WS X299 PRO Series

Motherboard

E15517
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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.

5. **Chapter 5: Multi GPU Support**

   This chapter describes how to install and configure multiple AMD® CrossFire™ graphics cards.

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 (+).

WS X299 PRO Series specifications summary

Model Name	WS X299 PRO/SE	WS X299 PRO
CPU	LGA2066 Socket for Intel® Core™ X-series Processors Supports 14nm CPU Supports Intel® Turbo Boost Max Technology 3.0* * **The Intel® Turbo Boost Max Technology 3.0 support depends on the CPU types.** ** **Refer to www.asus.com for Intel® CPU support list.**	
Chipset	Intel® X299 Chipset	
Memory	Intel® Socket 2066 Core™ X-series Processors (6 cores and above) 8 x DIMM, Max. 128GB, DDR4 4000(O.C.)/3600(O.C.)/2666/2400/2133* MHz, non-ECC, un-buffered memory Intel® Socket 2066 Core™ X-series Processors (4-core) 4 x DIMM, Max. 64GB, DDR4 4000(O.C.)/3600(O.C.)/2666/2400/2133 MHz Non-ECC, Un-buffered Memory Supports Intel® Extreme Memory Profile (XMP) * **Memory capacity supported depends on both CPU installed and Memory installed.** ** **Hyper DIMM support is subject to the physical characteristics of individual CPUs. Refer to www.asus.com for the Memory QVL (Qualified Vendors Lists).**	
Expansion slots	**44-Lane CPU -** 2 x PCI Express 3.0 x 16 slot (x16 link) 1 x PCI Express 3.0 x 16 slot (x8 link) 1 x PCI Express 3.0 x 16 slot (x4 link) 1 x PCI Express 3.0 x 4 slot (x4 link) **28-Lane CPU -** 1 x PCI Express 3.0 x 16 slot (x16 link) 1 x PCI Express 3.0 x 16 slot (x8 link) 1 x PCI Express 3.0 x 4 slot (x4 link) 1 x PCI Express 3.0 x 16 slot (x4 link) **16-Lane CPU -** 1 x PCI Express 3.0 x 16 slot (x8 link) 2 x PCI Express 3.0 x 16 slot (x4 link) 1 x PCI Express 3.0 x 4 slot (x4 link)	
Multi-GPU support	Supports AMD® 3-Way CrossFireX™ Technology Supports NVIDIA® 3-Way SLI™ Technology* * **Actual numbers of Multi-graphic supported differs per Vendors' Graphic cards. Please check with Vendor beforehand.**	

(continued on the next page)

WS X299 PRO Series specifications summary

Model Name	WS X299 PRO/SE	WS X299 PRO
Storage	**Intel® X299 Chipset with RAID 0, 1, 5, 10 and Intel Rapid Storage Technology 15 support** 1 x M.2_2 (Gen 3 x4) socket3, type 2242/2260/2280/22110 storage devices support (PCIe mode)* 1 x M.2_1 (Gen 3 x4) socket3, type 2242/2260/2280 storage devices support (both SATA & PCIe mode) 6 x SATA 6.0 Gb/s Ports 1 x U.2 connector (supports U.2 NVMe device)* Intel® Optane™ Memory Ready Intel® Virtual RAID (VROC) suuport for CPU RAID** * **Bandwidth is shared between M.2_2 and U.2.** ** **Intel® VROC is supported via RSTe, Hyper M.2 x 16 card, and Intel® VROC_HW_key. Hyper M.2 x 16 card and VROC_HW_Key are to be purchased separately. NVMe RAID type and function will depend on Intel® VROC_HW_key installed.**	
LAN	2 x Intel® I210-AT Gigabit LAN Controller	
Audio	**Realtek® ALC S1220A 8-Channel High Definition Audio CODEC featuring Crystal sound 3** - Power pre-regulator reduces power input noise to ensure consistent performance - Separate layer for left and right track, ensuring both sound deliver equal quality - Impedance sense for front and rear headphone outputs - Audio Shielding: Ensures precision analog/digital separation and greatly reduced multi-lateral interference - Internal audio Amplifier to enhance the highest quality sound for headphone and speakers - Unique de-pop circuit: Reduces start-up popping noise to audio outputs - Premium Japanese-made audio capacitors provides warm, natural and immersive sound with exceptional clarity and fidelity - High quality 120dB SNR stereo playback output (Line-out@back) & 113dB SNR input (Line-in) support - Supports up to 32-Bit/192kHz playback* - DTS Connect - DTS Headphone:X - Supports: Jack-detection, Multi-streaming, Front Panel Jack-retasking(MIC) - Optical S/PDIF out port(s) at back panel * **Due to limitations in HAD bandwidth, 32-Bit/192kHz is not supported for 8-channel audio. 32-Bit/192kHz is only available under Windows® 10.**	

(continued on the next page)

WS X299 PRO Series specifications summary

Model Name	WS X299 PRO/SE	WS X299 PRO
USB	**Intel® X299 Chipset** - 6 x USB 3.1 Gen 1 ports (4@ rear panel, 2@ front panel) - 6 x USB 2.0 ports (4@ rear panel, 2@ front panel) **ASMedia® USB 3.1 Gen 2 Controller** - 2 x USB 3.1 Gen 2 ports @ rear panel (1 x Type-A; 1 x Type-C™) - 1 x USB 3.1 Gen 2 @ front panel (optional Type-A or Type-C™)	
ASUS Special Features	**OC Design - ASUS PRO Clock Technology** - Full BCLK range for extreme overclocking performance. **DIGI+ Power Control** - CPU Power: Digital 8-phase power design - DRAM: Digital 2-phase power design **Turbo LAN** **Intel Virtual RAID on CPU (VROC) ready** **ASMedia USB 3.1 Gen 2 Controller supports Multiple-Ins function** **Thunderbolt 3 support** - Blistering-fast40 Gb/s data transfers upgrades with ThunderboltEX 3 cards **M.2 and U.2 Onboard (The Latest Transfer Technology with up to 32Gb/s Data-transfer Speeds for M.2 and U.2)** **ASUS SafeSlot and SafeSlot Core:** Fortified PCIe Slot preventing damages **ASUS Overvoltage Protection:** World-class circuit-protecting power design	**OC Design - ASUS PRO Clock Technology** - Full BCLK range for extreme overclocking performance. **5-Way Optimization by Dual Intelligent Processors 5** - Whole system optimization with a single click! Perfectly consolidates better CPU performance, power saving, digital power control, system cooling and app usages. **DIGI+ Power Control** - CPU Power: Digital 8-phase power design - DRAM: Digital 2-phase power design **TPU** - Auto Tuning, TPU **EPU** **Fan Xpert 4** **Turbo Core App** **Turbo LAN** **Intel Virtual RAID on CPU (VROC) ready** **ASMedia USB 3.1 Gen 2 Controller supports Multiple-Ins function** **Thunderbolt 3 support** - Blistering-fast40 Gb/s data transfers upgrades with ThunderboltEX 3 cards **M.2 and U.2 Onboard (The Latest Transfer Technology with up to 32Gb/s Data-transfer Speeds for M.2 and U.2)**

(continued on the next page)

WS X299 PRO Series specifications summary

Model Name	WS X299 PRO/SE	WS X299 PRO
ASUS Special Features	**ASUS Enhanced DRAM Overcurrent Protection** - Short circuit damage prevention **ASUS Stainless-Steel Back I/O:** 3X corrosion-resistance for greater durability! **ASUS ESD Guards** - Enhanced ESD protection **AURA Sync** - Aura RGB Strip Headers - Aura Lighting Effects Synchronization with compatible ASUS ROG devices - Aura Addressable Strip Header **Ai Charger+** **Supporting ASUS Control Center (ACC) Management IT software** **File Transfer** **Cloud GO!** **File Transfer** **ASUS Q-Design :** - ASUS Q-Shield - ASUS Q-Code - ASUS Q-LED (CPU, DRAM, VGA, Boot Device LED) - ASUS Q-Slot - ASUS Q-DIMM **ASUS USB BIOS Flashback** **Onboard Button: Power/Reset** **UEFI BIOS** - CrashFree BIOS 3 - EZ Flash3 - EZ Tuning Wizard - ASUS UEFI BIOS EZ Mode - Multi-language BIOS	**ASUS SafeSlot and SafeSlot Core:** Fortified PCIe Slot preventing damages **ASUS Overvoltage Protection:** World-class circuit-protecting power design **ASUS Enhanced DRAM Overcurrent Protection** - Short circuit damage prevention **ASUS Stainless-Steel Back I/O:** 3X corrosion-resistance for greater durability! **ASUS ESD Guards** - Enhanced ESD protection **AURA Sync** - Aura RGB Strip Headers - Aura Lighting Effects Synchronization with compatible ASUS ROG devices - Aura Addressable Strip Header **Ai Charger+** **Supporting ASUS Control Center (ACC) Management IT software** **File Transfer** **Cloud GO!** **File Transfer** **ASUS Q-Design:** - ASUS Q-Shield - ASUS Q-Code - ASUS Q-LED (CPU, DRAM, VGA, Boot Device LED) - ASUS Q-Slot - ASUS Q-DIMM - ASUS Q-Connector

(continued on the next page)

WS X299 PRO Series specifications summary

Model Name	WS X299 PRO/SE	WS X299 PRO
ASUS Special Features	**MemOK!** **ASUS Quiet Thermal Solution:** - Stylish M.2 Heat-sink solution	**ASUS USB BIOS Flashback** **Onboard Button: Power/Reset** **UEFI BIOS** - CrashFree BIOS 3 - EZ Flash3 - EZ Tuning Wizard - ASUS UEFI BIOS EZ Mode - Multi-language BIOS **AI Suite 3** **MemOK!** **ASUS Quiet Thermal Solution:** - Stylish M.2 Heat-sink solution
Rear Panel I/O Ports	1 x USB BIOS Flashback Button 2 x USB 3.1 Gen 2 ports (Type-C & Type-A) 4 x USB 3.1 Gen 1 ports (Blue) 4 x USB 2.0 ports (1 Supports USB BIOS Flashback) 1 x Optical S/PDIF Out Port 2 x Intel LAN (RJ45) Ports 8-channel Audio I/O Ports	
Internal I/O Connectors	1 x Aura Addressable Strip Header 1 x AAFP connector 1 x Aura RGB Strip Header 1 x USB 3.1 Gen 1 connector supports additional 2 USB 3.1 Gen 1 ports 1 x USB 2.0 connector supports additional 2 USB 2.0 ports 1 x USB 3.1 Gen 2 front panel connector 1 x M.2 Socket 3 with M key, type 2242/2260/2280 storage devices support (SATA & PCIE 3.0 x 4 mode) 1 x M.2 Socket 3 with M key, type 2242/2260/2280/22110 storage devices support (PCIE 3.0 x 4 mode) 6 x SATA 6Gb/s connectors 1 x VROC_HW_Key connector 2 x CPU Fan connectors 1 x FRNT Fan connector 1 x REAR Fan connector 1 x PUMP Fan connector 1 x AIO_PUMP connector 1 x Thunderbolt header	

(continued on the next page)

WS X299 PRO Series specifications summary

Model Name	WS X299 PRO/SE	WS X299 PRO
Internal I/O Connectors	1 x 24-pin EATX Power connector 2 x 8-pin ATX 12V Power connectors 1 x 6-pin ATX 12V Power connector 1 x EZ XMP switch 3 x System panels 1 x 5-pin EXT_FAN(Extension Fan) connector 1 x MemOK! button 1 x Thermal sensor connector 1 x Power-on button 1 x Reset button 1 x Clear CMOS button 1 x U.2 connector 1 x CPU_OV jumper 1 x COM port header 1 x VGA port header	1 x 24-pin EATX Power connector 2 x 8-pin ATX 12V Power connectors 1 x 6-pin ATX 12V Power connector 1 x EZ XMP switch 1 x System panel 1 x 5-pin EXT_FAN(Extension Fan) connector 1 x MemOK! button 1 x Thermal sensor connector 1 x Power-on button 1 x Reset button 1 x Clear CMOS button 1 x U.2 connector 1 x CPU_OV jumper 1 x COM port header
Form Factor	ATX Form Factor 12” x 9.6”	

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

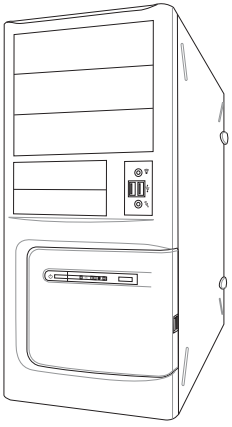
Package contents

Check your motherboard package for the following items.

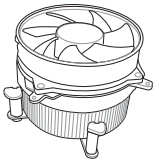
Motherboard	1 x WS X299 PRO Series motherboard
Cables	6 x Serial ATA 6Gb/s cables 1 x VGA bracket cable (for WS X299 PRO/SE only) 1 X USB 2.0 bracket cable 1 X Addressable cable
Accessories	2 x M.2 screws kits 1 x ASUS 3-Way SLI™ bridge 1 x ASUS SLI™ bridge 1 x COM port brackets 1 X I/O shield 1 X ASUS fan holder 1 X 40mm x 40mm fan kit
Application DVD	1 x Motherboard support DVD
Documentation	1 x User guide

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

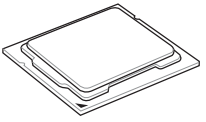
Installation tools and components



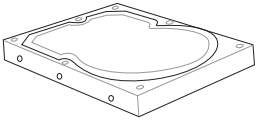
PC chassis



Intel® LGA2066 compatible CPU Fan

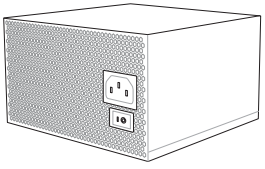


Intel® LGA2066 CPU

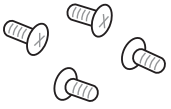


SATA hard disk drive

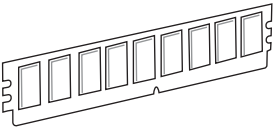
Phillips (cross) screwdriver



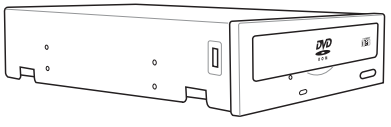
Power supply unit



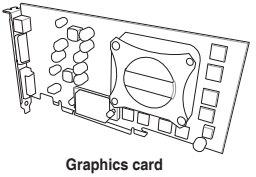
1 bag of screws



DIMM



SATA optical disc drive (optional)



Graphics card

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

Product Introduction

1

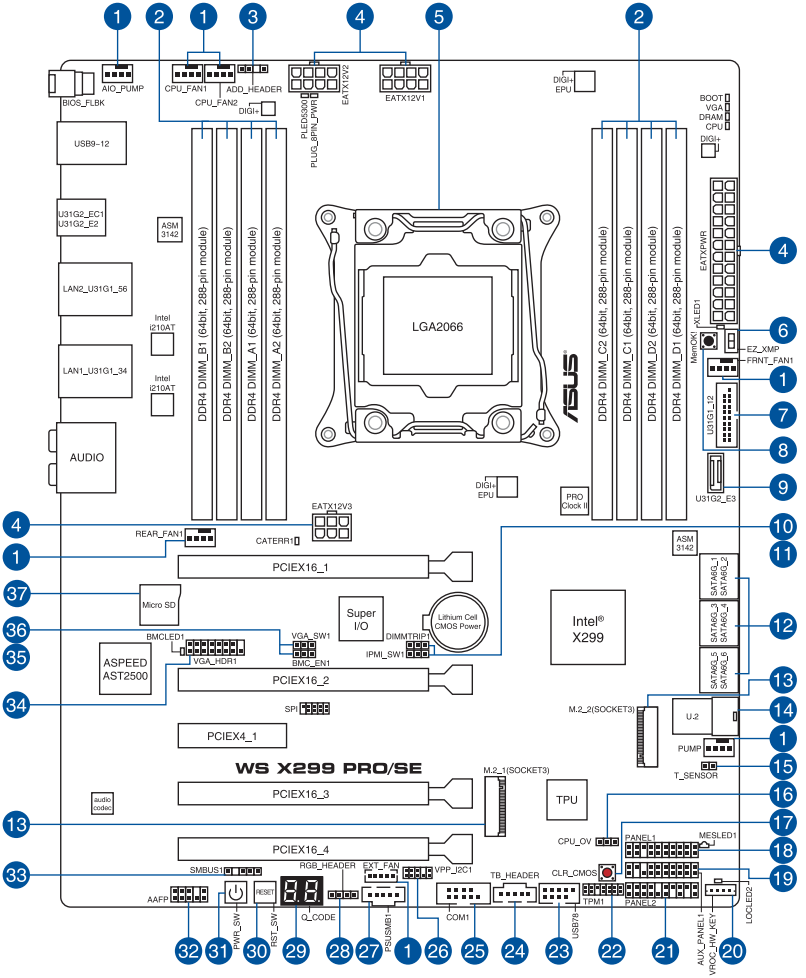
1.1 Motherboard overview

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.

1.1.2 Motherboard layout



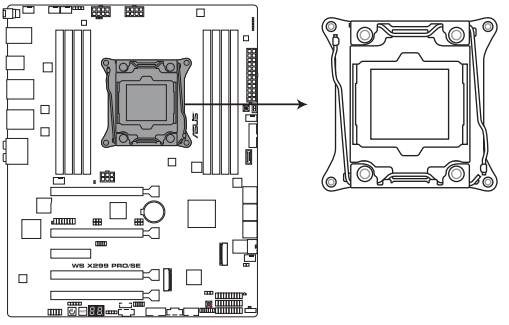
Refer to **1.1.9 Internal connectors** and **2.3.1 Rear I/O connection** for more information about rear panel connectors and internal connectors.

Layout contents

Connectors/Jumpers/Buttons and switches/Slots	Page
1. CPU, AIO pump, front, rear, pump, and extension fan connectors (4-pin CPU_FAN1-2; 4-pin AIO_PUMP; 4-pin FRNT_FAN1; 4-pin REAR_FAN1; 4-pin PUMP; 5-pin EXT_FAN)	1-23
2. DDR4 DIMM slots	1-5
3. Aura Addressable RGB header (4-pin ADD_HEADER)	1-34
4. ATX power connectors (24-pin EATXPWR; 8-pin EATX12V1; 8-pin EATX12V2; 6-pin EATX12V3)	1-27
5. LGA2066 CPU socket	1-4
6. EZ XMP switch	1-15
7. USB 3.1 Gen 1 connector (20-1 pin U31G1_12)	1-19
8. MemOK! button	1-10
9. USB 3.1 Gen 2 front panel connector (U31G2_E3)	1-18
10. DDR4 thermal event setting (3-pin DIMMTRIP1)	1-12
11. IPMI SW setting (3-pin IPMI_SW1)	1-13
12. Intel® Serial ATA 6 Gb/s connectors (7-pin SATA6G_12; SATA 6G_34; SATA 6G_56)	1-17
13. M.2 sockets (M.2_1(Socket 3); M.2_2(Socket 3))	1-31
14. U.2 connector (U.2)	1-30
15. Thermal sensor connector (2-pin T_SENSOR)	1-32
16. CPU Over Voltage jumper (3-pin CPU_OV)	1-12
17. Clear CMOS button (CLR_CMOS)	1-11
18. System panel connector (20-1 pin PANEL1)	1-24
19. Auxiliary panel connector (20-2 pin AUX_PANEL1)	1-26
20. VROC_KEY connector (4-pin VROC_HW_KEY)	1-22
21. System panel connector (20-3 pin PANEL2)	1-25
22. TPM connector (14-1 pin TPM1)	1-21
23. USB 2.0 connector (10-1 pin USB78)	1-20
24. Thunderbolt header (5-pin TB_HEADER)	1-30
25. Serial port connector (10-1 pin COM1)	1-28
26. VPP_I2C1 connector (10-1 pin VPP_I2C1)	1-29
27. Power Supply SMBus connector (5-pin PSUSMB1)	1-28
28. Aura RGB header (4-pin RGB_HEADER)	1-33
29. Q-Code LEDs	1-16
30. Reset button	1-9
31. Power-on button	1-9
32. Front panel audio connector (10-1 pin AAFP)	1-18
33. System Management Bus (SMBUS) connector (5-1 pin SMBUS1)	1-29
34. VGA connector (16-1 pin VGA_HDR1)	1-22
35. Baseboard Management Controller setting (3-pin BMC_EN1)	1-14
36. VGA controller setting (3-pin VGA_SW1)	1-13
37. MicroSD card slot (MSD1)	1-35

1.1.3 Central Processing Unit (CPU)

The motherboard comes with a surface mount LGA2066 socket designed for the Intel® Core™ X-series Processors.



WS X299 PRO Series LGA2066 Socket

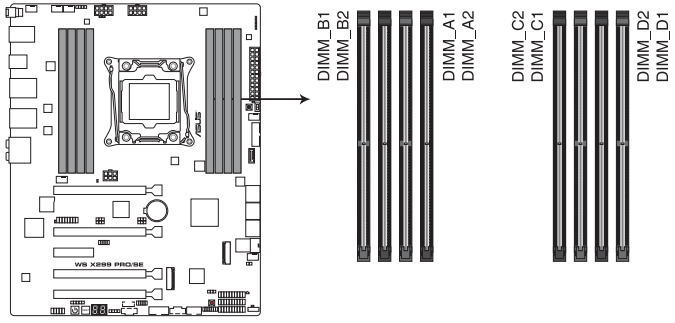
Ensure that you install the correct CPU designed for LGA2066 socket only. DO NOT install a CPU designed for other sockets on the LGA2066 socket.

