2.0 flash drive.
3. Connect the power cables to the 12V power connector (connect either one if there are two) and main power connector.
4. Please turn on the power supply before connecting the USB flash drive to the Q-Flash Plus port on the back panel.

B. Using Q-Flash Plus
Press the Q-Flash Plus button and the system will automatically search and match the BIOS file in the USB flash drive on the Q-Flash Plus port. The QFLED and the Q-Flash Plus button on the rear panel will flash during the BIOS matching and flashing process. Wait for 6-8 minutes and the LEDs will stop flashing when the BIOS flashing is complete.

> • If you choose to update the BIOS manually, first make sure that your system is off (S5 shutdown state).
> • If your motherboard has a BIOS switch and a SB switch, reset them to their default settings. (Default setting for the BIOS switch: Boot from the main BIOS; default setting for the SB switch: Dual BIOS)
> • On motherboards with DualBIOS™, the DualBIOS™ feature will continue to update the backup BIOS after the main BIOS has been flashed and the system restarts. After completion, the system will reboot again and boot from the main BIOS.

5-2 APP Center

GIGABYTE App Center gives you easy access to a wealth of GIGABYTE apps that help you get the most from your GIGABYTE motherboard (Note). Using a simple, unified user interface, GIGABYTE App Center allows you to easily launch all GIGABYTE apps installed on your system, check related updates online, and download the apps, drivers, and BIOS.

Running the APP Center
In Desktop mode, click the App Center icon ⚙ in the notification area to launch the App Center utility (Figure 1). On the main menu, you can select an app to run or click **LiveUpdate** to update an app online.
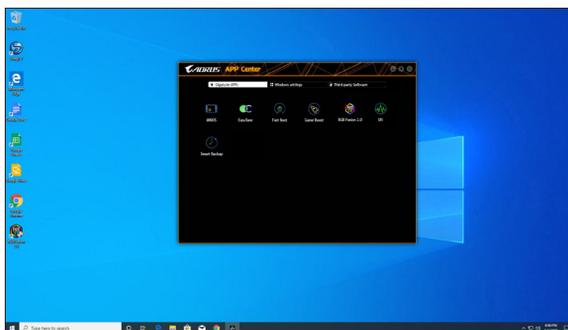
Figure 1

If the App Center is closed, you can restart it by clicking **Launch App Center** on the Start menu (Figure 2).
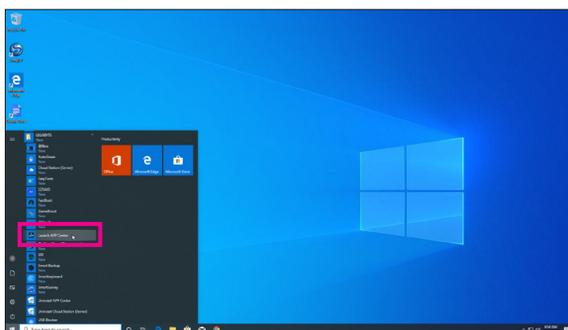
Figure 2

(Note)   Available applications in APP Center may differ by motherboard model. Supported functions of each application may also vary depending on motherboard specifications.

5-2-1 EasyTune

GIGABYTE's EasyTune is a simple and easy-to-use interface that allows users to fine-tune their system settings or do overclock/overvoltage in Windows environment.

The EasyTune Interface
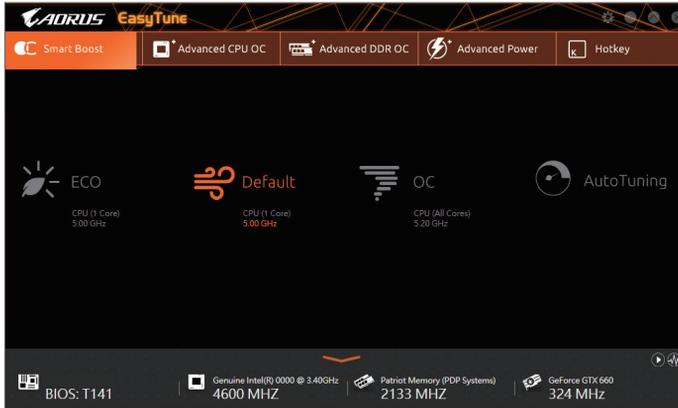
Tabs Information

Tab	Description
Smart Boost	The **Smart Boost** tab provides you with different levels of CPU frequency to choose to achieve desired system performance. After making changes, be sure to restart your system for these changes to take effect.
Advanced CPU OC	The **Advanced CPU OC** tab allows you to set CPU base clock, frequency, and voltages, and integrated graphics frequency. You can save the current settings to a profile. You can create up to 2 profiles.
Advanced DDR OC	The **Advanced DDR OC** tab allows you to set the memory clock.
Advanced Power	The **Advanced Power** tab allows you to adjust voltages.
Hotkey	The **HotKey** tab allows you to set hotkeys for your profiles.

Available functions in EasyTune may vary by motherboard model and CPU. Grayed-out area(s) indicates that the item is not configurable or the function is not supported.

Incorrectly doing overclock/overvoltage may result in damage to the hardware components such as CPU, chipset, and memory and reduce the useful life of these components. Before you do the overclock/overvoltage, make sure that you fully know each function of EasyTune, or system instability or other unexpected results may occur.

5-2-2 Fast Boot

Through the simple GIGABYTE Fast Boot interface, you can enable or change the **Fast Boot** or **Next Boot After AC Power Loss** setting right in the operating system.

The Fast Boot Interface
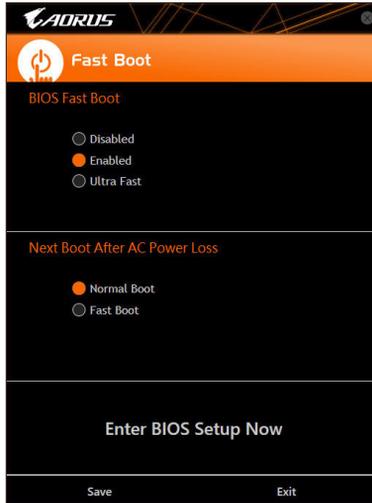
Using Fast Boot
- **BIOS Fast Boot:**
  This option is the same as the **Fast Boot** option [(Note)] in BIOS Setup. It allows you to enable or disable the fast boot function to shorten OS boot time.
- **Next Boot After AC Power Loss:**
  This option is the same as the **Next Boot After AC Power Loss** option [(Note)] in BIOS Setup. It allows you to select the system bootup mode upon the return of an AC power loss. (This mode is configurable only when **BIOS Fast Boot** is set to **Enabled** or **Ultra Fast**.)

