PRIME Z690M-PLUS D4

Motherboard

E18711
First Edition
August 2021

Contents

Safety information

Electrical safety

- To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.
- When adding or removing devices to or from the system, ensure that the power cables for the devices are unplugged before the signal cables are connected. If possible, disconnect all power cables from the existing system before you add a device.
- Before connecting or removing signal cables from the motherboard, ensure that all power cables are unplugged.
- Seek professional assistance before using an adapter or extension cord. These devices could interrupt the grounding circuit.
- Ensure that your power supply is set to the correct voltage in your area. If you are not sure about the voltage of the electrical outlet you are using, contact your local power company.
- If the power supply is broken, do not try to fix it by yourself. Contact a qualified service technician or your retailer.

Operation safety

- Before installing the motherboard and adding devices on it, carefully read all the manuals that came with the package.
- Before using the product, ensure all cables are correctly connected and the power cables are not damaged. If you detect any damage, contact your dealer immediately.
- To avoid short circuits, keep paper clips, screws, and staples away from connectors, slots, sockets and circuitry.
- Avoid dust, humidity, and temperature extremes. Do not place the product in any area where it may become wet.
- Place the product on a stable surface.
- If you encounter technical problems with the product, contact a qualified service technician or your retailer.
- Your motherboard should only be used in environments with ambient temperatures between 0°C and 40°C.

About this guide

This user guide contains the information you need when installing and configuring the motherboard.

How this guide is organized

This guide contains the following parts:

- **Chapter 1: Product Introduction**

  This chapter describes the features of the motherboard and the new technology it supports. It includes description of the switches, jumpers, and connectors on the motherboard.

- **Chapter 2: Basic Installation**

  This chapter lists the hardware setup procedures that you have to perform when installing system components.

- **Chapter 3: BIOS and RAID Support**

  This chapter tells how to boot into the BIOS, upgrade BIOS using the EZ Flash Utility and support on RAID.

Where to find more information

Refer to the following sources for additional information and for product and software updates.

1. **ASUS website**

   The ASUS website (www.asus.com) provides updated information on ASUS hardware and software products.

2. **Optional documentation**

   Your product package may include optional documentation, such as warranty flyers, that may have been added by your dealer. These documents are not part of the standard package.

Conventions used in this guide

To ensure that you perform certain tasks properly, take note of the following symbols used throughout this manual.

CAUTION: Information to prevent damage to the components and injuries to yourself when trying to complete a task.

IMPORTANT: Instructions that you MUST follow to complete a task.

NOTE: Tips and additional information to help you complete a task.

PRIME Z690M-PLUS D4 specifications summary

CPU	Intel® Socket LGA1700 for 12th Gen Intel® Core™, Pentium® Gold and Celeron® Processors* Supports Intel® Turbo Boost Technology 2.0 and Intel® Turbo Boost Max Technology 3.0** *** Refer to www.asus.com for CPU support list.** **** Intel® Turbo Boost Max Technology 3.0 support depends on the CPU types.**
Chipset	Intel® Z690 Chipset
Memory	4 x DIMM, Max. 128GB, DDR4 5333(OC)/5133(OC)/5000(OC)/4800(OC)/4600(OC)/4400(OC)/4266(OC)/4133(OC)/4000(OC)/3866(OC)/3733(OC)/3600(OC)/3466(OC)/3400(OC)/3333(OC)/3200/3000/2933/2800/2666/2400/2133 MHz Non-ECC, Un-buffered Memory* Dual Channel Memory Architecture Supports Intel® Extreme Memory Profile (XMP) OptiMem II *** Actual Memory frequency support depends on the CPU types and DRAM modules, for more information refer to www.asus.com for the Memory QVL (Qualified Vendors Lists).**
Graphics	1 x DisplayPort** 1 x HDMI® port*** *** Graphics specifications may vary between CPU types. Please refer to www.intel.com for any updates.** **** Support 4K@60Hz as specified in DisplayPort 1.4.** ***** Support 4K@60Hz as specified in HDMI® 2.1.**
Expansion Slots	**Intel® 12th Gen Processors*** 1 x PCIe 5.0 / 4.0 / 3.0 x16 slot **Intel® Z690 Chipset**** 1 x PCIe 4.0/3.0 x16 slot (supports x4 mode) 2 x PCIe 3.0 x1 slots *** Please check PCIe bifurcation table in support site.** **** Supports Intel® Optane Memory H Series on PCH-attached PCIe slot.**
Storage	**Total supports 3 x M.2 slots and 4 x SATA 6Gb/s ports*** **Intel® 12th Gen Processors** M.2_1 slot (Key M), type 2242/2260/2280 - Intel® 12th Gen processors support PCIe 4.0 x4 mode **Intel® Z690 Chipset**** M.2_2 slot (Key M), type 2260/2280 (supports PCIe 4.0 x4 mode) M.2_3 slot (Key M), type 2242/2260/2280 (supports PCIe 4.0 x4 & SATA modes) 4 x SATA 6Gb/s ports *** Intel® Rapid Storage Technology supports NVMe RAID 0/1/5, SATA RAID 0/1/5/10.** **** Intel® Rapid Storage Technology supports Intel® Optane Memory H Series on PCH attached M.2 slots.**
Ethernet	1 x Intel® 1Gb Ethernet
Wireless & Bluetooth	M.2 slot only (Key E, CNVi & PCIe)* *** Wi-Fi module is purchased separately.**

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PRIME Z690M-PLUS D4 specifications summary

USB	**Rear USB (Total 8 ports)** 1 x USB 3.2 Gen 2x2 port (1 x USB Type-C®) 1 x USB 3.2 Gen 2 port (1 x Type-A) 4 x USB 3.2 Gen 1 ports (4 x Type-A) 2 x USB 2.0 ports (2 x Type-A) **Front USB (Total 7 ports)** 1 x USB 3.2 Gen 1 connector (supports USB Type-C®) 1 x USB 3.2 Gen 1 header supports additional 2 USB 3.2 Gen 1 ports 2 x USB 2.0 headers support additional 4 USB 2.0 ports* *** USB_E1 port, USB_E2 port, USB_E3 port and USB_E4 port share the bandwidth.**
Audio	**Realtek 7.1 Surround Sound High Definition Audio CODEC*** - Supports: Jack-detection, Multi-streaming, Front Panel Jack-retasking - Supports up to 24-Bit/192 kHz playback **Audio Features:** - Audio Shielding - Premium audio capacitors - Dedicated audio PCB layers *** A chassis with an HD audio module in the front panel is required to support 7.1 Surround Sound audio output.**
Back Panel I/O Ports	1 x USB 3.2 Gen 2x2 port (1 x USB Type-C®) 1 x USB 3.2 Gen 2 port (1 x Type-A) 4 x USB 3.2 Gen 1 ports (4 x Type-A) 2 x USB 2.0 ports (2 x Type-A) 1 x DisplayPort 1 x HDMI® port 1 x Intel® 1Gb Ethernet port 3 x Audio jacks
Internal I/O Connectors	**Fan and cooling related** 1 x 4-pin CPU Fan header 1 x 4-pin CPU OPT Fan header 1 x 4-pin AIO_Pump header 3 x 4-pin Chassis Fan headers **Power related** 1 x 24-pin Main Power connector 1 x 8-pin +12V Power connector 1 x 4-pin +12V Power connector **Storage related** 3 x M.2 slots (Key M) 4 x SATA 6Gb/s ports **USB** 1 x USB 3.2 Gen 1 connector (supports USB Type-C®) 1 x USB 3.2 Gen 1 header supports additional 2 USB 3.2 Gen 1 ports 2 x USB 2.0 headers support additional 4 USB 2.0 ports

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PRIME Z690M-PLUS D4 specifications summary

Internal I/O Connectors	**Miscellaneous** 3 x Addressable Gen 2 headers 1 x AURA RGB header 1 x Clear CMOS header 1 x COM Port header 1 x Front Panel Audio header (AAFP) 1 x M.2 slot (Key E) 1 x S/PDIF Out header 1 x SPI TPM header (14-1pin) 1 x 20-3 pin System Panel header with Chassis intrude function 1 x Thunderbolt™ header
Special Features	**ASUS 5X PROTECTION III** - DIGI+ VRM (- Digital power design with DrMOS) - LANGuard - Overvoltage Protection - SafeSlot - Stainless-Steel Back I/O **ASUS Q-Design** - Q-DIMM - Q-Slot **ASUS Thermal Solution** - VRM heatsink design **ASUS EZ DIY** - ProCool **AURA Sync** - AURA RGB header - Addressable Gen 2 headers
Software Features	**ASUS Exclusive Software** Armoury Crate - AURA Sync - Fan Xpert 4 AI Suite 3 - Performance And Power Saving Utility TurboV EVO EPU DIGI+ VRM ASUS CPU-Z Norton Anti-virus software (Free Trial version) WinRAR **UEFI BIOS** ASUS EZ DIY - ASUS CrashFree BIOS 3 - ASUS EZ Flash 3 - ASUS UEFI BIOS EZ Mode

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PRIME Z690M-PLUS D4 specifications summary

BIOS	192 (128+64) Mb Flash ROM, UEFI AMI BIOS
Manageability	WOL by PME, PXE
Operating System	Windows® 11 64-bit Windows® 10 64-bit
Form Factor	mATX Form Factor 9.6 inch x 9.6 inch (24.4 cm x 24.4 cm)

Specifications are subject to change without notice. Please refer to the ASUS website for the latest specifications.

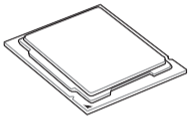
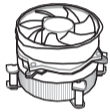
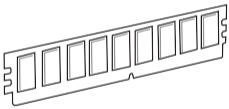
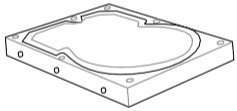
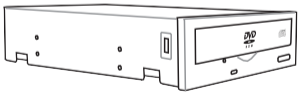
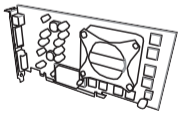
Package contents

Check your motherboard package for the following items.

Motherboard	1 x PRIME Z690M-PLUS D4 motherboard
Cables	2 x SATA 6Gb/s cables
Miscellaneous	1 x I/O Shield 2 x M.2 screw packages* *** The package including 2 screws and 1 nut is for installing an M.2 WIFI module into the M.2 WIFI slot and an M.2 SSD module into the M.2_2 slot.**
Installation Media	1 x Support DVD
Documentation	1 x User Guide

If any of the above items is damaged or missing, contact your retailer.

Installation tools and components

	
	Phillips (cross) screwdriver
	
PC chassis	Power supply unit
	
Intel® LGA 1700 CPU	Intel® LGA 1700 compatible CPU Fan
	
DDR4 DIMM	SATA hard disk drive
	
SATA optical disc drive (optional)	Graphics card (optional)
	
M.2 SSD module (optional)	2 Bags of screws

The tools and components in the table above are not included in the motherboard package.

Product Introduction

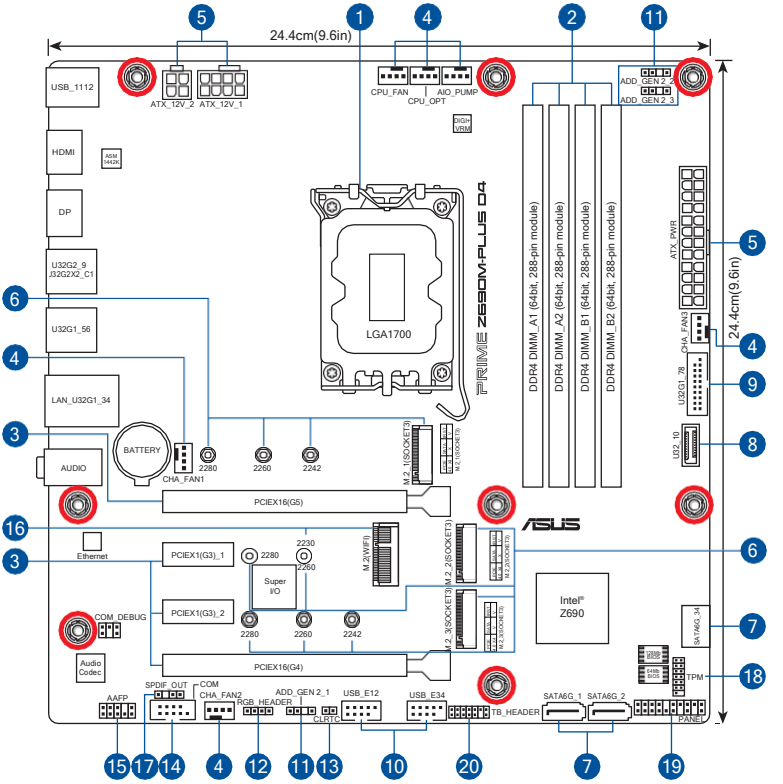
1

1.1 Before you proceed

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

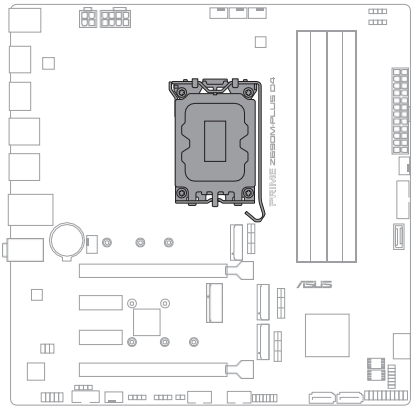
- Unplug the power cord from the wall socket before touching any component.
- Before handling components, use a grounded wrist strap or touch a safely grounded object or a metal object, such as the power supply case, to avoid damaging them due to static electricity.
- Hold components by the edges to avoid touching the ICs on them.
- Whenever you uninstall any component, place it on a grounded antistatic pad or in the bag that came with the component.
- Before you install or remove any component, ensure that the ATX power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, or components.

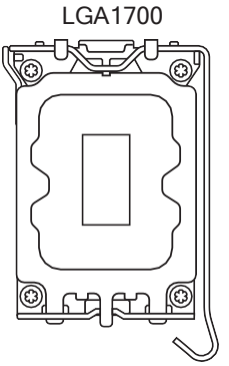
1.2 Motherboard layout



1. CPU socket

The motherboard comes with a LGA1700 socket designed for 12th Gen Intel® Core™, Pentium® Gold and Celeron® Processors.



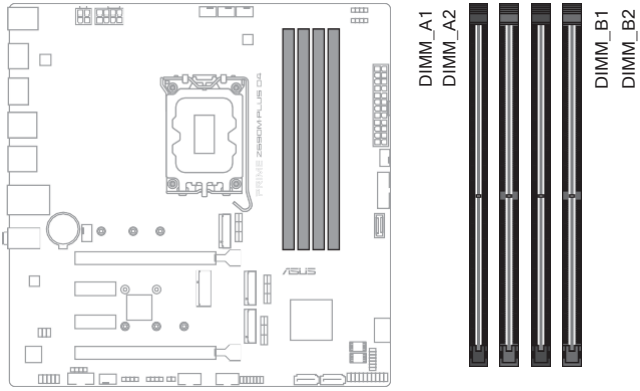


- Ensure that you install the correct CPU designed for LGA1700 socket only. DO NOT install a CPU designed for other sockets on the LGA1700 socket.
- The CPU fits in only one correct orientation. DO NOT force the CPU into the socket to prevent bending the connectors on the socket and damaging the CPU.
- Ensure that all power cables are unplugged before installing the CPU.
- Upon purchase of the motherboard, ensure that the PnP cap is on the socket and the socket contacts are not bent. Contact your retailer immediately if the PnP cap is missing, or if you see any damage to the PnP cap/socket contacts/motherboard components. ASUS will shoulder the cost of repair only if the damage is shipment/transit-related.
- Keep the cap after installing the motherboard. ASUS will process Return Merchandise Authorization (RMA) requests only if the motherboard comes with the cap on the LGA1700 socket.
- The product warranty does not cover damage to the socket contacts resulting from incorrect CPU installation/removal, or misplacement/loss/incorrect removal of the PnP cap.

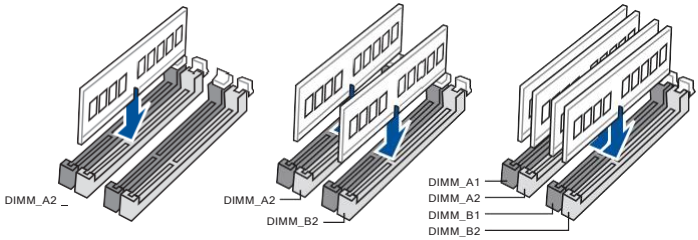
2. DIMM slots

The motherboard comes with Dual Inline Memory Modules (DIMM) slots designed for DDR4 (Double Data Rate 4) memory modules.

A DDR4 memory module is notched differently from a DDR, DDR2, or DDR3 module. DO NOT install a DDR, DDR2, or DDR3 memory module to the DDR4 slot.



Recommended memory configurations



Memory configurations

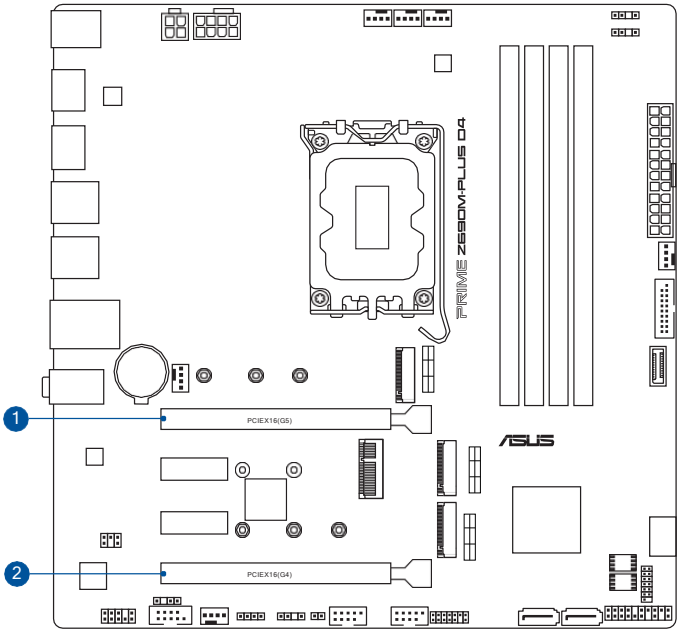
You may install 4 GB, 8 GB, 16 GB, and 32 GB unbuffered and non-ECC DDR4 DIMMs into the DIMM sockets.

You may install varying memory sizes in Channel A and Channel B. The system maps the total size of the lower-sized channel for the dual-channel configuration. Any excess memory from the higher-sized channel is then mapped for single-channel operation.

- The default memory operation frequency is dependent on its Serial Presence Detect (SPD), which is the standard way of accessing information from a memory module. Under the default state, some memory modules for overclocking may operate at a lower frequency than the vendor-marked value.
- For system stability, use a more efficient memory cooling system to support a full memory load or overclocking condition.
- Always install the DIMMS with the same CAS Latency. For an optimum compatibility, we recommend that you install memory modules of the same version or data code (D/C) from the same vendor. Check with the vendor to get the correct memory modules.
- Visit the ASUS website for the latest QVL.

3. Expansion slots

Unplug the power cord before adding or removing expansion cards. Failure to do so may cause you physical injury and damage motherboard components.



Please refer to the following tables for the recommended VGA configuration.

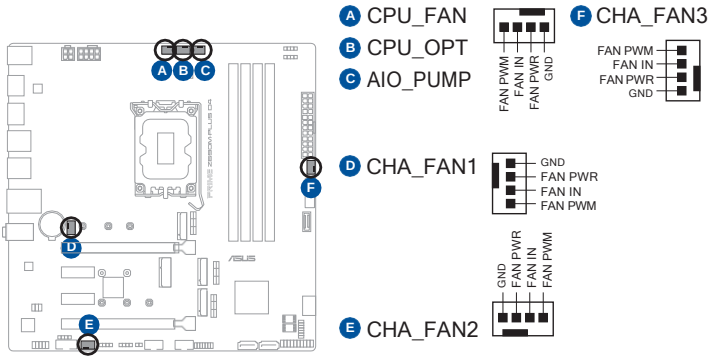
Recommended VGA configuration

Slot	Slot Description	Single VGA	Dual VGA
1.	PCIEX16(G5)	x16	x16
2.	PCIEX16(G4)	-	x4

Connect a chassis fan to the chassis fan connectors when using multiple graphics cards for better thermal environment.

4. Fan and Pump headers

The Fan and Pump headers allow you to connect fans or pumps to cool the system.

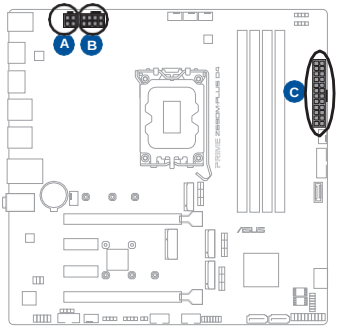


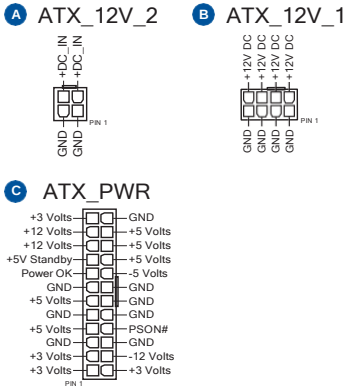
- DO NOT forget to connect the fan cables to the fan headers. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan headers!
- Ensure the cable is fully inserted into the header.

Header	Max. Current	Max. Power	Default Speed	Shared Control
CPU_FAN	1A	12W	Q-Fan Controlled	-
CPU_OPT	1A	12W	Q-Fan Controlled	-
CHA_FAN1	1A	12W	Q-Fan Controlled	-
CHA_FAN2	1A	12W	Q-Fan Controlled	-
CHA_FAN3	1A	12W	Q-Fan Controlled	-
AIO_PUMP	1A	12W	Full-Speed	-

5. Power connectors

These Power connectors allow you to connect your motherboard to a power supply. The power supply plugs are designed to fit in only one orientation. Find the proper orientation and push down firmly until the power supply plugs are fully inserted.



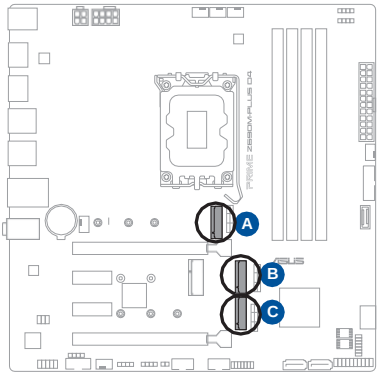


Ensure to connect the 8-pin power plug.

- For a fully configured system, we recommend that you use a power supply unit (PSU) that complies with ATX 12V Specification 2.0 (or later version) and provides a minimum power of 350W.
- We recommend that you use a PSU with a higher power output when configuring a system with more power-consuming devices. The system may become unstable or may not boot up if the power is inadequate.
- If you want to use two or more high-end PCI Express x16 cards, use a PSU with 1000W power or above to ensure the system stability.

6. M.2 slots

The M.2 slots allow you to install M.2 devices such as M.2 SSD modules.



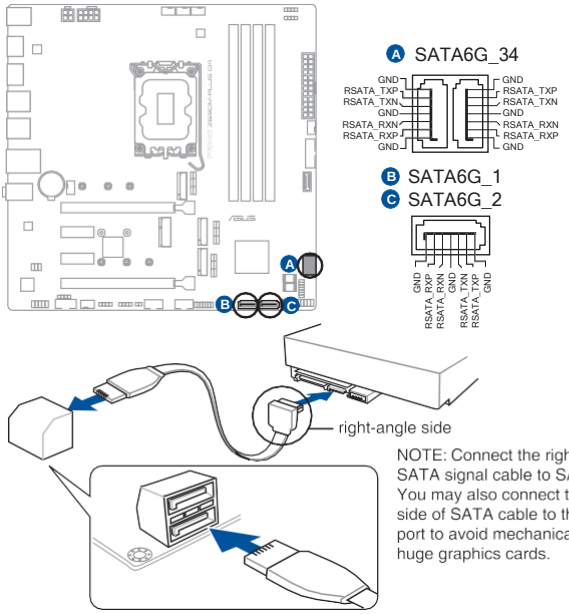
A M.2_1(SOCKET3)
B M.2_2(SOCKET3)
C M.2_3(SOCKET3)

- **Intel® 12th Gen processors:**
  - M.2_1 supports PCIe 4.0 x4 mode M Key design and type 2242/2260/2280 PCIe storage devices.
- **Intel® Z690 Chipset**
  - M.2_2 supports PCIe 4.0 x4 mode M Key design and type 2260/2280 storage devices.
  - M.2_3 supports PCIe 4.0 x4 and SATA mode M Key design and type 2242/2260/2280 storage devices.
- Intel® Rapid Storage Technology supports NVMe RAID 0/1/5, SATA RAID 0/1/5/10.
- Intel® Rapid Storage Technology supports Intel® Optane Memory H Series on PCH attached M.2 slots.

The M.2 SSD module is purchased separately.

7. SATA 6Gb/s ports

The SATA 6Gb/s ports allow you to connect SATA devices such as optical disc drives and hard disk drives via SATA cables.



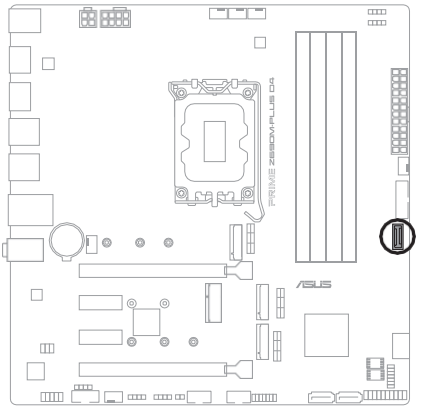
NOTE: Connect the right-angle side of SATA signal cable to SATA device. You may also connect the right-angle side of SATA cable to the onboard SATA port to avoid mechanical conflict with huge graphics cards.

If you installed SATA storage devices, you can create a RAID 0, 1, 5, and 10 configuration with the Intel® Rapid Storage Technology through the onboard Intel® Z690 chipset.

Before creating a RAID set, refer to the **RAID Configuration Guide**. You can download the **RAID Configuration Guide** from the ASUS website.

8. USB 3.2 Gen 1 Type-C® Front Panel connector

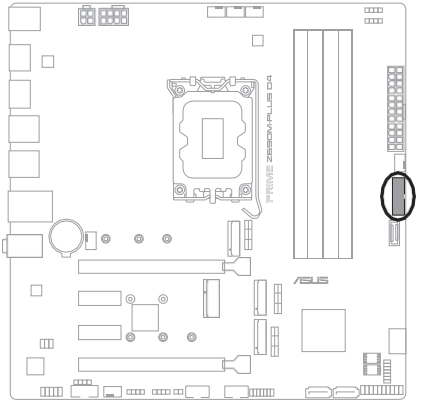
The USB 3.2 Gen 1 Type-C® connector allows you to connect a USB 3.2 Gen 1 Type-C® module for an additional USB 3.2 Gen 1 Type-C® port. The USB 3.2 Gen 1 Type-C® connector provides data transfer speeds of up to 5 Gb/s.



The USB 3.2 Gen 1 Type-C® module is purchased separately.

9. USB 3.2 Gen 1 header

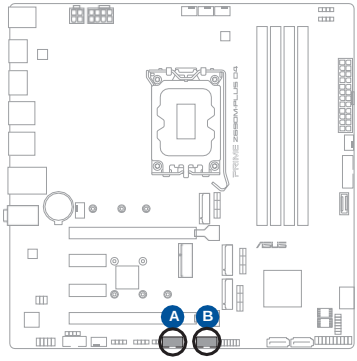
The USB 3.2 Gen 1 header allows you to connect a USB 3.2 Gen 1 module for additional USB 3.2 Gen 1 ports. The USB 3.2 Gen 1 header provides data transfer speeds of up to 5 Gb/s.

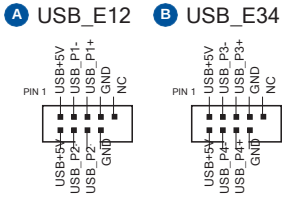


The USB 3.2 Gen 1 module is purchased separately.

10. USB 2.0 headers

The USB 2.0 headers allow you to connect USB modules for additional USB 2.0 ports. The USB 2.0 header provides data transfer speeds of up to 480 Mb/s.



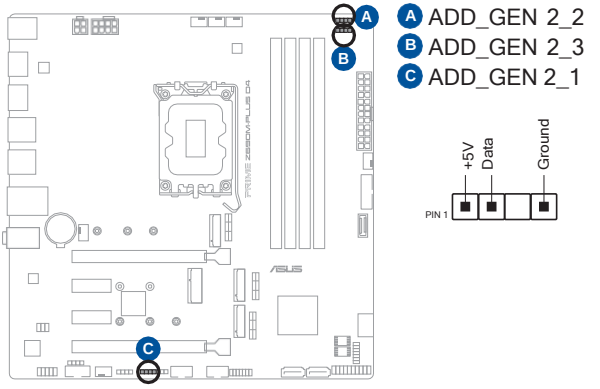


DO NOT connect a 1394 cable to the USB connectors. Doing so will damage the motherboard!

- The USB 2.0 module is purchased separately.
- USB_E1 port, USB_E2 port, USB_E3 port and USB_E4 port share the bandwidth.

11. Addressable Gen 2 headers

The Addressable Gen 2 headers allow you to connect individually addressable RGB WS2812B LED strips or WS2812B based LED strips.



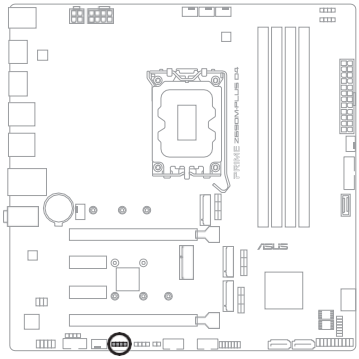
The Addressable Gen 2 header supports WS2812B addressable RGB LED strips (5V/Data/Ground), with a maximum power rating of 3A (5V), and the addressable headers on this board can handle a combined maximum of 500 LEDs.

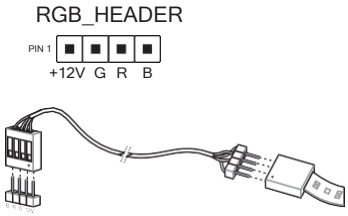
Before you install or remove any component, ensure that the power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, or components.

- Actual lighting and color will vary with LED strip.
- If your LED strip does not light up, check if the addressable RGB LED strip is connected in the correct orientation, and the 5V connector is aligned with the 5V header on the motherboard.
- The addressable RGB LED strip will only light up when the system is powered on.
- The addressable RGB LED strip is purchased separately.

12. AURA RGB header

The RGB header allows you to connect RGB LED strips.





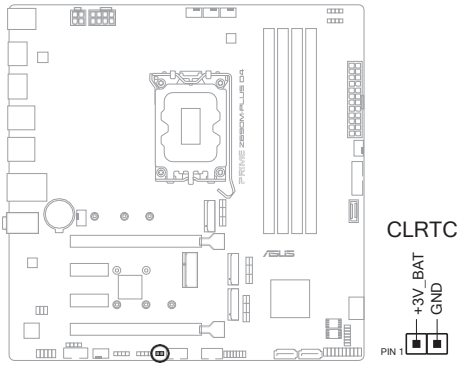
The RGB header supports 5050 RGB multi-color LED strips (12V/G/R/B), with a maximum power rating of 3A (12V).

Before you install or remove any component, ensure that the power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, or components.

- Actual lighting and color will vary with LED strip.
- If your LED strip does not light up, check if the RGB LED extension cable and the RGB LED strip is connected in the correct orientation, and the 12V connector is aligned with the 12V header on the motherboard.
- The LED strip will only light up when the system is powered on.
- The LED strip is purchased separately.

13. Clear CMOS header

This header allows you to clear the Real Time Clock (RTC) RAM in CMOS. You can clear the CMOS memory of date, time, and system setup parameters by erasing the CMOS RTC RAM data. The onboard button cell battery powers the RAM data in CMOS, which include system setup information such as system passwords.



To erase the RTC RAM:

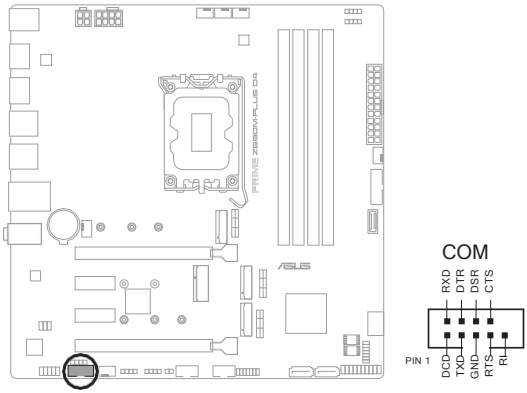
1. Turn OFF the computer and unplug the power cord.
2. Use a metal object such as a screwdriver to short the two pins.
3. Plug the power cord and turn on the computer.
4. Hold down the **<Del>** key during the boot process and enter BIOS setup to re-enter data.

