X99-E-10G WS

Motherboard

E13677
Revised Edition V3
December 2017

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Chapter 3: BIOS Setup

Chapter 4: Software Support

Chapter 5: RAID Support

Chapter 6: Multi GPU Support

Appendix

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: Software Support**

   This chapter describes the contents of the support DVD that comes with the motherboard package and the software.

5. **Chapter 5: RAID Support**

   This chapter describes the RAID configurations.

6. **Chapter 6: Multi GPU Support**

   This chapter describes how to install and configure multiple AMD® CrossFire™ and NVIDIA® SLI® 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 make sure 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 (+). Example: <Ctrl>+<Alt>+<Del>
`Command`	Means that you must type the command exactly as shown, then supply the required item or value enclosed in brackets. Example: At the DOS prompt, type the command line: **`format A:/S`**

X99-E-10G WS specifications summary

CPU	LGA2011-v3 socket for Intel® Core™ i7 X-Series / i7 & Xeon® E5-2600 v4/v3 and 1600 v4/v3 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.**
Chipset	Intel® X99 Chipset
Memory	8 x DIMM, Max. 128GB, DDR4 3333(O.C.)* / 3200(O.C)* / 3000(O.C)* / 2800(O.C.)* / 2666(O.C.)* / 2400(O.C.)* /2133 MHz Non-ECC, Un-buffered Memory *1 8 x DIMM, Max. 128GB, DDR4 2400/2133/1866 MHz ECC, Un-buffered Memory *2 8 x DIMM, Max. 128GB, DDR4 2400/2133/1866 MHz ECC, Register Memory ***1 When installing Intel® Socket 2011-v3 Core™ i7 X-Series/i7 Processors** ***2 When installing Intel® Xeon® E5-1600/2600 v4/v3 Processor** ***3 When installing Intel® Xeon® E5-1600/2600 v4/v3 Processor** Quad channel memory architecture Supports Intel® Extreme Memory Profile (XMP) *** 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	7 x PCI Express 3.0/2.0 x16 Slots (Single at x16, Dual at x16 / x16, Quad at x16/ x16/ x16/ x16, Seven at x16/ x8/ x8/ x8/ x8/ x8/ x8)
Multi-GPU support	Supports AMD® 4-Way CrossFireX™ Technology Supports NVIDIA® 4-Way SLI® Technology
Storage	**Intel® X99 Chipset with RAID 0, 1, 5, 10 and Intel® Rapid Storage Technology 14 support** - 1 x U.2 connector (support U.2 NVMe device) - 1 x M.2 x4 Socket 3 with M Key , Type 2260/2280 Storage Devices Support (PCIE mode only) - 10 x SATA 6.0 Gb/s Ports* - Supports Intel® Smart Response Technology *** Due to Chipset Behavior, The SATA6G_78, SATA6G_910 Ports (Black) do not Support IRST Including RAID Configuration.**
LAN	2*Intel® X550-AT2 10 Gigabit LAN ports
USB	**Intel® X99 Chipset - Supports ASUS USB 3.0 Boost** - 8 x USB 3.0/2.0 Ports (4 Ports at Rear I/O and 4 Ports at Front Panel) - 4 x USB 2.0/1.1 Ports (4 Ports at Mid-board) **ASMedia® USB 3.1 Controller- Supports ASUS USB 3.1 Boost** - 2 x USB 3.1/3.0/2.0 Ports at Rear I/O (Type A and Type C)

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Audio	Realtek® ALC1150 8-channel high definition audio CODEC featuring Crystal Sound 3 - Separate layer for left and right track, ensuring both sound deliver equal quality - Top notch audio sensation delivers according to the audio configuration - Audio shielding ensures precise analog/digital separation and greatly reduced multi-lateral interference - Audio Amplifier to enhance the highest quality sound for headphone and speakers - Premium Japan-made audio capacitors provides warm, natural, and immersive sound with exceptional clarity and fidelity - High quality 112dB SNR stereo playback output (Line-out@back) & 104dB SNR recording input (Line-in) support - Absolute Pitch 192khz/24bit true BD lossless sound - BD audio layer content protection - DTS Studio Sound - DTS Connect - Supports jack-detection, multi-streaming, front panel jack-retasking (MIC) - Optical S/PDIF out port at back I/O
ASUS Exclusive Features	**High Performance** **5-Way Optimization by Dual Intelligent Processors 5** - Whole System Optimization with a Single Click! 5-Way Optimization Tuning Key Perfectly Consolidates TPU, EPU, DIGI+ Power Control, Fan Xpert 4, and Turbo App Together, Providing Better CPU Performance, Efficient Power Saving, Precise Digital Power Control, Whole System Cooling and Even Tailor Your Own APP Usages. **DIGI+ Power Control** CPU Power - Industry Leading Digital 8-phase power design - ASUS CPU power utility DRAM Power - Industry Leading Digital 4-phase DRAM power design - ASUS DRAM power utility **TPU** - Auto Tuning, TPU, GPU Boost **EPU** - EPU **Fan Xpert 4** - Featuring Fan Auto Tuning Function and Multiple Thermistors Selection for Optimized System Cooling Control. **Turbo App** - Featuring System Performance Tuning, Network Priority, and Audio Scene Configuration for Selected Applications.

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X99-E-10G WS specifications summary

ASUS Exclusive Features	**UEFI BIOS** - Most Advanced Options with Fast Response Time **M.2 and U.2 Onboard** - The Latest Transfer Technology with up to 32Gb/s Data-transfer Speeds for M.2 and U.2 **Special Memory O.C. Design** - Superb Memory O.C. Capability under Full Load by Minimizing the Coupling Noise and Signal Reflection Effect **Powerful Home Server** **Media Streamer** **Gaming Scenario** **Turbo APP** - Perform Each Application with Tailored Performance, Network Priority and Audio Configuration for Your Needs **Turbo LAN** - Experience Smooth Online Gaming with Lower Pings and Less Lags **Crystal Sound 3** - Feel the Sound Power with Different Usage Scenarios. **Steam support** - Compatible with the Most Fun Gaming Platform under Windows System **ASUS EZ DIY** **Push Notice** - Monitor Your PC Status with Smart Devices in Real Time **USB BIOS Flashback** - with USB BIOS Flashback Wizard for EZ BIOS Download Scheduling **UEFI BIOS** - Featuring Friendly Graphics User Interface - O.C. Tuner - CrashFree BIOS 3 - EZ Flash 3 **Q-Design** - Q-Code - Q-Shield - Q-LED (CPU, VGA, HDD LED) - Q-Slot - Q-DIMM - Q-Connector

