AUSTRALIA ONLY

Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage caused by our goods. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure. If you require assistance please call ASRock Tel: +886-2-28965588 ext.123 (Standard International call charges apply)

The terms HDMI® and HDMI High-Definition Multimedia Interface, and the HDMI logo are trademarks or registered trademarks of HDMI Licensing LLC in the United States and other countries.
CE Warning

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

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

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

<table>
<thead>
<tr>
<th>Function</th>
<th>Frequency</th>
<th>Maximum Output Power (EIRP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WiFi</td>
<td>2400-2483.5 MHz</td>
<td>18.5 + / -1.5 dbm</td>
</tr>
<tr>
<td></td>
<td>5150-5250 MHz</td>
<td>21.5 + / -1.5 dbm</td>
</tr>
<tr>
<td></td>
<td>5250-5350 MHz</td>
<td>18.5 + / -1.5 dbm (no TPC)</td>
</tr>
<tr>
<td></td>
<td>5470-5725 MHz</td>
<td>21.5 + / -1.5 dbm (TPC)</td>
</tr>
<tr>
<td></td>
<td>5725-6427 MHz</td>
<td>25.5 + / -1.5 dbm (no TPC)</td>
</tr>
<tr>
<td>Bluetooth</td>
<td>2400-2483.5 MHz</td>
<td>28.5 + / -1.5 dbm (TPC)</td>
</tr>
<tr>
<td></td>
<td>2483.5-2497 MHz</td>
<td>8.3 + / -1.5 dbm</td>
</tr>
</tbody>
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<th>Page</th>
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<td>4.10</td>
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<tr>
<td>4.11</td>
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<td>111</td>
</tr>
</tbody>
</table>
Chapter 1 Introduction

Thank you for purchasing ASRock Z490 Taichi motherboard, a reliable motherboard produced under ASRock’s consistently stringent quality control. It delivers excellent performance with robust design conforming to ASRock’s commitment to quality and endurance.

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

1.1 Package Contents

- ASRock Z490 Taichi Motherboard (ATX Form Factor)
- ASRock Z490 Taichi Quick Installation Guide
- ASRock Z490 Taichi Support CD
- 4 x Serial ATA (SATA) Data Cables (Optional)
- 1 x ASRock SLI_HB_Bridge_2S Card
- 1 x ASRock WiFi 2.4/5 GHz Antenna
- 1 x ASRock Screwdriver (Optional)
- 3 x Screws for M.2 Sockets (Optional)
- 2 x Standoffs for M.2 Sockets (Optional)
## 1.2 Specifications

| Platform     | • ATX Form Factor  
|              | • 2oz Copper PCB  |
| CPU          | • Supports 10th Gen and future generation Intel® Core™ Processors (Socket 1200)  
|              | • Digi Power design  
|              | • 15 Power Phase design  
|              | • Supports Intel® Turbo Boost Max 3.0 Technology  
|              | • Supports Intel® K-Series unlocked CPUs  
|              | • Supports ASRock BCLK Full-range Overclocking  
|              | • Supports ASRock Hyper BCLK Engine III  |
| Chipset      | • Intel® Z490  |
| Memory       | • Dual Channel DDR4 Memory Technology  
|              | • 4 x DDR4 DIMM Slots  
|              | • Supports DDR4 4666+(OC)/4600/4500/4400/4333/4266 (OC)/4133(OC)/4000(OC)/3866(OC)/3800(OC)/3733(OC)/3600(OC)/3200(OC)/2933/2800/2666/2400/2133 non-ECC, un-buffered memory  
|              | * Please refer to Memory Support List on ASRock’s website for more information. (http://www.asrock.com/)  
|              | * Core™ i9/i7 support DDR4 up to 2933; Core™ i5/i3, Pentium* and Celeron* support DDR4 up to 2666.  
|              | • Supports ECC UDIMM memory modules (operate in non-ECC mode)  
|              | • Max. capacity of system memory: 128GB  
|              | • Supports Intel® Extreme Memory Profile (XMP) 2.0  
|              | • 15μ Gold Contact in DIMM Slots  |
| Expansion Slot | • 3 x PCI Express 3.0 x16 Slots (PCIE1/PCIE3/PCIE5: single at x16 (PCIE1); dual at x8 (PCIE1) / x8 (PCIE3); triple at x8 (PCIE1) / x8 (PCIE3) / x4 (PCIE5))*  
|              | * Supports NVMe SSD as boot disks  
|              | • 2 x PCI Express 3.0 x1 Slots  |
• Supports AMD Quad CrossFireX™, 3-Way CrossFireX™ and CrossFireX™
• Supports NVIDIA® SLI™
• Support NVIDIA® SLI™ with NVIDIA® Quadro graphics cards
• Supports NVIDIA® NVLink™ with dual NVIDIA® GeForce® RTX series graphics cards**
** NVIDIA NVLink Bridge does not come with the package. Please purchase it from NVIDIA® if necessary.
• 1 x Vertical M.2 Socket (Key E) with the bundled WiFi-802.11ax module (on the rear I/O)
• 15μ Gold Contact in VGA PCIe Slot (PCIE1)

** Graphics **
• Intel® UHD Graphics Built-in Visuals and the VGA outputs can be supported only with processors which are GPU integrated.
• Hardware Accelerated Codecs: AVC/H.264, HEVC/H.265 8bit, HEVC/H.265 10bit, VP8, VP9 8bit, VP9 10bit, MPEG 2, MJPEG, VC-1
  * VP9 10bit and VC-1 are for decode only.
  * VP8 and VP9 encode are not supported by Windows OS.
• Graphics, Media & Compute: Microsoft DirectX 12, OpenGL 4.5, Intel® Built In Visuals, Intel® Quick Sync Video, Hybrid / Switchable Graphics, OpenCL 2.1
• Display & Content Security: Rec. 2020 (Wide Color Gamut), Microsoft PlayReady 3.0, Intel® SGX Content Protection, UHD/HDR Blu-ray Disc
• Dual graphics output: support HDMI and DisplayPort 1.4 ports by independent display controllers
• Supports HDMI 1.4 with max. resolution up to 4K x 2K (4096x2160) @ 30Hz
• Supports DisplayPort 1.4 with max. resolution up to 4K x 2K (4096x2304) @ 60Hz
• Supports Auto Lip Sync, Deep Color (12bpc), xvYCC and HBR (High Bit Rate Audio) with HDMI 1.4 Port (Compliant HDMI monitor is required)
• Supports HDCP 2.3 with HDMI 1.4 and DisplayPort 1.4 Ports
• Supports 4K Ultra HD (UHD) playback with HDMI 1.4 and DisplayPort 1.4 Ports
Audio

- 7.1 CH HD Audio with Content Protection (Realtek ALC1220 Audio Codec)
- Premium Blu-ray Audio support
- Supports Surge Protection
- WIMA Audio Capacitors (For Front Outputs)
- ESS SABRE9218 DAC for Front Panel Audio
- 120dB SNR DAC with Differential Amplifier
- Pure Power-In
- Direct Drive Technology
- PCB Isolate Shielding
- Impedance Sensing on Rear Out port
- Individual PCB Layers for R/L Audio Channel
- Gold Audio Jacks
- 15μ Gold Audio Connector
- Nahimic Audio

LAN

1 x 2.5 Gigabit LAN 10/100/1000/2500 Mb/s (Dragon RTL-8125BG)

- Supports Dragon 2.5G LAN Software
  - Smart Auto Adjust Bandwidth Control
  - Visual User Friendly UI
  - Visual Network Usage Statistics
  - Optimized Default Setting for Game, Browser, and Streaming Modes
  - User Customized Priority Control
- Supports Wake-On-LAN
- Supports Lightning/ESD Protection
- Supports Energy Efficient Ethernet 802.3az
- Supports PXE

1 x Gigabit LAN 10/100/1000 Mb/s (Intel® I219V)

- Supports Wake-On-LAN
- Supports Lightning/ESD Protection
- Supports Energy Efficient Ethernet 802.3az
- Supports PXE
### Wireless LAN
- Intel® 802.11ax WiFi Module
- Supports IEEE 802.11a/b/g/n/ax
- Supports Dual-Band (2.4/5 GHz)
- Supports WiFi6 802.11ax (2.4Gbps)
- 2 antennas to support 2 (Transmit) x 2 (Receive) diversity technology
- Supports Bluetooth 5.1 + High speed class II
- Supports MU-MIMO

### Rear Panel I/O
- 2 x Antenna Ports
- 1 x PS/2 Mouse/Keyboard Port
- 1 x HDMI Port
- 1 x DisplayPort 1.4
- 1 x Optical SPDIF Out Port
- 2 x USB 3.2 Gen2 Type-A Ports (10 Gb/s) (ReDriver) (Supports ESD Protection)
- 1 x USB 3.2 Gen2x2 Type-C Port (20 Gb/s) (ASMedia ASM3242) (Supports ESD Protection)
* M2_3, SATA3_4, SATA3_5 and USB32_TC_1 share lanes. If either one of them is in use, USB32_TC_1 will downgrade to 16 Gb/s max.
* 5 x USB 3.2 Gen1 Ports (Supports ESD Protection)
* USB3_3 is from Intel® Z490; USB3_12 and USB3_4_5 are from ASMedia ASM1074 hub.
* Ultra USB Power is supported on USB3_4_5 ports.
* ACPI wake-up function is not supported on USB3_4_5 ports.
- 2 x RJ-45 LAN Ports with LED (ACT/LINK LED and SPEED LED)
- 1 x BIOS Flashback Button
- HD Audio Jacks: Rear Speaker / Central / Bass / Line in / Front Speaker / Microphone (Gold Audio Jacks)

### Storage
- 6 x SATA3 6.0 Gb/s Connectors, support RAID (RAID 0, RAID 1, RAID 5, RAID 10, Intel Rapid Storage Technology 17), NCQ, AHCI and Hot Plug*
- 2 x SATA3 6.0 Gb/s Connectors by ASMedia ASM1061, support NCQ, AHCI and Hot Plug
* M2_2, SATA3_0 and SATA3_1 share lanes. If either one of them is in use, the others will be disabled.
* M2_3, SATA3_4 and SATA3_5 share lanes. If either one of them is in use, the others will be disabled.
* M2_3, SATA3_4, SATA3_5 and USB32_TC_1 share lanes. If either one of them is in use, USB32_TC_1 will downgrade to 16 Gb/s max.