DO NOT short-circuit the pins except when clearing the RTC RAM. Short-circuiting or placing a jumper cap will cause system boot failure!

If the steps above do not help, remove the onboard button cell battery and move the jumper again to clear the CMOS RTC RAM data. After clearing the CMOS, reinstall the button cell battery.

14. COM Port header

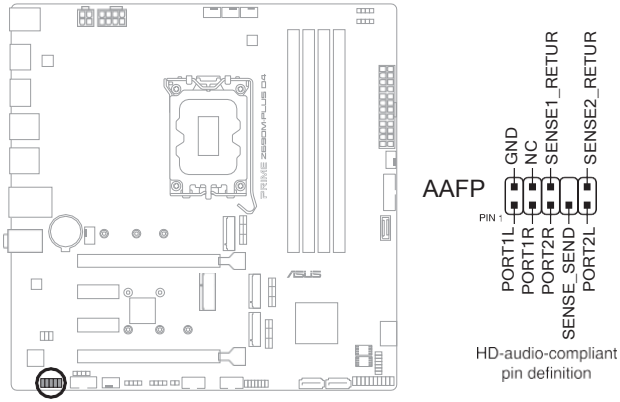
This header is for a serial (COM) port. Connect the serial port module cable to this header, then install the module to a slot opening at the back of the system chassis.



The COM module is purchased separately.

15. Front Panel Audio header

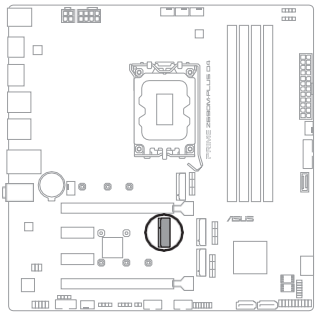
The front panel audio header is for a chassis-mounted front panel audio I/O module that supports HD Audio. Connect one end of the front panel audio I/O module cable to this header.

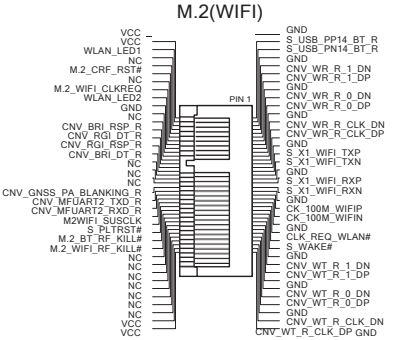


We recommend that you connect a high-definition front panel audio module to this connector to avail of the motherboard's high-definition audio capability.

16. M.2 slot (Key E)

The M.2(WIFI) slot allows you to install an M.2 Wi-Fi module (E-key, type 2230).

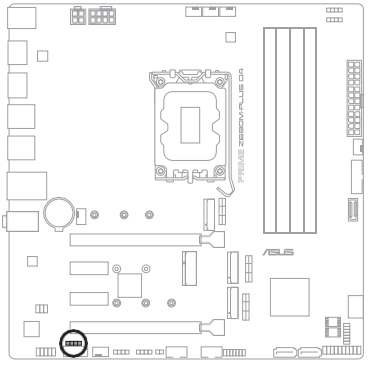


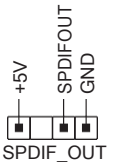


The M.2 Wi-Fi module is purchased separately.

17. S/PDIF Out header

This header is for an additional Sony/Philips Digital Interface (S/PDIF) port. Connect the S/PDIF Out module cable to this header, then install the module to a slot opening at the back of the system chassis.

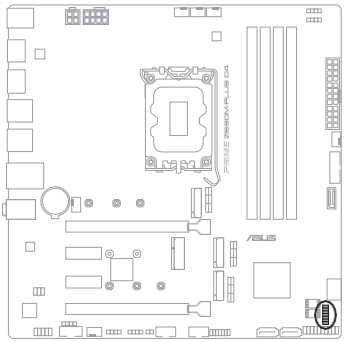


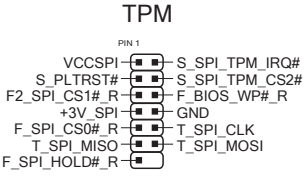


We recommend that you connect a high-definition front panel audio module to this connector to avail of the motherboard's high-definition audio capability.

18. SPI TPM header (14-1pin)

This header supports a Trusted Platform Module (TPM) system with a Serial Peripheral Interface (SPI), allowing you to securely store keys, digital certificates, passwords, and data. A TPM system also helps enhance network security, protects digital identities, and ensures platform integrity.

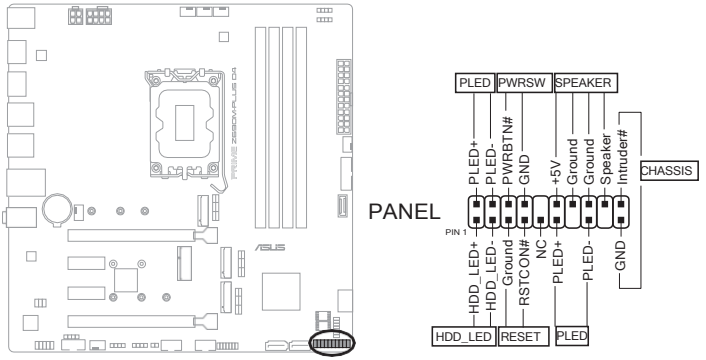




The TPM module is purchased separately.

19. System Panel header

The System Panel header supports several chassis-mounted functions.



- **System Power LED header (PLED)**

  The 2-pin header allows you to connect the System Power LED. The System Power LED lights up when the system is connected to a power source, or when you turn on the system power, and blinks when the system is in sleep mode.

- **Storage Device Activity LED header (HDD_LED)**

  The 2-pin header allows you to connect the Storage Device Activity LED. The Storage Device Activity LED lights up or blinks when data is read from or written to the storage device or storage device add-on card.

- **System Warning Speaker header (SPEAKER)**

  The 4-pin header allows you to connect the chassis-mounted system warning speaker. The speaker allows you to hear system beeps and warnings.

- **Power Button/Soft-off Button header (PWRSW)**

  The 3-1 pin header allows you to connect the system power button. Press the power button to power up the system, or put the system into sleep or soft-off mode (depending on the operating system settings).

- **Reset button header (RESET)**

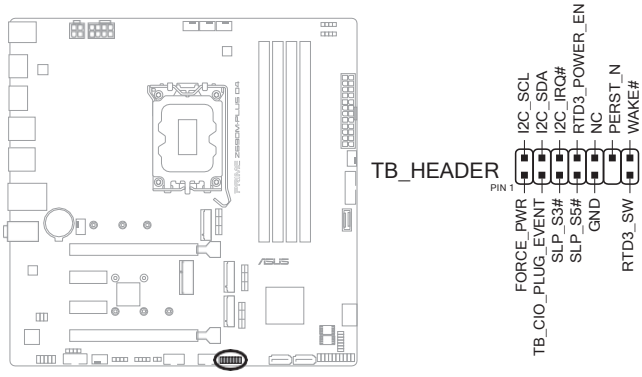
  The 2-pin header allows you to connect the chassis-mounted reset button. Press the reset button to reboot the system.

- **Chassis intrusion connector (CHASSIS)**

  The 2-pin connector allows you to connect the chassis-mounted intrusion detection sensor or switch. The chassis intrusion sensor or switch sends a high-level signal to the connector when a chassis component is removed or replaced, the signal is then generated as a chassis intrusion event.

20. Thunderbolt™ header

The Thunderbolt™ header allows you to connect an add-on Thunderbolt™ I/O card that supports Intel®'s Thunderbolt™ Technology, allowing you to connect Thunderbolt™-enabled devices and DisplayPort-enabled devices to form a daisy chain-configuration.



- The add-on Thunderbolt™ I/O card and Thunderbolt™ cables are purchased separately.
- Please visit the official website of your purchased Thunderbolt™ card for more details on compatibility.

Basic Installation

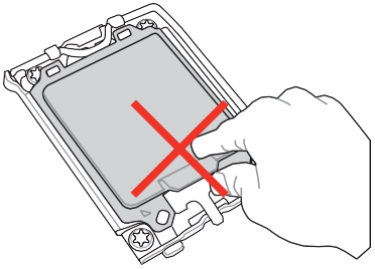
2

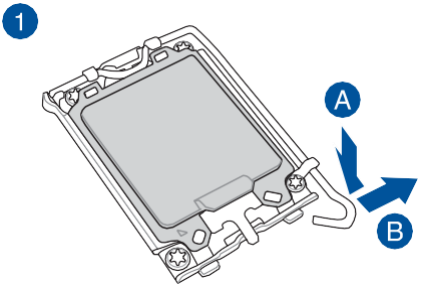
2.1 Building your PC system

The diagrams in this section are for reference only. The motherboard layout may vary with models, but the installation steps are the same for all models.

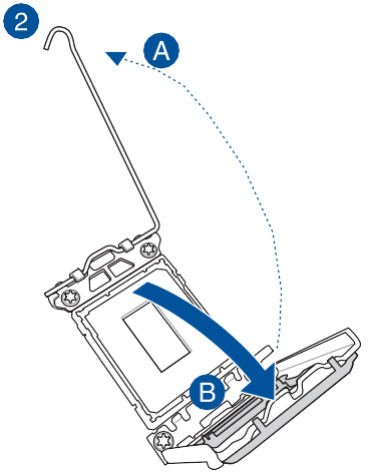
2.1.1 CPU installation

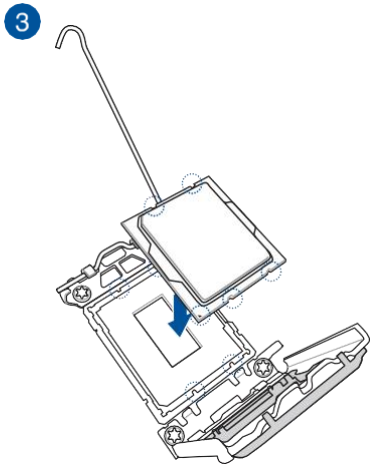
- Ensure that you install the correct CPU designed for LGA1700 socket only. DO NOT install a CPU designed for LGA1155, LGA1156, LGA1151, and LGA1200 sockets on the LGA1700 socket.
- ASUS will not cover damages resulting from incorrect CPU installation/removal, incorrect CPU orientation/placement, or other damages resulting from negligence by the user.





Take caution when lifting the load lever, ensure to hold onto the load lever when releasing the load lever. Letting go of the load lever immediately after releasing it may cause the load lever to spring back and cause damage to your motherboard.


2
A
B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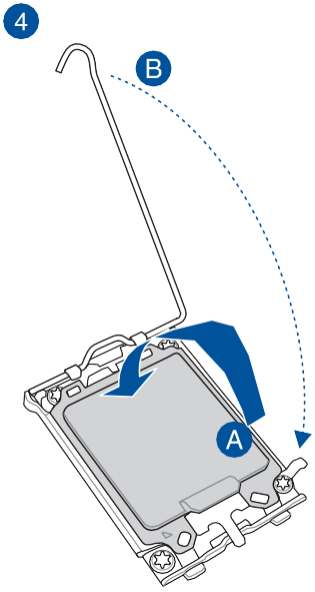
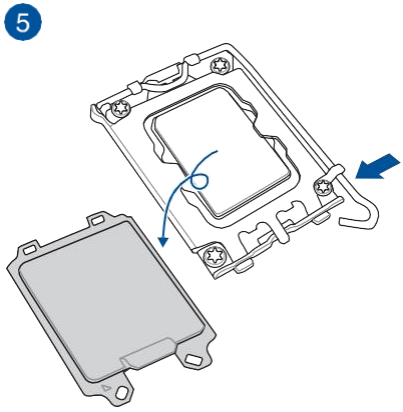
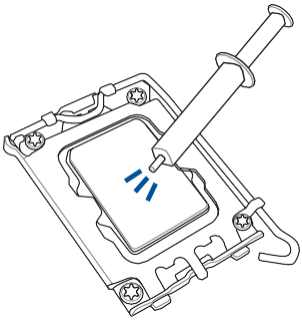

4
B
A

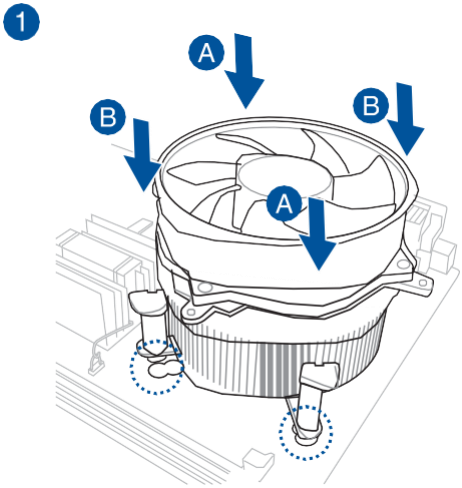

5

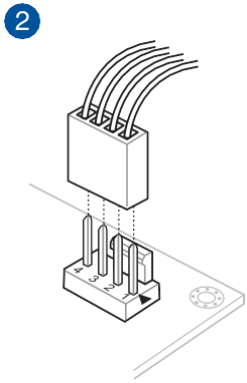
2.1.2 Cooling system installation

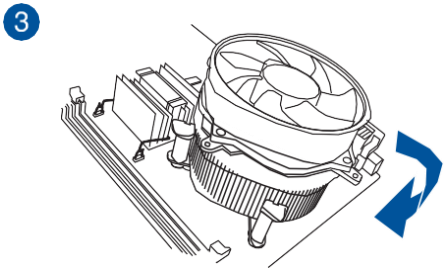


Apply Thermal Interface Material to the CPU cooling system and CPU before you install the cooling system, if necessary.

To install a CPU heatsink and fan assembly







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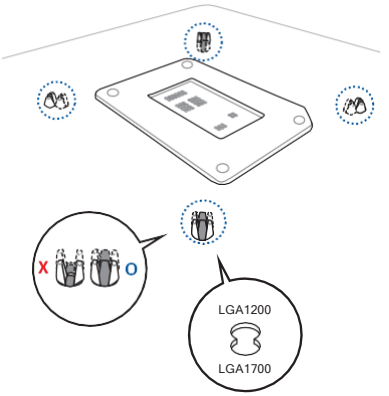
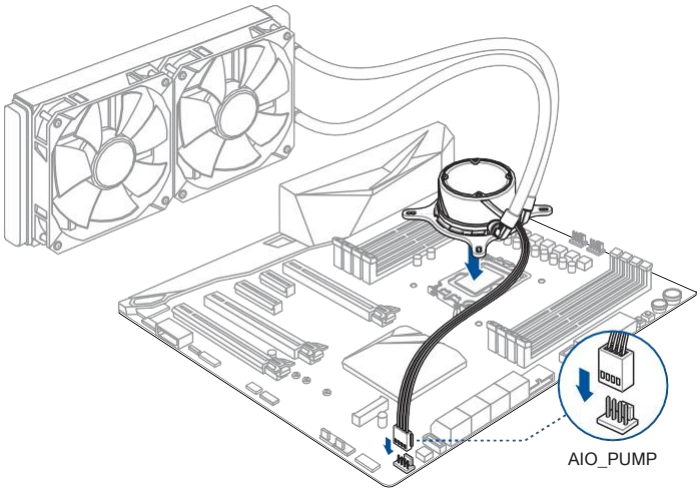


- We recommend using a LGA1700 compatible cooling system when installing a cooling system to an Intel® 600 series motherboard.
- An additional hole for LGA1200 compatible cooling systems is also available on ASUS' Intel® 600 series motherboards, allowing you more flexibility when installing a cooling system to your motherboard, however we still strongly advise you consult with your cooling system vendor on the compatibility and functionality of the cooling system and ASUS motherboard.
- Push-pin type LGA1200 compatible cooling systems cannot be installed to this motherboard.

To install an AIO cooler

- We recommend using a LGA1700 compatible cooling system on an Intel® 600 series motherboard.
- Additional holes for LGA1200 compatible cooling systems are also available on ASUS' Intel® 600 series motherboards, however, we still strongly advise consulting with your cooling system vendor or manufacturer on the compatibility and functionality of the cooling system.
- If you wish to install an AIO cooler, we recommend installing the AIO cooler after installing the motherboard into the chassis.

1



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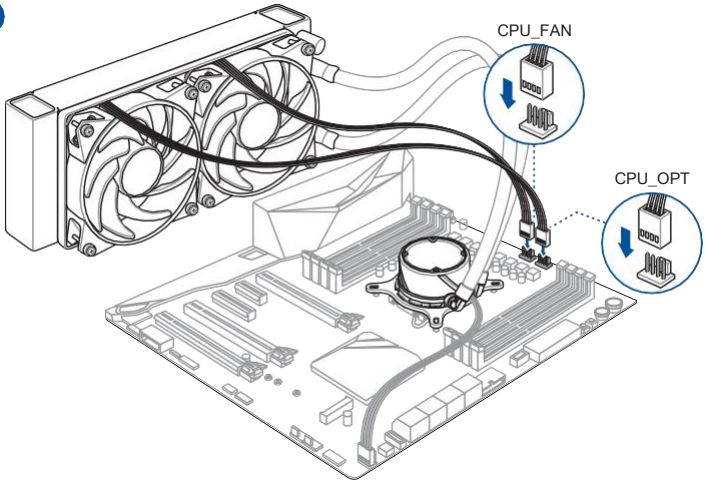
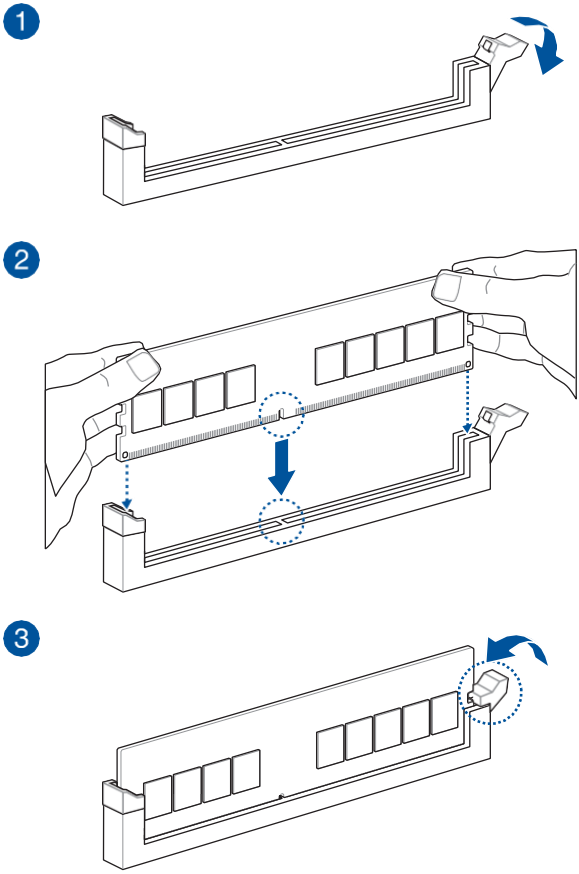
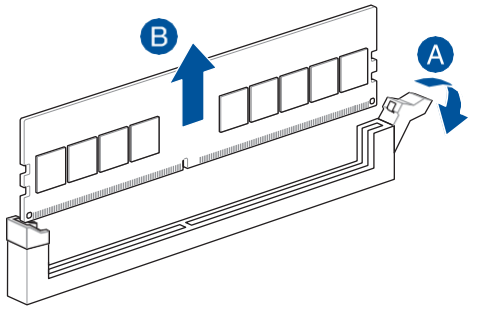


2.1.3 DIMM installation

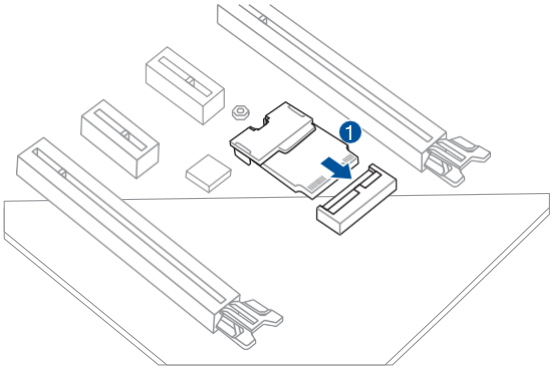


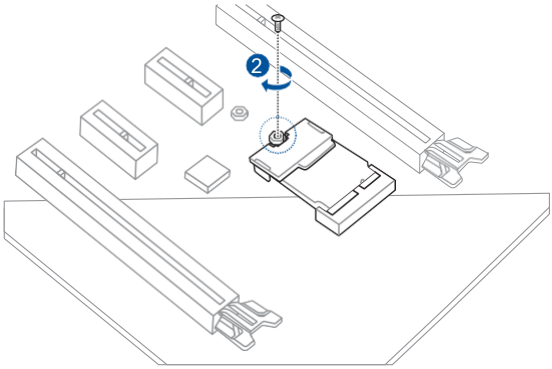
To remove a DIMM



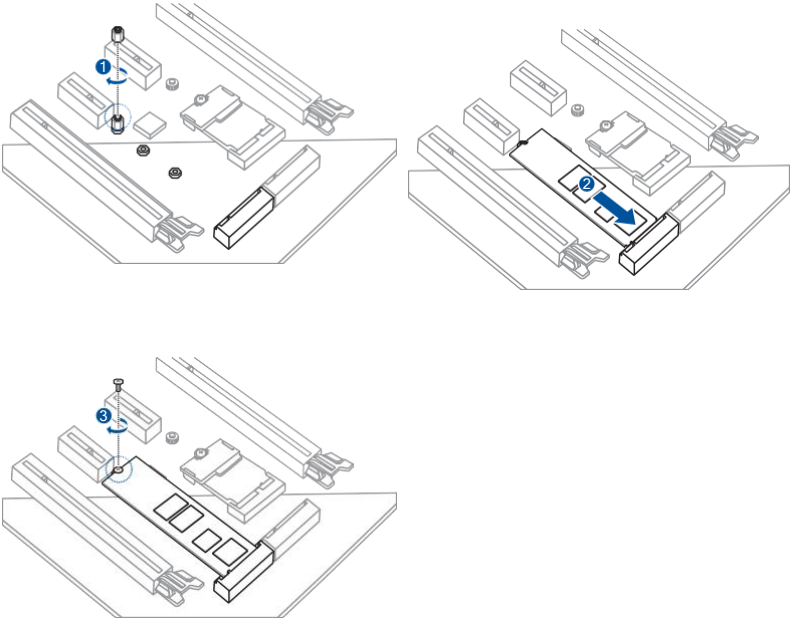
2.1.4 M.2 installation

To install an M.2 WIFI card





To install an M.2 SSD card



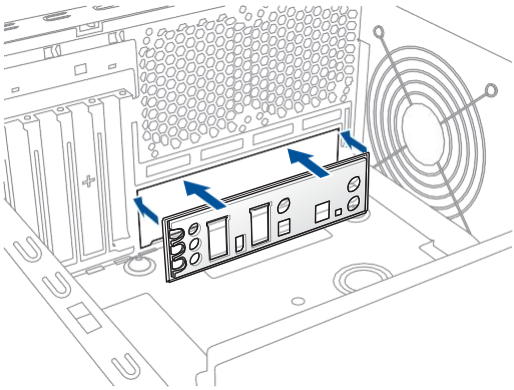
Supported M.2 type varies per motherboard.

- The M.2 modules are purchased separately.
- Use the screw and nut in the bundled 2-screw & 1-nut package when installing an M.2 SSD module into the M.2_2 socket.

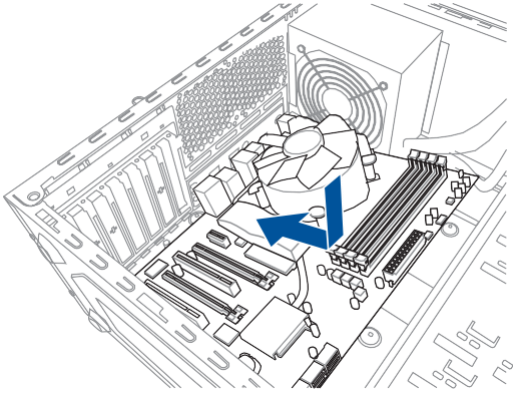
2.1.5 Motherboard installation

1. Install the ASUS I/O Shield to the chassis rear I/O panel.

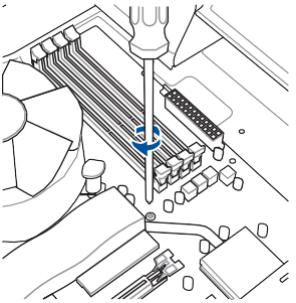
Some sharp edges and points might cause physical injury. We recommend you put on cut or puncture resistant gloves before motherboard and I/O shield installation.

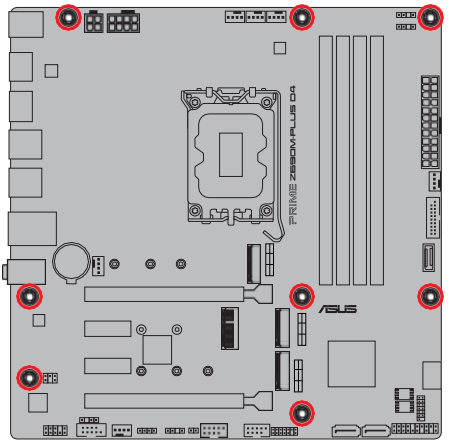


2. Place the motherboard into the chassis, ensuring that its rear I/O ports are aligned to the chassis' rear I/O panel.



3. Place eight (8) screws into the holes indicated by circles to secure the motherboard to the chassis.

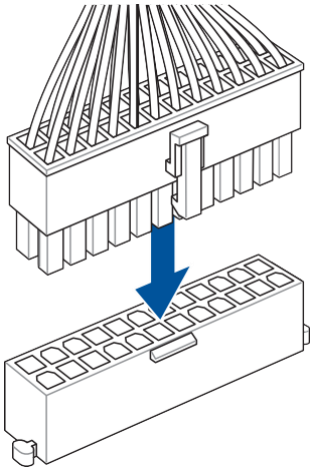




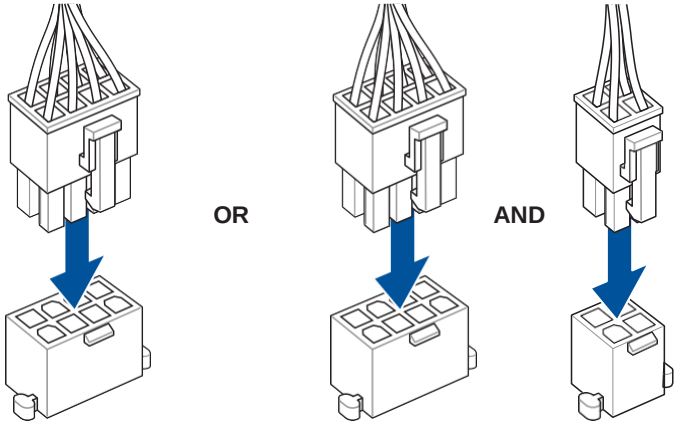
DO NOT over tighten the screws! Doing so can damage the motherboard.

2.1.6 ATX power connection

1

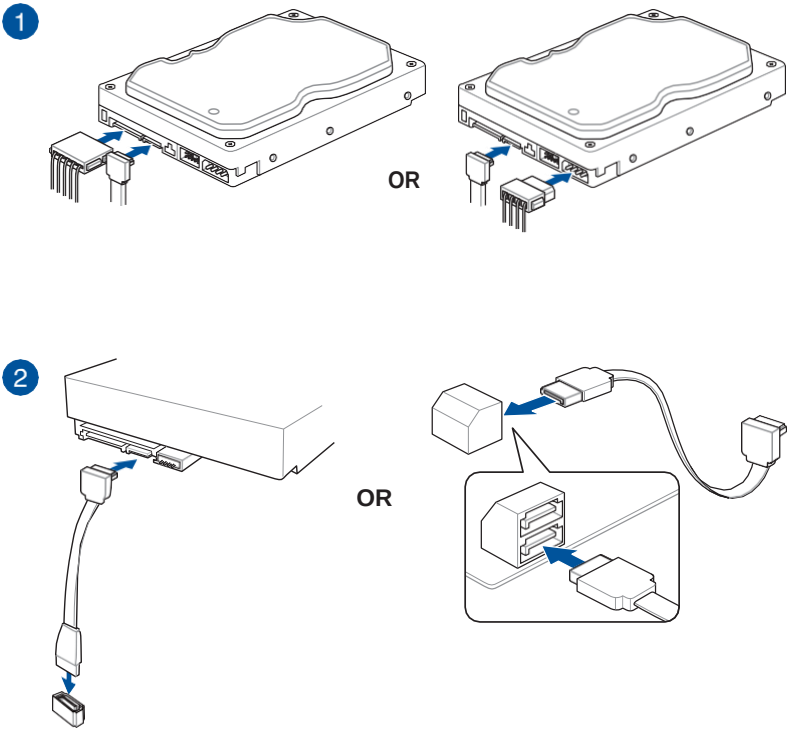


2



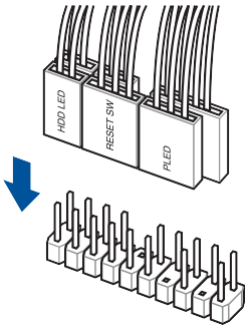
Ensure to connect the 8-pin power plug.

2.1.7 SATA device connection

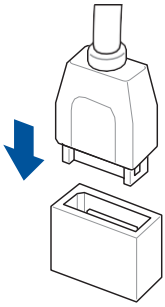


2.1.8 Front I/O connector

To install the front panel connector

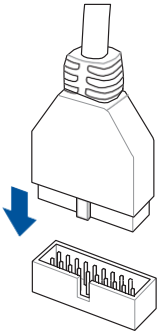


To install USB 3.2 Gen 1 connector

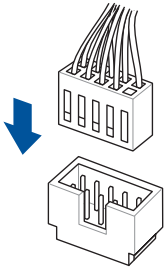


This connector will only fit in one orientation. Push the connector until it clicks into place.

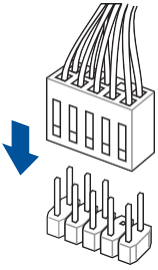
To install USB 3.2 Gen 1 connector



To install USB 2.0 connector



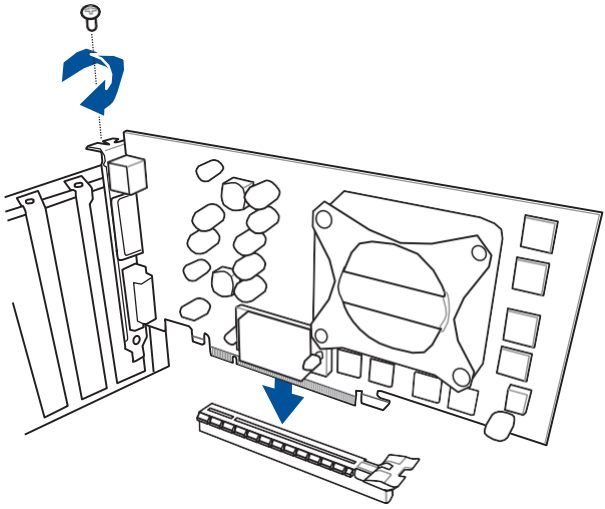
To install front panel audio connector



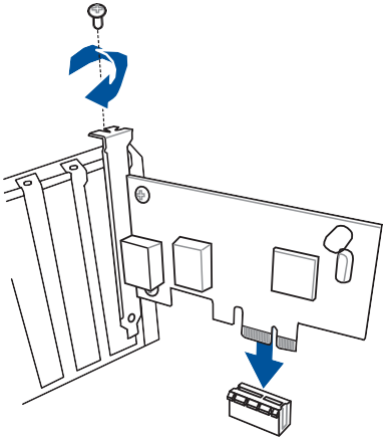
Chapter 2

2.1.9 Expansion card installation

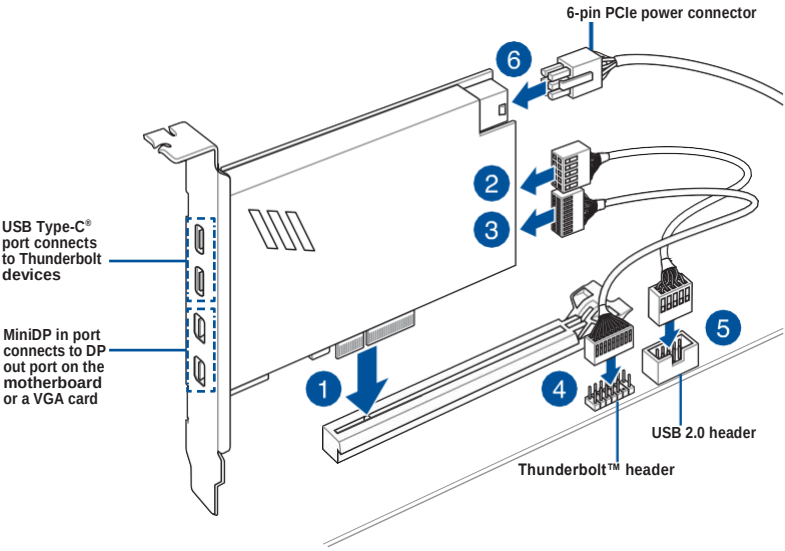
To install PCIe x16 cards



To install PCIe x1 cards



To install Thunderbolt™ series card

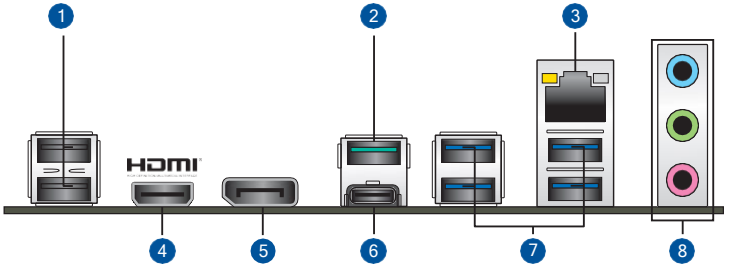


Ensure to install the Thunderbolt™ series card to the PCIEX16(G4) slot.

