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.

For more product details, please visit GIGABYTE’s website.
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published in any form or by any means without GIGABYTE's prior written permission.
In order to assist in the use of this product, 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:
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B450M DS3H V2 Motherboard Layout

Box Contents

- B450M DS3H V2 Motherboard
- Two SATA cables
- Motherboard driver disc
- I/O Shield
- User's Manual

* 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.
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**
- AM4 Socket:
  - AMD 3rd Generation Ryzen™ processors
  - AMD 2nd Generation Ryzen™ processors
  - AMD 1st Generation Ryzen™ processors
  - AMD 2nd Generation Ryzen™ with Radeon™ Vega Graphics processors
  - AMD 1st Generation Ryzen™ with Radeon™ Vega Graphics processors
  - AMD Athlon™ with Radeon™ Vega Graphics processors
  (Go to GIGABYTE’s website for the latest CPU support list.)

**Chipset**
- AMD B450

**Memory**
- 4 x DDR4 DIMM sockets supporting up to 128 GB (32 GB single DIMM capacity) of system memory
- Dual channel memory architecture
- Support for DDR4 2933/2667/2400/2133 MHz memory modules
- 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:
  - 1 x DVI-D port, supporting a maximum resolution of 1920x1200@60 Hz
    * The DVI-D port does not support D-Sub connection by adapter.
  - 1 x HDMI port, supporting a maximum resolution of 4096x2160@60 Hz (Note)
    * Support for HDMI 2.0 version and HDCP 2.2 (Note)
  - Maximum shared memory of 16 GB

**Audio**
- Realtek® ALC887 codec
- High Definition Audio
- 2/4/5.1/7.1-channel
  * To configure 7.1-channel audio, you need to open the audio software and select Device advanced settings > Playback Device to change the default setting first. Please visit GIGABYTE’s website for details on configuring the audio software.
  * Support for S/PDIF Out

**LAN**
- Realtek® GbE LAN chip (1000/100 Mbit)

**Expansion Slots**
- 1 x PCI Express x16 slot, running at x16 (PCIEX16) (Note)
  * For optimum performance, if only one PCI Express graphics card is to be installed, be sure to install it in the PCIEX16 slot.
  * The PCIEX16 slot conforms to PCI Express 3.0 standard.
- 1 x PCI Express x16 slot, running at x4 (PCIEX4)
- 1 x PCI Express x1 slot
  * The PCIEX4 and PCI Express x1 slots conform to PCI Express 2.0 standard.

**Multi-Graphics Technology**
- Support for AMD Quad-GPU CrossFire™ and 2-Way AMD CrossFire™ technologies

(Note) Actual support may vary by CPU.
### Storage Interface
- 1 x M.2 connector (Socket 3, M key, type 2242/2260/2280/22110 SATA and PCIe 3.0 x4/x2 SSD support)
- 4 x SATA 6Gb/s connectors
- Support for RAID 0, RAID 1, and RAID 10
  * Refer to “1-7 Internal Connectors,” for the installation notices for the M.2 and SATA connectors.

### USB
- Chipset:
  - 2 x USB 3.1 Gen 1 ports available through the internal USB header
  - 8 x USB 2.0/1.1 ports (4 ports on the back panel, 4 ports available through the internal USB headers)
- CPU:
  - 4 x USB 3.1 Gen 1 ports on the back panel

### Internal Connectors
- 1 x 24-pin ATX main power connector
- 1 x 8-pin ATX 12V power connector
- 1 x CPU fan header
- 1 x system fan header
- 1 x M.2 Socket 3 connector
- 4 x SATA 6Gb/s connectors
- 1 x front panel header
- 1 x front panel audio header
- 1 x S/PDIF Out header
- 1 x CPU cooler LED strip/RGB LED strip header
- 1 x USB 3.1 Gen 1 header
- 2 x USB 2.0/1.1 headers
- 1 x Trusted Platform Module (TPM) header (2x10 pin, for the GC-TPM2.0 module only)
- 1 x serial port header
- 1 x Clear CMOS jumper

### Back Panel Connectors
- 1 x PS/2 keyboard/mouse port
- 1 x DVI-D port
- 1 x HDMI port
- 4 x USB 3.1 Gen 1 ports
- 4 x USB 2.0/1.1 ports
- 1 x RJ-45 port
- 3 x audio jacks

### I/O Controller
- iTE® I/O Controller Chip

### Hardware Monitor
- Voltage detection
- Temperature detection
- Fan speed detection
- Overheating warning
- Fan fail warning
- Fan speed control
  * Whether the fan speed control function is supported will depend on the cooler you install.
### BIOS
- 1 x 128 Mbit flash
- Use of licensed AMI UEFI BIOS
- PnP 1.0a, DMI 2.7, WIM 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
- Support for Xpress Install

### Bundled Software
- Norton® Internet Security (OEM version)
- cFosSpeed

### Operating System
- Support for Windows 10 64-bit

### Form Factor
- Micro ATX Form Factor; 24.4cm x 21.5cm

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

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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

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.
• 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.