- 1 x Ultra M.2 Socket (M2_1), supports M Key type 2280 M.2 PCI Express module up to Gen3 x4 (32 Gb/s)**
- 1 x Ultra M.2 Socket (M2_2), supports M Key type 2260/2280 M.2 SATA3 6.0 Gb/s module and M.2 PCI Express module up to Gen3 x4 (32 Gb/s)**
- 1 x Ultra M.2 Socket (M2_3), supports M Key type 2230/2242/2260/2280/22110 M.2 SATA3 6.0 Gb/s module and M.2 PCI Express module up to Gen3 x4 (32 Gb/s)**

** Supports Intel® Optane™ Technology (M2_1 and M2_2 only)
** Supports NVMe SSD as boot disks
** Supports ASRock U.2 Kit

** Connector **

- 1 x SPI TPM Header
- 1 x Power LED and Speaker Header
- 2 x RGB LED Headers
  * Support in total up to 12V/3A, 36W LED Strip
- 2 x Addressable LED Headers
  * Support in total up to 5V/3A, 15W LED Strip
- 1 x CPU Fan Connector (4-pin)
  * The CPU Fan Connector supports the CPU fan of maximum 1A (12W) fan power.
- 1 x CPU/Water Pump Fan Connector (4-pin) (Smart Fan Speed Control)
- 6 x Chassis/Water Pump Fan Connectors (4-pin) (Smart Fan Speed Control)
  * The Chassis/Water Pump Fan supports the water cooler fan of maximum 2A (24W) fan power.
  * CPU_FAN2/WP_3A, CHA_FAN1/WP, CHA_FAN2/WP, CHA_FAN3/WP, CHA_FAN4/WP, CHA_FAN5/WP and CHA_FAN6/WP can auto detect if 3-pin or 4-pin fan is in use.
  * CPU_FAN2/WP_3A supports the water cooler fan of maximum 3A (36W) fan power.
- 1 x 24 pin ATX Power Connector (Hi-Density Power Connector)
- 2 x 8 pin 12V Power Connectors (Hi-Density Power Connector)
- 1 x Front Panel Audio Connector (15μ Gold Audio Connector)
- 1 x Thunderbolt AIC Connector (5-pin) (Supports ASRock Thunderbolt 3 AIC R2.0 Card only)
- 2 x USB 2.0 Headers (Support 4 USB 2.0 ports) (Intel® Z490) (Supports ESD Protection)
- 2 x USB 3.2 Gen1 Headers (Support 4 USB 3.2 Gen1 ports) (ASMedia ASM1074 hub) (Supports ESD Protection)
- 1 x Front Panel Type C USB 3.2 Gen2 Header (Intel® Z490) (Supports ESD Protection)
- 1 x Clear CMOS Button
- 1 x Dr. Debug with LED
- 1 x Power Button with LED
- 1 x Reset Button with LED

**BIOS Feature**
- AMI UEFI Legal BIOS with multilingual GUI support
- ACPI 6.0 Compliant wake up events
- SMBIOS 2.7 Support
- CPU Core/Cache, CPU GT, DRAM, VPPM, VCCSFR, VCCPLL, VCCSTG, VCCSTG_OUT, PCH Voltage, VCCIO, VCCST, VCCSA, CPU Internal PLL, GT PLL, Ring PLL, System Agent PLL, Memory Controller PLL Voltage Multi-adjustment

**Hardware Monitor**
- Temperature Sensing: CPU, CPU/Water Pump, Chassis/Water Pump Fans
- Fan Tachometer: CPU, CPU/Water Pump, Chassis/Water Pump Fans
- Quiet Fan (Auto adjust chassis fan speed by CPU temperature): CPU, CPU/Water Pump, Chassis/Water Pump Fans
- Fan Multi-Speed Control: CPU, CPU/Water Pump, Chassis/Water Pump Fans
- Voltage monitoring: +12V, +5V, +3.3V, CPU Vcore, DRAM, VPPM, PCH, VCCSA, VCCST, VCCIO, VCCFSR OC, VCCSFR
OS

- Microsoft® Windows® 10 64-bit

Certifications

- FCC, CE
- ErP/EuP ready (ErP/EuP ready power supply is required)

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

* Please realize that there is a certain risk involved with overclocking, including adjusting the setting in the BIOS, applying Untied Overclocking Technology, or using third-party overclocking tools. Overclocking may affect your system’s stability, or even cause damage to the components and devices of your system. It should be done at your own risk and expense. We are not responsible for possible damage caused by overclocking.
1.3 Motherboard Layout
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8 pin 12V Power Connector (ATX12V1)</td>
</tr>
<tr>
<td>2</td>
<td>8 pin 12V Power Connector (ATX12V2)</td>
</tr>
<tr>
<td>3</td>
<td>CPU Fan Connector (CPU_FAN1)</td>
</tr>
<tr>
<td>4</td>
<td>CPU/Water Pump Fan Connector (CPU_FAN2/WP_3A)</td>
</tr>
<tr>
<td>5</td>
<td>2 x 288-pin DDR4 DIMM Slots (DDR4_A1, DDR4_B1)</td>
</tr>
<tr>
<td>6</td>
<td>2 x 288-pin DDR4 DIMM Slots (DDR4_A2, DDR4_B2)</td>
</tr>
<tr>
<td>7</td>
<td>Addressable LED Header (ADDR_LED2)</td>
</tr>
<tr>
<td>8</td>
<td>ATX Power Connector (ATXPWR1)</td>
</tr>
<tr>
<td>9</td>
<td>USB 3.2 Gen1 Header (USB3_8_9)</td>
</tr>
<tr>
<td>10</td>
<td>USB 3.2 Gen1 Header (USB3_6_7)</td>
</tr>
<tr>
<td>11</td>
<td>RGB LED Header (RGB_LED2)</td>
</tr>
<tr>
<td>12</td>
<td>Front Panel Type C USB 3.2 Gen2 Header (USB31_TC_2)</td>
</tr>
<tr>
<td>13</td>
<td>Chassis/Water Pump Fan Connector (CHA_FAN5/WP)</td>
</tr>
<tr>
<td>14</td>
<td>SATA3 Connectors (SATA3_0_1)</td>
</tr>
<tr>
<td>15</td>
<td>SATA3 Connectors (SATA3_2_3)</td>
</tr>
<tr>
<td>16</td>
<td>SATA3 Connectors (SATA3_4_5)</td>
</tr>
<tr>
<td>17</td>
<td>SATA3 Connectors (SATA3_A1_A2)</td>
</tr>
<tr>
<td>18</td>
<td>Chassis/Water Pump Fan Connector (CHA_FAN6/WP)</td>
</tr>
<tr>
<td>19</td>
<td>Chassis/Water Pump Fan Connector (CHA_FAN3/WP)</td>
</tr>
<tr>
<td>20</td>
<td>Power LED and Speaker Header (SPK_PLED1)</td>
</tr>
<tr>
<td>21</td>
<td>System Panel Header (PANEL1)</td>
</tr>
<tr>
<td>22</td>
<td>Power Button (PWRBTN1)</td>
</tr>
<tr>
<td>23</td>
<td>Clear CMOS Button (CLRCBTN1)</td>
</tr>
<tr>
<td>24</td>
<td>Reset Button (RSTBTN1)</td>
</tr>
<tr>
<td>25</td>
<td>USB 2.0 Header (USB_3_4)</td>
</tr>
<tr>
<td>26</td>
<td>USB 2.0 Header (USB_1_2)</td>
</tr>
<tr>
<td>27</td>
<td>SPI TPM Header (SPI_TPM_J1)</td>
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<tr>
<td>28</td>
<td>Clear CMOS Button (CLRCBTN1)</td>
</tr>
<tr>
<td>29</td>
<td>RGB LED Header (RGB_LED1)</td>
</tr>
<tr>
<td>30</td>
<td>Chassis/Water Pump Fan Connector (CHA_FAN4/WP)</td>
</tr>
<tr>
<td>31</td>
<td>Chassis/Water Pump Fan Connector (CHA_FAN2/WP)</td>
</tr>
<tr>
<td>32</td>
<td>Addressable LED Header (ADDR_LED1)</td>
</tr>
<tr>
<td>33</td>
<td>Thunderbolt AIC Connector (TB1)</td>
</tr>
<tr>
<td>34</td>
<td>Front Panel Audio Header (HD_AUDIO1)</td>
</tr>
<tr>
<td>35</td>
<td>Chassis/Water Pump Fan Connector (CHA_FAN1/WP)</td>
</tr>
</tbody>
</table>
### 1.4 I/O Panel