After you configure the settings, click **Save** to save and click **Exit**. The settings will take effect on next boot. If you click the **Enter BIOS Setup Now** button, the system will restart and enter BIOS Setup immediately.

(Note)   For more details about this function, refer to Chapter 2, "BIOS Setup."

5-2-3   Game Boost

This app allows you to flexibly manage your applications to optimize your gaming performance by freeing up system resources and memory usage.

The Game Boost Interface
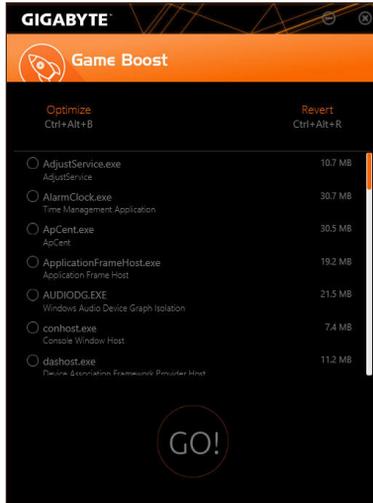
Using Game Boost
Select the application you want to suspend and then click **Go** to optimize your system for gaming. To revert the computer back to the state it was before, click **Revert**. In addition, two hotkeys are provided as follows:

• **Optimize(Ctrl+Alt+B):** Automatically optimizes your gaming platform and gaming performance.

• **Revert(Ctrl+Alt+R):** Restores your computer back to the state before the gaming begins.

5-2-4   RGB Fusion

This application allows you to enable or specify the lighting mode of the select device [Note 1] while in the Windows environment.

The RGB Fusion Interface

Using RGB Fusion
• **The [icon] icon on the top right corner:** Allows your computer to connect to the GIGABYTE RGB Fusion app installed on your handheld devices. [Note 2]

• Click the icon of the desired device and select the LED color/ lighting behaviour on the right section of the screen.

Static	All LEDs emit a single color.
Pulse	All LEDs simultaneously fade in and fade out.
Flash	All LEDs simultaneously flash on and off.
Double Flash	All LEDs flash in an interlaced pattern.
Color Cycle	All LEDs simultaneously cycle through a full spectrum of colors.
Music	All LEDs are synchronized with your music.
Random	Single LED regions flash randomly.
Wave	A full color spectrum cascades throughout the LED.
Game	All LEDs are synchronized with your game.
Off	Turn off all LEDs.

(Note 1)   RGB Fusion will automatically search for the devices that have LED lighting feature and display them on the list.
(Note 2)   Please download the **GIGABYTE RGB Fusion** app from App Store or Google Play.
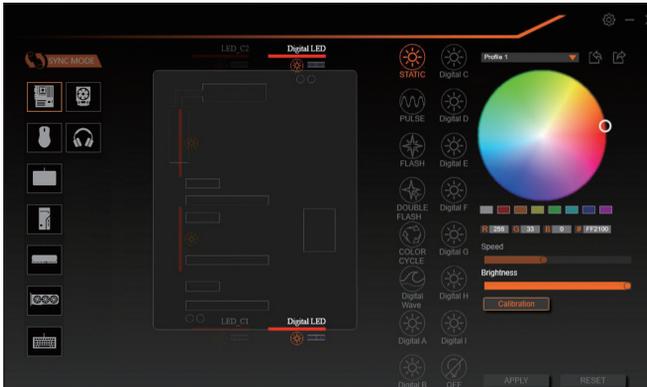
- Options for controlling the LEDs on the motherboard and digital LED strip. Click the motherboard icon for further settings. (Note)

  Select your desired area and select the LED color/ lighting behaviour on the right section of the screen.

Static	The selected region LEDs emit a single color.
Pulse	The selected region LEDs simultaneously fade in and fade out.
Flash	The selected region LEDs simultaneously flash on and off.
Double Flash	All LEDs flash in an interlaced pattern.
Color Cycle	All LEDs simultaneously cycle through a full spectrum of colors.
Digital Wave	A full color spectrum cascades throughout the armor LED.
Digital A~I Mode	Provides multiple digital lighting mode throughout the armor LED and LED strip.
Off	Disable the selected region LEDs.

(Note)　　Regions/Modes/Colors available may vary by motherboard.

5-2-5 Smart Backup

Smart Backup allows you to back up a partition as an image file every hour. You can use these images to restore your system or files when needed.
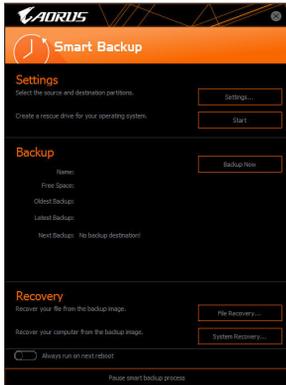
The Smart Backup main menu:

Button	Description
Settings	Allows you to select the source and destination partition
Start	Allows you to create a rescue drive
Backup Now	Allows you to perform the backup immediately
File Recovery...	Allows you to recover your files from the backup image
System Recovery...	Allows you to recover your system from the backup image

- Smart Backup only supports NTFS file system.
- You need to select the destination partition in **Settings** the first time you use Smart Backup.
- The **Backup Now** button will be available only after 10 minutes you have logged in Windows.
- Select the **Always run on next reboot** checkbox to automatically enable Smart Backup after system reboot.

Creating a backup:
Click the **Settings** button on the main menu. In the **Settings** dialog box, select the source partition and destination partition and click **OK**. The initial backup will start after 10 minutes and regular backup will be performed hourly. Note: By default, all partitions on the system drive are selected as the backup source. The backup destination cannot be on the same partition as the backup source.

