PRIME
X299-A II

Motherboard

E15936
Revised Edition V2
October 2019

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Contents

Chapter 3: BIOS Setup

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.

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:

1. **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.

2. **Chapter 2: Basic Installation**

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

3. **Chapter 3: BIOS Setup**

   This chapter tells how to change system settings through the BIOS Setup menus. Detailed descriptions of the BIOS parameters are also provided.

4. **Chapter 4: RAID Support**

   This chapter describes the RAID configurations.

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.

DANGER/WARNING: Information to prevent injury to yourself when trying to complete a task.

CAUTION: Information to prevent damage to the components 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.

Typography

Bold text	Indicates a menu or an item to select.
Italics	Used to emphasize a word or a phrase.
<Key>	Keys enclosed in the less-than and greater-than sign means that you must press the enclosed key.
	Example: <Enter> means that you must press the Enter or Return key.
<Key1> + <Key2> + <Key3>	If you must press two or more keys simultaneously, the key names are linked with a plus sign (+).

PRIME X299-A II specifications summary

CPU	Optimized for Intel® Core™ X-Series 10000 Processors Family, Intel® Core™ X-Series Processors Family (6-core above) on LGA 2066 Socket*
	Supports Intel® Virtual RAID on CPU (Intel® VROC)
	Supports 14nm CPU
	Supports Intel® Turbo Boost Max Technology 3.0**
	* Refer to www.asus.com for Intel® CPU support list.
	** Support of these features depends on the CPU types.
Chipset	Intel® X299 Chipset
Memory	**Intel® Core™ i9 10000 X-Series CPU**
	8 x DIMM, max. 256GB, DDR4 4266+(O.C.) / 4133(O.C.) / 4000(O.C.) / 3866(O.C.) / 3800(O.C.) / 3733(O.C.) / 3600(O.C.) / 3466(O.C.) / 3400(O.C.) / 3333(O.C.) / 3300(O.C.) / 3200(O.C.) / 3000(O.C.) / 2933 / 2800 / 2666 / 2400 / 2133 MHz, non-ECC, un-buffered memory*
	Intel® Core™ i9 9000/7000 and i7 9000/7000 X-Series CPU
	8 x DIMM, max. 256GB, DDR4 4266(O.C.) / 4133(O.C.) / 4000(O.C.) / 3600(O.C.) / 3400(O.C.) / 3333(O.C.) / 3300(O.C.) / 3200(O.C.) / 3000(O.C.) / 2800(O.C.) / 2666 / 2400 / 2133 MHz, non-ECC, un-buffered memory*
	Quad channel memory architecture
	Supports Intel® Extreme Memory Profile (XMP)
	* Hyper DIMM support is subject to the physical characteristics of individual CPUs. Please refer to Memory QVL (Qualified Vendors List) for details.
	* If you are using a DIMM with a higher supported frequency than the CPU BCLK frequency, please enter BIOS and go to Ai Tweaker > DRAM Frequency and set it to the memory frequency of your DIMM. Please refer to BIOS Setup section for more information on navigation BIOS.
Expansion slots	**48-Lane CPU (Intel® Core™ i9 10000 X-Series CPU)**
	3 x PCIe 3.0/2.0 x16 slots (single@x16, dual@x16/x16, triple@x16/x16/x8 mode)
	2 x PCIe 3.0/2.0 x1 slots (compatible with PCIe x1 devices)*
	44-Lane CPU (Intel® Core™ i9 9000/7000 and i7 9000 X-Series CPU)
	3 x PCIe 3.0/2.0 x16 slots (single@x16, dual@x16/x16, triple@x16/x16/x8 mode)
	2 x PCIe 3.0/2.0 x1 slots (compatible with PCIe x1 devices)*
	28-Lane CPU (Intel® Core™ i7 7000 X-Series CPU)
	2 x PCIe 3.0/2.0 x16 slots (single@x16, dual@x16/x8 mode)**
	2 x PCIe 3.0/2.0 x1 slots (compatible with PCIe x1 devices)*
	* PCIEX1_1 shares bandwidth with Wi-Fi E Key. PCIEX1_1 is disabled by default. PCIEX1_2 shares bandwidth with SATA6G_7. PCIEX1_2 is disabled by default.
	** PCIEX16_3 will be disabled when using 28-lane CPU.
Multi-GPU support	Supports NVIDIA® 2-Way & 3-Way/Quad-GPU SLI® Technology
	Supports AMD 2-Way & 3-Way/Quad-GPU CrossFireX™ Technology*
	* This support depends on the CPU types and VGA cards.

PRIME X299-A II specifications summary

Storage	**Intel® Core™ i9 10000 X-Series Processors with Intel® Virtual RAID on CPU (VROC) support** - 1 x M.2_1 Socket 3 with M key, type 2242/2260/2280/22110 storage devices support (PCIe 3.0 x 4 mode) - 1 x M.2_3 Socket 3 with M key, type 2242/2260/2280/22110 storage devices support (PCIe 3.0 x 4 mode) **Intel® Core™ i9 9000/7000 and i7 9000/7000 X-Series Processors with Intel® Virtual RAID on CPU (VROC) support** - 1 x M.2_3 Socket 3 with M key, type 2242/2260/2280/22110 storage devices support (PCIe 3.0 x 4 mode) **Intel® X299 Chipset with Intel® Rapid Storage Technology (RAID 0, 1, 5, 10) support** - 1 x M.2_1 Socket 3 with M key, type 2242/2260/2280/22110 storage devices support (PCIe 3.0 x 4 mode)* - 1 x M.2_2 Socket 3 with vertical M key, type 2242/2260/2280/22110 (Support both SATA & PCIe 3.0 x 4 mode)** - 8 x SATA 6.0 Gb/s ports*** * **The M.2_1 PCIe mode source is from X299 Chipset when using 44 and 28-lane CPU.** ** **The M.2_2 socket shares bandwidth with SATA6G_1 when using M.2 SATA devices.** *** **The SATA6G_7 shares bandwidth with PCIEX1_2.** - The M.2 PCIe mode source from X299 Chipset supports Intel® Optane™ Memory
LAN	**Intel® I219-V Gigabit LAN** ASUS LANGuard ASUS Turbo LAN Utility
Wireless & Bluetooth	1 x M.2 Socket (Key E), supports type 2230 PCIe Wi-Fi/BT module* * **The Wi-Fi/BT module is purchased separately.** ** **The Wi-Fi E key shares bandwidth with PCIEX1_1.**

PRIME X299-A II specifications summary

Audio	**Realtek® S1220A 8-channel high definition audio CODEC featuring Crystal Sound 3** - Impedance sense for front and rear headphone outputs - High quality 120dB SNR stereo playback output and 113dB SNR recording input - Internal audio Amplifier to enhance the highest quality sound for headphone and speakers - Power pre-regulator reduces power input noise to ensure consistent performance - Unique de-pop circuit to reduce start-up popping noise to audio outputs - Separate layer for left and right track, ensuring both sound deliver equal quality - Audio shielding ensures precise analog/digital separation and greatly reduced multi-lateral interference - Premium Japan-made audio capacitors - Supports up to 32-Bit/192kHz playback* - Supports jack-detection, multi-streaming, front panel jack-retasking (MIC) - Optical S/PDIF out port at back I/O **Audio Features** - DTS: X® Ultra *** Due to limitations in HDA bandwidth, 32-Bit/192kHz is not supported for 8-Channel audio. 32-Bit/192kHz is only available under Windows® 10.**
USB	**Intel® X299 Chipset** - 8 x USB 3.2 Gen 1 ports (4 ports at back panel, 4 ports at mid-board) - 6 x USB 2.0 ports (2 ports at back panel, 4 ports at mid-board) **ASMedia® USB 3.2 Gen 2 controllers** - 1 x USB 3.2 Gen 2 front panel Type-C™ connector - 2 x USB 3.2 Gen 2 ports at back panel (1 x USB Type-C™, 1 x Type A)

PRIME X299-A II specifications summary

ASUS Exclusive Features	**\<Performance\>** **5-Way Optimization with AI Overclocking** - AI overclocking: Quickly optimizes your CPU performance based on the CPU and cooler, achieving results that are extremely close to manual tuning by experts. - DIGI+ Power Control - TPU Insight - EPU Guidance - Fan Xpert 4 with FAN Extension Card II support - Turbo Core App **OC Design: ASUS PRO Clock II Technology** **UEFI BIOS** - AI Overclocking Guide - CrashFree BIOS 3 - EZ Flash 3 - EZ Tuning Wizard - BIOS FlashBack™ **\<Connectivity\>** - Intel® VROC Ready - Front USB 3.2 Gen 2 Support - USB 3.2 Gen 2 Hub Multiple-IN Support **\<Gaming\>** **Armoury Crate** - AURA SYNC - ASUS NODE: Hardware control interface - Turbo LAN **\<EZ DIY\>** **Pre-mounted I/O Shield** **Q-Design** - ASUS Q-Code - ASUS Q-Connector - ASUS Q-DIMM - ASUS Q-LED (CPU, DRAM, VGA, Boot Device LED) - ASUS Q-Slot

(continued on the next page)

PRIME X299-A II specifications summary

Special Features	**ASUS SafeSlot** - Protect your graphics card investment **ASUS 5X Protection III** - ASUS SafeSlot Core: Fortified PCIe with solid soldering - ASUS LANGuard: Protects against LAN surges, lightning strikes and static-electricity discharges! - ASUS Overvoltage Protection: World-class circuit-protecting power design - ASUS Stainless-Steel Back I/O: 3X corrosion-resistance for greater durability! - DIGI+ VRM AI Suite 3 Ai Charger
Thermal Design	- ASUS Fan Xpert 4 - Stylish heatsink and 22110 M.2 heatsink design
Back Panel I/O Ports	1 x PS/2 keyboard/mouse combo port(s) 1 x Optical S/PDIF out 1 x Intel® LAN (RJ45) port (black) 2 x USB 3.2 Gen 2 ports (1 x USB Type-C™, 1 x USB Type-A) 4 x USB 3.2 Gen 1 ports 2 x USB 2.0 ports 1 x BIOS FlashBack™ button 8-channel Audio I/O ports

PRIME X299-A II specifications summary

Internal I/O Connectors	1 x USB 3.2 Gen 2 front panel USB Type-C™ connector
	2 x USB 3.2 Gen 1 connectors support additional 4 USB ports (19-pin)
	2 x USB 2.0 connectors support additional 4 USB ports
	1 x M.2_1 Socket 3 with M key, type 2242/2260/2280/22110 storage devices support (PCIe 3.0 x 4 mode from CPU or X299 Chipset)
	1 x M.2_2 Socket 3 with vertical M key, type 2242/2260/2280/22110 storage devices support (both SATA & PCIe 3.0 x 4 mode from X299 Chipset)
	1 x M.2_3 Socket 3 with M key, type 2242/2260/2280/22110 storage devices support (PCIe 3.0 x 4 mode from CPU)
	8 x SATA 6.0Gb/s connectors
	1 x 5-pin Thunderbolt header for ASUS ThunderboltEX series support
	1 x 4-pin W_PUMP+ connector
	1 x 4-pin AIO_PUMP Fan connector
	1 x 4-pin CPU Fan connector
	1 x 4-pin CPU_OPT Fan connector
	2 x 4-pin Chassis Fan connectors
	1 x 4-pin M.2 Fan connector
	1 x 2-pin Thermal sensor header
	1 x NODE connector supports FAN Extension Card II
	1 x 24-pin EATX Power connector
	2 x 8-pin EATX 12V Power connector
	2 x RGB headers
	1 x Addressable Gen 2 header
	1 x Front panel audio connector (AAFP)
	1 x VROC_HW_KEY
	1 x System Panel connector (Q-Connector) (FlexKey)
	1 x 3-pin CPU_OV header
	1 x Q_Code
	1 x Clear CMOS header
	1 x Power-on button

PRIME X299-A II specifications summary

BIOS	128 Mb Flash ROM, UEFI AMI BIOS, PnP, WfM2.0, SM BIOS 3.2, ACPI 6.2
Manageability	WfM 2.0, WOL by PME, PXE
Support DVD	Drivers ASUS Utilities EZ Update Anti-virus software (OEM version)
Operating System	Windows® 10 64-bit
Form Factor	ATX Form Factor, 12"x 9.6" (30.5 cm x 24.4 cm)

- Specifications are subject to change without notice.
- Visit the ASUS website for the software manual.

Package contents

Check your motherboard package for the following items.