Installing the CPU

Completely lift up the CPU socket locking lever. Locate the pin one (denoted by a small triangle) of the CPU socket and the CPU. Once the CPU is positioned into its socket, place one finger down on the middle of the CPU, lowering the locking lever and latching it into the fully locked position.

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.

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_2, DDR4_4
- Channel B: DDR4_1, DDR4_3

Please visit GIGABYTE’s website for details on hardware installation.
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.

1-6 Back Panel Connectors

USB 2.0/1.1 Port
The USB port supports the USB 2.0/1.1 specification. Use this port for USB devices.

PS/2 Keyboard/Mouse Port
Use this port to connect a PS/2 mouse or keyboard.

DVI-D Port (Note 1)
The DVI-D port conforms to the DVI-D specification and supports a maximum resolution of 1920x1200@60 Hz (the actual resolutions supported depend on the monitor being used). Connect a monitor that supports DVI-D connection to this port.

HDMI Port
The HDMI port supports HDR 2.2 (Note 2) and Dolby TrueHD and DTS HD Master Audio formats. It also supports up to 192KHz/24bit 7.1-channel LPCM audio output. You can use this port to connect your HDMI-supported monitor. The maximum supported resolution is 4096x2160@60 Hz (Note 2), but the actual resolutions supported are dependent on the monitor being used.

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

(Note 1) The DVI-D port does not support D-Sub connection by adapter.
(Note 2) Actual support may vary by CPU.

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. For optimum performance, when enabling Dual Channel mode with four memory modules, we recommend that you install them in DDR4_1 and DDR4_2 sockets.

Dual Channel Memory Configurations Table

<table>
<thead>
<tr>
<th></th>
<th>DDR4_4</th>
<th>DDR4_2</th>
<th>DDR4_3</th>
<th>DDR4_1</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Modules</td>
<td>-</td>
<td>DS/SS</td>
<td>-</td>
<td>DS/SS</td>
</tr>
<tr>
<td>4 Modules</td>
<td>DS/SS</td>
<td>DS/SS</td>
<td>DS/SS</td>
<td>DS/SS</td>
</tr>
</tbody>
</table>

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

(Note 1) The DVI-D port does not support D-Sub connection by adapter.
(Note 2) Actual support may vary by CPU.
To configure 7.1-channel audio, you need to open the audio software and select Device advanced settings > Playback Device to change the default setting first. Please visit GIGABYTE’s website for details on configuring the audio software.

- 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.
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/ATX (2x4 12V Power Connector 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.

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Definition</th>
<th>Pin No.</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND (Only for 2x4-pin 12V)</td>
<td>5</td>
<td>+12V (Only for 2x4-pin 12V)</td>
</tr>
<tr>
<td>2</td>
<td>GND (Only for 2x4-pin 12V)</td>
<td>6</td>
<td>+12V (Only for 2x4-pin 12V)</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>7</td>
<td>+12V</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>8</td>
<td>+12V</td>
</tr>
</tbody>
</table>

ATX:

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

3/4) CPU_FAN/SYS_FAN1 (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 motherboard supports CPU fan speed control, which requires the use of a CPU fan with fan speed control design. For optimum heat dissipation, it is recommended that a system fan be installed inside the chassis.

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
</tr>
<tr>
<td>2</td>
<td>Voltage Speed Control</td>
</tr>
<tr>
<td>3</td>
<td>Sense</td>
</tr>
<tr>
<td>4</td>
<td>PWM Speed Control</td>
</tr>
</tbody>
</table>

• 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.
5) **LED_CPU (CPU Cooler LED Strip/RGB LED Strip Header)**

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

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12V</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
</tr>
<tr>
<td>3</td>
<td>R</td>
</tr>
<tr>
<td>4</td>
<td>B</td>
</tr>
</tbody>
</table>

Connect the CPU cooler LED strip/RGB 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 (12V) of this header. Incorrect connection may lead to the damage of the LED strip.

6) **SATA3 0/1/2/3 (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 SATA connectors support RAID 0, RAID 1, and RAID 10. Refer to Chapter 3, "Configuring a RAID Set," for instructions on configuring a RAID array.