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X99-E-10G WS specifications summary

ASUS Special Features	**Special Features:** - USB 3.1 Boost - Ai Charger+ - Disk Unlocker - AI Suite 3 - MemOK! - EZ XMP
Workstation Exclusive	- 7 PCIe x 16 Slots - ProCool Power Connector - ASUS PIKE SAS upgrade kit (Optional)
Internal I/O Connectors	2 x USB 3.0/2.0 Connectors Support Additional 4 USB Ports (19-pin) 2 x USB 2.0/1.1 Connectors Support Additional 4 USB Ports 1 x M.2 Socket 3 (for M Key, Type 2260/2280 Devices) 1 x U.2 Connector (support U.2 NVMe device) 10 x SATA 6.0Gb/s Connectors (6 x Gray; 4 x Black) 1 x CPU Fan Connector 1 x CPU OPT Fan Connector (4-pin) 2 x Chassis Fan Connectors 1 x High AMP Fan Header 1 x Water Pump Header 1 x Front Panel Audio Connector (AAFP) 1 x S/PDIF Out Header 1 x T_Sensor Connector 1 x TPM Connector 1 x 24-pin EATX Power Connector 2 x 8-pin EATX 12V Power Connector 1 x 6-pin EATX 12V_1 Power Connector 1 x System Panel (Q-Connector) 1 x MemOK! Button 1 x Clear CMOS Button 1 x DRCT (Direct Key) Connector 1 x CPU OV Connector 1 x RGB HEADER 1 x EZ XMP Switch 1 x Power-on Button 1 x Reset Button 1 x 3-pin CHASSIS (Chassis Intrusion) Connector 1 x BIOS Flashback Button 1 x SLI/CFX switch (2/3-WAY adjustments)

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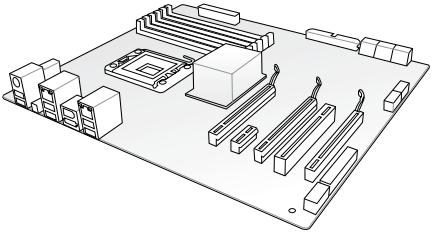
X99-E-10G WS specifications summary

Rear Panel I/O Ports	4 x USB 3.0/2.0 Ports (blue) 2 x USB 3.1 Ports (Type A and Type C) 1 x Optical S/PDIF Out Port 1 x COM port header 2 x Intel 10G LAN (BASE-T) Ports 8-channel Audio I/O Ports
Operating system	Windows® 10* Windows® 8.1* Windows® 7* * **64-bit supported only**
Form Factors	CEB Form Factor, 12”x 10.5” (30.5cm x 26.7cm)

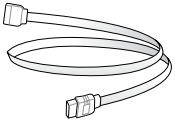
Specifications are subject to change without notice.

Package contents

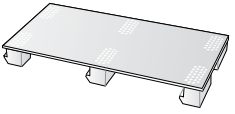
Check your motherboard package for the following items



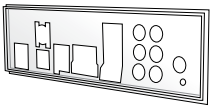
ASUS X99-E-10G WS motherboard



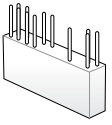
10 x Serial ATA 6 Gb/s cables



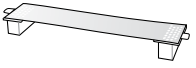
1 x 3-WAY SLI bridge connector



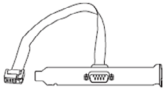
1 x ASUS Q-Shield



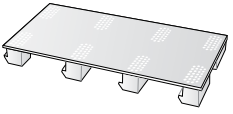
1 x 2-in-1 ASUS Q-Connector kit



1 x ASUS SLI© bridge connector

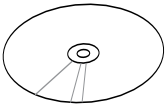


COM port bracket



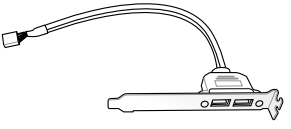
1 x 4-WAY SLI bridge connector

1 x RGB LED extension cable



Support DVD

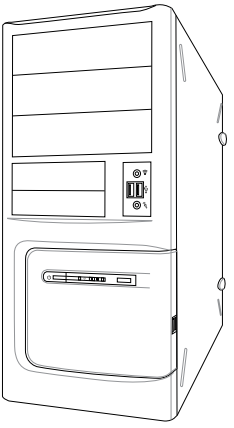
User Guide



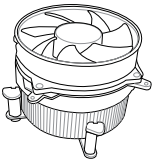
1 x 2-port USB 2.0 cable

- If any of the above items is damaged or missing, contact your retailer.
- The illustrated items above are for reference only. Actual product specifications may vary with different models.

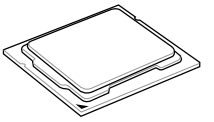
Installation tools and components



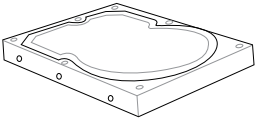
PC chassis



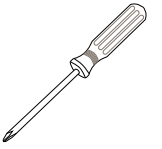
Intel® LGA2011-v3 compatible CPU Fan



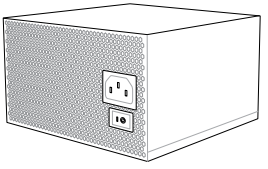
Intel® LGA2011-v3 CPU



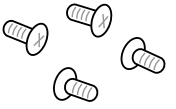
SATA hard disk drive



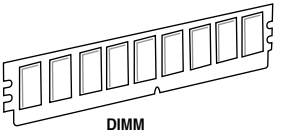
Phillips (cross) screwdriver



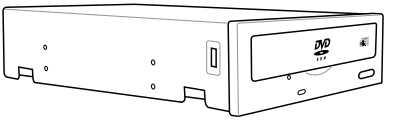
Power supply unit



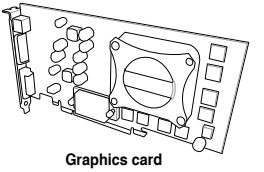
1 bag of screws



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 Special features

1.1.1 Product highlights

LGA2011-v3 socket for Intel® Core™ i7 X-Series / i7 processors

This motherboard supports Intel® Core™ i7 X-Series / i7 processors in the LGA2011-v3 package. It provides great system performance, quad-channel DDR4 memory slots and PCI Express 2.0/3.0 expansion slots.

Intel® X99 Express Chipset

Intel® X99 Express Chipset is a single chipset that supports the LGA2011-v3 socket for Intel® Core™ i7 X-Series / i7 processors. It utilizes the serial point-to-point links, which increases bandwidth and enhances the system's performance. It natively supports up to eight (8) USB 3.0 ports and ten (10) SATA 6 Gb/s ports.