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PS/2 Mouse/Keyboard Port</td>
<td>10</td>
<td>USB 3.2 Gen2x2 Type-C Port (USB32_TC_1)</td>
</tr>
<tr>
<td>2</td>
<td>Central / Bass (Orange)</td>
<td>11</td>
<td>USB 3.2 Gen2 Ports (USB31_1_2)</td>
</tr>
<tr>
<td>3</td>
<td>Rear Speaker (Black)</td>
<td>12</td>
<td>Microphone (Pink)</td>
</tr>
<tr>
<td>4</td>
<td>Line In (Light Blue)</td>
<td>13</td>
<td>Optical SPDIF Out Port</td>
</tr>
<tr>
<td>5</td>
<td>Front Speaker (Lime)*</td>
<td>14</td>
<td>USB 3.2 Gen1 Ports (USB3_12)</td>
</tr>
<tr>
<td>6</td>
<td>2.5G LAN RJ-45 Port (Dragon RTL8125BG)**</td>
<td>15</td>
<td>DisplayPort 1.4</td>
</tr>
<tr>
<td>7</td>
<td>LAN RJ-45 Port (Intel® I219V)**</td>
<td>16</td>
<td>HDMI Port</td>
</tr>
<tr>
<td>8</td>
<td>USB 3.2 Gen1 Ports (USB3_4_5)****</td>
<td>17</td>
<td>Antenna Ports (on I/O Panel Shield)</td>
</tr>
<tr>
<td>9</td>
<td>USB 3.2 Gen1 Type-A Port                (USB3_3)</td>
<td>18</td>
<td>BIOS Flashback Button</td>
</tr>
</tbody>
</table>
*If you use a 2-channel speaker, please connect the speaker’s plug into “Front Speaker Jack”. See the table below for connection details in accordance with the type of speaker you use.

<table>
<thead>
<tr>
<th>Audio Output Channels</th>
<th>Front Speaker (No. 5)</th>
<th>Rear Speaker (No. 3)</th>
<th>Central / Bass (No. 2)</th>
<th>Line In (No. 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>V</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>4</td>
<td>V</td>
<td>V</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>6</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>--</td>
</tr>
<tr>
<td>8</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>V</td>
</tr>
</tbody>
</table>

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

- **ACT/LINK LED**
- **SPEED LED**

<table>
<thead>
<tr>
<th>Activity / Link LED</th>
<th>Speed LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Description</td>
</tr>
<tr>
<td>Off</td>
<td>No Link</td>
</tr>
<tr>
<td>Blinking</td>
<td>Data Activity</td>
</tr>
<tr>
<td>On</td>
<td>Link</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Activity / Link LED</th>
<th>Speed LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
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</tr>
<tr>
<td>Off</td>
<td>No Link</td>
</tr>
<tr>
<td>Blinking</td>
<td>Data Activity</td>
</tr>
<tr>
<td>On</td>
<td>Link</td>
</tr>
</tbody>
</table>

**** ACPI wake-up function is not supported on USB3_4_5 ports.****
1.5 WiFi-802.11ax Module and ASRock WiFi 2.4/5 GHz Antenna

WiFi-802.11ax + BT Module

This motherboard comes with an exclusive WiFi 802.11 a/b/g/n/ax + BT v5.1 module (pre-installed on the rear I/O panel) that offers support for WiFi 802.11 a/b/g/n/ax connectivity standards and Bluetooth v5.1. WiFi + BT module is an easy-to-use wireless local area network (WLAN) adapter to support WiFi + BT. Bluetooth v5.1 standard features Smart Ready technology that adds a whole new class of functionality into the mobile devices. BT 5.1 also includes Low Energy Technology and ensures extraordinary low power consumption for PCs. The 2T2R WiFi solution sets a WiFi high speed standard and offers max link rate up to 2.4Gbps.

* The transmission speed may vary according to the environment.
Chapter 2 Installation

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

Pre-installation Precautions

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

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

• In order to avoid damage from static electricity to the motherboard's components, NEVER place your motherboard directly on a carpet. Also remember to use a grounded wrist strap or touch a safety grounded object before you handle the components.

• Hold components by the edges and do not touch the ICs.

• Whenever you uninstall any components, place them on a grounded anti-static pad or in the bag that comes with the components.

• When placing screws to secure the motherboard to the chassis, please do not overtighten the screws! Doing so may damage the motherboard.
2.1 Installing the CPU

1. Before you insert the 1200-Pin CPU into the socket, please check if the PnP cap is on the socket, if the CPU surface is unclean, or if there are any bent pins in the socket. Do not force to insert the CPU into the socket if above situation is found. Otherwise, the CPU will be seriously damaged.

2. Unplug all power cables before installing the CPU.
Please save and replace the cover if the processor is removed. The cover must be placed if you wish to return the motherboard for after service.
2.2 Installing the CPU Fan and Heatsink
2.3 Installing Memory Modules (DIMM)

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

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

Dual Channel Memory Configuration

<table>
<thead>
<tr>
<th>Priority</th>
<th>DDR4_A1</th>
<th>DDR4_A2</th>
<th>DDR4_B1</th>
<th>DDR4_B2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Populated</td>
<td></td>
<td></td>
<td>Populated</td>
</tr>
<tr>
<td>2</td>
<td>Populated</td>
<td>Populated</td>
<td>Populated</td>
<td>Populated</td>
</tr>
</tbody>
</table>

The DIMM only fits in one correct orientation. It will cause permanent damage to the motherboard and the DIMM if you force the DIMM into the slot at incorrect orientation.
2.4 Expansion Slots (PCI Express Slots)

There are 5 PCI Express slots on the motherboard.

Before installing an expansion card, please make sure that the power supply is switched off or the power cord is unplugged. Please read the documentation of the expansion card and make necessary hardware settings for the card before you start the installation.

PCle slots:

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

PCle Slot Configurations

<table>
<thead>
<tr>
<th></th>
<th>PCIE1</th>
<th>PCIE3</th>
<th>PCIE5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Graphics Card</td>
<td>x16</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Two Graphics Cards in</td>
<td>x8</td>
<td>x8</td>
<td>N/A</td>
</tr>
<tr>
<td>CrossFireX™ or SLI™ Mode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three Graphics Cards in</td>
<td>x8</td>
<td>x8</td>
<td>x4</td>
</tr>
<tr>
<td>3-Way CrossFireX™ Mode</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For a better thermal environment, please connect a chassis fan to the motherboard’s chassis fan connector (CHA_FAN1–6/WP) when using multiple graphics cards.
2.5 MOS Heatsink Height

MOS-N Heatsink Height
42.0 mm
2.6 Jumpers Setup

The illustration shows how jumpers are setup. When the jumper cap is placed on the pins, the jumper is “Short”. If no jumper cap is placed on the pins, the jumper is “Open”.

Clear CMOS Jumper (CLRCMOS1) (see p.9, No. 28)

CLRCMOS1 allows you to clear the data in CMOS. The data in CMOS includes system setup information such as system password, date, time, and system setup parameters. To clear and reset the system parameters to default setup, please turn off the computer and unplug the power cord, then use a jumper cap to short the pins on CLRCMOS1 for 3 seconds. Please remember to remove the jumper cap after clearing the CMOS. If you need to clear the CMOS when you just finish updating the BIOS, you must boot up the system first, and then shut it down before you do the clear-CMOS action.
2.7 Onboard Headers and Connectors

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

System Panel Header
(9-pin PANEL1)
(see p.9, No. 21)

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

- **PWRBTN (Power Button):** Connect to the power button on the chassis front panel. You may configure the way to turn off your system using the power button.
- **RESET (Reset Button):** Connect to the reset button on the chassis front panel. Press the reset button to restart the computer if the computer freezes and fails to perform a normal restart.
- **PLED (System Power LED):** Connect to the power status indicator on the chassis front panel. The LED is on when the system is operating. The LED keeps blinking when the system is in S1/S3 sleep state. The LED is off when the system is in S4 sleep state or powered off (S5).
- **HDLED (Hard Drive Activity LED):** Connect to the hard drive activity LED on the chassis front panel. The LED is on when the hard drive is reading or writing data.