Saving the backup to a network location:
If you want to save the backup to a network location, select **Browse network location**. Make sure your computer and the computer where you want to save the backup are in the same domain. Choose the network location where you want to store the backup and enter the user name and password. Follow the on-screen instructions to complete.
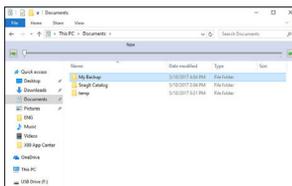
Recovering a file:
Click the **File Recovery** button on the main menu. Use the time slider on the top of the popped out window to select a previous backup time. The right pane will display the backed-up partitions in the backup destination (in the **My Backup** folder). Browse to the file you want and copy it.
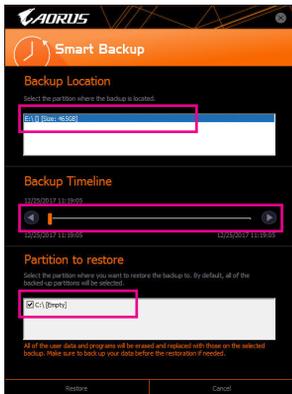
Recovering your system with Smart Backup:
Steps:
1. Click the **System Recovery** button on the main menu.
2. Select the location where your backup is saved.
3. Use the time slider to select a time point.
4. Select a partition backup created on the selected time point and click **Restore**.
5. Confirm whether to restart your system to proceed with the restore immediately or later. Once you respond "Yes" the system will restart to the Windows recovery environment. Follow the onscreen instructions to restore your system.

> ⚠️ All of your files and programs will be deleted and replaced with those on the selected backup. If needed, be sure to make a copy of your data before the restore.

5-2-6   System Information Viewer

GIGABYTE System Information Viewer allows you to monitor and adjust the fan speed in the operating system. You can also display the hardware monitor information on the desktop to view the system status at any time.

The System Information Viewer Interface

Tabs Information

Tab	Description
System Information	The **System Information** tab provides information on the installed CPU, motherboard, and the BIOS version.
Smart Fan 6 Auto	The **Smart Fan 6 Auto** tab allows you to specify a Smart Fan mode.
Smart Fan 6 Advanced	The **Smart Fan 6 Advanced** tab allows you to adjust the smart fan speed. The fans will run at different speeds according to system temperatures. Using the **Smart Fan** option you can adjust the fan's workload according system temperatures or you can fix the fan speeds using the **RPM Fixed Mode** option. Click the **Calibrate** button and the fan speed will be shown in relation to overall fan workload after calibration. The **Reset** button can revert the fan settings back to the last saved values. ⚙ Noise Detection provides detection of the noise level (measured in decibels) inside the chassis.
System Alert	The **System Alert** tab allows you to monitor hardware temperature, voltage and fan speed, and set temperature/fan speed alarm. 🖥 allows you to select what information to be displayed in quick mode (by default, all of the hardware information are displayed); ⚠ allows you to enable alert notification, click **Apply** after selection.
Record	The **Record** tab allows you to record changes in system voltages, temperatures, and fan speeds. Please note, the recording will stop if you exit the **Record** tab during the recording process.

> • The speed control function requires the use of a fan with fan speed control design.
> • To use the noise detection function, you must have a motherboard with a noise detection header.

Chapter 6   Appendix

6-1   Configuring Audio Input and Output

After you install the included motherboard drivers, make sure your Internet connection works properly. The system will automatically install the audio driver from Microsoft Store. Restart the system after the audio driver is installed.

6-1-1   Configuring 2/4/5.1/7.1-Channel Audio

The motherboard provides five audio jacks on the back panel which support 2/4/5.1/7.1-channel audio. The picture to the right shows the default audio jack assignments.

Center/Subwoofer Speaker Out
Rear Speaker Out
Line In
Front Speaker Out
Mic In

To configure 4/5.1/7.1-channel audio, you have to retask either the Line in or Mic in jack to be Side speaker out through the audio driver.

A. Configuring Speakers
Step 1:
Go to the Start menu click the **Realtek Audio Console**. For speaker connection, refer to the instructions in Chapter 1, "Hardware Installation," "Back Panel Connectors."
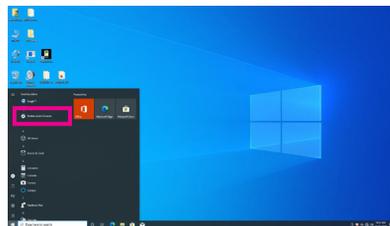
Step 2:
Connect an audio device to an audio jack. The **Which device did you plut in ?** dialog box appears. Select the device according to the type of device you connect. Then click **OK**.
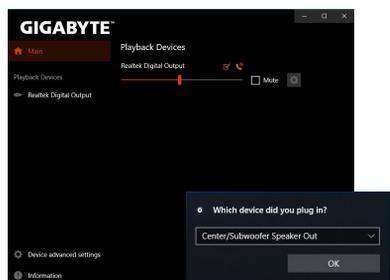
Step 3:

On the **Speakers** screen, click the **Speaker Configuration** tab. In the **Speaker Configuration** list, select **Stereo**, **Quadraphonic**, **5.1 Speaker**, or **7.1 Speaker** according to the type of speaker configuration you wish to set up. Then the speaker setup is completed.
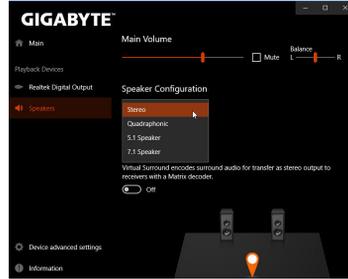
B. Configuring Sound Effect
You may configure an audio environment on the **Speakers** tab.

C. Enabling Smart Headphone Amp
The Smart Headphone Amp feature automatically detects impedance of your head-worn audio device, whether earbuds or high-end headphones to provide optimal audio dynamics. To enable this feature, connect your head-worn audio device to the Line out jack on the front panel and then go to the **Speaker** page. Enable the **Smart Headphone Amp** feature. The **Headphone Power** list below allows you to manually set the level of headphone volume, preventing the volume from being too high or too low.
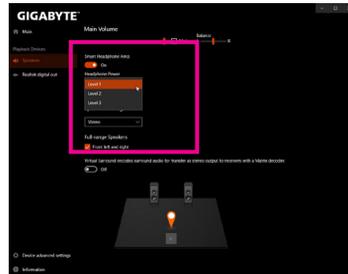
* Configuring the Headphone
When you connect your headphone to the Line out jack on the back panel or front panel, make sure the default playback device is configured correctly.