PCI Express® 3.0

PCI Express® 3.0 (PCIe 3.0) is the PCI Express bus standard that provides twice the performance and speed of PCIe 2.0. It provides an optimal graphics performance, unprecedented data speed and seamless transition with its complete backward compatibility to PCIe 1.0/2.0 devices.

4-WAY SLI and 4-Way CrossFireX™ Support

This motherboad features NVIDIA 4-WAY SLI and AMD 4-Way CrossfireX support that enables mulit-GPU setup, giving you the full power of the latest graphics technologies. It also features native support for 4K/UHD (ultra high definition) resolution of up to 4096 x 2160 via HDMI or DisplayPort, resulting to four times the number of pixels for incredible visual clarity, detail, and realism.

Quad-Channel DDR4 2400 MHz Support

The motherboard supports the quad-channel DDR4 memory that features data transfer rates of DDR4 2400 MHz to boost the system's performance, and to meet the higher bandwidth requirements of 3D graphics, multimedia and Internet applications.

M.2* and U.2 Support

This motherboard features the M.2 slot and U.2 connector, which shares bandwidth with PCI Express 3.0 x4 slot to speed up data transfer up to 32 Gb/s. This helps enhance the performance of your SSD (Solid State Drive) that is dedicated only to the operating system.

*** Supports PCIe mode only.**

Complete USB 3.1 integration

This motherboard has the latest USB 3.1 connectivity built in with Type-A and Type-C ports for the very fastest USB data transfers — that's up to 10 Gb/s, or twice as fast as USB 3.0. The Type-A USB 3.1 port is completely backward compatible with your existing USB devices, and you'll be all set for USB 3.1's breakneck speeds. The Type-C USB 3.1 port is the all new reversible socket for any-way-up convenience. And ASUS-exclusive USB 3.1 Boost technology automatically accelerates USB 3.1 performance even further!

1.1.2 Other special features

DTS Connect

To get the most out of your audio entertainment across all formats and quality levels, DTS Connect combines two enabling technologies, DTS Neo:PC™ upmixes stereo sources (CDs, MP3s, WMAs, internet radio) into as many as 7.1 channels of incredible surround sound. Consumers can connect their PC to a home theater system. DTS Interactive is capable of performing mult-channel encoding of DTS bitstreams on personal computers, and sending encoded bitstreams out of a digital audio connection (such as S/PDIF or HDMI) designed to deliver audio to an external decoder.

DTS UltraPC II

DTS UltraPC II delivers a superior surround sound experience through your system's speakers and headphones while monitoring and balancing the loudness level difference between digital audio formats. It also ehnances the audio settings through augmenting low and high frequencies of musical tones, restores compressed or re-mastered sounds, improves bass performance even without a subwoofer, and improves dialogues derived from DVD or Blu-ray Disc™.

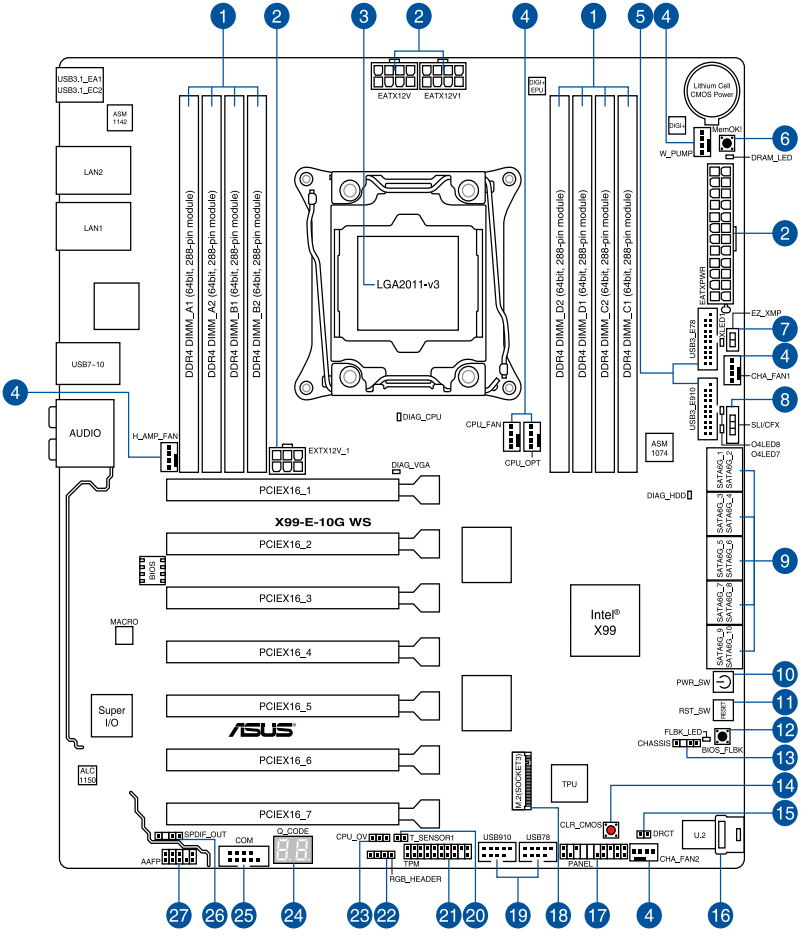
1.2 Motherboard overview

1.2.1 Before you proceed

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

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

1.2.2 Motherboard layout



Refer to **1.2.9 Internal connectors** and **2.3.1 Rear I/O connection** for more information about rear panel connectors and internal connectors.

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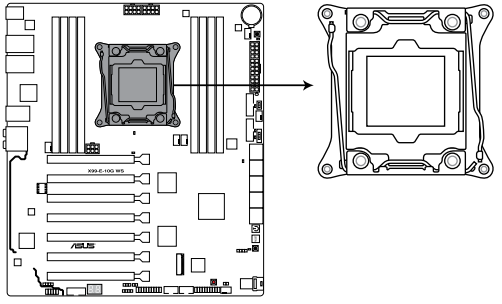
17. System panel connector (20-8 pin PANEL)	1-30
18. M.2 (Socket 3) connector	1-32
19. USB 2.0 connectors (10-1 pin USB78, USB910)	1-27
20. T_Sensor connector (T_SENSOR1)	1-35
21. TPM connector (20-1 pin TPM)	1-31
22. RGB header (4-pin RGB_HEADER)	1-34
23. CPU Over Voltage jumper (3-pin CPU_OV)	1-16
24 Q-Code LEDs	1-20
25. Serial port connector (10-1 pin COM)	1-33
26. Digital audio connector (4-1 pin SPDIF_OUT)	1-25
27. Front panel audio connector (10-1 pin AAFP)	1-25

1.2.3 Central Processing Unit (CPU)

The motherboard comes with a surface mount LGA2011-v3 socket designed for Intel® Core™ i7 X-Series / i7 processors.