Motherboard	ASUS PRIME X299-A II motherboard
Cables	4 x Serial ATA 6.0 Gb/s cables
	1 x Addressable LED extension cable
	1 x RGB LED extension cable
Accessories	1 x FAN holder
	1 x Q-Connector
	1 x M.2 vertical bracket
	1 x M.2 screw package
Application DVD	Motherboard support DVD
Documentation	User manual

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

Installation tools and components
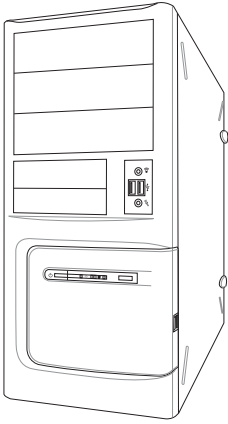
PC chassis
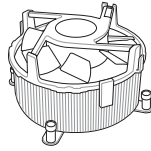
Intel® LGA 2066 compatible CPU Fan
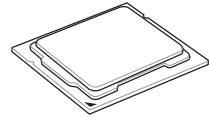
Intel® LGA 2066 CPU
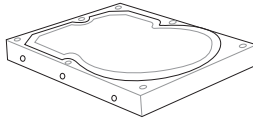
SATA hard disk drive

Phillips (cross) screwdriver
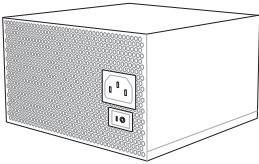
Power supply unit
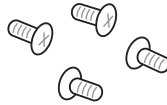
1 bag of screws
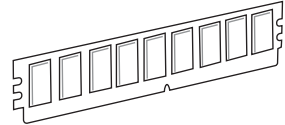
DIMM
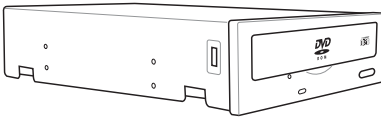
SATA optical disc drive (optional)
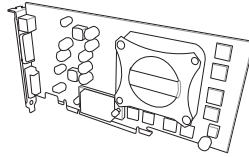
Graphics card

M.2 SSD module (optional)

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
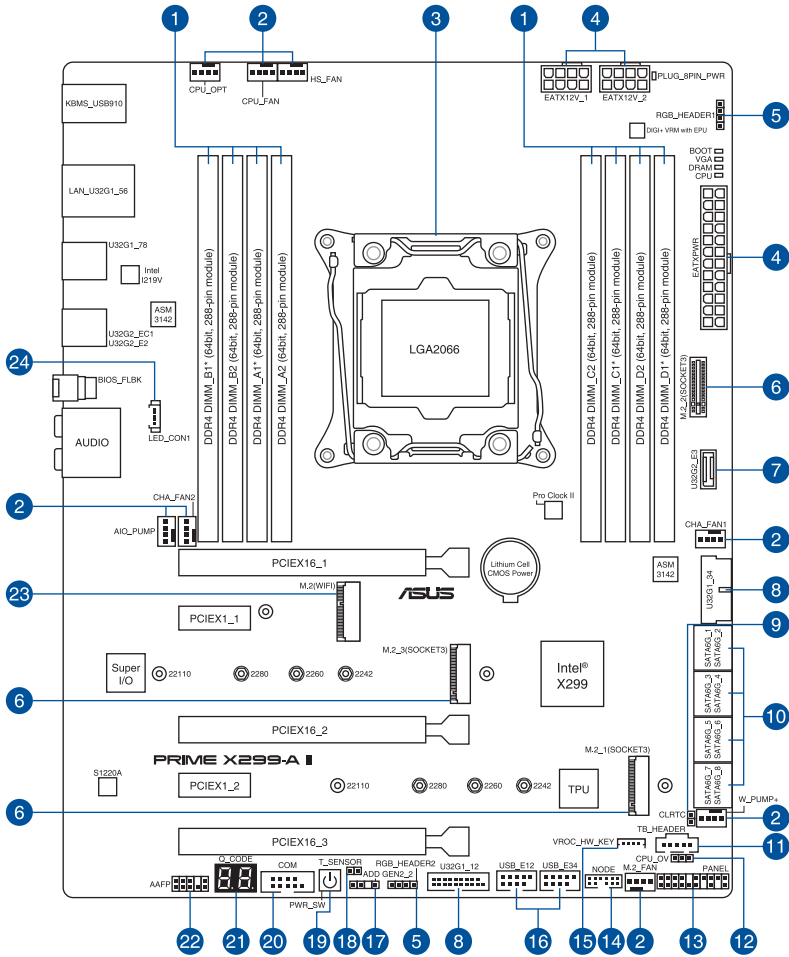
Refer to **Internal connectors** and **Rear panel features** for more information.

Layout contents	Page
1. DIMM slots	1-5
2. Fan and pump connectors	1-22
3. CPU socket	1-4
4. Power connectors	1-23
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9. Clear RTC RAM jumper	1-10
10. SATA 6 Gb/s connectors	1-13
11. Thunderbolt connector	1-14
12. CPU Over Voltage jumper	1-11
13. System Panel connector	1-15
14. Node connector	1-14
15. VROC Key connector	1-16
16. USB 2.0 connector	1-16
17. Addressable RGB LED connector	1-19
18. Thermal sensor connector	1-20
19. Power button	1-9
20. Serial port connector	1-21
21. Q-Code LED	1-12
22. Front Panel Audio connector	1-21
23. M.2 Wi-Fi slot	1-25
24. Rear I/O Cover LED connector	1-20

1.3 Central Processing Unit (CPU)

The motherboard comes with a surface mount LGA2066 socket designed for the Intel® Core™ X-series Processors.
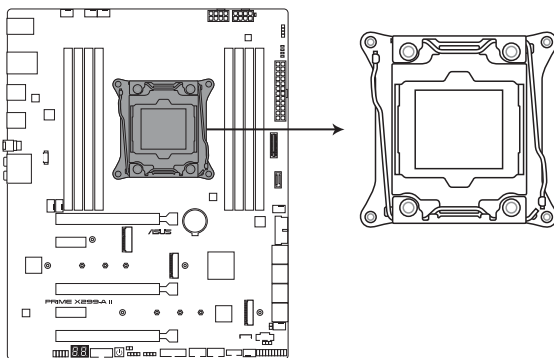
PRIME X299-A II CPU LGA2066 Socket

- Ensure that you install the correct CPU designed for LGA2066 socket only. DO NOT install a CPU designed for other sockets on the LGA2066 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 LGA2066 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.

1.4 System memory

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.

DIMM_B1*
DIMM_B2
DIMM_A1*
DIMM_A2
DIMM_C2
DIMM_C1*
DIMM_D2
DIMM_D1*
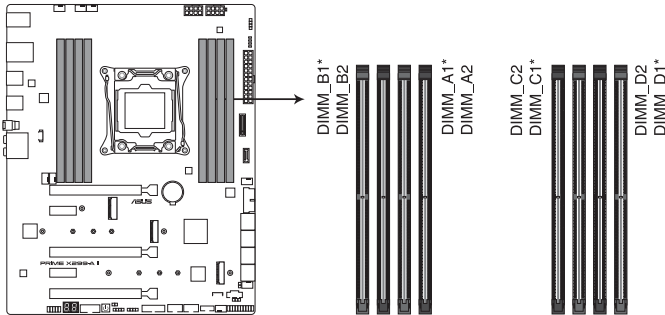
PRIME X299-A II 288-pin DDR4 DIMM socket

Recommended memory configurations

Intel® Core™ X-series Processors (6-core or above)

DIMM_C1*

DIMM_A1*
DIMM_C1*

DIMM_B1*
DIMM_A1*
DIMM_C1*
DIMM_D1*

DIMM_B1*
DIMM_A1*
DIMM_A2
DIMM_C2
DIMM_C1*
DIMM_D1*

DIMM_B1*
DIMM_B2
DIMM_A1*
DIMM_A2
DIMM_C2
DIMM_C1*
DIMM_D2
DIMM_D1*
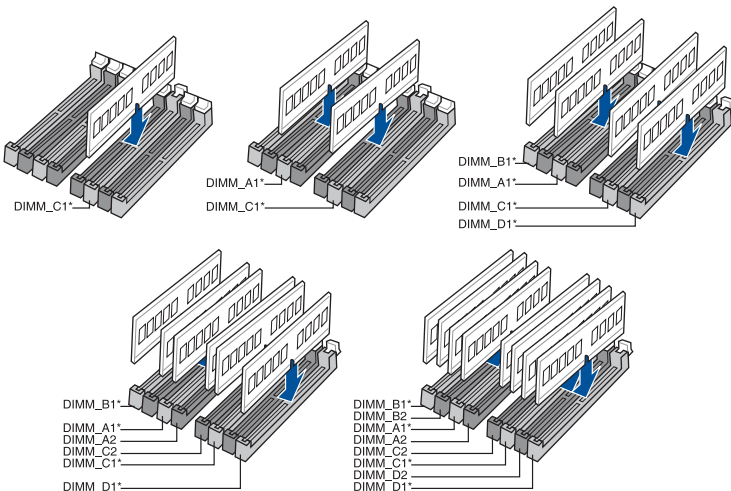
Memory configurations

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

- 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.

1.5 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.
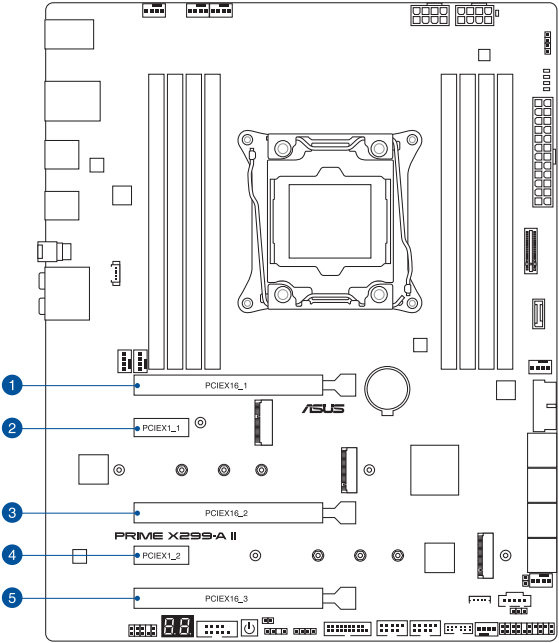
48 and 44-Lane CPUs

Slot Description	Single VGA	Dual VGA	Triple VGA
1. PCIEX16_1	X16	X16	X16
2. PCIEX1_1	-	-	-
3. PCIEX16_2	-	X16	X16
4. PCIEX1_2	-	-	-
5. PCIEX16_3	-	-	X8

28-Lane CPUs

Slot Description	Single VGA	Dual VGA
1. PCIEX16_1	X16	X16
2. PCIEX1_1	-	-
3. PCIEX16_2	-	X8
4. PCIEX1_2	-	-
5. PCIEX16_3	-	-

- We recommend that you provide sufficient power when running CrossFireX™ or SLI® mode.

- Ensure to connect both 8-pin power plugs when running CrossFireX™ or SLI® mode.

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

1.6 Onboard buttons

1.   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).

PWR_SW
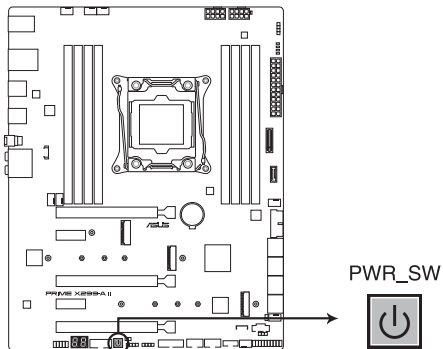
PRIME X299-A II Power on button

The button also lights up when the system is plugged to a power source, indicating that you should shut down the system and unplug the power cable before removing or installing any motherboard component.

1.7 Onboard jumpers

1. **Clear RTC RAM jumper**

   The Clear RTC RAM jumper allows you to clear the Real Time Clock (RTC) RAM in the CMOS, which contains the date, time, system passwords, and system setup parameters.

CLRTC
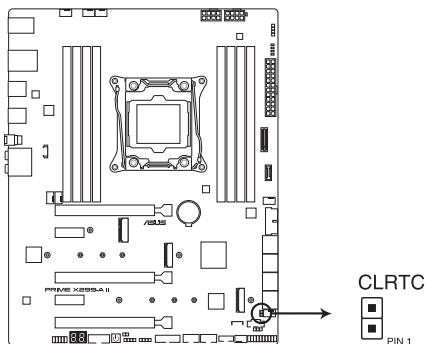
PIN 1

PRIME X299-A II Clear RTC RAM jumper

To erase the RTC RAM:

1. Turn OFF the computer and unplug the power cord.

2. Short-circuit pin 1-2 with a metal object or jumper cap for about 5-10 seconds.

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.

2. CPU Over Voltage jumper

The CPU Over Voltage jumper allows you to set a higher CPU voltage for a flexible overclocking system (depending on the type of the installed CPU). Set to pins 2-3 to increase the CPU voltage setting, or set to pins 1-2 to use the default CPU voltage setting.

CPU_OV

1 2   2 3

Disable   Enable
(default setting)
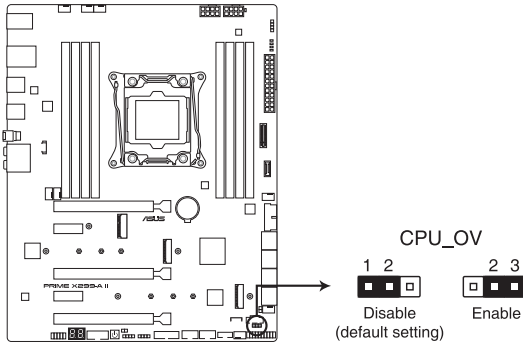
PRIME X299-A II CPU Over Voltage jumper

1.8   Onboard LEDs

1.   **Q LEDs**

The Q LEDs check key components (CPU, DRAM, VGA, and booting devices) during the motherboard booting process. If an error is found, the critical component's LED stays lit up until the problem is solved.

▢ BOOT (YELLOW GREEN)
▢ VGA (WHITE)
▢ DRAM (YELLOW)
▢ CPU (RED)
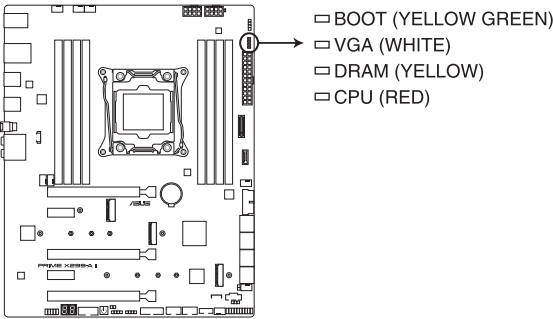
PRIME X299-A Ⅱ Q LEDs

> The Q LEDs provide the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.

2.   **Q-Code LED**

The Q-Code LED design provides you with a 2-digit error code that displays the system status.
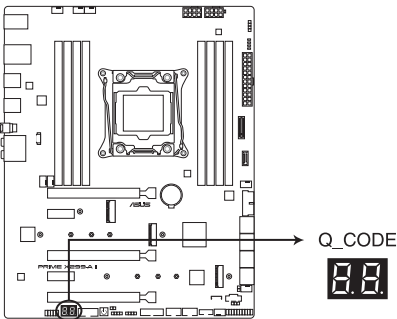
Q_CODE

PRIME X299-A Ⅱ Q-Code LED

> • The Q-Code LEDs provide the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.
>
> • Please refer to the Q-Code table in the **Appendix** section for more details.

1.9   Internal connectors

1.   SATA 6 Gb/s connectors

The SATA 6 Gb/s connector allows you to connect SATA devices such as optical disc drives and hard disk drives via a SATA cable.