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
</tr>
<tr>
<td>2</td>
<td>TXP</td>
</tr>
<tr>
<td>3</td>
<td>TXN</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
</tr>
<tr>
<td>5</td>
<td>RXN</td>
</tr>
<tr>
<td>6</td>
<td>RXP</td>
</tr>
<tr>
<td>7</td>
<td>GND</td>
</tr>
</tbody>
</table>
7) **M2A_SOCKET (M.2 Socket 3 Connector)**

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 a SATA hard drive. To create a RAID array with an M.2 PCIe SSD, you must set up the configuration in UEFI BIOS mode. 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:**
Use a screw driver to unfasten the screw and nut from the motherboard. Locate the proper mounting hole for the M.2 SSD to be installed and then screw the nut first.

Slide the M.2 SSD into the connector at an angle.

**Step 2:**
Press the M.2 SSD down and then secure it with the screw.

Select the proper hole for the M.2 SSD to be installed and refasten the screw and nut.

---

8) **SPDIF_O (S/PDIF Out Header)**

This header supports digital S/PDIF Out and connects a S/PDIF digital audio cable (provided by expansion cards) for digital audio output from your motherboard to certain expansion cards like graphics cards and sound cards. For example, some graphics cards may require you to use a S/PDIF digital audio cable for digital audio output from your motherboard to your graphics card if you wish to connect an HDMI display to the graphics card and have digital audio output from the HDMI display at the same time. For information about connecting the S/PDIF digital audio cable, carefully read the manual for your expansion card.

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5VDUAL</td>
</tr>
<tr>
<td>2</td>
<td>No Pin</td>
</tr>
<tr>
<td>3</td>
<td>SPDIFO</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
</tr>
</tbody>
</table>
9) 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):
  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," "Power Management," 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.

10) 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.

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Definition</th>
<th>Pin No.</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MIC2_L</td>
<td>6</td>
<td>Sense</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>7</td>
<td>FAUDIO_JD</td>
</tr>
<tr>
<td>3</td>
<td>MIC2_R</td>
<td>8</td>
<td>No Pin</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>9</td>
<td>LINE2_L</td>
</tr>
<tr>
<td>5</td>
<td>LINE2_R</td>
<td>10</td>
<td>Sense</td>
</tr>
</tbody>
</table>

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.
11) F_USB30 (USB 3.1 Gen 1 Header)
The header conforms to USB 3.1 Gen 1 and USB 2.0 specification and can provide two USB ports. For purchasing the optional 3.5" front panel that provides two USB 3.1 Gen 1 ports, please contact the local dealer.

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Definition</th>
<th>Pin No.</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VBUS</td>
<td>11</td>
<td>D2+</td>
</tr>
<tr>
<td>2</td>
<td>SSRX1-</td>
<td>12</td>
<td>D2-</td>
</tr>
<tr>
<td>3</td>
<td>SSRX1+</td>
<td>13</td>
<td>GND</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>14</td>
<td>SSTX2+</td>
</tr>
<tr>
<td>5</td>
<td>SSTX1-</td>
<td>15</td>
<td>SSTX2-</td>
</tr>
<tr>
<td>6</td>
<td>SSTX1+</td>
<td>16</td>
<td>GND</td>
</tr>
<tr>
<td>7</td>
<td>GND</td>
<td>17</td>
<td>SSRX2+</td>
</tr>
<tr>
<td>8</td>
<td>D1-</td>
<td>18</td>
<td>SSRX2-</td>
</tr>
<tr>
<td>9</td>
<td>D1+</td>
<td>19</td>
<td>VBUS</td>
</tr>
<tr>
<td>10</td>
<td>NC</td>
<td>20</td>
<td>No Pin</td>
</tr>
</tbody>
</table>

12) 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.

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Definition</th>
<th>Pin No.</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power (5V)</td>
<td>6</td>
<td>USB DY+</td>
</tr>
<tr>
<td>2</td>
<td>Power (5V)</td>
<td>7</td>
<td>GND</td>
</tr>
<tr>
<td>3</td>
<td>USB DX-</td>
<td>8</td>
<td>GND</td>
</tr>
<tr>
<td>4</td>
<td>USB DY-</td>
<td>9</td>
<td>No Pin</td>
</tr>
<tr>
<td>5</td>
<td>USB DX+</td>
<td>10</td>
<td>NC</td>
</tr>
</tbody>
</table>

- 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.