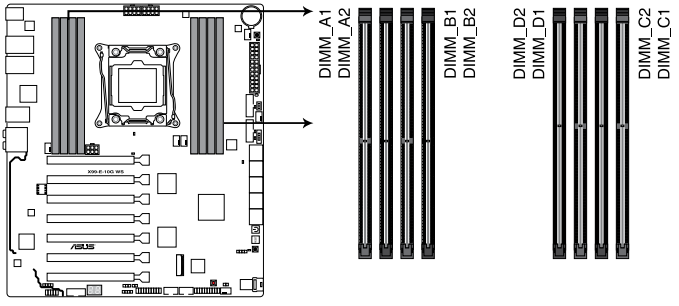
X99-E-10G WS CPU LGA2011-v3 Socket

- 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 LGA2011-v3 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.

1.2.4 System memory

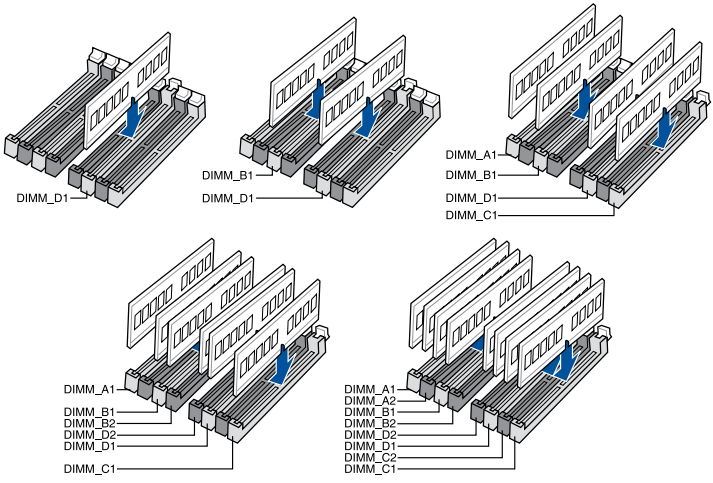
The motherboard comes with eight (8) DDR 4 (Double Data Rate 4) Quad Inline Memory Modules (DIMM) slots.

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.



X99-E-10G WS 288-pin DDR4 DIMM socket

Recommended memory configurations



Chapter 1

Memory configurations

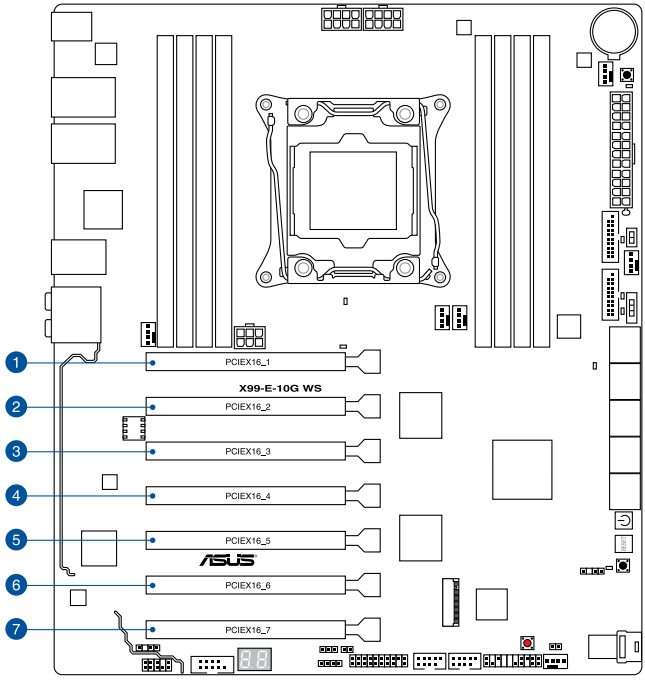
You may install 2 GB, 4 GB, 8 GB, and 16GB unbuffered and non-ECC DDR4 DIMMs into the DIMM sockets.

- 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 dual-channel configuration. Any excess memory from the higher-sized channel is then mapped for single-channel operation.
- According to Intel® CPU spec, DIMM voltage below 1.65 V is recommended to protect the CPU.
- Due to the memory address limitation on 32-bit Windows® OS, when you install 4GB or more memory on the motherboard, the actual usable memory for the OS can be about 3GB or less. For effective use of memory, we recommend that you do any of the following:
  a) Use a maximum of 3GB system memory if you are using a 32-bit Windows® OS.
  b) Install a 64-bit Windows® OS when you want to install 4 GB or more on the motherboard.
  c) For more details, refer to the Microsoft® support site at http://support.microsoft.com/kb/929605/en-us.
- The design of the DIMM fan may vary. Ensure that the DIMM fan fits to the motherboard.

- 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. To operate at the vendor-marked or at a higher frequency, refer to section **3.5 Ai Tweaker menu** for manual memory frequency adjustment.
- For system stability, use a more efficient memory cooling system to support a full memory load (8 DIMMs) or overclocking condition.
- Memory modules with memory frequency higher than 2133MHz and their corresponding timing or the loaded XMP profile is not the JEDEC memory standard. The stability and compatibility of the memory modules depend on the CPU's capabilities and other installed devices.
- 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.
- ASUS exclusively provides hyper DIMM support function.
- Hyper DIMM support is subject to the physical characteristics of individual CPUs. Load the X.M.P. or D.O.C.P. settings in the BIOS for the hyper DIMM support.
- Visit the ASUS website for the latest QVL.