PRIME X299-A II SATA 6 Gb/s connector
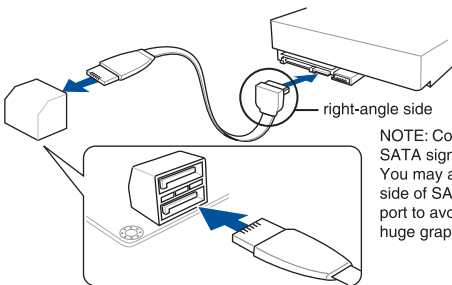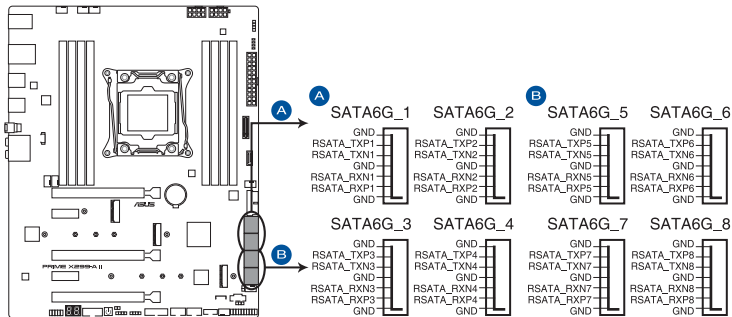
right-angle side

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® X299 chipset.

- The connectors are set to **[IRST Mode]** by default.
- The M.2_2 socket shares bandwidth with SATA6G_1 port when using M.2 SATA devices.
- The SATA6G_7 port shares bandwidth with PCIEX1_2.
- Before creating a RAID set, refer to the **RAID Configuration Guide**. You can download the **RAID Configuration Guide** from the ASUS website.

2. **Thunderbolt connector**

The Thunderbolt connector allows you to connect an add-on Thunderbolt I/O card that supports Intel's Thunderbolt Technology, allowing you to connect up to six Thunderbolt-enabled devices and a DisplayPort-enabled display in a daisy-chain configuration.

TB_HEADER

GND
Platform Sequence Control
Platform Sequence Control
Plug_Event
Power
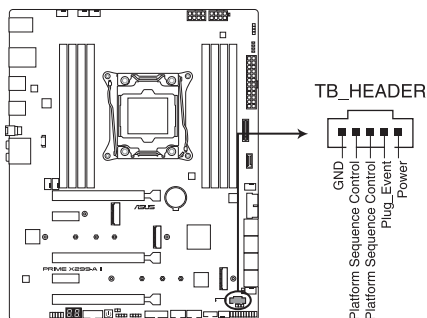
PRIME X299-A II Thunderbolt header

The add-on Thunderbolt I/O card and Thunderbolt cables are purchased separately.

3. **Node connector**

The Node connector allows you to connect Node compatible devices.

NODE

PIN 1
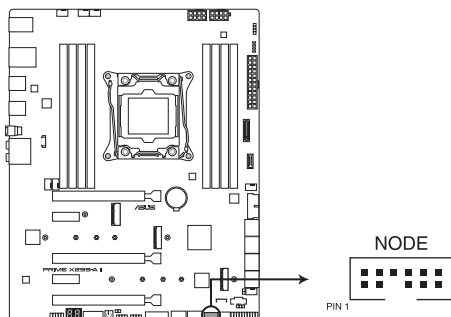
PRIME X299-A II Node connector

Visit www.asus.com for more information about the devices and the latest compatibility list.

4. System Panel connector

The System Panel connector supports several chassis-mounted functions.
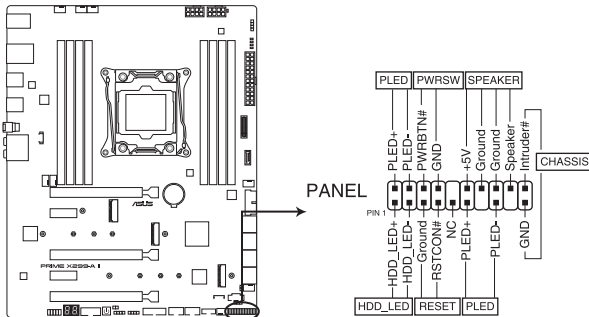
PRIME X299-A II System panel connector

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

  The 2-pin and/or 3-1 pin connectors allow 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 connector (HDD_LED)**

  The 2-pin connector 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 connector (SPEAKER)**

  The 4-pin connector 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 connector (PWRSW)**

  The 3-1 pin connector 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 connector (RESET)**

  The 2-pin connector 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.

5. VROC Key connector

The VROC (Virtual Raid on CPU) Key connector allows you to connect a VROC hardware key to enable additional CPU RAID functions with Intel® CPU RSTe.

VROC_HW_KEY

PIN 1

GND
KEY1
GND
KEY2

PRIME X299-A II VROC Key connector
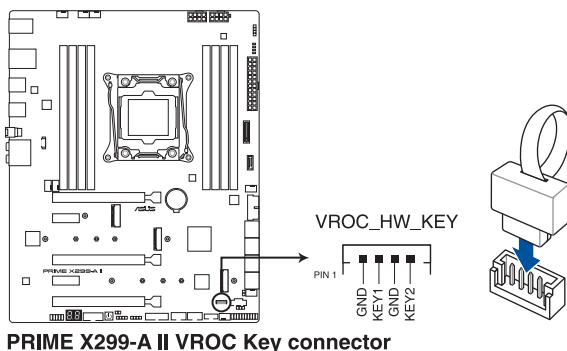
The VROC hardware key is purchased separately.

6. USB 2.0 connector

The USB 2.0 connector allows you to connect a USB module for additional USB 2.0 ports. The USB 2.0 connector provides data transfer speeds of up to 480 MB/s connection speed.

A USB_E12

USB+5V
USB_P2-
USB_P2+
GND
NC

PIN 1

USB+5V
USB_P1-
USB_P1+
GND

B USB_E34

USB+5V
USB_P4-
USB_P4+
GND
NC

PIN 1

USB+5V
USB_P3-
USB_P3+
GND

PRIME X299-A II USB 2.0 connector
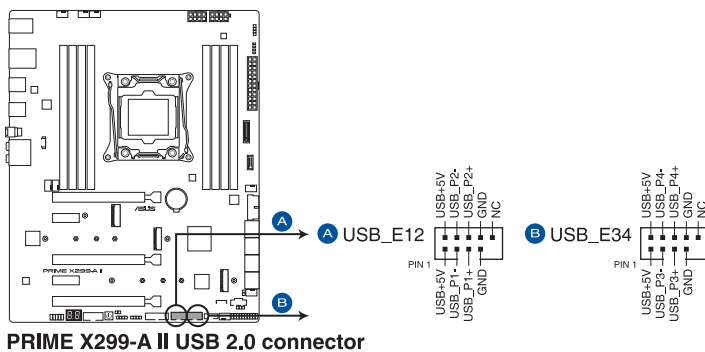
7. **USB 3.2 Gen 1 connector**

The USB 3.2 Gen 1 connector 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 connector provides data transfer speeds of up to 5 Gb/s

PRIME X299-A II USB 3.2 Gen 1 connector
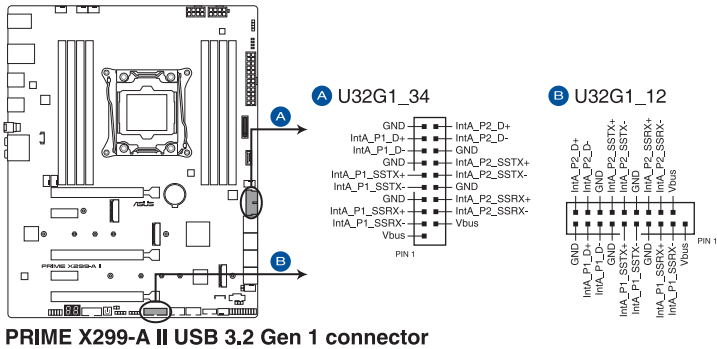
The USB 3.2 Gen 1 module is purchased separately.

The plugged USB 3.2 Gen 1 device may run on xHCI or EHCI mode depending on the operating system's setting.

8. **USB 3.2 Gen 2 connector**

The USB 3.2 Gen 2 connector allows you to connect a USB 3.2 Gen 2 module for additional USB 3.2 Gen 2 ports. The USB 3.2 Gen 2 connector provides data transfer speeds of up to 10 Gb/s.

PRIME X299-A II USB 3.2 Gen 2 connector
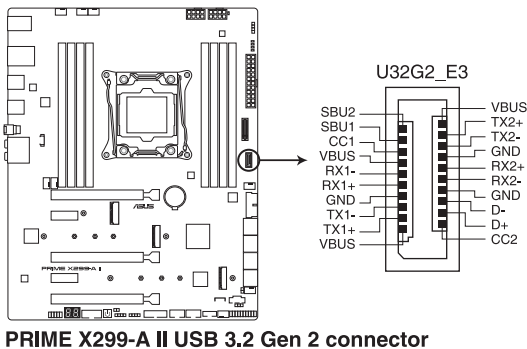
The USB 3.2 Gen 2 module is purchased separately.

9. **AURA RGB LED connector**

The AURA RGB LED connector allows you to connect RGB LED strips.

A RGB_HEADER1   B RGB_HEADER2

B
R
G
+12V
PIN 1

PIN 1
+12V G R B
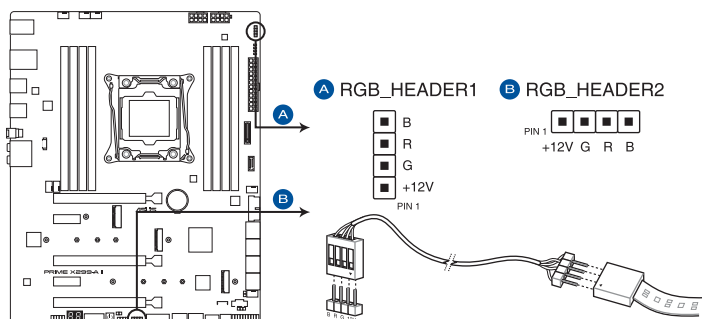
PRIME X299-A II AURA RGB LED connector

The AURA RGB LED connector supports 5050 RGB multi-color LED strips (12V/G/R/B), with a maximum power rating of 3A (12V), and no longer than 3 m.

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.

10. **Addressable RGB LED connector**

The Addressable RGB LED connector allows you to connect individually addressable RGB WS2812B LED strips or WS2812B based LED strips.

ADD GEN2_2

PIN 1

+5V
Data
Ground
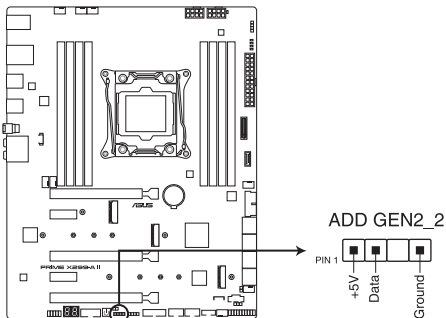
PRIME X299-A II Addressable RGB LED connector

The Addressable RGB LED connector supports WS2812B addressable RGB LED strips (5V/Data/Ground), with a maximum power rating of 3A (5V) and a maximum of 120 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.

11.   Rear I/O Cover LED connector

The Rear I/O Cover LED connector is for connecting the LED board on your rear I/O cover.
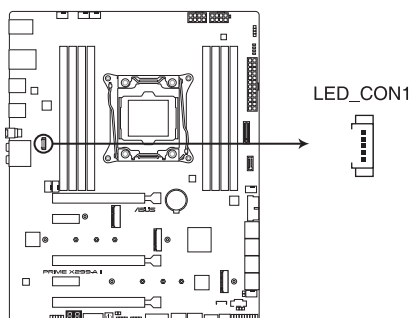
LED_CON1

PRIME X299-A II Rear I/O Cover LED connector

12.   Thermal Sensor connector

The Thermal Sensor connector allows you to connect a sensor to monitor the temperature of the devices and the critical components inside the motherboard. Connect the thermal sensor and place it on the device or the motherboard's component to detect its temperature.

T_SENSOR

PIN 1
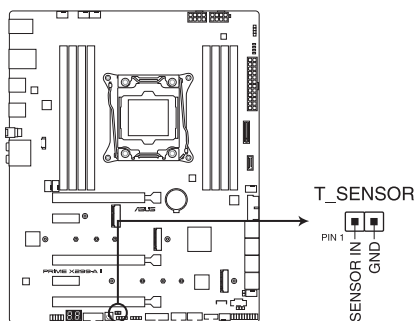
SENSOR IN
GND

PRIME X299-A II Thermal Sensor connector

13. **Serial Port connector**

The Serial (COM) Port connector allows you to connect a serial port module. Connect the serial port module cable to this connector, then install the module to a slot opening on the system chassis.
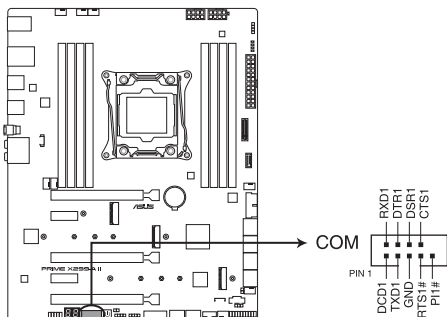
PRIME X299-A II Serial port connector

The serial port module is purchased separately.

14. **Front Panel Audio connector**

The front panel audio connector 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 connector.
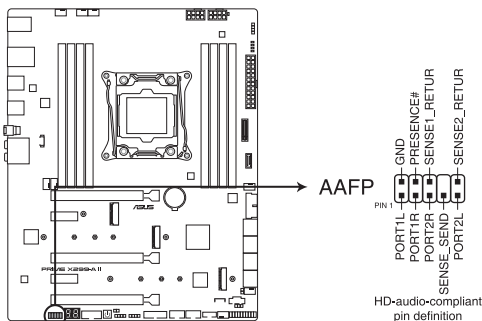
PRIME X299-A II Front Panel Audio connector

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.