Step 1:
Locate the icon in the notification area and right-click on the icon. Select **Open Sound settings**.
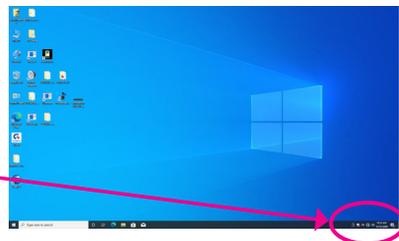
Step 2:
Select **Sound Control Panel**.
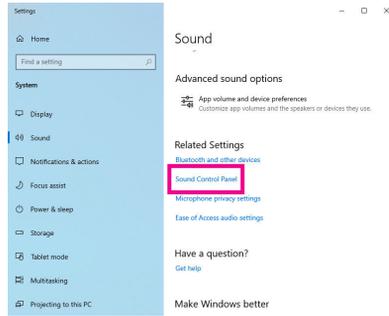
Step 3:
On the **Playback** tab, make sure your headphone is set as the default playback device. For the device connected to the Line out jack on the back panel, right-click on **Speakers** and select **Set as Default Device**; for the device connected to the Line out jack on the front panel, right-click on **Realtek HD Audio 2nd output**.
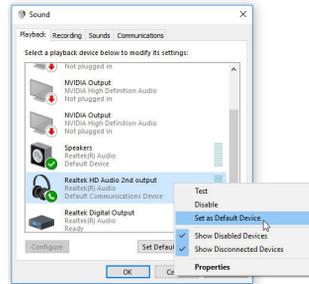
6-1-2   Configuring S/PDIF Out

The S/PDIF Out jack can transmit audio signals to an external decoder for decoding to get the best audio quality.

1. Connecting a S/PDIF Out Cable:
Connect a S/PDIF optical cable to an external decoder for transmitting the S/PDIF digital audio signals.
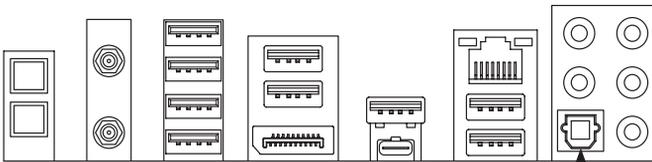
Connects to a S/PDIF optical cable

2. Configuring S/PDIF Out:
On the **Realtek Digital Output** screen, Select the sample rate and bit depth in the **Default Format** section.

6-1-3   Stereo Mix

The following steps explain how to enable Stereo Mix (which may be needed when you want to record sound from your computer).

Step 1:
Locate the ![icon] icon in the notification area and right-click on the icon. Select **Open Sound settings**.

Step 2:
Select **Sound Control Panel**.

Step 3:
On the **Recording** tab, right-click on **Stereo Mix** item and select **Enable**. Then set it as the default device. (if you do not see **Stereo Mix**, right-click on an empty space and select **Show Disabled Devices**.)
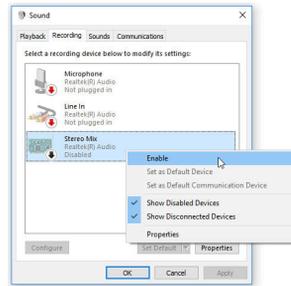
Step 4:
Now you can access the **HD Audio Manager** to configure **Stereo Mix** and use **Voice Recorder** to record the sound.

6-1-4   Using the Voice Recorder

After setting up the audio input device, to open the **Voice Recorder**, go to the Start menu and search for **Voice Recorder**.
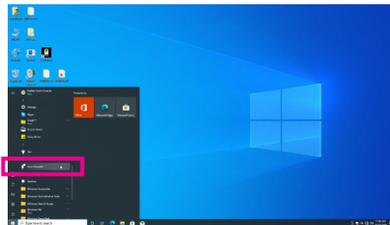
A. Recording Audio
    1. To begin the recording, click the **Record** icon   .
    2. To stop the recording, click the **Stop recording** icon   .

B. Playing the Recorded Sound
The recordings will saved in Documents>Sound Recordings. Voice Recorder records audio in MPEG-4 (.m4a) format. You can play the recording with a digital media player program that supports the audio file format.

6-1-5   DTS:X® Ultra

Hear what you have been missing! DTS:X® Ultra technology is designed to enhance your gaming, movies, AR, and VR experiences on headphones and speakers. It delivers an advanced audio solution that renders sounds above, around, and close to you, stepping up your game play to new levels. Now with support for Microsoft Spatial sound. Key features include:

*   **Believable 3D audio**
    DTS latest spatial audio rendering that delivers believable 3D audio over headphones and speakers.
*   **PC sound gets real**
    DTS:X decoding technology places sound where it would occur naturally in the real world.
*   **Hear sound as it was intended**
    Speaker and headphone tuning that preserves the audio experience as it was designed.

A. Using DTS:X Ultra

Step 1:

After you install the included motherboard drivers, make sure your Internet connection works properly. The system will automatically install DTS:X Ultra from the Microsoft Store. Restart the system after it is installed.