1.2.5 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 3.0/2.0 x16_1 slot
2	PCIe 3.0/2.0 x16_2 slot
3	PCIe 3.0/2.0 x16_3 slot
4	PCIe 3.0/2.0 x16_4 slot
5	PCIe 3.0/2.0 x16_5 slot
6	PCIe 3.0/2.0 x16_6 slot
7	PCIe 3.0/2.0 x16_7 slot

VGA configuration	PCI Express 3.0 operating mode						
	PCIe 3.0/2.0 x16_1	PCIe 3.0/2.0 x16_2	PCIe 3.0/2.0 x16_3	PCIe 3.0/2.0 x16_4	PCIe 3.0/2.0 x16_5	PCIe 3.0/2.0 x16_6	PCIe 3.0/2.0 x16_7
Single VGA/ PCIe card	x16 (single VGA recommended)	N/A	N/A	N/A	N/A	N/A	N/A
Dual VGA/PCIe cards	x16	N/A	N/A	N/A	x16	N/A	N/A
Triple VGA/ PCIe cards	x16	N/A	x16	N/A	x16	N/A	N/A
Quad VGA/ PCIe cards	x16	N/A	x16	N/A	x16	N/A	x16
Septuple VGA/ PCIe cards	x16	x8	x8	x8	x8	x8	x8

- We recommend that you provide sufficient power when running CrossFireX™ or SLI® mode.
- Connect a chassis fan to the motherboard connector labeled CHA_FAN1-2 when using multiple graphics cards for better thermal environment.

IRQ assignments for this motherboard

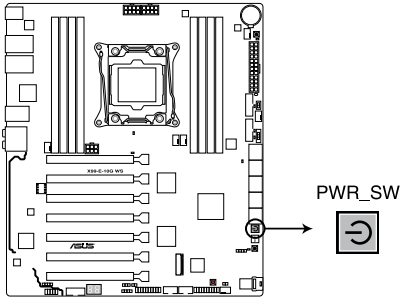
	A	B	C	D	E	F	G	H
PCIEX16_1	shared	–	–	–	–	–	–	–
PCIEX16_2	shared	–	–	–	–	–	–	–
PCIEX16_3	shared	–	–	–	–	–	–	–
PCIEX16_4	shared	–	–	–	–	–	–	–
PCIEX16_5	shared	–	–	–	–	–	–	–
PCIEX16_6	shared	–	–	–	–	–	–	–
PCIEX16_7	shared	–	–	–	–	–	–	–
SMBUS Controller	–	–	shared	–	–	–	–	–
Intel® SATA Controller 1	–	shared	–	–	–	–	–	–
Intel® SATA Controller 2	–	–	shared	–	–	–	–	–
Intel® LAN1 (x550)	shared	–	–	–	–	–	–	–
Intel® LAN2 (x550)	–	shared	–	–	–	–	–	–
Intel® xHCI	–	–	–	–	–	–	–	shared
Intel® EHCI 1	shared	–	–	–	–	–	–	–
Intel® EHCI 2	–	–	–	–	–	shared	–	–
HD Audio	–	–	–	–	–	–	shared	–

1.2.6 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 (PWR_SW)

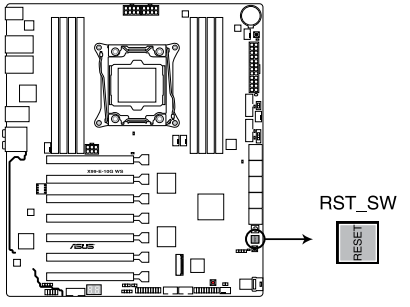
The motherboard comes with a power-on button that allows you to power up or wake up the system. The button also lights up when the system is plugged to a power source indicating that you should shut down the system and unplug the power cable before removing or installing any motherboard component.



X99-E-10G WS Power on button

2. Reset button (RST_SW)

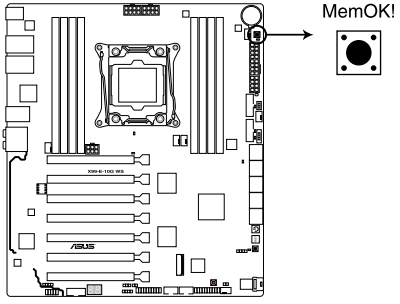
Press the reset button to reboot the system.



X99-E-10G WS Reset button

3. MemOK! button (MemOK)

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 near the MemOK! button lights continuously, press the MemOK! button until the DRAM_LED starts blinking. System will begin automatic memory compatibility tuning and reboot for successful boot.

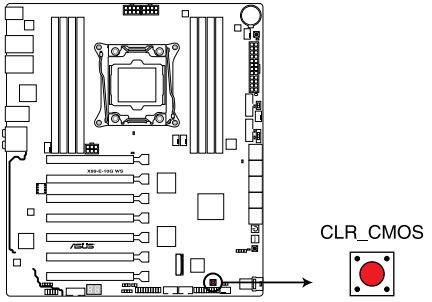


X99-E-10G WS MemOK! button

- Refer to section **1.2.8 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 test 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)

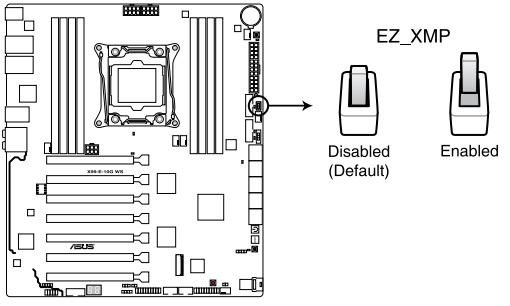
Press this button to clear the BIOS setup information only when the systems hangs due to overclocking.



X99-E-10G WS CLR_CMOS button

5. EZ XMP switch (EZ_XMP)

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

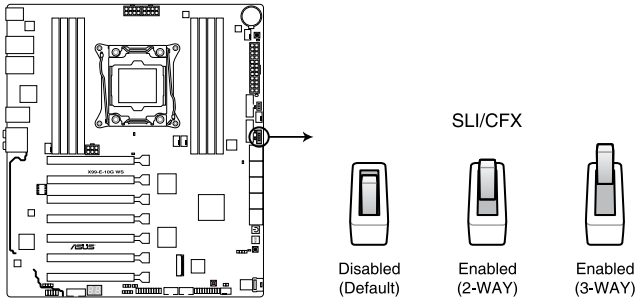


X99-E-10G WS EZ_XMP switch

The EZ XMP LED (XLED1) lights up when you enable the EZ XMP switch. For the location of the EZ XMP LED, refer to section **1.2.8 Onboard LEDs**.

6. SLI/CFX switch (SLI/CFX)

This switch allows you to determine the slots for 2-WAY or 3-WAY graphics card installation. When enabled, the PCIE LEDs near the slots light up, telling you to install the graphics cards to the specific slots.