The front panel design may differ by chassis. A front panel module mainly consists of power button, reset button, power LED, hard drive activity LED, speaker and etc. When connecting your chassis front panel module to this header, make sure the wire assignments and the pin assignments are matched correctly.
Power LED and Speaker Header
(7-pin SPK_PLED1)
(see p.9, No. 20)

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

Serial ATA3 Connectors
(SATA3_0_1: see p.9, No. 14)
(SATA3_2_3: see p.9, No. 15)
(SATA3_4_5: see p.9, No. 16)
(SATA3_A1_A2: see p.9, No. 17)

These eight SATA3 connectors support SATA data cables for internal storage devices with up to 6.0 Gb/s data transfer rate.
* M2_2, SATA3_0 and SATA3_1 share lanes. If either one of them is in use, the others will be disabled.
* M2_3, SATA3_4 and SATA3_5 share lanes. If either one of them is in use, the others will be disabled.
* M2_3, SATA3_4, SATA3_5 and USB32_TC_1 share lanes. If either one of them is in use, USB32_TC_1 will downgrade to 16 Gb/s max.
* To minimize the boot time, use Intel® Z490 SATA ports (SATA3_0) for your SSDs.

USB 2.0 Headers
(9-pin USB_1_2)
(see p.9, No. 26)
(9-pin USB_3_4)
(see p.9, No. 25)

There are two headers on this motherboard. Each USB 2.0 header can support two ports.
There are two headers on this motherboard. Each USB 3.2 Gen1 header can support two ports.

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

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

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

(4-pin CHA_FAN1/WP)
(see p.9, No. 35)

(4-pin CHA_FAN2/WP)
(see p.9, No. 31)

(4-pin CHA_FAN3/WP)
(see p.9, No. 19)

(4-pin CHA_FAN4/WP)
(see p.9, No. 30)

(4-pin CHA_FAN5/WP)
(see p.9, No. 13)

(4-pin CHA_FAN6/WP)
(see p.9, No. 18)

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

CPU Fan Connector

(4-pin CPU_FAN1)
(see p.9, No. 3)

This motherboard provides a 4-Pin CPU fan (Quiet Fan) connector. If you plan to connect a 3-Pin CPU fan, please connect it to Pin 1-3.
CPU/Water Pump Fan Connector
(4-pin CPU_FAN2/WP_3A)
(see p.9, No. 4)

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

ATX Power Connector
(24-pin ATXPWR1)
(see p.9, No. 8)

This motherboard provides a 24-pin ATX power connector. To use a 20-pin ATX power supply, please plug it along Pin 1 and Pin 13.

ATX 12V Power Connectors
(8-pin ATX12V1)
(see p.9, No. 1)
(8-pin ATX12V2)
(see p.9, No. 2)

This motherboard provides two 8-pin ATX 12V power connectors. To use a 4-pin ATX power supply, please plug it along Pin 1 and Pin 5.

*Connecting an ATX 12V 8-pin cable to ATX12V2 is optional.

*Warning: Please make sure that the power cable connected is for the CPU and not the graphics card. Do not plug the PCIe power cable to this connector.

Thunderbolt AIC Connectors
(5-pin TB1)
(see p.9, No. 33)

Please connect a Thunderbolt™ add-in card (AIC) to the Thunderbolt AIC connector via the GPIO cable.

*Please install the Thunderbolt™ AIC card to PCIE3 (default slot).
**SPI TPM Header**
(13-pin SPI_TPM_J1)
(see p.9, No. 27)

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

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**RGB LED Headers**
(4-pin RGB_LED1)
(see p.9, No. 29)

These two RGB headers are used to connect RGB LED extension cable which allows users to choose from various LED lighting effects.

**Caution:** Never install the RGB LED cable in the wrong orientation; otherwise, the cable may be damaged.

*Please refer to page 67 for further instructions on these two headers.

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**Addressable LED Headers**
(3-pin ADDR_LED1)
(see p.9, No. 32)

These two Addressable headers are used to connect Addressable LED extension cable which allows users to choose from various LED lighting effects.

**Caution:** Never install the Addressable LED cable in the wrong orientation; otherwise, the cable may be damaged.

*Please refer to page 68 for further instructions on this header.
2.8 Smart Switches

The motherboard has four smart switches: Power Button, Reset Button, Clear CMOS Buttons and BIOS Flashback Button, allowing users to quickly turn on/off the system, reset the system, clear the CMOS values or flash the BIOS.

Power Button (PWRBTN1) (see p.9, No. 22)
Power Button allows users to quickly turn on/off the system.

Reset Button (RSTBTN1) (see p.9, No. 24)
Reset Button allows users to quickly reset the system.

Clear CMOS Button (CLRCBTN1) (see p.9, No. 23)
Clear CMOS Button allows users to quickly clear the CMOS values.
ASRock BIOS Flashback feature allows you to update BIOS without powering on the system, even without CPU.

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

2. Copy the BIOS file to your USB flash drive. Please make sure the file system of your USB flash drive must be FAT32.
3. Extract BIOS file from the zip file.
4. Rename the file to "creative.rom" and save it to the root directory of X: USB flash drive.
5. Plug the 24 pin power connector to the motherboard. Then turn on the power supply's AC switch.
   *There is no need to power on the system.
6. Then plug your USB drive to the USB BIOS Flashback port.
7. Press the BIOS Flashback Switch for about three seconds. Then the LED starts to blink.
8. Wait until the LED stops blinking, indicating that BIOS flashing has been completed.
   *If the LED light turns solid green, this means that the BIOS Flashback is not operating properly. Please make sure that you plug the USB drive to the USB BIOS Flashback port.
2.9 Dr. Debug

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x10</td>
<td>PEI_CORE_STARTED</td>
</tr>
<tr>
<td>0x11</td>
<td>PEI_CAR_CPU_INIT</td>
</tr>
<tr>
<td>0x15</td>
<td>PEI_CAR_NB_INIT</td>
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<td>0x19</td>
<td>PEI_CAR_SB_INIT</td>
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<tr>
<td>0x31</td>
<td>PEI_MEMORY_INSTALLED</td>
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<tr>
<td>0x32</td>
<td>PEI_CPU_INIT</td>
</tr>
<tr>
<td>0x33</td>
<td>PEI_CPU_CACHE_INIT</td>
</tr>
<tr>
<td>0x34</td>
<td>PEI_CPU_AP_INIT</td>
</tr>
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<td>0x35</td>
<td>PEI_CPU_BSP_SELECT</td>
</tr>
<tr>
<td>0x36</td>
<td>PEI_CPU_SMM_INIT</td>
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<td>0x37</td>
<td>PEI_MEM_NB_INIT</td>
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<td>0x3B</td>
<td>PEI_MEM_SB_INIT</td>
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<tr>
<td>0x4F</td>
<td>PEI_DXE_IPL_STARTED</td>
</tr>
<tr>
<td>0x60</td>
<td>DXE_CORE_STARTED</td>
</tr>
<tr>
<td>0x61</td>
<td>DXE_NVRAM_INIT</td>
</tr>
<tr>
<td>0x62</td>
<td>DXE_SBRUN_INIT</td>
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<tr>
<td>Address</td>
<td>Function</td>
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<td>0x63</td>
<td>DXE_CPU_INIT</td>
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<td>0x68</td>
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<td>DXE_SB_INIT</td>
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<td>0x71</td>
<td>DXE_SB_SMM_INIT</td>
</tr>
<tr>
<td>0x72</td>
<td>DXE_SB_DEVICES_INIT</td>
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<td>0x78</td>
<td>DXE_ACPI_INIT</td>
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<td>0x79</td>
<td>DXE_CSM_INIT</td>
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<td>DXE_BDS_STARTED</td>
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<td>0x91</td>
<td>DXE_BDS_CONNECT_DRIVERS</td>
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<td>DXE_PCI_BUS.Assign_RESOURCES</td>
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<td>0x99</td>
<td>DXE_SIO_INIT</td>
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<tr>
<td>0x9B</td>
<td>DXE_USB_RESET</td>
</tr>
<tr>
<td>0x9C</td>
<td>DXE_USB_DETECT</td>
</tr>
<tr>
<td>0x9D</td>
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<td>DXE_SETUP_VERIFYING_PASSWORD</td>
</tr>
<tr>
<td>0xA9</td>
<td>DXE_SETUP_START</td>
</tr>
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<td>0xAB</td>
<td>DXE_SETUP_INPUT_WAIT</td>
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<tr>
<td>0xAD</td>
<td>DXE_READY_TO_BOOT</td>
</tr>
<tr>
<td>0xAE</td>
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<td>Code</td>
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<tr>
<td>0xAF</td>
<td>DXE_EXIT_BOOT_SERVICES</td>
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<td>0xB2</td>
<td>DXE_LEGACY_OPROM_INIT</td>
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<td>0xB3</td>
<td>DXE_RESET_SYSTEM</td>
</tr>
<tr>
<td>0xB4</td>
<td>DXE_USB_HOTPLUG</td>
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<tr>
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<td>DXE_PCI_BUS_HOTPLUG</td>
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<td>DXE_NVRAM_CLEANUP</td>
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<tr>
<td>0xB7</td>
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<td>0xF0</td>
<td>PEI_RECOVERY_AUTO</td>
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<td>PEI_S3_OS_WAKE_ERROR</td>
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</table>
2.10 SLI™ Operation Guide

This motherboard supports NVIDIA® SLI™ (Scalable Link Interface) technology that allows you to install up to two identical PCI Express x16 graphics cards.