- 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.

1.1.4 System memory

The motherboard comes with eight (8) DDR 4 (Double Data Rate 4) Dual Inline Memory Modules (DIMM) slots.

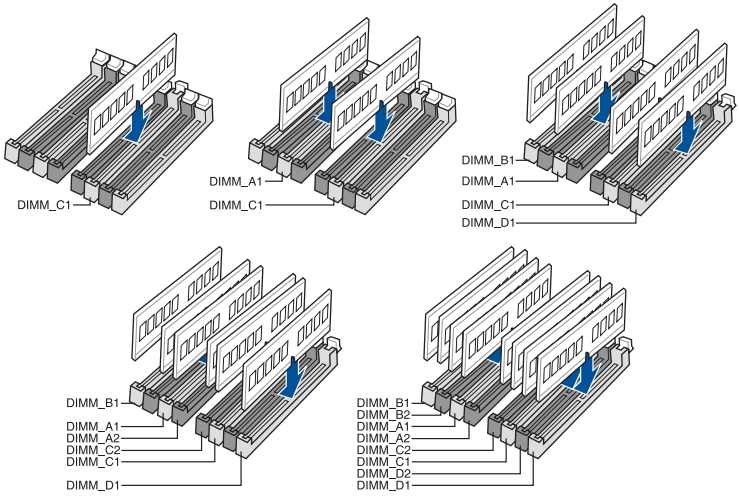
A DDR4 module is notched differently from a DDR, DDR2 or DDR3 module. DO NOT install a DDR, DDR2 or DDR3 memory module to the DDR4 slot.



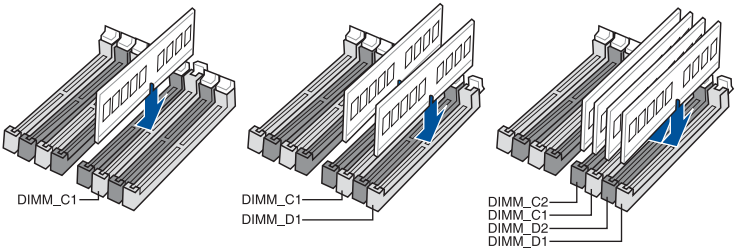
WS X299 PRO Series 288-pin DDR4 DIMM socket

Recommended memory configurations

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



Intel® Core™ X-series Processors (4-core)



Memory configurations

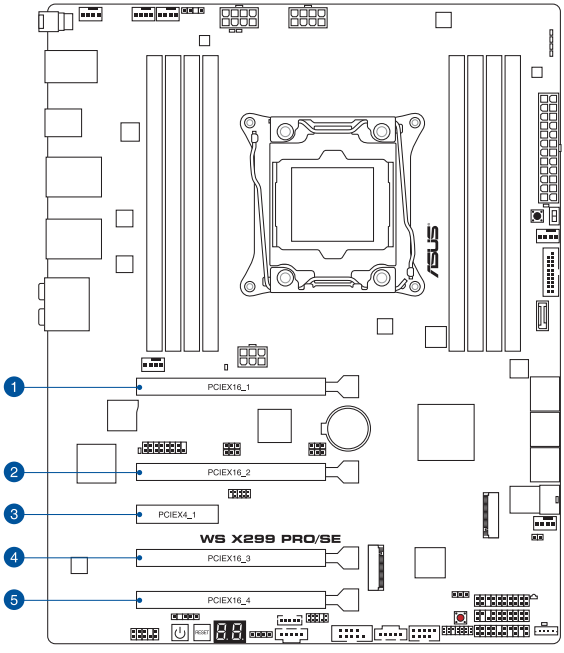
You may install 2 GB, 4 GB, 8 GB and 16 GB unbuffered and non-ECC DDR4 DIMMs into the DIMM sockets.

- For Inte® Core™ X-Series Processors (4-core), you may install varying memory sizes in Channel C and Channel D. The system maps the total size of the lower-sized channel for the dual-channel configuration. Any excess memory from the higher-sized channel is then mapped for single-channel operation.
- For Intel® Core™ X-Series Processors (6-core or above), you may install varying memory sizes in Channel A, Channel B, Channel C, and Channel D. The system maps the total size of the lower-sized channel for the quad-channel configuration. Any excess memory from the higher-sized channel is then mapped for single-channel operation.

- The default memory operation frequency is dependent on its Serial Presence Detect (SPD), which is the standard way of accessing information from a memory module. Under the default state, some memory modules for overclocking may operate at a lower frequency than the vendor-marked value.
- For system stability, use a more efficient memory cooling system to support a full memory load (8 DIMMs) 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.

1.1.5 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.



Slot No.	Slot Description
1	PCIE 3.0 x16_1 slot
2	PCIE 3.0 x16_2 slot
3	PCIE 3.0 x4_1 slot
4	PCIE 3.0 x16_3 slot
5	PCIE 3.0 x16_4 slot

44-Lane CPUs

	PCI Express 3.0 operating mode		
VGA / PCIe configuration	Single VGA / PCIe card	Dual VGA / PCIe cards	Triple VGA / PCIe cards
PCIe 3.0 x16_1	x16 (single VGA recommended)	x16	x16
PCIe 3.0 x16_2	N/A	x16	x16
PCIe 3.0 x16_3	N/A	N/A	x8
PCIe 3.0 x16_4	N/A	N/A	N/A

28-Lane CPUs

	PCI Express 3.0 operating mode	
VGA / PCIe configuration	Single VGA / PCIe card	Dual VGA / PCIe cards
PCIe 3.0 x16_1	x16 (single VGA recommended)	x16
PCIe 3.0 x16_2	N/A	x8
PCIe 3.0 x16_3	N/A	N/A
PCIe 3.0 x16_4	N/A	N/A

16-Lane CPUs

	PCI Express 3.0 operating mode	
VGA / PCIe configuration	Single VGA / PCIe card	Dual VGA / PCIe cards
PCIe 3.0 x16_1	x8 (single VGA recommended)	x8
PCIe 3.0 x16_2	N/A	N/A
PCIe 3.0 x16_3	N/A	x4
PCIe 3.0 x16_4	N/A	N/A

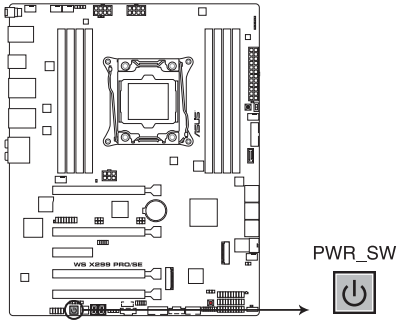
- We recommend that you provide sufficient power when running CrossFireX™ or SLI™ mode.
- The PCIe 3.0/2.0 x16_2 slot is not recommended for VGA cards or PCIe cards running at x8 mode or above.

1.1.6 Onboard buttons and switches

Onboard buttons and switches allow you to fine-tune performance when working on a bare or open-case system. This is ideal for overclockers and gamers who continually change settings to enhance system performance.

1. Power-on button

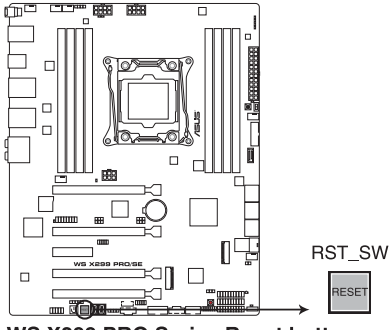
The motherboard comes with a power-on button that allows you to power up or wake up the system. The button also lights up when the system is plugged to a power source indicating that you should shut down the system and unplug the power cable before removing or installing any motherboard component.



WS X299 PRO Series Power on button

2. Reset button

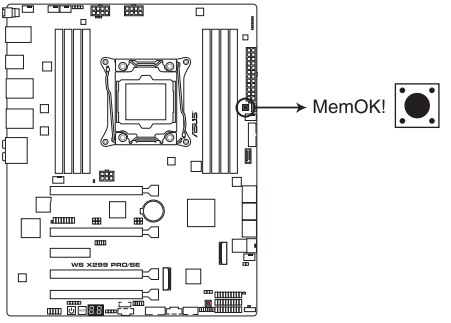
Press the reset button to reboot the system.



WS X299 PRO Series Reset button

3. MemOK! button

Installing DIMMs that are not compatible with the motherboard may cause system boot failure. If the system fails to boot during POST stage and the DRAM_LED lights continuously, press the MemOK! button until the DRAM_LED starts blinking. System will begin automatic memory compatibility tuning and reboot for successful boot.

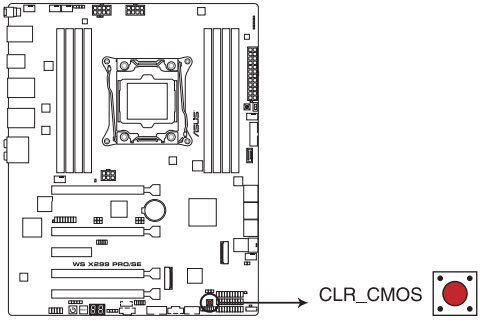


WS X299 PRO Series MemOK! button

- Refer to section **1.1.8 Onboard LEDs** for the exact location of the DRAM_LED.
- The DRAM_LED also lights up when the DIMM is not properly installed. Turn off the system and reinstall the DIMM before using the MemOK! function.
- The MemOK! button does not function under Windows® OS environment.
- During the tuning process, the system loads and tests failsafe memory settings. It takes about 30 seconds for the system to test one set of failsafe settings. If the test fails, the system reboots and tests the next set of failsafe settings. The blinking speed of the DRAM_LED increases, indicating different test processes.
- Due to memory tuning requirement, the system automatically reboots when each timing set is tested. If the installed DIMMs still fail to boot after the whole tuning process, the DRAM_LED lights continuously. Replace the DIMMs with ones recommended in the Memory QVL (Qualified Vendors Lists) at www.asus.com.
- If you turn off the computer and replace DIMMs during the tuning process, the system continues memory tuning after turning on the computer. To stop memory tuning, turn off the computer and unplug the power cord for about 5–10 seconds.
- If your system fails to boot up due to BIOS overclocking, press the MemOK! button to boot and load the BIOS default settings. A message will appear during POST reminding you that the BIOS has been restored to its default settings.
- We recommend that you download and update to the latest BIOS version from www.asus.com after using the MemOK! function.

4. Clear CMOS button (CLR_CMOS)

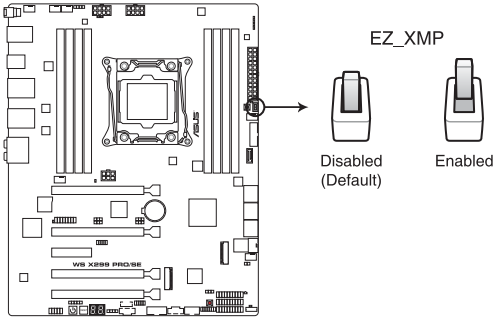
Press this button to clear the BIOS setup information only when the systems hangs due to overclocking.



WS X299 PRO Series Clear CMOS button

5. EZ XMP switch

Enable this switch to overclock the installed DIMMs, allowing you to enhance the DIMM's speed and performance.

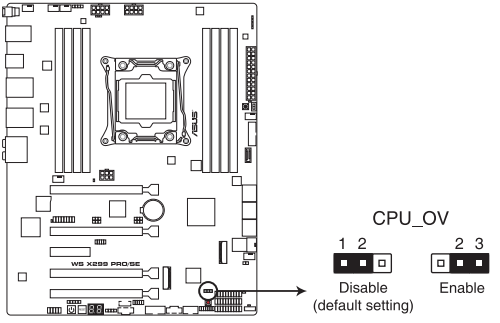


WS X299 PRO Series EZ_XMP switch

1.1.7 Jumpers

1. CPU Over Voltage jumper (3-pin CPU_OV)

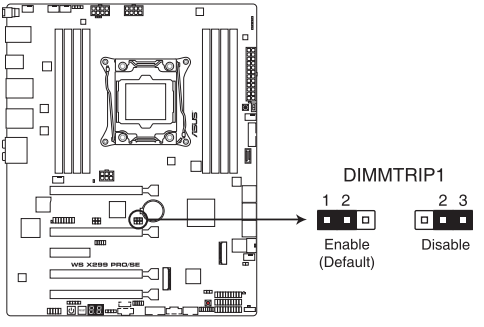
The CPU Over Voltage jumper allows you to set a higher CPU voltage for a flexible overclocking system, depending on the type of the installed CPU. To gain more CPU voltage setting, insert the jumper to pins 2-3. To go back to its default CPU voltage setting, insert the jumper to pins 1-2.



WS X299 PRO Series CPU_OV setting

2. DDR4 thermal event setting (3-pin DIMMTRIP1)

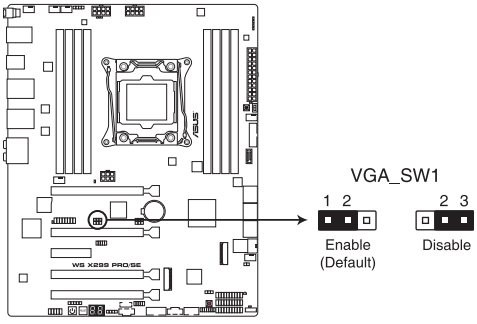
These jumpers allow you to enable or disable DDR4 DIMM thermal sensing event pin.



WS X299 PRO Series Thermaltrip setting

3. VGA controller setting (3-pin VGA_SW1)

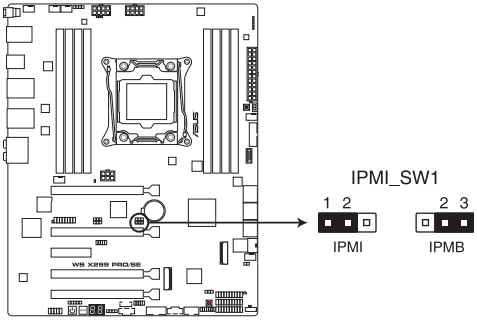
This jumper allows you to enable or disable the onboard VGA controller. Set to pins 1–2 to activate the VGA feature.



WS X299 PRO Series VGA setting

4. IPMI SW setting (3-pin IPMI_SW1)

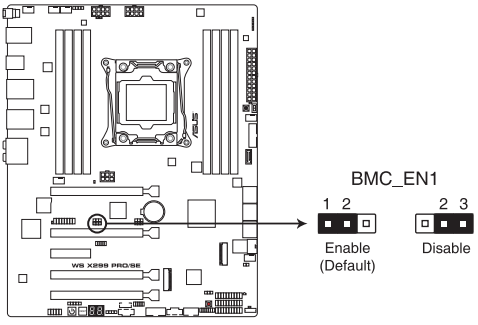
This jumper allows you to select which protocol in the GPU sensor to function.



WS X299 PRO Series IPMI_SW1 setting

5. Baseboard Management Controller setting (3-pin BMC_EN1) (for WS X299 PRO/SE only)

This jumper allows you to enable (default) or disable on-board BMC. Ensure to set this BMC jumper to enabled to avoid system fan control and hardware monitor error.

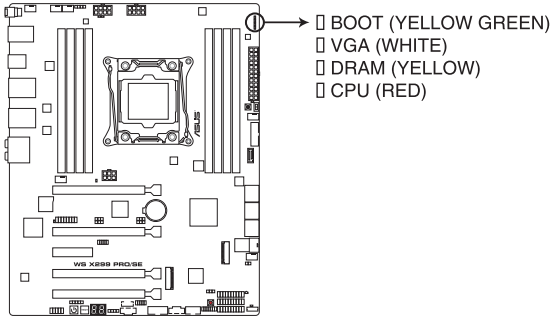


WS X299 PRO Series BMC setting

1.1.8 Onboard LEDs

1. Q LED (CPU, DRAM, VGA, BOOT)

Q LED checks key components (CPU, DRAM, VGA card, and booting devices) in sequence during motherboard booting process. If an error is found, the corresponding LED remains lit until the problem is solved. This user-friendly design provides an intuitive way to locate the root problem within seconds.

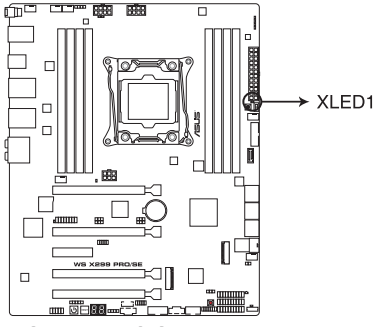


WS X299 PRO Series CPU/ DRAM/ BOOT_DEVICE/ VGA LED

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. EZ XMP LED (XLED1)

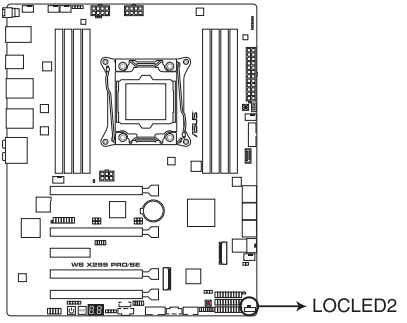
This LED lights up when you enable the EZ XMP switch.



WS X299 PRO Series XLED1

3. Location LED (LOCLED2)

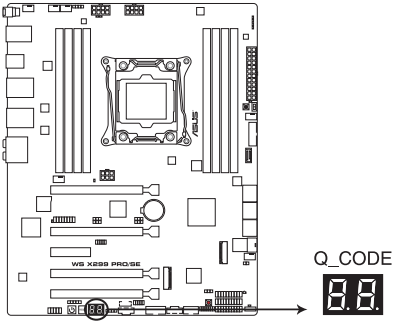
This onboard LED lights up when the Location button on the server is pressed or when triggered by a system management software. The Location LED helps visually locate and quickly identify the server in error on a server rack.



WS X299 PRO Series Location LED

4. Q-Code LEDs

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



WS X299 PRO Series Q-Code LED

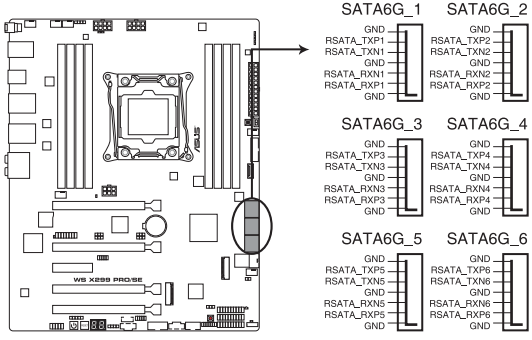
- The Q-Code LEDs provide the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.
- Please refer to the Q-Code table in the **Appendix** section for more details.

1.1.9 Internal connectors

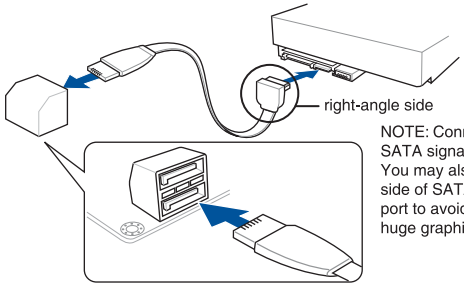
1. Intel® Serial ATA 6 Gb/s connectors (7-pin SATA6G_12; SATA 6G_34; SATA 6G_56)

These connectors connect to Serial ATA 6 Gb/s hard disk drives via Serial ATA 6 Gb/s signal cables.

If you installed Serial ATA hard disk drives, you can create a RAID 0, 1, 5, and 10 configuration with the Intel® Rapid Storage Technology through the onboard Intel® X299 chipset.



WS X299 PRO Series Intel® Serial ATA 6 Gb/s connectors

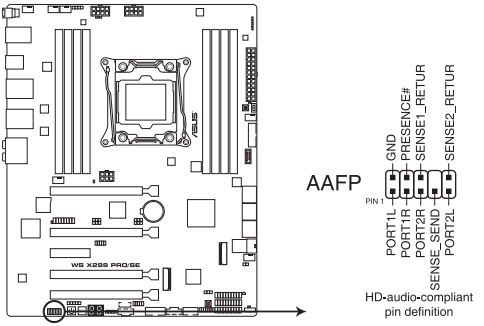


NOTE: Connect the right-angle side of SATA signal cable to SATA device. You may also connect the right-angle side of SATA cable to the onboard SATA port to avoid mechanical conflict with huge graphics cards.

These connectors are set to **[AHCI Mode]** by default. If you intend to create a Serial ATA RAID set using these connectors, set the SATA Mode item in the BIOS to **[Intel RST Premium With Intel Optane System Acceleration (RAID)]**.

2. Front panel audio connector (10-1 pin AAFP)

This 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.

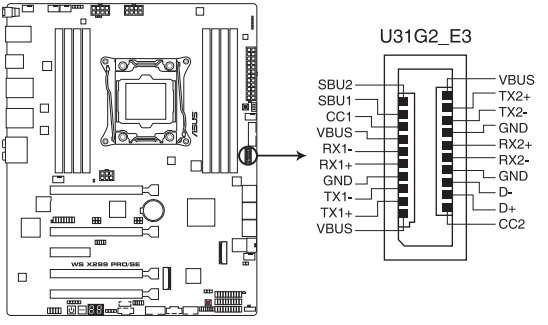


WS X299 PRO Series Front panel audio connector

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.