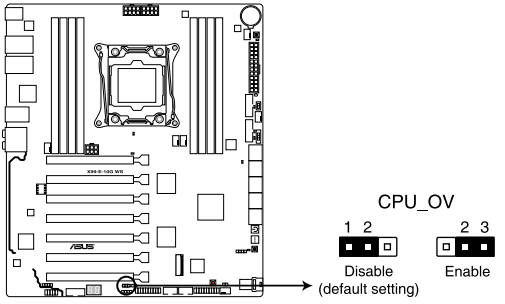
X99-E-10G WS SLI/CFX switch

- We recommend that you insert your graphics cards into PCIEX16_1 and PCIEX16_5 when 2-WAY SLI/Crossfire is enabled.
- We recommend that you insert your graphics cards into PCIEX16_1, PCIEX16_3, and PCIEX16_5 when 3-WAY SLI/Crossfire is enabled.
- The LEDs below the SLI/CFX switch and near the PCIE slots light up when the SLI/CFX switch is enabled. Refer to section **1.2.8 Onboard LEDs** for the exact location of the SLI/CFX and PCIE LEDs.
- After adjusting PCIE bandwidth in the BIOS, shut down the system for the PCIE LEDs to update the lighting effect.

1.2.7 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.



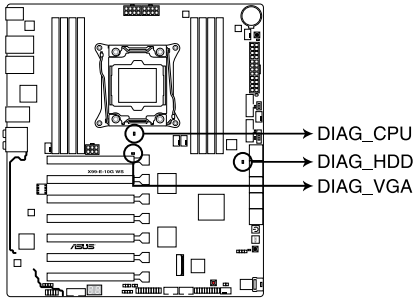
X99-E-10G WS CPU_OV setting

Chapter 1

1.2.8 Onboard LEDs

1. Diagnosis LEDs

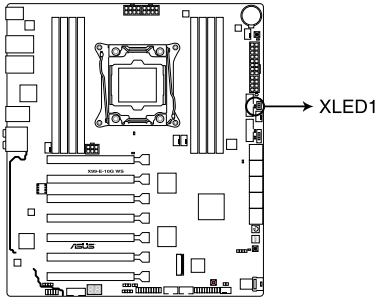
The Diagnosis LEDs provide the status of these key components during POST (Power-On-Self Test): CPU, VGA card, and hard disk drives. If an error is found, the critical component's LED stays lit up until the problem is solved.



X99-E-10G WS Diagnosis LED

2. EZ XMP LED (XLED1)

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

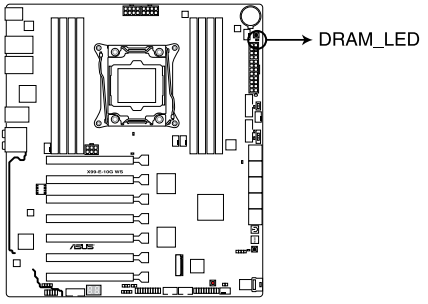


X99-E-10G WS XLED1

Chapter 1

3. DRAM LED (DRAM_LED)

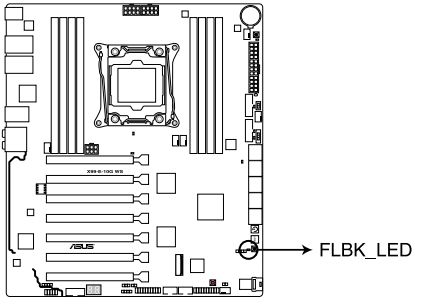
The DRAM LED checks DRAM during motherboard booting process. If an error is found, the LED flashes until the problem is solved.



X99-E-10G WS DRAM_LED

4. USB BIOS Flashback LED (FLBK_LED)

The BIOS Flashback LED flashes when you press the BIOS Flashback button for BIOS update.

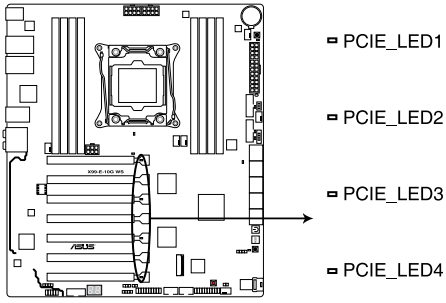


X99-E-10G WS FLBK_LED

Chapter 1

5. PCIE LEDs

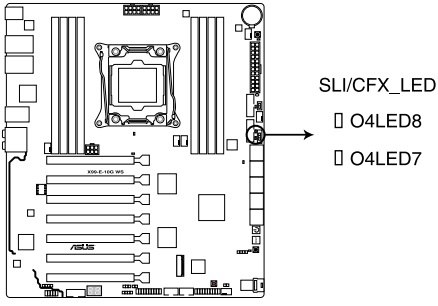
The PCIE LEDs light up to indicate which PCIE slots to use when SLI/CFX switch is enabled.



X99-E-10G WS PCIE LEDs

6. SLI/CFX LEDs

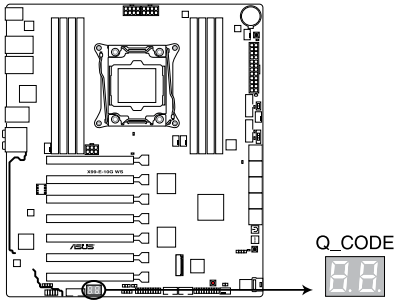
The SLI/CFX LEDs light up when SLI/CFX switch is enabled.



X99-E-10G WS SLI/CFX_LED

7. Q-Code LEDs

The Q-Code LED design provides you with a 2-digit error code that displays the system status. Refer to the Q-Code table on the next page for details.



X99-E-10G WS Q-Code LED

Chapter 1

Q-Code table

Code	Description
00	Not used
02	microcode
03	CACHE_ENABLED
04	PCH initialization
06	CPU_EARLY_INIT
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
4F	DXE IPL is started
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
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

(continued on the next page)

Code	Description
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
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

(continued on the next page)

Code	Description
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
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)

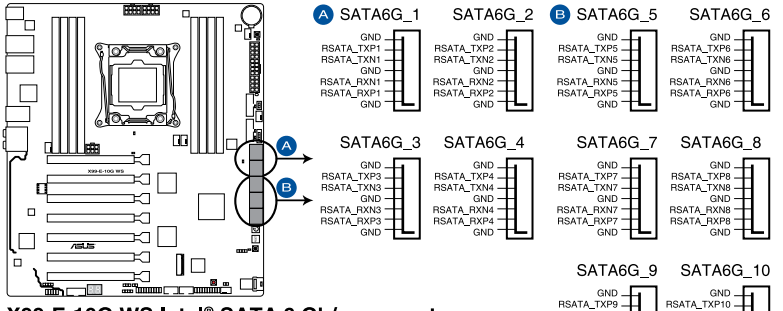
Code	Description
03	System is entering S3 sleep state
04	System is entering S4 sleep state
05	System is entering S5 sleep state
30	System is waking up from the S3 sleep state
40	System is waking up from the S4 sleep state
AC	System has transitioned into ACPI mode. Interrupt controller is in PIC mode.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

1.2.9 Internal connectors

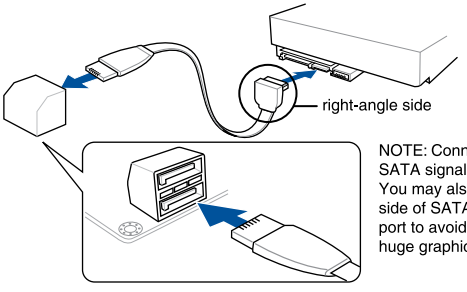
1. Intel® X99 Serial ATA 6 Gb/s connectors (7-pin SATA6G_12, SATA6G_34, SATA6G_56, SATA6G_78, SATA6G_910)

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® X99 chipset.