Requirements

1. You should only use identical SLI™-ready graphics cards that are NVIDIA® certified.
2. Make sure that your graphics card driver supports NVIDIA® SLI™ technology. Download the drivers from the NVIDIA® website: www.nvidia.com
3. Make sure that your power supply unit (PSU) can provide at least the minimum power your system requires. It is recommended to use a NVIDIA® certified PSU. Please refer to the NVIDIA® website for details.

2.10.1 Installing Two SLI™-Ready Graphics Cards

**Step 1**

Insert one graphics card into PCIE1 slot and the other graphics card to PCIE3 slot. Make sure that the cards are properly seated on the slots.

**Step 2**

If required, connect the auxiliary power source to the PCI Express graphics cards.
**Step 3**
Align and insert the ASRock SLI_HB_Bridge_2S Card to the goldfingers on each graphics card. Make sure the ASRock SLI_HB_Bridge_2S Card is firmly in place.

**Step 4**
Connect a VGA cable or a DVI cable to the monitor connector or the DVI connector of the graphics card that is inserted to PCIE1 slot.
2.10.2 Driver Installation and Setup

Install the graphics card drivers to your system. After that, you can enable the Multi-Graphics Processing Unit (GPU) in the NVIDIA® nView system tray utility. Please follow the below procedures to enable the multi-GPU.

For SLI™ mode

**Step 1**
Double-click the NVIDIA Control Panel icon in the Windows’ system tray.

**Step 2**
In the left pane, click Set SLI and PhysX configuration. Then select Maximize 3D performance and click Apply.

**Step 3**
Reboot your system.

**Step 4**
You can freely enjoy the benefits of SLI™.
2.11 CrossFireX™, 3-Way CrossFireX™ and Quad CrossFireX™
Operation Guide

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

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

2.11.1 Installing Two CrossFireX™-Ready Graphics Cards

Step 1
Insert one graphics card into PCIE1 slot and the other graphics card to PCIE3 slot. Make sure that the cards are properly seated on the slots.

Step 2
Connect two graphics cards by installing a CrossFire Bridge on the CrossFire Bridge Interconnects on the top of the graphics cards. (The CrossFire Bridge is provided with the graphics card you purchase, not bundled with this motherboard. Please refer to your graphics card vendor for details.)
Step 3

Connect a VGA cable or a DVI cable to the monitor connector or the DVI connector of the graphics card that is inserted to PCIE1 slot.
2.11.2 Installing Three CrossFireX™-Ready Graphics Cards

**Step 1**
Insert one graphics card into PCIE1 slot, another graphics card to PCIE3 slot, and the other graphics card to PCIE5 slot. Make sure that the cards are properly seated on the slots.

**Step 2**
Use one CrossFire Bridge to connect the graphics cards on PCIE1 and PCIE3 slots, and use the other CrossFire Bridge to connect the graphics cards on PCIE3 and PCIE5 slots. (The CrossFire Bridge is provided with the graphics card you purchase, not bundled with this motherboard. Please refer to your graphics card vendor for details.)

**Step 3**
Connect a VGA cable or a DVI cable to the monitor connector or the DVI connector of the graphics card that is inserted to PCIE1 slot.
2.11.3 Driver Installation and Setup

**Step 1**
Power on your computer and boot into OS.

**Step 2**
Remove the AMD drivers if you have any VGA drivers installed in your system.

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

**Step 3**
Install the required drivers and CATALYST Control Center then restart your computer. Please check AMD’s website for details.

**Step 4**
Double-click the AMD Catalyst Control Center icon in the Windows® system tray.

**Step 5**
In the left pane, click Performance and then AMD CrossFireX™. Then select Enable AMD CrossFireX and click Apply. Select the GPU number according to your graphics card and click Apply.
2.12 M.2_SSD (NGFF) Module Installation Guide (M2_1)

The Ultra M.2 Socket (M2_1) supports type 2280 M.2 PCI Express module up to Gen3 x4 (32 Gb/s).

Installing the M.2_SSD (NGFF) Module

**Step 1**

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

**Step 2**

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

<table>
<thead>
<tr>
<th>No.</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nut Location</td>
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<tr>
<td>PCB Length</td>
<td>8cm</td>
</tr>
<tr>
<td>Module Type</td>
<td>Type2280</td>
</tr>
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</table>
Step 3
Before installing a M.2 (NGFF) SSD module, please loosen the screws to remove the M.2 heatsink.
*Please remove the protective films on the bottom side of the M.2 heatsink before you install a M.2 SSD module.

Step 4
Align and gently insert the M.2 (NGFF) SSD module into the M.2 slot. Please be aware that the M.2 (NGFF) SSD module only fits in one orientation.

Step 5
Tighten the screw with a screwdriver to secure the module into place.
Please do not overtighten the screw as this might damage the module.
## M.2_SSD (NGFF) Module Support List (M2_1)

<table>
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<tr>
<th>Vendor</th>
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<tr>
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For the latest updates of M.2_SSD (NGFF) module support list, please visit our website for details: [http://www.asrock.com](http://www.asrock.com)
2.13 M.2_SSD (NGFF) Module Installation Guide (M2_2)
The M.2, also known as the Next Generation Form Factor (NGFF), is a small size and versatile card edge connector that aims to replace mPCIe and mSATA. The Ultra M.2 Socket (M2_2) supports type 2260/2280 M.2 PCI Express module up to Gen3 x4 (32 Gb/s).
* M2_2, SATA3_0 and SATA3_1 share lanes. If either one of them is in use, the others will be disabled.

Installing the M.2_SSD (NGFF) Module

**Step 1**
This motherboard supports M.2_SSD (NGFF) module type 2260 and 2280 only. Prepare a proper PCB length of module, the screw and the standoff.

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

<table>
<thead>
<tr>
<th>No.</th>
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<tr>
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<td>Type 2280</td>
</tr>
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</table>
**Step 3**

Before installing a M.2 (NGFF) SSD module, please loosen the screws to remove the M.2 heatsink.

*Please remove the protective films on the bottom side of the M.2 heatsink before you install a M.2 SSD module.

**Step 4**

Prepare the M.2 standoff that comes with the package. Then hand tighten the standoff into the desired nut location on the motherboard. Align and gently insert the M.2 (NGFF) SSD module into the M.2 slot. Please be aware that the M.2 (NGFF) SSD module only fits in one orientation.

**Step 5**

Tighten the screw with a screwdriver to secure the module into place. Please do not overtighten the screw as this might damage the module.
## M.2_SSD (NGFF) Module Support List (M2_2)

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</table>

For the latest updates of M.2_SSD (NFGG) module support list, please visit our website for details: [http://www.asrock.com](http://www.asrock.com)
2.14 M.2_SSD (NGFF) Module Installation Guide (M2_3)

The M.2, also known as the Next Generation Form Factor (NGFF), is a small size and versatile card edge connector that aims to replace mPCIe and mSATA. The Ultra M.2 Socket (M2_3) supports type 2230/2242/2260/2280/22110 M.2 SATA3 6.0 Gb/s module and M.2 PCI Express module up to Gen3 x4 (32 Gb/s).

* M2_3, SATA3_4 and SATA3_5 share lanes. If either one of them is in use, the others will be disabled.
* Enter the BIOS Setup and go to Advanced\USB Configuration to disable "Third Party USB 3.2 Controller"; otherwise, M2_3 will support M.2 PCI Express module up to Gen3 x2 (16 Gb/s) by default.

Installing the M.2_SSD (NGFF) Module

**Step 1**
Prepare a M.2_SSD (NGFF) module and the screw.

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

<table>
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<tr>
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</table>
Step 3
Before installing a M.2 (NGFF) SSD module, please loosen the screws to remove the M.2 heatsink.
*Please remove the protective films on the bottom side of the M.2 heatsink before you install a M.2 SSD module.

Step 4
Prepare the M.2 standoff that comes with the package. Then hand tighten the standoff into the desired nut location on the motherboard. Align and gently insert the M.2 (NGFF) SSD module into the M.2 slot. Please be aware that the M.2 (NGFF) SSD module only fits in one orientation.