15. Fan and Pump connectors

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

PRIME X299-A II
Fan and Pump connectors
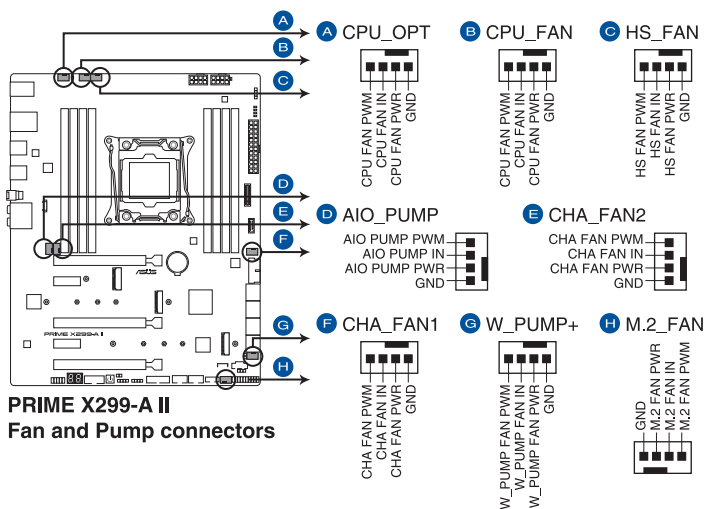
⚠️ • DO NOT forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan connectors!

• Ensure the cable is fully inserted into the connector.

✎ • Connect the fan of your water cooling kit to the AIO_PUMP connector.

• W_PUMP+ function support depends on water cooling device.

Header	Max. Current	Max. Power	Default Speed	Shared Control
CPU_FAN	1A	12W	Q-Fan Controlled	A
CPU_OPT	1A	12W	Q-Fan Controlled	A
CHA_FAN1	1A	12W	Q-Fan Controlled	-
CHA_FAN2	1A	12W	Q-Fan Controlled	-
AIO_PUMP	1A	12W	Full-Speed	-
W_PUMP+	3A	36W	Full-Speed	-
HS_FAN	1A	12W	Q-Fan Controlled	-

16. 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.
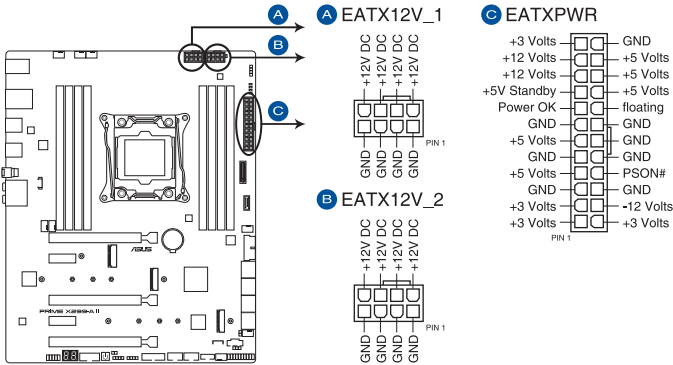
PRIME X299-A II Power connectors

Ensure to connect both 8-pin power plugs under heavy usage.

- 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 PCIe x16 cards, use a PSU with 1000W power or above to ensure the system stability.

17. M.2 slot

The M.2 slot allows you to install M.2 devices such as M.2 SSD modules.
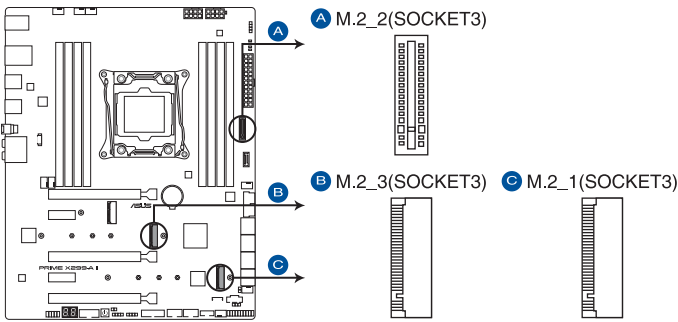
PRIME X299-A II M.2 slot

- **For Intel® Core™ i9 10000 X-Series Processors support with Intel® Virtual RAID on CPU (VROC):**

  - M.2_1 socket supports PCIe 3.0 x4 mode M Key design and type 2242 / 2260 / 2280 / 22110 PCIe storage devices.

  - M.2_3 socket supports PCIe 3.0 x4 mode M Key design and type 2242 / 2260 / 2280 / 22110 PCIe storage devices.

- **For Intel® Core™ i9 9000/7000 and i7 9000/7000 X-Series Processors support with Intel® Virtual RAID on CPU (VROC):**

  - M.2_3 sockets support PCIe 3.0 x4 mode M Key design and type 2242 / 2260 / 2280 / 22110 PCIe storage devices.

- **For Intel® X299 Chipset supports with Intel® Rapid Storage Technology (RAID 0, 1, 5, 10):**

  - M.2_2 socket supports PCIe 3.0 x4 mode and SATA mode vertical M Key design and type 2242 / 2260 / 2280 / 22110 PCIe and SATA storage devices. The M.2_2 socket shares bandwidth with SATA6G_1 port when using M.2 SATA devices.

  - M.2_1 socket supports PCIe 3.0 x4 mode M Key design and type 2242 / 2260 / 2280 / 22110 PCIe storage devices. The M.2_1 PCIe mode source is from X299 Chipset when using 44 and 28-lane CPU.

- The M.2 PCIe mode source from X299 Chipset supports Intel® Optane Memory.

The M.2 SSD module is purchased separately.

18. M.2 Wi-Fi slot

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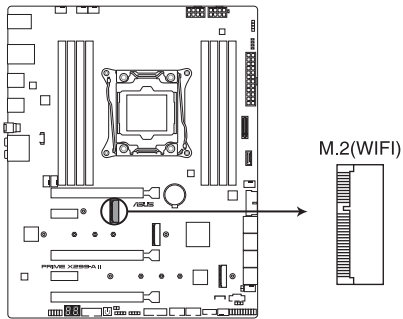
M.2(WIFI)

PRIME X299-A II M.2(WIFI) slot

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

Chapter 1

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 Motherboard installation

1. Place the motherboard into the chassis, ensuring that its rear I/O ports are aligned to the chassis' rear I/O panel.
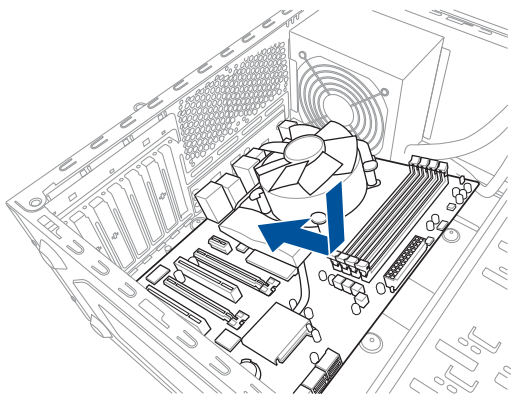
2. Place nine screws into the holes indicated by circles to secure the motherboard to the chassis.
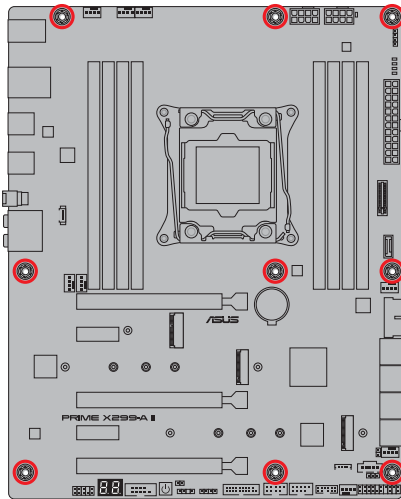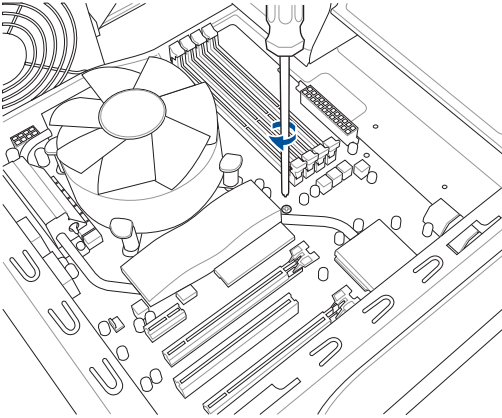
DO NOT overtighten the screws! Doing so can damage the motherboard.

2.1.2   CPU installation

⚠️
- Ensure that you install the correct CPU designed for LGA2066 socket only.

- ASUS will not cover damages resulting from incorrect CPU installation/removal, incorrect CPU orientation/placement, or other damages resulting from negligence by the user.

- Please note the order in opening/closing the double latch. Follow the instructions printed on the metal sealing hatch or the illustrations shown below in this manual. The plastic cap will pop up automatically once the CPU is in place and the hatch properly sealed down.

Triangle mark

Triangle mark
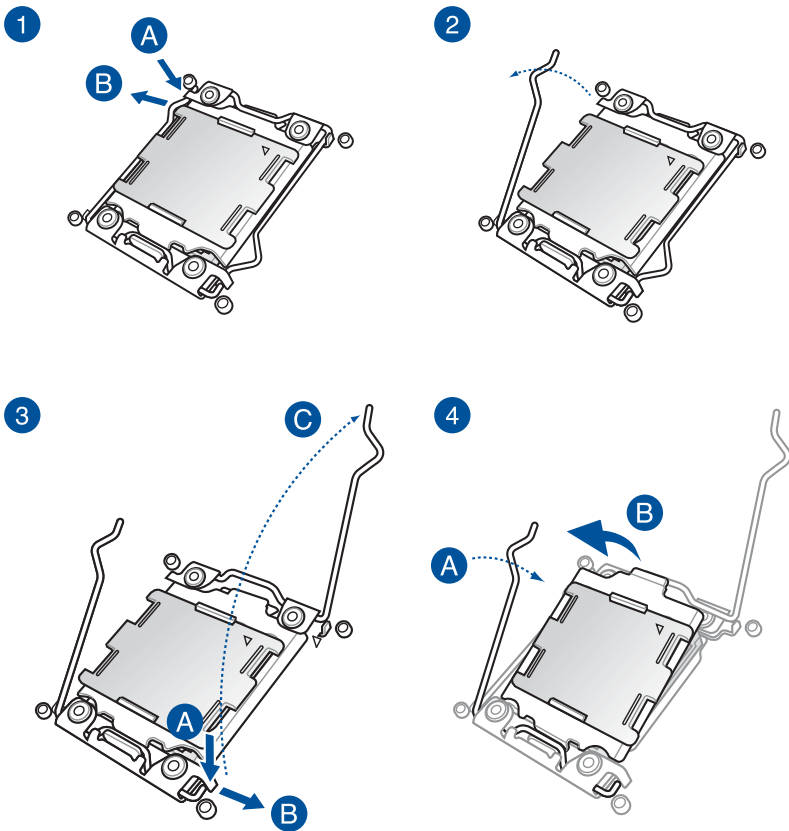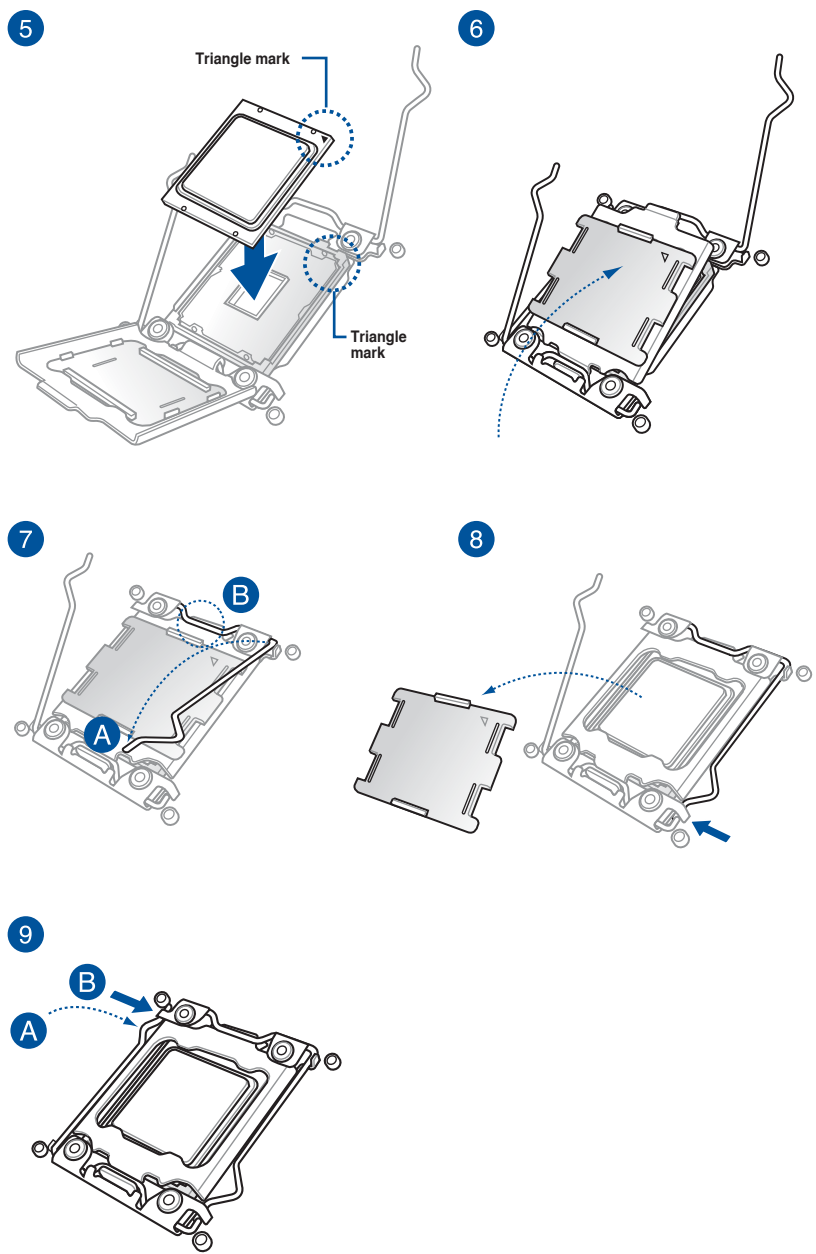
2.1.3 Cooling system installation
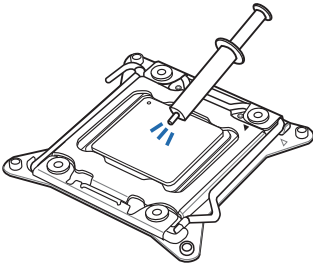
Apply the Thermal Interface Material to the CPU heatsink and CPU before you install the heatsink and fan, if necessary.