- Step 6 is optional, please connect a 6-pin PCIe power connector when you wish to use the USB Type-C® port Thunderbolt™ quick charge feature to charge a 5V or more device.
- The TypeC_1 port can support up to 20V devices, and the TypeC_2 port can support up to 9V devices when the 6-pin PCIe power connector is connected.
- The Thunderbolt™ series card is sold separately.
- Please visit the official website of your purchased Thunderbolt™ card for more details on compatibility.

2.2 Motherboard rear and audio connections

2.2.1 Rear I/O connection



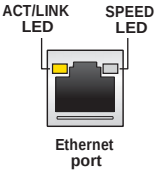
Rear panel connectors	
1.	USB 2.0 ports 11 and 12
2.	USB 3.2 Gen 2 Type-A port 9
3.	Intel® I219-V 1Gb Ethernet port*
4.	HDMI® port
5.	DisplayPort
6.	USB 3.2 Gen 2x2 port (Type-C® port)
7.	USB 3.2 Gen 1 Type-A ports 3, 4 and 5, 6
8.	Audio jacks**

*** and ** : Refer to the tables below for LAN port LEDs, and audio port definitions.**

We strongly recommend that you connect your devices to ports with matching data transfer rate. Please connect your USB 3.2 Gen 1 devices to USB 3.2 Gen 1 ports and your USB 3.2 Gen 2 devices to USB 3.2 Gen 2 ports for faster and better performance for your devices.

*** Intel® I219-V 1Gb Ethernet port LED indications**

Activity Link LED		Speed LED	
Status	Description	Status	Description
OFF	No link	OFF	10 Mbps connection
ORANGE	Linked	ORANGE	100 Mbps connection
BLINKING	Data activity	GREEN	1 Gbps connection



**** Audio 2, 4, 5.1, or 7.1-channel configuration**

Port	Headset 2-channel	4-channel	5.1-channel	7.1-channel
Light Blue (Rear panel)	Line In	Rear Speaker Out	Rear Speaker Out	Rear Speaker Out
Lime (Rear panel)	Line Out	Front Speaker Out	Front Speaker Out	Front Speaker Out
Pink (Rear panel)	Mic In	Mic In	Bass/Center	Bass/Center
Lime (Front panel)	–	–	–	Side Speaker Out* / Headphone
Pink (Front panel)	–	–	–	Mic in* / Side Speaker Out

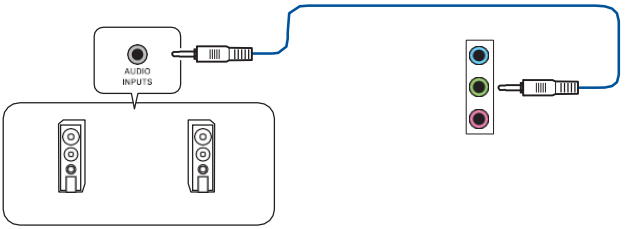
*** Multi-streaming is disabled by default, and the Lime (front panel) jack may be used as Side Speaker Out. If multi-streaming is enabled, the Lime (front panel) jack will support headphone, and the Pink (front panel) jack will support Side Speaker Out.**

2.2.2 Audio I/O connections

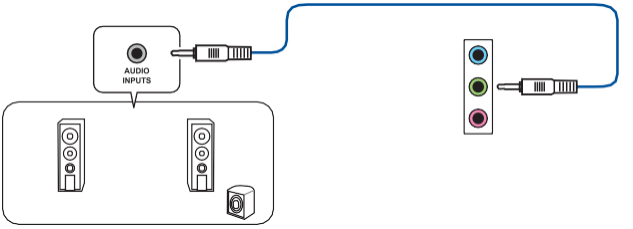
Audio I/O ports

Connect to Headphone and Mic

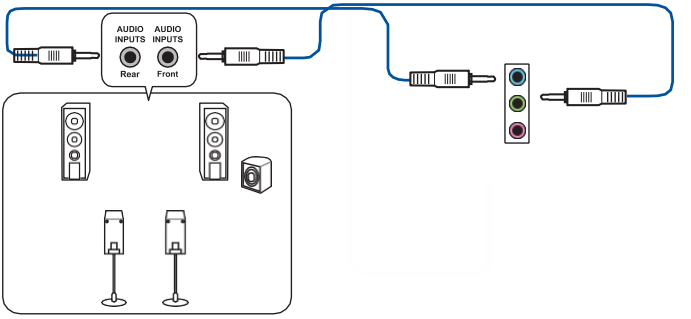
Connect to Stereo Speakers



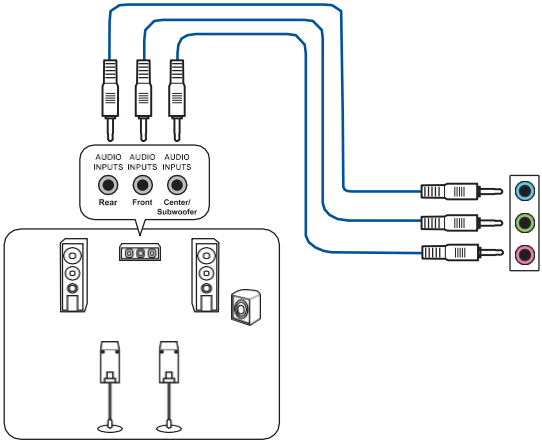
Connect to 2-channel Speakers



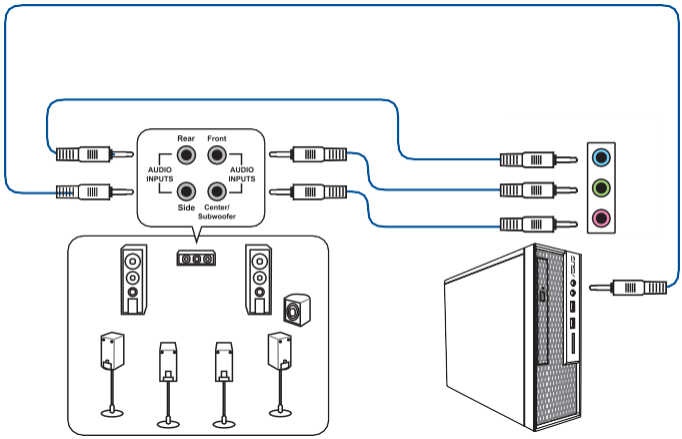
Connect to 4-channel Speakers



Connect to 5.1-channel Speakers



Connect to 7.1-channel Speakers



2.3 Starting up for the first time

1. After making all the connections, replace the system case cover.
2. Ensure that all switches are off.
3. Connect the power cord to the power connector at the back of the system chassis.
4. Connect the power cord to a power outlet that is equipped with a surge protector.
5. Turn on the devices in the following order:
   a. Monitor
   b. External SCSI devices (starting with the last device on the chain)
   c. System power
6. After applying power, the system power LED on the system front panel case lights up. For systems with ATX power supplies, the system LED lights up when you press the ATX power button. If your monitor complies with the "green" standards or if it has a "power standby" feature, the monitor LED may light up or change from orange to green after the system LED turns on.

   The system then runs the power-on self tests (POST). While the tests are running, the BIOS beeps (refer to the BIOS beep codes table) or additional messages appear on the screen. If you do not see anything within 30 seconds from the time you turned on the power, the system may have failed a power-on test. Check the jumper settings and connections or call your retailer for assistance.

BIOS Beep	Description
One short beep	VGA detected Quick boot set to disabled No keyboard detected
One continuous beep followed by two short beeps then a pause (repeated)	No memory detected
One continuous beep followed by three short beeps	No VGA detected
One continuous beep followed by four short beeps	Hardware component failure

7. At power on, hold down the <Delete> key to enter the BIOS Setup. Follow the instructions in Chapter 3.

2.4 Turning off the computer

While the system is ON, press the power button for less than four seconds to put the system on sleep mode or soft-off mode, depending on the BIOS setting. Press the power button for more than four seconds to let the system enter the soft-off mode regardless of the BIOS setting.

BIOS and RAID Support 3

3.1 Knowing BIOS

The new ASUS UEFI BIOS is a Unified Extensible Interface that complies with UEFI architecture, offering a user-friendly interface that goes beyond the traditional keyboard-only BIOS controls to enable a more flexible and convenient mouse input. You can easily navigate the new UEFI BIOS with the same smoothness as your operating system. The term "BIOS" in this user manual refers to "UEFI BIOS" unless otherwise specified.

BIOS (Basic Input and Output System) stores system hardware settings such as storage device configuration, overclocking settings, advanced power management, and boot device configuration that are needed for system startup in the motherboard CMOS. In normal circumstances, the default BIOS settings apply to most conditions to ensure optimal performance. **DO NOT change the default BIOS settings** except in the following circumstances:

- An error message appears on the screen during the system bootup and requests you to run the BIOS Setup.
- You have installed a new system component that requires further BIOS settings or update.

Inappropriate BIOS settings may result to instability or boot failure. **We strongly recommend that you change the BIOS settings only with the help of a trained service personnel**.

BIOS settings and options may vary due to different BIOS release versions. Please refer to the latest BIOS version for settings and options.

For more information on BIOS configurations, please refer to https://www.asus.com/support, or download the BIOS manual by scanning the QR code.

3.2 BIOS setup program

Use the BIOS Setup to update the BIOS or configure its parameters. The BIOS screen include navigation keys and brief onscreen help to guide you in using the BIOS Setup program.

Entering BIOS at startup

To enter BIOS Setup at startup, press <Delete> or <F2> during the Power-On Self Test (POST). If you do not press <Delete> or <F2>, POST continues with its routines.

Entering BIOS Setup after POST

To enter BIOS Setup after POST:

- Press <Ctrl>+<Alt>+<Delete> simultaneously.
- Press the reset button on the system chassis.
- Press the power button to turn the system off then back on. Do this option only if you failed to enter BIOS Setup using the first two options.

After doing either of the three options, press <Delete> key to enter BIOS.

- Ensure that a USB mouse is connected to your motherboard if you want to use the mouse to control the BIOS setup program.
- If the system becomes unstable after changing any BIOS setting, load the default settings to ensure system compatibility and stability. Select the **Load Optimized Defaults** item under the **Exit** menu or press hotkey **<F5>**.
- If the system fails to boot after changing any BIOS setting, try to clear the CMOS and reset the motherboard to the default value.
- The BIOS setup program does not support Bluetooth devices.

BIOS menu screen

The BIOS Setup program can be used under two modes: **EZ Mode** and **Advanced Mode**. You can change modes from **Setup Mode** in **Boot menu** or by pressing the <F7> hotkey.

3.3 ASUS EZ Flash 3

The ASUS EZ Flash 3 feature allows you to update the BIOS without using an OS-based utility.

Ensure to load the BIOS default settings to ensure system compatibility and stability. Select the **Load Optimized Defaults** item under the **Exit** menu or press hotkey **<F5>**.

To update the BIOS:

- This function can support devices such as a USB flash disk with FAT 32/16 format and single partition only.
- DO NOT shut down or reset the system while updating the BIOS to prevent system boot failure!

1. Insert the USB flash disk that contains the latest BIOS file to the USB port.
2. Enter the Advanced Mode of the BIOS setup program. Go to the **Tool** menu to select **ASUS EZ Flash 3 Utility** and press <Enter>.
3. Press the Left/Right arrow keys to switch to the **Drive** field.
4. Press the Up/Down arrow keys to find the USB flash disk that contains the latest BIOS, and then press <Enter>.
5. Press the Left/Right arrow keys to switch to the **Folder** field.
6. Press the Up/Down arrow keys to find the BIOS file, and then press <Enter> to perform the BIOS update process. Reboot the system when the update process is done.

3.4 ASUS CrashFree BIOS 3

The ASUS CrashFree BIOS 3 utility is an auto recovery tool that allows you to restore the BIOS file when it fails or gets corrupted during the updating process. You can restore a corrupted BIOS file using a USB flash drive that contains the BIOS file.

Recovering the BIOS

1. Download the latest BIOS version for this motherboard from https://www.asus.com/support/.
2. Rename the BIOS file as **ASUS.CAP** or **PZ690MP.CAP** and copy the renamed BIOS file to a USB flash drive.
3. Turn on the system.
4. Insert the USB flash drive containing the BIOS file to a USB port.
5. The utility automatically checks the devices for the BIOS file. When found, the utility reads the BIOS file and enters ASUS EZ Flash 3 automatically.
6. The system requires you to enter BIOS Setup to recover the BIOS setting. To ensure system compatibility and stability, we recommend that you press <F5> to load default BIOS values.

DO NOT shut down or reset the system while updating the BIOS! Doing so can cause system boot failure!

3.5 RAID configurations

The motherboard comes with the Intel® Rapid Storage Technology that supports RAID 0, RAID 1, RAID 5 and RAID 10 configuration.

For more information on configuring your RAID sets, please refer to the **RAID Configuration Guide** which you can find at https://www.asus.com/support, or by scanning the QR code.

RAID definitions

RAID 0 (Data striping) optimizes two identical hard disk drives to read and write data in parallel, interleaved stacks. Two hard disks perform the same work as a single drive but at a sustained data transfer rate, double that of a single disk alone, thus improving data access and storage. Use of two new identical hard disk drives is required for this setup.

RAID 1 (Data mirroring) copies and maintains an identical image of data from one drive to a second drive. If one drive fails, the disk array management software directs all applications to the surviving drive as it contains a complete copy of the data in the other drive. This RAID configuration provides data protection and increases fault tolerance to the entire system. Use two new drives or use an existing drive and a new drive for this setup. The new drive must be of the same size or larger than the existing drive.

RAID 5 stripes both data and parity information across three or more hard disk drives. Among the advantages of RAID 5 configuration include better HDD performance, fault tolerance, and higher storage capacity. The RAID 5 configuration is best suited for transaction processing, relational database applications, enterprise resource planning, and other business systems. Use a minimum of three identical hard disk drives for this setup.

RAID 10 is data striping and data mirroring combined without parity (redundancy data) having to be calculated and written. With the RAID 10 configuration you get all the benefits of both RAID 0 and RAID 1 configurations. Use four new hard disk drives or use an existing drive and three new drives for this setup.

Appendix

Notices

FCC Compliance Information

Responsible Party: Asus Computer International

Address: 48720 Kato Rd., Fremont, CA 94538, USA

Phone / Fax No: (510)739-3777 / (510)608-4555

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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

HDMI Compliance Statement

The terms HDMI, HDMI High-Definition Multimedia Interface, and the HDMI Logo are trademarks or registered trademarks of HDMI Licensing Administrator, Inc.

Compliance Statement of Innovation, Science and Economic Development Canada (ISED)

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

CAN ICES-003(B)/NMB-003(B)

Déclaration de conformité de Innovation, Sciences et Développement économique Canada (ISED)

Le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CAN ICES-003(B)/NMB-003(B)

VCCI: Japan Compliance Statement

Class B ITE

この装置は、クラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。

取扱説明書に従って正しい取り扱いをして下さい。

VCCI－B

Japan JATE

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KC: Korea Warning Statement

B급 기기 (가정용 방송통신기자재)
이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

Google™ License Terms

Declaration of compliance for product environmental regulation

ASUS follows the green design concept to design and manufacture our products, and makes sure that each stage of the product life cycle of ASUS product is in line with global environmental regulations. In addition, ASUS disclose the relevant information based on regulation requirements.

Please refer to http://csr.asus.com/Compliance.htm for information disclosure based on regulation requirements ASUS is complied with:

EU REACH and Article 33

Complying with the REACH (Registration, Evaluation, Authorisation, and Restriction of Chemicals) regulatory framework, we published the chemical substances in our products at ASUS REACH website at http://csr.asus.com/english/REACH.htm.

EU RoHS

This product complies with the EU RoHS Directive. For more details, see http://csr.asus.com/english/article.aspx?id=35

India RoHS

This product complies with the "India E-Waste (Management) Rules, 2016" and prohibits use of lead, mercury, hexavalent chromium, polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs) in concentrations exceeding 0.1% by weight in homogenous materials and 0.01% by weight in homogenous materials for cadmium, except for the exemptions listed in Schedule II of the Rule.

Vietnam RoHS

ASUS products sold in Vietnam, on or after September 23, 2011,meet the requirements of the Vietnam Circular 30/2011/TT-BCT.

Các sản phẩm ASUS bán tại Việt Nam, vào ngày 23 tháng 9 năm2011 trở về sau, đều phải đáp ứng các yêu cầu của Thông tư 30/2011/TT-BCT của Việt Nam.

Turkey RoHS

AEEE Yönetmeliğine Uygundur

ASUS Recycling/Takeback Services

ASUS recycling and takeback programs come from our commitment to the highest standards for protecting our environment. We believe in providing solutions for you to be able to responsibly recycle our products, batteries, other components as well as the packaging materials. Please go to http://csr.asus.com/english/Takeback.htm for detailed recycling information in different regions.

DO NOT throw the motherboard in municipal waste. This product has been designed to enable proper reuse of parts and recycling. This symbol of the crossed out wheeled bin indicates that the product (electrical and electronic equipment) should not be placed in municipal waste. Check local regulations for disposal of electronic products.

DO NOT throw the mercury-containing button cell battery in municipal waste. This symbol of the crossed out wheeled bin indicates that the battery should not be placed in municipal waste.

Appendix

English ASUSTeK Computer Inc. hereby declares that this device is in compliance with the essential requirements and other relevant provisions of related UKCA Directives. Full text of UKCA declaration of conformity is available at: www.asus.com/support

English ASUSTeK Computer Inc. hereby declares that this device is in compliance with the essential requirements and other relevant provisions of related Directives. Full text of EU declaration of conformity is available at: www.asus.com/support

Français AsusTek Computer Inc. déclare par la présente que cet appareil est conforme aux critères essentiels et autres clauses pertinentes des directives concernées. La déclaration de conformité de l'UE peut être téléchargée à partir du site Internet suivant : www.asus.com/support

Deutsch ASUSTeK Computer Inc. erklärt hiermit, dass dieses Gerät mit den wesentlichen Anforderungen und anderen relevanten Bestimmungen der zugehörigen Richtlinien übereinstimmt. Der gesamte Text der EU-Konformitätserklärung ist verfügbar unter: www.asus.com/support

Italiano ASUSTeK Computer Inc. con la presente dichiara che questo dispositivo è conforme ai requisiti essenziali e alle altre disposizioni pertinenti con le direttive correlate. Il testo completo della dichiarazione di conformità UE è disponibile all'indirizzo: www.asus.com/support

Русский Компания ASUS заявляет, что это устройство соответствует основным требованиям и другим соответствующим условиям соответствующих директив. Подробную информацию, пожалуйста, смотрите на www.asus.com/support

Български С настоящото ASUSTeK Computer Inc. декларира, че това устройство е в съответствие със съществените изисквания и другите приложими постановления на свързаните директиви. Пълният текст на декларацията за съответствие на ЕС е достъпна на адрес: www.asus.com/support

Hrvatski ASUSTeK Computer Inc. ovim izjavljuje da je ovaj uređaj sukladan s bitnim zahtjevima i ostalim odgovarajućim odredbama vezanih direktiva. Cijeli tekst EU izjave o sukladnosti dostupan je na: www.asus.com/support

Čeština Společnost ASUSTeK Computer Inc. tímto prohlašuje, že toto zařízení splňuje základní požadavky a další příslušná ustanovení souvisejících směrnic. Plné znění prohlášení o shodě EU je k dispozici na adrese: www.asus.com/support

Dansk ASUSTeK Computer Inc. erklærer hermed, at denne enhed er i overensstemmelse med hovedkravene og andre relevante bestemmelser i de relaterede direktiver. Hele EU-overensstemmelseserklæringen kan findes på: www.asus.com/support

Nederlands ASUSTeK Computer Inc. verklaart hierbij dat dit apparaat voldoet aan de essentiële vereisten en andere relevante bepalingen van de verwante richtlijnen. De volledige tekst van de EU-verklaring van conformiteit is beschikbaar op: www.asus.com/support

Eesti Käesolevaga kinnitab ASUSTeK Computer Inc, et see seade vastab asjakohaste direktiivide oluliste nõuetele ja teistele asjassepuutuvatele sätetele. EL vastavusdeklaratsiooni täielik tekst on saadaval järgmisel aadressil: www.asus.com/support

Suomi ASUSTeK Computer Inc. ilmoittaa täten, että tämä laite on asiaankuuluvien direktiivien olennaisten vaatimusten ja muiden tätä koskevien säädösten mukainen. EU-yhdenmukaisuusilmoituksen koko teksti on luettavissa osoitteessa: www.asus.com/support

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Magyar Az ASUSTeK Computer Inc. ezennel kijelenti, hogy ez az eszköz megfelel a kapcsolódó Irányelvek lényeges követelményeinek és egyéb vonatkozó rendelkezéseinek. Az EU megfelelőségi nyilatkozat teljes szövege innen letölthető: www.asus.com/support

Latviski ASUSTeK Computer Inc. ar šo paziņo, ka šī ierīce atbilst saistīto Direktīvu būtiskajām prasībām un citiem citiem saistošajiem nosacījumiem. Pilns ES atbilstības paziņojuma teksts pieejams šeit: www.asus.com/support

Lietuvių „ASUSTeK Computer Inc." šiuo tvirtina, kad šis įrenginys atitinka pagrindinius reikalavimus ir kitas svarbias susijusių direktyvų nuostatas. Visą ES atitikties deklaracijos tekstą galima rasti: www.asus.com/support

Norsk ASUSTeK Computer Inc. erklærer herved at denne enheten er i samsvar med hovedsaklige krav og andre relevante forskrifter i relaterte direktiver. Fullstendig tekst for EU-samsvarserklæringen finnes på: www.asus.com/support

Polski Firma ASUSTeK Computer Inc. niniejszym oświadcza, że urządzenie to jest zgodne z zasadniczymi wymogami i innymi właściwymi postanowieniami powiązanych dyrektyw. Pełny tekst deklaracji zgodności UE jest dostępny pod adresem: www.asus.com/support

Português A ASUSTeK Computer Inc. declara que este dispositivo está em conformidade com os requisitos essenciais e outras disposições relevantes das Diretivas relacionadas. Texto integral da declaração da UE disponível em: www.asus.com/support

Română ASUSTeK Computer Inc. declară că acest dispozitiv se conformează cerinţelor esenţiale şi altor prevederi relevante ale directivelor conexe. Textul complet al declaraţiei de conformitate a Uniunii Europene se găseşte la: www.asus.com/support

Srpski ASUSTeK Computer Inc. ovim izjavljuje da je ovaj uređaj u saglasnosti sa osnovnim zahtevima i drugim relevantnim odredbama povezanih Direktiva. Pun tekst EU deklaracije o usaglašenosti je dostupan da adresi: www.asus.com/support

Slovensky Spoločnosť ASUSTeK Computer Inc. týmto vyhlasuje, že toto zariadenie vyhovuje základným požiadavkám a ostatým príslušným ustanoveniam príslušných smerníc. Celý text vyhlásenia o zhode pre štáty EÚ je dostupný na adrese: www.asus.com/support

Slovenščina ASUSTeK Computer Inc. izjavlja, da je ta naprava skladna z bistvenimi zahtevami in drugimi ustreznimi določbami povezanih direktiv. Celotno besedilo EU-izjave o skladnosti je na voljo na spletnem mestu: www.asus.com/support

Español Por la presente, ASUSTeK Computer Inc. declara que este dispositivo cumple los requisitos básicos y otras disposiciones pertinentes de las directivas relacionadas. El texto completo de la declaración de la UE de conformidad está disponible en: www.asus.com/support

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Українська ASUSTeK Computer Inc. заявляє, що цей пристрій відповідає основним вимогам та іншим відповідним положенням відповідних Директив. Повний текст декларації відповідності стандартам ЄС доступний на: www.asus.com/support

Türkçe AsusTek Computer Inc., bu aygıtın temel gereksinimlerle ve ilişkili Yönergelerin diğer ilgili koşullarıyla uyumlu olduğunu beyan eder. AB uygunluk bildiriminin tam metni şu adreste bulunabilir: www.asus.com/support

Bosanski ASUSTeK Computer Inc. ovim izjavljuje da je ovaj uređaj usklađen sa bitnim zahtjevima i ostalim odgovarajućim odredbama vezanih direktiva. Cijeli tekst EU izjave o usklađenosti dostupan je na: www.asus.com/support

Appendix

Warranty

EN: ASUS Guarantee Information

- ASUS offers a voluntary manufacturer's Commercial Guarantee.
- ASUS reserves the right to interpret the provisions of the ASUS Commercial Guarantee.
- This ASUS Commercial Guarantee is provided independently and in addition to the statutory Legal Guarantee and in no way affects or limits the rights under the Legal Guarantee.

For all the guarantee information, please visit https://www.asus.com/support.

F: Garantie ASUS

- ASUS fournit une garantie commerciale en tant que garantie volontaire du fabricant.
- ASUS se réserve le droit d'interpréter et de clarifier les informations relatives à la garantie commerciale ASUS.
- Cette garantie commerciale ASUS est fournie indépendamment et parallèlement à la garantie légale, elle n'affecte ou ne limite d'aucune façon les droits acquis par la garantie légale.

Pour plus d'informations sur la garantie, consultez le site https://www.asus.com/fr/support/.

G: ASUS Garantieinformationen

- ASUS bietet eine freiwillige Warengarantie des Herstellers an.
- ASUS behält sich das Recht zur Auslegung der Bestimmungen in der ASUS Warengarantie vor.
- Diese ASUS Warengarantie wird unabhängig und zusätzlich zur rechtmäßigen gesetzlichen Garantie gewährt und beeinträchtigt oder beschränkt in keiner Weise die Rechte aus der gesetzlichen Garantie.

Die vollständigen Garantieinformationen finden Sie unter https://www.asus.com/de/support/.

I: Informativa sulla Garanzia ASUS

- ASUS offre una Garanzia Commerciale volontaria del produttore.
- ASUS si riserva il diritto di interpretare le disposizioni della Garanzia Commerciale ASUS.
- La presente Garanzia Commerciale ASUS viene fornita in modo indipendente e in aggiunta alla Garanzia Legale prevista per legge e non pregiudica o limita in alcun modo i diritti previsti dalla Garanzia Legale.

Per tutte le informazioni sulla garanzia, visitare https://www.asus.com/it/support.

R: Информация о гарантии ASUS

- ASUS предлагает добровольную гарантию от производителя.
- ASUS оставляет за собой право интерпретирование положений гарантии ASUS.
- Настоящая гарантия ASUS никоим образом не ограничивает Ваши права, предусмотренные локальным законодательством.

Для получения полной информации о гарантии посетите https://www.asus.com/ru/support/.

DA: ASUS garantioplysninger

- ASUS tilbyder en valgfri handelsmæssig garanti.
- ASUS forbeholder sig retten til at fortolke bestemmelserne i ASUS' handelsmæssige garanti.
- Denne handelsmæssige garanti fra ASUS tilbydes uafhængigt, som en tilføjelse til den lovbestemte juridiske garanti og den påvirker eller begrænser på ingen måde rettighederne i den juridiske garanti.

Alle garantioplysningerne kan findes på https://www.asus.com/dk/support/.

BG: Информация за гаранцията от ASUS

- ASUS предлага доброволна търговска гаранция от производителя.
- ASUS си запазва правото да тълкува условията на търговската гаранция на ASUS.
- Тази търговска гаранция на ASUS се предлага независимо от и в допълнение на законовата гаранция. Тя по никакъв начин не оказва влияние върху правата на потребителя в законовата гаранция и по никакъв начин не ги ограничава.

За цялостна информация относно гаранцията, моля, посетете https://www.asus.com/support.

CZ: Informace o záruce společnosti ASUS

- Společnost ASUS nabízí dobrovolnou komerční záruku výrobce.
- Společnost ASUS si vyhrazuje právo vykládat ustanovení komerční záruky společnosti ASUS.
- Tato komerční záruka společnosti ASUS je poskytována nezávisle a jako doplněk zákonné záruky a žádným způsobem neovlivňuje ani neomezuje práva vyplývající ze zákonné záruky.

Všechny informace o záruce najdete na adrese https://www.asus.com/cz/support/.

CR: Informacije o ASUS jamstvu

- ASUS dragovoljno nudi komercijalno proizvođačko jamstvo.
- ASUS zadržava prava na tumačenje odredbi ASUS komercijalnog jamstva.
- Ovo ASUS komercijalno jamstvo daje se neovisno i kao dodatak zakonskom jamstvu i ni na koji način ne ograničuje prava iz okvira zakonskog jamstva.

Sve informacije o jamstvu potražite na https://www.asus.com/support.

DU: ASUS-garantie-informatie

- SUS biedt een vrijwillige commerciële garantie van de fabrikant.
- ASUS behoudt zich het recht voor om de bepalingen van de commerciële garantie van ASUS uit te leggen.
- Deze commerciële garantie van ASUS wordt onafhankelijk en als aanvulling op de statutaire Wettelijke garantie geboden en beïnvloedt of beperkt in geen geval de rechten onder de wettelijke garantie.

Voor alle informatie over de garantie, gaat u naar https://www.asus.com/nl/support/.

EE: Teave ASUS-e garantii kohta

- ASUS pakub vabatahtlikku tasulist tootjagarantiid.
- ASUS jätab endale õiguse tõlgendada ASUS-e tasulise garantii tingimusi.
- See ASUS-e tasuline garantii on sõltumatu lisagarantii seadusega kehtestatud garantiile ega mõjuta mingil määral seadusega kehtestatud garantiid ning seadusega kehtestatud garantii piiranguid.

Vaadake garantiiga seotud teavet veebisaidilt https://www.asus.com/ee/.

GK: Πληροφορίες εγγύησης ASUS

- Η ASUS προσφέρει μια εθελοντική Εμπορική εγγύηση κατασκευαστή.
- Η ASUS διατηρεί το δικαίωμα ερμηνείας των διατάξεων της Εμπορικής εγγύησης ASUS.
- Αυτή η Εμπορική εγγύηση ASUS παρέχεται ανεξάρτητα και επιπροσθέτως της θεσμικής Νομικής εγγύησης και σε καμία περίπτωση δεν επηρεάζει ή περιορίζει τα δικαιώματα βάσει της Νομικής εγγύησης.

Για όλες τις πληροφορίες εγγύησης, επισκεφθείτε τη διεύθυνση https://www.asus.com/gr-el/.

HUG: ASUS garanciális információk

- Az ASUS önkéntes gyártói kereskedelmi garanciát kínál.
- Az ASUS fenntartja magának a jogot, hogy értelmezze az ASUS kereskedelmi garanciára vonatkozó rendelkezéseket.
- Ezt a kereskedelmi garanciát az ASUS függetlenül és a törvényes garancia mellett nyújtja és semmilyen módon nem befolyásolja, vagy korlátozza a jogi garancia nyújtotta jogokat.

A garanciára vonatkozó teljes körű információkért látogasson el a https://www.asus.com/hu/support/ oldalra.