Step 5
Tighten the screw with a screwdriver to secure the module into place. Please do not overtighten the screw as this might damage the module.
# M.2_SSD (NGFF) Module Support List (M2_3)

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<td>ADATA</td>
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<td>ASX7000NP-256GT-C</td>
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<tr>
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<td>CT240M500SSD4</td>
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<td>SATA3</td>
<td>Intel SSDSCKGW080A401/80G</td>
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<td>SM2280S3</td>
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<td>PCIe3 x4</td>
<td>SKC1000/480G</td>
</tr>
<tr>
<td>Kingston</td>
<td>PCIe2 x4</td>
<td>SH2280S3/480G</td>
</tr>
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<td>OCZ</td>
<td>PCIe3 x4</td>
<td>RVD400 -M2280-512G (NVME)</td>
</tr>
<tr>
<td>PATRIOT</td>
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<td>PH240GPM280SSDR NVME</td>
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<td>PX-128M8PeG</td>
</tr>
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<td>PX-1TM8PeG</td>
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<td>PCIe3 x4</td>
<td>PX-256M8PeG</td>
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<td>PX-G256M6e</td>
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</tr>
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<td>SM951 (NVME)</td>
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<td>SM951 (MZHPV256HDGL)</td>
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<td>SM951 (NVME)</td>
</tr>
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<td>PCIe x4</td>
<td>XP941-512G (MZHPU512HCGL)</td>
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<td>SanDisk</td>
<td>PCIe x4</td>
<td>SD6PP4M-256G</td>
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<tr>
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</tr>
<tr>
<td>Brand</td>
<td>Interface</td>
<td>Model</td>
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<tr>
<td>-----------</td>
<td>-----------</td>
<td>--------------------------------------------</td>
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<tr>
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<tr>
<td>TEAM</td>
<td>PCIe3 x4</td>
<td>TM8FP2480GC110</td>
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<td>TS512GMTS600</td>
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<td>SATA3</td>
<td>TS512GMTS800</td>
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<td>SATA3</td>
<td>VLM100-240G-2280RGB</td>
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<td>SATA3</td>
<td>VSM100-240G-2280</td>
</tr>
<tr>
<td>V-Color</td>
<td>SATA3</td>
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<td>WD</td>
<td>SATA3</td>
<td>WDS240G1G0B-00RC30</td>
</tr>
<tr>
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<td>PCIe3 x4</td>
<td>WDS256G1X0C-00ENX0 (NVME)</td>
</tr>
<tr>
<td>WD</td>
<td>PCIe3 x4</td>
<td>WDS512G1X0C-00ENX0 (NVME)</td>
</tr>
</tbody>
</table>

For the latest updates of M.2 SSD (NFGG) module support list, please visit our website for details: [http://www.asrock.com](http://www.asrock.com)
Chapter 3 Software and Utilities Operation

3.1 Installing Drivers

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

Running The Support CD

To begin using the support CD, insert the CD into your CD-ROM drive. The CD automatically displays the Main Menu if “AUTORUN” is enabled in your computer. If the Main Menu does not appear automatically, locate and double click on the file “ASRSETUP.EXE” in the Support CD to display the menu.

Drivers Menu

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

Utilities Menu

The Utilities Menu shows the application software that the motherboard supports. Click on a specific item then follow the installation wizard to install it.
3.2 ASRock Motherboard Utility (A-Tuning)

ASRock Motherboard Utility (A-Tuning) is ASRock’s multi purpose software suite with a new interface, more new features and improved utilities.

3.2.1 Installing ASRock Motherboard Utility (A-Tuning)

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

3.2.2 Using ASRock Motherboard Utility (A-Tuning)

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

Operation Mode
Choose an operation mode for your computer.
OC Tweaker
Configurations for overclocking the system.

System Info
View information about the system.
*The System Browser tab may not appear for certain models.
FAN-Tastic Tuning

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

Settings

Configure ASRock Motherboard Utility (A-Tuning). Click to select "Auto run at Windows Startup" if you want ASRock Motherboard Utility (A-Tuning) to be launched when you start up the Windows operating system.
3.3 ASRock Live Update & APP Shop

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

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

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

3.3.1 UI Overview

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

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

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

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

Installing an App

**Step 1**

Find the app you want to install.

![Screen shot of ASRock APP SHOP with a recommended app (Chrome) and various other apps]

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

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

- **Free** - The red icon displays the price or "Free" if the app is free of charge.
- **Installed** - The green "Installed" icon means the app is installed on your computer.

**Step 2**

Click on the app icon to see more details about the selected app.
**Step 3**

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

![App Shop](image1)

**Step 4**

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

![App Shop](image2)

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

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

**Step 1**

Click on the app icon to see more details.

**Step 2**

Click on the yellow icon to start upgrading.
3.3.3 BIOS & Drivers

Installing BIOS or Drivers

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

**Step 1**

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

**Step 2**

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

**Step 3**

Click Update to start the update process.
3.3.4 Setting

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

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

There are four functions in Nahimic audio:

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

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

**Connecting the LED Strip**

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

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

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

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

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

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

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

- **Toggle on/off the RGB LED switch**
- **Sync RGB LED effects for all LED regions of the motherboard**
- **Drag the tab to customize your preference.**
- **Select a RGB LED light effect from the drop-down menu.**
Chapter 4 UEFI SETUP UTILITY

4.1 Introduction

This section explains how to use the UEFI SETUP UTILITY to configure your system. You may run the UEFI SETUP UTILITY by pressing <F2> or <Del> right after you power on the computer, otherwise, the Power-On-Self-Test (POST) will continue with its test routines. If you wish to enter the UEFI SETUP UTILITY after POST, restart the system by pressing <Ctrl> + <Alt> + <Delete>, or by pressing the reset button on the system chassis. You may also restart by turning the system off and then back on.

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

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

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

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Help</td>
</tr>
<tr>
<td>2</td>
<td>Load UEFI Defaults</td>
</tr>
<tr>
<td>3</td>
<td>Save Changes and Exit</td>
</tr>
<tr>
<td>4</td>
<td>Discard Changes</td>
</tr>
<tr>
<td>5</td>
<td>Change Language</td>
</tr>
<tr>
<td>6</td>
<td>Switch to Advanced Mode</td>
</tr>
</tbody>
</table>
4.3 Advanced Mode

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

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

4.3.1 UEFI Menu Bar

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

<table>
<thead>
<tr>
<th>Menu</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main</td>
<td>For setting system time/date information</td>
</tr>
<tr>
<td>OC Tweaker</td>
<td>For overclocking configurations</td>
</tr>
<tr>
<td>Advanced</td>
<td>For advanced system configurations</td>
</tr>
<tr>
<td>Tool</td>
<td>Useful tools</td>
</tr>
<tr>
<td>H/W Monitor</td>
<td>Displays current hardware status</td>
</tr>
<tr>
<td>Security</td>
<td>For security settings</td>
</tr>
<tr>
<td>Boot</td>
<td>For configuring boot settings and boot priority</td>
</tr>
<tr>
<td>Exit</td>
<td>Exit the current screen or the UEFI Setup Utility</td>
</tr>
</tbody>
</table>
4.3.2 Navigation Keys

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

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

<table>
<thead>
<tr>
<th>Navigation Key(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ / -</td>
<td>To change option for the selected items</td>
</tr>
<tr>
<td>&lt;Tab&gt;</td>
<td>Switch to next function</td>
</tr>
<tr>
<td>&lt;PGUP&gt;</td>
<td>Go to the previous page</td>
</tr>
<tr>
<td>&lt;PGDN&gt;</td>
<td>Go to the next page</td>
</tr>
<tr>
<td>&lt;HOME&gt;</td>
<td>Go to the top of the screen</td>
</tr>
<tr>
<td>&lt;END&gt;</td>
<td>Go to the bottom of the screen</td>
</tr>
<tr>
<td>&lt;F1&gt;</td>
<td>To display the General Help Screen</td>
</tr>
<tr>
<td>&lt;F5&gt;</td>
<td>Add / Remove Favorite</td>
</tr>
<tr>
<td>&lt;F7&gt;</td>
<td>Discard changes and exit the SETUP UTILITY</td>
</tr>
<tr>
<td>&lt;F9&gt;</td>
<td>Load optimal default values for all the settings</td>
</tr>
<tr>
<td>&lt;F10&gt;</td>
<td>Save changes and exit the SETUP UTILITY</td>
</tr>
<tr>
<td>&lt;F12&gt;</td>
<td>Print screen</td>
</tr>
<tr>
<td>&lt;ESC&gt;</td>
<td>Jump to the Exit Screen or exit the current screen</td>
</tr>
</tbody>
</table>
4.4 Main Screen

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

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

My Favorite

Display your collection of BIOS items. Press F5 to add/remove your favorite items.
4.5 OC Tweaker Screen

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

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

Advanced Turbo

You can use this option to increase your system performance. This option appears only when your CPU supports this function. This option appears only when you adopt K-Series CPU.

Load Optimized CPU OC Setting

You can use this option to load optimized CPU overclocking setting. Please note that overclocking may cause damage to your CPU and motherboard. It should be done at your own risk and expense.

Load Optimized GPU OC Setting

You can use this option to load optimized GPU overclocking setting. Please note that overclocking may cause damage to your GPU and motherboard. It should be done at your own risk and expense. This option appears only when you adopt K-Series CPU.
CPU Configuration

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

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

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

BCLK Advanced Setting
Configure BCLK advanced settings.

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

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

FCLK Frequency
Configure the FCLK Frequency.

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

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

Intel Turbo Boost Technology
Intel Turbo Boost Technology enables the processor to run above its base operating frequency when the operating system requests the highest performance state.
Intel Thermal Velocity Boost Ratio Clipping
This service controls Core frequency reduction caused by high package tempera-
tures for processors that implement the Intel Thermal Velocity Boost (TVB) feature.
It is required to be disabled for supporting overclocking at frequencies higher than
the default max turbo frequency.

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

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

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

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

Short Duration Power Limit
Configure Package Power Limit 2 in watts. When the limit is exceeded, the CPU
ratio will be lowered immediately. A lower limit can protect the CPU and save
power, while a higher limit may improve performance.