13) COM (Serial Port Header)
The COM header can provide one serial port via an optional COM port cable. For purchasing the optional COM port cable, please contact the local dealer.

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Definition</th>
<th>Pin No.</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NDCD-</td>
<td>6</td>
<td>NDSR-</td>
</tr>
<tr>
<td>2</td>
<td>NSIN</td>
<td>7</td>
<td>NRTS-</td>
</tr>
<tr>
<td>3</td>
<td>NSOUT</td>
<td>8</td>
<td>NCTS-</td>
</tr>
<tr>
<td>4</td>
<td>NDTR-</td>
<td>9</td>
<td>NRI-</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>10</td>
<td>No Pin</td>
</tr>
</tbody>
</table>
14) TPM (Trusted Platform Module Header)
You may connect a TPM (Trusted Platform Module) to this header.

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Definition</th>
<th>Pin No.</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LCLK</td>
<td>11</td>
<td>LAD0</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>12</td>
<td>GND</td>
</tr>
<tr>
<td>3</td>
<td>LFRAME</td>
<td>13</td>
<td>NC</td>
</tr>
<tr>
<td>4</td>
<td>No Pin</td>
<td>14</td>
<td>NC</td>
</tr>
<tr>
<td>5</td>
<td>LRESET</td>
<td>15</td>
<td>SB3V</td>
</tr>
<tr>
<td>6</td>
<td>NC</td>
<td>16</td>
<td>SERIRQ</td>
</tr>
<tr>
<td>7</td>
<td>LAD3</td>
<td>17</td>
<td>GND</td>
</tr>
<tr>
<td>8</td>
<td>LAD2</td>
<td>18</td>
<td>NC</td>
</tr>
<tr>
<td>9</td>
<td>VCC3</td>
<td>19</td>
<td>NC</td>
</tr>
<tr>
<td>10</td>
<td>LAD1</td>
<td>20</td>
<td>NC</td>
</tr>
</tbody>
</table>

15) 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.

16) 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.

- 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).
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.

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/clear CMOS jumper 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.

There are two different BIOS modes as follows and you can use the <F2> key to switch between the two modes. The Classic Setup 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.

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.

- When the system is not stable as usual, select the Load Optimized Defaults item to set your system to its defaults.
- The BIOS Setup menus described in this chapter are for reference only and may differ by BIOS version.
2-2 The Main Menu

Quick Access Bar allows you to enter Easy Mode, select BIOS default language, configure fan settings, or enter Q-Flash.

Classic Setup Function Keys

<leftrightarrow> Move the selection bar to select a setup menu
<up-down> Move the selection bar to select an configuration item on a menu
<Enter> 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
<F5> Restore the previous BIOS settings for the current submenus
<F7> Load the Optimized BIOS default settings for the current submenus
<F8> Access the Q-Flash utility
<F9> Display system information
<F10> Save all the changes and exit the BIOS Setup program
<F12> Capture the current screen as an image and save it to your USB drive
<Esc> Main Menu: Exit the BIOS Setup program
Submenus: Exit current submenu
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.)

**Advanced Frequency Settings**

- **CPU Clock Control**
  Allows you to manually set the CPU base clock in 1 MHz increments. (Default: Auto)
  **Important:** It is highly recommended that the CPU frequency be set in accordance with the CPU specifications.

- **Host Clock Value**
  Displays the current operating Host Clock frequency.

- **GFX Clock Frequency** *(Note)*
  Allows you to alter the frequency for the GPU. After you alter the **GFX Clock Frequency** settings, make sure to adjust the **GFX Core Voltage** settings. (Default: Auto)
  **NOTE:** The adjustable range is dependent on the CPU being installed. **Auto** lets the BIOS automatically configure this setting.

- **GFX Core Voltage** *(Note)*
  Allows you to alter the voltage for the GPU. (Default: Auto)
  **NOTE:** The adjustable range is dependent on the CPU being installed. **Auto** lets the BIOS automatically configure this setting.

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

- **CPU Frequency**
  Displays the current operating CPU frequency.

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

CPU Clock Ratio, CPU Frequency
The settings above are synchronous to those under the same items on the Advanced Frequency Settings menu.

Core Performance Boost
Allows you to determine whether to enable the Core Performance Boost (CPB) technology, a CPU performance-boost technology. (Default: Auto)

AMD Cool&Quiet function
- Enabled Lets the AMD Cool'n'Quiet driver dynamically adjust the CPU clock and VID to reduce heat output from your computer and its power consumption. (Default)
- Disabled Disables this function.