3. USB 3.1 Gen 2 front panel connector (U31G2_E3)

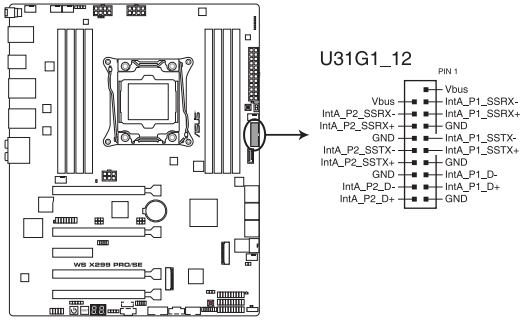
This connector allows you to connect a USB 3.1 Gen 2 module for additional USB 3.1 Gen 2 ports. The latest USB 3.1 Gen 2 connectivity provides data transfer speeds of up to 10 Gbps.



WS X299 PRO Series USB 3.1 Gen 2 front panel connector

4. USB 3.1 Gen 1 connector (20-1 pin U31G1_12)

These connector allows you to connect a USB 3.1 Gen 1 module for additional USB 3.1 Gen 1 front or rear panel ports. With an installed USB 3.1 Gen 1 module, you can enjoy all the benefits of USB 3.1 Gen 1 including faster data transfer speeds of up to 5 Gb/s, faster charging time for USB-chargeable devices, optimized power efficiency, and backward compatibility with USB 2.0.



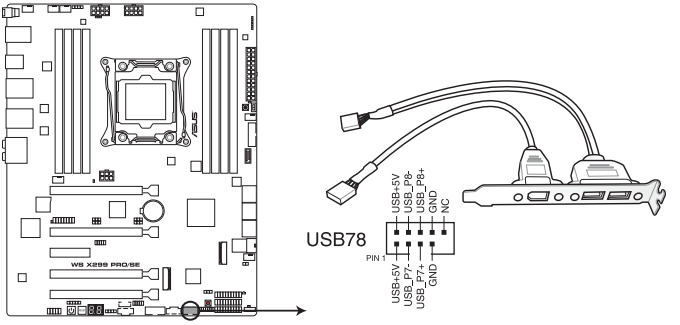
WS X299 PRO Series USB 3.1 Gen 1 connector

The USB 3.1 Gen 1 module is purchased separately.

- Ensure to install the related driver to fully use the USB 3.1 Gen 1 ports under Windows® 7.
- The plugged USB 3.1 Gen 1 device may run on xHCI or EHCI mode depending on the operating system's setting.

5. USB 2.0 connector (10-1 pin USB78)

This connector is for USB 2.0 ports. Connect the USB module cable to this connector, then install the module to a slot opening at the back of the system chassis. This USB connector complies with USB 2.0 specification that supports up to 480 Mb/s connection speed.

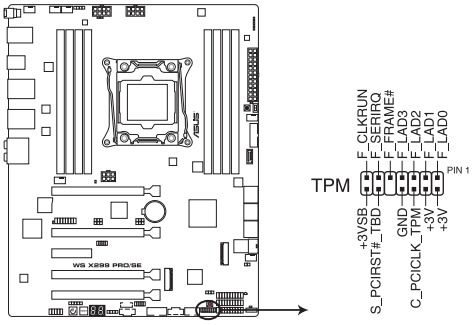


WS X299 PRO Series USB 2.0 connector

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

6. TPM connector (14-1 pin TPM1)

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

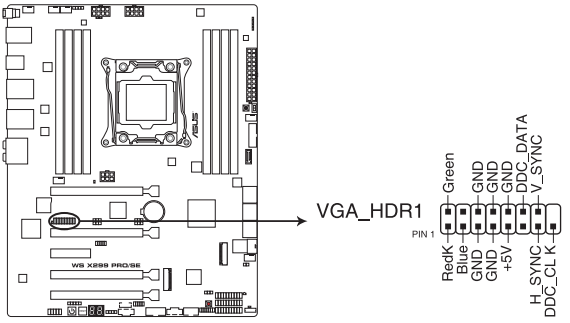


WS X299 PRO Series TPM connector

The TPM module is purchased separately.

7. VGA connector (16-1 pin VGA_HDR1)
(for WS X299 PRO/SE only)

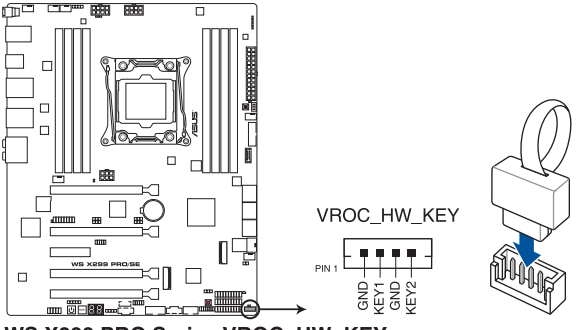
This connector supports the VGA High Dynamic-Range interface.



WS X299 PRO Series Internal VGA connector

8. VROC_KEY connector (4-pin VROC_HW_KEY)

This connector allows you to connect a KEY module to enable CPU RAID functions with Intel® CPU RSTe.

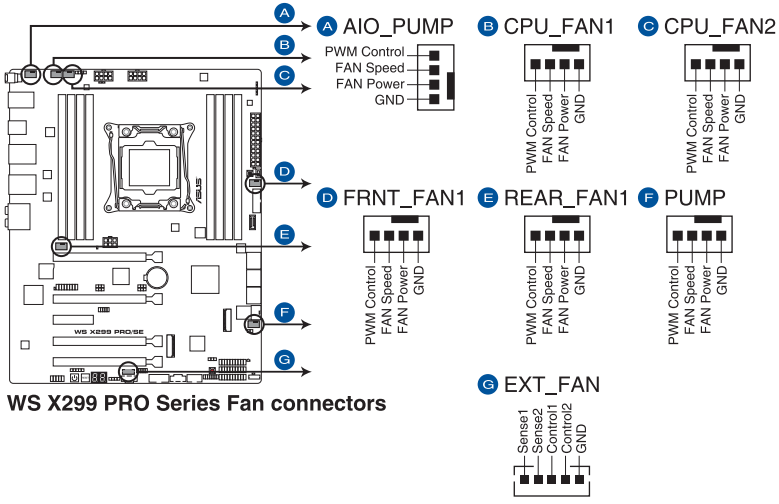


WS X299 PRO Series VROC_HW_KEY

The KEY module is purchased separately.

9. CPU, AIO pump, front, rear, pump, and extension fan connectors (4-pin CPU_ FAN1-2; 4-pin AIO_PUMP; 4-pin FRNT_FAN1; 4-pin REAR_FAN1; 4-pin PUMP; 5-pin EXT_FAN)

Connect the fan cables to the fan connectors on the motherboard, ensuring that the black wire of each cable matches the ground pin of the connector.



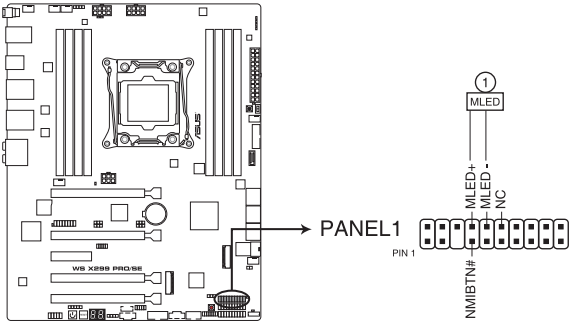
WS X299 PRO Series Fan connectors

- 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 that the CPU fan cable is securely installed to the CPU fan connector.

- The CPU_FAN connector supports the CPU fan of maximum 1A (12 W) fan power.
- PUMP function support depends on water cooling device.
- Connect the fan of your water cooling kit to the AIO_PUMP/PUMP connector.

10. System panel connector (20-1 pin PANEL1) (for WS X299 PRO/SE only)

This connector supports several chassis-mounted functions.



WS X299 PRO Series System panel connector

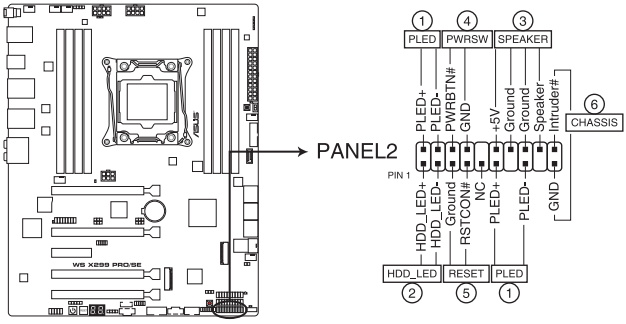
1. Message LED (2-pin MLED)

This 2-pin connector is for the message LED cable that connects to the front message LED. The message LED is controlled by the BMC to indicate an abnormal event occurrence.

This connector may be disabled depending on the model.

11. System panel connector (20-3 pin PANEL2)

This connector supports several chassis-mounted functions.



WS X299 PRO Series System panel connector

1. System power LED (2-pin or 3-1 pin PLED)

The 2-pin or 3-1 pin connector is for the system power LED. Connect the chassis power LED cable to this connector. The system power LED lights up when you turn on the system power, and blinks when the system is in sleep mode.

2. Hard disk drive activity LED (2-pin HDD_LED)

This 2-pin connector is for the HDD Activity LED. Connect the HDD Activity LED cable to this connector. The HDD LED lights up or flashes when data is read from or written to the HDD.

3. System warning speaker (4-pin SPEAKER)

This 4-pin connector is for the chassis-mounted system warning speaker. The speaker allows you to hear system beeps and warnings.

4. ATX power button/soft-off button (2-pin PWRSW)

This connector is for the system power button. Pressing the power button turns the system on or puts the system in sleep or soft-off mode depending on the operating system settings. Pressing the power switch for more than four seconds while the system is ON turns the system OFF.

5. Reset button (2-pin RESET)

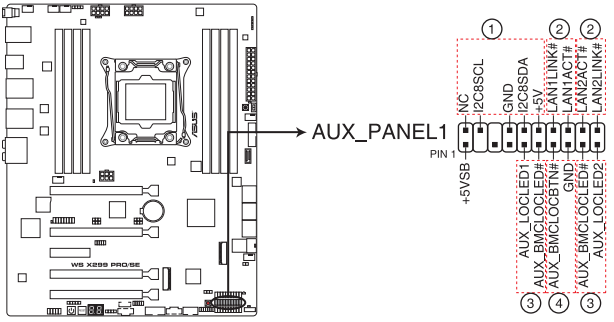
This 2-pin connector is for the chassis-mounted reset button for system reboot without turning off the system power.

6. Chassis intrusion connector (2-pin CHASSIS)

This connector is for a chassis-mounted intrusion detection sensor or switch. Connect one end of the chassis intrusion sensor or switch cable to this connector. The chassis intrusion sensor or switch sends a high-level signal to this connector when a chassis component is removed or replaced. The signal is then generated as a chassis intrusion event.

12. Auxiliary panel connector (20-2 pin AUX_PANEL1) (for WS X299 PRO/SE only)

This connector is for additional front panel features including front panel SMB, locator LED and switch, chassis intrusion, and LAN LEDs.



WS X299 PRO Series Auxiliary panel connector

1. Front panel SMB (6-1 pin FPSMB)

This connector is for the front panel SMBus cable.

2. LAN activity LED (2-pin LAN1_LED, LAN2_LED)

These connectors are for the Gigabit LAN activity LEDs on the front panel.

3. Locator LED (2-pin LOCATORLED1, 2-pin LOCATORLED2)

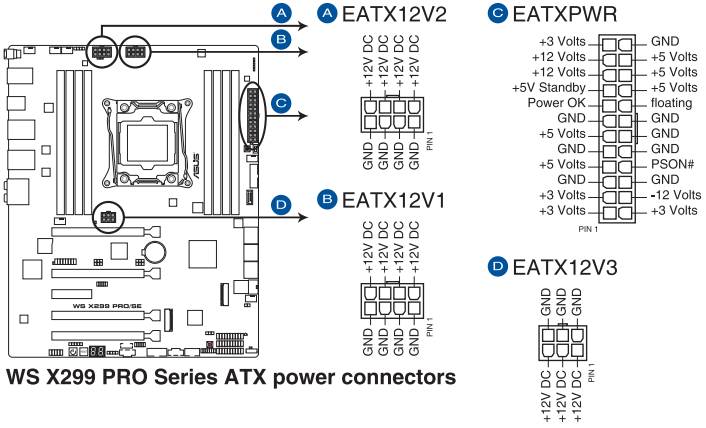
These connectors are for the locator LED1 and LED2 on the front panel. Connect the Locator LED cables to these 2-pin connector. The LEDs will light up when the Locator button is pressed.

4. Locator Button/Switch (2-pin LOCATORBTN)

This connector is for the locator button on the front panel. This button queries the state of the system locator.

13. ATX power connectors (24-pin EATXPWR; 8-pin EATX12V1; 8-pin EATX12V2; 6-pin EATX12V3)

These connectors are for ATX power supply plugs. The power supply plugs are designed to fit these connectors in only one orientation. Find the proper orientation and push down firmly until the connectors completely fit.



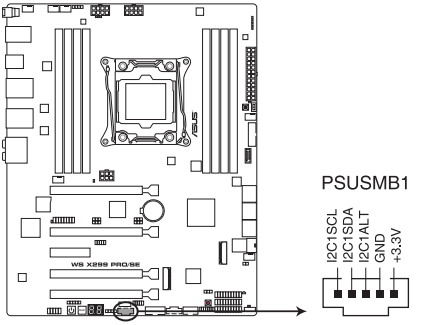
WS X299 PRO Series ATX power connectors

Ensure to connect the 8-pin power plug, or connect both the 8-pin and 6-pin power plugs.

- For a fully configured system, we recommend that you use a power supply unit (PSU) that complies with ATX 12 V Specification 2.0 (or later version) and provides a minimum power of 350 W.
- DO NOT forget to connect the 8-pin EATX12V1/EATX12V2 power plugs. Otherwise, the system will not boot.
- We recommend that you use a PSU with a higher power output when configuring a system with more power-consuming devices. The system may become unstable or may not boot up if the power is inadequate.
- If you want to use two or more high-end PCI Express x16 cards, use a PSU with 1000W power or above to ensure the system stability, and recommend connecting the 6-pin EATX12V3 power plug.

14. Power Supply SMBus connector (5-pin PSUSMB1)

This connector allows you to connect SMBus (System Management Bus) to the PSU (power supply unit) to read PSU information. Devices communicate with an SMBus host and/or other SMBus devices using the SMBus interface.



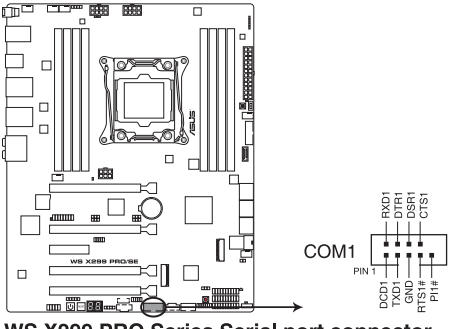
WS X299 PRO Series Power supply SMBus connector

This connector functions only when you enable the ASUS ASMB9.

Power supply is required to meet PMBus specification and customized BMC FW may be needed. Please contact ASUS if your need further support

15. Serial port connector (10-1 pin COM1)

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

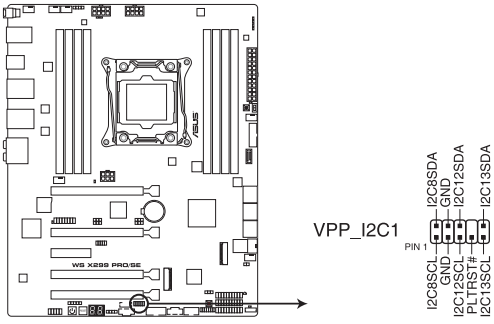


WS X299 PRO Series Serial port connector

The COM module is purchased separately.

16. VPP_I2C1 connector (10-1 pin VPP_I2C1)

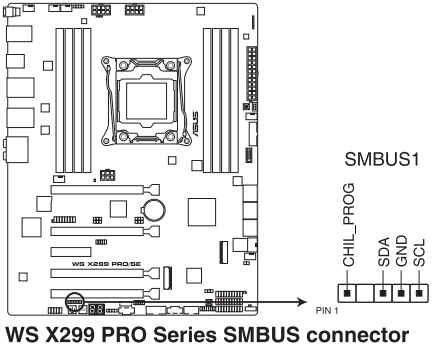
This connector is used for the Intel VMD function and sensor readings.



WS X299 PRO Series VPP_I2C1 connector

17. System Management Bus (SMBUS) connector (5-1 pin SMBUS1)

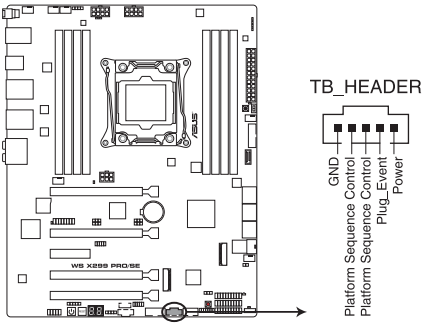
This connector controls the system and power management-related tasks. This connector processes the messages to and from devices rather than tripping the individual control lines.



WS X299 PRO Series SMBUS connector

18. Thunderbolt header (5-pin TB_HEADER)

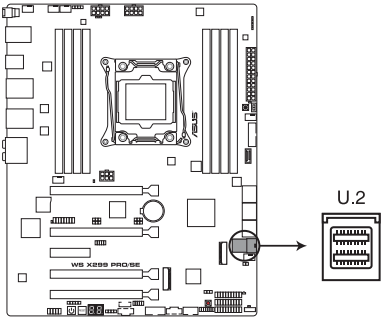
This connector is for the add-on Thunderbolt I/O card that supports Intel's Thunderbolt Technology, allowing you to connect up to six Thunderbolt-enabled devices and a DisplayPort-enabled display in a daisy-chain configuration.



WS X299 PRO Series TB_HEADER connector

19. U.2 connector (U.2)

This motherboard comes with a U.2 connector which supports PCIe 3.0 x4 NVM Express storage.

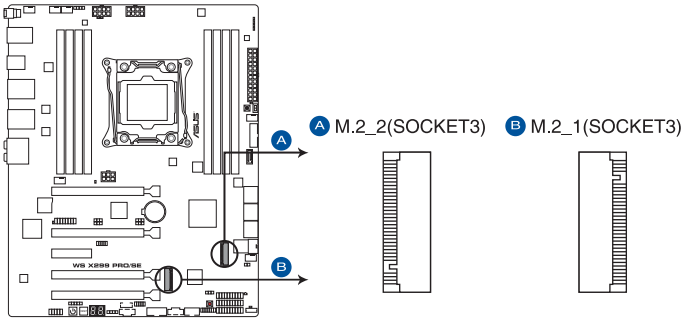


WS X299 PRO Series U.2 connector

The U.2 connector shares bandwidth with the M.2_2 socket . Adjust the BIOS settings to use U.2 devices.

20. M.2 sockets (M.2_1(Socket 3); M.2_2(Socket 3))

These sockets allow you to install M.2 SSD modules.



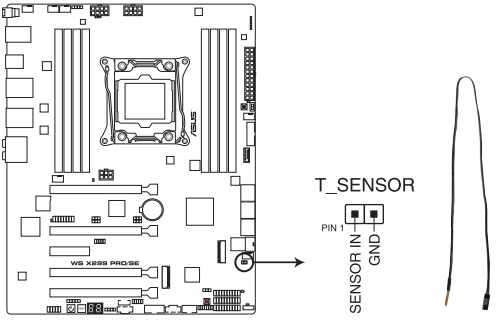
WS X299 PRO Series M.2 sockets

- M.2_1 socket supports PCIe 3.0 x4 and SATA mode M Key design and type 2242 / 2260 / 2280 PCIe and SATA storage devices.
- M.2_2 socket supports PCIe 3.0 x4 M Key design and type 2242 / 2260 / 2280 / 22110 PCIe storage devices.
- These sockets support IRST (Intel® Rapid Storage Technology).
- The M.2_2 socket shares bandwidth with the U.2 connector. Adjust the BIOS settings to use U.2 devices.

The M.2 SSD module is purchased separately.

21. Thermal sensor connector (2-pin T_SENSOR) (for WS X299 PRO only)

This connector is for the thermistor cable that monitors the temperature of the devices and the critical components inside the motherboard. Connect the thermistor cable and place the sensor on the device or the motherboard's component to detect its temperature.

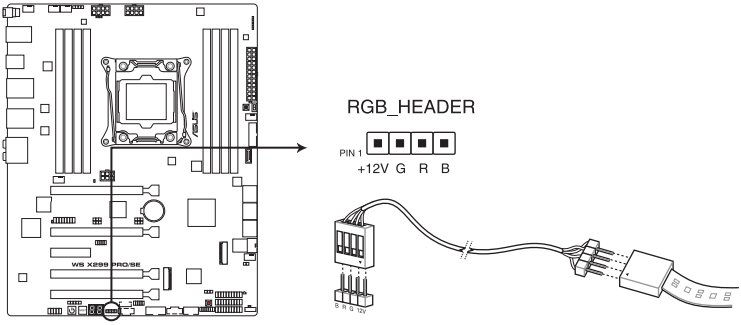


WS X299 PRO Series Thermal sensor connector

The thermal sensor is purchased separately.

22. Aura RGB header (4-pin RGB_HEADER)

This connector is for RGB LED strips.