X99-E-10G WS Intel® SATA 6 Gb/s connectors



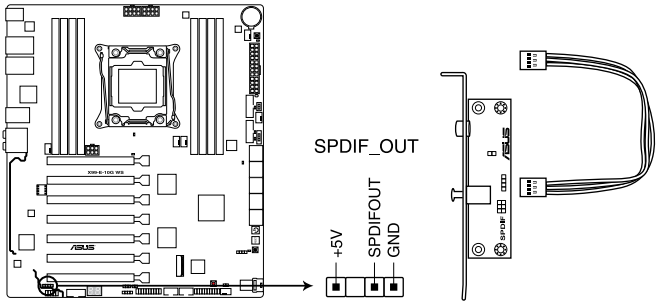
NOTE: Connect the right-angle side of SATA signal cable to SATA device. You may also connect the right-angle side of SATA cable to the onboard SATA port to avoid mechanical conflict with huge graphics cards.

- 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 **[RAID Mode]**. Refer to section **3.6.3 PCH Storage Configuration** for details.
- Before creating a RAID set, refer to the manual bundled in the motherboard support DVD.

Due to chipset behavior, the SATA6G_78 and SATA6G_910 ports (black) do not support Intel® Rapid Storage Technology and RAID configuration.

2. Digital audio connector (4-1 pin SPDIF_OUT)

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

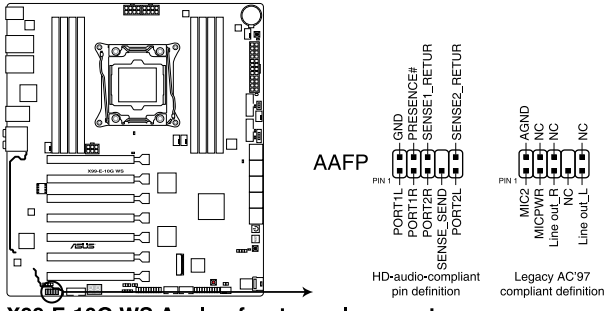


X99-E-10G WS Digital audio connector

The S/PDIF module is purchased separately.

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

This connector is for a chassis-mounted front panel audio I/O module that supports either HD Audio or legacy AC`97 audio standard. Connect one end of the front panel audio I/O module cable to this connector.



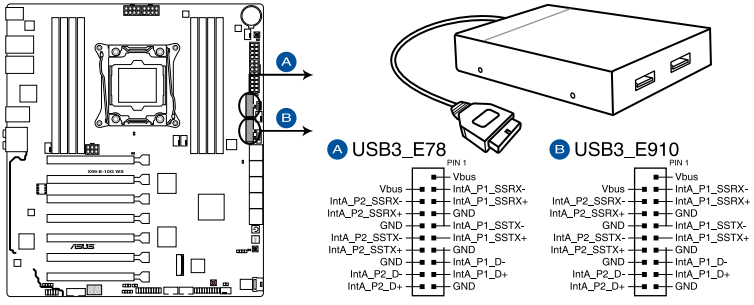
X99-E-10G WS Analog front panel connector

- 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.
- If you want to connect a high-definition or an AC'97 front panel audio module to this connector, set the Front Panel Type item in the BIOS setup to **[HD]** or **[AC97]**.

Chapter 1

4. USB 3.0 connectors (20-1 pin USB3_E78, USB3_E910)

These connectors allow you to connect a USB 3.0 module for additional USB 3.0 front or rear panel ports. With an installed USB 3.0 module, you can enjoy all the benefits of USB 3.0 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.



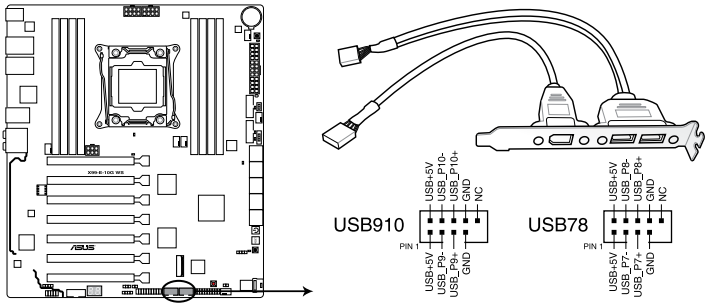
X99-E-10G WS USB3.0 connectors

The USB 3.0 module is purchased separately.

- Ensure to install the related driver to fully use the USB 3.0 ports under Windows® 7.
- The plugged USB 3.0 device may run on xHCI or EHCI mode depending on the operating system's setting.
- These USB 3.0 ports support native UASP transfer standard in Windows® 8.1 / Windows® 10 and Turbo Mode when using USB 3.0 Boost feature.

5. USB 2.0 connectors (10-1 pin USB78, USB910)

These connectors are for USB 2.0 ports. Connect the USB module cable to any of these connectors, then install the module to a slot opening at the back of the system chassis. These USB connectors comply with USB 2.0 specification that supports up to 48 Mb/s connection speed.



X99-E-10G WS USB2.0 connectors

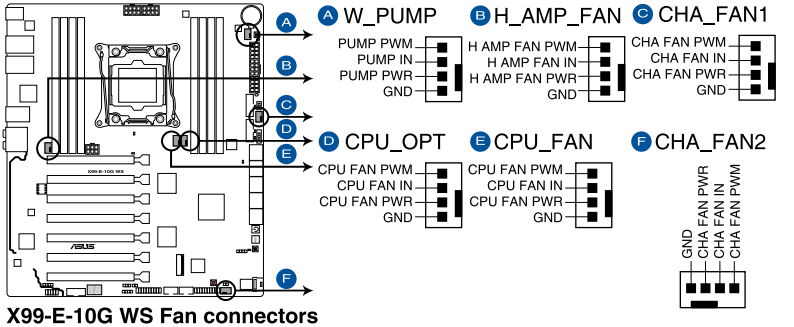
DO NOT connect a 1394 cable to the USB connectors. Doing so will damage the motherboard!