Step 2:

Connect your audio device and select **DTS:X Ultra** on the Start menu. The **Content Mode** main menu allows you to select content modes including Music, Video, and Movies, or you can select specifically tuned sound modes, including Strategy, RPG, and Shooter, to suit different game genres. The **Custom Audio** allows you to create customized audio profiles based on personal preference for later use.
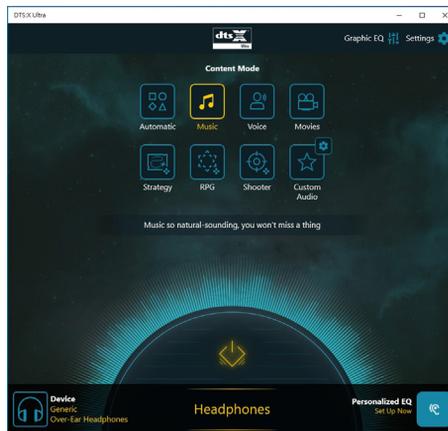
B. Using DTS Sound Unbound
Installing DTS Sound Unbound
Step 1:
Connect your headphones to the front panel line out jack and make sure your Internet connection works properly, Locate the ![icon] icon in the notification area and right-click on the icon. Click on **Spatial Sound** and then select **DTS Sound Unbound**.
Step 2:
The system will connect to the Microsoft Store. When the DTS Sound Unbound application appears, click **Install** and follow the on-screen instructions to proceed with the installation.
Step 3:
After the DTS Sound Unbound application is installed, click **Launch**. Accept the **End User License Agreement** and restart the system.
Step 4:
Select **DTS Sound Unbound** on the Start menu. DTS Sound Unbound allows you to use the DTS Headphone:X and DTS:X features.
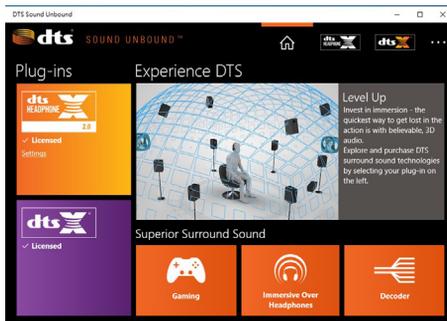
6-2   Troubleshooting

6-2-1   Frequently Asked Questions
To read more FAQs for your motherboard, please go to the **Support\FAQ** page on GIGABYTE's website.

Q: Why is the light of my keyboard/optical mouse still on after the computer shuts down?
A: Some motherboards provide a small amount of standby power after the computer shuts down and that's why the light is still on.

Q: How do I clear the CMOS values?
A: For motherboards that have a Clear CMOS button, press this button to clear the CMOS values (before doing this, please turn off the computer and unplug the power cord). For motherboards that have a Clear CMOS jumper, refer to the instructions in Chapter 1 to short the jumper to clear the CMOS values. If your board doesn't have this jumper/button, refer to the instructions on the motherboard battery in Chapter 1. You can temporarily remove the battery from the battery holder to stop supplying power to the CMOS, which will clear the CMOS values after about one minute.

Q: Why do I still get a weak sound even though I have turned my speaker to the maximum volume?
A: Make sure your speaker is equipped with an internal amplifier. If not, try a speaker with power/amplifier.

6-2-2   Troubleshooting Procedure

If you encounter any troubles during system startup, follow the troubleshooting procedure below to solve the problem.

```
                              ┌─────────────┐
                              │    START    │
                              └─────────────┘
                                     │
                                     ▼
┌──────────────────────────────────────────────────────────────┐
│ Turn off the power. Remove all peripherals, connecting cables,│
│ and power cord etc.                                            │
└──────────────────────────────────────────────────────────────┘
                                     │
                                     ▼
        Make sure the motherboard does not short-circuit      Yes   ┌──────────────────────────┐
        with the chassis or other metal objects.            ──────► │ Isolate the short circuit.│
                                                                    └──────────────────────────┘
                            No                              The problem is verified and solved.
                                     ▼
                                                                    ┌──────────────────────────┐
        Check if the CPU cooler is attached to the CPU        No    │ Secure the CPU cooler    │
        securely. Is the power connector of the CPU cooler  ──────► │ on the CPU. Connect the  │
        connected to the CPU_FAN header properly?                   │ CPU cooler power cable   │
                                                                    │ to the motherboard.      │
                           Yes                                      └──────────────────────────┘
                                     ▼                      The problem is verified and solved.
                                                                    ┌──────────────────────────┐
        Check if the memory is installed properly on the      No    │ Correctly insert the     │
        memory slot.                                        ──────► │ memory into the memory   │
                                                                    │ socket.                  │
                           Yes                                      └──────────────────────────┘
                                     ▼                      The problem is verified and solved.
┌──────────────────────────────────────────────────────────────┐
│ Insert the graphics card. Connect the ATX main power cable    │
│ and the 12V power cable. Turn on the power to start the       │
│ computer.                                                      │
└──────────────────────────────────────────────────────────────┘
                Make sure the graphics card is securely seated in the
                     │   expansion slot and power connectors are firmly attached.
                     ▼
                ┌─────────┐
                │    A    │
                └─────────┘

              (Continued...)
```

```
                              ( A )
                                │
                                ▼
   ◇ When the computer is turned on, is the CPU cooler running? ◇ ──No──▶ ┌──────────────────────┐
                                │                                          │ The power supply, CPU or │
                               Yes ◀─────────────────────────────────      │ CPU socket might fail.   │
                                │          The problem is verified and solved. └──────────────────────┘
                                ▼
        ◇ Check if there is display on your monitor. ◇ ──No──▶ ┌──────────────────────┐
                                │                                │ The graphics card,       │
                               Yes ◀───────────────────────      │ expansion slot, or monitor │
                                │    The problem is verified and solved. │ might fail.            │
                                ▼                                 └──────────────────────┘
   ┌─────────────────────────────────────────────────────────┐
   │ Turn off the computer. Plug in the keyboard and mouse and restart │
   │ the computer.                                                     │
   └─────────────────────────────────────────────────────────┘
                                │
                                ▼
        ◇ Check if the keyboard is working properly. ◇ ──No──▶ ┌──────────────────────┐
                                │                                │ The keyboard or keyboard │
                               Yes ◀───────────────────────      │ connector might fail.    │
                                │    The problem is verified and solved. └──────────────────────┘
                                ▼
   ┌─────────────────────────────────────────────────────────┐
   │ Press <Delete> to enter BIOS Setup. Select "Load Optimized Defaults." │
   │ Select "Save & Exit Setup" to save changes and exit BIOS Setup.       │
   └─────────────────────────────────────────────────────────┘
                                │
                                ▼
   ◇ Turn off the computer and connect the hard drive(s). Check if the system ◇ ──No──▶ ┌──────────────────────┐
   ◇ can boot successfully.                                                   ◇         │ The hard drive, connector, │
                                │                                                        │ or cable might fail.       │
                               Yes ◀───────────────────────────────────────            └──────────────────────┘
                                │    The problem is verified and solved.
                                ▼
   ┌─────────────────────────────────────────────────────────┐
   │ Reinstall the operating system. Reinstall other devices one by one │
   │ (install one device at one time and then boot the system to see if the │
   │ device works successfully).                                            │
   └─────────────────────────────────────────────────────────┘
                                │
                                ▼
                            ( END )
```

If the procedure above is unable to solve your problem, contact the place of purchase or local dealer for help. Or go to the **Support\Technical Support** page to submit your question. Our customer service staff will reply you as soon as possible.