WS X299 PRO Series RGB header

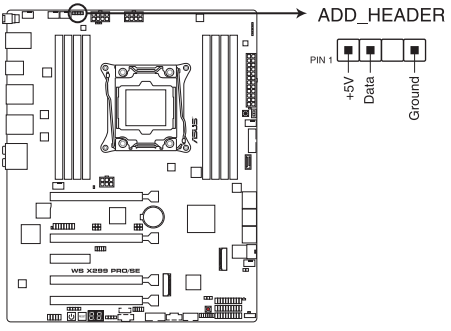
The RGB header supports 5050 RGB multi-color LED strips (12V/G/R/B), with a maximum power rating of 2A (12V), and no longer than 2 m.

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.

- 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 under the operating system.
- The LED strip is purchased separately.

23. Aura Addressable RGB header (4-pin ADD_HEADER)

This connector is for individually addressable RGB WS2812B LED strips or WS2812B based LED strips.



WS X299 PRO Series ADD header

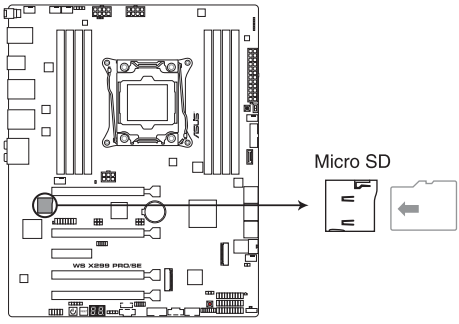
The addressable RGB header supports WS2812B addressable RGB LED strips (5V/Data/Ground), with a maximum power rating of 3A (5V) and a maximum of 60 LEDs.

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.

- 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 under the operating system.
- The addressable RGB LED strip is purchased separately.

24. MicroSD card slot (MSD1)
(for WS X299 PRO/SE only)

Your motherboard supports SD Memory Card v2.00 (SDHC) / v3.00 (SDXC).



WS X299 PRO Series Micro SD

Disconnect all power (including redundant PSUs) from the existing system before you add or remove a Memory Card, then reboot the system to access the Memory Card.

Some memory cards may not be compatible with your motherboard. Ensure that you use only compatible memory cards to prevent loss of data, damage to your device, or memory card, or both.

Basic Installation

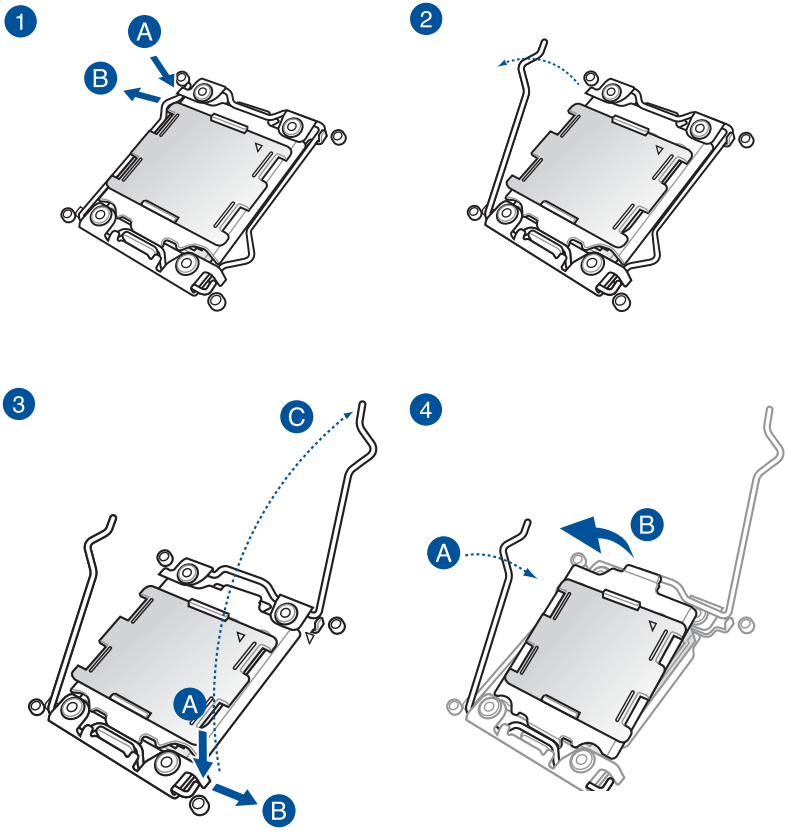
2

2.1 Building your PC system

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

2.1.1 CPU installation

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.



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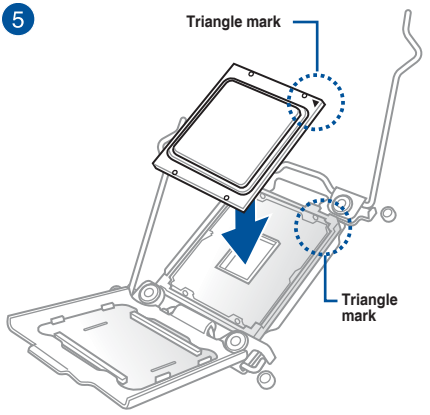

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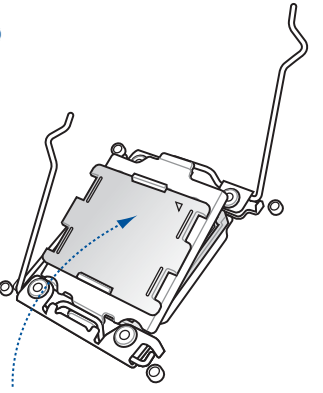

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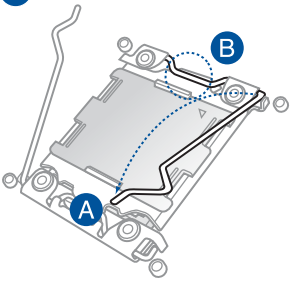

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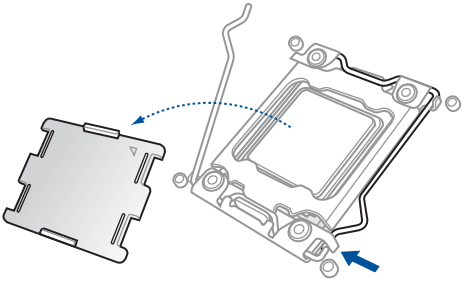

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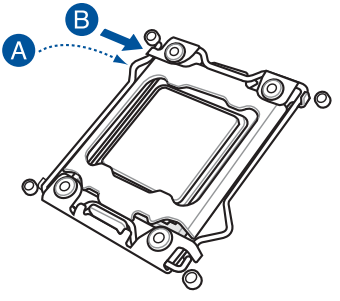
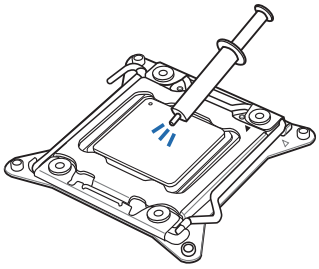
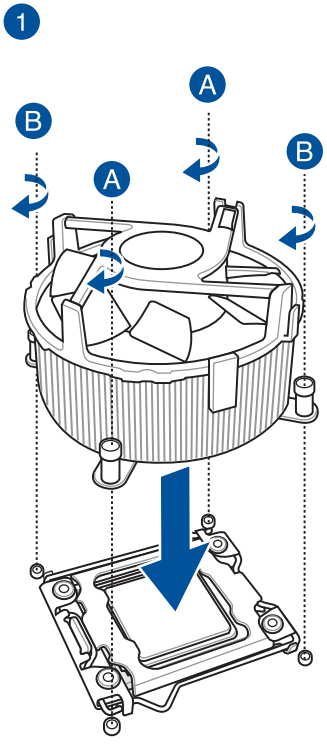


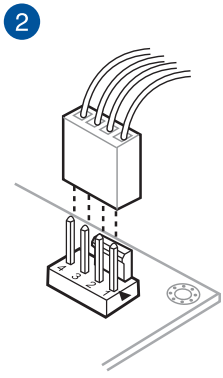
2.1.2 CPU heatsink and fan assembly installation



Apply the Thermal Interface Material to the CPU heatsink and CPU before you install the heatsink and fan, if necessary.

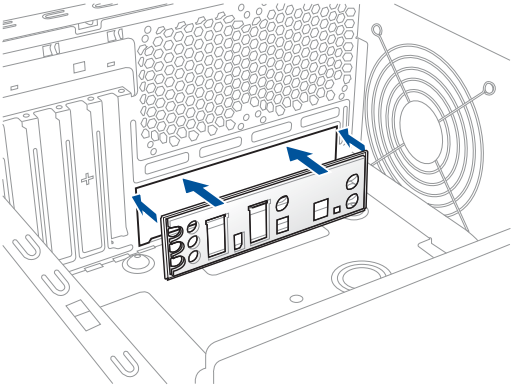
To install the CPU heatsink and fan assembly



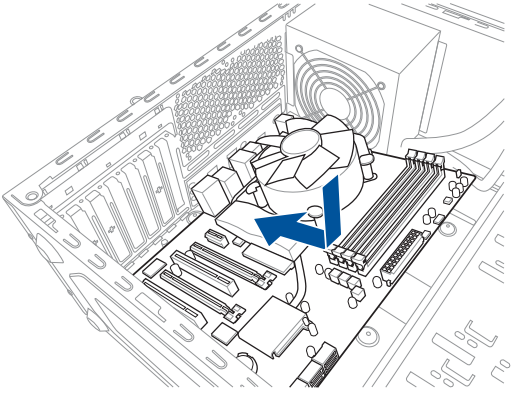


2.1.3 Motherboard installation

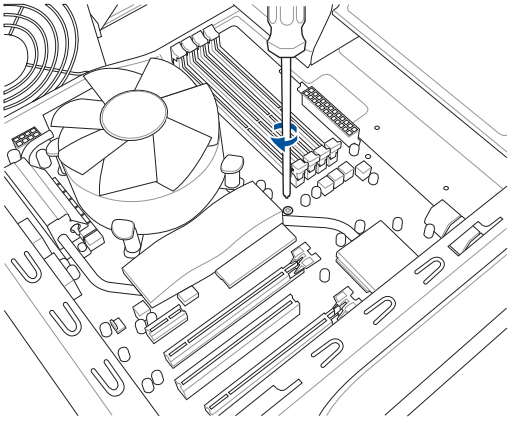
1. Install the ASUS Q-Shield to the chassis rear I/O panel.

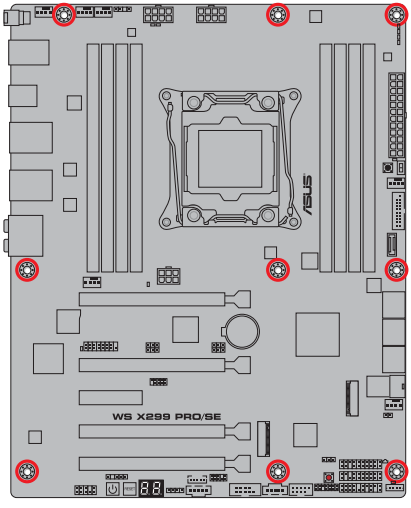


2. Place the motherboard into the chassis, ensuring that its rear I/O ports are aligned to the chassis' rear I/O panel.



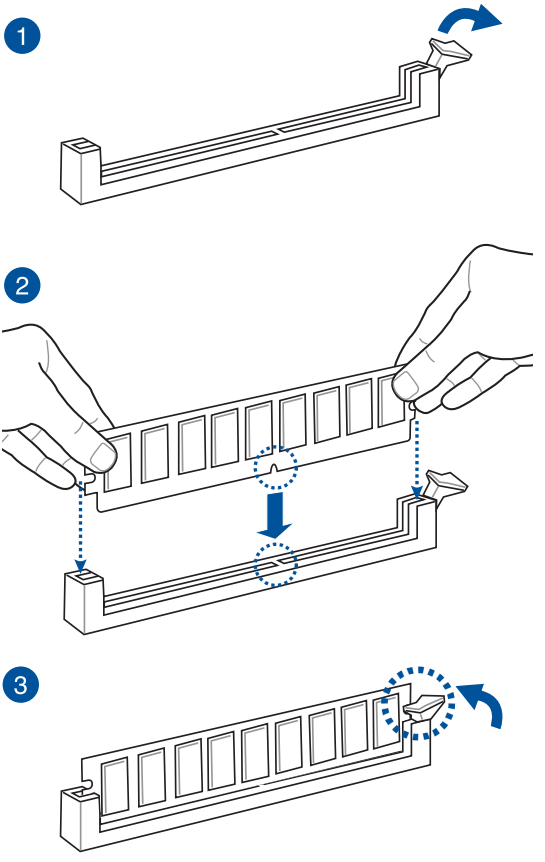
3. Place nine screws into the holes indicated by circles to secure the motherboard to the chassis.



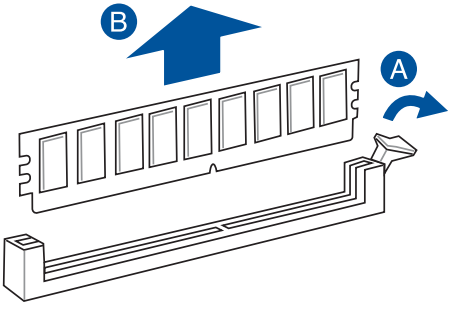


DO NOT overtighten the screws! Doing so can damage the motherboard.

2.1.4 DIMM installation

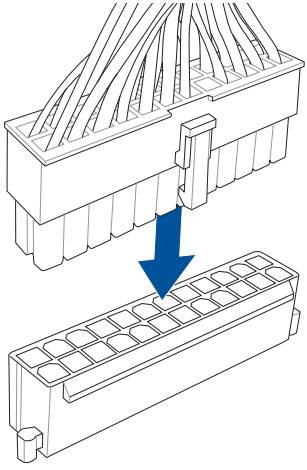


To remove a DIMM



2.1.5 ATX power connection

1



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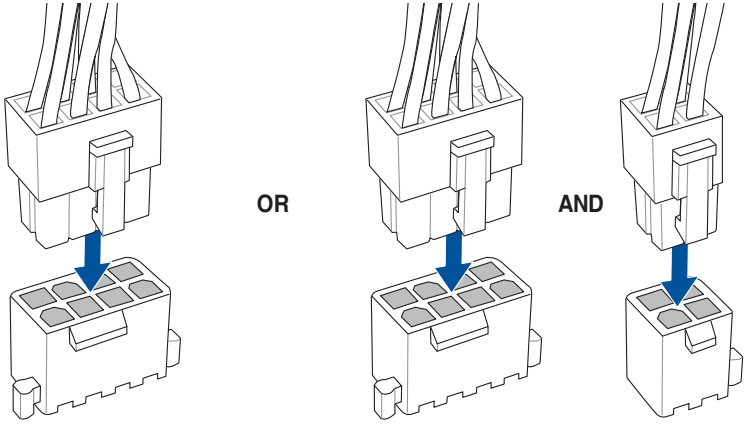
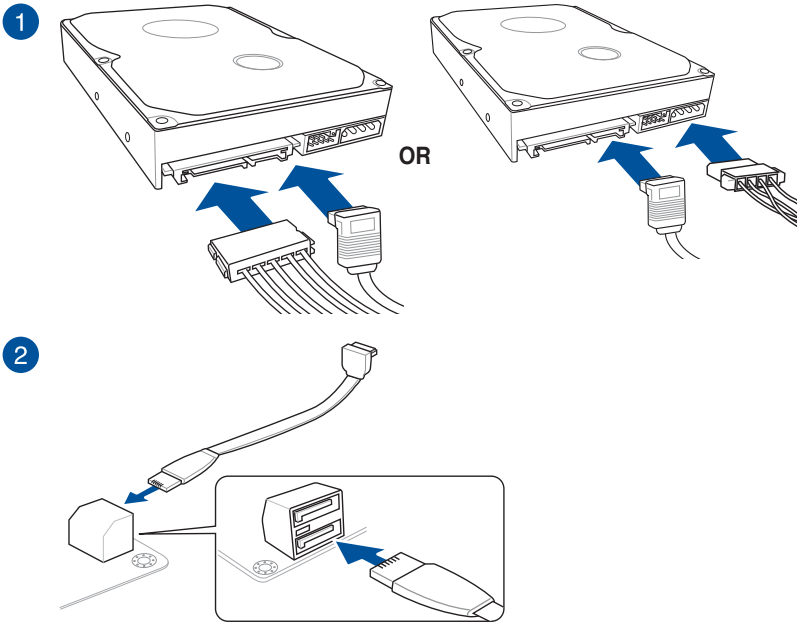


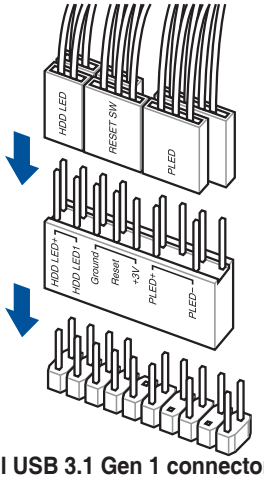
- DO NOT connect the 4-pin power plug only, the motherboard may overheat under heavy usage.
- Ensure to connect the 8-pin power plug, or connect both the 8-pin and 4-pin power plugs.

2.1.6 SATA device connection

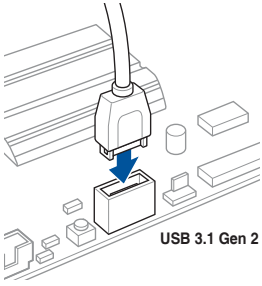


2.1.7 Front I/O connector

To install ASUS Q-Connector

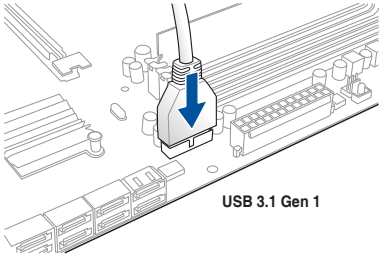


To install USB 3.1 Gen 2 connector

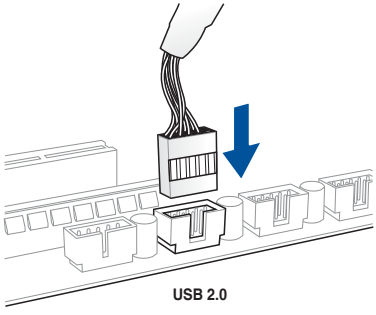


This connector will only fit in one orientation. Push the connector until it clicks into place.