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

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

DRAM Configuration

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

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

Primary Timing

CAS# Latency (tCL)
The time between sending a column address to the memory and the beginning of the data in response.

RAS# to CAS# Delay and Row Precharge (tRCDtRP)
RAS# to CAS# Delay: The number of clock cycles required between the opening of a row of memory and accessing columns within it.
Row Precharge: The number of clock cycles required between the issuing of the precharge command and opening the next row.

RAS# Active Time (tRAS)
The number of clock cycles required between a bank active command and issuing the precharge command.

Command Rate (CR)
The delay between when a memory chip is selected and when the first active command can be issued.

Secondary Timing

Write Recovery Time (tWR)
The amount of delay that must elapse after the completion of a valid write operation, before an active bank can be precharged.

Refresh Cycle Time (tRFC)
The number of clocks from a Refresh command until the first Activate command to the same rank.

RAS to RAS Delay (tRRD_L)
The number of clocks between two rows activated in different banks of the same rank.

RAS to RAS Delay (tRRD_S)
The number of clocks between two rows activated in different banks of the same rank.
Write to Read Delay (tWTR_L)
The number of clocks between the last valid write operation and the next read command to the same internal bank.

Write to Read Delay (tWTR_S)
The number of clocks between the last valid write operation and the next read command to the same internal bank.

Read to Precharge (tRTP)
The number of clocks that are inserted between a read command to a row precharge command to the same rank.

Four Activate Window (tFAW)
The time window in which four activates are allowed the same rank.

CAS Write Latency (tCWL)
Configure CAS Write Latency.

Third Timing

tREFI
Configure refresh cycles at an average periodic interval.

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

Turn Around Timing

tRDRD_sg
Configure between module read to read delay.

tRDRD_dg
Configure between module read to read delay.

tRDRD_dr
Configure between module read to read delay.

tRDRD_dd
Configure between module read to read delay.
Configure round trip latency init value for round trip latency training.
IOL Init Value
Configure IO latency init value for IO latency training.

RTL (CH A)
Configure round trip latency for channel A.

RTL (CH B)
Configure round trip latency for channel B.

IOL (CH A)
Configure IO latency for channel A.

IOL (CH B)
Configure IO latency for channel B.

IOL Offset (CH A)
Configure IO latency offset for channel A.

IOL Offset (CH B)
Configure IO latency offset for channel B.

RFR Delay (CH A)
Configure RFR Delay for Channel A.

RFR Delay (CH B)
Configure RFR Delay for Channel B.

ODT Setting

ODT WR (A1)
Configure the memory on die termination resistors’ WR for channel A1.

ODT WR (A2)
Configure the memory on die termination resistors’ WR for channel A2.

ODT WR (B1)
Configure the memory on die termination resistors’ WR for channel B1.

ODT WR (B2)
Configure the memory on die termination resistors’ WR for channel B2.
ODT NOM (A1)
Use this to change ODT (CH A1) Auto/Manual settings. The default is [Auto].

ODT NOM (A2)
Use this to change ODT (CH A2) Auto/Manual settings. The default is [Auto].

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

ODT NOM (B2)
Use this to change ODT (CH B2) Auto/Manual settings. The default is [Auto].

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

ODT PARK (A2)
Configure the memory on die termination resistors' PARK for channel A2.

ODT PARK (B1)
Configure the memory on die termination resistors' PARK for channel B1.

ODT PARK (B2)
Configure the memory on die termination resistors' PARK for channel B2.

COMP Setting
RCOMP0: DQ ODT (Read)
Default is 121.

RCOMP1: DQ /CLK Ron (Drive Strength)
Default is 75.

RCOMP2: CMD/CTL Ron (Drive Strength)
Default is 100.

DQ ODT Driving
Adjust ODT Driving for better signal. Default is 60.

DQ Driving
Adjust DQ Driving for better signal. Default is 26.
Command Driving
Adjust Command Driving for better signal. Default is 20.

Control Driving
Adjust Control Driving for better signal. Default is 20.

Clock Driving
Adjust Clock Driving for better signal. Default is 26.

DQ Slew Rate
Adjust DQ Slew Rate for better signal. Default is 59.

Command Slew Rate
Adjust Command Slew Rate for better signal. Default is 53 for IN, 89 for 2N.

Control Slew Rate
Adjust Control Slew Rate for better signal. Default is 53.

Clock Slew Rate
Adjust Clock Slew Rate for better signal. Default is 53.

MRS Setting
MRS tCL
Configure the tCL for Memory MRS MR0.

MRS tWRtRTP
Configure the tWRtRTP for Memory MRS MRC.

MRS tCWL
Configure the tCWL for Memory MRS MR2.

MRS tCCD_L
Configure the tCL for Memory MRS MR6.

Advanced Setting
ASRock Timing Optimization
Configure the fast path through the MRC.
Realtime Memory Timing
Configure the realtime memory timings.

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

Command Tristate
Configure the Command Tristate Support.

Exit On Failure
Configure the Exit On Failure for MRC training steps.

Reset On Training Fail
Reset system if the MRC training fails.

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

CPU V/F Curve
Configure CPU Voltage/Frequency Curve.

Voltage Configuration
CPU Core/Cache Voltage
Input voltage for the processor by the external voltage regulator.

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

CPU GT Voltage
Configure the voltage for the integrated GPU.

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

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

DRAM Activating Power Supply
Configure the voltage for the DRAM Activating Power Supply.

PCH Voltage
Configure the chipset voltage (1.0V).

VCCSFR Voltage
Configure the voltage for the VCCSFR.

VCCIO Voltage
Configure the voltage for the VCCIO.

VCCSTG Voltage
Configure the voltage for the VCCTG.

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

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

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

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

Memory Controller PLL Voltage

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

Save User Default

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

Load User Default

Load previously saved user defaults.

Save User UEFI Setup Profile to Disk

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

Load User UEFI Setup Profile from Disk

You can load previous saved profile from the disk.
4.6 Advanced Screen

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

UEFI Configuration

UEFI Setup Style
Select the default mode when entering the UEFI setup utility.

Active Page on Entry
Select the default page when entering the UEFI setup utility.

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

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

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

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

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

CPU C3 State Support
Enable C3 deep sleep state for lower power consumption.

CPU C6 State Support
Enable C6 deep sleep state for lower power consumption.

CPU C7 State Support
Enable C7 deep sleep state for lower power consumption.
Package C State Support
Enable CPU, PCIe, Memory, Graphics C State Support for power saving.

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

C6DRAM
Enable/Disable moving of DRAM contents to PRM memory when CPU is in C6 state.

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

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

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

Adjacent Cache Line Prefetch
Automatically prefetch the subsequent cache line while retrieving the currently requested cache line. Enable for better performance.

Software Guard Extensions (SGX)
Intel SGX is a set of new CPU instructions that can be used by applications to set aside private regions of code and data.
4.6.2 Chipset Configuration

Primary Graphics Adapter
Select a primary VGA.

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

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

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

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

PCIE1 Link Speed
Select the link speed for PCIE1.
PCIE2 Link Speed
Select the link speed for PCIE2.

PCIE3 Link Speed
Select the link speed for PCIE3.

PCIE4 Link Speed
Select the link speed for PCIE4.

PCIE5 Link Speed
Select the link speed for PCIE5.

PCI Express Native Control
Select Enable for enhanced PCI Express power saving in OS.

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

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

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

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

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

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

Intel(R) Ethernet Connection I219-V
Enable or disable the onboard network interface controller (Intel® I219V).

Realtek RTL8125BG
Enable or disable the onboard network interface controller (Realtek RTL8125BG).
Onboard HD Audio
Enable/disable onboard HD audio. Set to Auto to enable onboard HD audio and automatically disable it when a sound card is installed.

Front Panel
Enable/disable front panel HD audio.

Onboard HDMI HD Audio
Enable audio for the onboard digital outputs.

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

WAN Radio
Enable/disable the WiFi module's connectivity.

Bluetooth
Enable/disable the Bluetooth connectivity.

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

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

Turn On Onboard LED in S5
Turn on Onboard LED in the ACPI S5 state.

Restore Onboard LED Default
Restore Onboard LED default value.

RGB LED
This option enables/disables the RGB LED.
4.6.3 Storage Configuration

**SATA Controller(s)**
Enable/disable the SATA controllers.

**SATA Mode Selection**
AHCI: Supports new features that improve performance.

RAID: Combine multiple disk drives into a logical unit.

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

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

**Third Party SATA 3 Controller**
Enable or disable the third party SATA3 controller.
Third Party SATA3 Hot Plug
Enable or disable the third party SATA3 controller.
4.6.4 Intel(R) Thunderbolt

Discrete Thunderbolt(TM) Support
Enable or disable the Discrete Thunderbolt(TM) Support.

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

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

Titan Ridge Workaround for OSUP
Enable or disable Titan Ridge Workaround for OSUP.

Security Level
This item allows you to choose a security level for the Thunderbolt ports.
4.6.5 Super IO Configuration

PS2 Y-Cable
Enable the PS2 Y-Cable or set this option to Auto.
4.6.6 ACPI Configuration

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

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

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

I219 LAN Power On
Allow the system to be waked up by I219 LAN.