6-3   Debug LED Codes

Regular Boot

Code	Description
10	PEI Core is started.
11	Pre-memory CPU initialization is started.
12~14	Reserved.
15	Pre-memory North-Bridge initialization is started.
16~18	Reserved.
19	Pre-memory South-Bridge initialization is started.
1A~2A	Reserved.
2B~2F	Memory initialization.
31	Memory installed.
32~36	CPU PEI initialization.
37~3A	IOH PEI initialization.
3B~3E	PCH PEI initialization.
3F~4F	Reserved.
60	DXE Core is started.
61	NVRAM initialization.
62	Installation of the PCH runtime services.
63~67	CPU DXE initialization is started.
68	PCI host bridge initialization is started.
69	IOH DXE initialization.
6A	IOH SMM initialization.
6B~6F	Reserved.
70	PCH DXE initialization.
71	PCH SMM initialization.
72	PCH devices initialization.
73~77	PCH DXE initialization (PCH module specific).
78	ACPI Core initialization.
79	CSM initialization is started.
7A~7F	Reserved for AMI use.
80~8F	Reserved for OEM use (OEM DXE initialization codes).
90	Phase transfer to BDS (Boot Device Selection) from DXE.
91	Issue event to connect drivers.

Code	Description
92	PCI Bus initialization is started.
93	PCI Bus hot plug initialization.
94	PCI Bus enumeration for detecting how many resources are requested.
95	Check PCI device requested resources.
96	Assign PCI device resources.
97	Console Output devices connect (ex. Monitor is lighted).
98	Console input devices connect (ex. PS2/USB keyboard/mouse are activated).
99	Super IO initialization.
9A	USB initialization is started.
9B	Issue reset during USB initialization process.
9C	Detect and install all currently connected USB devices.
9D	Activated all currently connected USB devices.
9E~9F	Reserved.
A0	IDE initialization is started.
A1	Issue reset during IDE initialization process.
A2	Detect and install all currently connected IDE devices.
A3	Activated all currently connected IDE devices.
A4	SCSI initialization is started.
A5	Issue reset during SCSI initialization process.
A6	Detect and install all currently connected SCSI devices.
A7	Activated all currently connected SCSI devices.
A8	Verify password if needed.
A9	BIOS Setup is started.
AA	Reserved.
AB	Wait user command in BIOS Setup.
AC	Reserved.
AD	Issue Ready To Boot event for OS Boot.
AE	Boot to Legacy OS.
AF	Exit Boot Services.
B0	Runtime AP installation begins.
B1	Runtime AP installation ends.
B2	Legacy Option ROM initialization.
B3	System reset if needed.

Code	Description
B4	USB device hot plug-in.
B5	PCI device hot plug.
B6	Clean-up of NVRAM.
B7	Reconfigure NVRAM settings.
B8~BF	Reserved.
C0~CF	Reserved.

S3 Resume

Code	Description
E0	S3 Resume is started (called from DXE IPL).
E1	Fill boot script data for S3 resume.
E2	Initializes VGA for S3 resume.
E3	OS S3 wake vector call.

Recovery

Code	Description
F0	Recovery mode will be triggered due to invalid firmware volume detection.
F1	Recovery mode will be triggered by user decision.
F2	Recovery is started.
F3	Recovery firmware image is found.
F4	Recovery firmware image is loaded.
F5~F7	Reserved for future AMI progress codes.

Error

Code	Description
50~55	Memory initialization error occurs.
56	Invalid CPU type or speed.
57	CPU mismatch.
58	CPU self test failed or possible CPU cache error.
59	CPU micro-code is not found or micro-code update is failed.
5A	Internal CPU error.
5B	Reset PPI is failed.
5C~5F	Reserved.
D0	CPU initialization error.
D1	IOH initialization error.

Code	Description
D2	PCH initialization error.
D3	Some of the Architectural Protocols are not available.
D4	PCI resource allocation error. Out of Resources.
D5	No Space for Legacy Option ROM initialization.
D6	No Console Output Devices are found.
D7	No Console Input Devices are found.
D8	It is an invalid password.
D9~DA	Can't load Boot Option.
DB	Flash update is failed.
DC	Reset protocol is failed.
DE~DF	Reserved.
E8	S3 resume is failed.
E9	S3 Resume PPI is not found.
EA	S3 Resume Boot Script is invalid.
EB	S3 OS Wake call is failed.
EC~EF	Reserved.
F8	Recovery PPI is invalid.
F9	Recovery capsule is not found.
FA	Invalid recovery capsule.
FB~FF	Reserved.

Regulatory Notices

United States of America, Federal Communications Commission Statement

Supplier's Declaration of Conformity
47 CFR § 2.1077 Compliance Information

Product Name: **Motherboard**
Trade Name: **GIGABYTE**
Model Number: **Z590 AORUS MASTER**

Responsible Party – U.S. Contact Information: **G.B.T. Inc.**
Address: 17358 Railroad street, City Of Industry, CA91748
Tel.: 1-626-854-9338
Internet contact information: https://www.gigabyte.com

FCC Compliance Statement:
This device complies with Part 15 of the FCC Rules, Subpart B, Unintentional Radiators.
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.

The FCC with its action in ET Docket 96-8 has adopted a safety standard for human exposure to radio frequency (RF) electromagnetic energy emitted by FCC certified equipment. The Intel PRO/Wireless 5000 LAN products meet the Human Exposure limits found in OET Bulletin 65, 2001, and ANSI/IEEE C95.1, 1992. Proper operation of this radio according to the instructions found in this manual will result in exposure substantially below the FCC's recommended limits.