SVM Mode
Virtualization enhanced by Virtualization Technology will allow a platform to run multiple operating systems and applications in independent partitions. With virtualization, one computer system can function as multiple virtual systems. (Default: Disabled)

PPC Adjustment (Note 1)
Allows you to fix the PState of the CPU. (Default: PState 0)

Global C-state Control
Allows you to determine whether to let the CPU enter C states. When enabled, the CPU core frequency will be reduced during system halt state to decrease power consumption. (Default: Enabled)

Power Supply Idle Control
Enables or disables Package C6 State.
- Typical Current Idle Disables this function.
- Low Current Idle Enables this function.
- Auto Lets the BIOS automatically configure this setting. (Default)

CCD Control (Note 1)
Sets the number of CCDs to be used. (Default: Auto)

CPPC (Note 1)
Enables or disables theCPPC feature. (Default: Auto)

CPPC Preferred Cores (Note 1)
Enables or disables the CPPC Preferred Cores feature. (Default: Auto)

Opcache Control (Note 1)
Enables or disables Opcache. Auto lets the BIOS automatically configure this setting. (Default: Auto)

Downcore Control
Allows you to select the number of CPU cores to enable (the number of CPU cores may vary by CPU). Auto lets the BIOS automatically configure this setting. (Default: Auto)

SMT Mode
Allows you to enable or disable the CPU Simultaneous Multi-Threading technology. This feature only works for operating systems that support multi-processor mode. Auto lets the BIOS automatically configure this setting. (Default: Auto)

Extreme Memory Profile (X.M.P.) (Note 2)
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 2) Uses Profile 2 settings.

(Note 1) This item is present only when you install a CPU that supports this feature.
(Note 2) This item is present only when you install a CPU and a memory module that support this feature.
System Memory Multiplier
Allows you to set the system memory multiplier. Auto sets memory multiplier according to memory SPD data. (Default: Auto)

Memory Frequency (MHz)
The first memory frequency value is the normal operating frequency of the memory being used; the second is the memory frequency that is automatically adjusted according to the System Memory Multiplier settings.

Advanced Memory Settings
Extreme Memory Profile (X.M.P.) (Note), System Memory Multiplier, Memory Frequency (Mhz)
The settings above are synchronous to those under the same items on the Advanced Frequency Settings menu.

XMP High Frequency Support (Note)
Allows you to select the compatibility level for high-frequency memory. This item is configurable only when Extreme Memory Profile (X.M.P.) is set to Profile1 or Profile2. (Default: Auto)

Memory Timing Mode
Manual allows the memory timing settings below to be configurable. Options are: Auto (default), Manual.

Profile DDR Voltage
When using a non-XMP memory module or Extreme Memory Profile (X.M.P.) is set to Disabled, the value is displayed according to your memory specification. When Extreme Memory Profile (X.M.P.) is set to Profile1 or Profile2, the value is displayed according to the SPD data on the XMP memory.

Standard Timing Control, Advanced Timing Control, CAD Bus Setup Timing, CAD Bus Drive Strength, Data Bus Configuration
These sections provide memory timing settings. The respective timing setting screens are configurable only when Memory Timing Mode is set to Manual. 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.

Advanced Voltage Settings
This sub-menu allows you to set CPU, chipset and memory voltages.

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 VDDP/DRAM Channel A/B Voltage/+3.3V/+5V/+12V/VCORE SOC
Displays the current system voltages.

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

- **PCIe Slot Configuration**
  Allows you to set the operation mode of the 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)

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

- **Smart Fan 5**

  - **Monitor**
    Allows you to select a target to monitor and to make further adjustment. (Default: CPU FAN)

  - **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 control the fan speed in the curve graph.
    - **Full Speed**
      Allows the fan to run at full speeds.

  - **Fan Control Use Temperature Input**

  - **Temperature Interval**

  - **Fan 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.
    - **PWM**
      PWM mode is recommended for a 4-pin fan.

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

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

  - **Fan Speed**
    Displays current fan speeds.

  - **Temperature Warning**
    Sets the warning threshold for temperature. When temperature exceeds the threshold, BIOS will emit warning sound. Options are: Disabled (default), 60°C/140°F, 70°C/158°F, 80°C/176°F, 90°C/194°F.

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

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

- **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.

- **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.
**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.

**Hard Drive/CD/DVD ROM Drive/Floppy Drive/Network Device BBS Priorities**
Specifies the boot order for a specific device type, such as hard drives, optical drives, floppy disc drives, and devices that support Boot from LAN function, etc. Press <Enter> on this item to enter the submenu that presents the devices of the same type that are connected. This item is present only if at least one device for this type is installed.