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

USB Keyboard/Remote Power On
Allow the system to be waked up by an USB keyboard or remote controller.

USB Mouse Power On
Allow the system to be waked up by an USB mouse.
4.6.7 USB Configuration

Legacy USB Support
Enable or disable Legacy OS Support for USB 2.0 devices. If you encounter USB compatibility issues it is recommended to disable legacy USB support. Select UEFI Setup Only to support USB devices under the UEFI setup and Windows/Linux operating systems only.

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

Third Party USB 3.2 Controller
Enable or disable all of the USB 3.2 ports controlled by Third Party chips.
4.6.8 Trusted Computing

Security Device Support
Enable or disable BIOS support for security device.
4.7 Tools

ASRock Polychrome RGB
Select LED lighting color.

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

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

SSD Secure Erase Tool
All the SSD’s listed that supports Secure Erase function.

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

Instant Flash
Save UEFI files in your USB storage device and run Instant Flash to update your UEFI.
Bios MEI Recovery Flash
Starts BIOS recovery flash.

Internet Flash - DHCP (Auto IP), Auto
ASRock Internet Flash downloads and updates the latest UEFI firmware version from our servers for you. Please setup network configuration before using Internet Flash.
*For BIOS backup and recovery purpose, it is recommended to plug in your USB pen drive before using this function.

Network Configuration
Use this to configure internet connection settings for Internet Flash.

Internet Setting
Enable or disable sound effects in the setup utility.

UEFI Download Server
Select a server to download the UEFI firmware.
4.8 Hardware Health Event Monitoring Screen

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

Fan Tuning

Measure Fan Min Duty Cycle.

Fan-Tastic Tuning

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

CPU Fan 1 Setting

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

CPU Fan 1 Step Up

Set the value of CPU Fan Step Up.

CPU Fan 1 Step Down

Set the value of CPU Fan Step Down.

CPU_FAN2 / W_PUMP Switch

Switch CPU_FAN2 / W_PUMP header function.
CPU Fan 2 Control Mode
Select DC/PWM mode for CPU Fan 2.

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

CPU Fan 2 Temp Source
Select a fan temperature source for CPU Fan 2.

CPU Fan 2 Step Up
Set the value of CPU Fan 2 Step Up.

CPU Fan 2 Step Down
Set the value of CPU Fan 2 Step Down.

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

MOS Fan 1 Step Up
Set the value of MOS Fan Step Up.

MOS Fan 1 Step Down
Set the value of MOS Fan Step Down.

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

MOS Fan 2 Step Up
Set the value of MOS Fan Step Up.

MOS Fan 2 Step Down
Set the value of MOS Fan Step Down.

CHA_FAN1 / W_PUMP Switch
Select Chassis Fan 1 or Water Pump mode.
Chassis Fan 1 Control Mode
Select PWM mode or DC mode for Chassis Fan 1.

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

Chassis Fan 1 Temp Source
Select a fan temperature source for Chassis Fan 1.

Chassis Fan 1 Step Up
Set the value of Chassis Fan 1 Step Up.

Chassis Fan 1 Step Down
Set the value of Chassis Fan 1 Step Down.

CHA_FAN2 / W_Pump Switch
Select Chassis Fan 2 or Water Pump mode.

Chassis Fan 2 Control Mode
Select PWM mode or DC mode for Chassis Fan 2.

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

Chassis Fan 2 Temp Source
Select a fan temperature source for Chassis Fan 2.

Chassis Fan 2 Step Up
Set the value of Chassis Fan 2 Step Up.

Chassis Fan 2 Step Down
Set the value of Chassis Fan 2 Step Down.

CHA_FAN3 / W_PUMP Switch
Select Chassis Fan 3 or Water Pump mode.

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

Chassis Fan 3 Temp Source
Select a fan temperature source for Chassis Fan 3.

Chassis Fan 3 Step Up
Set the value of Chassis Fan 3 Step Up.

Chassis Fan 3 Step Down
Set the value of Chassis Fan 3 Step Down.

CHA_FAN4 / W_PUMP Switch
Select Chassis Fan 4 or Water Pump mode.

Chassis Fan 4 Control Mode
Select PWM mode or DC mode for Chassis Fan 4.

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

Chassis Fan 4 Temp Source
Select a fan temperature source for Chassis Fan 4.

Chassis Fan 4 Step Up
Set the value of Chassis Fan 4 Step Up.

Chassis Fan 4 Step Down
Set the value of Chassis Fan 4 Step Down.

CHA_FAN5 / W_PUMP Switch
Select Chassis Fan 5 or Water Pump mode.

Chassis Fan 5 Control Mode
Select PWM mode or DC mode for Chassis Fan 5.

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

**Chassis Fan 5 Temp Source**
Select a fan temperature source for Chassis Fan 5.

**Chassis Fan 5 Step Up**
Set the value of Chassis Fan 5 Step Up.

**Chassis Fan 5 Step Down**
Set the value of Chassis Fan 5 Step Down.

**CHA_FAN6 / W_PUMP Switch**
Select Chassis Fan 6 or Water Pump mode.

**Chassis Fan 6 Control Mode**
Select PWM mode or DC mode for Chassis Fan 6.

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

**Chassis Fan 6 Temp Source**
Select a fan temperature source for Chassis Fan 6.

**Chassis Fan 6 Step Up**
Set the value of Chassis Fan 6 Step Up.

**Chassis Fan 6 Step Down**
Set the value of Chassis Fan 6 Step Down.
4.9 Security Screen

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

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

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

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

Intel(R) Platform Trust Technology
Enable/disable Intel PTT in ME. Disable this option to use discrete TPM Module.
4.10 Boot Screen

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

**Fast Boot**

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

**Boot From Onboard LAN**

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

**Setup Prompt Timeout**

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

**Bootup Num-Lock**

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

**Boot Beep**

Select whether the Boot Beep should be turned on or off when the system boots up. Please note that a buzzer is needed.
Full Screen Logo
Enable to display the boot logo or disable to show normal POST messages.

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

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

Boot Failure Guard Count
Configure the number of attempts to boot until the system automatically restores the default settings.

CSM (Compatibility Support Module)

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

Launch PXE OpROM Policy
Select UEFI only to run those that support UEFI option ROM only. Select Legacy only to run those that support legacy option ROM only. Select Do not launch to not execute both legacy and UEFI option ROM.
Launch Storage OpROM Policy
Select UEFI only to run those that support UEFI option ROM only. Select Legacy only to run those that support legacy option ROM only. Select Do not launch to not execute both legacy and UEFI option ROM.

Other PCI Device ROM Priority
For PCI devices other than Network, Mass storage or Video defines which OpROM to launch.
4.11 Exit Screen

Save Changes and Exit
When you select this option the following message, “Save configuration changes and exit setup?” will pop out. Select [OK] to save changes and exit the UEFI SETUP UTILITY.

Discard Changes and Exit
When you select this option the following message, “Discard changes and exit setup?” will pop out. Select [OK] to exit the UEFI SETUP UTILITY without saving any changes.

Discard Changes
When you select this option the following message, “Discard changes?” will pop out. Select [OK] to discard all changes.

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

Launch EFI Shell from filesystem device
Copy shellx64.efi to the root directory to launch EFI Shell.
Contact Information

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

**ASRock Incorporation**
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Taipei City 112, Taiwan (R.O.C.)

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DECLARATION OF CONFORMITY
Per FCC Part 2 Section 2.1077(a)

Responsible Party Name: ASRock Incorporation

Address: 13848 Magnolia Ave, Chino, CA91710

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

hereby declares that the product

Product Name: Motherboard

Model Number: Z490 Taichi

Conforms to the following specifications:

☒ FCC Part 15, Subpart B, Unintentional Radiators

Supplementary Information:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Representative Person’s Name: James

Signature: [Signature]

Date: May 12, 2017
EU Declaration of Conformity

For the following equipment:

**Motherboard**

(Product Name)

**Z490 Taichi / ASRock**

(Model Designation / Trade Name)

**ASRock Incorporation**

(Manufacturer Name)

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

(Manufacturer Address)

- **EMC — Directive 2014/30/EU (from April 20th, 2016)**
  - EN 55022:2010/AC:2011 Class B
  - EN 55032:2012+AC:2013 Class B
  - EN 61000-3-2:2014
  - EN 61000-3-3:2013

- **RED — Directive 2014/53/EU**
  - EN 300 328 V2.1.1
  - EN 301 489-17 V3.1.1
  - EN 301 489-3 V2.1.1

- **LVD — Directive 2014/35/EU (from April 20th, 2016)**
  - EN 60950-1 : 2011+ A2: 2013
  - EN 60950-1 : 2006/A12: 2011

- **RoHS — Directive 2011/65/EU**

- **CE marking**

ASRock EUROPE B.V.

(Company Name)

Bijsterhuizen 1111 6546 AR Nijmegen The Netherlands

(Company Address)

Person responsible for making this declaration:

(Name, Surname)

A.V.P

(Position / Title)

April 17, 2020

(Date)

P/N: 15G062200000AK V1.0

(EU conformity marking)