To install the CPU heatsink and fan assembly
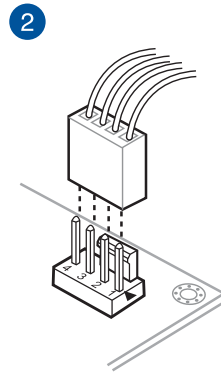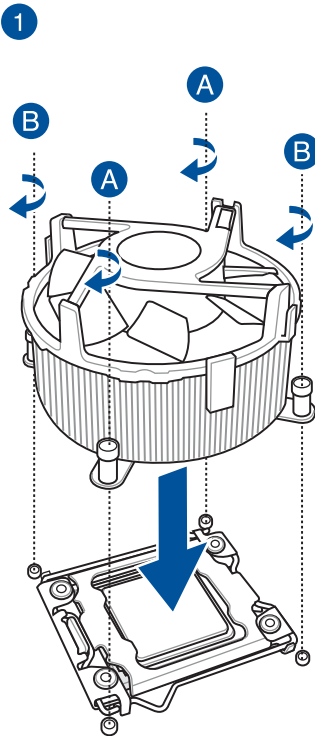
To install an AIO cooler

AIO_PUMP

CPU_FAN

CPU_OPT
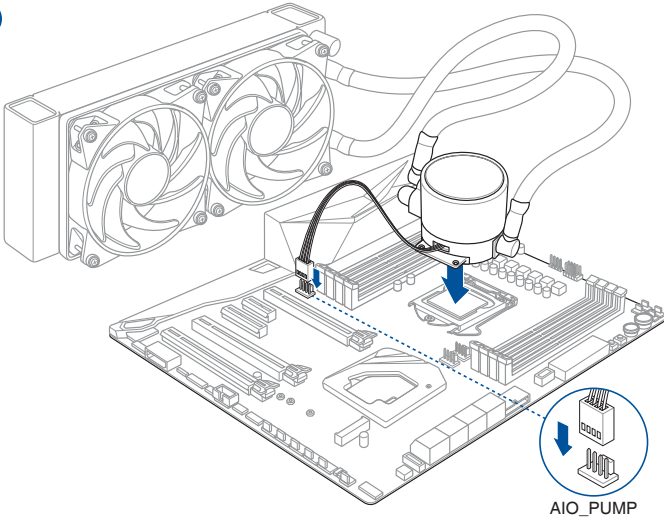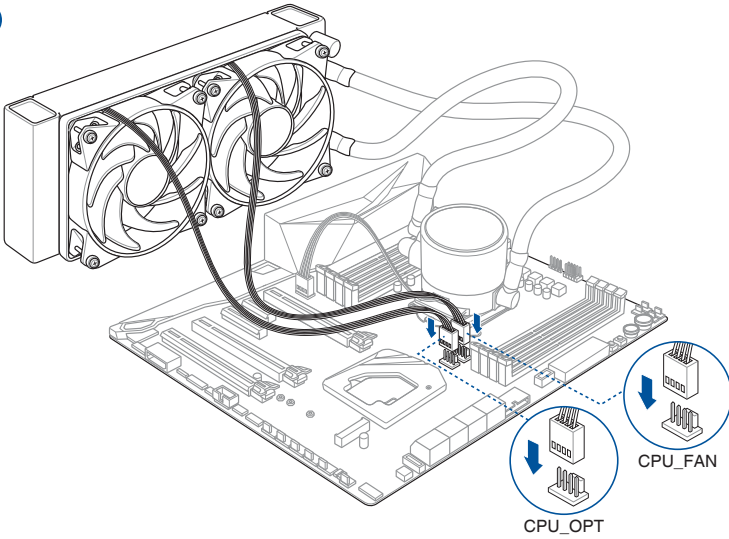
2.1.4   DIMM installation
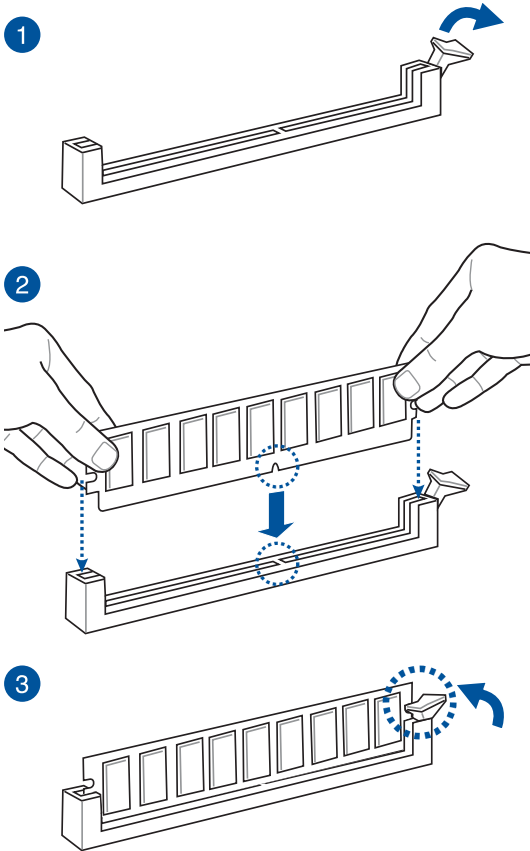
To remove a DIMM
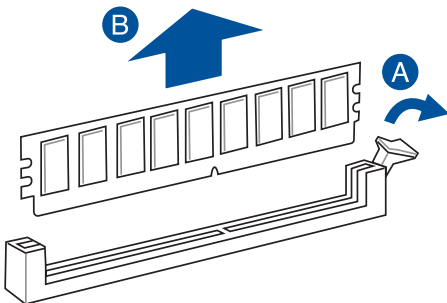
2.1.5 ATX power connection
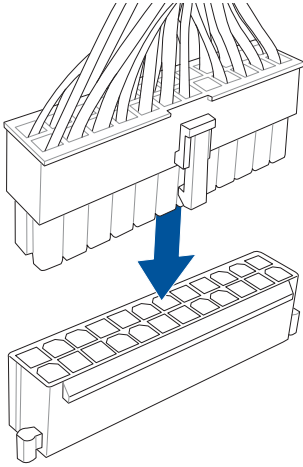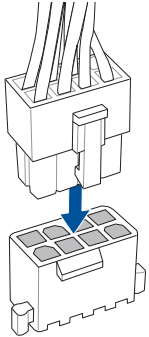
⚠️ Ensure to connect both 8-pin power plugs under heavy usage.

2.1.6   SATA device connection

OR

OR
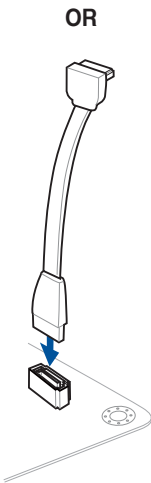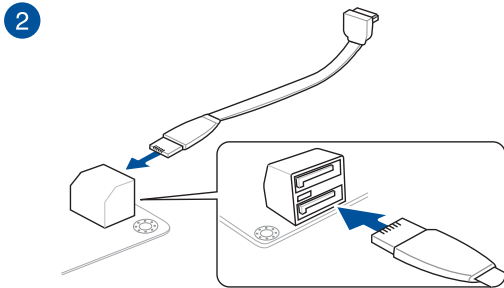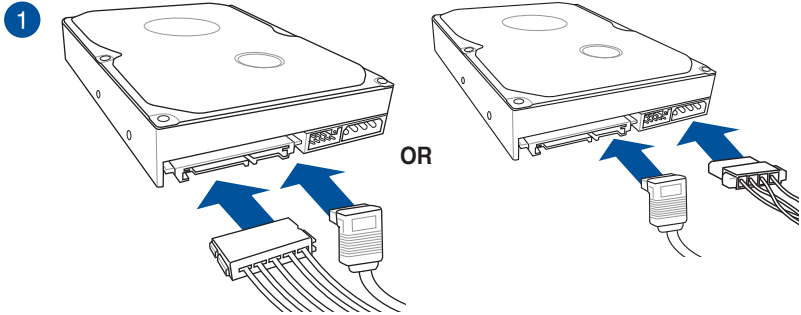
2.1.7   Front I/O connector

To install ASUS Q-Connector

HDD LED

RESET SW

PLED

HDD LED+

HDD LED1

Ground

Reset

+3V

PLED+

PLED-
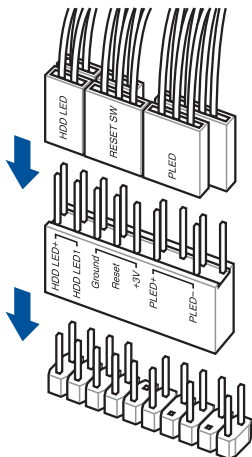
To install USB 3.2 Gen 2 connector
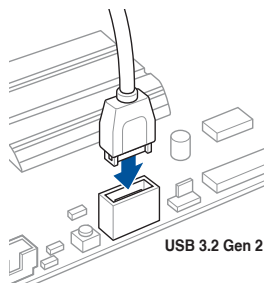
USB 3.2 Gen 2

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

To install USB 3.2 Gen 1 connector

USB 3.2 Gen 1
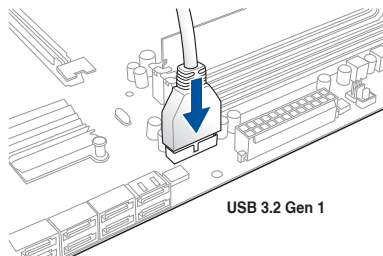
To install USB 2.0 connector

USB 2.0
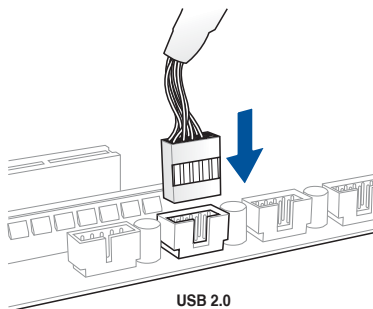
To install front panel audio connector

AAFP
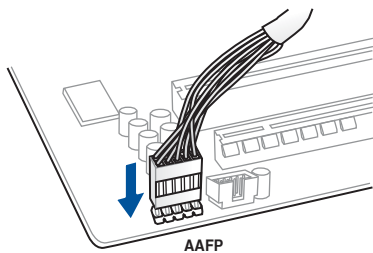
To install system speaker connector

SPEAKER
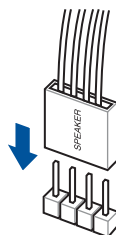
2.1.8   Expansion card installation

To install PCIe x16 cards
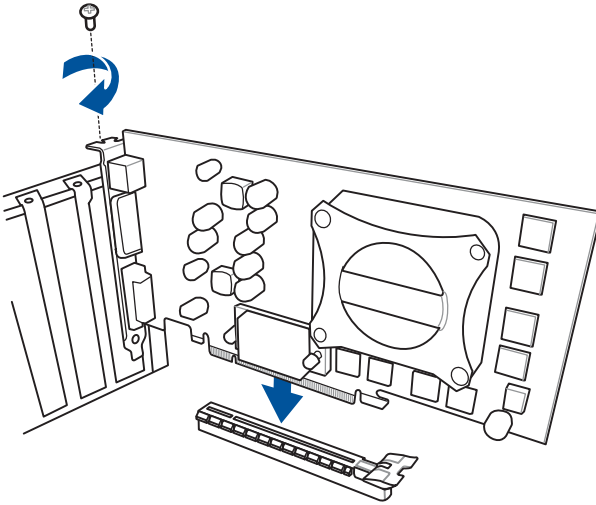
To install PCIe x1 cards
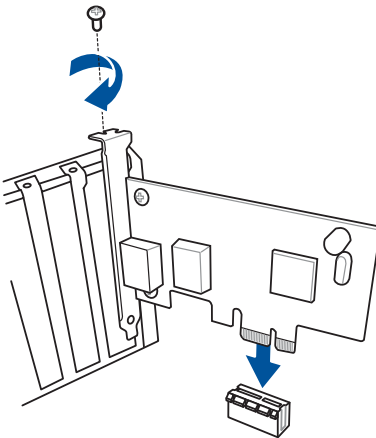
2.1.9   M.2 installation
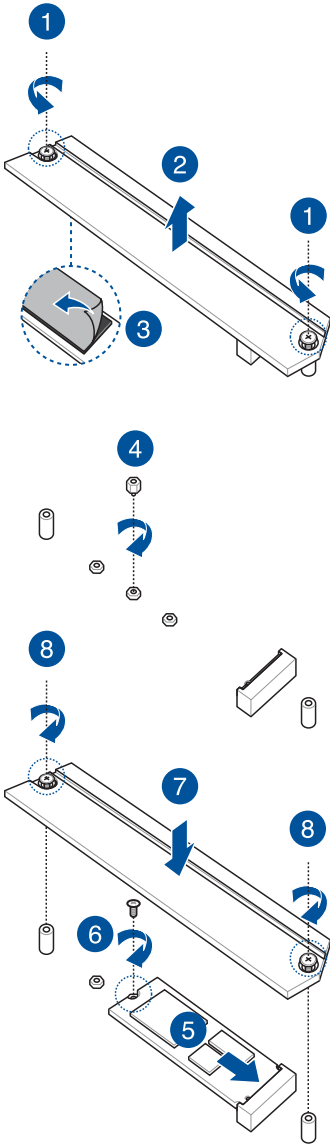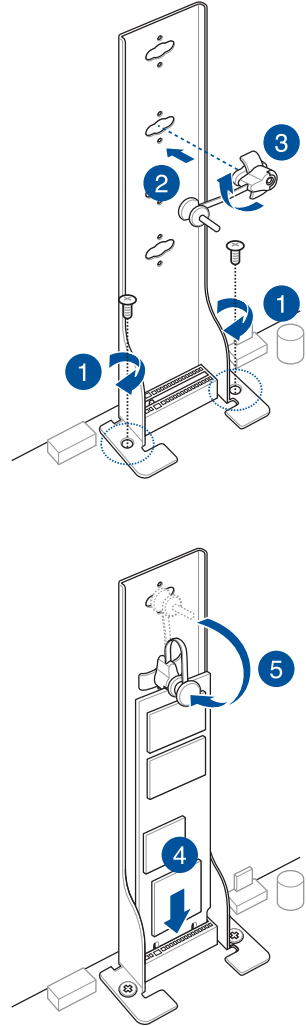
Supported M.2 type varies per motherboard.