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

**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)

**Fast Boot**
Enables or disables Fast Boot to shorten the OS boot process. **Ultra Fast** provides the fastest bootup speed. (Default: Disabled)
SATA Support
- All Sata Devices: All SATA devices are functional in the operating system and during the POST.
- Last Boot HDD Only: Except for the previous boot drive, all SATA devices are disabled before the OS boot process completes. (Default)

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

NVMe Support
Allows you to enable or disable NVMe device(s). (Default: Enabled)
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
- Disabled: 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. This function is disabled when Fast Boot is set to Ultra Fast.

PS2 Devices Support
- Disabled: All PS/2 devices are disabled before the OS boot process completes.
- Enabled: All PS/2 devices are functional in the operating system and during the POST. (Default)

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

NetWork Stack Driver Support
- Disabled: 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.

CSM Support
Enables or disables UEFI CSM (Compatibility Support Module) to support a legacy PC boot process.
- Enabled: Enables UEFI CSM. (Default)
- Disabled: Disables UEFI CSM and supports UEFI BIOS boot process only.

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.
- Disabled: Disables option ROM.
- UEFI Only: Enables UEFI option ROM only.
- Legacy Only: Enables legacy option ROM only. (Default)

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

Other PCI Device ROM Priority
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.
- Disabled: Disables option ROM.
- UEFI Only: Enables UEFI option ROM only. (Default)
- Legacy Only: 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**.
2-6 Peripherals

AMD CPU fTPM
Enables or disables the TPM 2.0 function integrated in the AMD CPU. (Default: Disabled)

Initial Display Output (Note)
Specifies the first initiation of the monitor display from the installed PCI Express graphics card or the onboard graphics.
- IGD Video Sets the onboard graphics as the first display.
- PCIe 1 Slot Sets the graphics card on the PCIEX16 slot as the first display. (Default)

RGB Fusion (Onboard LED)
Allows you to set the LED lighting mode for the motherboard.
- On Enables this function. (Default)
- Off Disables this function.
- Pulse Mode All LEDs simultaneously fade in and fade out.

RGB Fusion (LED strip)
Allows you to set the display color of the external LED strip.

HD 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.

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)

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

(Note) This item is present only when you install a CPU that supports this feature.
- Super IO Configuration
  - Serial Port 1
    Enables or disables the onboard serial port. (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.
  - Port 60/64 Emulation
    Enables or disables emulation of I/O ports 64h and 60h. This should be enabled for full legacy support for USB keyboards/mice in MS-DOS or in operating system that does not natively support USB devices. (Default: Disabled)

- NVMe Configuration
  Displays information on your M.2 NVME PCIe SSD if 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.
  - IPSEC Certificate
    Enables or disables Internet Protocol Security. 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)
- AMD CBS
  This sub-menu provides AMD CBS-related configuration options.
- Realtek PCIe GBE Family Controller
  This sub-menu provides information on LAN configuration and related configuration options.
2-7 Chipset

- IOMMU
  Enables or disables AMD IOMMU support. (Default: Auto)

- Integrated Graphics (Note)
  Enables or disables the onboard graphics function.
  » Auto
    The BIOS will automatically enable or disable the onboard graphics depending on the graphics card being installed. (Default)
  » Forces
    Enables the onboard graphics.
  » Disabled
    Disables the onboard graphics.

- UMA Mode (Note)
  Specify the UMA mode.
  » Auto
    Lets the BIOS automatically configure this setting. (Default)
  » UMA Specified
    Sets the UMA Frame Buffer Size.
  » UMA Auto
    Sets the display resolution.
  This item is configurable only when Integrated Graphics is set to Forces.

- UMA Frame Buffer Size (Note)
  Frame buffer size is the total amount of system memory allocated solely for the onboard graphics controller. MS-DOS, for example, will use only this memory for display. Options are: Auto (default), 64M~16G.
  This item is configurable only when UMA Mode is set to UMA Specified.

- Display Resolution (Note)
  Allows you to set the display resolution. Options are: Auto (default), 1920x1080 and below, 2560x1600, 3840x2160.
  This item is configurable only when UMA Mode is set to UMA Auto.

(Note) This item is present only when you install a CPU that supports this feature.
SATA Mode
Enables or disables RAID for the integrated SATA controllers or configures the SATA controllers to AHCI mode.