LV: ASUS garantijas informācija

- ASUS piedāvā brīvprātīgu ražotāja komerciālo garantiju.
- ASUS patur tiesības interpretēt ASUS komerciālās garantijas noteikumus.
- Šī ASUS komerciālā garantija tiek piedāvāta neatkarīgi un papildus likumā noteiktajai juridiskajai garantijai, un tā nekādi neietekmē vai neierobežo juridiskajā garantijā noteiktās tiesības.

Lai iegūtu informāciju par garantiju, apmeklējiet vietni https://www.asus.com/lv/.

LT: Informacija apie ASUS garantiją

- ASUS siūlo savanorišką komercinę gamintojo garantiją.
- ASUS pasilieka teisę savo nuožiūra aiškinti šios komercinės ASUS garantijos nuostatas.
- Ši komercinė ASUS garantija suteikiama nepriklausoma, be įstatyminės teisinės garantijos, ir jokiu būdu nepaveikia ar neapriboja teisinės garantijos suteikiamų teisių.

Norėdami gauti visą informaciją apie garantiją, apsilankykite https://www.asus.com/lt/.

PL: Informacje o gwarancji firmy ASUS

- Firma ASUS oferuje dobrowolną gwarancję handlową producenta.
- Firma ASUS zastrzega sobie prawo do interpretacji warunków gwarancji handlowej firmy ASUS.
- Niniejsza gwarancja handlowa firmy ASUS jest udzielana niezależnie, jako dodatek do wymaganej ustawowo gwarancji prawnej i w żaden sposób nie wpływa na prawa przysługujące na mocy gwarancji prawnej ani ich nie ogranicza.

Wszelkie informacje na temat gwarancji można znaleźć na stronie https://www.asus.com/pl/support.

PG: Informações de Garantia ASUS

- A ASUS oferece uma Garantia Comercial voluntária do fabricante.
- A ASUS reserva o direito de interpretar as disposições da Garantia Comercial da ASUS.
- Esta Garantia Comercial da ASUS é fornecida de forma independente além da Garantia Legal estatutária e não afeta nem limita de qualquer forma os direitos estabelecidos na Garantia Legal.

Para consultar todas as informações sobre a garantia, visite https://www.asus.com/pt/support/.

RO: Informații despre garanția ASUS

- ASUS oferă o garanție comercială voluntară a producătorului.
- ASUS își rezervă dreptul de a interpreta prevederile garanției comerciale ASUS.
- Această garanție comercială ASUS este oferită independent și în plus față de garanția obligatorie legal și nu afectează sau limitează în niciun fel drepturile acordate conform garanției legale.

Pentru toate informațiile legate de garanție, vizitați https://www.asus.com/ro/support.

SL: Informacije o garanciji ASUS

- ASUS ponuja prostovoljno tržno garancijo proizvajalca.
- ASUS si pridržuje pravico do razlage določb tržne garancije družbe ASUS.
- Ta tržna garancija družbe ASUS je na voljo neodvisno in kot dodatek zakonsko predpisani pravni garanciji ter na noben način ne vpliva na pravice, ki jih zagotavlja pravna garancija, oziroma jih omejuje.

Vse informacije o garanciji najdete na spletnem mestu https://www.asus.com/support.

SK: Informácie o záruke ASUS

- ASUS ponúka dobrovoľnú obchodnú záruku výrobcu.
- ASUS si vyhradzuje právo interpretovať ustanovenia obchodnej záruky ASUS.
- Táto obchodná záruka ASUS je poskytnutá nezávisle a navyše k zákonnej záruke a v žiadnom prípade neovplyvňuje ani neobmedzuje tieto práva podľa tejto zákonnej záruky.

Všetky ďalšie informácie o záruke nájdete na https://www.asus.com/sk/support.

ES: Información de garantía de ASUS

- ASUS ofrece una garantía comercial voluntaria del fabricante.
- ASUS se reserva el derecho de interpretar las disposiciones de esta garantía comercial de ASUS.
- Esta garantía comercial de ASUS se proporciona de forma independiente y adicional a la garantía estatutaria y de ninguna manera afecta a los derechos bajo la garantía legal ni los limita.

Para obtener toda la información sobre la garantía, visite https://www.asus.com/ES/support/.

TR: ASUS Garanti Bilgileri

- ASUS, gönüllü olarak üretici Ticari Garantisi sunar.
- ASUS, ASUS Ticari Garantisinin hükümlerini yorumlama hakkını saklı tutar.
- Bu ASUS Ticari Garantisi, bağımsız olarak ve hukuki Yasal Garanti'ye ek olarak sağlanır ve hiçbir şekilde Yasal Garanti kapsamındaki hakları etkilemez veya sınırlandırmaz.

Tüm garanti bilgileri için lütfen https://www.asus.com/tr/support adresini ziyaret edin.

FI: ASUS-takuutiedot

- ASUS tarjoaa vapaaehtoisen valmistajan kaupallisen takuun.
- ASUS pidättää oikeuden tulkita ASUS-kaupallisen takuun ehdot.
- Tämä ASUS-kaupallinen takuu tarjotaan itsenäisesti lakisääteisen oikeudellisen takuun lisäksi eikä se vaikuta millään tavoin laillisen takuun oikeuksiin tai rajoita niitä.

Saadaksesi kaikki takuutiedot, siirry osoitteeseen https://www.asus.com/fi/support.

NW: Informasjon om ASUS-garanti

- ASUS tilbyr som produsent en frivillig kommersiell garanti.
- ASUS forbeholder seg retten til å tolke bestemmelsene i ASUS sin kommersielle garanti.
- ASUS sin kommersielle garanti gis uavhengig og i tillegg til den lovbestemte juridiske garantien, og verken påvirker eller begrenser rettighetene under den juridiske garantien på noen måte.

Du finner fullstendig informasjon om garanti på https://www.asus.com/no/support/.

SB: Informacije o ASUS garanciji

- ASUS nudi dobrovoljnu proizvođačku komercijalnu garanciju.
- ASUS zadržava pravo da tumači odredbe svoje ASUS komercijalne garancije.
- Ova ASUS komercijalna garancija daje se nezavisno, kao dodatak zakonskoj pravnoj garanciji, i ni ka koji način ne utiče na i ne ograničava prava data pravnom garancijom.

Za sve informacije o garanciji, posetite https://www.asus.com/support/.

SW: ASUS garantiinformation

- ASUS erbjuder en frivillig kommersiell tillverkningsgaranti.
- ASUS förbehåller sig rätten att tolka bestämmelserna i ASUS kommersiella garanti.
- Denna kommersiella garanti från ASUS tillhandahålles separat och som tillägg till den lagstadgade garantin, och påverkar eller begränsar på intet sätts rättigheterna under den lagstadgade garantin.

För all garantiinformation, besök https://www.asus.com/se/support/.

UA: Інформація про Гарантію ASUS

- ASUS пропонує добровільну Комерційну Гарантію виробника.
- ASUS застерігає за собою право тлумачити положення Комерційної Гарантії ASUS
- Цю Комерційну Гарантію надано незалежно і на додаток до обов'язкової Законної Гарантії; вона жодним чином не впливає на права за Законною Гарантією і не обмежує їх.

Всю інформацію про гарантію подано тут: https://www.asus.com/ua/support.

MX: Garantía y Soporte

Esta Garantía aplica en el país de compra. Usted acepta que en esta garantía:

- Los procedimientos de servicio pueden variar en función del país.
- Algunos servicios y/o piezas de reemplazo pudieran no estar disponibles en todos los países.
- Algunos países pueden tener tarifas y restricciones que se apliquen en el momento de realizar el servicio, visite el sitio de soporte de ASUS en https://www.asus.com/mx/support/ para ver más detalles.
- Si tiene alguna queja o necesidad de un centro de reparación local o el periodo de garantía del producto ASUS, por favor visite el sitio de Soporte de ASUS en https://www.asus.com/mx/support/ para mayores detalles.

Información de contacto ASUS
Esta garantía está respaldada por:
ASUSTeK Computer Inc.
Centro de Atención ASUS +52 (55) 1946-3663

BP: Informações de garantia ASUS

Esta garantia aplica-se ao período definido pela garantia legal (90 dias) mais o período de garantia comercial oferecido pela ASUS. Por exemplo: 12M significa 12 meses de garantia no total (3 meses de garantia legal mais 9 meses de garantia contratual), 24 meses significa 24 meses de garantia no total (3 meses de garantia legal mais 21 meses de garantia contratual) e 36 meses significa 36 meses de garantia no total (3 meses de garantia legal e 33 de garantia contratual) a contar da data da garantia declarada (Data de Início da Garantia).

Para todas as informações de garantia, visite https://www.asus.com/br/support/.

ID: Informasi Garansi ASUS

Garansi ini berlaku di negara tempat pembelian.

Periode Garansi tertera pada kemasan/kotak dari Produk dan Masa Garansi dimulai sejak tanggal pembelian Produk ASUS dengan kondisi baru.

Silahkan pindai Kode QR di bagian bawah halaman terakhir untuk Kartu Garansi versi Web dalam format PDF untuk lebih informasi jelas mengenai jaminan garansi Produk ASUS.

- Informasi Dukungan ASUS, silakan kunjungi https://www.asus.com/id/support.
- Informasi Lokasi Layanan, silakan kunjungi https://www.asus.com/id/support/Service-Center/Indonesia.
- Layanan Call Center: 1500128

VI: Thông tin đảm bảo của ASUS

- ASUS cung cấp Bảo hành thương mại tự nguyện của nhà sản xuất.
- ASUS bảo lưu quyền giải thích các điều khoản của Bảo hành thương mại của ASUS.
- Bảo hành thương mại này của ASUS được cung cấp độc lập và ngoài Bảo đảm pháp lý theo luật định và không có cách nào ảnh hưởng đến hoặc giới hạn các quyền theo Bảo lãnh pháp lý. Để biết tất cả các thông tin bảo hành, vui lòng truy cập https://www.asus.com/vn/support

ASUS contact information

ASUSTeK COMPUTER INC.
Address: 1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan

ASUS COMPUTER INTERNATIONAL (America)
Address: 48720 Kato Rd., Fremont, CA 94538, USA

ASUS COMPUTER GmbH (Germany and Austria)
Address: Harkortstrasse 21-23, 40880 Ratingen, Germany

ASUSTeK (UK) LIMITED
Address: 1st Floor, Sackville House, 143-149 Fenchurch Street, London, EC3M 6BL, England, United Kingdom

Service and Support

Visit our multi-language website at https://www.asus.com/support.

Appendix

PRIME / ProArt / TUF GAMING Intel 600 Series

BIOS Manual

Motherboard

E19474
First Edition
December 2021

Contents

BIOS Setup

1. Knowing BIOS

The new ASUS UEFI BIOS is a Unified Extensible Interface that complies with UEFI architecture, offering a user-friendly interface that goes beyond the traditional keyboard-only BIOS controls to enable a more flexible and convenient mouse input. You can easily navigate the new UEFI BIOS with the same smoothness as your operating system. The term "BIOS" in this user manual refers to "UEFI BIOS" unless otherwise specified.

BIOS (Basic Input and Output System) stores system hardware settings such as storage device configuration, overclocking settings, advanced power management, and boot device configuration that are needed for system startup in the motherboard CMOS. In normal circumstances, the default BIOS settings apply to most conditions to ensure optimal performance. **DO NOT change the default BIOS settings** except in the following circumstances:

- An error message appears on the screen during the system bootup and requests you to run the BIOS Setup.
- You have installed a new system component that requires further BIOS settings or update.

Inappropriate BIOS settings may result to instability or boot failure. **We strongly recommend that you change the BIOS settings only with the help of a trained service personnel**.

- When downloading or updating the BIOS file for your motherboard, rename it as **XXXXX.CAP** or launch the **BIOSRenamer.exe** application to automatically rename the file. The name of the CAP file varies depending on models. Refer to the user manual that came with your motherboard for the name.
- The screenshots in this manual are for reference only, please refer to the latest BIOS version for settings and options.
- BIOS settings and options may vary due to different BIOS release versions or CPU installed. Please refer to the latest BIOS version for settings and options.

2. BIOS setup program

Use the BIOS Setup to update the BIOS or configure its parameters. The BIOS screen include navigation keys and brief onscreen help to guide you in using the BIOS Setup program.

Entering BIOS at startup

To enter BIOS Setup at startup, press <Delete> or <F2> during the Power-On Self Test (POST). If you do not press <Delete> or <F2>, POST continues with its routines.

Entering BIOS Setup after POST

To enter BIOS Setup after POST:

- Press <Ctrl>+<Alt>+<Delete> simultaneously.
- Press the reset button on the system chassis.
- Press the power button to turn the system off then back on. Do this option only if you failed to enter BIOS Setup using the first two options.

After doing either of the three options, press <Delete> key to enter BIOS.

- The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.
- Ensure that a USB mouse is connected to your motherboard if you want to use the mouse to control the BIOS setup program.
- If the system becomes unstable after changing any BIOS setting, load the default settings to ensure system compatibility and stability. Select the **Load Optimized Defaults** item under the **Exit** menu or press hotkey **<F5>**. See section **Exit menu** for details.
- If the system fails to boot after changing any BIOS setting, try to clear the CMOS and reset the motherboard to the default value. See your motherboard manual for information on how to erase the RTC RAM.
- The BIOS setup program does not support Bluetooth devices.

BIOS menu screen

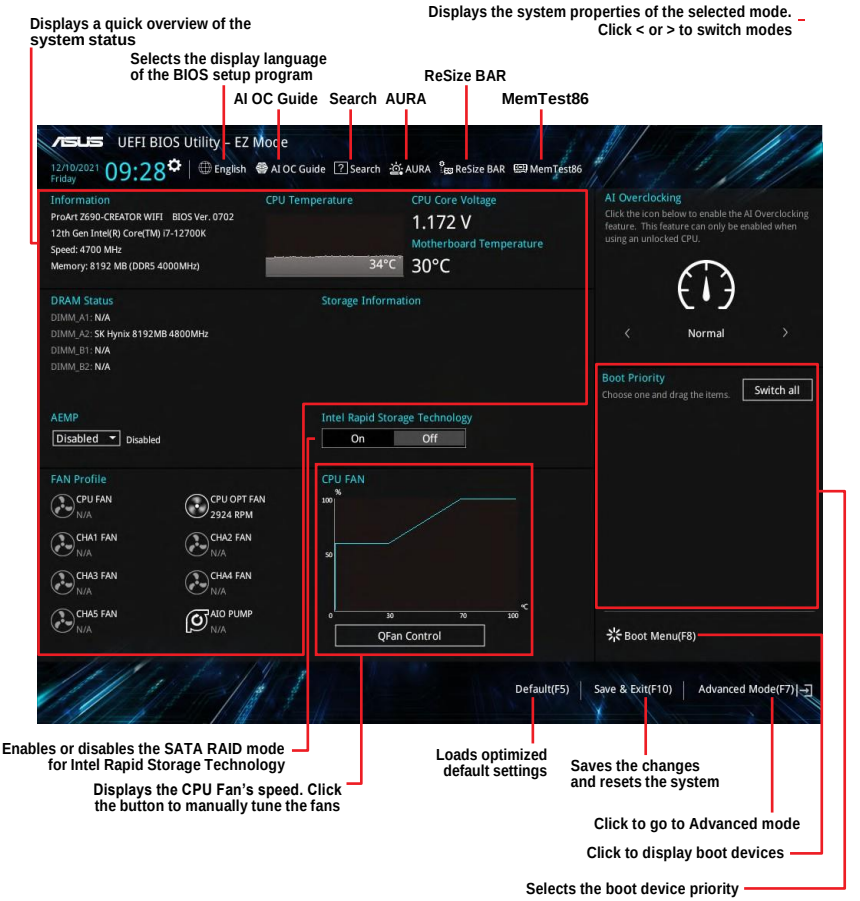
The BIOS Setup program can be used under two modes: **EZ Mode** and **Advanced Mode**. You can change modes from **Setup Mode** in **Boot menu** or by pressing the <F7> hotkey.

The BIOS settings and options for each motherboard may differ slightly with the options in this manual. Please refer to the BIOS of your motherboard for the settings and options.

2.1 EZ Mode

The EZ Mode provides you an overview of the basic system information, and allows you to select the display language, system performance, mode and boot device priority. To access the Advanced Mode, select **Advanced Mode(F7)** or press the <F7> hotkey for the advanced BIOS settings.

The default screen for entering the BIOS setup program can be changed. Refer to the **Setup Mode** item in section **Boot menu** for details.

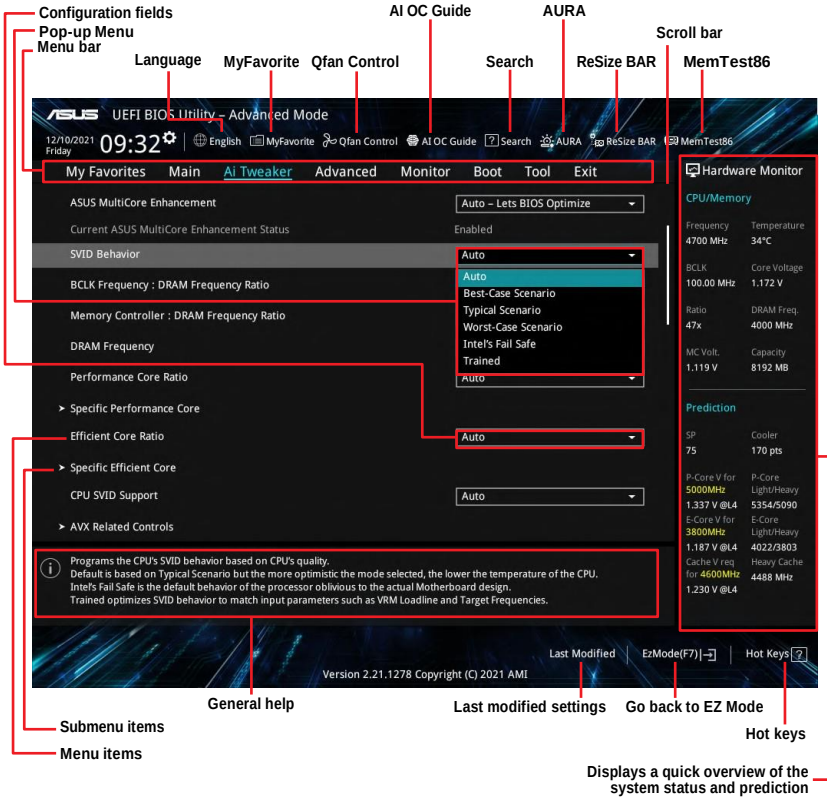


The boot device options vary depending on the devices you installed to the system.

2.2 Advanced Mode

The Advanced Mode provides advanced options for experienced end-users to configure the BIOS settings. The figure below shows an example of the Advanced Mode. Refer to the following sections for the detailed configurations.

To switch from EZ Mode to Advanced Mode, click **Advanced Mode(F7)** or press the <F7> hotkey.



Menu bar

The menu bar on top of the screen has the following main items:

My Favorites	For saving the frequently-used system settings and configuration.
Main	For changing the basic system configuration
Ai Tweaker	For changing the overclocking settings
Advanced	For changing the advanced system settings
Monitor	For displaying the system temperature, power status, and changing the fan settings.
Boot	For changing the system boot configuration
Tool	For configuring options for special functions
Exit	For selecting the exit options and loading default settings

Menu items

The highlighted item on the menu bar displays the specific items for that menu. For example, selecting **Main** shows the Main menu items.

The other items (My Favorites, Ai Tweaker, Advanced, Monitor, Boot, Tool, and Exit) on the menu bar have their respective menu items.

Submenu items

An arrow sign (>) before each item on any menu screen means that the item has a submenu. To display the submenu, select the item and press <Enter>.

Language

This button above the menu bar contains the languages that you can select for your BIOS. Click this button to select the language that you want to display in your BIOS screen.

MyFavorite

This button above the menu bar shows all BIOS items in a Tree Map setup. Select frequently-used BIOS settings and save it to **My Favorites** menu. You may also access this item by pressing the <F3> key on the keyboard.

Refer to section **My Favorites** for more information.

Qfan Control

This button above the menu bar displays the current settings of your fans. Use this button to manually tweak the fans to your desired settings. You may also access this item by pressing the <F6> key on the keyboard.

Refer to section **Qfan Control** for more information.

AI OC Guide

This button above the menu bar allows you to view the descriptions of AI overclocking and enable it. You may also access this item by pressing the <F11> key on the keyboard.

- Refer to section **AI OC Guide** for more information.
- This function is only enabled when using an unlocked CPU.

Search

This button allows you to search for BIOS items by entering its name, enter the item name to find the related item listing. You may also access this item by pressing the <F9> key on the keyboard.

AURA

This button allows you to turn the RGB LED lighting or functional LED on or off. You may also access this item by pressing the <F4> key on the keyboard.

[All On]: All LEDs (Aura or Functional) will be enabled.

[Stealth Mode]: All LEDs (Aura and Functional) will be disabled.

[Aura Only]: Aura LEDs will be enabled and functional LEDs will be disabled.

[Aura Off]: Aura LEDs will be disabled, however functional LEDs will still be enabled.

ReSize BAR

This button allows you to turn ReSize BAR function on or off.

[On] Enable ReSize BAR support to fully harness GPU memory. CSM (Compatibility Support Module) will be disabled.

[Off] ReSize BAR support will be disabled.

MemTest86

This button above the menu bar allows you to activate MemTest86. MemTest86 can be used to scan and detect if there are problems with your memory. For more information on using MemTest86, please refer to www.asus.com/support.

- Please save all changes made before using MemTest86.
- There will be a few seconds of loading time after clicking the MemTest86 button.

Hot keys

This button at the bottom right contains the navigation keys for the BIOS setup program. Use the navigation keys to select items in the menu and change the settings.

Scroll bar

A scroll bar appears on the right side of a menu screen when there are items that do not fit on the screen. Press the Up/Down arrow keys or <Page Up> / <Page Down> keys to display the other items on the screen.

General help

At the bottom of the menu screen is a brief description of the selected item. Use <F12> key to capture the BIOS screen and save it to the removable storage device.

Configuration fields

These fields show the values for the menu items. If an item is user-configurable, you can change the value of the field opposite the item. You cannot select an item that is not user-configurable.

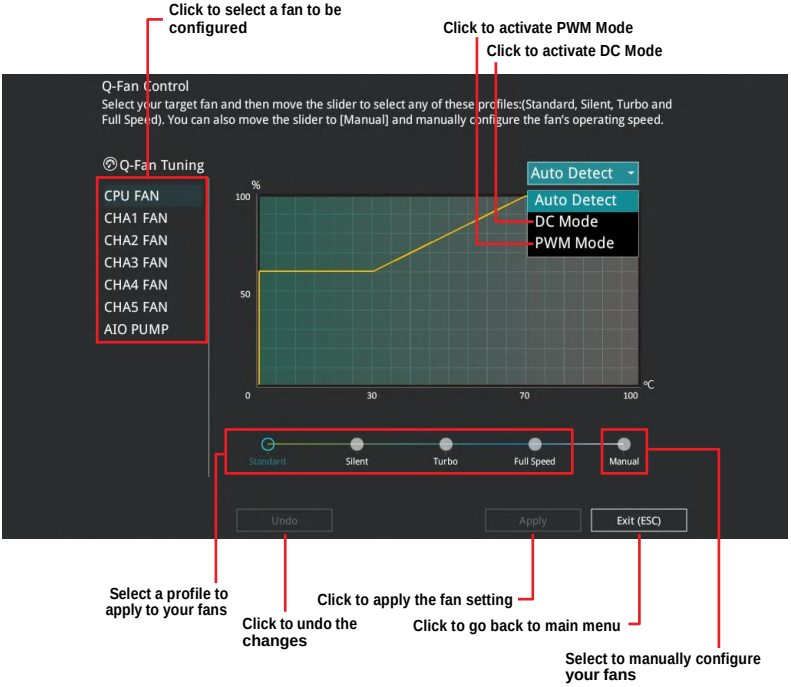
A configurable field is highlighted when selected. To change the value of a field, select it and press <Enter> to display a list of options.

Last Modified button

This button shows the items that you last modified and saved in BIOS Setup.

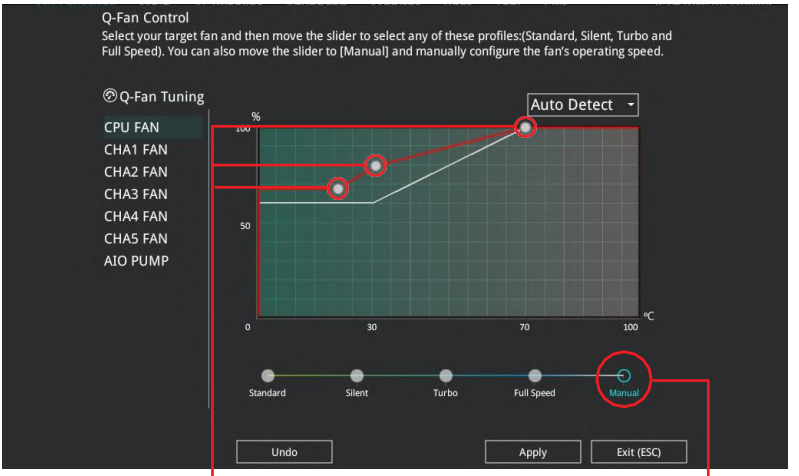
2.3 Qfan Control

The Qfan Control allows you to set a fan profile or manually configure the operating speed of your CPU and chassis fans.



Configuring fans manually

Select **Manual** from the list of profiles to manually configure your fans' operating speed.



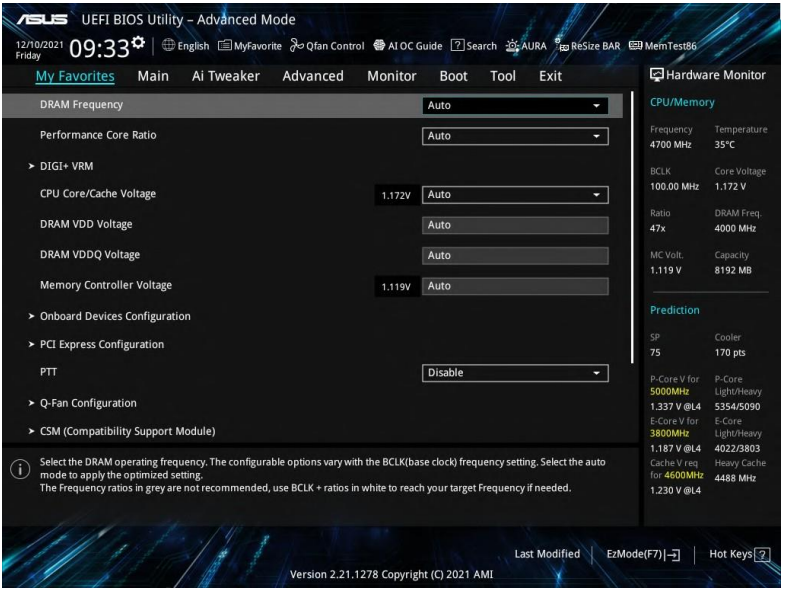
Speed points **Select to manually configure your fans**

To configure your fans:

1. Select the fan that you want to configure and to view its current status.
2. Click and drag the speed points to adjust the fans' operating speed.
3. Click **Apply** to save the changes then click **Exit (ESC)**.

3. My Favorites

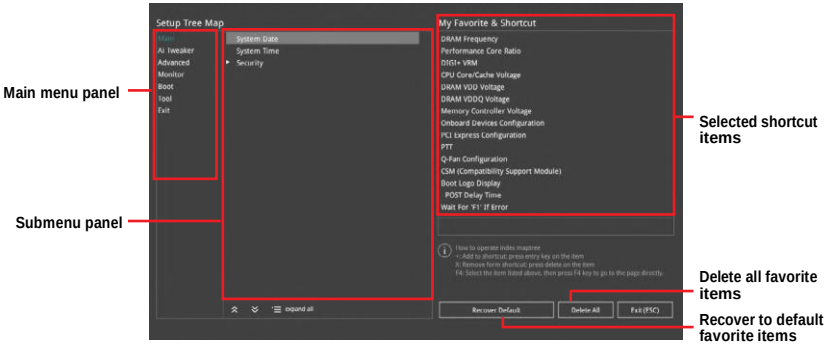
My Favorites is your personal space where you can easily save and access your favorite BIOS items. You can personalize this screen by adding or removing items.



Adding items to My Favorites

To add BIOS items:

1. Press <F3> on your keyboard or click **MyFavorite** from the BIOS screen to open Setup Tree Map screen.
2. On the Setup Tree Map screen, select the BIOS items that you want to save in My Favorites screen.



3. Select an item from main menu panel, then click the submenu that you want to save as favorite from the submenu panel and click + or press <Enter> on your keyboard.

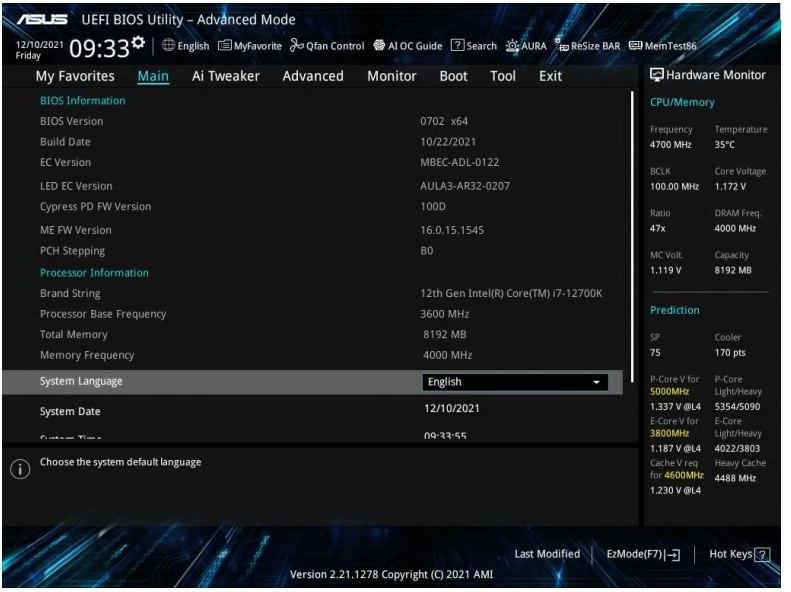
You cannot add the following items to My Favorite items:

- Items with submenu options.
- User-managed items such as language and boot order.
- Configuration items such as Memory SPD Information, system time and date.

4. Click **Exit (ESC)** or press <Esc> key to close Setup Tree Map screen.
5. Go to My Favorites menu to view the saved BIOS items.

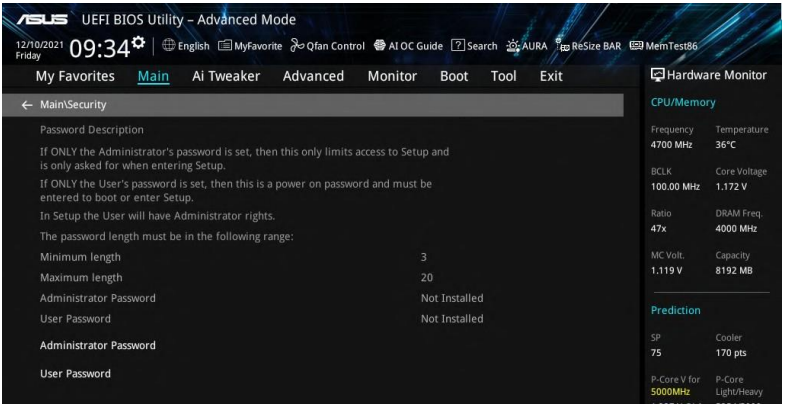
4. Main menu

The Main menu screen appears when you enter the Advanced Mode of the BIOS Setup program. The Main menu provides you an overview of the basic system information, and allows you to set the system date, time, language, and security settings.



Security

The Security menu items allow you to change the system security settings.



- If you have forgotten your BIOS password, erase the CMOS Real Time Clock (RTC) RAM to clear the BIOS password. See the motherboard for information on how to erase the RTC RAM via the Clear CMOS header.
- The Administrator or User Password items on top of the screen show the default **[Not Installed]**. After you set a password, these items show **[Installed]**.

Administrator Password

If you have set an administrator password, we recommend that you enter the administrator password for accessing the system. Otherwise, you might be able to see or change only selected fields in the BIOS setup program.

To set an administrator password:

1. Select the **Administrator Password** item and press <Enter>.
2. From the **Create New Password** box, key in a password, then press <Enter>.
3. Re-type to confirm the password then select **OK**.

To change an administrator password:

1. Select the **Administrator Password** item and press <Enter>.
2. From the **Enter Current Password** box, key in the current password, then press <Enter>.
3. From the **Create New Password** box, key in a new password, then press <Enter>.
4. Re-type to confirm the password then select **OK**.