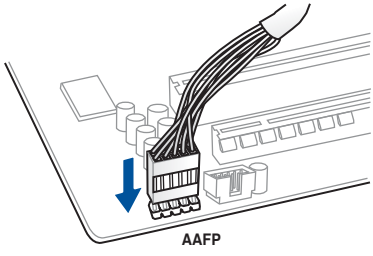
To install USB 3.1 Gen 1 connector



To install USB 2.0 connector



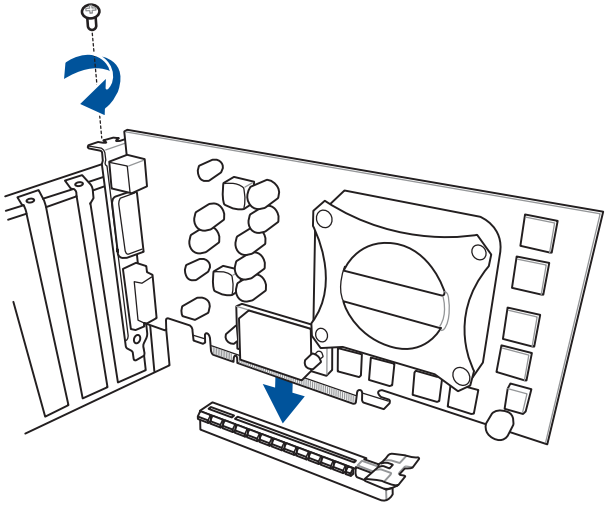
To install front panel audio connector



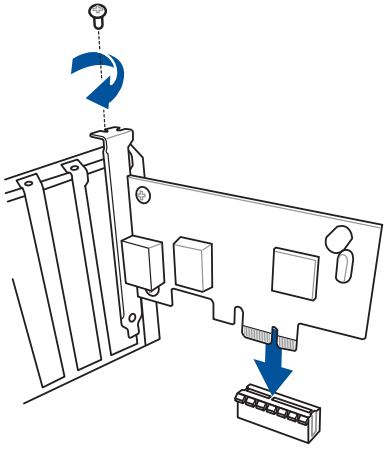
Chapter 2

2.1.8 Expansion card installation

To install PCIe x16 cards

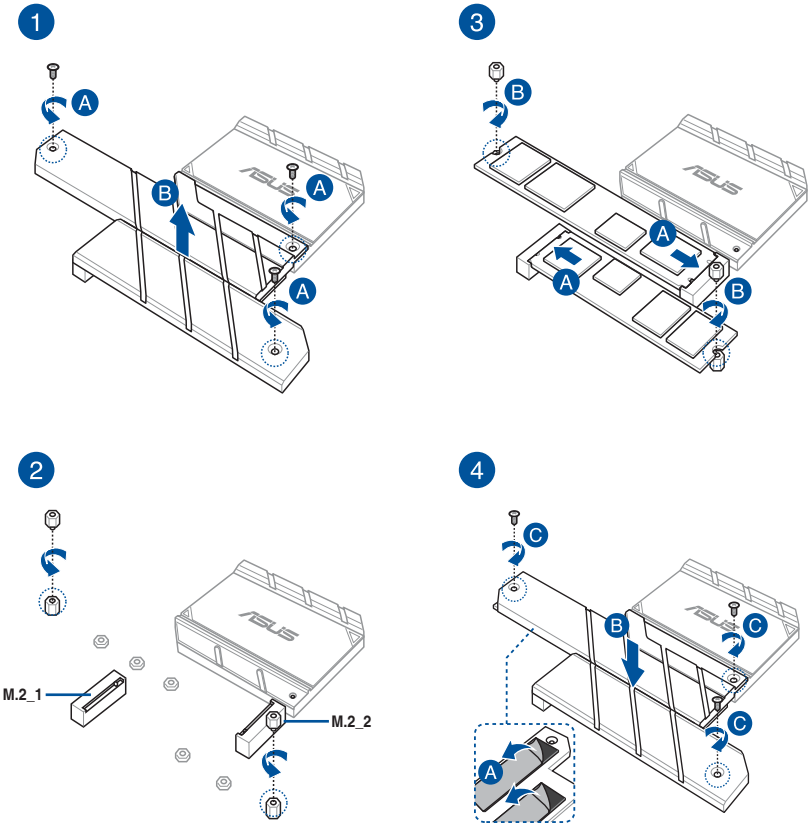


To install PCIe x4 cards



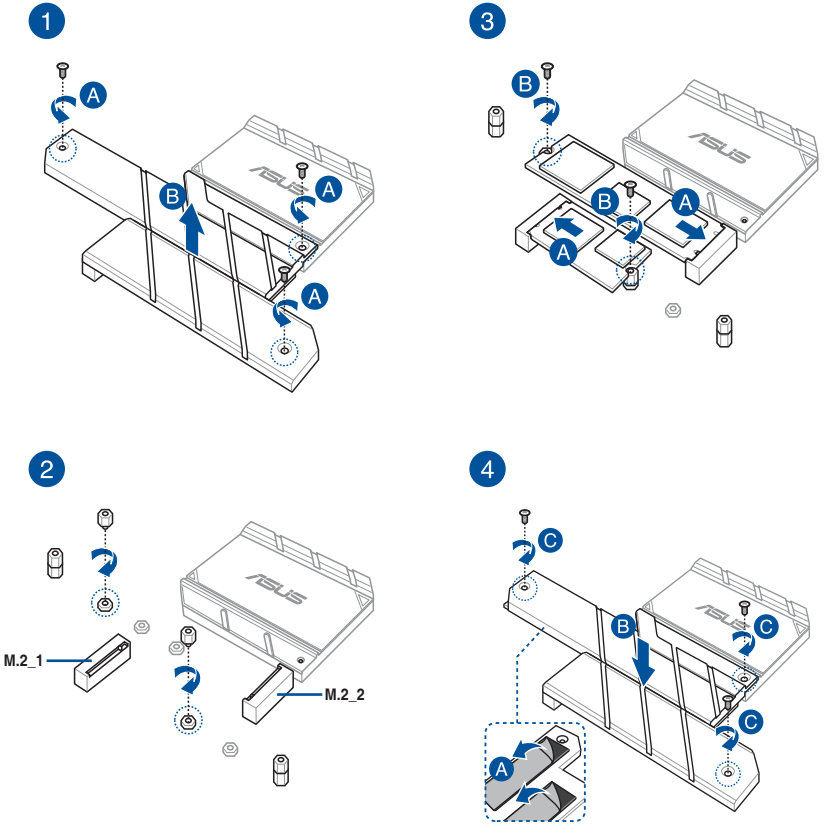
2.1.9 M.2 installation

To install M.2 type 22110 storage device to M.2_2 and/or M.2 type 2280 storage device to M.2_1



Supported M.2 type varies per motherboard.

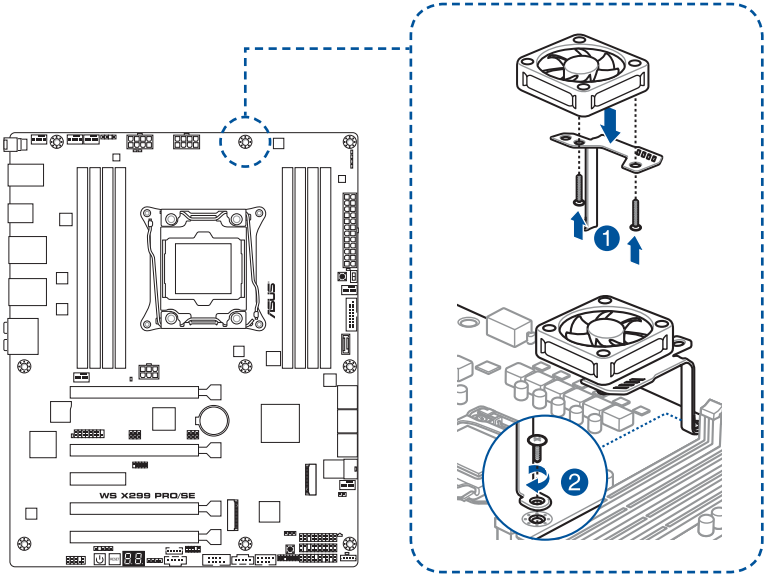
To install M.2 type 2242/2260/2280 storage device to M.2_2 and/or M.2 type 2242/2260 storage device to M.2_1



Supported M.2 type varies per motherboard.

2.1.10 ASUS fan holder installation

To install the ASUS fan holder and fan



When using high performance settings whilst overclocking, ensure to install the fan holder for additional fan(s).

- You may install 12V (1A, 12W), 40mm x 40mm fans or 50mm x 50mm fans.
- Ensure to the use the bundled screws that came with your fans.

2.2 BIOS update utility

USB BIOS Flashback

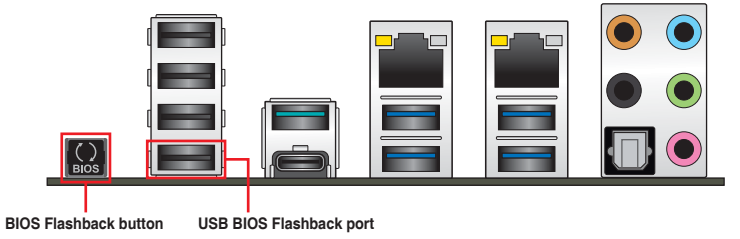
USB BIOS Flashback allows you to easily update the BIOS without entering the existing BIOS or operating system. Simply insert a USB storage device to the USB port (the USB port hole marked in green on the I/O shield) then press the USB BIOS Flashback button for three seconds to automatically update the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

To use USB BIOS Flashback:

1. Insert a USB storage device to the USB Flashback port.

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

2. Visit https://www.asus.com/support/ and download the latest BIOS version for this motherboard.
3. Rename the file as **WSPRO.CAP**, then copy it to your USB storage device.
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.



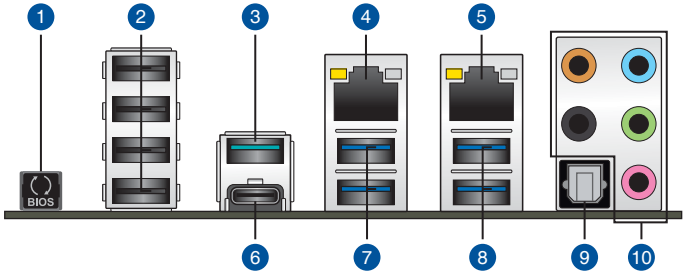
6. Wait until the light goes out, indicating that the BIOS updating process is completed.

For more BIOS update utilities in BIOS setup, refer to the section **3.12 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



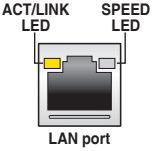
Rear panel connectors			
1.	USB BIOS Flashback button	6.	USB 3.1 Gen 2 Type-C™ port EC1
2.	USB 2.0 ports 9-12 (bottom port supports USB BIOS Flashback)	7.	USB 3.1 Gen 1 ports 56
3.	USB 3.1 Gen 2 Type-A port E2	8.	USB 3.1 Gen 1 ports 34
4.	Intel® LAN port (LAN2)*	9.	Optical S/PDIF Out port
5.	Intel® LAN port (LAN1)*	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 3.1 Gen 1 devices to USB 3.1 Gen 1 ports and your USB 3.1 Gen 2 devices to USB 3.1 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		



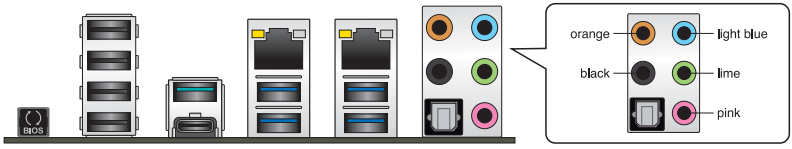
You can disable the LAN controllers in BIOS. Due to hardware design, the LAN1 port's LEDs may continue to blink even when disabled.

** Audio 2, 4, 6 or 8-channel configuration

Port	Headset 2-channel	4-channel	6-channel	8-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

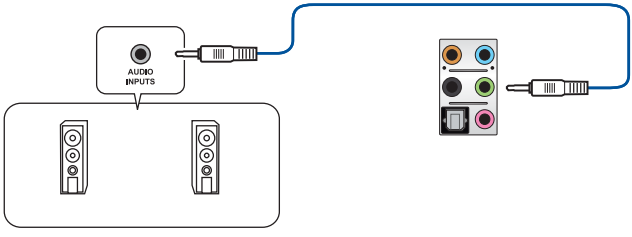
2.3.2 Audio I/O connections

Audio I/O ports

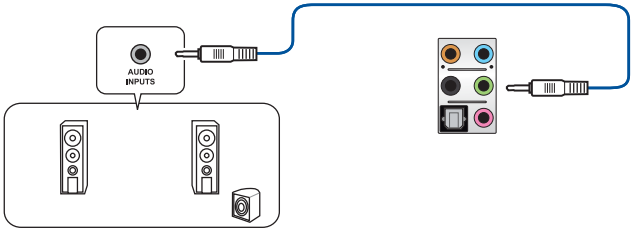


Connect to Headphone and Mic

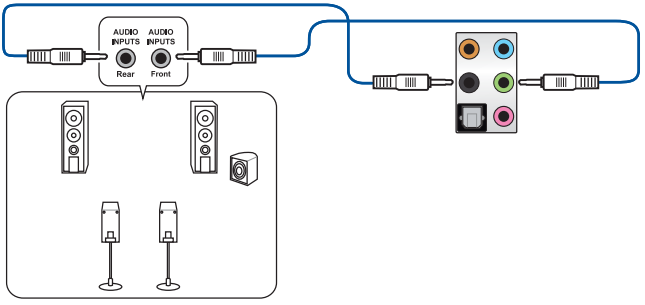
Connect to Stereo Speakers



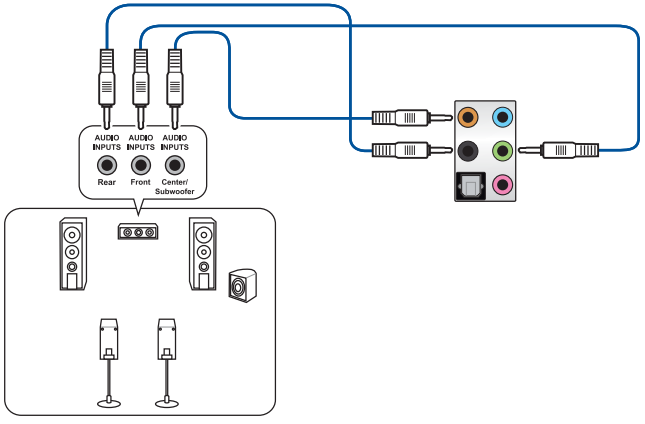
Connect to 2 Speakers



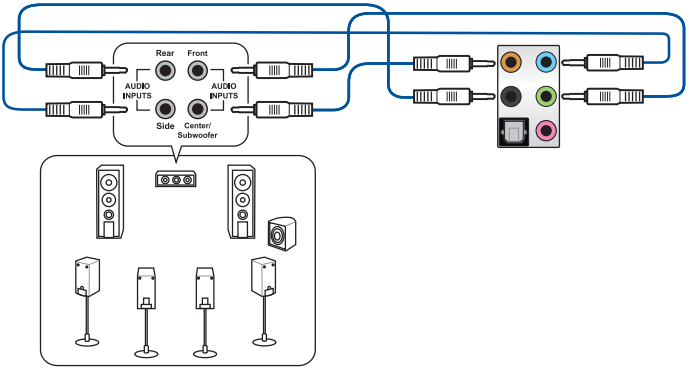
Connect to 4 Speakers



Connect to 6 Speakers



Connect to 8 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

3

3.1 Knowing BIOS

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

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

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

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

- When downloading or updating the BIOS file, rename it as **WSPRO.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 **3.10 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 **1.1.6 Onboard buttons and switches** 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.

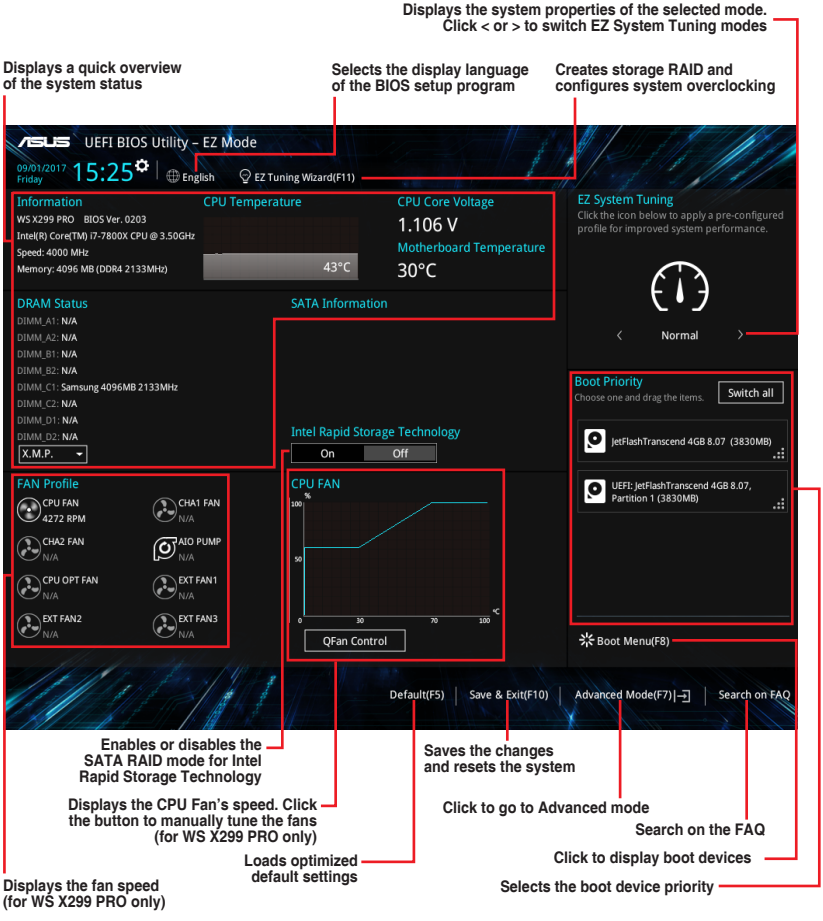
BIOS menu screen

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.

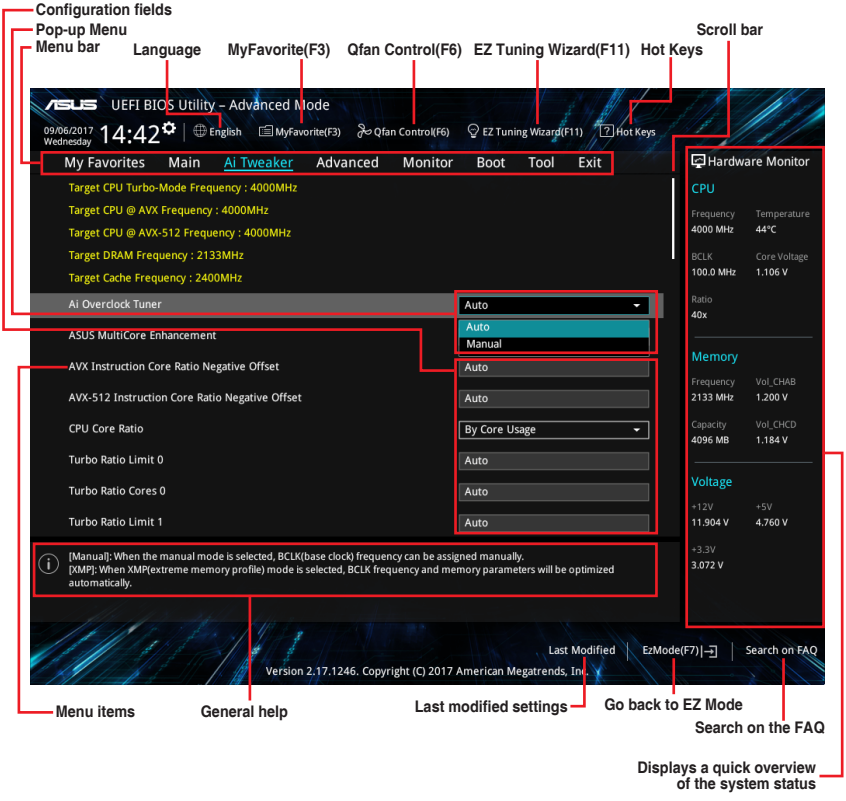


The boot device options vary depending on the devices you installed to the system.

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.



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 WS X299 PRO only)	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
Server Mgmt (for WS X299 PRO/SE only)	For changing the server mgmt 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 **3.3 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 **3.2.3 QFan Control** for more information.

EZ Tuning Wizard (F11)

This button above the menu bar allows you to view and tweak the overclocking settings of your system. It also allows you to change the motherboard's SATA mode from AHCI to RAID mode.

Refer to section **3.2.4 EZ Tuning Wizard** for more information.

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:

Hot keys

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

Scroll bar

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

General help

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

Configuration fields

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

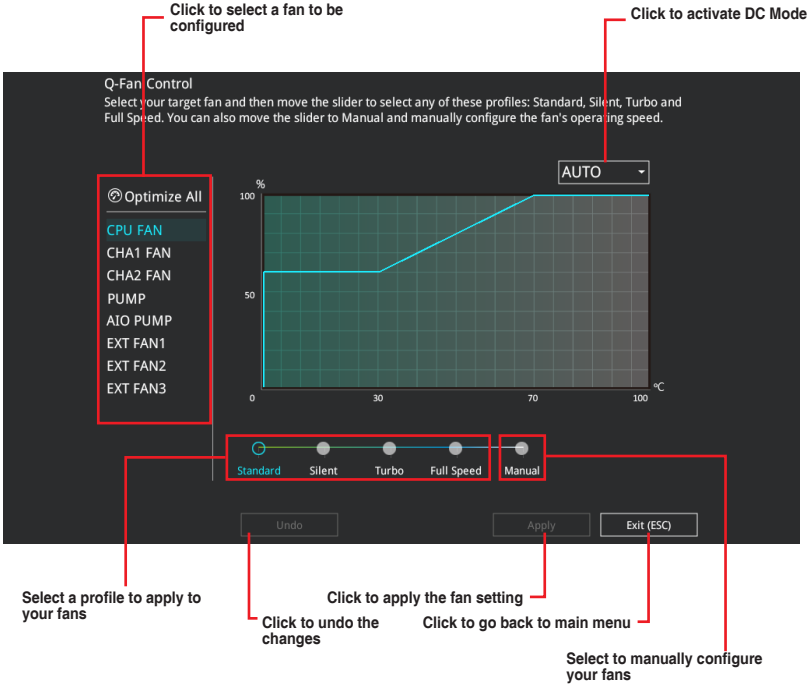
A configurable field is highlighted when selected. To change the value of a field, select it and press <Enter> to display a list of options.