2.1.10   Fan bracket installation

To install the MOS FAN bracket and fan
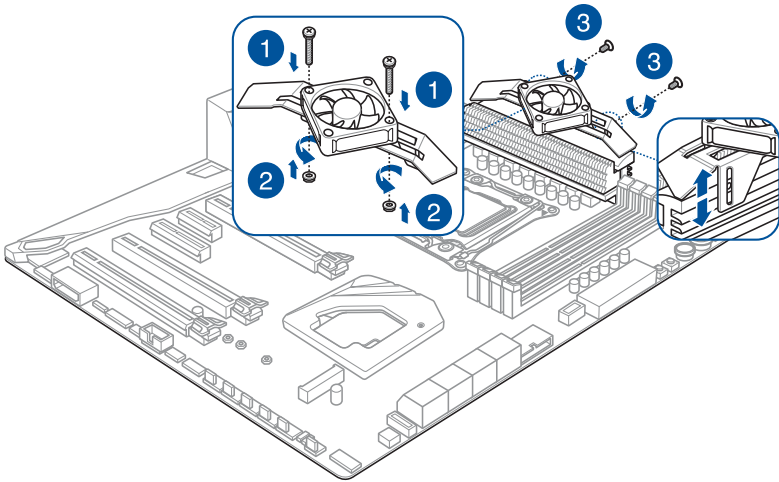
When using high performance settings whilst overclocking, ensure to install the MOS FAN bracket for additional fan(s).

• You may install 12V (1A, 12W), 40mm x 40mm fans.

• The fan is purchased separately.

2.2 BIOS update utility

BIOS FlashBack™

BIOS FlashBack™ allows you to easily update the BIOS without entering the existing BIOS or operating system. Simply insert a USB storage device to the USB port (the USB port hole marked in green on the I/O shield) then press the BIOS FlashBack™ button for three seconds to automatically update the BIOS.

To use BIOS FlashBack™:

1. Insert a USB storage device to the BIOS FlashBack™ port.

    - We recommend you to use a USB 2.0 storage device to save the latest BIOS version for better compatibility and stability.

    - Refer to section **2.3.1 Rear I/O connection** for the location of the USB port that supports BIOS FlashBack™.

2. Visit https://www.asus.com/support/ and download the latest BIOS version for this motherboard.

3. Manually rename the file as **X299A2.CAP**, or launch the **BIOSRenamer.exe** application to automatically rename the file, then copy it to your USB storage device.

    The **BIOSRenamer.exe** application is zipped together with your BIOS file when you download a BIOS file for a BIOS FlashBack™ compatible motherboard.

4. Shut down your computer.

5. Press the BIOS FlashBack™ button for three seconds until the FlashBack™ LED blinks three times, indicating that the BIOS FlashBack™ function is enabled.

BIOS FlashBack™ port   **BIOS FlashBack™ button**
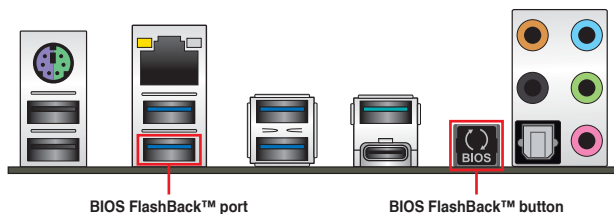
6. Wait until the light goes out, indicating that the BIOS updating process is completed.

For more BIOS update utilities in BIOS setup, refer to the section **3.11 Updating BIOS** in Chapter 3.

- Do not unplug portable disk, power system, or press the CLR_CMOS button while BIOS update is ongoing, otherwise update will be interrupted. In case of interruption, please follow the steps again.

- If the light flashes for five seconds and turns into a solid light, this means that the BIOS FlashBack™ is not operating properly. This may be caused by improper installation of the USB storage device and filename/file format error. If this scenario happens, please restart the system to turn off the light.

- Updating BIOS may have risks. If the BIOS program is damaged during the process and results to the system's failure to boot up, please contact your local ASUS Service Center.

2.3 Motherboard rear and audio connections

2.3.1 Rear I/O connection
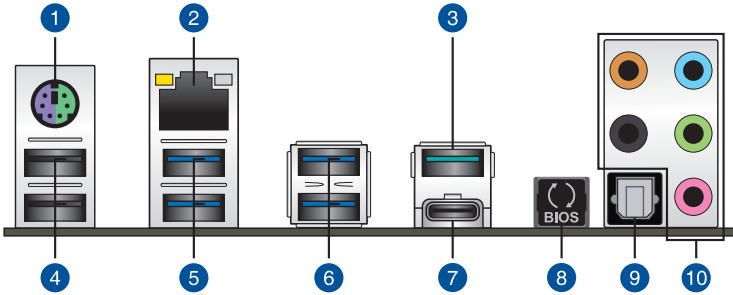
Rear panel connectors			
1.	PS/2 keyboard/mouse combo port	6.	USB 3.2 Gen 1 ports 7 and 8
2.	Intel® LAN port (LAN1)*	7.	USB 3.2 Gen 2 Type-C™ port EC1
3.	USB 3.2 Gen 2 port E2	8.	BIOS FlashBack™ button
4.	USB 2.0 ports 9 and 10	9.	Optical S/PDIF Out port
5.	USB 3.2 Gen 1 ports 5 and 6	10.	Audio I/O ports**

* and **: Refer to the tables on the next page for LAN port LEDs and audio port definitions.

- USB 3.1 Gen 1/Gen 2 devices can only be used as data storage only.
- 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.

* LAN ports LED indications

Activity Link LED		Speed LED	
Status	**Description**	**Status**	**Description**
Off	No link	Off	10 Mbps connection
Orange	Linked	Orange	100 Mbps connection
Orange (Blinking)	Data activity	Green	1 Gbps connection
Orange (Blinking then steady)	Ready to wake up from S5 mode		

ACT/LINK LED   SPEED LED

LAN port
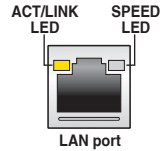
You can disable the LAN controllers in BIOS. Due to hardware design, the LAN1 port's LEDs may continue to blink even when disabled.

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

Port	Headset 2-channel	4-channel	5.1-channel	7.1-channel
Light Blue	Line In	Line In	Line In	Side Speaker Out
Lime	Line Out	Front Speaker Out	Front Speaker Out	Front Speaker Out
Pink	Mic In	Mic In	Mic In	Mic In
Orange	–	–	Center/Sub woofer	Center/Sub woofer
Black	–	Rear Speaker Out	Rear Speaker Out	Rear Speaker Out

2.3.2 Audio I/O connections

Audio I/O ports
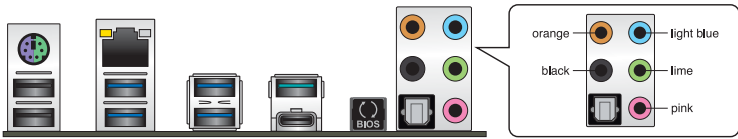
Connect to Headphone and Mic

Connect to Stereo Speakers
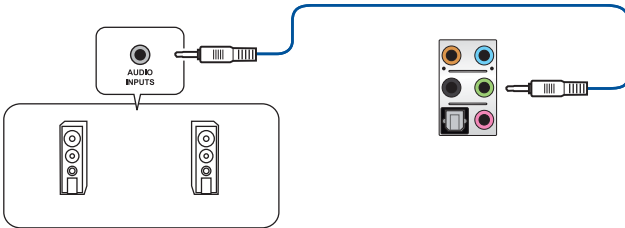
Connect to 2-channel Speakers
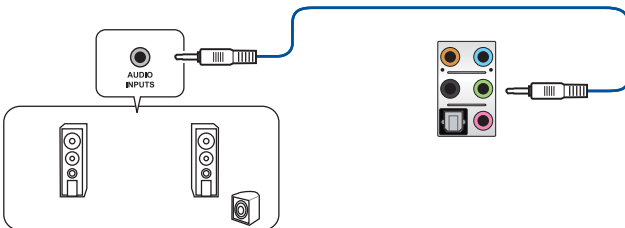
Connect to 4-channel Speakers
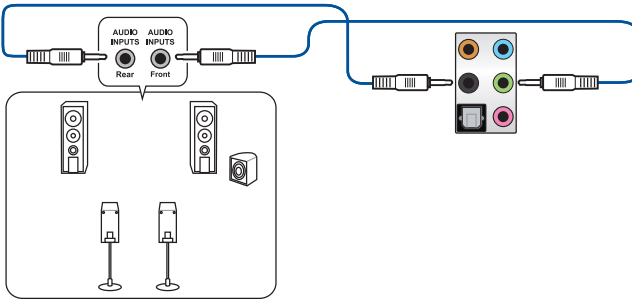
Connect to 5.1-channel Speakers
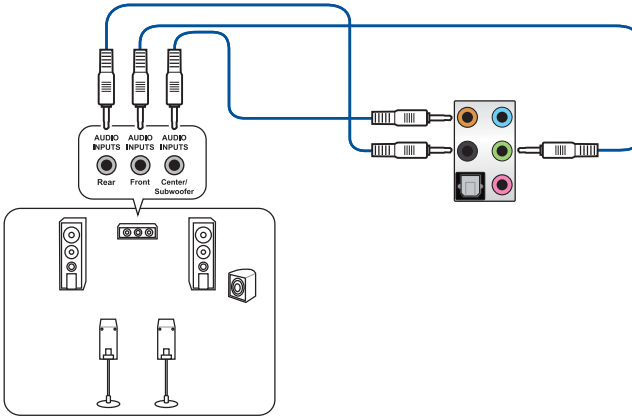
Connect to 7.1-channel Speakers
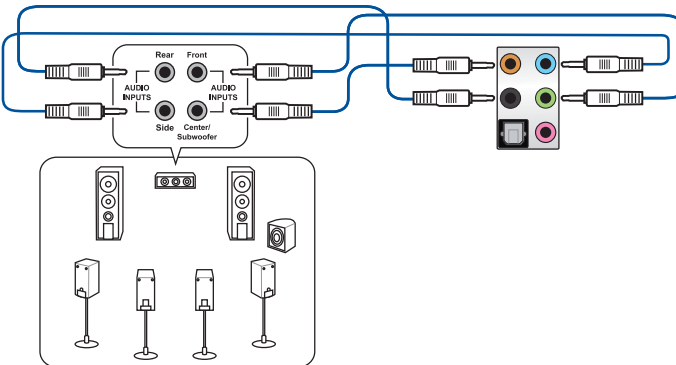
2.4 Starting up for the first time

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.

2.5 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 switch for more than four seconds to let the system enter the soft-off mode regardless of the BIOS setting.

BIOS Setup

<div style="text-align: right; font-size: 3em;">3</div>

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**.

- When downloading or updating the BIOS file, rename it as **X299A2.CAP** for this motherboard.
- BIOS settings and options may vary due to different BIOS release versions. Please refer to the latest BIOS version for settings and options.

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.

- 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 section **Onboard jumpers** for information on how to erase the RTC RAM via the Clear CMOS button.

- The BIOS setup program does not support the Bluetooth devices.

Please visit ASUS website for the detailed BIOS content manual.

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.

3.2.1 EZ Mode

By default, the EZ Mode screen appears when you enter the BIOS setup program. 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** 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.

Displays a quick overview of the system status

Displays the system properties of the selected mode. Click < or > to switch modes

EZ Tuning Wizard

Selects the display language of the BIOS setup program

AI OC Guide(F11)   **Search(F9)**   **AURA ON/OFF(F4)**

Enables or disables the SATA RAID mode for Intel Rapid Storage Technology

Displays the CPU Fan's speed. Click the button to manually tune the fans

Loads optimized default settings

Saves the changes and resets the system

Click to go to Advanced Mode

Search on the FAQ

Click to display boot devices

Selects the boot device priority

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

Chapter 3

3.2.2 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.

Search(F9)

Configuration fields
Pop-up Menu
Scroll bar
Menu bar

Language   **MyFavorite(F3)**   **Qfan Control(F6)**   **AI OC Guide(F11)**   **AURA ON/OFF(F4)**

Menu items   **General help**   **Last modified settings**   **EZ Tuning Wizard**   **Go back to EZ Mode**

Search on the FAQ

Displays a quick overview of the system status

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

A greater than 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.

My Favorites(F3)

This button above the menu bar shows all BIOS items in a Tree Map setup. Select frequently-used BIOS settings and save it to MyFavorites menu.

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

Q-Fan Control(F6)

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.

Refer to section **Q-Fan Control** for more information.

AI OC Guide(F11)

This button above the menu bar allows you to view the descriptions of AI overclocking and enable it.

- Refer to section **AI OC Guide** for more information.

- This function is only enabled when using an unlocked CPU.

Search (F9)

This button allows you to search for BIOS items by entering its name, enter the item name to find the related item listing.

AURA (F4)

This button allows you to turn the RGB LED lighting or functional LED on or off.

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

[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.

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

Search on FAQ

Move your mouse over this button to show a QR code, scan this QR code on your mobile device to connect to the BIOS FAQ web page of the ASUS support website. You can also scan the following QR code:

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.

Hot keys

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

EZ Tuning Wizard

This button allows you to view and configure the RAID settings of your system.

Refer to section **EZ Tuning Wizard** for more information.

Last Modified button

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

3.2.3 Q-Fan Control

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

Click to select a fan to be configured

Select between different Q-Fan modes

Q-Fan Control
Select your target fan and then move the slider to select any of these profiles: Standard, Silent, Turbo and Full Speed. You can also move the slider to Manual and manually configure the fan's operating speed.

⊛ Optimize All

CPU FAN
CHA FAN1
CHA FAN2
M.2 FAN
W_PUMP+
AIO PUMP

AUTO

Standard   Silent   Turbo   Full Speed   Manual

Undo   Apply   Exit (ESC)

Select a profile to apply to your fans

Click to apply the fan setting

Click to undo the changes

Click to go back to main menu

Select to manually configure your fans

Configuring fans manually

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

Q-Fan Control
Select your target fan and then move the slider to select any of these profiles: Standard, Silent, Turbo and Full Speed. You can also move the slider to Manual and manually configure the fan's operating speed.

AUTO

⊘ Optimize All

CPU FAN
CHA FAN1
CHA FAN2
M.2 FAN
W_PUMP+
AIO PUMP

Standard   Silent   Turbo   Full Speed   Manual

Undo   Apply   Exit (ESC)

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)**.