To clear the administrator password, follow the same steps as in changing an administrator password, but leave other fields blank then select **OK** to continue. After you clear the password, the **Administrator Password** item on top of the screen shows **[Not Installed]**.

User Password

If you have set a user password, you must enter the user password for accessing the system. The User Password item on top of the screen shows the default **[Not Installed]**. After you set a password, this item shows **[Installed]**.

To set a user password:

1. Select the **User Password** item and press <Enter>.
2. From the **Create New Password** box, key in a password, then press <Enter>.
3. Re-type to confirm the password then select **OK**.

To change a user password:

1. Select the **User Password** item and press <Enter>.
2. From the **Enter Current Password** box, key in the current password, then press <Enter>.
3. From the **Create New Password** box, key in a new password, then press <Enter>.
4. Re-type to confirm the password then select **OK**.

To clear the user password, follow the same steps as in changing a user password, but leave other fields blank then select **OK** to continue. After you clear the password, the **User Password** item on top of the screen shows **[Not Installed]**.

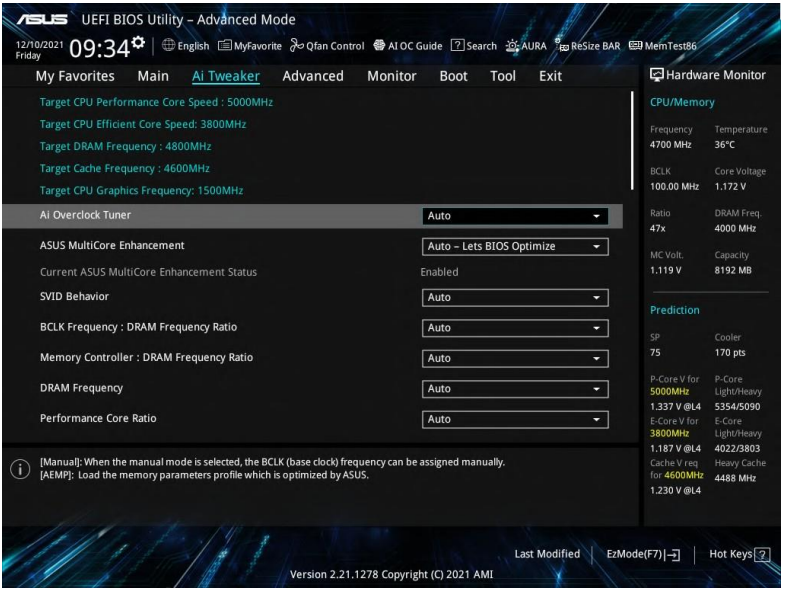
5. Ai Tweaker menu

The Ai Tweaker menu items allow you to configure overclocking-related items.

Be cautious when changing the settings of the Ai Tweaker menu items. Incorrect field values can cause the system to malfunction.

The configuration options for this section vary depending on the CPU and DIMM model you installed on the motherboard.

Scroll down to display other BIOS items.



Ai Overclock Tuner

[Auto]	Loads the optimal settings for the system.
[Manual]	When the manual mode is selected, the BCLK (base clock) frequency can be assigned manually.
[ASUS Enhanced Memory Profile]	Loads the memory parameters profile which is optimized by ASUS.

The following item appears only when **Ai Overclock Tuner** is set to **[Manual]** or **[ASUS Enhanced Memory Profile]**..

BCLK Frequency

Allows you to set the BCLK (base clock) frequency to enhance the system performance. Use the <+> or <-> to adjust the value.

We recommend you to set the value based on the CPU specification, as high BCLK frequencies may damage the CPU permanently.

The following item appears only when **Ai Overclock Tuner** is set to **[ASUS Enhanced Memory Profile]**.

AEMP

Allows you to select your ASUS Enhanced Memory Profile (AEMP). Each profile has its own DRAM frequency, timing and voltage.

ASUS MultiCore Enhancement

[Auto - Lets BIOS Optimize]	This item allows you to use ASUS optimized core ratio Turbo settings at default processor speeds.
[Disabled - Enforce All limits]	This item allows you to use Intel default Turbo core ratio settings.
[Enabled - Remove All limits]	This item allows you to use optimized power and current thresholds for maintaining maximum performance.

SVID Behavior

Allows you to program the CPU's SVID behavior based on the CPU's quality. The default option is based on **[Typical Scenario]**, but the more optimistic the mode selected, the lower the temperature of the CPU. **[Intel's Fail Safe]** is the default behavior of the processor oblivious to the actual Motherboard design. **[Trained]** optimizes SVID behavior to match input parameters such as VRM Loadline and Target Frequencies.
Configuration options: [Auto] [Best-Case Scenario] [Typical Scenario] [Worst-Case Scenario] [Intel's Fail Safe] [Trained]

BCLK Frequency : DRAM Frequency Ratio

[Auto]	The BCLK frequency to DRAM frequency ratio will be set to the optimized setting.
[100:133]	The BCLK frequency to DRAM frequency ratio will be set to 100:133.
[100:100]	The BCLK frequency to DRAM frequency ratio will be set to 100:100.

Memory Controller : DRAM Frequency Ratio

BCLK Frequency: DRAM Frequency Ratio of 100:133 tends to overclock better and 1:2 Memory Controller: DRAM Frequency Ratio only works with even numbered DRAM Ratios and not odd numbered ratios.
Configuration options: [Auto] [1:1] [1:2] [1:4]

DRAM Frequency

Allows you to set the memory operating frequency. The configurable options vary with the BCLK (base clock) frequency setting. Select the auto mode to apply the optimized setting.
Configuration options: [Auto] [DDR5-800MHz] - [DDR5-13333MHz]

Performance Core Ratio

[Auto] The system will adjust all Performance core ratios automatically.

[Sync All Cores] Configure a core ratio limit to synchronize all Performance cores.

[By Core Usage] Configure the ratio limits for active cores depending on how many Performance cores are being utilized.

[AI Optimized] Use AI to optimize the Performance core ratios.

- The **[AI Optimized]** item appears only when you use an unlocked CPU.
- The following item appears only when **Performance Core Ratio** is set to **[Auto] [Sync All Cores]**, or **[By Core Usage]**.

Specific Performance Core

Performance Core0-7 Specific Ratio Limit

Configure a ratio limit for certain Performance Cores. Use the <+> or <-> to adjust the value.
Configuration options: [Auto] [8] - [85]

Performance Core0-7 Specific Adaptive Voltage

Allows configuration of the voltage supply to the CPU cores. Setting to **[Auto]** will scale voltage according to the applied CPU core ratio. Do not confuse this setting with VCCIN (CPU Input voltage).
Configuration options: [Auto] [Adaptive Mode]

The following item appears only when **Performance Core0-7 Specific Adaptive Voltage** is set to **[Adaptive Mode]**.

Offset Mode Sign

[+] Offset the CPU core voltage by a positive value.

[-] Offset the CPU core voltage by a negative value.

Performance Core0-7 Offset

Configure the CPU core voltage offset value. Use the <+> or <-> to adjust the value. The values range from 0.001 V to 0.999 V with an interval of 0.001 V.
Configuration options: [Auto] [0.00100] - [0.99900]

You need to save the changes and reset the system for the changes to take effect.

Additional Turbo Mode CPU Core0-7 Voltage

Configure the amount of voltage fed to the CPU cores when running in the turbo mode. Increase the voltage when configuring a High CPU core frequency. This voltage will be affected by the offset value. Use the <+> or <-> to adjust the value. The values range from 0.250 V to 1.920 V with an interval of 0.001 V.
Configuration options: [Auto] [0.25000] - [1.92000]

The following item appears only when **Performance Core Ratio** is set to **[Sync All Cores]**.

ALL-Core Ratio Limit

Enter **[Auto]** to apply the CPU default Turbo Ratio setting or manually assign a Core ratio limit to synchronize all cores. Use the <+> or <-> to adjust the value.
Configuration options: [Auto] [8] - [85]

The following items appear only when **Performance Core Ratio** is set to **[By Core Usage]**.

1-Core Ratio Limit / 2-Core Ratio Limit / 3-Core Ratio Limit / 4-Core Ratio Limit / 5-Core Ratio Limit / 6-Core Ratio Limit / 7-Core Ratio Limit / 8-Core Ratio Limit

The N-core ratio limit must be higher than or equal to the (N+1)-core ratio limit. (N stands for the number of CPU cores) The core ratio limit cannot be set to **[Auto]** when the core number is lower than N. The biggest core's ratio limit must be lower than or equal to the second biggest core's ratio limit. Use the <+> or <-> to adjust the value.
Configuration options: [Auto] [36] - [85]

The following item appears only when **Performance Core Ratio** is set to **[AI Optimized]**.

Optimized AVX Frequency

Select **[Normal Use]** for typical use cases, or select **[Heavy AVX]** for extreme loads such as Prime 95 AVX.
Configuration options: [Normal Use] [Heavy AVX]

Efficient Core Ratio

[Auto] The system will adjust all Efficient core ratios automatically.
[Sync All Cores] Configure a core ratio limit to synchronize all Efficient cores.
[By Core Usage] Configure the ratio limits for active cores depending on how many Efficient cores are being utilized.
[AI Optimized] Use AI to optimize the Efficient core ratios.

The following items appear only when **Efficient Core Ratio** is set to **[Auto]**, **[Sync All Cores]** or **[By Core Usage]**.

Specific Efficient Core

Efficient Core Group0 Specific Ratio Limit

Configure a ratio limit for certain Efficient Cores. Use the <+> or <-> to adjust the value.
Configuration options: [Auto] [8] - [120]

Efficient Core Group0 Specific Adaptive Voltage

Allows configuration of the voltage supply to the CPU cores. Setting to **[Auto]** will scale voltage according to the applied CPU core ratio. Do not confuse this setting with VCCIN (CPU Input voltage).
Configuration options: [Auto] [Adaptive Mode]

The following item appears only when **Efficient Core Group0 Specific Adaptive Voltage** is set to **[Adaptive Mode]**.

Offset Mode Sign

[+] Offset the CPU core voltage by a positive value.

[-] Offset the CPU core voltage by a negative value.

Efficient Core Group0 Offset

Configure the CPU core voltage offset value. Use the <+> or <-> to adjust the value. The values range from 0.001 V to 0.999 V with an interval of 0.001 V.
Configuration options: [Auto] [0.00100] - [0.99900]

You need to save the changes and reset the system for the changes to take effect.

Additional Turbo Mode Efficient Group0 Voltage

Configure the amount of voltage fed to the CPU cores when running in the turbo mode. Increase the voltage when configuring a High CPU core frequency. This voltage will be affected by the offset value. Use the <+> or <-> to adjust the value. The values range from 0.250 V to 1.920 V with an interval of 0.001 V.
Configuration options: [Auto] [0.25000] - [1.92000]

The following item appears only when **Efficient Core Ratio** is set to **[Sync All Cores]**.

ALL-Core Ratio Limit

Ratio Limit for Efficient Cores when N Efficient cores are loaded. Use the <+> or <-> to adjust the value.
Configuration options: [Auto] [8] - [85]

The following items appear only when **CPU Core Ratio** is set to **[By Core Usage]**.

Efficient 1-Core Ratio Limit / Efficient 2-Core Ratio Limit / Efficient 3-Core Ratio Limit / Efficient 4-Core Ratio Limit

Ratio Limit for Efficient cores when N Efficient cores are loaded. Use the <+> or <-> to adjust the value.
Configuration options: [Auto] [27] - [85]

CPU SVID Support

Disable this item to stop the CPU from communicating with the external voltage regulator. We recommend setting this item to **[Disabled]** for overclocking.
Configuration options: [Auto] [Disabled] [Enabled]

AVX Related Controls

AVX2

Allows you to enable or disable the AVX 2 Instructions.
Configuration options: [Auto] [Disabled] [Enabled]

AVX512

Allows you to enable or disable the AVX 512 Instructions.
Configuration options: [Auto] [Disabled] [Enabled]

AVX512 is only available when E-Cores are disabled.

AVX2 Ratio Offset to per-core Ratio Limit

Configuration options: [Auto] [User Specify]

The following item appears only when **AVX2 Ratio Offset to per-core Ratio Limit** is set to **[User Specify]**.

AVX2 Ratio Offset

Specifies number of bins to decrease AVX ratio vs. Per-Core Ratio. AVX is a more stressful workload, it is helpful to lower the AVX ratio to ensure maximum possible ratio for SSE workloads. Uses Mailbox MSR 0x150, cmd 0x1B. Range 0-31. 0=No offset. Use the <+> or <-> to adjust the value.
Configuration options: [0] - [31]

AVX2 Voltage Guardband Scale Factor

Configuration options: [Auto] [User Specify]

The following item appears only when **AVX2 Voltage Guardband Scale Factor** is set to **[User Specify]**.

AVX2 Voltage Guardband Scale Factor

Controls the voltage guardband applied to AVX workloads. Range in 1/100 units, where 125=1.25 scale factor. The resulting final voltage guardband is default guardband * Scale Factor. Therefore lower than 100 values reduce guardband while higher than 100 values increase guardband. Use the <+> or <-> to adjust the value.
Configuration options: [0] - [199]

DRAM Timing Control

The sub-items in this menu allow you to set the DRAM timing control features. Use the <+> and <-> keys to adjust the value. To restore the default setting, type **[Auto]** using the keyboard and press the <Enter> key. You can also select various Memory Presets to load settings suitably tuned for some memory modules.

Changing the values in this menu may cause the system to become unstable! If this happens, revert to the default settings.

Primary Timings

DRAM CAS# Latency

Configuration options: [Auto] [1] - [127]

DRAM RAS# to CAS# Delay

Configuration options: [Auto] [0] - [255]

DRAM RAS# PRE Time

Configuration options: [Auto] [0] - [255]

DRAM RAS# ACT Time

Configuration options: [Auto] [1] - [511]

DRAM Command Rate

Configuration options: [Auto] [1N] [2N] [3N] [N:1]

The following item appears only when **DRAM Command Rate** is set to **[N:1]**.

N to 1 ratio

Number of bubbles between each valid command cycle.
Configurations: [1] - [7]

Secondary Timings

DRAM RAS# to RAS# Delay L

Configuration options: [Auto] [1] - [63]

DRAM RAS# to RAS# Delay S

Configuration options: [Auto] [1] - [127]

DRAM REF Cycle Time

Configuration options: [Auto] [1] - [65535]

DRAM REF Cycle Time 2

Configuration options: [Auto] [1] - [65535]

DRAM REF Cycle Time Same Bank

Configuration options: [Auto] [1] - [1023]

DRAM Refresh Interval

Configuration options: [Auto] [1] - [262143]

DRAM WRITE Recovery Time

Configuration options: [Auto] [1] - [234]

DRAM READ to PRE Time

Configuration options: [Auto] [1] - [255]

DRAM FOUR ACT WIN Time

Configuration options: [Auto] [1] - [511]

DRAM WRITE to READ Delay

Configuration options: [Auto] [1] - [15]

DRAM WRITE to READ Delay L

Configuration options: [Auto] [1] - [15]

DRAM WRITE to READ Delay S

Configuration options: [Auto] [1] - [15]

DRAM CKE Minimum Pulse Width

Configuration options: [Auto] [0] - [127]

DRAM Write Latency

Configuration options: [Auto] [1] - [255]

Skew Control

DDRCRCOMPCTL0/1/2

Ctl0 dqvrefup
Configuration options: [Auto] [0] - [255]

Ctl0 dqvrefdn
Configuration options: [Auto] [0] - [255]

Ctl0 dqodtvrefup
Configuration options: [Auto] [0] - [255]

Ctl0 dqodtvrefdn
Configuration options: [Auto] [0] - [255]

Ctl1 cmdvrefup
Configuration options: [Auto] [0] - [255]

Ctl1 ctlvrefup
Configuration options: [Auto] [0] - [255]

Ctl1 clkvrefup
Configuration options: [Auto] [0] - [255]

Ctl1 ckecsvrefup
Configuration options: [Auto] [0] - [255]

Ctl2 cmdvrefup
Configuration options: [Auto] [0] - [255]

Ctl2 ctlvrefdn
Configuration options: [Auto] [0] - [255]

Ctl2 clkvrefdn
Configuration options: [Auto] [0] - [255]

Tc Odt Control

ODT_READ_DURATION
Configuration options: [Auto] [0] - [7]

ODT_READ_DELAY
Configuration options: [Auto] [0] - [7]

ODT_WRITE_DURATION
Configuration options: [Auto] [0] - [7]

ODT_WRITE_DELAY
Configuration options: [Auto] [0] - [7]

MC0 Dimm0 / MC0 Dimm1 / MC1 Dimm0 / MC1 Dimm1

DQ RTT WR

Configuration options: [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]

DQ RTT NOM RD

Configuration options: [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]

DQ RTT NOM WR

Configuration options: [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]

DQ RTT PARK

Configuration options: [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]

DQ RTT PARK DQS

Configuration options: [0 DRAM Clock] [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock]

GroupA CA ODT

Configuration options: [0 DRAM Clock] [40 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock] [480 DRAM Clock]

GroupA CS ODT

Configuration options: [0 DRAM Clock] [40 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock] [480 DRAM Clock]

GroupA CK ODT

Configuration options: [0 DRAM Clock] [40 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock] [480 DRAM Clock]

GroupB CA ODT

Configuration options: [0 DRAM Clock] [40 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock] [480 DRAM Clock]

GroupB CS ODT

Configuration options: [0 DRAM Clock] [40 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock] [480 DRAM Clock]

GroupB CK ODT

Configuration options: [0 DRAM Clock] [40 DRAM Clock] [60 DRAM Clock] [80 DRAM Clock] [120 DRAM Clock] [240 DRAM Clock] [480 DRAM Clock]

Pull-up Output Driver Impedance

Configuration options: [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock]

Pull-Down Output Driver Impedance

Configuration options: [34 DRAM Clock] [40 DRAM Clock] [48 DRAM Clock]

RTL IOL Control

Round Trip Latency Init Value MC0-1 CHA-B

Configuration options: [Auto] [0] - [255]

Round Trip Latency Max Value MC0-1 CHA-B

Configuration options: [Auto] [0] - [255]

Round Trip Latency Offset Value Mode Sign MC0-1 CHA-B

Configuration options: [-] [+]

Round Trip Latency Offset Value MC0-1 CHA-B

Configuration options: [Auto] [0] - [255]

Round Trip Latency MC0-1 CHA-B R0-7

Configuration options: [Auto] [0] - [255]

Memory Training Algorithms

The items in this menu allows you to enable or disable different Memory Training Algorithms.

Early Command Training

Configuration options: [Auto] [Enabled] [Disabled]

SenseAmp Offset Training

Configuration options: [Auto] [Enabled] [Disabled]

Early ReadMPR Timing Centering 2D

Configuration options: [Auto] [Enabled] [Disabled]

Read MPR Training

Configuration options: [Auto] [Enabled] [Disabled]

Receive Enable Training

Configuration options: [Auto] [Enabled] [Disabled]

Jedec Write Leveling

Configuration options: [Auto] [Enabled] [Disabled]

Early Write Timing Centering 2D

Configuration options: [Auto] [Disabled] [Enabled]

Early Read Timing Centering 2D

Configuration options: [Auto] [Disabled] [Enabled]

Write Timing Centering 1D

Configuration options: [Disabled] [Enabled]

Write Voltage Centering 1D

Configuration options: [Auto] [Disabled] [Enabled]

Read Timing Centering 1D

Configuration options: [Auto] [Disabled] [Enabled]

Read Timing Centering with JR

Configuration options: [Auto] [Disabled] [Enabled]

Dimm ODT Training*

Configuration options: [Auto] [Disabled] [Enabled]

Max RTT_WR

Allows you to cap the maximum RTT_WR in power training.
Configuration options: [ODT OFF] [120 Ohms]

DIMM RON Training*

Configuration options: [Auto] [Disabled] [Enabled]

Write Drive Strength/Equalization 2D*

Configuration options: [Auto] [Disabled] [Enabled]

Write Slew Rate Training*

Configuration options: [Auto] [Disabled] [Enabled]

Read ODT Training*

Configuration options: [Auto] [Disabled] [Enabled]

Comp Optimization Traning

Configuration options: [Auto] [Disabled] [Enabled]

Read Equalization Training*

Configuration options: [Auto] [Disabled] [Enabled]

Read Amplifier Training*

Configuration options: [Auto] [Disabled] [Enabled]

Write Timing Centering 2D

Configuration options: [Auto] [Disabled] [Enabled]

Read Timing Centering 2D

Configuration options: [Auto] [Disabled] [Enabled]

Command Voltage Centering

Configuration options: [Auto] [Disabled] [Enabled]

Early Command Voltage Centering

Configuration options: [Auto] [Disabled] [Enabled]

Write Voltage Centering 2D

Configuration options: [Auto] [Disabled] [Enabled]

Read Voltage Centering 2D

Configuration options: [Auto] [Disabled] [Enabled]

Late Command Training

Configuration options: [Disabled] [Enabled] [Auto]

Round Trip Latency

Configuration options: [Auto] [Disabled] [Enabled]

Turn Around Timing Training

Configuration options: [Auto] [Disabled] [Enabled]

CMD CTL CLK Slew Rate

Configuration options: [Auto] [Disabled] [Enabled]

CMD/CTL DS & E 2D

Configuration options: [Auto] [Disabled] [Enabled]

Read Voltage Centering 1D

Configuration options: [Auto] [Disabled] [Enabled]

TxDqTCO Comp Training*

Configuration options: [Auto] [Disabled] [Enabled]

ClkTCO Comp Training*

Configuration options: [Auto] [Disabled] [Enabled]

TxDqsTCO Comp Training*

Configuration options: [Auto] [Disabled] [Enabled]

VccDLL Bypass Training*

Configuration options: [Auto] [Disabled] [Enabled]

CMD/CTL Drive Strength Up/Dn 2D

Configuration options: [Auto] [Disabled] [Enabled]

DIMM CA ODT Training

Configuration options: [Auto] [Disabled] [Enabled]

PanicVttDnLp Training*

Configuration options: [Auto] [Disabled] [Enabled]

Read Vref Decap Traning*

Configuration options: [Auto] [Disabled] [Enabled]

Vddq Training

Configuration options: [Auto] [Disabled] [Enabled]

Duty Cycle Correction Training

Configuration options: [Auto] [Disabled] [Enabled]

Rank Margin Tool Per Bit

Configuration options: [Auto] [Disabled] [Enabled]

DIMM DFE Training

Configuration options: [Auto] [Disabled] [Enabled]

Tx Dqs Dcc Training

Configuration options: [Auto] [Disabled] [Enabled]

Rank Margin Tool

Configuration options: [Auto] [Disabled] [Enabled]

Memory Test

Configuration options: [Auto] [Disabled] [Enabled]

DIMM SPD Alias Test

Configuration options: [Auto] [Disabled] [Enabled]

Receive Enable Centering 1D

Configuration options: [Auto] [Disabled] [Enabled]

Retrain Margin Check

Configuration options: [Auto] [Disabled] [Enabled]

Write Drive Strength Up/Dn independently

Configuration options: [Auto] [Disabled] [Enabled]

Margin Check Limit

Checks Margin to Limit to see if next boot memory needs to be retrained.
Configuration options: [Disabled] [L1] [L2] [Both]

The following item appears only when **Margin Check Limit** is set to **[L2]** or **[Both]**.

Margin Limit Check L2

L2 check threshold is scale of L1 check.
Configuration options: [1] - [300]

Third Timings

tRDRD_sg_Training

Configuration options: [Auto] [0] - [127]

tRDRD_sg_Runtime

Configuration options: [Auto] [0] - [127]

tRDRD_dg_Training

Configuration options: [Auto] [0] - [127]

tRDRD_dg_Runtime

Configuration options: [Auto] [0] - [127]

tRDWR_sg

Configuration options: [Auto] [0] - [255]

tRDWR_dg

Configuration options: [Auto] [0] - [255]

tWRWR_sg

Configuration options: [Auto] [0] - [127]

tWRWR_dg

Configuration options: [Auto] [0] - [127]

tWRRD_sg

Configuration options: [Auto] [0] - [511]

tWRRD_dg

Configuration options: [Auto] [0] - [511]

tRDRD_dr

Configuration options: [Auto] [0] - [255]

tRDRD_dd

Configuration options: [Auto] [0] - [255]

tRDWR_dr

Configuration options: [Auto] [0] - [255]

tRDWR_dd

Configuration options: [Auto] [0] - [255]

tWRWR_dr

Configuration options: [Auto] [0] - [127]

tWRWR_dd

Configuration options: [Auto] [0] - [255]

tWRRD_dr

Configuration options: [Auto] [0] - [127]

tWRRD_dd

Configuration options: [Auto] [0] - [127]

tWRPRE

Configuration options: [Auto] [0] - [1023]

tPRPDEN

Configuration options: [Auto] [0] - [31]

tRDPDEN

Configuration options: [Auto] [0] - [255]

tWRPDEN

Configuration options: [Auto] [0] - [1023]

tCPDED

Configuration options: [Auto] [0] - [31]

tREFIX9

Configuration options: [Auto] [0] - [255]

Ref Interval

Configuration options: [Auto] [0] - [8191]

tXPDLL

Configuration options: [Auto] [0] - [127]

tXP

Configuration options: [Auto] [0] - [127]

tPPD

Configuration options: [Auto] [0] - [15]

tCCD_L_tDLLK

Configuration options: [Auto] [0] - [15]

Misc.

MRC Fast Boot

Allows you to enable or disable the MRC fast boot.
Configuration options: [Disabled] [Enabled]

MCH Full Check

Enable this item to enhance the system stability. Setting this item to **[Disabled]** may enhance the DRAM overclocking capability.
Configuration options: [Auto] [Enabled] [Disabled]

Mem Over Clock Fail Count

Configuration options: [Auto] [1] - [255]

Training Profile

Allows you to select the DIMM training profile.
Configuration options: [Auto] [Standard Profile] [ASUS User Profile]

RxDfe

Allows you to set the DFE on SOC Rx.
Configuration options: [Auto] [Enabled] [Disabled]

Mrc Training Loop Count

Allows you to set the exponential number of loops to run the test.
Configuration options: [Auto] [0] - [32]

DRAM CLK Period

Allows you to set the DRAM clock period.
Configuration options: [Auto] [0] - [161]

Controller 0, Channel 0 Control

Allows you to enable or disable Controller 0, Channel 0.
Configuration options: [Enabled] [Disabled]

Controller 0, Channel 1 Control

Allows you to enable or disable Controller 0, Channel 1.
Configuration options: [Enabled] [Disabled]

Controller 1, Channel 0 Control

Allows you to enable or disable Controller 1, Channel 0.
Configuration options: [Enabled] [Disabled]

Controller 1, Channel 1 Control

Allows you to enable or disable Controller 1, Channel 1.
Configuration options: [Enabled] [Disabled]

MC_Vref0-2

Configuration options: [Auto] [0] - [65533]

Configure Memory Dynamic Frequency Switching

The following item appears only when **Realtime Memory Frequency** is set to **[Disabled]**.

Dynamic Memory Boost

Allows you to enable or disable Dynamic Memory Boost Feature. Allows automatic switching between default SPD Profile frequency and selected XMP profile frequency. Only valid if an XMP Profile is selected.
Configuration options: [Disabled] [Enabled]

The following item appears only when **Dynamic Memory Boost** is set to **[Disabled]**.

Realtime Memory Frequency

Allows you to enable or disable Memory Frequency feature. Allows manual switching between in runtime between default SPD Profile frequency and selected XMP profile frequency. Only valid if an XMP Profile is selected.
Configuration options: [Disabled] [Enabled]

SA GV

System Agent Geyserville. Can disable, fix to a specific point, or enable frequency switching. If enabled, we recommend you to leave options at parked values for best compatibility. Enabling this feature requires a longer boot time.
Configuration options: [Disabled] [Enabled] [Fixed to 1st Point] [Fixed to 2nd Point] [Fixed to 3rd Point] [Fixed to 4th Point]

The following items appear only when **SA GV** is set to **[Enabled]**, **[Fixed to 1st Point]**, **[Fixed to 2nd Point]**, **[Fixed to 3rd Point]**, or **[Fixed to 4th Point]**.

First Point Frequency

Allows you to specify the frequency for the given point. 0-MRC auto, else a specific frequency as an integer: 2000Mhz.
Configuration options: [0] - [65535]

First Point Gear

Allows you to set the gear ratio for this SAGV point. 0-Auto, 1-G1, 2-G2, 4-G4.
Configuration options: [0] - [4]

Second Point Frequency

Allows you to specify the frequency for the given point. 0-MRC auto, else a specific frequency as an integer: 2000Mhz.
Configuration options: [0] - [65535]

Second Point Gear

Allows you to set the gear ratio for this SAGV point. 0-Auto, 1-G1, 2-G2, 4-G4.
Configuration options: [0] - [4]

Third Point Frequency

Allows you to specify the frequency for the given point. 0-MRC auto, else a specific frequency as an integer: 2000Mhz.
Configuration options: [0] - [65535]

Third Point Gear

Allows you to set the gear ratio for this SAGV point. 0-Auto, 1-G1, 2-G2, 4-G4.
Configuration options: [0] - [4]

The Fourth Point Gear will always be the settings you set in the main menu, so configure the Fourth Point Gear there.

Digi+ VRM

VRM Initialization Check

When any error occurs during VRM initialization, the system will hang at POST code 76/77 if this function is enabled.
Configuration options: [Disabled] [Enabled]

CPU Input Voltage Load-line Calibration

Configuration options [Auto] [Level 1] [Level 2] [Level 3]

CPU Load-line Calibration

The load-line is defined by the Intel VRM specification and affects the level of voltage supplied to the processor. Higher load-line calibration settings result in reduced VDroop at the expense of voltage overshoot and will increase CPU temperatures due to higher voltage under load. Select from level 1 to 7 to adjust the load-line slope. Level 1 = greater VDroop, Level 7 = minimum VDroop.
Configuration options [Auto] [Level 1] [Level 2] [Level 3] [Level 4:Recommended for OC] [Level 5] [Level 6] [Level 7]

The actual performance boost may vary depending on your CPU specification.

DO NOT remove the thermal module. The thermal conditions should be monitored.

Synch ACDC Loadline with VRM Loadline

Enable this item to allow the VRM Loadline to be adjusted automatically to match the AC/DC Loadline.
Configuration options: [Disabled] [Enabled

CPU Current Capability

Allows you to set the shut-off current limit for external voltage regulator. A higher setting will allow the voltage regulator to supply more current while a lower setting will cause the voltage regulator to shut off the system when the supplied current is higher than the set value.
Configuration options: [Auto] [100%] - [120%]

Configure higher values when overclocking or under a high loading for extra power support.

CPU VRM Switching Frequency

This item affects the VRM transient response speed and the component thermal production. Select [**Manual**] to configure a higher frequency for a quicker transient response speed. Setting a higher switching frequency will result in better transient response at the expense of higher VRM temperatures. Active cooling of the VRM heatsink is recommended when running high CPU voltage and high load-line calibration values.
Configuration options: [Auto] [Manual]

DO NOT remove the thermal module. The thermal conditions should be monitored.

The following item appears only when **CPU VRM Switching Frequency** is set to **[Manual]**.

Fixed CPU VRM Switching Frequency(KHz)

Allows you to set a higher frequency for a quicker transient response speed. The values range from 250 KHz to 500 KHz with an interval of 50 KHz.

The following item appears only when **CPU VRM Switching Frequency** is set to **[Auto]**.

VRM Spread Spectrum

Allows you to reduce the magnitude of peak noise from the VRM. Enable this item to reduce peak noise. Disable this settings when overclocking.
Configuration options: [Auto] [Disabled] [Enabled]

CPU Power Duty Control

CPU power duty control adjusts the duty cycle of each VRM phase based upon current and/or temperature.

[T. Probe] Sets the buck controller to balance VRM FET temperatures
[Extreme] Select to set the VRM current balance mode.

DO NOT remove the thermal module when setting this item to **[Extreme]**. The thermal conditions should be monitored.

CPU Power Phase Control

Allows you to set the power phase control of the CPU.

[Auto] Automatically selects the power phase control.
[Standard] The number of active phases is controlled by the CPU.
[Extreme] Sets full phase mode.

DO NOT remove the thermal module when setting this item to **[Extreme]**. The thermal conditions should be monitored.

CPU Power Thermal Control

Allows you to set the VRM thermal cut-off trip point. 125 Celsius is default and recommended for all overclocking and normal use. Can be set to a lower value if a lower thermal cut-off point is preferred. Use the <+> or <-> to adjust the value.

DO NOT remove the VRM heatsink.

The following items appear only when using the onboard graphics.