The following safety precautions should be observed:
• Do not touch or move antenna while the unit is transmitting or receiving.
• Do not hold any component containing the radio such that the antenna is very close or touching any exposed parts of the body, especially the face or eyes, while transmitting.
• Do not operate the radio or attempt to transmit data unless the antenna is connected; if not, the radio may be damaged.
• Use in specific environments:
  - The use of wireless devices in hazardous locations is limited by the constraints posed by the safety directors of such environments.
  - The use of wireless devices on airplanes is governed by the Federal Aviation Administration (FAA).
  - The use of wireless devices in hospitals is restricted to the limits set forth by each hospital.

Antenna use:
In order to comply with FCC RF exposure limits, low gain integrated antennas should be located at a minimum distance of 7.9 inches (20 cm) or more from the body of all persons.

Explosive Device Proximity Warning
Warning: Do not operate a portable transmitter (such as a wireless network device) near unshielded blasting caps or in an explosive environment unless the device has been modified to be qualified for such use.

Antenna Warning
The wireless adapter is not designed for use with high-gain antennas.

Use On Aircraft Caution
Caution: Regulations of the FCC and FAA prohibit airborne operation of radio-frequency wireless devices because their signals could interfere with critical aircraft instruments.

Other Wireless Devices
Safety Notices for Other Devices in the Wireless Network: Refer to the documentation supplied with wireless Ethernet adapters or other devices in the wireless network.

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

Cet appareil est conforme aux normes Canada d'Industrie de RSS permis-exempt. L'utilisation est assujetti aux deux conditions suivantes:
(1) le dispositif ne doit pas produire de brouillage préjudiciable, et
(2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

Caution: When using IEEE 802.11a wireless LAN, this product is restricted to indoor use due to its operation in the 5.15-to 5.25-GHz frequency range. Industry Canada requires this product to be used indoors for the frequency range of 5.15 GHz to 5.25 GHz to reduce the potential for harmful interference to co-channel mobile satellite systems. High power radar is allocated as the primary user of the 5.25-to 5.35-GHz and 5.65 to 5.85-GHz bands. These radar stations can cause interference with and/or damage to this device. The maximum allowed antenna gain for use with this device is 6dBi in order tocomply with the E.I.R.P limit for the 5.25-to 5.35 and 5.725 to 5.85 GHz frequency range in point-to-point operation. To comply with RF exposure requirements all antennas should be located at a minimum distance of 20cm, or the minimum separation distance allowed by the module approval, from the body of all persons.

Attention: l'utilisation d'un réseau sans fil IEEE802.11a est restreinte à une utilisation en intérieur à cause du fonctionnement dansla bande de fréquence 5.15-5.25 GHz. Industry Canada requiert que ce produit soit utilisé à l'intérieur des bâtiments pour la bande de fréquence 5.15-5.25 GHz afin de réduire les possibilités d'interférences nuisibles aux canaux co-existants des systèmes de transmission satellites. Les radars de puissances ont fait l'objet d'une allocation primaire de fréquences dans les bandes 5.25-5.35 GHz et 5.65-5.85 GHz. Ces stations radar peuvent créer des interférences avec ce produit et/ou lui être nuisible. Le gain d'antenne maximum permissible pour une utilisation avec ce produit est de 6 dBi afin d'être conforme aux limites de puissance isotropique rayonnée équivalente (P.I.R.E.) applicable.
dans les bandes 5.25-5.35 GHz et 5.725-5.85 GHz en fonctionnement point-à-point. Pour se conformer aux conditions d'exposition de RF toutes les antennes devraient être localisées à une distance minimum de 20 cm, ou la distance de séparation minimum permise par l'approbation du module, du corps de toutes les personnes.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be chosen so that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radio électrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

European Union (EU) CE Declaration of Conformity
This device complies with the following directives: Electromagnetic Compatibility Directive 2014/30/EU, Low-voltage Directive 2014/35/EU, Radio Equipment Directive 2014/53/EU, ErP Directive 2009/125/EC, RoHS directive (recast) 2011/65/EU & the 2015/863 Statement.
This product has been tested and found to comply with all essential requirements of the Directives.

European Union (EU) RoHS (recast) Directive 2011/65/EU & the European Commission Delegated Directive (EU) 2015/863 Statement
GIGABYTE products have not intended to add and safe from hazardous substances (Cd, Pb, Hg, Cr+6, PBDE, PBB, DEHP, BBP, DBP and DIBP). The parts and components have been carefully selected to meet RoHS requirement. Moreover, we at GIGABYTE are continuing our efforts to develop products that do not use internationally banned toxic chemicals.

European Union (EU) Community Waste Electrical & Electronic Equipment (WEEE) Directive Statement
GIGABYTE will fulfill the national laws as interpreted from the 2012/19/EU WEEE (Waste Electrical and Electronic Equipment) (recast) directive. The WEEE Directive specifies the treatment, collection, recycling and disposal of electric and electronic devices and their components. Under the Directive, used equipment must be marked, collected separately, and disposed of properly.

WEEE Symbol Statement
The symbol shown below is on the product or on its packaging, which indicates that this product must not be disposed of with other waste. Instead, the device should be taken to the waste collection centers for activation of the treatment, collection, recycling and disposal procedure.

For more information about where you can drop off your waste equipment for recycling, please contact your local government office, your household waste disposal service or where you purchased the product for details of environmentally safe recycling.

End of Life Directives-Recycling
The symbol shown below is on the product or on its packaging, which indicates that this product must not be disposed of with other waste. Instead, the device should be taken to the waste collection centers for activation of the treatment, collection, recycling and disposal procedure.

Déclaration de Conformité aux Directives de l'Union européenne (UE)
Cet appareil portant la marque CE est conforme aux directives de l'UE suivantes: directive Compatibilité Electromagnétique 2014/30/UE, directive Basse Tension 2014/35/UE, directive équipements radioélectriques 2014/53/UE, la directive RoHS II 2011/65/UE & la déclaration 2015/863. La conformité à ces directives est évaluée sur la base des normes européennes harmonisées applicables.