Chapter 3

3.2.4   AI OC Guide

> • The screenshot shown in this section is for reference purposes only, and may not exactly match what you see on your screen.
>
> • This function is only enabled when using an unlocked CPU.

The AI OC Guide allows you to enable the Ai Overclocking feature, or view a quick guide of the Ai Overclocking feature which highlights the recommended setup procedure and descriptions of the AI Overclocking.

Clicking on **Enable AI** will enable AI Overclocking.
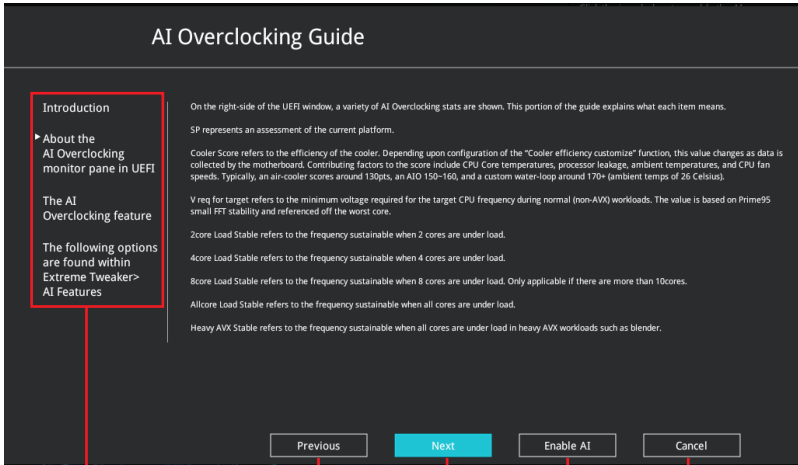
Quick guide topics   Click to view the   Click to view   Click to enable   Click to go back
                            previous topic in   the next topic in   AI Overclocking   to main menu
                            the quick guide   the quick guide

3.2.5   EZ Tuning Wizard

EZ Tuning Wizard allows you to easily set RAID in your system using this feature.

Creating RAID

To create RAID:

1.   Click **EZ Tuning Wizard** from the BIOS screen to open EZ Tuning Wizard screen.

2.   Click **RAID** then select the port that you want to set to [RAID] mode, **CPU**, **PCH** or **SATA**, then click **Next**.

- Ensure that your HDDs have no existing RAID volumes.
- Ensure to connect your HDDs to Intel® SATA connectors.
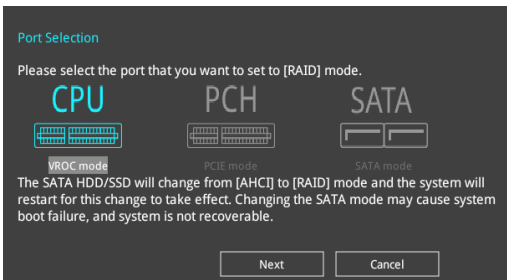
3.   Select **Yes** to enable RAID.
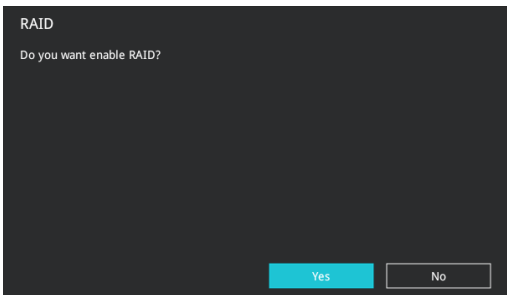
4. Select the type of storage for your RAID, **Easy Backup** or **Super Speed**, then click **Next**.
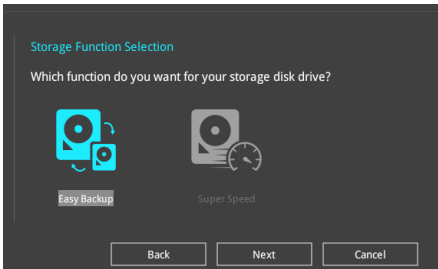
a. For Easy Backup, click **Next** then select from **Easy Backup (RAID 1)** or **Easy Backup (RAID 10)**.
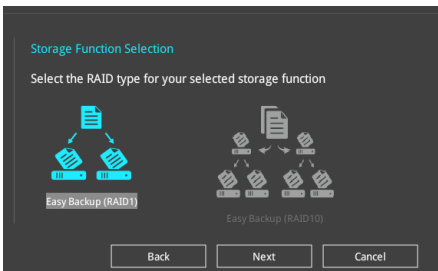
You can only select Easy Backup (RAID 10) if you connect four (4) HDDs.

b. For Super Speed, click **Next** then select from **Super Speed (RAID 0)** or **Super Speed (RAID 5)**.
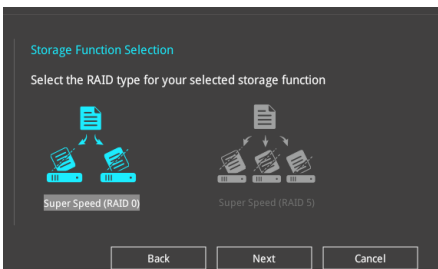
5. After selecting the type of RAID, click **Next** then click **Yes** to continue the RAID setup.

6. After the RAID setup is done, click **Yes** to exit the setup then click **OK** to reset your system.

3.3   My Favorites

My Favorites is your personal space where you can easily save and access your favorite BIOS items. My Favorites comes with several performance, power saving, and fast boot related items by default. You can personalize this screen by adding or removing items.
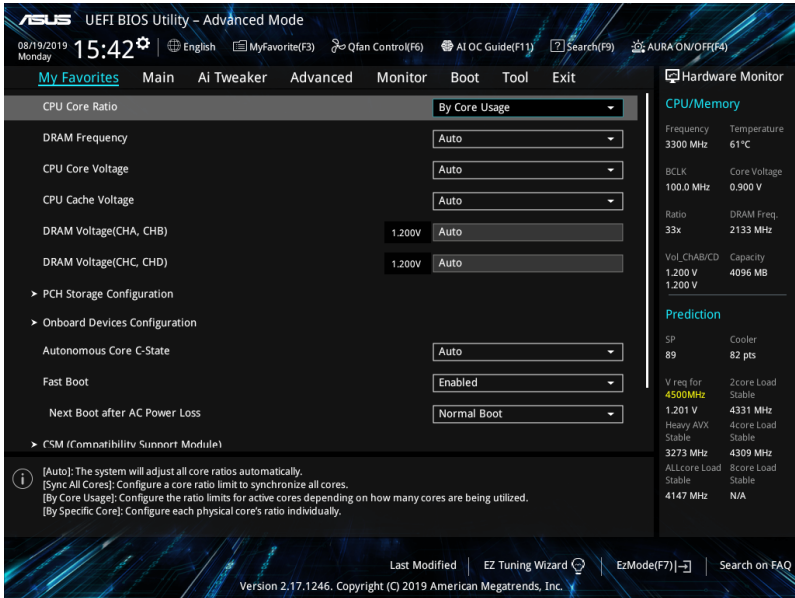
Adding items to My Favorites

To add BIOS items:

1. Press <F3> on your keyboard or click **MyFavorite(F3)** 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.

Main menu panel

Submenu panel

Selected shortcut items

Delete all favorite items

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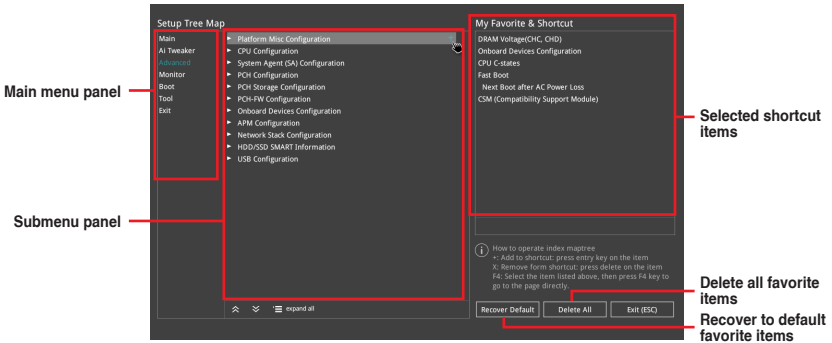
3. Select an item from main menu panel, then click the submenu that you want to save as favorite from the submenu panel and click + or press <Enter> on your keyboard.

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.

Chapter 3: BIOS Setup

Chapter 3

3.4 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 section **Onboard jumpers** for information on how to erase the RTC RAM via the Clear CMOS button.

- 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]**.

3.5 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.

Ai Overclock Tuner

Allows you to select the CPU overclocking options to achieve the desired CPU internal frequency. Configuration options:

[Auto]   Loads the optimal settings for the system.

[Manual]   Allows you to individually set overclocking parameters.

[X.M.P.]   If you install memory modules supporting the eXtreme Memory Profile (X.M.P.) Technology, choose this item to set the profiles supported by your memory modules for optimizing the system performance.

The [X.M.P.] configuration option appears only when you install memory modules supporting the eXtreme Memory Profile(X.M.P.) Technology.

The following item appears only when you set the Ai Overclocking Tuner to **[Manual]**.

BCLK Frequency

This item 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.

ASUS MultiCore Enhancement

[Auto]   This item allows you to maximize the oveclocking performance optimized by ASUS core ratio settings.

[Disabled]   This item allows you to set to default core ratio settings.

CPU Core Ratio

This item allows you to set the CPU core ratios.

Configuration options: [Auto] [Sync All Cores] [By Core Usage] [By Specific Core] [AI Optimized]

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.

DRAM Frequency

This item 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.

If you are using a DIMM with a higher supported frequency than the CPU BCLK frequency, please enter BIOS and go to **Ai Tweaker** > **DRAM Frequency** and set it to the memory frequency of your DIMM. Please refer to BIOS Setup section for more information on navigation BIOS.

Internal CPU Power Management

The subitems in this menu allow you to set the CPU ratio and features.

Enhanced Intel SpeedStep Technology

Allows the operating system to dynamically adjust the processor voltage and cores frequency to decrease the average power consumption and decrease average heat production. Configuration options: [Enabled] [Disabled]

Turbo Mode

Allows you to enable your processor cores to run faster than the base operating frequency when it is below power, current and specification limit. Configuration options: [Disabled] [Enabled]

3.6 Advanced menu

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

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

3.6.1 CPU Configuration

The items in this menu show the CPU-related information that the BIOS automatically detects.

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

Hyper-Threading [ALL]

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

Configuration options: [Disabled] [Enabled]

CPU Power Management Configuration

This item allows you to manage and configure the CPU's power.

Enhanced Intel SpeedStep Technology

This item allows more than two frequency to be supported.
Configuration options: [Enabled] [Disabled]

Turbo Mode

This item 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.
Configuration options: [Enabled] [Disabled]

Autonomous Core C-State

This item allows you to set the power saving of the CPU states.
Configuration options: [Auto] [Disabled] [Enabled]

3.6.2 Platform Misc Configuration

The items in this menu allow you to change the ASPM for PCH and SA PCIe.

3.6.3 System Agent (SA) Configuration

The items in this menu allow you to adjust the Link Speed for PEG Port and Multi-Monitor.

3.6.4   PCH Configuration

The items in this menu allow you to adjust the PCH PCIe speed.

PCI Express Configuration

This item allows you to configure the PCIe slots.

PCIe Speed

This item allows your system to automatically select the PCIe port speed.
Configuration options: [Auto] [Gen 1 (2.5 GT/s)] [Gen 2 (5 GT/s)] [Gen 3 (8 GT/s)]

3.6.5   PCH Storage Configuration

While entering Setup, the BIOS automatically detects the presence of SATA devices. The
SATA Port items show **Not Present** if no SATA device is installed to the corresponding SATA
port.

SATA Controller(s)

This item allows you to enable or disable the SATA Device.

Configuration options: [Disabled] [Enabled]

SATA Mode Selection

This item allows you to set the SATA configuration.

[AHCI]	Set to [AHCI] when you want the SATA hard disk drives to use the AHCI (Advanced Host Controller Interface). The AHCI allows the onboard storage driver to enable advanced Serial ATA features that increases storage performance on random workloads by allowing the drive to internally optimize the order of commands.
[Intel RST Premium (RAID)]	Set to [Intel RST Premium (RAID)] when you want to create a RAID configuration from the SATA hard disk drives.

SMART Status Check

SMART (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: [On] [Off]

SATA6G_1 - SATA6G_8

SATA6G_1 - SATA6G_8

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

Hot Plug

These items appears only when the SATA Mode Selection is set to [**AHCI**] and allows
you to enable or disable SATA Hot Plug Support.
Configuration options: [Disabled] [Enabled]

3.6.6   CPU Storage Configuration

The items in this menu allow you to configure CPU storage configurations.

3.6.7   Onboard Devices Configuration

The items in this menu allow you to switch between PCIe Lanes and configure onboard devices.

HD Audio Controller

This item allows you to use the Azalia High Definition Audio Controller.

Configuration options: [Disabled] [Enabled]

RGB LED lighting

When system is in working state

This item allows you to turn the RGB LED lighting on or off when the system is in the working state.
Configuration options: [On] [Off]

When system is in sleep, hibernate or soft off states

This item allows you to turn the RGB LED lighting on or off when the system is in the sleep, hibernate or soft off states.
Configuration options: [On] [Off]

Intel LAN Controller

This item allows you to enable or disable the Intel LAN controller.

Configuration options: [Disabled] [Enabled]

Chapter 3

3.6.8 APM Configuration

The items in this menu allow you to set system wake and sleep settings.

ErP Ready [Disabled]

This item 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.

Configuration options: [Disabled] [Enable(S4+S5)] [Enable(S5)]

3.6.9 Network Stack Configuration

The items in this menu allow you to configure Ipv4 / Ipv6 PXE support.

3.6.10 HDD/SSD SMART Information

This menu displays the SMART information of the connected devices.

> NVM Express devices do not support SMART information.

3.6.11 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**.

USB Single Port Control

This item allows you to enable or disable the individual USB ports.

> Refer to section **Motherboard layout** for the location of the USB ports.

3.6.12   Thunderbolt(TM) Configuration

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

TBT Root port Selector

This item allows you to select the thunder root port.