CPU Graphics Load-line Calibration

The load-line is defined by the Intel VRM specification and affects the CPU Graphics power voltage. The CPU Graphics working voltage will decrease proportionally depending on the CPU Graphics loading. Higher levels of the load-line calibration can get a higher voltage and a better overclocking performance but increase the CPU Graphics and VRM thermal production. Select from level 1 to 8 to adjust the CPU Graphics power voltage from 100% to 0%.
Configuration options [Auto] [Level 1] [Level 2] [Level 3] [Level 4:Recommended for OC] [Level 5] [Level 6] [Level 7]

Boosted performance may vary depending on the CPU Graphics specification. DO NOT remove the thermal module.

CPU Graphics VRM Switching Frequency

The switching frequency will affect the CPU Graphics transient response spreed and the component thermal production. Select manual mode to configure a higher frequency to get a quicker transient response speed.
Configuration options: [Auto] [Manual]

DO NOT remove the thermal module when setting this item to **[Manual]**. The thermal conditions should be monitored.

The following item appears only when **CPU Graphics VRM Switching Frequency** is set to **[Manual]**.

Fixed CPU Graphics Switching Frequency(KHz)

The switching frequency will affect the CPU Graphics transient response spreed and the component thermal production. Use the <+> or <-> to adjust the value. The values range from 250 KHz to 500 KHz with an interval of 50 KHz.

Boot Voltages

CPU Core/Cache Boot Voltage

Allows you to set the CPU voltage at initial boot up.
Configuration options: [Auto] [0.60000] - [1.70000]

CPU Input Boot Voltage

Allows you to set the CPU Input Voltage at initial boot up.
Configuration options: [Auto] [1.50000] - [2.10000]

PLL Termination Boot Voltage

Allows you to set the PLL Termination voltage at initial boot up.
Configuration options: [Auto] [0.80000] - [1.80000]

CPU Standby Boot Voltage

Allows you to set the CPU Standby voltage at initial bootup.
Configuration options: [Auto] [0.80000] - [1.80000]

Memory Controller Boot Voltage

Allows you to set the Memory Controller voltage at initial bootup.
Configuration options: [Auto] [1.00000] - [2.00000]

Auto Voltage Caps

CPU Core Auto Voltage Cap

Setting this to a specific value will set a ceiling for CPU Core Auto Voltage. When not in manual mode, it's effectiveness is subject to other factors such as AC/DC Loadline values and CPU's native VID.
Configuration options: [Auto] [0.60000] - [1.70000]

CPU Input Auto Voltage Cap

Setting this to a specific value will set a ceiling for CPU Input Auto Voltage.
Configuration options: [Auto] [1.50000] - [2.10000]

Memory Controller Auto Voltage Cap

Setting this to a specific value will set a ceiling for Memory Controller Auto Voltage.
Configuration options: [Auto] [1.00000] - [2.00000]

Internal CPU Power Management

The items in this submenu allow you to set the CPU ratio and features.

Maximum CPU Core Temperature

Set the maximum allowable temperature for CPU cores. The CPU will throttle or shutdown when it reaches this temperature to prevent damaging the cores.
Configuration options: [Auto] [62] - [115]

Do not set this value too high, as high temperatures may damage the CPU permanently.

TCC Activation Offset

Offset from factory set TCC activation temperature at which the Thermal Control Circuit must be activated. Tcc will be activated at: TCC Activation Temp - Tcc Activation Offset.
Configuration options: [Auto] [1] - [63]

Package Temperature Threshold

When regulation is set to enable, frequency will adjust to stay below this package temperature threshold.
Configuration options: [Auto] [30] - [115]

Regulate Frequency by above Threshold

When regulation is set to enable, frequency will adjust to stay below the above threshold. SVID must be enabled for this to work.
Configuration options: [Auto] [Enabled] [Disabled]

Turbo Mode Parameters

IVR Transmitter VDDQ ICCMAX

Configuration options: [Auto] [0] - [15]

Unlimited ICCMAX

Allows you to enable or disable Unlimited ICCMAX. Support VR Current Limit (ICCMAX) value set above 511.75A
Configuration options: [Auto] [Disabled] [Enabled]

CPU Core/Cache Current Limit Max.

Allows you to configure a current limit for frequency or power throttling when overclocking. Can be set to maximum value (511.75) to prevent throttling when overclocking.
Configuration options: [Auto] [0.00] - [511.75]

CPU Graphics Current Limit

Allows you to configure a high current limit to prevent frequency or power throttling when overclocking.
Configuration options: [Auto] [0.00] - [511.75]

Long Duration Package Power Limit

An Intel parameter known as [power limit 1] and specified in Watts. The defualt value is defined by TDP of the processor. Increasing the value will allow the Turbo ratio to be maintained for a longer duration under higher current loads.
Configuration options: [Auto] [1] - [4095]

Package Power Time Window

An Intel parameter of [power limit 1] and specified in seconds. The applied value indicates how long the Turbo ratio can be active when TDP is exceeded.
Configuration options: [Auto] [1] [2] [3] [4] [5] [6] [7] [8] [10] [12] [14] [16] [20] [24] [28] [32] [40] [48] [56] [64] [80] [96] [112] [128] [160] [192] [224] [256] [320] [384] [448]

Short Duration Package Power Limit

An Intel parameter known as [power limit 2] and specified in Watts. It is the second Intel power limit which provides protection when package power exceeds power limit 1. The default setting is 1.25 times power limit 1. According to Intel, the platform must support this value for up to 10msec when power consumption exceeds power limit 2. ASUS motherboards are engineered to support this duration for a longer time as required to facilitate overclocking.
Configuration options: [Auto] [1] - [4095]

IA AC Load Line

Allows you to set the AC loadline defined in mOhms. Use the <+> and <-> keys to adjust the value.
Configuration options: [Auto] [0.01] - [62.49]

IA DC Load Line

Allows you to set the DC loadline defined in mOhms. Use the <+> and <-> keys to adjust the value.
Configuration options: [Auto] [0.01] - [62.49]

IA CEP Enable

Allows you to enable or disable IA CEP (Current Excursion Protection) Support. Uses pCode Mailbox Command 0x37, Sub-command 0x1. Set Databit2 to 1.
Configuration options: [Auto] [Disabled] [Enabled]

GT CEP Enable

Allows you to enable or disable GT CEP (Current Excursion Protection) Support. Uses pCode Mailbox Command 0x37, Sub-command 0x1. Set Databit3 to 1.
Configuration options: [Auto] [Disabled] [Enabled]

SA CEP Enable

Allows you to enable or disable SA CEP (Current Excursion Protection) Support. Uses pCode Mailbox Command 0x37, Sub-command 0x1. Set Databit3 to 1.
Configuration options: [Auto] [Disabled] [Enabled]

IA SoC Iccmax Reactive Protector

Configuration options: [Auto] [Disabled] [Enabled]

Inverse Temperature Dependency Throttle

Configuration options: [Auto] [Disabled] [Enabled]

IA VR Voltage Limit

Voltage Limit (VMAX). This value represents the Maximum instantaneous voltage allowed at any given time. Range is 0 - 7999mV. Uses BIOS VR mailbox command 0x8.
Configuration options: [Auto] [0] - [7999]

Thermal Velocity Boost

TVB Voltage Optimizations

This service controls thermal based voltage optimizations for processors that implement the Intel Thermal Velocity Boost (TVB) feature. This item is set to **[Enabled]** by default. Uses Overclocking Mailbox command 0x18/0x19.
Configuration options: [Auto] [Disabled] [Enabled]

V-Max Stress

If set to **[Enabled]**, Frequency may be clipped if the max voltage on the silicon is too high. Frequency will not be clipped if disabled.
Configuration options: [Auto] [Disabled] [Enabled]

Overclocking TVB

Enable this to be able to draw temperature/frequency dependencies.
Configuration options: [Auto] [Disabled] [Enabled] [+1Boost Profile] [+2Boost Profile]

+1Boost Profile(K CPU):
This setting will enable additional boost of one bin with the help of Auto Optimized Temperature Control.
+2Boost Profile(K CPU):
This setting will enable additional boost of two bins with the help of Auto Optimized Temperature Control.

The following items appear only when **Overclocking TVB** is set to **[Enabled]**.

1-Core Active / 2-Core Active / 3-Core Active / 4-Core Active / 5-Core Active / 6-Core Active

Configuration options: [Auto] [Enabled]

The following items appear only when **1-Core Active**, **2-Core Active**, **3-Core Active**, **4-Core Active**, **5-Core Active**, or **6-Core Active** is set to **[Enabled]**.

Temperature A

Package passing this temperature threshold will engage the negative ratio offset specified in **Negative Ratio Offset A**. Unit in Degree Celsius.
Configuration options: [Auto] [1] - [115]

Negative Ratio Offset A

This will be the potential negative offset to respective ratio when package temperature rises above threshold specified in **Temperature A**.
Configuration options: [Auto] [User Specify]

The following item appears only when **Negative Ratio Offset A** is set to **[User Specify]**.

Ratio Offset

Use the <+> and <-> keys to adjust the value.
Configuration options: [0] - [31]

Temperature B

Package passing this temperature threshold will engage the negative ratio offset specified in **Negative Ratio Offset B**. Unit in Degree Celsius.
Configuration options: [Auto] [1] - [115]

Negative Ratio Offset A

This will be the potential negative offset to respective ratio when package temperature rises above threshold specified in **Temperature B**.
Configuration options: [Auto] [User Specify]

The following item appears only when **Negative Ratio Offset B** is set to **[User Specify]**.

Ratio Offset

Use the <+> and <-> keys to adjust the value.
Configuration options: [0] - [31]

V/F Point Offset

Offset Mode Sign 1-11

Configuration options: [+] [-]

V/F Point 1-11 Offset

Configuration options: [Auto] [0.001] - [0.999]

Tweaker's Paradise

Realtime Memory Timing

Allows you to enable or disable realtime memory timing. When set to **[Enabled]**, the system will allow performing realtime memory timing changes after MRC_DONE.
Configuration options: [Disabled] [Enabled]

SPD Write Disable

Allows you to enable or disable setting SPD Write Disable. For security recommendations, SPD write disable bit must be set.
Configuration options: [TRUE] [FALSE]**PVD Ratio Threshold**

For the Core Domain PLL, the threshold to switch to lower post divider is 15 by default. You can set a value lower than 15 when pushing high BCLK so that Digitally Controlled Oscillator (DCO) remains at reasonable frequency.
Configuration options: [Auto] [1] - [40]

Banding Ratio

Use the <+> or <-> to adjust the value.
Configuration options: [Auto] [0] - [120]

SA PLL Frequency Override

Allows you to configure Sa PLL Frequency.
Configuration options: [Auto] [3200 MHz] [1600 MHz]

BCLK TSC HW Fixup

Allows you to enable or disable BCLK TSC HW Fixup disable during TSC copy from PMA to APIC.
Configuration options: [Enabled] [Disabled]

Core Ratio Extension Mode

Allows you to enable or disable Core Ratio Above 85 Extension Mode.

[Disabled]	Max Overclocking Ratio Limit as specified by OCMB 0x1 command is 85.
[Enabled]	Max Overclocking Ratio Limit as specified by OCMB 0x1 command is 120.

FLL OC mode

Configuration options: [Auto] [Disabled] [Normal] [Elevated] [Extreme Elevated]

Core PLL Voltage

Allows you to configure the offset for the Core PLL VCC Trim. The values range from 0.900V to 1.845V with an interval of 0.015V.
Configuration options: [Auto] [0.90000] - [1.84500]

GT PLL Voltage

Allows you to configure the offset for the GT PLL VCC Trim. The values range from 0.900V to 1.845V with an interval of 0.015V.
Configuration options: [Auto] [0.90000] - [1.84500]

Ring PLL Voltage

Allows you to configure the offset for the Ring PLL VCC Trim. The values range from 0.900V to 1.845V with an interval of 0.015V.
Configuration options: [Auto] [0.90000] - [1.84500]

System Agent PLL Voltage

Allows you to configure the offset for the System Agent PLL VCC Trim. The values range from 0.900V to 1.845V with an interval of 0.015V.
Configuration options: [Auto] [0.90000] - [1.84500]

Memory Controller PLL Voltage

Allows you to configure the offset for the Memory Controller PLL VCC Trim. The values range from 0.900V to 1.845V with an interval of 0.015V.
Configuration options: [Auto] [0.90000] - [1.84500]

CPU 1.8V Small Rail

Allows you to configure the voltage for the CPU 1.8V Small Rail. The values range from 1.500V to 2.300V with an interval of 0.010V.
Configuration options: [Auto] [1.50000] - [2.30000]

PLL Termination Voltage

Allows you to configure the voltage for the PLL Termination. The values range from 0.800V to 1.800V with an interval of 0.010V.
Configuration options: [Auto] [0.80000V] - [1.80000V]

CPU Standby Voltage

Allows you to configure the voltage for the CPU Standby. The values range from 0.800V to 1.800V with an interval of 0.010V.
Configuration options: [Auto] [0.80000] - [1.80000]

PCH 1.05V Voltage

Allows you to configure the voltage for the PCH 1.05V. The values range from 0.800V to 1.600V with an interval of 0.010V.
Configuration options: [Auto] [0.80000] - [1.60000]

PCH 0.82V Voltage

Allows you to configure the voltage for the PCH 0.82V. The values range from 0.700V to 1.300V with an interval of 0.010V.
Configuration options: [Auto] [0.70000] - [1.30000]

CPU Input Voltage Reset Voltage

Allows you to configure the voltage for the CPU Input when reset. The values range from 1.500V to 2.100V with an interval of 0.010V.
Configuration options: [Auto] [1.50000] - [2.10000]

AI Features

The items in this menu allows you to enable or disable different AI Features.

Package Temperature Threshold

Frequency will adjust to stay below this package temperature threshold when regulation is enabled.
Configuration options: [Auto] [30] - [115]

Regulate Frequency by above Threshold

Frequency will adjust to stay below the **Package Temperature Threshold** when this item is enabled. SVID must be enabled for this to work.
Configuration options: [Auto] [Enabled] [Disabled]

Cooler Efficiency Customize

[Keep Training]	Continuous evaluations will be performed on Cooler efficiency and updated accordingly.
[Stop Training]	Cooler efficiency evaluations will stop and current evaluated efficiency will be used.
[User Specify]	Manually specify the Cooler efficiency and all predictions will be based off this manual setting.

The following item appears only when **Cooler Efficiency Customize** is set to **[User Specify]**.

Cooler Score

The value of the Cooler's pts. [Maximum] 250 pts; [Minimum] 1 pts; [Default] 125 pts.
Configuration options: [1] - [250]

Recalibrate Cooler

Allows you to recalibrate your cooler efficiency.

Cooler Re-evaluation Algorithm

Allows you to set how inclined the re-evaluation will update.
Configuration options: [Normal] [More inclined to update] [Very inclined to update] [Less inclined to update] [Least inclined to update]

Optimism Scale

Allows you to set the optimism of the predictions. The higher the value, the more optimistic the predictions and vice versa.
Configuration options: [50] - [150]

Ring Down Bin

Allows you to enable or disable the Ring Downbin feature. This option is defaulted to **[Enabled]**. Uses OC mailbox command 0x19.

[Auto]	Set to default.
[Disabled]	CPU will not down bin the ring ratio and the requested ring ratio limit will be observed.
[Enabled]	CPU will down bin the ring ratio, which means the requested max ring ratio may not be observed.

Please use caution when disabling this feature as it may result in overvoltaging of the CPU.

Min. CPU Cache Ratio

Allows you to set the minimum possible CPU cache ratio. Use the <+> and <-> keys to adjust the value.
Configuration options: [Auto] [8] - [44]

Max. CPU Cache Ratio

Allows you to set the maximum possible CPU cache ratio. Use the <+> and <-> keys to adjust the value.
Configuration options: [Auto] [8] - [44]

Max. CPU Graphics Ratio

Allows you to configure the CPU graphics ratio. The ratio may vary depending on the system loading. Use the <+> and <-> keys to adjust the value.
Configuration options: [Auto] [1] - [29]

Extreme Over-voltage

This item can only be enabled when the onboard CPU_OV jumper is switched on. Setting this item to **[Enabled]** allows you to configure higher voltages for overclocking, but the CPU lifetime will not be guaranteed.
Configuration options: [Disabled] [Enabled]

BCLK Aware Adaptive Voltage

Allows you to enable or disable BCLK Aware Adaptive Voltage. 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.
Configuration options: [Disabled] [Enabled]

CPU Core/Cache Voltage

Configures the mode of Voltage fed to the CPU cores. Manual mode allows user-defined values. Offset mode modifies values by SVID.
Configuration options: [Auto] [Manual Mode] [Offset Mode]

The following item appears only when **CPU Core/Cache Voltage** is set to **[Manual Mode]**.

CPU Core Voltage Override

Allows you to configure the input voltage for the CPU by the external voltage regulator. Use the <+> and <-> keys to adjust the value. The values range from 0.600V to 1.700V with an interval of 0.005V.
Configuration options: [Auto] [0.60000] - [1.70000]

The following items appear only when **CPU Core/Cache Voltage** is set to **[Offset Mode]**.

Offset Mode Sign

[+] To offset the CPU core voltage by a positive value.

[-] To offset the CPU core voltage by a negative value.

CPU Core Voltage Offset

Allows you to configure the input voltage for the CPU by the external voltage regulator. Use the <+> or <-> to adjust the value. The values range from 0.005V to 0.635V with an interval of 0.005V.
Configuration options: [Auto] [0.00500] - [0.63500]

CPU Graphics Voltage

Allows you to configure the mode of voltage fed to the CPU Graphics. Manual mode allows user-defined values. Offset mode modified values by SVID.
Configuration options: [Auto] [Manual Mode] [Offset Mode]

The following item appears only when **CPU Graphics Voltage** is set to **[Manual Mode]**.

CPU Graphics Voltage Override

Allows you to configure the voltage for the CPU Graphics. Use the <+> or <-> to adjust the value. The values range from 0.600V to 1.700V with an interval of 0.005V.
Configuration options: [Auto] [0.60000] - [1.70000]

The following items appear only when **CPU Graphics Voltage** is set to **[Offset Mode]**.

Offset Mode Sign

[+] To offset the voltage by a positive value.

[-] To offset the voltage by a negative value.

CPU Graphics Voltage Offset

Allows you to configure the CPU graphics voltage offset value. Use the <+> or <-> to adjust the value. The values range from 0.005V to 0.635V with an interval of 0.005V.
Configuration options: [Auto] [0.00500] - [0.63500]

You need to save the changes and reset the system for the changes to take effect.

CPU L2 Voltage

Allows you to configure the voltage for the CPU L2. This may help for sustaining high clock speeds.
Configuration options: [Auto] [Manual Mode] [Adaptive Mode]

The following item appears only when **CPU L2 Voltage** is set to **[Manual Mode]**.

CPU L2 Voltage Override

Allows you to configure the voltage for the CPU L2. Use the <+> or <-> to adjust the value. The values range from 0.700V to 1.800V with an interval of 0.001V.
Configuration options: [Auto] [0.70000] - [1.80000]

The following items appear only when **CPU L2 Voltage** is set to **[Adaptive Mode]**.

Offset Mode Sign

[+] To offset the CPU L2 voltage by a positive value.

[-] To offset the CPU L2 voltage by a negative value.

Additional Turbo Mode CPU L2 Voltage

Allows you to configure the amount of voltage fed to the CPU cores when running in Turbo mode. Increase the voltage when configuring a high CPU core frequency. This voltage will be affected by the offset value. Use the <+> or <-> to adjust the value. The values range from 0.250V to 1.920V with an interval of 0.001V.
Configuration options: [Auto] [0.25000] - [1.92000]

Offset Voltage

Allows you to configure the CPU L2 voltage offset value. Use the <+> or <-> to adjust the value. The values range from 0.001V to 0.999V with an interval of 0.001V.
Configuration options: [Auto] [0.00100] - [0.99900]

You need to save the changes and reset the system for the changes to take effect.

CPU System Agent Voltage

Allows you to configure the voltage for the CPU System Agent.
Configuration options: [Auto] [Manual Mode] [Offset Mode]

The following item appears only when **CPU System Agent Voltage** is set to **[Manual Mode]**.

CPU System Agent Voltage Override

Allows you to configure the input voltage for the CPU by the external voltage regulator. Use the <+> and <-> keys to adjust the value. The values range from 0.700V to 1.800V with an interval of 0.001V.
Configuration options: [Auto] [0.70000] - [1.80000]

The following item appears only when **CPU System Agent Voltage** is set to **[Offset Mode]**.

CPU System Agent Voltage Offset

Allows you to configure the CPU System Agent Voltage offset value. Use the <+> or <-> to adjust the value. The values range from 0.001V to 0.999V with an interval of 0.001V.
Configuration options: [Auto] [0.00100] - [0.99900]

You need to save the changes and reset the system for the changes to take effect.

CPU Input Voltage

Allows you to configure the voltage for the CPU Input. Use the <+> or <-> to adjust the value. The values range from 1.500V to 2.100V with an interval of 0.010V.
Configuration options: [Auto] [1.50000] - [2.10000]

High DRAM Voltage Mode

If this item is set to **[Disabled]**, the upper range for DRAM Voltage will be 1.435V. If this item is set to **[Enabled]**, the upper range will be 2.070V. If enabled on non-supported DRAM, the voltage will be lower than requested.
Configuration options: [Auto] [Disabled] [Enabled]

DRAM VDD Voltage

Power for the DRAM ICs' VDD portion. Use the <+> or <-> to adjust the value. The values range from 0.800V to 1.435V with an interval of 0.005V.
Configuration options: [Auto] [0.80000] - [1.43500]

DRAM VDDQ Voltage

Power for the DRAM ICs' VDD Data portion. Use the <+> or <-> to adjust the value. The values range from 0.800V to 1.435V with an interval of 0.005V.
Configuration options: [Auto] [0.80000] - [1.43500]

Advanced Memory Voltages

IVR Transmitter VDDQ Voltage

Allows you to set the voltage for the internal transmitter voltage for the Memory Controller. Use the <+> or <-> to adjust the value. The values range from 0.700V to 2.200V with an interval of 0.005V.
Configuration options: [Auto] [0.70000] - [2.20000]

Memory Controller Voltage

Allows you to set the voltage for the Memory Controller. Use the <+> or <-> to adjust the value. The values range from 1.000V to 2.000V with an interval of 0.00625V.
Configuration options: [Auto] [1.00000] - [2.00000]

PMIC Voltages

Configuration options: [Auto] [Sync All PMICs] [By per PMIC]

The following items appear only when **PMIC Voltages** is set to **[Sync All PMICs]**.

SPD HUB VLDO (1.8V)

Allows you to set the main power for the SPD Hub Logic. Default set to 1.8V. Use the <+> or <-> to adjust the value. The values range from 1.700V to 2.000V with an interval of 0.100V.
Configuration options: [Auto] [1.70000] - [2.00000]

SPD HUB VDDIO (1.0V)

Allows you to set the main power for the SPD Hub side-band interface. Default set to 1.0V. Use the <+> or <-> to adjust the value. The values range from 0.900V to 1.200V with an interval of 0.100V.
Configuration options: [Auto] [0.90000] - [1.20000]

Memory VDD Voltage

Allows you to set the power for the DRAM IC's VDD portion. Use the <+> or <-> to adjust the value. The values range from 0.800V to 1.435V with an interval of 0.005V.
Configuration options: [Auto] [0.80000] - [1.43500]

Memory VDDQ Voltage

Allows you to set the power for the DRAM IC's Data portion. Use the <+> or <-> to adjust the value. The values range from 0.800V to 1.435V with an interval of 0.005V.
Configuration options: [Auto] [0.80000] - [1.43500]

Memory VPP Voltage

Allows you to set the power for the DRAM Activating Power Supply. Use the <+> or <-> to adjust the value. The values range from 1.500V to 2.135V with an interval of 0.005V.
Configuration options: [Auto] [1.50000] - [2.13500]

Memory VDD Switching Frequency

Allows you to set the switching frequency of memory VDD regulator in MHz. Use the <+> or <-> to adjust the value. The values range from 0.750MHz to 1.500MHz with an interval of 0.250MHz.
Configuration options: [Auto] [0.75000] - [1.50000]

Memory VDDQ Switching Frequency

Allows you to set the switching frequency of memory VDDQ regulator in MHz. Use the <+> or <-> to adjust the value. The values range from 0.750MHz to 1.500MHz with an interval of 0.250MHz.
Configuration options: [Auto] [0.75000] - [1.50000]

Memory VPP Switching Frequency

Allows you to set the switching frequency of memory VPP regulator in MHz. Use the <+> or <-> to adjust the value. The values range from 0.750MHz to 1.500MHz with an interval of 0.250MHz.
Configuration options: [Auto] [0.75000] - [1.50000]

Memory Current Capability

Allows you to set the current capability for the switching regulators in Amps. Use the <+> or <-> to adjust the value. The values range from 0.125A to 6.000A with an interval of 0.125A.
Configuration options: [Auto] [0.12500] - [6.00000]

The following items appear only when **PMIC Voltages** is set to **[By per PMIC]**.

PMIC0-3 SPD HUB VLDO (1.8V)

Allows you to set the main power for the SPD Hub Logic. Default set to 1.8V. Use the <+> or <-> to adjust the value. The values range from 1.700V to 2.000V with an interval of 0.100V.
Configuration options: [Auto] [1.70000] - [2.00000]

PMIC0-3 SPD HUB VDDIO (1.0V)

Allows you to set the main power for the SPD Hub side-band interface. Default set to 1.0V. Use the <+> or <-> to adjust the value. The values range from 0.900V to 1.200V with an interval of 0.100V.
Configuration options: [Auto] [0.90000] - [1.20000]

PMIC0-3 Memory VDD Voltage

Allows you to set the power for the DRAM IC's VDD portion. Use the <+> or <-> to adjust the value. The values range from 0.800V to 1.435V with an interval of 0.005V.
Configuration options: [Auto] [0.80000] - [1.43500]

PMIC0-3 Memory VDDQ Voltage

Allows you to set the power for the DRAM IC's Data portion. Use the <+> or <-> to adjust the value. The values range from 0.800V to 1.435V with an interval of 0.005V.
Configuration options: [Auto] [0.80000] - [1.43500]

PMIC0-3 Memory VPP Voltage

Allows you to set the power for the DRAM Activating Power Supply. Use the <+> or <-> to adjust the value. The values range from 1.500V to 2.135V with an interval of 0.005V.
Configuration options: [Auto] [1.50000] - [2.13500]

PMIC0-3 Memory VDD Switching Frequency

Allows you to set the switching frequency of memory VDD regulator in MHz. Use the <+> or <-> to adjust the value. The values range from 0.750MHz to 1.500MHz with an interval of 0.250MHz.
Configuration options: [Auto] [0.75000] - [1.50000]

PMIC0-3 Memory VDDQ Switching Frequency

Allows you to set the switching frequency of memory VDDQ regulator in MHz. Use the <+> or <-> to adjust the value. The values range from 0.750MHz to 1.500MHz with an interval of 0.250MHz.
Configuration options: [Auto] [0.75000] - [1.50000]

PMIC0-3 Memory VPP Switching Frequency

Allows you to set the switching frequency of memory VPP regulator in MHz. Use the <+> or <-> to adjust the value. The values range from 0.750MHz to 1.500MHz with an interval of 0.250MHz.
Configuration options: [Auto] [0.75000] - [1.50000]

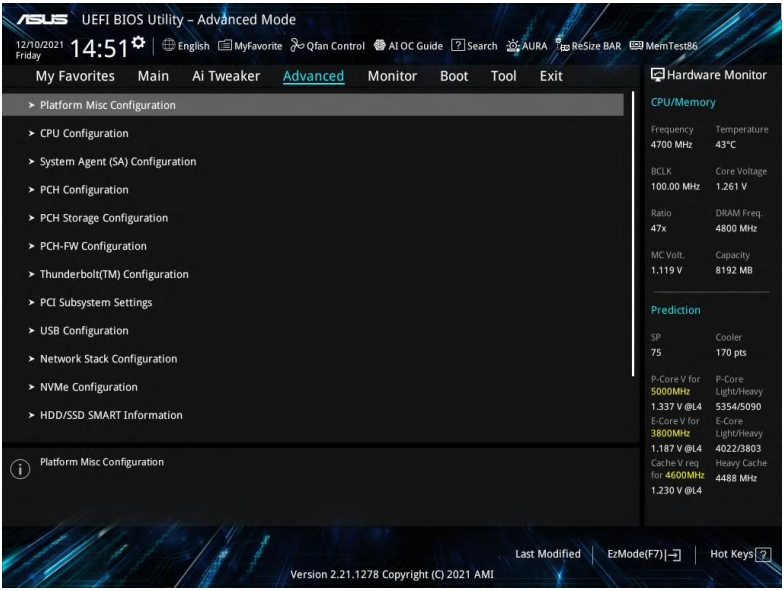
PMIC0-3 Memory Current Capability

Allows you to set the current capability for the switching regulators in Amps. Use the <+> or <-> to adjust the value. The values range from 0.125A to 6.000A with an interval of 0.125A.
Configuration options: [Auto] [0.12500] - [6.00000]

6. Advanced menu

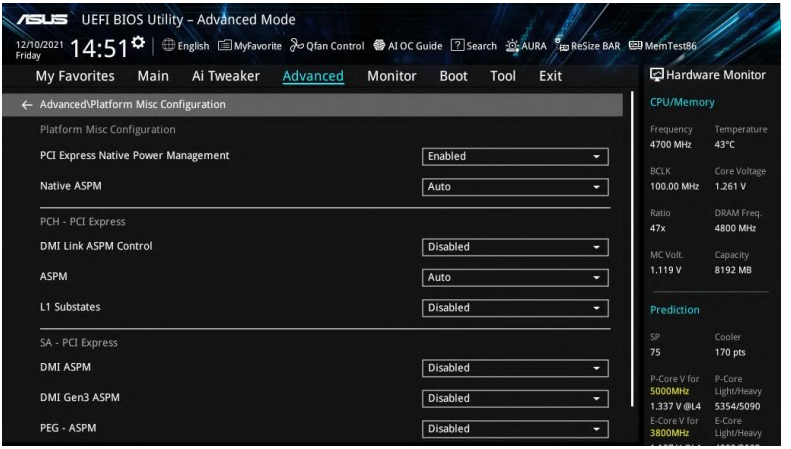
The Advanced menu items allow you to change the settings for the CPU and other system devices. Scroll down to display other BIOS items.

Be cautious when changing the settings of the Advanced menu items. Incorrect field values can cause the system to malfunction.



6.1 Platform Misc Configuration

The items in this menu allow you to configure the platform-related features.



PCI Express Native Power Management

Allows you to enhance the power saving feature of PCI Express and perform ASPM operations in the operating system.
Configuration options: [Disabled] [Enabled]

The following item appears only when **PCI Express Native Power Management** is set to **[Enabled]**.

Native ASPM

Set this item to **[Enabled]** for OS Controlled ASPM, or set this item to **[Disabled]** for BIOS controlled ASPM.
Configuration options: [Auto] [Enabled] [Disabled]

PCH - PCI Express

DMI Link ASPM Control

Allows you to control the Active State Power Management of the DMI Link.
Configuration options: [Disabled] [L1] [Auto]

ASPM

Allows you to select the ASPM state for energy-saving conditions.
Configuration options: [Disabled] [L1] [Auto]

L1 Substates

Allows you to select the PCI Express L1 Substates settings.
Configuration options: [Disabled] [L1.1] [L1.1 & L1.2]

SA - PCI Express

DMI ASPM Control

Allows you to set the DMI ASPM Support.
Configuration options: [Disabled] [Auto] [ASPM L1]

DMI Gen3 ASPM

Allows you to set the DMI Gen3 ASPM Support.
Configuration options: [Disabled] [Auto] [ASPM L1]

PEG - ASPM

Allows you to control the ASPM support for the PEG 0. This has no effect if PEG is not the currently active device.
Configuration options: [Disabled] [L0s] [L1] [L0sL1]

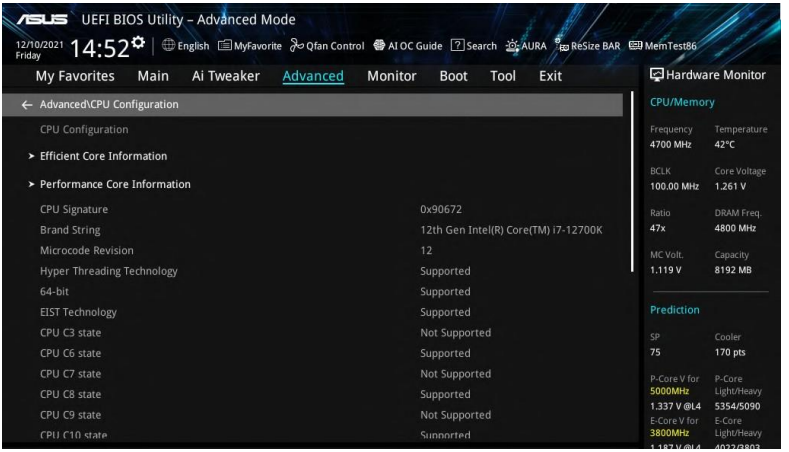
PCI Express Clock Gating

Allows you to enable or disable PCI Express Clock Gating for each root port.
Configuration options: [Disabled] [Enabled]

6.2 CPU Configuration

The items in this menu show the CPU-related information that the BIOS automatically detects. Scroll down to display other BIOS items.