- RAID
  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)

NVMe RAID mode (M2A_SOCKET Connector)
Allows you to determine whether to use your M.2 NVMe PCIe SSDs to configure RAID. (Default: Disabled)

APU SATA Port Enable (M2A_SOCKET Connector)
Enables or disables the M.2 NVMe PCIe SSDs controller. (Default: Enabled)

APU SATA Hot plug
Enables or disable the hot plug capability for M2A_SOCKET Connector. (Default: Disabled)

Chipset SATA Port Enable (SATA3 0, 1, 2, 3 Connectors)
Enables or disables the integrated SATA controllers. (Default: Enabled)

APU SATA Port 0 (M2A_SOCKET Connector)
Displays the information of the connected M.2 SATA device.

Chipset SATA Port 0/1/2/3 (SATA3 0, 1, 2, 3 Connectors)
Displays the information of the connected SATA device(s).
2-8  Power

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)

Power On By Keyboard
Allows the system to be turned on by a PS/2 keyboard wake-up event.
Note: To use this function, you need an ATX power supply providing at least 1A on the +5VSB lead.

- Disabled  Disables this function. (Default)
- Password  Set a password with 1~5 characters to turn on the system.
- Keyboard 98  Press POWER button on the Windows 98 keyboard to turn on the system.
- Any key  Press any key to turn on the system.

Power On Password
Set the password when Power On By Keyboard is set to Password.
Press <Enter> on this item and set a password with up to 5 characters and then press <Enter> to accept.
To turn on the system, enter the password and press <Enter>.
Note: To cancel the password, press <Enter> on this item. When prompted for the password, press <Enter>
again without entering the password to clear the password settings.

Power On By Mouse
Allows the system to be turned on by a PS/2 mouse wake-up event.
Note: To use this function, you need an ATX power supply providing at least 1A on the +5VSB lead.

- Disabled  Disables this function. (Default)
- Move  Move the mouse to turn on the system.
- Double Click  Double click on left button on the mouse to turn on the system.
ErP
Determines whether to let the system consume least power in S5 (shutdown) state. Note: When this item is set to Enabled, the following functions will become unavailable: Resume by Alarm, power on by mouse, and power on by keyboard.

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.

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)

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.

Wake on LAN
Enables or disables the wake on LAN function. (Default: Enabled)

High Precision Event Timer
Enables or disables High Precision Event Timer (HPET) in the operating system. (Default: Enabled)

CEC 2019 Ready
Allows you to select whether to allow the system to adjust power consumption when it is in shutdown, idle, or standby state in order to comply with the CEC (California Energy Commission) 2019 Standards. (Default: Disabled)
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 default 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. 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  Appendix

3-1 Configuring a RAID Set

RAID Levels

<table>
<thead>
<tr>
<th>Minimum Number of Hard Drives</th>
<th>RAID 0</th>
<th>RAID 1</th>
<th>RAID 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥2</td>
<td></td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Array Capacity

<table>
<thead>
<tr>
<th>Number of hard drives</th>
<th>Size of the smallest drive</th>
<th>Number of hard drives/2</th>
<th>Size of the smallest drive</th>
</tr>
</thead>
</table>

Fault Tolerance

| No | Yes | Yes |

Before you begin, please prepare the following items:

- At least two SATA hard drives or SSDs (To ensure optimal performance, it is recommended that you use two hard drives with identical model and capacity).
- Windows setup disc.
- Motherboard driver disc.
- A USB thumb drive.

Configuring the Onboard SATA Controller

A. Installing SATA hard drive(s) in your computer

Install the hard drives/SSDs in the SATA/M.2 connectors on the motherboard. Then connect the power connectors from your power supply to the hard drives.

B. Configuring SATA controller mode in BIOS Setup

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

Steps:

1. Turn on your computer and press <Delete> to enter BIOS Setup during the POST (Power-On Self-Test). Under Chipset, ensure Chipset SATA Port Enable is enabled. Set SATA Mode to RAID. Then save the settings and restart your computer. (If you want to use NVMe PCIe SSDs to configure RAID, make sure to set NVMe RAID mode to Enabled.)

2. If you want to configure UEFI RAID, follow the steps in "C-1." To enter the legacy RAID ROM, save the settings and exit BIOS Setup. Refer to "C-2" for more information.

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.

C-1. UEFI RAID Configuration

Steps:

1. In BIOS Setup, go to BIOS and set CSM Support to Disabled. Save the changes and exit BIOS Setup.

2. After the system reboot, enter BIOS Setup again. Then enter the Peripherals|RAIDXpert2 Configuration Utility sub-menu.