Last Modified button

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

3.2.3 QFan Control (for WS X299 PRO only)

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



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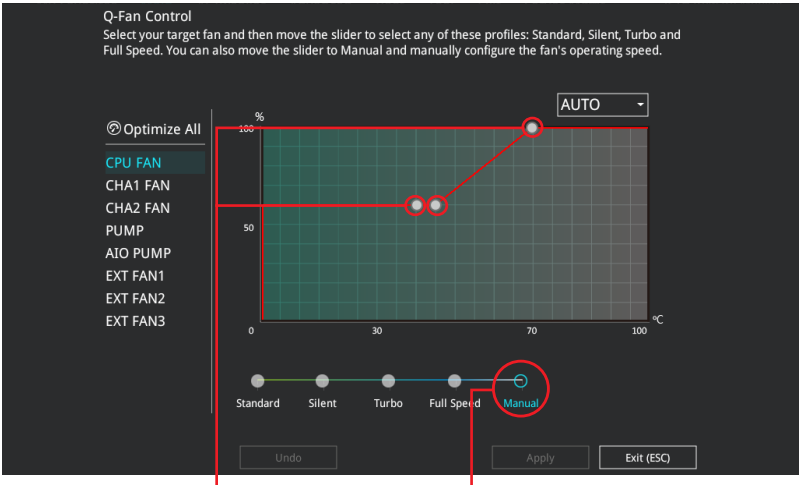
Configuring fans manually

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

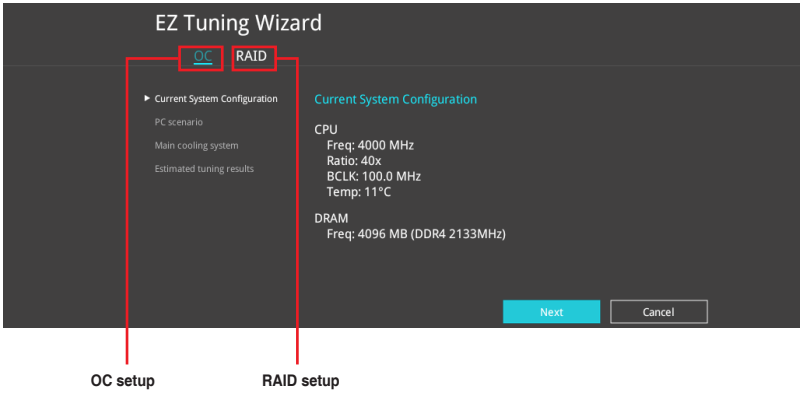


To configure your fans:

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

3.2.4 EZ Tuning Wizard

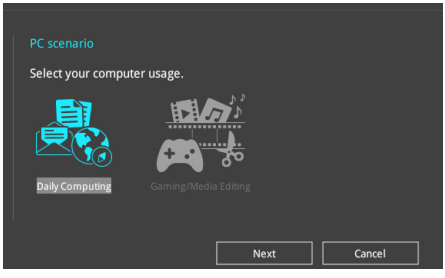
EZ Tuning Wizard allows you to easily overclock your CPU and DRAM, computer usage, and CPU fan to their best settings. You can also set RAID in your system using this feature.



OC Tuning

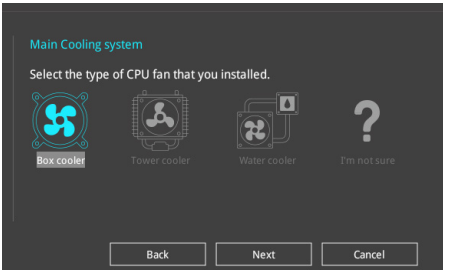
To start OC Tuning:

1. Press <F11> on your keyboard or click EZ Tuning Wizard(F11) from the BIOS screen to open EZ Tuning Wizard screen.
2. Click **OC** then click **Next**.
3. Select a PC scenario **Daily Computing** or **Gaming/Media Editing,** then click **Next**.



Chapter 3

4. Select a Main Cooling System **BOX cooler, Tower cooler, Water cooler,** or **I'm not sure,** then click **Next**.



5. After selecting the Main Cooling System, click **Next** then click **Yes** to start the OC Tuning.

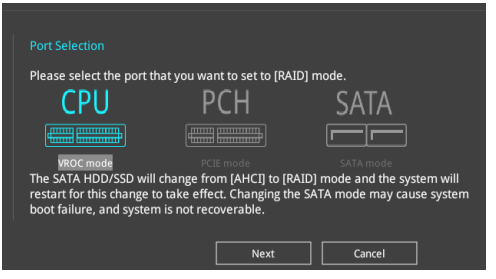
Creating RAID

To create RAID:

1. Press <F11> on your keyboard or click EZ Tuning Wizard(F11) from the BIOS screen to open EZ Tuning Wizard screen.
2. Click **Yes** to enable RAID.

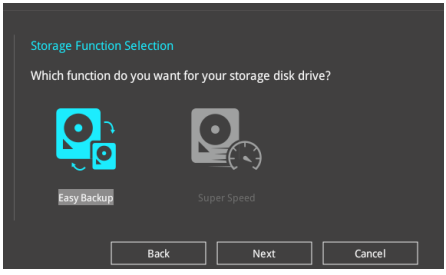
- Ensure that your HDDs have no existing RAID volumes.
- Ensure to connect your HDDs to Intel® SATA connectors.

3. Select the port that you want to set to [RAID] mode, **CPU**, **PCIE** or **SATA**, then click **Next**.

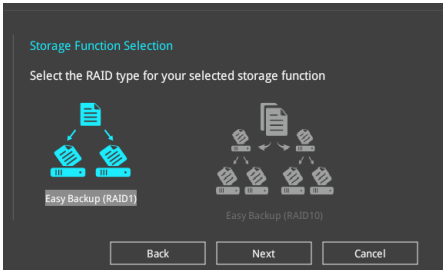


- **CPU (VROC mode)**: Supports Intel® Virtual Raid on CPU. This feature requires a KEY module (purchased separately) and Intel® SSD modules.
- **PCH (PCIE mode)**: Supports U.2, and M.2 PCIE mode RAID.
- **SATA (SATA mode)**: Supports SATA RAID.

4. Select the type of storage for your RAID, **Easy Backup** or **Super Speed**, then click **Next**.

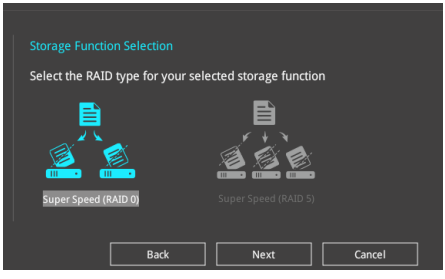


a. For Easy Backup, click **Next** then select from **Easy Backup (RAID 1)** or **Easy Backup (RAID 10)**.



You can only select Easy Backup (RAID 10) if you connect four (4) HDDs.

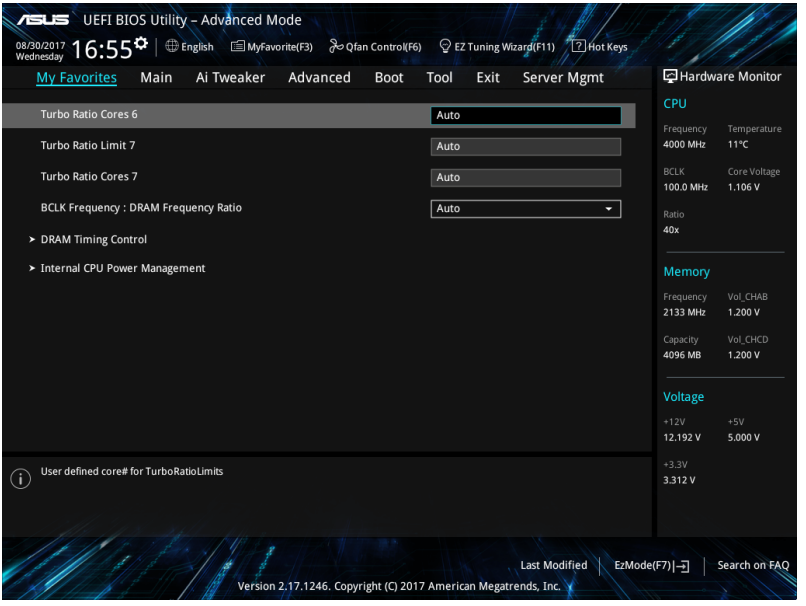
b. For Super Speed, click **Next** then select from **Super Speed (RAID 0)** or **Super Speed (RAID 5)**.



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

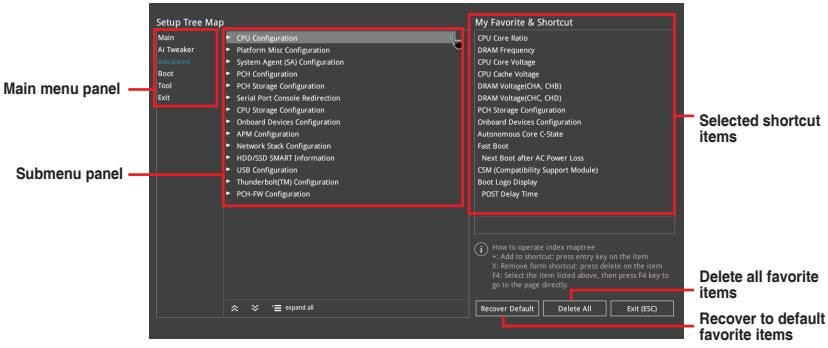
My Favorites is your personal space where you can easily save and access your favorite BIOS items. My Favorites comes with several performance, power saving, and fast boot related items by default. You can personalize this screen by adding or removing items.



Adding items to My Favorites

To add BIOS items:

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



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

You cannot add the following items to My Favorite items:

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

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

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 **1.1.6 Onboard buttons and switches** 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.

[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]

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.

Configuration options: [Auto] [DDR4-800MHz] - [DDR4-4400MHz]

TPU

This item allows you to automatically overclock the CPU and DRAM frequencies and voltage for an enhanced system performance.

[Keep Current Settings] Keep the current settings without changing anything.

[TPU I] Applies air cooling overclocking conditions.

[TPU II] Applies water cooling overclocking conditions.

Ensure to use water cooling device before selecting **[TPU II].**

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

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

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 [Disabled]

Allows you to enable or disable Autonomous Core C-State Report.

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 PCI Express.

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 PCI Express speed.

PCI Express Configuration

This item allows you to configure the PCI Express slots.

PCIe Speed

This item allows your system to automatically select the PCI Express port speed.
Configuration options: [Auto] [Gen1 (2.5 GT/s)] [Gen2 (5 GT/s)] [Gen3 (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_6

SATA6G_1 - SATA6G_6

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.

- This menu will appear only when an Intel® Core™ X-series Processors (6-core or above) is installed.
- Due to CPU behavior, CPU RAID functions with Intel® CPU RSTe only supports Intel® Core™ X-series Processors (6-core or above) and Intel® SSD modules.

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]

M2_2 and U.2 Switch Function

[Auto] If a device is detected in M.2_2, M.2_2 will be enabled and U.2 will be disabled.

[U.2] Enable U.2 and disable M.2_2.

USB Type C Power Switch

[Auto] The system will automatically detect your USB Type C devices and provide suitable power if needed.

[Enabled] The USB Type C port will always provide power to your devices.

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 / LAN2 Controller

This item allows you to enable or disable the Intel LAN / LAN2 controllers.

Configuration options: [Disabled] [Enabled]

3.6.8 APM Configuration

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

ErP Ready

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 **1.1.2 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] [PCIE16_1] [PCIE16_2] [PCIE4_1] [PCIE16_3] [PCIE16_4]

16/28-lane CPUs only support and display [PCIE16_1] [PCIE16_2] [PCIE4_1] options. 44-lane CPUs will support all PCIe slots.

3.6.13 PCH-FW Configuration

This item allows you to configure the firmware TPM.

3.7 Monitor menu (for WS X299 PRO only)

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

Qfan Configuration

Qfan 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 PCI-E/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 **3.12.2 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.

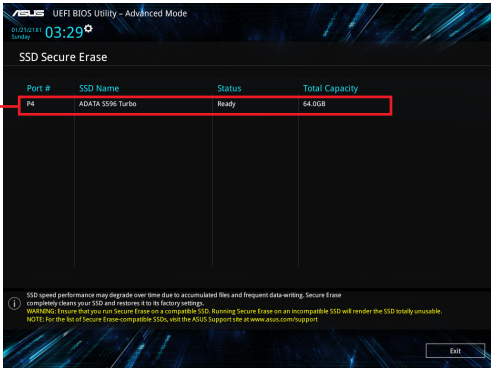
Secure Erase is only available in AHCI mode. Ensure to set the SATA mode to AHCI. Click **Advanced > PCH Storage Configuration > SATA Mode Selection > AHCI.**

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 **1.1.2 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.

3.9.3 ASUS Overclocking Profile

This item allows you to store or load multiple BIOS settings.

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.

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 Server Mgmt menu (for WS X299 PRO/SE only)

The Server Management menu displays the server management status and allows you to change the settings.

3.12 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.

3.12.1 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.

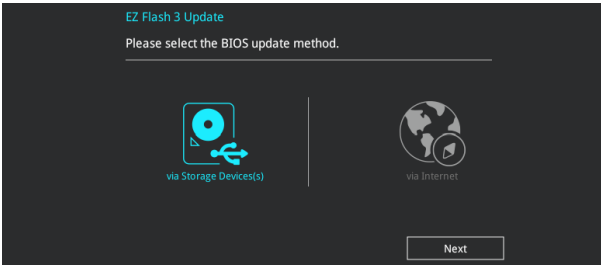
3.12.2 ASUS EZ Flash 3

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.

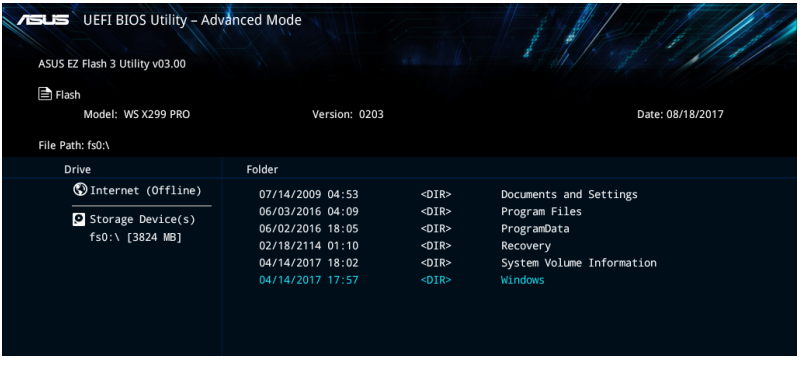
Updating through the Internet varies per region and Internet conditions. Check your local Internet connection before updating through the Internet.

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.

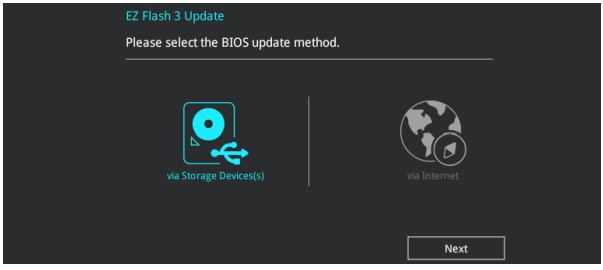


- This function can support devices such as a USB flash disk with FAT 32/16 format and single partition only.
- DO NOT shut down or reset the system while updating the BIOS to prevent system boot failure!

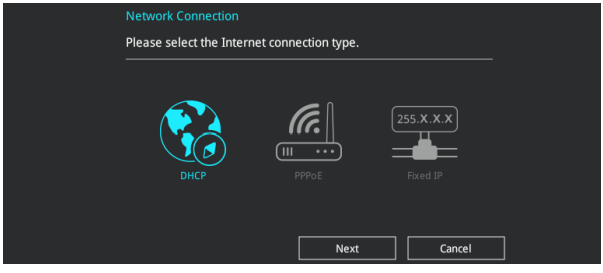
Ensure to load the BIOS default settings to ensure system compatibility and stability. Select the Load Optimized Defaults item under the Exit menu. See section **3.10 Exit Menu** for details.

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 **by 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 **3.10 Exit Menu** for details.

3.12.3 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.

If you want to install a Windows® operating system to a hard disk drive included in a RAID set, you have to create a RAID driver disk and load the RAID driver during OS installation. Refer to section **4.2 Creating a RAID driver disk** for details.

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 strips 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.

4.1.2 Installing storage devices

The motherboard supports Serial ATA hard disk drives and PCIE SSD storage devices. For optimal performance, install identical drives of the same model and capacity when creating a disk array.

Refer to Chapter 2 for details on installing storage devices to your motherboard.

4.1.3 Intel® Rapid Storage Technology in UEFI BIOS

To enter the Intel® Rapid Storage Technology in UEFI BIOS:

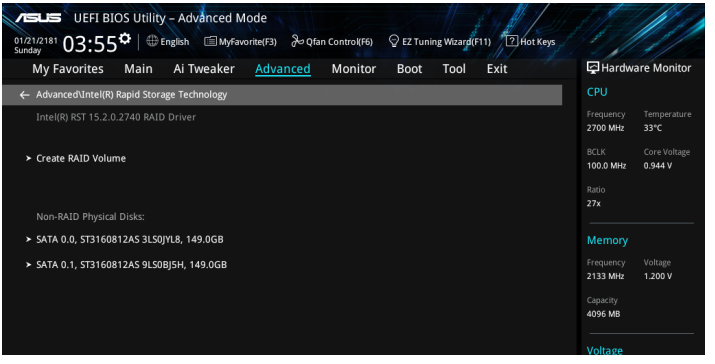
1. Enter the BIOS Setup during POST.
2. Go to the **Advanced** menu > **PCH Storage Configuration**, then press <Enter>.
3. Set the SATA Mode Selection item to **[Intel RST Premium With Intel Optane System Acceleration (RAID)]**.

If you are using PCIE storage devices, ensure to enable all the **PCIE Storage RAID Support** items.

4. Go to the **Boot** menu > **CSM (Compatibility Support Module)** > **Launch CSM**, then set the item to **[Disabled]**.
5. Save your changes and exit the BIOS Setup, then enter the BIOS Setup again.
6. Go to the **Advanced** menu > **Intel(R) Rapid Storage Technology**, then press <Enter> to display the Intel® Rapid Storage Technology menu.

Refer to Chapter 3 for details on entering and navigating through the BIOS Setup.

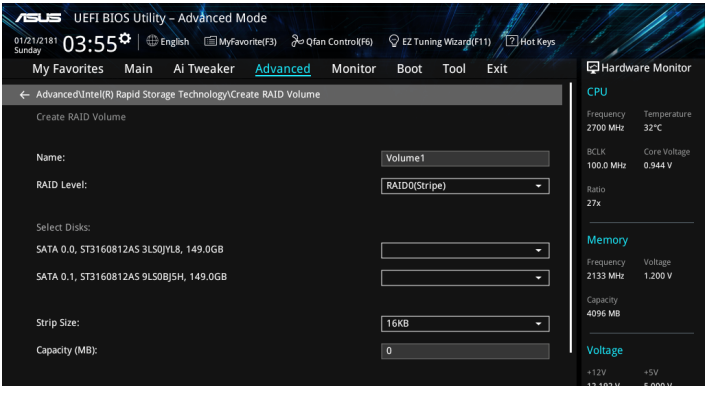
Due to chipset limitation, when SATA ports are set to RAID mode, all SATA ports run at RAID mode together.



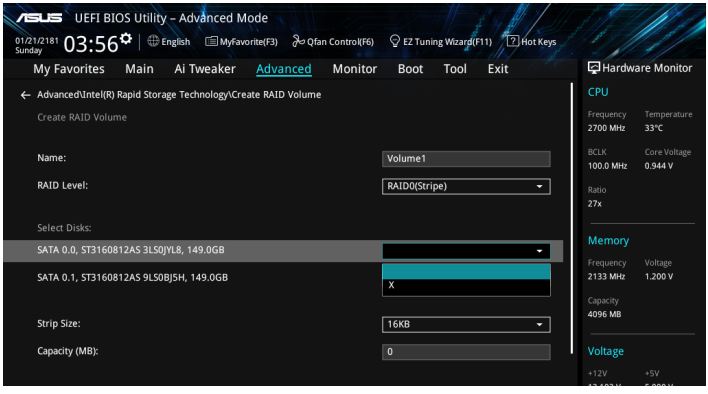
Creating a RAID set

To create a RAID set:

1. From the Intel® Rapid Storage Technology menu, select **Create RAID Volume** and press <Enter>. The following screen appears:



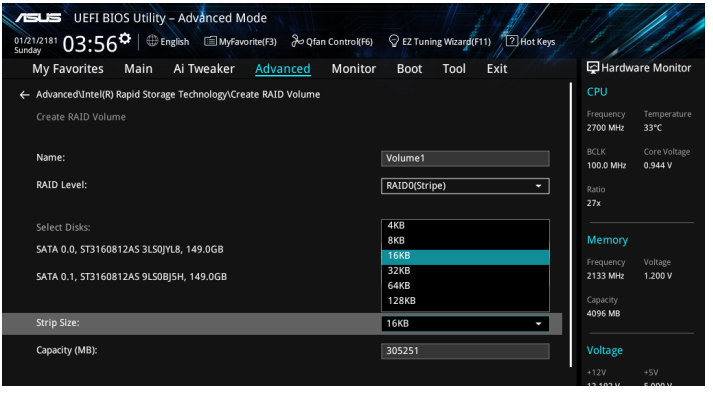
2. When the **Name** item is selected, enter a name for the RAID set and press <Enter>.
3. When the **RAID Level** item is selected, press <Enter> to select the RAID level to create, and then press <Enter>.
4. Under **Select Disks**, press <Enter> and select **X** for the disks you want to include in the RAID set.



5. When the **Strip Size** item is selected, press <Enter> to select strip size for the RAID array (for RAID 0, 10 and 5 only), and then press <Enter>. The available strip size values range from 4 KB to 128 KB. The following are typical values:

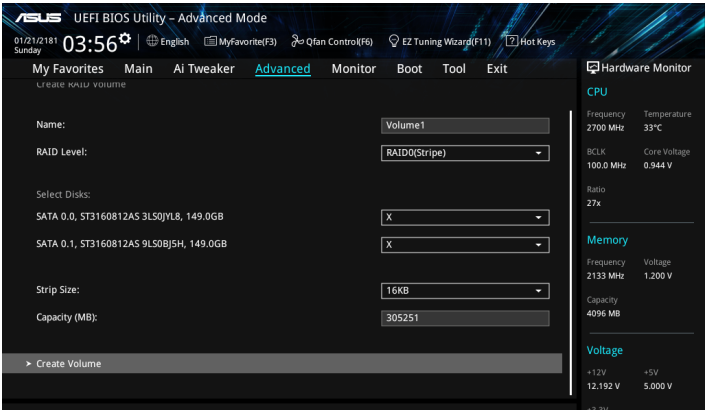
   - RAID 0: 128 KB
   - RAID 10: 64 KB
   - RAID 5: 64 KB

We recommend a lower strip size for server systems, and a higher strip size for multimedia computer systems used mainly for audio and video editing.