Configuration options: [Thunderbolt Disabled] [PCIEX16_1] [PCIEX16_2] [PCIEX16_3]

3.6.13   PCH-FW Configuration

This item allows you to configure the firmware TPM.

3.7   Monitor menu

The Monitor menu displays the system temperature/power status, and allows you to change the fan settings.

Q-Fan Configuration

> **Q-Fan Tuning**
>
> Click this item to automatically detect the lowest speed and configure the minimum duty cycle for each fan.
>
> **AIO PUMP/W_PUMP+ Control**
>
> | | |
> |---|---|
> | [Disabled] | Disable the Water Pump control feature. |
> | [Auto] | Detects the type of water pump installed and automatically switches the control modes. |
> | [DC mode] | Enable the Water Pump control in DC mode for 3-pin chassis fan. |
> | [PWM mode] | Enable the Water Pump control in PWM mode for 4-pin chassis fan. |

3.8   Boot menu

The Boot menu items allow you to change the system boot options.

Fast Boot

[Disabled]	Allows your system to go back to its normal boot speed.
[Enabled]	Allows your system to accelerate the boot speed.

The following items appear only when you set the Fast Boot 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 Configuration

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.

CSM (Compatibility Support Module)

This item 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

[Auto]   The system automatically detects the bootable devices and the add-
              on devices.

[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 you set the Launch CSM to **[Enabled]**.

Boot Devices Control
This item 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
This item allows you to select the type of network devices that you want to
launch.

Configuration options: [Ignore] [Legacy only] [UEFI driver first]

Boot from Storage Devices
This item allows you to select the type of storage devices that you want to
launch.

Configuration options: [Ignore] [Legacy only] [UEFI driver first]

Boot from PCI-E/PCI Expansion Devices
This item allows you to select the type of PCIe/PCI expansion devices that
you want to launch.

Configuration options: [Legacy only] [UEFI driver first]

Secure Boot

This item allows you to configure the Windows® Secure Boot settings and manage its keys to
protect the system from unauthorized access and malwares during POST.

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 the ASUS Logo appears.

Boot Override

These items displays the available devices. The number of device items that appears on the screen depends on the number of devices installed in the system. Click an item to start booting from the selected device.

3.9   Tool menu

The Tool menu items allow you to configure options for special functions. Select an item then press <Enter> to display the submenu.

Setup Animator

This item allows you to enable or disable the Setup animator.

Configuration options: [Disabled] [Enabled]

3.9.1   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**.

3.9.2 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.

Secure Erase is only available in AHCI mode. Ensure to set the SATA mode to AHCI. Click **Advanced > PCH Storage Configuration > SATA Mode Selection > AHCI.**

To launch Secure Erase, click **Tool > Secure Erase** on the Advanced mode menu.

Check the ASUS support site for a full list of SSDs tested with Secure Erase. The drive may become unstable if you run Secure Erase on an incompatible SSD.

- 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** of this manual.

Displays the available SSDs
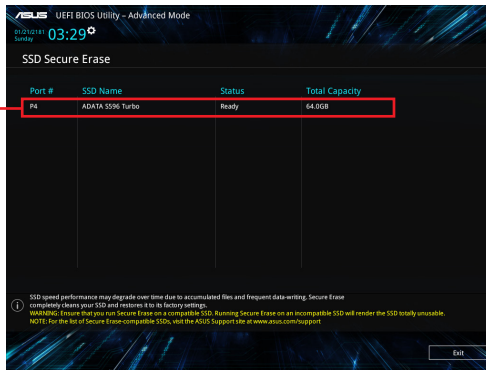
Status definition:

- **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.

Chapter 3

3.9.3   ASUS User Profile

This item allows you to save and load BIOS setting profiles.

Load from Profile

This item 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

This item allows you to key in a profile name.

Save to Profile

This item 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

This item allows you to load or save profile from your USB drive, load and save profile to your USB drive.

3.9.4   ASUS SPD Information

This item allows you to view the DRAM SPD information.

3.9.5   Graphics Card Information

This item displays the information about the graphics card installed in your system.

GPU Post

This item displays the information and recommended configuration for the PCIe slots that the graphics card is installed in your system.

This feature is only supported on selected ASUS graphics cards.

Bus Interface

This item allows you to select the bus interface.

Configuration options: [PCIEX16_1]

3.10   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 item allows you to attempt to launch the EFI Shell application (shellx64.efi) from one of the available filesystem devices.

3.11   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.   EZ Update: Updates the BIOS in Windows® environment.

2.   ASUS EZ Flash 3: Updates the BIOS using a USB flash drive.

3.   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.

3.11.1   EZ Update

The EZ Update is a utility that allows you to update the motherboard BIOS in Windows® environment.

- EZ Update requires an Internet connection either through a network or an ISP (Internet Service Provider).

- This utility is available in the support DVD that comes with the motherboard package.

3.11.2   ASUS EZ Flash 3

ASUS EZ Flash 3 allows you to download and update to the latest BIOS through the Internet without having to use a bootable floppy disk or an OS-based utility.

> Updating through the Internet varies per region and Internet conditions. Check your local Internet connection before updating through the Internet.

To update the BIOS by USB:

1.   Enter the Advanced Mode of the BIOS setup program. Go to the Tool menu to select **ASUS EZ Flash 3 Utility** and press <Enter>.

2.   Insert the USB flash disk that contains the latest BIOS file to the USB port.

3.   Select **via Storage Device(s).**
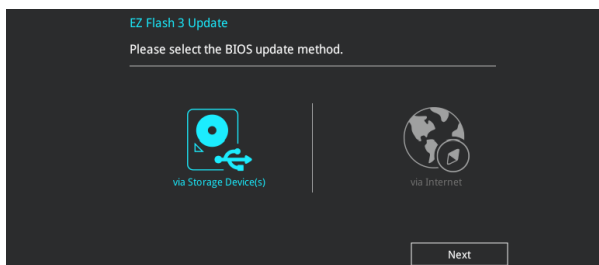
4.   Press <Tab> to switch to the Drive field.

5.   Press the Up/Down arrow keys to find the USB flash disk that contains the latest BIOS, and then press <Enter>.

6.   Press <Tab> to switch to the Folder Info field.

7.   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.

- 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!

Ensure to load the BIOS default settings to ensure system compatibility and stability. Select the Load Optimized Defaults item under the Exit menu. See section **Exit menu** for details.

To update the BIOS by Internet:

1. Enter the Advanced Mode of the BIOS setup program. Go to the Tool menu to select **ASUS EZ Flash 3 Utility** and press <Enter>.

2. Select **via Internet.**
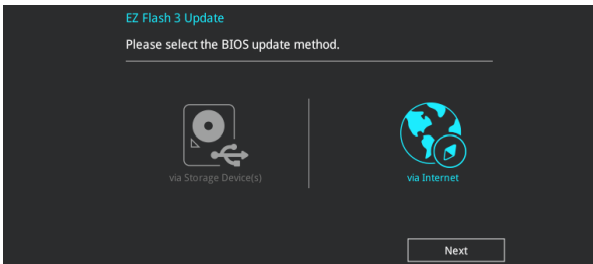
3. Press the Left/Right arrow keys to select an Internet connection method, and then press <Enter>.
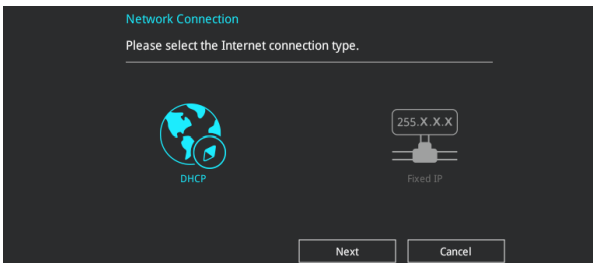
4. Follow the onscreen instructions to complete the update.

5. Reboot the system when the update process is done.

Ensure to load the BIOS default settings to ensure system compatibility and stability. Select the Load Optimized Defaults item under the Exit menu. See section **Exit menu** for details.

3.11.3   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!

RAID Support

4

4.1   RAID configurations

The motherboard supports Intel® Rapid Storage Technology with RAID 0, RAID 1, RAID 5, and RAID 10 solution.

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.

4.1.1   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.

Chapter 4

Chapter 4

Appendix

Q-Code table

Code	Description
00	Not used
01	Power on. Reset type detection (soft/hard).
02	AP initialization before microcode loading
03	System Agent initialization before microcode loading
04	PCH initialization before microcode loading
06	Microcode loading
07	AP initialization after microcode loading
08	System Agent initialization after microcode loading
09	PCH initialization after microcode loading
0B	Cache initialization
0C – 0D	Reserved for future AMI SEC error codes
0E	Microcode not found
0F	Microcode not loaded
10	PEI Core is started
11 – 14	Pre-memory CPU initialization is started
15 – 18	Pre-memory System Agent initialization is started
19 – 1C	Pre-memory PCH initialization is started
2B – 2F	Memory initialization
30	Reserved for ASL (see ASL Status Codes section below)
31	Memory Installed
32 – 36	CPU post-memory initialization
37 – 3A	Post-Memory System Agent initialization is started
3B – 3E	Post-Memory PCH initialization is started
4F	DXE IPL is started
50 – 53	Memory initialization error. Invalid memory type or incompatible memory speed
54	Unspecified memory initialization error
55	Memory not installed
56	Invalid CPU type or Speed
57	CPU mismatch
58	CPU self test failed or possible CPU cache error
59	CPU micro-code is not found or micro-code update is failed
5A	Internal CPU error
5B	Reset PPI is not available
5C – 5F	Reserved for future AMI error codes

(continued on the next page)

Q-Code table

Code	Description
E0	S3 Resume is stared (S3 Resume PPI is called by the DXE IPL)
E1	S3 Boot Script execution
E2	Video repost
E3	OS S3 wake vector call
E4 – E7	Reserved for future AMI progress codes
E8	S3 Resume Failed
E9	S3 Resume PPI not Found
EA	S3 Resume Boot Script Error
EB	S3 OS Wake Error
EC – EF	Reserved for future AMI error codes
F0	Recovery condition triggered by firmware (Auto recovery)
F1	Recovery condition triggered by user (Forced recovery)
F2	Recovery process started
F3	Recovery firmware image is found
F4	Recovery firmware image is loaded
F5 – F7	Reserved for future AMI progress codes
F8	Recovery PPI is not available
F9	Recovery capsule is not found
FA	Invalid recovery capsule
FB – FF	Reserved for future AMI error codes
60	DXE Core is started
61	NVRAM initialization
62	Installation of the PCH Runtime Services
63 – 67	CPU DXE initialization is started
68	PCI host bridge initialization
69	System Agent DXE initialization is started
6A	System Agent DXE SMM initialization is started
6B – 6F	System Agent DXE initialization (System Agent module specific)
70	PCH DXE initialization is started
71	PCH DXE SMM initialization is started
72	PCH devices initialization
73 – 77	PCH DXE Initialization (PCH module specific)
78	ACPI module initialization
79	CSM initialization
7A – 7F	Reserved for future AMI DXE codes

Q-Code table

Code	Description
90	Boot Device Selection (BDS) phase is started
91	Driver connecting is started
92	PCI Bus initialization is started
93	PCI Bus Hot Plug Controller Initialization
94	PCI Bus Enumeration
95	PCI Bus Request Resources
96	PCI Bus Assign Resources
97	Console Output devices connect
98	Console input devices connect
99	Super IO Initialization
9A	USB initialization is started
9B	USB Reset
9C	USB Detect
9D	USB Enable
9E – 9F	Reserved for future AMI codes
A0	IDE initialization is started
A1	IDE Reset
A2	IDE Detect
A3	IDE Enable
A4	SCSI initialization is started
A5	SCSI Reset
A6	SCSI Detect
A7	SCSI Enable
A8	Setup Verifying Password
A9	Start of Setup
AA	Reserved for ASL (see ASL Status Codes section below)
AB	Setup Input Wait
AC	Reserved for ASL (see ASL Status Codes section below)
AD	Ready To Boot event
AE	Legacy Boot event
AF	Exit Boot Services event
B0	Runtime Set Virtual Address MAP Begin
B1	Runtime Set Virtual Address MAP End
B2	Legacy Option ROM Initialization
B3	System Reset

Q-Code table

Code	Description
B4	USB hot plug
B5	PCI bus hot plug
B6	Clean-up of NVRAM
B7	Configuration Reset (reset of NVRAM settings)
B8– BF	Reserved for future AMI codes
D0	CPU initialization error
D1	System Agent initialization error
D2	PCH initialization error
D3	Some of the Architectural Protocols are not available
D4	PCI resource allocation error. Out of Resources
D5	No Space for Legacy Option ROM
D6	No Console Output Devices are found
D7	No Console Input Devices are found
D8	Invalid password
D9	Error loading Boot Option (LoadImage returned error)
DA	Boot Option is failed (StartImage returned error)
DB	Flash update is failed
DC	Reset protocol is not available

ACPI/ASL Checkpoints (under OS)

Code	Description
03	System is entering S3 sleep state
04	System is entering S4 sleep state
05	System is entering S5 sleep state
30	System is waking up from the S3 sleep state
40	System is waking up from the S4 sleep state
AC	System has transitioned into ACPI mode. Interrupt controller is in PIC mode.
AA	System has transitioned into ACPI mode. Interrupt controller is in APIC mode.

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.

Appendix

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-3(B)/NMB-3(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-3(B)/NMB-3(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

KC: Korea Warning Statement

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

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.

Regional notice for California

WARNING

Cancer and Reproductive Harm -
www.P65Warnings.ca.gov

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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

Ελληνικά Με το παρόν, η AsusTek Computer Inc. δηλώνει ότι αυτή η συσκευή συμμορφώνεται με τις θεμελιώδεις απαιτήσεις και άλλες σχετικές διατάξεις των Οδηγιών της ΕΕ. Το πλήρες κείμενο της δήλωσης συμβατότητας είναι διαθέσιμο στη διεύθυνση: www.asus.com/support

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 cerințelor esențiale și altor prevederi relevante ale directivelor conexe. Textul complet al declarației de conformitate a Uniunii Europene se găsește 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

Svenska ASUSTeK Computer Inc. förklarar härmed att denna enhet överensstämmer med de grundläggande kraven och andra relevanta föreskrifter i relaterade direktiv. Fulltext av EU-försäkran om överensstämmelse finns på: www.asus.com/support

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

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