3. On the RAIDXpert2 Configuration Utility screen, press <Enter> on Array Management to enter the Create Array screen. Then, select a RAID level. RAID levels supported include RAID 0(Stripe), RAID 1(Mirror), and RAID 10 (the selections available depend on the number of the hard drives being installed). Next, press <Enter> on Select Physical Disks to enter the Select Physical Disks screen.

4. On the Select Physical Disks screen, select the hard drives to be included in the RAID array and set them to Enabled. Next, use the down arrow key to move to Apply Changes and press <Enter>. Then return to the previous screen and set the Array Size, Array Size Unit, Read Cache Policy and Write Cache Policy.

(Note) 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.
5. After setting the capacity, move to **Create Array** and press <Enter> to begin.
6. After completing, you'll be brought back to the **Array Management** screen. Under **Manage Array Properties** you can see the new RAID volume and information on RAID level, array name, array capacity, etc.

### C-2. Configuring Legacy RAID ROM

Enter the legacy RAID BIOS setup utility to configure a RAID array. Skip this step and proceed with the installation of Windows operating system for a non-RAID configuration.

**Steps:**

1. After the POST memory test begins and before the operating system boot begins, look for a message which says "Press <Ctrl-F> to enter RAID Option ROM Utility". Press <Ctrl> + <R> to enter the RAID BIOS setup utility.
2. To create a new array, press <Enter> on the **Create Array** option.
3. The selection bar will move to the **Disks** section on the right of the screen. Select the hard drives to be included in the RAID array. Use the up or down arrow key to select a hard drive and press <Insert>. The selected hard drive will be shown in green. To use all of the hard drives, simply press <A> to select all. Then press <Enter> and the selection bar will move to the **User Input** section on the left bottom of the screen.
4. First, select a RAID mode and press <Enter>. The selections available depend on the number of the hard drives being installed. Then follow the on-screen instructions to specify the array size. You can select **All available space** to use the maximum size allowed or use the up or down arrow key to adjust the size and press <Enter>.
5. Select a caching mode. Options include Read/Write, Read Only, and None. Then press <Enter> to proceed.
6. Finally, a message which says "Confirm Creation of Array" will appear. Press <C> to confirm or <Esc> to return to the previous screen.
7. When completed, you will see the new array on the main screen. To exit the RAID BIOS utility, press <Esc> and then press <C> to confirm.

### Installing the SATA RAID Driver and Operating System

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

#### Installing 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 motherboard driver disc using "Xpress Install" 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:

1. Copy the Hw10 folder under the \Boot folder in the driver disc to your USB thumb drive.
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**.
3. Insert the USB thumb drive and then browse to the location of the driver. The location of the drivers is as follows:
   \Hw10\RAID\x64
4. Select **AMD-RAID Bottom Device** first and click **Next** to load the driver. Then select **AMD-RAID Controller** and click **Next** to load the driver. Finally, continue the OS installation.

Please visit GIGABYTE's website for details on configuring a RAID array.
3-2 Drivers Installation

- Before installing the drivers, first install the operating system.
- After installing the operating system, insert the motherboard driver disc into your optical drive. Click on the message "Tap to choose what happens with this disc" on the top-right corner of the screen and select "Run Run.exe." (Or go to My Computer, double-click the optical drive and execute the Run.exe program.)

"Xpress Install" will automatically scan your system and then list all of the drivers that are recommended to install. You can click the Xpress Install button and "Xpress Install" will install all of the selected drivers. Or click the arrow icon to individually install the drivers you need.

Please visit GIGABYTE's website for more software information.
Please visit GIGABYTE's website for more troubleshooting information.
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: B450M DS3H V2

Responsible Party – U.S. Contact Information: G.B.T. Inc.
Address: 17358 Railroad street, City Of Industry, CA 91748
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.

- 40 -

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with manufacturer's instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and receiver.
• Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced radio/TV technician for help.

Canadian Department of Communications Statement
This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications. This class B digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

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, 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.

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.

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.

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.

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.

European Union (EU) CE-Konformitätserklärung

CE declaración de conformidad
Este producto cumple con la marca CE. Cumple con las normas europeas armonizadas.

CE Declaración de conformidad

Dichiarazione di conformità CE
Questo prodotto è conforme alle seguenti direttive: Direttiva sulla compatibilità elettromagnetica 2014/30/UE, Direttiva sulla bassa tensione 2014/35/UE, Direttiva RoHS (rifiutazione) 2011/65/UE. Questo prodotto è stato testato e trovato conforme a tutti i requisiti essenziali delle Direttive.
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To submit a technical or non-technical (Sales/Marketing) question, please link to:
https://esupport.gigabyte.com