European Union (EU) CE-Konformitätserklärung
Dieses Produkte mit CE-Kennzeichnung erfüllen folgenden EU-Richtlinien: EMV-Richtlinie 2014/30/EU, Niederspannungsrichtlinie 2014/35/EU, Funkanlagen Richtlinie 2014/53/EU, RoHS-Richtlinie 2011/65/EU erfüllt und die 2015/863 Erklärung.
Die Konformität mit diesen Richtlinien wird unter Verwendung der entsprechenden Standards zurEuropäischen Normierung beurteilt.

CE declaração de conformidade
Este produto com a marcação CE estão em conformidade com das seguintes Diretivas UE: Diretiva Baixa Tensão 2014/35/EU; Diretiva CEM 2014/30/EU; Diretiva RSP 2011/65/UE e a declaração 2015/863.
A conformidade com estas diretivas é verificada utilizando as normas europeias harmonizadas.

CE Declaración de conformidad
Este producto que llevan la marca CE cumplen con las siguientes Directivas de la Unión Europea: Directiva EMC 2014/30/EU, Directiva de bajo voltaje 2014/35/EU, Directiva de equipamentos de rádio 2014/53/EU, Directiva RoHS 2011/65/EU y la Declaración 2015/863.
El cumplimiento de estas directivas se evalúa mediante las normas europeas armonizadas.

CE Dichiarazione di conformità
I prodotti con il marchio CE sono conformi con una o più delle seguenti Direttive UE, come applicabile: Direttiva EMC 2014/30/UE, Direttiva sulla bassa tensione 2014/35/UE, Direttiva di apparecchiature radio 2014/53/UE, Direttiva RoHS 2011/65/EU e Dichiarazione 2015/863.
La conformità con tali direttive viene valutata utilizzando gli Standard europei armonizzati applicabili.

Deklaracja zgodności UE Unii Europejskiej
Urządzenie jest zgodne z następującymi dyrektywami: Dyrektywa kompatybilności elektromagnetycznej 2014/30/UE, Dyrektywa niskonapięciowej 2014/35/UE, Dyrektywa urządzeń radiowych 2014/53/UE, Dyrektywa RoHS 2011/65/UE i dyrektywa2015/863.
Niniejsze urządzenie zostało poddane testom i stwierdzono jego zgodność z wymaganiami dyrektywy.

ES Prohlášení o shodě
Toto zařízení splňuje požadavky Směrnice o Elektromagnetické kompatibilitě 2014/30/EU, Směrnice o Nízkém napětí 2014/35/EU, Směrnice o rádiových zařízeních 2014/53/EU, Směrnice RoHS 2011/65/EU a 2015/863.
Tento produkt byl testován a bylo shledáno, že splňuje všechny základní požadavky směrnic.

EK megfelelőségi nyilatkozata
A termék megfelelnek az alábbi irányelvek és szabványok követelményeinek, azok a kiállításidőpontjában érvényes, aktuális változatában: EMC irányelv 2014/30/EU, Kisfeszültségű villamos berendezésekre vonatkozó irányelv 2014/35/EU, rádióberendezések irányelv 2014/53/EU, RoHS irányelv 2011/65/EU és 2015/863.

Δήλωση συμμόρφωσης ΕΕ
Είναι σε συμμόρφωση με τις διατάξεις των παρακάτω Οδηγιών της Ευρωπαϊκής Κοινότητας: Οδηγία 2014/30/ΕΕ σχετικά με την ηλεκτρομαγνητική συμβατότητα, Οοδηγία χαμηλή τάση 2014/35/EU, Οδηγία 2014/53/ΕΕ σε ραδιοεξοπλισμό, Οδηγία RoHS 2011/65/ΕΕ και 2015/863.
Η συμμόρφωση με αυτές τις οδηγίες αξιολογείται χρησιμοποιώντας τα ισχύοντα εναρμονισμένα ευρωπαϊκά πρότυπα.

European Community Radio Equipment Directive Compliance Statement:

This equipment complies with all the requirements and other relevant provisions of Radio Equipment Directive 2014/53/EU.
This equipment is suitable for home and office use in all the European Community Member States and EFTA Member States.
The low band 5.15 -5.35 GHz is for indoor use 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	PL	PT	RO	SE
SI	SK	TR	UK			

Wireless module manufacturer: Intel® Corporation SAS
Wireless module model name: AX210NGW

Taiwan NCC Wireless Statements / 無線設備警告聲明：
低功率電波輻射性電機管理辦法
第十二條： 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原
設計之特性及功能。
第十四條： 低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干
擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工
業、科學及醫療用電波輻射性電機設備之干擾。

在 5.25-5.35 秭赫頻帶內操作之無線資訊傳輸設備，限於室內使用。

Korea KCC NCC Wireless Statement:
5,25GHz - 5,35 GHz 대역을 사용하는 무선 장치는 실내에서만 사용하도록 제한됩니다。

Japan Wireless Statement:
5.15 GHz 帯 ~ 5.35 GHz 帯: 屋内のみの使用。

Wireless module country approvals:
Wireless module manufacturer: Intel® Corporation
Wireless module model name: AX210NGW

United States: FCC: PD9AX210NG	India: ETA-SD-20201006833	Singapore: Complies with IMDA standards DA108442
Canada: IC: 1000M-AX210NG	Japan:	Taiwan: CCAH20Y10080T6
Australia, New-Zealand:	R 003-200209 T D200188003 5.15~5.35GHz 屋内限定 5.15~5.35GHz indoor use only	South Korea: R-C-INT-AX210NGW
Belarus: TP BY	Pakistan: Approved by PTA: 9.1000/2020	Ukraine: UA.TR.028
China: CMIIT ID: 2020AJ11402 (M)	Serbia: I1011 20	1.상호명: INTEL CORPORATION 2.기자재의 명칭(모델명): 특정소출력 무선기기 (무선랜을 포함한 무선접속시스템용 무선기기) AX210NGW 3.제조시기: 2020/09 4.제조자/제조국: Intel Corporation / China, Taiwan
Europe: CE		

Appendix

Contact Us

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• **Gigabyte Technology Pty. Ltd. - Australia**

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