The items in this menu may vary based on the CPU installed.



Efficient Core Information

This submenu displays the Efficient Core Information.

Performance Core Information

This submenu displays the Performance Core Information.

Hardware Prefetcher

Allows you to enable or disable the MLC streamer prefetcher.
Configuration options: [Disabled] [Enabled]

Adjacent Cache Line Prefetch

Allows you to prefetch adjacent cache lines, reducing the DRAM loading time and improving the system performance.
Configuration options: [Disabled] [Enabled]

Intel (VMX) Virtualization Technology

When set to **[Enabled]**, VMX can utilize the additional hardware capabilities provided by Vanderpool Technology.
Configuration options: [Disabled] [Enabled]

Active Performance Cores

Allows you to select the number of CPU cores to activate in each processor package.
Configuration options: [All] [1] - [7]

Active Efficient Cores

Allows you to select the number of Efficient cores to activate in each processor package.
Configuration options: [All] [0] - [3]

Number of Cores and Efficient Cores are looked at together. When both are {0,0}, Pcode will enable all cores.

Hyper-Threading

Allows a hyper-threading processor to appear as two logical processors, allowing the operating system to schedule two threads or processes simultaneously.

[Enabled] For two threads per activated core.

[Disabled] For only one thread per activated core.

Per Core Hyper-Threading

The items in this submenu allow you to enable or disable Hyper-Threading for each core.

Hyper-Threading of Core 0-7

Configuration options: [Disabled] [Enabled]

Total Memory Encryption

Allows you to configure the Total Memory Encryption (TME) to protect DRAM data from physical attacks.
Configuration options: [Disabled] [Enabled]

CPU - Power Management Control

The items in this submenu allow you to manage and configure the CPU's power.

Boot performance mode

Allows you to select the performance state that the BIOS will set starting from the reset vector.
Configuration options: [Max Battery] [Max Non-Turbo Performance] [Turbo Performance] [Auto]

Intel(R) SpeedStep(tm)

Allows more than two frequency to be supported.
Configuration options: [Disabled] [Enabled]

Intel(R) Speed Shift Technology

Allows you to disable or enable Intel(R) Speed Shift Technology support. When enabled, CPPC v2 interface allows hardware controlled P-states.
Configuration options: [Disabled] [Enabled]

Intel(R) Turbo Boost Max Technology 3.0

Allows you to disable or enable Intel(R) Turbo Boost Max Technology 3.0 support. Disabling will report the maximum ratio of the slowest core in _CPC object.
Configuration options: [Disabled] [Enabled]

Turbo Mode

Allows you to automatically set the CPU cores to run faster than the base operating frequency when it is below the operating power, current and temperature specification limit. (Requires EMTTM enabled too)
Configuration options: [Disabled] [Enabled]

Acoustic Noise Settings

The items in this submenu allow you to configure Acoustic Noise Settings for IA, GT, and SA domains.

Acoustic Noise Settings

Acoustic Noise Mitigation

Enabling this option will help mitigate acoustic noise on certain SKUs when the CPU is in deeper C state.
Configuration options: [Disabled] [Enabled]

The following items appear only when **Acoustic Noise Mitigation** is set to **[Enabled]**.

Pre Wake Time

Allows you to set the maximum Pre Wake randomization time in micro ticks. This is for acoustic noise mitigation Dynamic Periodicity Alteration (DPA) tuning. Use the <+> or <-> to adjust the value.
Configuration options: [0] - [255]

Ramp Up Time

Allows you to set the maximum Ramp Up randomization time in micro ticks. This is for acoustic noise mitigation Dynamic Periodicity Alteration (DPA) tuning. Use the <+> or <-> to adjust the value.
Configuration options: [0] - [255]

Ramp Down Time

Allows you to set the maximum Ramp Down randomization time in micro ticks. This is for acoustic noise mitigation Dynamic Periodicity Alteration (DPA) tuning. Use the <+> or <-> to adjust the value.
Configuration options: [0] - [255]

IA VR Domain

Disable Fast PKG C State Ramp for IA Domain

This option needs to be configured to reduce acoustic noise during deeper C states.
[FALSE] Don't disable Fast ramp during deeper C states.
[TRUE] Disable Fast ramp during deeper C state.

Slow Slew Rate for IA Domain

Set VR IA Slow Slew Rate for Deep Package C State ramp time; Slow slew rate equals to Fast divided by number, the number is 2, 4, 8 to slow down the slew rate to help minimize acoustic noise.
Configuration options: [Fast/2] [Fast/4] [Fast/8]

GT VR Domain

Disable Fast PKG C State Ramp for GT Domain

This option needs to be configured to reduce acoustic noise during deeper C states.
[FALSE] Don't disable Fast ramp during deeper C states.
[TRUE] Disable Fast ramp during deeper C state.

Slow Slew Rate for GT Domain

Set VR GT Slow Slew Rate for Deep Package C State ramp time; Slow slew rate equals to Fast divided by number, the number is 2, 4, 8 to slow down the slew rate to help minimize acoustic noise.
Configuration options: [Fast/2] [Fast/4] [Fast/8]

CPU C-states

Allows you to enable or disable CPU Power Management. Allows CPU to go to C states when it's not 100% utilized.
Configuration options: [Auto] [Disabled] [Enabled]

The following items appear only when **CPU C-states** is set to **[Enabled]**.

Enhanced C-States

Allows you to enable or disable C1E. When enabled, CPU will switch to minimum speed when all cores enter C-State.
Configuration options: [Enabled] [Disabled]

Package C State Limit

Allows you to set the C-state limit for the CPU package. Setting to **[CPU Default]** will leave it as the Factory default value. Setting to **[Auto]** will initialize the deepest available Package C State Limit.
Configuration options: [C0/C1] [C2] [C3] [C6] [C7] [C7s] [C8] [C9] [C10] [CPU Default] [Auto]

Thermal Monitor

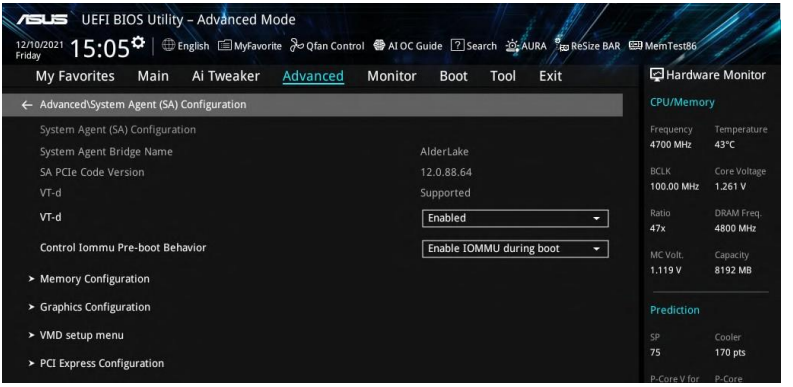
Allows you to enable or disable the Thermal Monitor.
Configuration options: [Disabled] [Enabled]

Dual Tau Boost

Allows you to enable Dual Tau Boost feature. This is only applicable for CMLS 35W/65W/125W sku. When DPTF is enabled this feature is ignored.
Configuration options: [Disabled] [Enabled]

6.3 System Agent (SA) Configuration

The items in this menu allow you to change the System Agent (SA) parameters.



VT-d

Allows you to enable virtualization technology function on memory control hub.
Configuration options: [Enabled] [Disabled]

The following item appears only when **VT-d** is set to **[Enabled]**.

Control Iommu Pre-boot Behavior

Allows you to enable IOMMU in Pre-boot environment (if DMAR table is installed in DXE and if VTD_INFO_PPI is installed in PEI).
Configuration options: [Disable IOMMU] [Enable IOMMU during boot]

Memory Configuration

The items in this submenu allow you to set memory configuration parameters.

Memory Remap

Allows you to enable or disable memory remap above 4GB.
Configuration options: [Enabled] [Disabled]

Graphics Configuration

The items in this submenu allow you to select a primary display from CPU Graphics, PEG Graphics devices, or PCIe Graphics devices.

Primary Display

Allows you to select the primary display from CPU Graphics / PEG Graphics / PCIe Graphics device.
Configuration options: [Auto] [CPU Graphics] [PEG Slot] [PCIE]

iGPU Multi-Monitor

Set this item to [Enabled] to empower both integrated and discrete graphics for multi-monitor output. iGPU shared system memory size will be fixed at 64M.
Configuration options: [Disabled] [Enabled]

DVMT Pre-Allocated

Allows you to select the DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.
Configuration options: [32M] [64M] [96M] [128M] [160M] [192M] [224M] [256M] [288M] [320M] [352M] [384M] [416M] [448M] [480M] [512M]

RC6(Render Standby)

Allows you to enable render standby support.
Configuration options: [Disabled] [Enabled]

VMD setup menu

The items in this submenu allow you to set the VMD configuration settings.

Enable VMD controller

Allows you to enable or disable the VMD controller.
Configuration options: [Disabled] [Enabled]

Setting the **Enable VMD controller** to **[Disabled]** may result in data loss.

The following items appear only when **Enable VMD controller** is set to **[Enabled]**.

Map PCIE Storage under VMD

Allows you to map or unmap PCIE Storage to VMD.
Configuration options: [Disabled] [Enabled]

Ensure to set **Map SATA Controller under VMD** to **[Disabled]** if you set **Map PCIE Storage under VMD** to **[Enabled]**.

Map SATA Controller under VMD

Allows you to map or unmap this Root Port to VMD.
Configuration options: [Disabled] [Enabled]

Ensure to set **Map PCIE Storage under VMD** to **[Disabled]** if you set **Map SATA Controller under VMD** to **[Enabled]**.

PCI Express Configuration

The items in this submenu allow you to configure the PCIe Speeds for the different onboard slots.

The items in this submenu may vary according to your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.

M.2_1 Link Speed

Allows you to configure the M.2_1 slot.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3] [Gen4]

PCIEX16_1 Link Speed

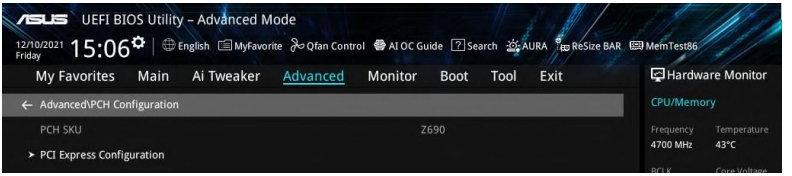
Allows you to configure the PCIEX16_1 slot.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3] [Gen4] [Gen5]

PCIEX16_2 Link Speed

Allows you to configure the PCIEX16_2 slot.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3] [Gen4] [Gen5]

6.4 PCH Configuration

The items in this menu allow you to change the PCIe configurations for slots supported by the PCH.



PCI Express Configuration

The items in this submenu allow you to configure the PCIe Speeds for the different onboard slots supported by the PCH.

The items in this submenu may vary according to your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.

PCIEX16_3(G3) Link Speed

Allows you to configure the PCIEX16_3(G3) slot.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

M.2_4 Link Speed

Allows you to configure the M.2_4 slot.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3] [Gen4]

M.2_2 Link Speed

Allows you to configure the M.2_2 slot.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3] [Gen4]

M.2_3 Link Speed

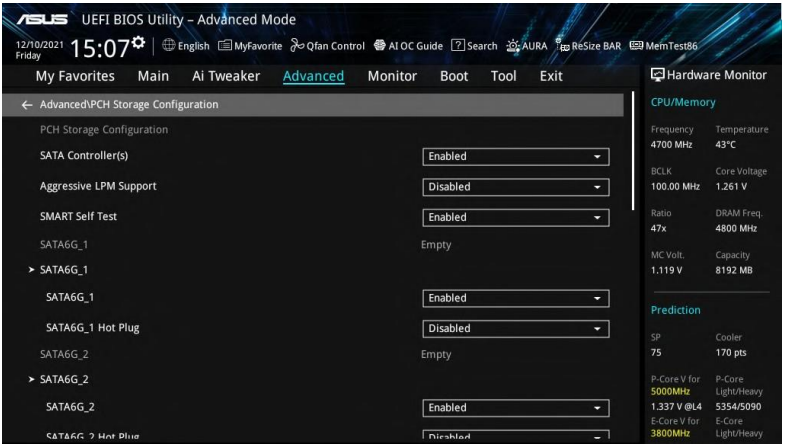
Allows you to configure the M.2_3 slot.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3] [Gen4]

6.5 PCH Storage Configuration

While entering Setup, the BIOS automatically detects the presence of SATA devices. The SATA Port items show **Empty** if no SATA device is installed to the corresponding SATA port.

Scroll down to display the other BIOS items.

The settings and options of this menu may vary depending on your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.



SATA Controller(s)

Allows you to enable or disable the SATA Device.
Configuration options: [Disabled] [Enabled]

The following items appear only when **SATA Controller(s)** is set to **[Enabled]**.

Aggressive LPM support

Allows PCH to aggressively enter link power state.
Configuration options: [Disabled] [Enabled]

SMART Self Test

S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) is a monitoring system that shows a warning message during POST (Power-on Self Test) when an error occurs in the hard disks.
Configuration options: [Disabled] [Enabled]

SATA6G_1 - SATA6G_8

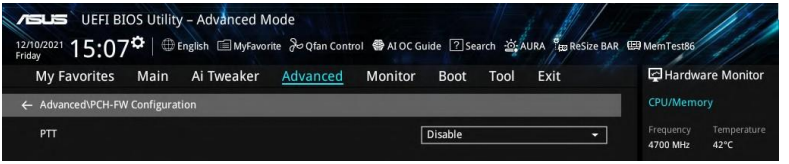
Allows you to enable or disable the selected SATA port.
Configuration options: [Disabled] [Enabled]

SATA6G_1 - SATA6G_8 Hot Plug

Designates this port as Hot Pluggable.
Configuration options: [Disabled] [Enabled]

6.6 PCH-FW Configuration

This item allows you to configure the firmware TPM.



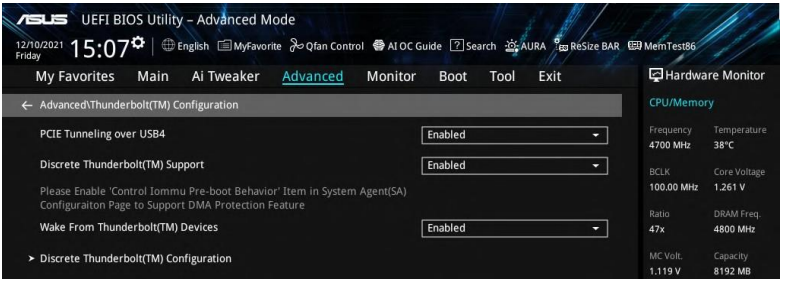
PTT

Allows you to enable or disable PTT in SkuMgr.
Configuration options: [Disabled] [Enabled]

6.7 Thunderbolt(TM) Configuration

The items in this menu allow you to configure Thunderbolt settings.

The availability of this menu, as well as the settings and options may vary depending on your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.



PCIE Tunneling over USB4

Allows you to enable or disable PCIE Tunneling over USB4.
Configuration options: [Disabled] [Enabled]

Discrete Thunderbolt(TM) Support

Allows you to enable or disable Discrete Thunderbolt(TM) Support.
Configuration options: [Disabled] [Enabled]

Please set **Control Iommu Pre-boot Behavior** in the **System Agent(SA) Configuration** page to **[Enabled]** to support DMA Protection Feature.

The following items appear only when **Discrete Thunderbolt(TM) Support** is set to **[Enabled]**.

Wake From Thunderbolt(TM) Devices

Allows you to enable or disable system wake from Thunderbolt(TM) devices.
Configuration options: [Disabled] [Enabled]

Discrete Thunderbolt(TM) Configuration

The items in this submenu allow you to configure Discrete Thunderbolt(TM) related configurations.

DTBT Go2Sx Command

Allows you to enable the command to put DTBT into Sx state while system is going into Sx.
Configuration options: [Disabled] [Enabled]

Windows 10 Thunderbolt Support

Allows you to specify Windows 10 Thunderbolt support level.
[Enable + RTD3] OS Native support plus RTD3.
[Disabled] No OS native support.

DTBT Controller 0 Configuration

DTBT Contorller 0

Configuration options: [Disabled] [Enabled]

TBT Host Router

Allows you to enable host router based on ports available.
Configuration options: [One Port] [Two Port]

Extra Bus Reserved

Allows you to select the TBT Root Port Type.
[56] One port Host.
[106] Two port Host.

Reserved Memory

Allows you to set the Reserved Memory for this Root Bridge. Use the <+> and <-> keys to adjust the value.
Configuration options: [1] - [4096]

Memory alignment

Allows you to set the memory alignment bits. Use the <+> and <-> keys to adjust the value.
Configuration options: [0] - [31]

Reserved PMemory

Allows you to set the Reserved Prefetchable Memory for this Root Bridge. Use the <+> and <-> keys to adjust the value.
Configuration options: [1] - [4096]

PMemory alignment

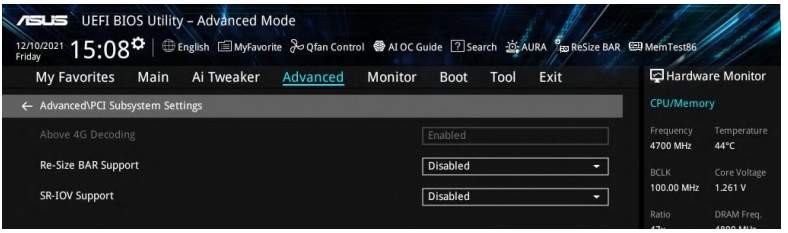
Allows you to set the PMemory alignment bits. Use the <+> and <-> keys to adjust the value.
Configuration options: [0] - [31]

Reserved I/O

Use the <+> and <-> keys to adjust the value. The values range from 0 to 60.

6.8 PCI Subsystem Settings

The items in this menu allow you to configure PCI, PCI-X, and PCI Express settings.



Above 4G Decoding

Allows you to enable or disable 64bit capable Devices to be Decoded in Above 4G Address Space (Only if System supports 64 bit PCI Decoding).
Configuration options: [Disabled] [Enabled]

- Only enabled under 64bit operating system.
- The following item appears only when **Above 4G Decoding** is set to **[Enabled]**.

Re-Size BAR Support

If the system has Resizable BAR capable PCIe Devices, this option enables or disables Resizable BAR Support (Only if System supports 64 bit PCI Decoding).
Configuration options: [Disabled] [Enabled]

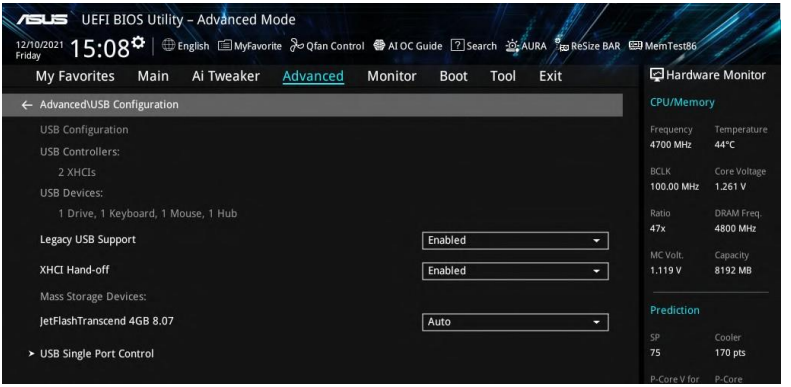
To enable Re-Size BAR Support for harnessing full GPU memory, please go to the **Boot** section and set **CSM(Compatibility Support Module)** to **[Disabled]**.

SR-IOV Support

This option enables or disables Single Root IO Virtualization Support if the system has SR-IOV capable PCIe devices.
Configuration options: [Disabled] [Enabled]

6.9 USB Configuration

The items in this menu allow you to change the USB-related features.



The **Mass Storage Devices** item shows the auto-detected values. If no USB device is detected, the item shows **None**.

Legacy USB Support

[Enabled] Your system supports the USB devices in legacy operating systems.

[Disabled] Your USB devices can be used for BIOS setup only and cannot be recognized in the boot devices list.

[Auto] Your system automatically detects the presence of USB devices at startup. If any USB devices are detected, the legacy USB support is enabled.

XHCI Hand-off

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

[Disabled] Support XHCI by XHCI drivers for operating systems with XHCI support.

[Enabled] Support XHCI by BIOS for operating systems without XHCI support.

Mass Storage Devices:

Allows you to select the mass storage device emulation type for devices connected. **[Auto]** enumerates devices according to their media format. Optical drives are emulated as **[CD-ROM]**, drives with no media will be emulated according to a drive type.
Configuration options: [Auto] [Floppy] [Forced FDD] [Hard Disk] [CD-ROM]

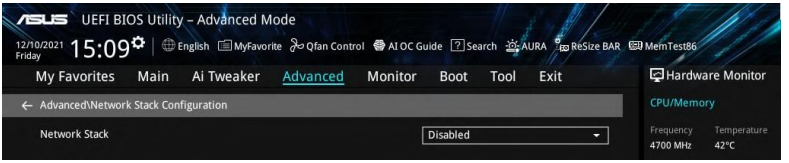
USB Single Port Control

Allows you to enable or disable the individual USB ports.

Refer to section **Motherboard layout** and **Rear I/O connection** in your motherboard's user manual for the location of the USB ports.

6.10 Network Stack Configuration

The items in this menu allow you to change the Network Stack Configuration.



Network stack

Allows you to disable or enable the UEFI network stack.
Configuration options: [Disabled] [Enabled]

The following items appear only when **Network Stack** is set to **[Enabled]**.

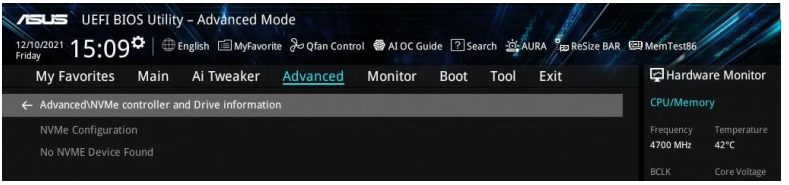
Ipv4/Ipv6 PXE Support

Allows you to enable or disable the Ipv4/Ipv6 PXE boot support.
Configuration options: [Disabled] [Enabled]

6.11 NVMe Configuration

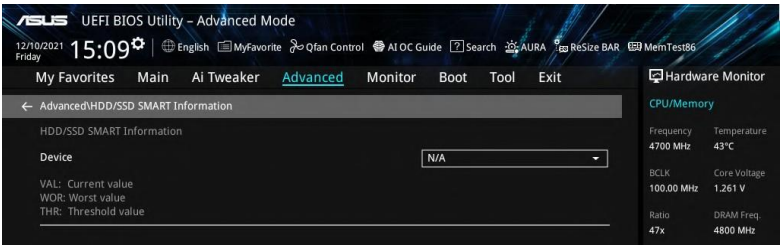
This menu displays the NVMe controller and Drive information of the connected devices. You may press <Enter> on a connected NVMe device which appears in this menu to view more information on the NVMe device.

The options displayed in this menu may vary depending on the devices connected to your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.



6.12 HDD/SSD SMART Information

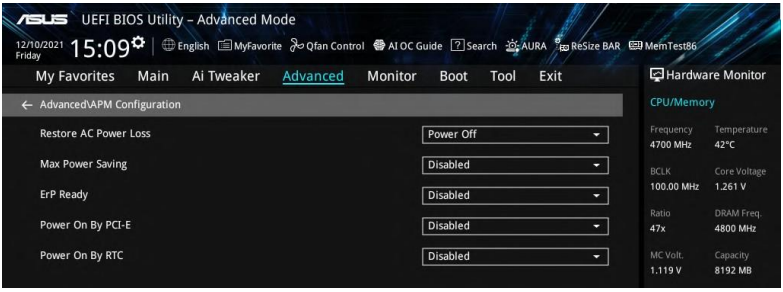
The items in this menu allow you to view the SMART information for connected storage devices.



NVM Express devices do not support SMART information.

6.13 APM Configuration

The items in this menu allow you to change the advanced power management settings.



Restore AC Power Loss

Allows your system to go to ON state, OFF state, or both states after an AC power loss. When setting your system to **[Last State]**, it goes to the previous state before the AC power loss.
Configuration options: [Power Off] [Power On] [Last State]

Max Power Saving

Configuration options: [Disabled] [Enabled]

ErP Ready

Allows you to switch off some power at S4+S5 or S5 to get the system ready for ErP requirement. When set to **[Enabled]**, all other PME options are switched off. RGB LEDs and RGB/Addressable RGB Headers will also be disabled.
Configuration options: [Disabled] [Enabled (S4+S5)] [Enabled (S5)]

Power On By PCI-E

Allows you to enable or disable the Wake-on-LAN function of the onboard LAN controller or other installed PCI-E LAN cards.
Configuration options: [Disabled] [Enabled]

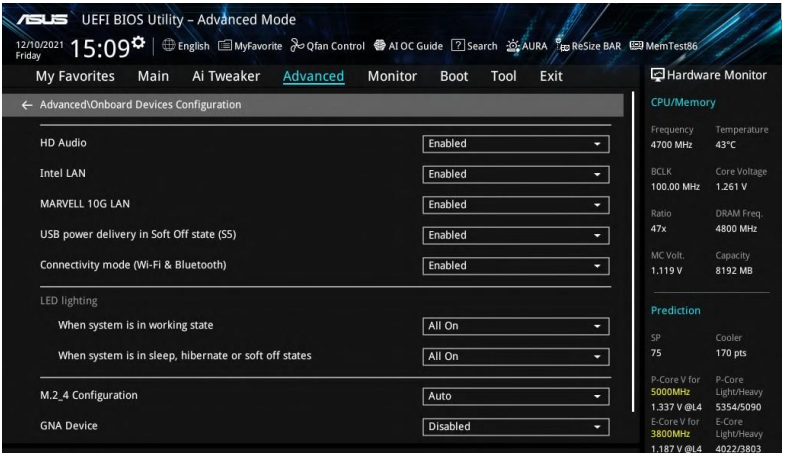
Power On By RTC

Allows you to enable or disable the RTC (Real-Time Clock) to generate a wake event and configure the RTC alarm date. When enabled, you can set the days, hours, minutes, or seconds to schedule an RTC alarm date.
Configuration options: [Disabled] [Enabled]

6.14 Onboard Devices Configuration

The items in this menu allow you to change the onboard devices settings. Scroll down to view the other BIOS items.

The settings and options of this menu may vary depending on your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.



HD Audio

Controls the detection of the HD-Audio device.

[Disabled] HDA will be unconditionally disabled.

[Enabled] HDA will be unconditionally enabled.

Intel LAN

Allows you to enable or disable Intel LAN.
Configuration options: [Disabled] [Enabled]

MARVELL 10G LAN

Allows you to enable or disable the 10G LAN card.
Configuration options: [Disabled] [Enabled]

USB power delivery in Soft Off state (S5)

Allows you to enable or disable USB power when your PC is in the S5 state.
Configuration options: [Disabled] [Enabled]

Connectivity mode (Wi-Fi & Bluetooth)

Allows you to enable or disable Wi-Fi and Bluetooth connectivity module.
Configuration options: [Disabled] [Enabled]

LED lighting

When system is in working state

Allows you to turn the RGB LED lighting on or off when the system is in the working state.

[All On] RGB LEDs and Functional will be behave normally.
[Stealth Mode] All LEDs will be disabled.
[Aura Only] RGB LEDs will light up, while all functional LEDs will be disabled.
[Aura Off] Functional LEDs behave normally, while RGB LEDs will be disabled.

The RGB Header(s) and Addressable Header(s) will only work under the S0 (working) state.

When system is in sleep, hibernate or soft off states

Allows you to turn the RGB LED lighting on or off when the system is in the sleep, hibernate or soft off states.

[All On] RGB LEDs and Functional will be behave normally.
[Stealth Mode] All LEDs will be disabled.
[Aura Only] RGB LEDs will light up, while all functional LEDs will be disabled.
[Aura Off] Functional LEDs behave normally, while RGB LEDs will be disabled.

The RGB Header(s) and Addressable Header(s) will only work under the S0 (working) state.

M.2_4 Configuration

Allows you to set the M.2_4 configuration.

[Auto] Auto-detects the M.2_4 device mode.
[SATA mode] Only supports M.2_4 SATA devices.
[PCIE mode] Only supports M.2_4 PCIE devices.

GNA Device

Allows you to enable or disable SA GNA Device.
Configuration options: [Enabled] [Disabled]

Serial Port Configuration

This submenu allows you to set parameters for Serial Port.

This item will only function if there is a serial port (COM) connector on your motherboard.

Serial Port

Allows you to enable or disable the Serial port.
Configuration options: [Enabled] [Disabled]

The following item appears only when **Serial Port** is set to **[Enabled]**.

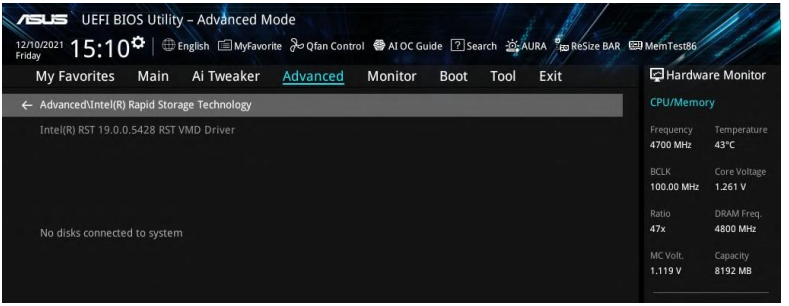
Change settings

Allows you to select an optimal setting for super IO device.
Configuration options: [IO=3F8h; IRQ=4] [IO=2F8h; IRQ=3] [IO=3E8h; IRQ=4] [IO=2E8h; IRQ=3]

6.15 Intel(R) Rapid Storage Technology

The items in this menu allow you manage RAID volumes on the Intel(R) RAID Controller.

- The settings and options of this menu may vary depending on the storage devices connected. Please refer to the BIOS of your motherboard for the actual settings and options.
- Ensure to set the **VMD configuration settings** before using **Intel(R) Rapid Storage Technology** to create a RAID set.

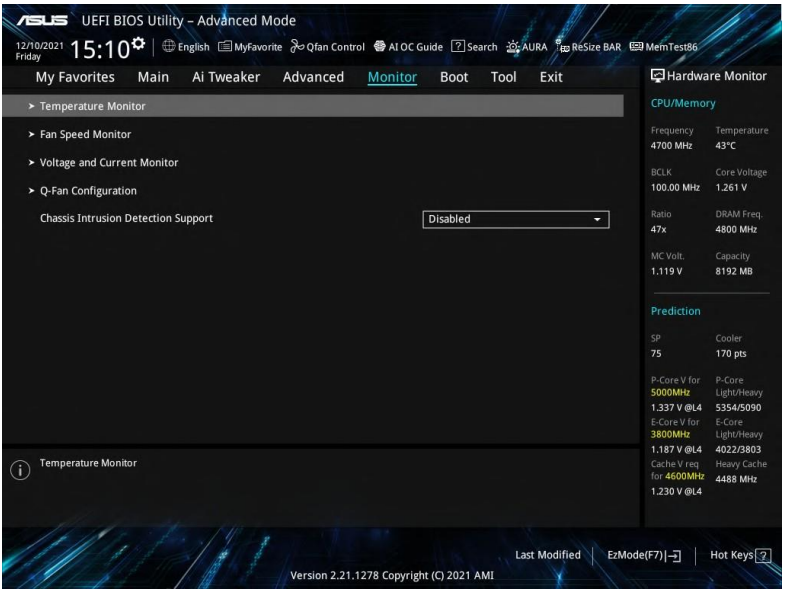


7. Monitor menu

The Monitor menu displays the system temperature/power status, and allows you to change the fan settings.

Scroll down to display the other BIOS items.

The settings and options of this menu may vary depending on your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.



Temperature Monitor

CPU Temperature, CPU Package Temperature, MotherBoard Temperature, VRM Temperature, Chipset Temperature, T_Sensor Temperature, DIMM A1-2 Temperature, DIMM B1-2 Temperature [xxx°C/xxx°F]

The onboard hardware monitor automatically detects and displays the temperatures for the different components. Select **[Ignore]** if you do not wish to display the detected temperatures.