6. When the **Capacity (MB)** item is selected, enter the RAID volume capacity that you want and press <Enter>. The default value indicates the maximum allowed capacity.

7. When the **Create Volume** item is selected, press <Enter> to create the RAID volume and return to the Intel® Rapid Storage Technology menu.

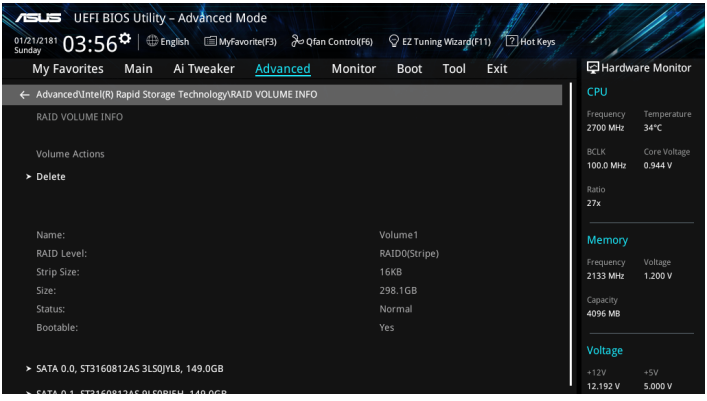


Deleting a RAID set

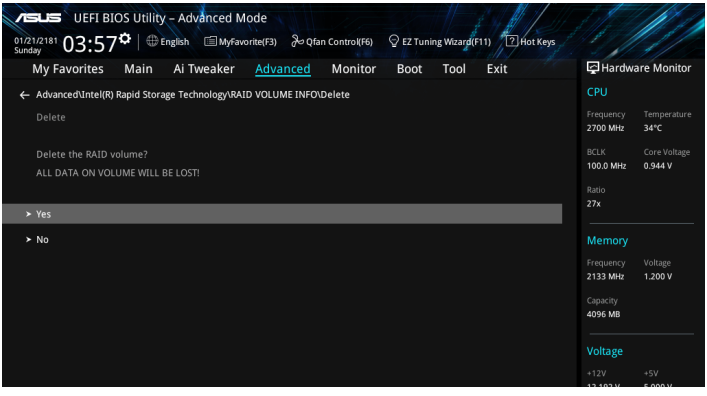
Be cautious when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

To delete a RAID set:

1. From the Intel® Rapid Storage Technology menu, select the RAID volume you want to delete and press <Enter>. The following screen appears:



2. When the **Delete** item is selected, press <Enter>, then select **Yes** to delete the RAID volume and return to the Intel® Rapid Storage Technology menu, or select **No** to cancel.



4.1.4 Intel® Virtual Raid on CPU in UEFI BIOS

This feature requires a KEY module to enable CPU RAID functions with Intel® CPU RSTe.

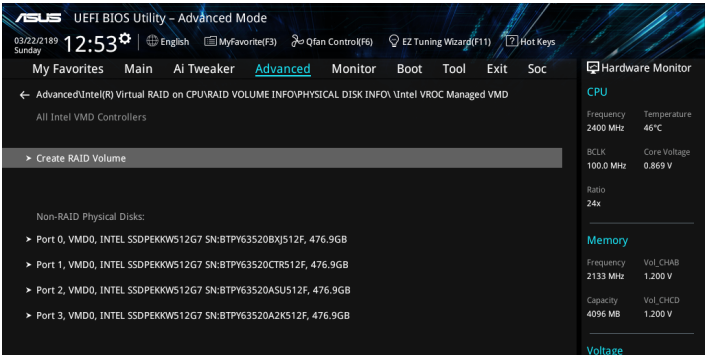
- The KEY module is purchased separately.
- The HYPER M.2 X16 Card is purchased separately.
- Due to CPU behavior, CPU RAID functions with Intel® CPU RSTe only supports Intel® Core™ X-series Processors (6-core or above) and Intel® SSD modules.
- Refer to section **1.1.9 Internal connectors** for the location of the VROC_HW_KEY connector.

If you plan on using the CPU RAID configuration spanned across different PCIE slots as OS drives. Please install the Hyper M.2 X16 Cards to PCIEX16_3 and PCIEX16_4 slots.

To enter the Intel® Virtual Raid on CPU in UEFI BIOS:

1. Enter the BIOS Setup during POST.
2. Go to the **Boot** menu > **CSM (Compatibility Support Module)** > **Launch CSM**, then set the item to **[Disabled]**.
3. Go to the **Advanced** menu **>** CPU Storage Configuration, then set the PCIE slot(s) that you have installed the Hyper M.2 X16 Card(s) or PCIE X4 SSD Card(s) to Hyper M.2 X16 or PCIE X4 SSD Card correspondingly.
4. Save your changes and exit the BIOS Setup, then enter the BIOS Setup again.
5. Go to the **Advanced** menu > **Intel(R) Virtual Raid on CPU** > **All Intel VMD Controllers**, then press <Enter> to display the Intel® Virtual Raid on CPU menu.

Refer to Chapter 3 for details on entering and navigating through the BIOS Setup.

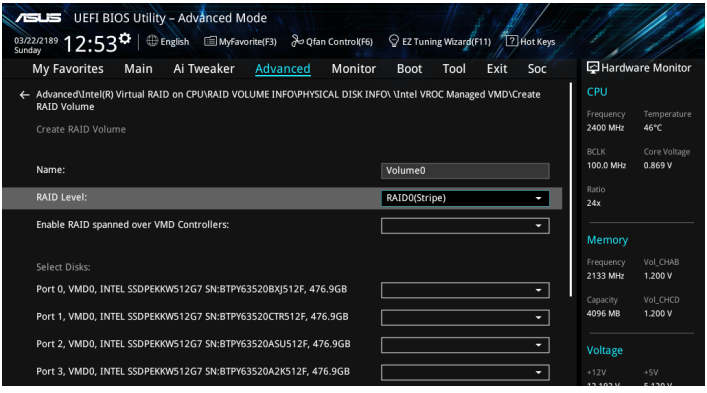


Chapter 4

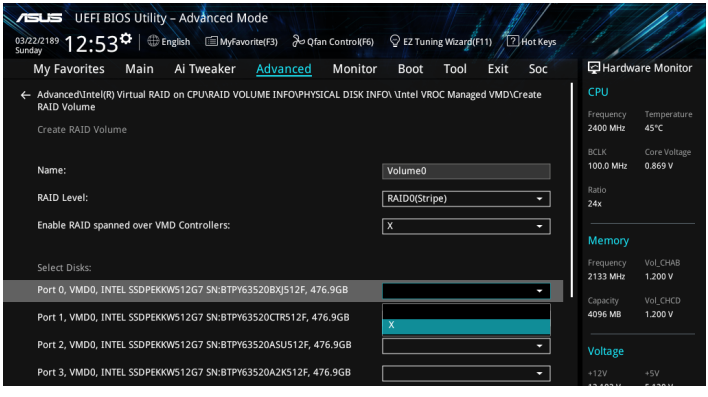
Creating a RAID set

To create a RAID set:

1. From the Intel® Virtual Raid on CPU menu, select **Create RAID Volume** and press <Enter>. The following screen appears:



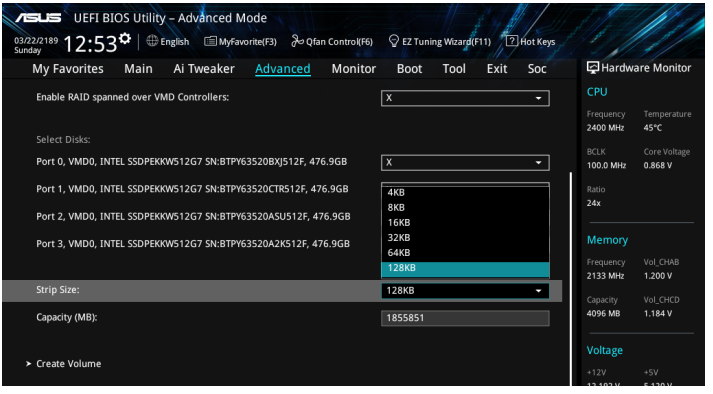
2. When the **Name** item is selected, enter a name for the RAID set and press <Enter>.
3. When the **RAID Level** item is selected, press <Enter> to select the RAID level to create, and then press <Enter>.
4. When the **Enable RAID spanned over VMD Controllers** item is selected, press <Enter> and select **X** to enable this function.
5. Under Select Disks, press <Enter> and select **X** for the disks you want to include in the RAID set.



6. When the **Strip Size** item is selected, press <Enter> to select strip size for the RAID array (for RAID 0, 10 and 5 only), and then press <Enter>. The available strip size values range from 4 KB to 128 KB. The following are typical values:

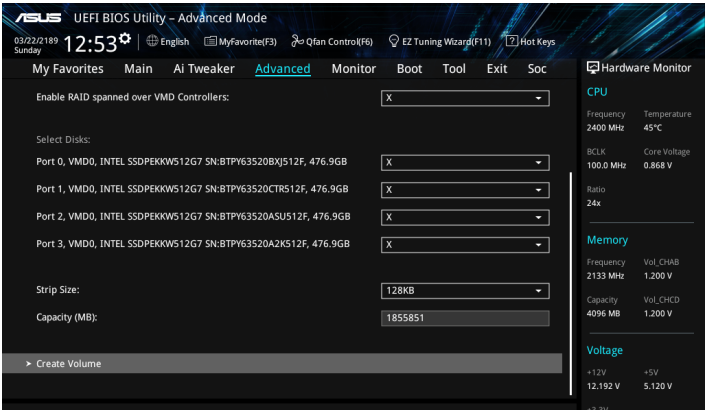
   - RAID 0: 128 KB
   - RAID 10: 64 KB
   - RAID 5: 64 KB

We recommend a lower strip size for server systems, and a higher strip size for multimedia computer systems used mainly for audio and video editing.



7. When the **Capacity (MB)** item is selected, enter the RAID volume capacity that you want and press <Enter>. The default value indicates the maximum allowed capacity.

8. When the **Create Volume** item is selected, press <Enter> to create the RAID volume and return to the Intel® Rapid Storage Technology menu.

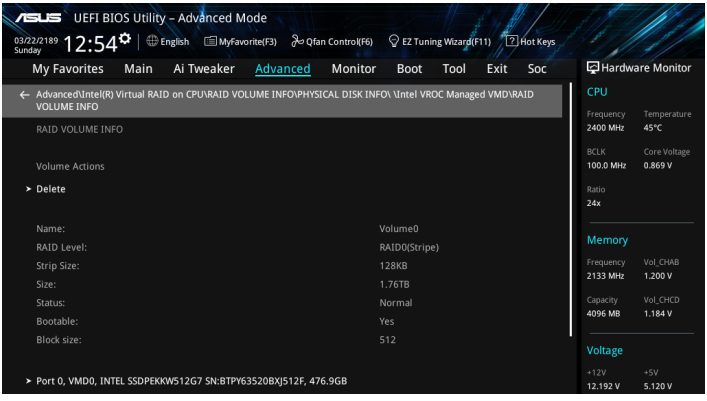


Deleting a RAID set

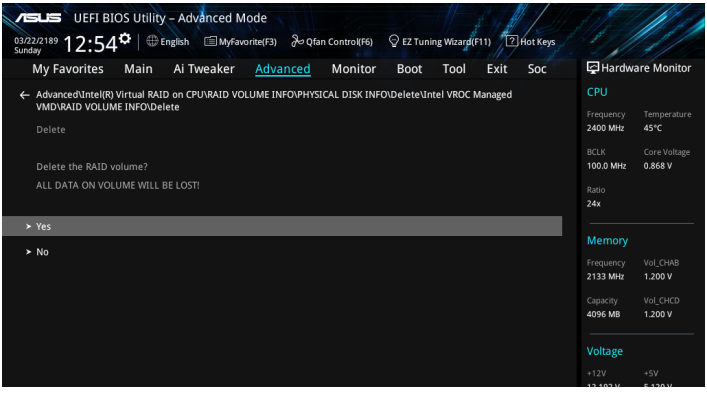
Be cautious when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

To delete a RAID set:

1. From the Intel® Virtual Raid on CPU menu, select the RAID volume you want to delete and press <Enter>. The following screen appears:



2. When the **Delete** item is selected, press <Enter>, then select **Yes** to delete the RAID volume and return to the Intel® Virtual Raid on CPU menu, or select **No** to cancel.



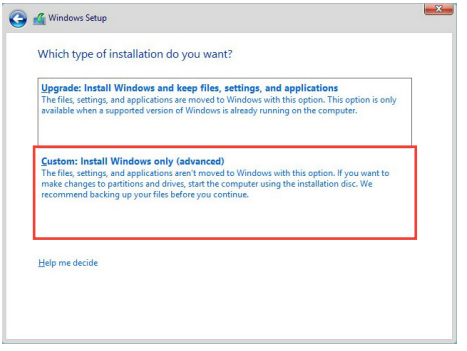
Installing the RAID controller driver during Windows® 10 OS installation

This part provides the instructions on how to install the RAID controller drivers during OS installation.

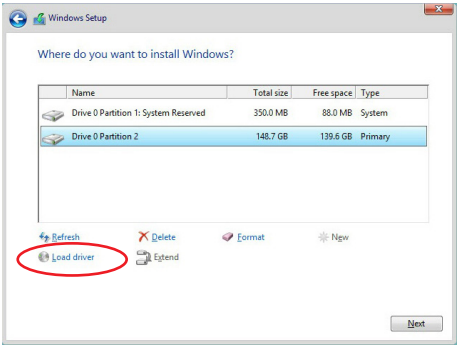
To install the RAID controller driver when installing Windows® 10 OS:

1. Boot the computer using the Windows® 10 OS installation disc. Follow the screen instructions to start installing Windows® 10.

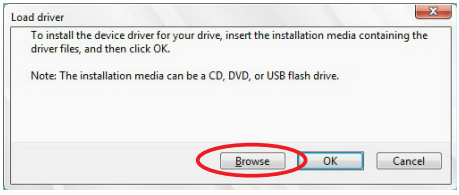
2. When prompted to choose a type of installation, click **Custom: Install Windows only (advanced)**.



3. Click **Load Driver**.



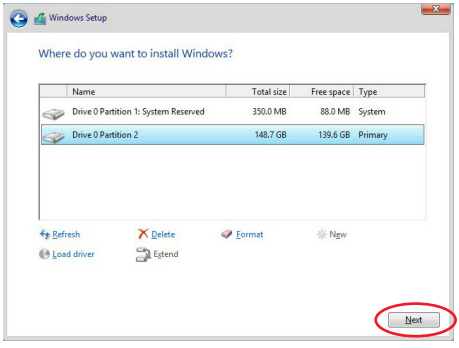
4. A message appears, reminding you to insert the installation media containing the driver of the RAID controller driver. If you have only one optical drive installed in your system, eject the Windows OS installation disc and replace with the motherboard Support DVD into the optical drive. Click **Browse** to continue.



5. Locate the driver in the corresponding folder of the Support DVD then click **OK** to continue.

6. Select the RAID controller driver you need from the list and click **Next**.

7. When the system finishes loading the RAID driver, replace the motherboard Support DVD with the Windows Server installation disc. Select the drive to install Windows and click **Next**.

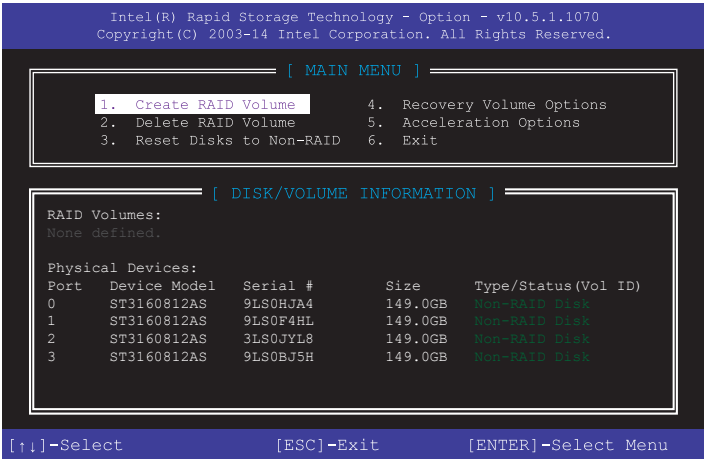


8. Setup then proceeds with the OS installation. Follow screen instructions to continue.

4.1.5 Intel® Rapid Storage Technology Option ROM utility

To enter the Intel® Rapid Storage Technology Option ROM utility:

1. Turn on the system.
2. During POST, press <Ctrl> + <I> to display the utility main menu.



The navigation keys at the bottom of the screen allow you to move through the menus and select the menu options.

The RAID BIOS setup screens shown in this section are for reference only and may not exactly match the items on your screen.

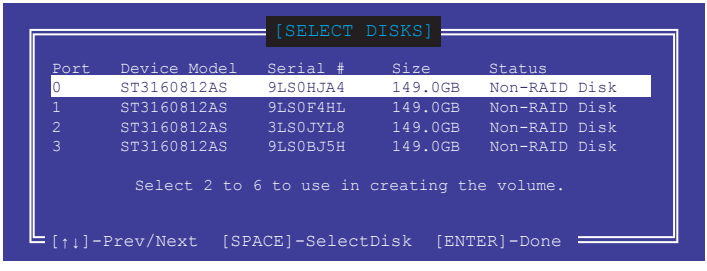
The utility supports maximum four hard disk drives for RAID configuration.

Creating a RAID set

To create a RAID set:

1. From the utility main menu, select **1. Create RAID Volume** and press <Enter>. The following screen appears:

2. Enter a name for the RAID set and press <Enter>.
3. When the RAID Level item is selected, press the up/down arrow key to select a RAID level to create, and then press <Enter>.
4. When the Disks item is selected, press <Enter> to select the hard disk drives you want to include in the RAID set. The SELECT DISKS screen appears:



5. Use the up/down arrow key to select a drive, and then press <Space> to select. A small triangle marks the selected drive. Press <Enter> after completing your selection.

6. Use the up/down arrow key to select the strip size for the RAID array (for RAID 0, 10 and 5 only), and then press <Enter>. The available strip size values range from 4 KB to 128 KB. The following are typical values:

   - RAID 0: 128 KB
   - RAID 10: 64 KB
   - RAID 5: 64 KB

We recommend a lower strip size for server systems, and a higher strip size for multimedia computer systems used mainly for audio and video editing.

7. When the **Capacity** item is selected, enter the RAID volume capacity that you want and press <Enter>. The default value indicates the maximum allowed capacity.

8. When the **Create Volume** item is selected, press <Enter>. The following warning message appears:

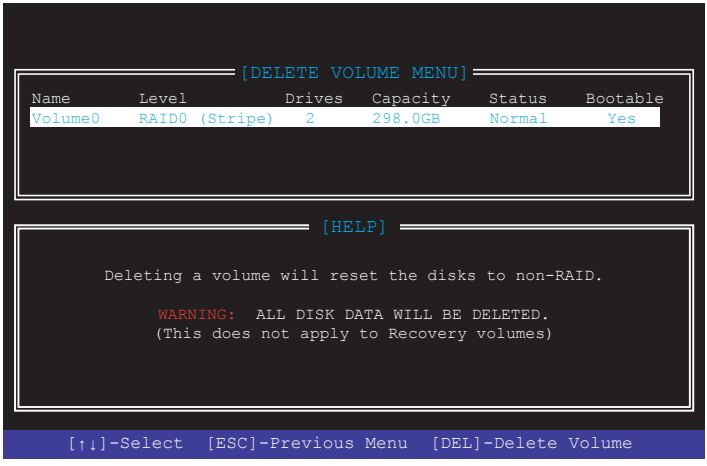
9. Press <Y> to create the RAID volume and return to the main menu, or <N> to go back to the CREATE VOLUME menu.

Deleting a RAID set

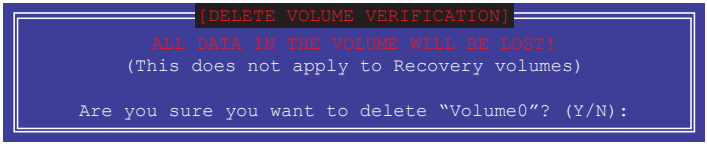
Be cautious when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

To delete a RAID set:

1. From the utility main menu, select **2. Delete RAID Volume** and press <Enter>. The following screen appears:



2. Use the up/down arrow key to select the RAID set you want to delete, and then press <Delete>. The following warning message appears:

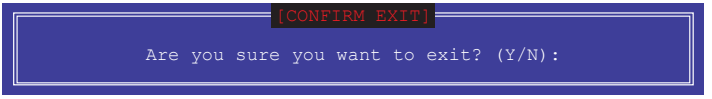


3. Press <Y> to delete the RAID set and return to the utility main menu, or press <N> to return to the DELETE VOLUME menu.

Exiting the Intel® Rapid Storage Technology Option ROM utility

To exit the utility:

1. From the utility main menu, select **6. Exit**, then press <Enter>. The following warning message appears:



2. Press <Y> to exit or press <N> to return to the utility main menu.

4.2 Creating a RAID driver disk

4.2.1 Creating a RAID driver disk in Windows®

To install the RAID driver for Windows® OS:

1. During the OS installation, click **Load Driver** to allow you to select the installation media containing the RAID driver.
2. Insert the USB flash drive with RAID driver into the USB port or the support DVD into the optical drive, and then click **Browse**.
3. Click the name of the device you've inserted, go to **Drivers** > **RAID**, and then select the RAID driver for the corresponding OS version. Click **OK**.
4. Follow the succeeding screen instructions to complete the installation.

Before loading the RAID driver from a USB flash drive, you have to use another computer to copy the RAID driver from the support DVD to the USB flash drive.

To set up a Windows® UEFI operating system under RAID mode, ensure to load the UEFI driver for your optical drive.

Multiple GPU Support

5

5.1 AMD® CrossFireX™ technology

The motherboard supports the AMD® CrossFireX™ technology that allows you to install multi-graphics processing units (GPU) graphics cards. Follow the installation procedures in this section.

5.1.1 Requirements

- In Dual CrossFireX mode, you should have two identical CrossFireX-ready graphics cards or one CrossFireX-ready dual-GPU graphics card that are AMD® certified.
- Ensure that your graphics card driver supports the AMD CrossFireX technology. Download the latest driver from the AMD website (www.amd.com).
- Ensure that your power supply unit (PSU) can provide at least the minimum power required by your system. See Chapter 1 for details.

- We recommend that you install additional chassis fans for better thermal environment.
- Visit the AMD Game website (http://game.amd.com) for the latest certified graphics card and the supported 3D application list.

5.1.2 Before you begin

For AMD® CrossFireX™ to work properly, you have to uninstall all existing graphics card drivers before installing AMD® CrossFireX™ graphics cards to your system.

To uninstall existing graphics card drivers:

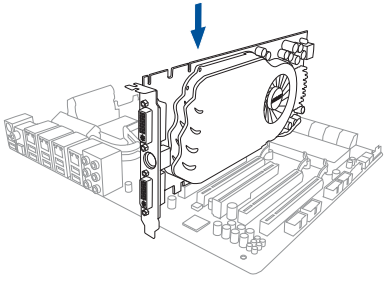
1. Close all current applications.
2. Press the Windows key on your keyboard to bring up the Start menu.
3. Type Control Panel in the search box, then select **Control Panel**.
4. Select **Programs and Features**.
5. Select your current graphics card driver/s, then select **Uninstall/Change**.
6. Turn off your computer.

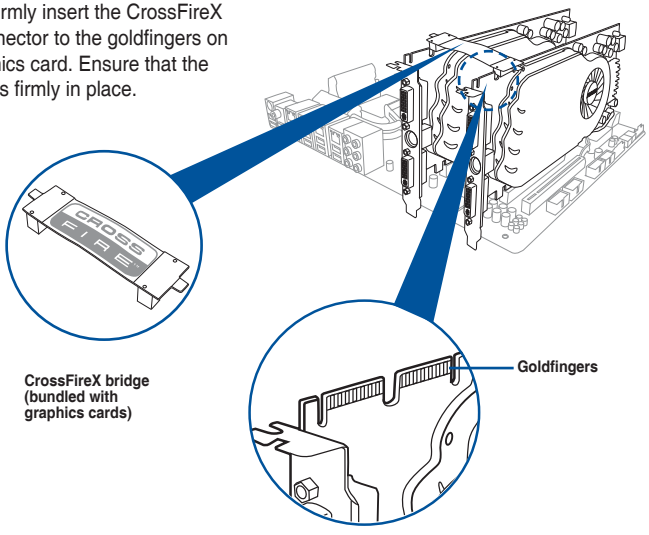
5.1.3 Installing two CrossFireX™ graphics cards

The following pictures are for reference only. The graphics cards and the motherboard layout may vary with models, but the installation steps remain the same.

To install two CrossFire™ graphics cards:

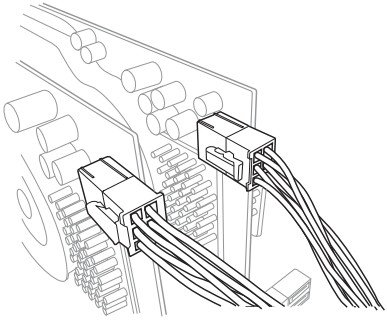
1. Prepare two CrossFireX-ready graphics cards.
2. Insert the two graphics card into the PCIEX16 slots. If your motherboard has more than two PCIEX16 slots, refer to Chapter 1 in this user manual for the locations of the PCIEX16 slots recommended for multi-graphics card installation.
3. Ensure that the cards are properly seated on the slots.
4. Align and firmly insert the CrossFireX bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.





The CrossFireX™ bridge is only required for selected graphics cards.

5. Connect two independent auxiliary power sources from the power supply to the two graphics cards separately.
6. Connect a VGA or a DVI cable to the graphics card.



5.1.4 Installing the device drivers

Refer to the documentation that came with your graphics card package to install the device drivers.

Ensure that your PCI Express graphics card driver supports the AMD® CrossFireX™ technology. Download the latest driver from the AMD website at www.amd.com.

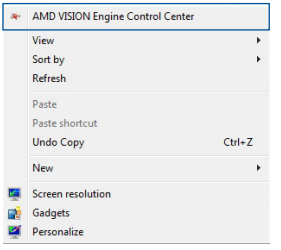
5.1.5 Enabling the AMD® CrossFireX™ technology

After installing your graphics cards and the device drivers, enable the CrossFireX™ feature through the AMD Vision Engine Control Center in Windows environment.

Launching the AMD VISION Engine Control Center

To launch the AMD VISION Engine Control Center:

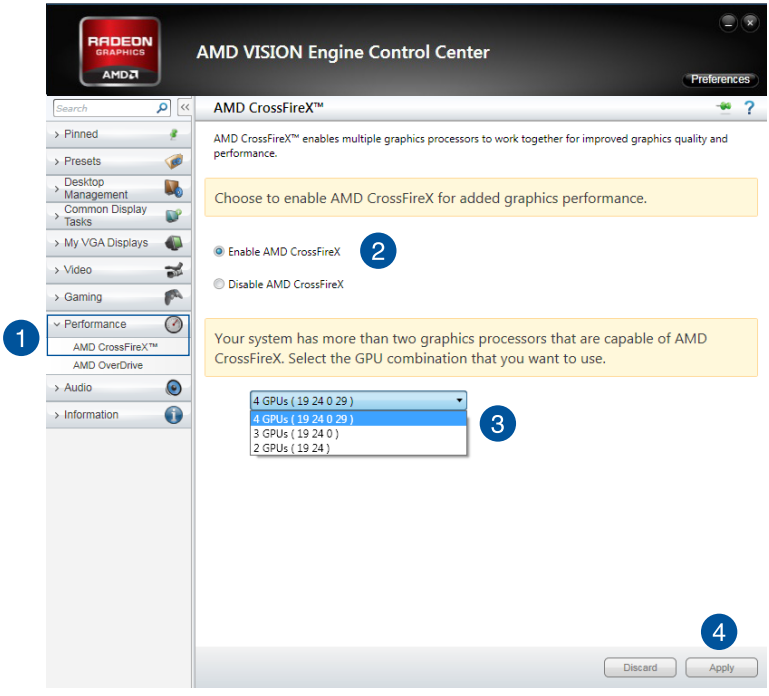
Right-click on the Windows® desktop and select **AMD VISION Engine Control Center**.



Enabling Dual CrossFireX™ technology

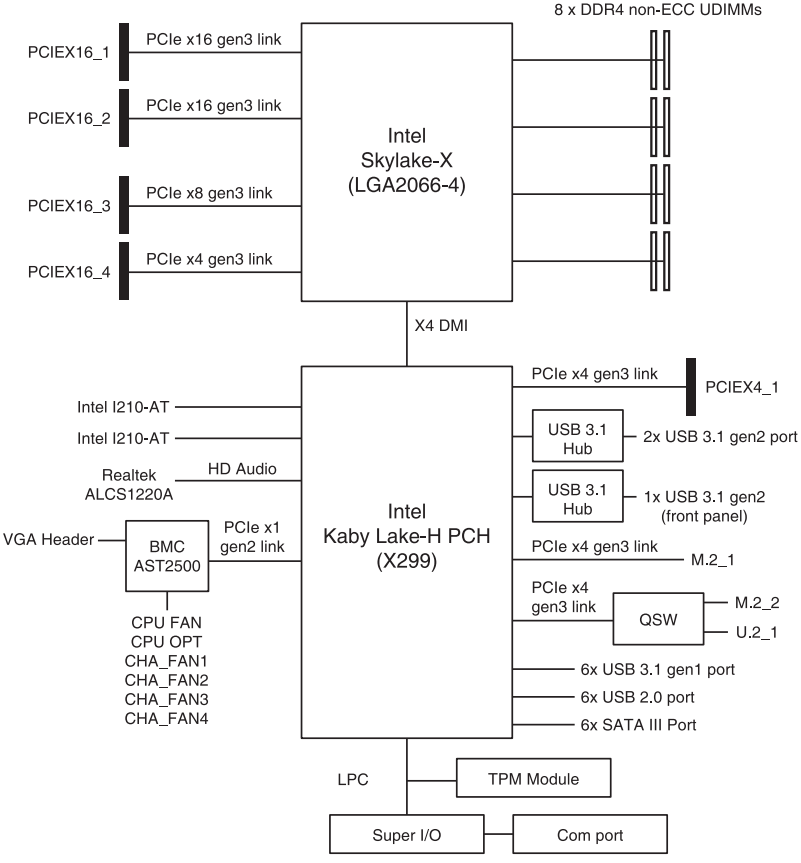
To enable Dual CrossFire™ technology:

1. In the AMD Vision Engine Control Center window, click **Performance > AMD CrossFireX™**.
2. Select **Enable CrossFireX™**.
3. Select a GPU combination from the drop-down list.
4. Click **Apply** to save and activate the GPU settings made.

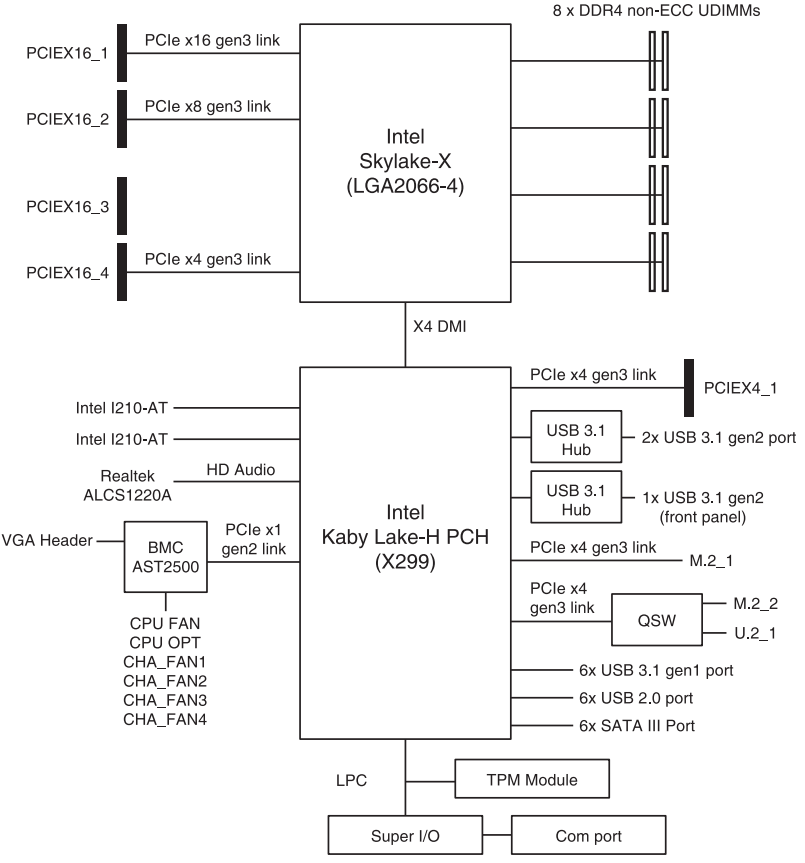


Appendix

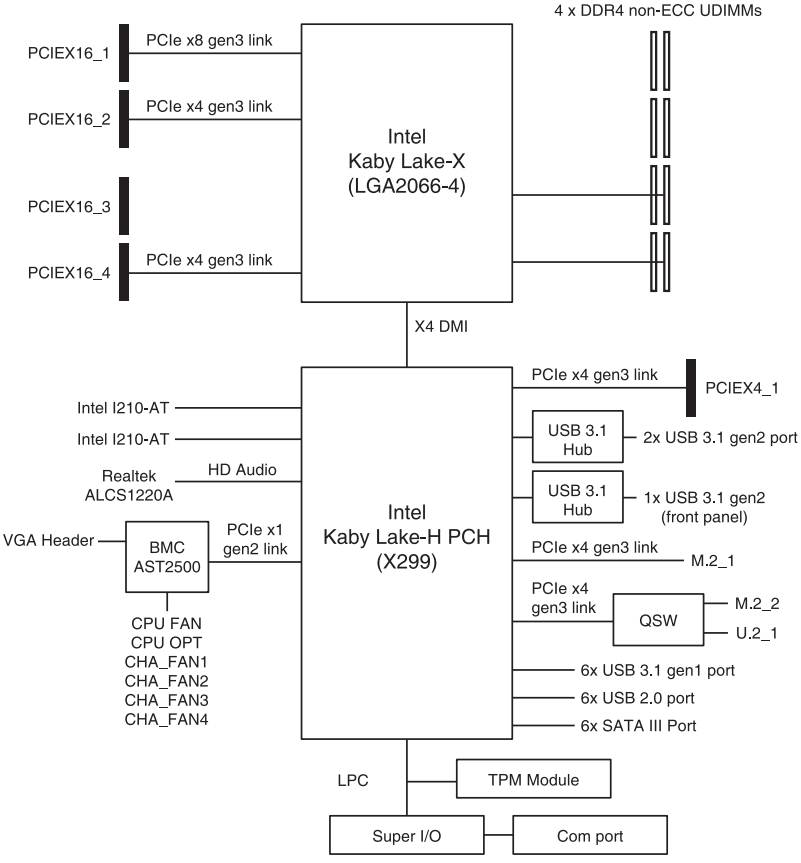
WS X299 PRO/SE block diagram (44-Lane)



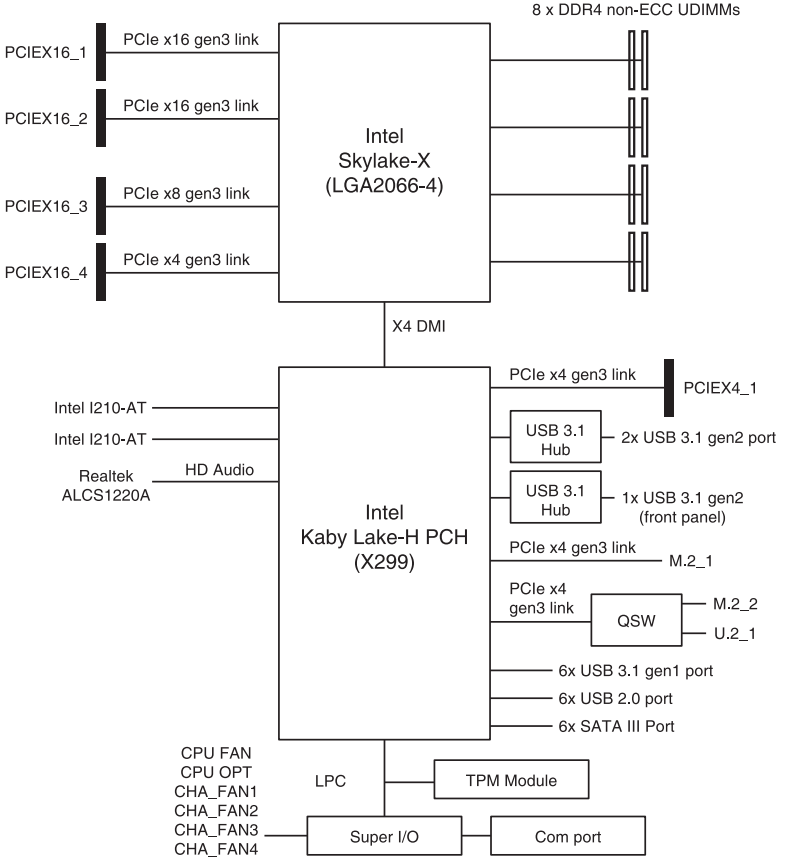
WS X299 PRO/SE block diagram (28-Lane)



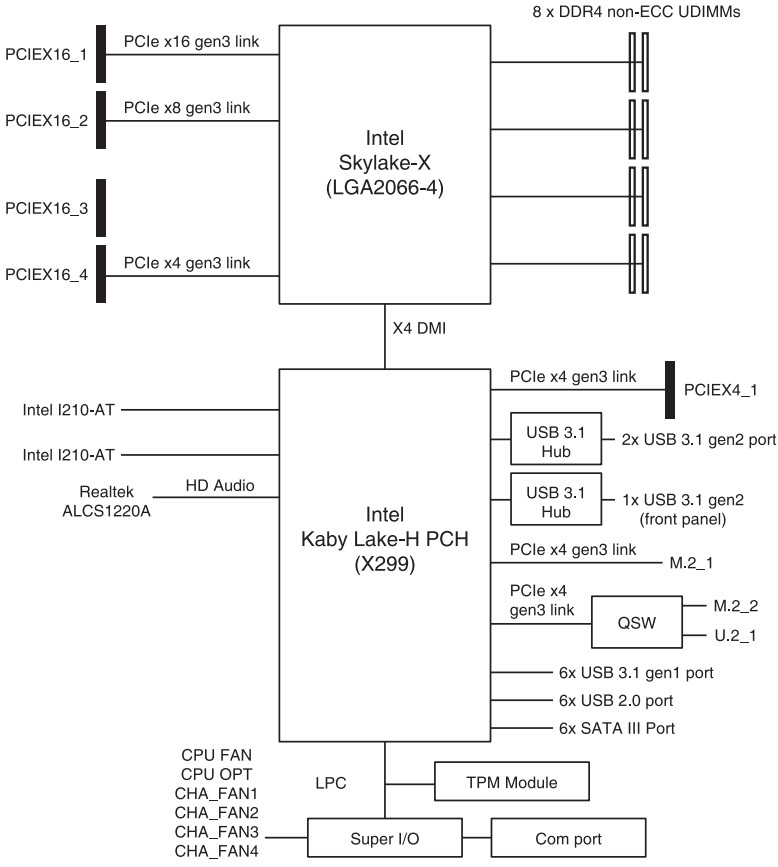
WS X299 PRO/SE block diagram (16-Lane)



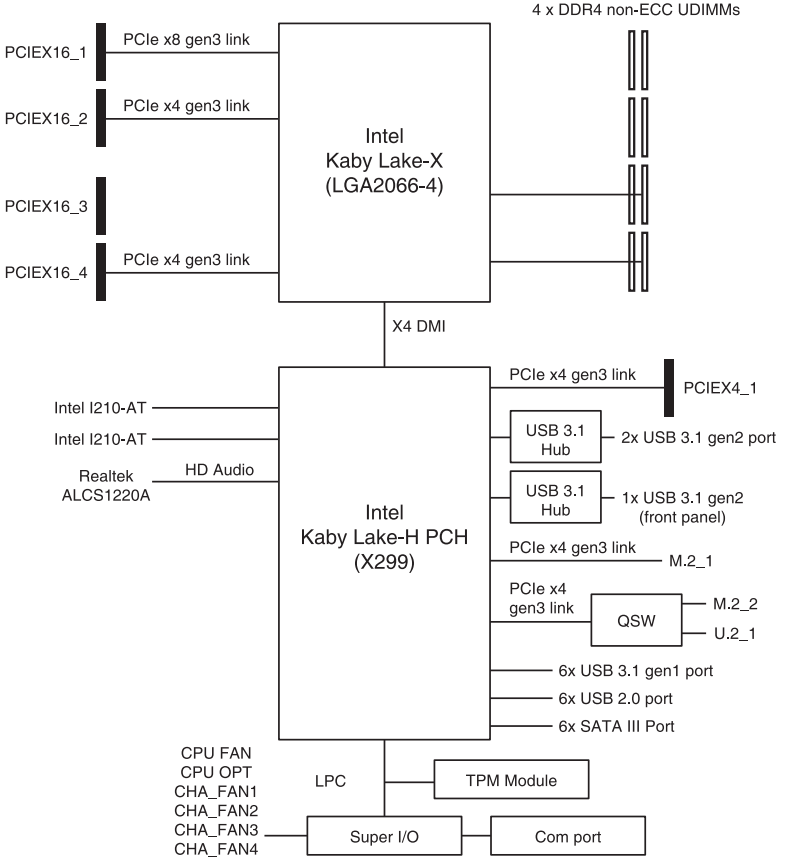
WS X299 PRO block diagram (44-Lane)



WS X299 PRO block diagram (28-Lane)



WS X299 PRO block diagram (16-Lane)



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

(continued on the next page)

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

(continued on the next page)

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.

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)

Appendix

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.

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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.

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.

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.

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

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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

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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

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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

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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

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