Fan Speed Monitor

CPU Fan Speed, CPU Optional Fan Speed, Chassis Fan 1-5 Speed, AIO PUMP Speed [xxxx RPM]

The onboard hardware monitor automatically detects and displays the fan speeds in rotations per minute (RPM). If the fan is not connected to the motherboard, the field shows N/A. Select **[Ignore]** if you do not wish to display the detected speed.

Voltage and Current Monitor

CPU Core Voltage, 12V Voltage, 5V Voltage, 3.3V Voltage, Memory Controller Voltage [x.xxx V]

The onboard hardware monitor automatically detects the voltage output through the onboard voltage regulators. Select **[Ignore]** if you do not want to detect this item.

CPU Core Current [xx A]

The onboard hardware monitor automatically detects the current output. Select **[Ignore]** if you do not want to detect this item.

Q-Fan Configuration

AI Cooling

ASUS AI Cooling will automatically manage and control all motherboard fans, ensuring the most efficient settings are set depending on the current system load and temperature. When you enable this function, AI Cooling function will try to lower fan speed to decrease fan noise without compromising current performance. You can keep track of fan performance via the ASUS Fan Xpert software with a blue dot in the Fan curve chart.
Configuration options: [Enabled] [Disabled]

Q-Fan Tuning

Click this item to automatically detect the lowest speed and configure the minimum duty cycle for each fan.

The process may take 2 to 5 minutes. DO NOT shut down or reset your system during the tuning process.

CPU Q-Fan Control

Allows you to set the CPU Q-Fan operating mode.

[Auto Detect]	Detects the type of installed fan/pump and automatically switches the control modes.
[DC Mode]	Enables the Q-Fan Control feature in DC mode for 3-pin fan/pump.
[PWM Mode]	Enables the Q-Fan Control feature in PWM mode for 4-pin fan/pump.

CPU Fan Profile

Allows you to set the appropriate performance level of the assigned fan/pump. When selecting **[Manual]**, we suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty.
Configuration options: [Standard] [Silent] [Turbo] [Full Speed] [Manual]

The following items appear only when **CPU Fan Profile** is set to **[Standard]**, **[Silent]**, **[Turbo]**, or **[Manual].**

CPU Fan Step Up

Step up allows you to adjust how quickly the fan rotation speed changes, with level 0 being an instantaneous change in speed. The higher the level, the slower the change in speed, and may also result in less noise, but this will also cause slower heat dissipation.
Configuration options: [Level 0] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5]

CPU Fan Step Down

Step down allows you to adjust how quickly the fan rotation speed changes, with level 0 being an instantaneous change in speed. The higher the level, the slower the change in speed, and may also result in less noise, but this will also cause slower heat dissipation.
Configuration options: [Level 0] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5]

CPU Fan Speed Low Limit

Allows you to set the lower speed limit for assigned fan/pump. A warning message will appear when the limit is reached; the warning message will not appear if **[Ignore]** is selected.
Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

The following items appear only when **CPU Fan Profile** is set to **[Manual].**

CPU Fan Upper Temperature

Configure the fan/pump upper temperature to make assigned fan/pump operate at the max. duty cycle when the source temperature reaches the limit. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the upper temperature.

The fan/pump upper temperature cannot be lower than the fan/pump lower temperature.

CPU Fan Max. Duty Cycle (%)

Set the maximum fan/pump duty cycle of the assigned fan/pump for when the source temp. reaches the upper limit. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the fan/pump maximum duty cycle.

CPU Fan Middle Temperature

Configure the fan/pump middle temperature to make assigned fan/pump operate at the mid. duty cycle when the source temperature is higher than the limit. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the middle temperature.

CPU Fan Middle. Duty Cycle (%)

Set the middle fan/pump duty cycle of the assigned fan/pump for when the source temp. exceeds the middle temperature. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the fan/pump middle duty cycle.

CPU Fan Lower Temperature

Configure the fan/pump lower temperature to make assigned fan/pump operate at the min. duty cycle when the source temperature is lower than the limit. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the lower temperature.

CPU Fan Min. Duty Cycle(%)

Set the middle fan/pump duty cycle of the assigned fan/pump for when the source temp. is lower than the lower temperature. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the fan/pump minimum duty cycle.

Chassis Fan(s) Configuration

Chassis Fan 1-5 Q-Fan Control

Allows you to set the Chassis Fan 1-5 operating mode.

[Auto Detect]	Detects the type of installed fan/pump and automatically switches the control modes.
[DC Mode]	Enables the Q-Fan Control feature in DC mode for 3-pin fan/pump.
[PWM Mode]	Enables the Q-Fan Control feature in PWM mode for 4-pin fan/pump.

Chassis Fan 1-5 Profile

Allows you to set the appropriate performance level of the assigned fan/pump. When selecting **[Manual]**, we suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty.
Configuration options: [Standard] [Silent] [Turbo] [Full Speed] [Manual]

The following items appear only when **CPU Fan 1-5 Profile** is set to **[Standard]**, **[Silent]**, **[Turbo]**, or **[Manual].**

Chassis Fan 1-5 Q-Fan Source

The assigned fan/pump will be controlled according to the selected temperature source.
Configuration options: [CPU] [MotherBoard] [VRM] [Chipset] [T_Sensor] [Multiple Sources]

For Multiple Sources, select up to three temperature sources and the fan will automatically change based on the highest temperature.

Chassis Fan 1-5 Step Up

Step up allows you to adjust how quickly the fan rotation speed changes, with level 0 being an instantaneous change in speed. The higher the level, the slower the change in speed, and may also result in less noise, but this will also cause slower heat dissipation.
Configuration options: [Level 0] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5]

Chassis Fan 1-5 Step Down

Step down allows you to adjust how quickly the fan rotation speed changes, with level 0 being an instantaneous change in speed. The higher the level, the slower the change in speed, and may also result in less noise, but this will also cause slower heat dissipation.
Configuration options: [Level 0] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5]

Chassis Fan 1-5 Speed Low Limit

Allows you to set the lower speed limit for assigned fan/pump. A warning message will appear when the limit is reached; the warning message will not appear if **[Ignore]** is selected.
Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

The following items appear only when **Chassis Fan 1-5 Profile** is set to **[Manual].**

Chassis Fan 1-5 Upper Temperature

Configure the fan/pump upper temperature to make assigned fan/pump operate at the max. duty cycle when the source temperature reaches the limit. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the upper temperature.

The fan/pump upper temperature cannot be lower than the fan/pump lower temperature.

Chassis Fan 1-5 Max. Duty Cycle (%)

Set the maximum fan/pump duty cycle of the assigned fan/pump for when the source temp. reaches the upper limit. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the fan/pump maximum duty cycle.

Chassis Fan 1-5 Middle Temperature

Configure the fan/pump middle temperature to make assigned fan/pump operate at the mid. duty cycle when the source temperature is higher than the limit. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the middle temperature.

Chassis Fan 1-5 Middle. Duty Cycle (%)

Set the middle fan/pump duty cycle of the assigned fan/pump for when the source temp. exceeds the middle temperature. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the fan/pump middle duty cycle.

Chassis Fan 1-5 Lower Temperature

Configure the fan/pump lower temperature to make assigned fan/pump operate at the min. duty cycle when the source temperature is lower than the limit. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the lower temperature.

Chassis Fan 1-5 Min. Duty Cycle(%)

Set the middle fan/pump duty cycle of the assigned fan/pump for when the source temp. is lower than the lower temperature. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the fan/pump minimum duty cycle.

Allow Fan Stop

This function allows the fan to run at 0% duty cycle when the temperature of the source is dropped below the lower temperature.
Configuration options: [Disabled] [Enabled]

AIO Pump Q-Fan Control

Allows you to set the AIO Pump operating mode.

[Auto Detect]	Detects the type of installed fan/pump and automatically switches the control modes.
[DC Mode]	Enables the Q-Fan Control feature in DC mode for 3-pin fan/pump.
[PWM Mode]	Enables the Q-Fan Control feature in PWM mode for 4-pin fan/pump.

AIO Pump Profile

Allows you to set the appropriate performance level of the assigned fan/pump. When selecting **[Manual]**, we suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty.
Configuration options: [Standard] [Silent] [Turbo] [Full Speed] [Manual]

The following items appear only when **AIO Pump Profile** is set to **[Standard]**, **[Silent]**, **[Turbo]**, or **[Manual].**

AIO Pump Q-Fan Source

The assigned fan/pump will be controlled according to the selected temperature source.
Configuration options: [CPU] [MotherBoard] [VRM] [Chipset] [T_Sensor] [Multiple Sources]

AIO Pump Step Up

Step up allows you to adjust how quickly the fan rotation speed changes, with level 0 being an instantaneous change in speed. The higher the level, the slower the change in speed, and may also result in less noise, but this will also cause slower heat dissipation.
Configuration options: [Level 0] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5]

AIO Pump Step Down

Step down allows you to adjust how quickly the fan rotation speed changes, with level 0 being an instantaneous change in speed. The higher the level, the slower the change in speed, and may also result in less noise, but this will also cause slower heat dissipation.
Configuration options: [Level 0] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5]

AIO Pump Speed Low Limit

Allows you to set the lower speed limit for assigned fan/pump. A warning message will appear when the limit is reached; the warning message will not appear if **[Ignore]** is selected.
Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

The following items appear only when **AIO Pump Profile** is set to **[Manual].**

AIO Pump Upper Temperature

Configure the fan/pump upper temperature to make assigned fan/pump operate at the max. duty cycle when the source temperature reaches the limit. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the upper temperature.

The fan/pump upper temperature cannot be lower than the fan/pump lower temperature.

AIO Pump Max. Duty Cycle (%)

Set the maximum fan/pump duty cycle of the assigned fan/pump for when the source temp. reaches the upper limit. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the fan/pump maximum duty cycle.

AIO Pump Middle Temperature

Configure the fan/pump middle temperature to make assigned fan/pump operate at the mid. duty cycle when the source temperature is higher than the limit. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the middle temperature.

AIO Pump Middle. Duty Cycle (%)

Set the middle fan/pump duty cycle of the assigned fan/pump for when the source temp. exceeds the middle temperature. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the fan/pump middle duty cycle.

AIO Pump Lower Temperature

Configure the fan/pump lower temperature to make assigned fan/pump operate at the min. duty cycle when the source temperature is lower than the limit. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the lower temperature.

AIO Pump Min. Duty Cycle(%)

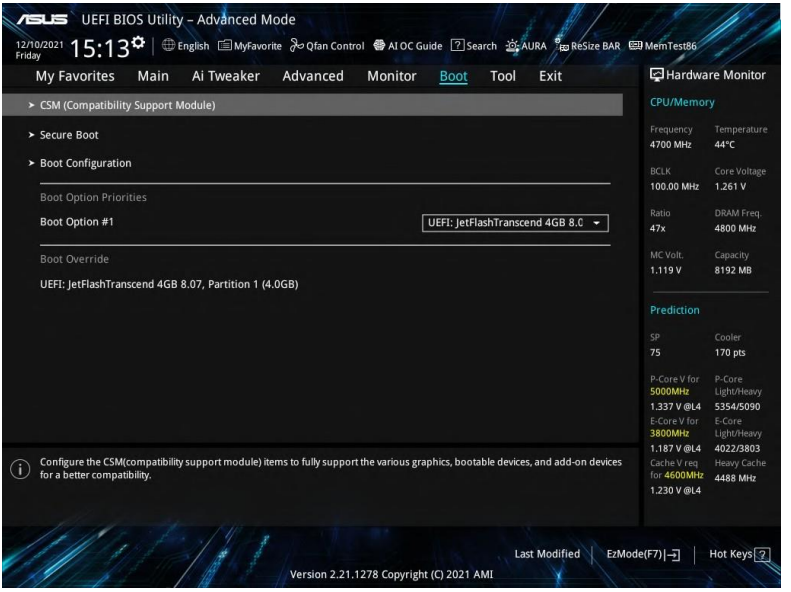
Set the middle fan/pump duty cycle of the assigned fan/pump for when the source temp. is lower than the lower temperature. We suggest raising your fan/pump duty to 100% if your CPU temperature exceeds 75°C. Please be noted CPU performance will throttle due to overheating with inefficient fan/pump duty. Use the <+> or <-> keys to adjust the fan/pump minimum duty cycle.

Chassis Intrusion Detection Support

Set this item to **[Enabled]** to enable the chassis intrusion detection function.
Configuration options: [Enabled] [Disabled]

8. Boot menu

The Boot menu items allow you to change the system boot options.



CSM (Compatibility Support Module)

Allows you to configure the CSM (Compatibility Support Module) items to fully support the various VGA, bootable devices and add-on devices for better compatibility.

Launch CSM will be set to **[Disabled]** and cannot be configured when using the integrated graphics.

Launch CSM

[Enabled] For better compatibility, enable the CSM to fully support the non-UEFI driver add-on devices or the Windows® UEFI mode.

[Disabled] Disable the CSM to fully support the non-UEFI driver add-on devices or the Windows® UEFI mode.

The following items appear only when **Launch CSM** is set to **[Enabled]**.

Boot Device Control

Allows you to select the type of devices that you want to boot.
Configuration options: [UEFI and Legacy OPROM] [Legacy OPROM only] [UEFI only]

Boot from Network Devices

Allows you to select the type of network devices that you want to launch.
Configuration options: [Ignore] [Legacy only] [UEFI only]

Boot from Storage Devices

Allows you to select the type of storage devices that you want to launch.
Configuration options: [Ignore] [Legacy only] [UEFI only]

Boot from PCI-E/PCI Expansion Devices

Allows you to select the type of PCI-E/PCI expansion devices that you want to launch.
Configuration options: [Ignore] [Legacy only] [UEFI only]

Secure Boot

Allows you to configure the Windows® Secure Boot settings and manage its keys to protect the system from unauthorized access and malwares during POST.

OS Type

[Windows UEFI Mode]	This item allows you to select your installed operating system. Execute the Microsoft® Secure Boot check. Only select this option when booting on Windows® UEFI mode or other Microsoft® Secure Boot compliant OS.
[Other OS]	Get the optimized function when booting on Windows® non-UEFI mode. Microsoft® Secure Boot only supports Windows® UEFI mode.

The Microsoft secure boot can only function properly on Windows UEFI mode.

Secure Boot Mode

This option allows you to select the Secure Boot mode from between Standard or Custom. In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication.
Configuration options: [Standard] [Custom]

The following item appears only when **Secure Boot Mode** is set to **[Custom]**.

Key Management

Install Default Secure Boot keys

Allows you to immediately load the default Security Boot keys, Platform key (PK), Key-exchange Key (KEK), Signature database (db), and Revoked Signatures (dbx). When the default Secure boot keys are loaded, the PK state will change from Unloaded mode to loaded mode.

Clear Secure Boot keys

This item appears only when you load the default Secure Boot keys. Allows you to clear all default Secure Boot keys.

Save all Secure Boot variables

Allows you to save all secure boot keys to a USB storage device.

PK Management

The Platform Key (PK) locks and secures the firmware from any permissible changes. The system verifies the PK before your system enters the OS.

Save To File

Allows you to save the PK to a USB storage device.

Set New key

Allows you to load the downloaded PK from a USB storage device.

Delete key

Allows you to delete the PK from your system. Once the PK is deleted, all the system's Secure Boot keys will not be active.
Configuration options: [Yes] [No]

The PK file must be formatted as a UEFI variable structure with time-based authenticated variable.

KEK Management

The KEK (Key-exchange Key or Key Enrollment Key) manages the Signature database (db) and Revoked Signature database (dbx).

Key-exchange Key (KEK) refers to Microsoft® Secure Boot Key-Enrollment Key (KEK).

Save to file

Allows you to save the KEK to a USB storage device.

Set New key

Allows you to load the downloaded KEK from a USB storage device.

Append Key

Allows you to load the additional KEK from a storage device for an additional db and dbx loaded management.

Delete key

Allows you to delete the KEK from your system.
Configuration options: [Yes] [No]

The KEK file must be formatted as a UEFI variable structure with time-based authenticated variable.

DB Management

The db (Authorized Signature database) lists the signers or images of UEFI applications, operating system loaders, and UEFI drivers that you can load on the single computer.

Save to file

Allows you to save the db to a USB storage device.

Set New key

Allows you to load the downloaded db from a USB storage device.

Append Key

Allows you to load the additional db from a storage device for an additional db and dbx loaded management.

Delete key

Allows you to delete the db file from your system.
Configuration options: [Yes] [No]

The db file must be formatted as a UEFI variable structure with time-based authenticated variable.

DBX Management

The dbx (Revoked Signature database) lists the forbidden images of db items that are no longer trusted and cannot be loaded.

Save to file

Allows you to save the dbx to a USB storage device.

Set New key

Allows you to load the downloaded dbx from a USB storage device.

Append Key

Allows you to load the additional dbx from a storage device for an additional db and dbx loaded management.

Delete key

Allows you to delete the dbx file from your system.
Configuration options: [Yes] [No]

The dbx file must be formatted as a UEFI variable structure with time-based authenticated variable.

Boot Configuration

Fast Boot

Allows you to enable or disable boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.
Configuration options: [Disabled] [Enabled]

The following item appears only when **Fast Boot** is set to **[Enabled]**.

Next Boot after AC Power Loss

[Normal Boot]	Returns to normal boot on the next boot after an AC power loss.
[Fast Boot]	Accelerates the boot speed on the next boot after an AC power loss.

Boot Logo Display

[Auto]	Automatically adjust the boot logo size for Windows requirements.
[Full Screen]	Maximize the boot logo size.
[Disabled]	Hide the logo during POST.

The following item appears only when **Boot Logo Display** is set to **[Auto]** or **[Full Screen]**.

Post Delay Time

Allows you to select a desired additional POST waiting time to easily enter the BIOS Setup. You can only execute the POST delay time during normal boot.
Configuration options: [0 sec] - [10 sec]

This feature only works when set under normal boot.

The following item appears only when **Boot Logo Display** is set to **[Disabled]**.

Post Report

Allows you to select a desired POST report waiting time or until ESC is pressed.
Configuration options: [1 sec] - [10 sec] [Until Press ESC]

Boot up NumLock State

Allows you to select the keyboard NumLock state.
Configuration options: [On] [Off]

Wait For 'F1' If Error

Allows your system to wait for the <F1> key to be pressed when error occurs.
Configuration options: [Disabled] [Enabled]

Option ROM Messages

[Force BIOS] The Option ROM Messages will be shown during the POST.
[Keep Current] Only the ASUS logo will be shown during the POST.

Interrupt 19 Capture

Enable this item to allow the option ROMs to trap the interrupt 19.
Configuration options: [Enabled] [Disabled]

AMI Native NVMe Driver Support

Allows you to enable or disable AMI Native NVMe driver.
Configuration options: [Disabled] [Enabled]

Setup Mode

[Advanced Mode] This item allows you to go to Advanced Mode of the BIOS after POST.
[EZ Mode] This item allows you to go to EZ Mode of the BIOS after POST.

Boot Sector (MBR/GPT) Recovery Policy

Allows you to set the Boot Sector Policy.
[Auto Recovery] Follow UEFI Rule.
[Local User Control] You can enter setup page and select Boot Sector (MBR/GPT) Recovery Policy to recovery MBR/GPT on the next boot time.

The following item appears only when **Boot Sector (MBR/GPT) Recovery Policy** is set to **[Local User Control]**.

Next Boot Recovery Action

Choose the (MBR/GPT) recovery action on the next boot.
Configuration options: [Skip] [Recovery]

Boot Option Priorities

These items specify the boot device priority sequence from the available devices. The number of device items that appears on the screen depends on the number of devices installed in the system.

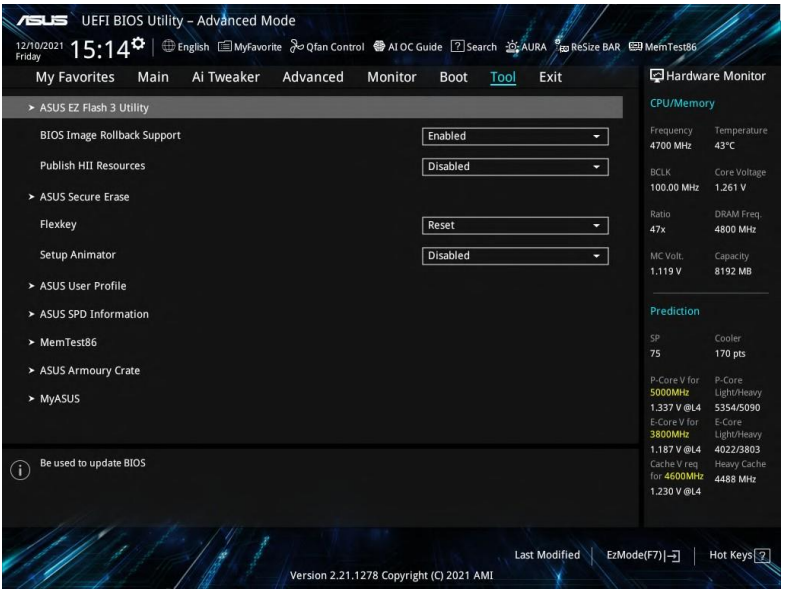
- To access Windows® OS in Safe Mode, press <F8 > after POST (Windows® 8 not supported).
- To select the boot device during system startup, press <F8> when ASUS Logo appears.

Boot Override

These item displays the available devices. The number of device items that appear on the screen depends on the number of devices installed in the system. Click an item to start booting from the selected device.

9. Tool menu

The Tool menu items allow you to configure options for special functions. Select an item then press <Enter> to display the submenu.



BIOS Image Rollback Support

[Enabled] Support roll back your BIOS to a previous version, but this setting violates the NIST SP 800-147 requirement.

[Disabled] Only support updating your BIOS to a newer version, and this setting meets the NIST SP 800-147 requirement.

Publish HII Resources

Configuration options: [Disabled] [Enabled]

Flexkey

[Reset] Reboots the system.

[Aura On/Off] Enable or Disable Aura LEDs. This setting does not sync with the BIOS/ software option.

[DirectKey] Boot directly into the BIOS.

Setup Animator

Allows you to enable or disable the Setup animator.
Configuration options: [Disabled] [Enabled]

9.1 ASUS EZ Flash 3 Utility

This item allows you to run ASUS EZ Flash 3. When you press <Enter>, a confirmation message appears. Use the left/right arrow key to select between [Yes] or [No], then press <Enter> to confirm your choice.

For more details, refer to section **ASUS EZ Flash 3**.

9.2 ASUS Secure Erase

SSD speeds may lower over time as with any storage medium due to data processing. Secure Erase completely and safely cleans your SSD, restoring it to factory performance levels.

To launch Secure Erase, click **Tool > ASUS Secure Erase** on the Advanced mode menu.

- The time to erase the contents of your SSD may take a while depending on its size. Do not turn off the system during the process.
- Secure Erase is only supported on Intel SATA port. For more information about Intel SATA ports, refer to section **Motherboard layout** in your user manual.

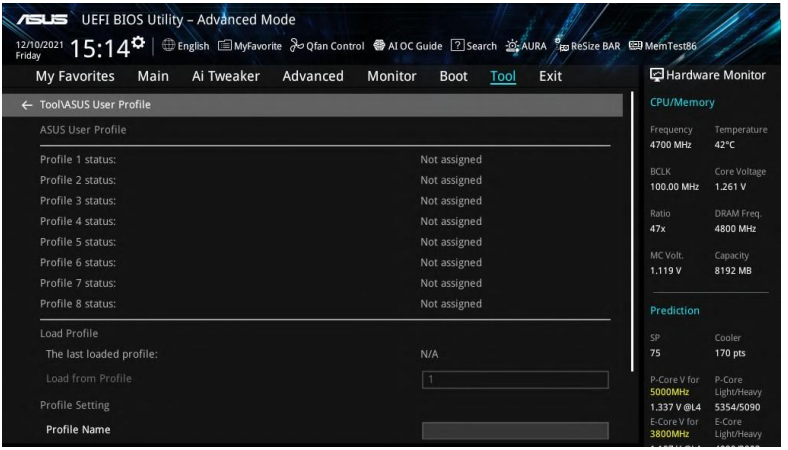
Displays the available SSDs

Status definition:

- **Frozen.** The frozen state is the result of a BIOS protective measure. The BIOS guards drives that do not have password protection by freezing them prior to booting. If the drive is frozen, a power off or hard reset of your PC must be performed to proceed with the Secure Erase.
- **Locked.** SSDs might be locked if the Secure Erase process is either incomplete or was stopped. This may be due to a third party software that uses a different password defined by ASUS. You have to unlock the SSD in the software before proceeding with Secure Erase.

9.3 ASUS User Profile

This item allows you to store or load multiple BIOS settings.



Load from Profile

Allows you to load the previous BIOS settings saved in the BIOS Flash. Key in the profile number that saved your BIOS settings, press <Enter>, and then select **Yes**.

- DO NOT shut down or reset the system while updating the BIOS to prevent the system boot failure!
- We recommend that you update the BIOS file only coming from the same memory/ CPU configuration and BIOS version.

Profile Name

Allows you to key in a profile name.

Save to Profile

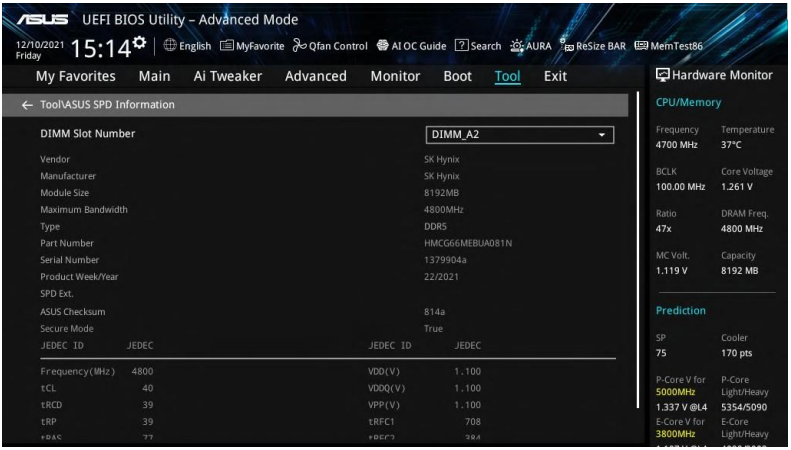
Allows you to save the current BIOS settings to the BIOS Flash, and create a profile. Key in a profile number from one to eight, press <Enter>, and then select **Yes**.

Load/Save Profile from/to USB Drive

Allows you to load or save profile from your USB drive, load and save profile to your USB drive.

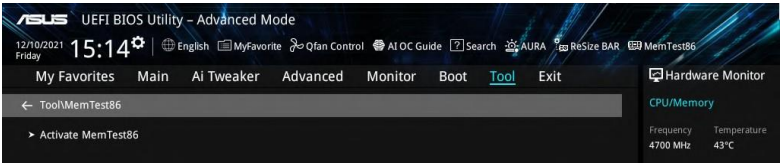
9.4 ASUS SPD Information

This item allows you to view the DRAM SPD information.



9.5 MemTest86

This item allows you to obtain a memory diagnosis.



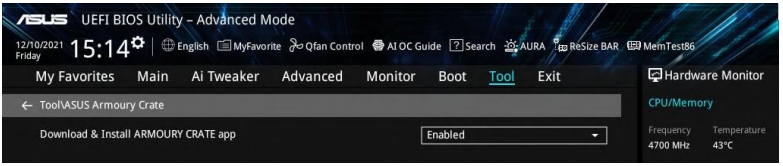
Activate MemTest86

Press <Enter> to open MemTest86 to perform and check testing results.

- Please save all changes made before using MemTest86.
- There will be a few seconds of loading time after pressing <Enter> on this option.

9.6 ASUS Armoury Crate

This item allows you to enable or disable downloading and installing of the Armoury Crate app in the Windows® OS. The Armoury Crate app can help you manage and download the latest drivers and utilities for your motherboard.



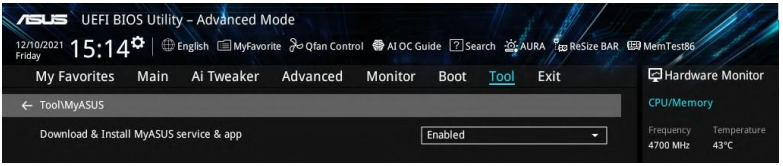
Download & Install ARMOURY CRATE app

Configuration options: [Disabled] [Enabled]

9.7 MyASUS

This item allows you to enable or disable downloading and installing of the MyASUS app in the Windows® OS.

The availability of this menu, as well as the settings and options may vary depending on your motherboard. Please refer to the BIOS of your motherboard for the actual settings and options.

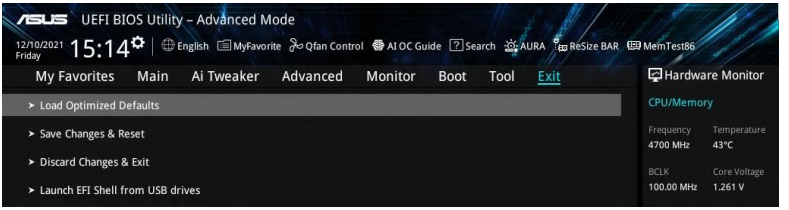


Download & Install MyASUS service & app

Configuration options: [Disabled] [Enabled]

10. Exit menu

The Exit menu items allow you to load the optimal default values for the BIOS items, and save or discard your changes to the BIOS items. You can access the EZ Mode from the Exit menu.



Load Optimized Defaults

This option allows you to load the default values for each of the parameters on the Setup menus. When you select this option or if you press <F5>, a confirmation window appears. Select **OK** to load the default values.

Save Changes & Reset

Once you are finished making your selections, choose this option from the Exit menu to ensure the values you selected are saved. When you select this option or if you press <F10>, a confirmation window appears. Select **OK** to save changes and exit.

Discard Changes & Exit

This option allows you to exit the Setup program without saving your changes. When you select this option or if you press <Esc>, a confirmation window appears. Select **Yes** to discard changes and exit.

Launch EFI Shell from USB drives

This option allows you to attempt to launch the EFI Shell application (shellx64.efi) from one of the available filesystem devices.

11. Updating BIOS

The ASUS website publishes the latest BIOS versions to provide enhancements on system stability, compatibility,and performance. However, BIOS updating is potentially risky. If there is no problem using the current version of BIOS, DO NOT manually update the BIOS. Inappropriate BIOS updating may result to system's failure to boot. Carefully follow the instructions in this chapter to update your BIOS when necessary.

Visit http://www.asus.com to download the latest BIOS file for this motherboard.

The following utilities allow you to manage and update the motherboard BIOS setup program.

1. ASUS EZ Flash 3: Updates the BIOS using a USB flash drive.
2. ASUS CrashFree BIOS 3: Restores the BIOS using the motherboard support DVD or a USB flash drive when the BIOS file fails or gets corrupted.

11.1 ASUS EZ Flash 3

ASUS EZ Flash 3 allows you to download and update to the latest BIOS using a USB drive.

To update the BIOS:

1. Insert the USB flash drive that contains the latest BIOS file to a USB port.
2. Enter the Advanced Mode of the BIOS setup program. Go to the **Tool** menu to select **ASUS EZ Flash 3 Utility** and press <Enter>.
3. Press Left arrow key to switch to the Drive field.
4. Press the Up/Down arrow keys to find the USB flash drive that contains the latest BIOS, and then press <Enter>.
5. Press Right arrow key to switch to the Folder Info field.
6. Press the Up/Down arrow keys to find the BIOS file, and then press <Enter> to perform the BIOS update process. Reboot the system when the update process is done.

11.2 ASUS CrashFree BIOS 3

The ASUS CrashFree BIOS 3 utility is an auto recovery tool that allows you to restore the BIOS file when it fails or gets corrupted during the updating process. You can restore a corrupted BIOS file using the motherboard support DVD or a USB flash drive that contains the BIOS file.

The BIOS file in the motherboard support DVD may be older than the BIOS file published on the ASUS official website. If you want to use the newer BIOS file, download the file at https://www.asus.com/support/ and save it to a USB flash drive.

Recovering the BIOS

To recover the BIOS:

1. Turn on the system.
2. Insert the motherboard support DVD to the optical drive, or the USB flash drive containing the BIOS file to the USB port.
3. The utility automatically checks the devices for the BIOS file. When found, the utility reads the BIOS file and enters ASUS EZ Flash 3 automatically.
4. The system requires you to enter BIOS Setup to recover the BIOS setting. To ensure system compatibility and stability, we recommend that you press <F5> to load default BIOS values.

DO NOT shut down or reset the system while updating the BIOS! Doing so can cause system boot failure!

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ASUS WebStorage

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