You can connect the front panel USB cable to the ASUS Q-Connector (USB) first, and then install the Q-Connector (USB) to the USB connector onboard if your chassis supports front panel USB ports.

6. CPU, CPU optional, water pump, chassis, and high amp fan connectors (4-pin CPU_FAN, 4-pin CPU_OPT, 4-pin W_PUMP, 4-pin CHA_FAN1-2, 4-pin H_AMP_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.

- 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.

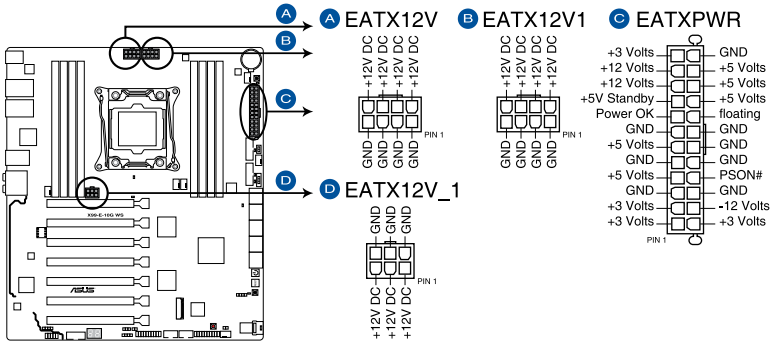


X99-E-10G WS Fan connectors

- The CPU_FAN connector supports the CPU fan of maximum 1A (12 W) fan power.
- The CPU_FAN and CHA_FAN connectors support the ASUS FAN Xpert 4 feature on X99 platform.
- The CPU fan connector detects the type of CPU fan installed and automatically switches the control modes. To configure the CPU fan's control mode, go to **Advanced Mode > Monitor > CPU Q-Fan Control** item in BIOS.
- The chassis fan connectors support DC and PWM modes. To set these fans to DC or PWM, go to **Advanced Mode > Monitor > Chassis Fan 1/2 Q-Fan Control** items in BIOS.

7. ATX power connectors (24-pin EATXPWR; 8-pin EATX12V; 8-pin EATX12V1; 6-pin EATX12V_1)

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.

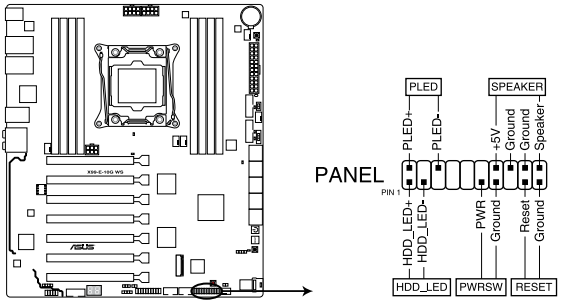


X99-E-10G WS ATX power connectors

- 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 EATX12V/EATX12V1 power plug. 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.

8. System panel connector (20-8 pin PANEL)

This connector supports several chassis-mounted functions.



X99-E-10G WS System panel connector

- **System power LED (2-pin PLED)**

  This 2-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.

- **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.

- **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.

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

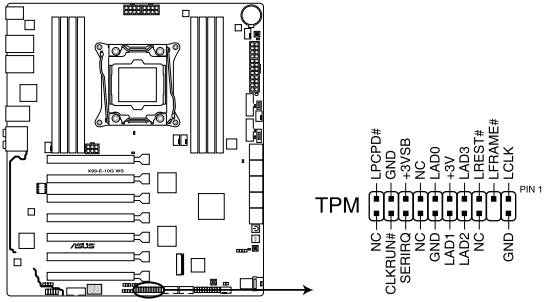
  This connector is for the system power button. Pressing the power button turns the system on or puts the system in sleep or soft-off mode depending on the operating system settings. Pressing the power switch for more than four seconds while the system is ON turns the system OFF.

- **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.

9. TPM connector (20-1 pin TPM)

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.

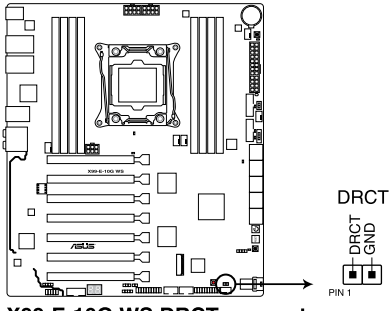


X99-E-10G WS TPM connector

The TPM module is purchased separately.

10. DirectKey connector (2-pin DRCT)

This connector is for the chassis-mounted button that supports the DirectKey function. Connect the button cable that supports DirectKey, from the chassis to this connector on the motherboard.

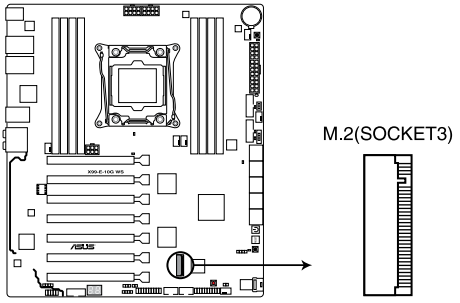


X99-E-10G WS DRCT connector

Ensure that your chassis comes with the extra button cable that supports the DirectKey feature. Refer to the technical documentation that came with the chassis for details.

11. M.2 (Socket 3)

This socket allows you to install an M.2 (NGFF) SSD module.

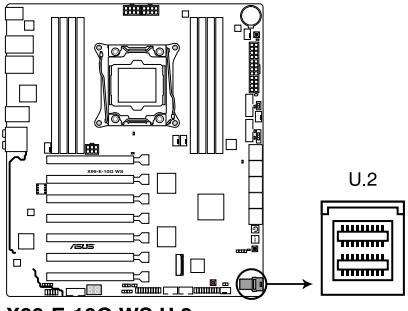


X99-E-10G WS M.2(SOCKET3)

- This socket supports PCIe 3.0 x4 M Key design and type 2260/2280 PCIe storage devices.
- This socket supports PCIe mode only.
- When M.2 is in use, U.2 will be disabled, and when U.2 is in use, M.2 will be disabled.
- When using a 28-lane CPU, only X550 ports will be enabled. M.2 and U.2 ports will be disabled.
- The M.2 (NGFF) SSD module is purchased separately.

12. U.2 connector (U.2)

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



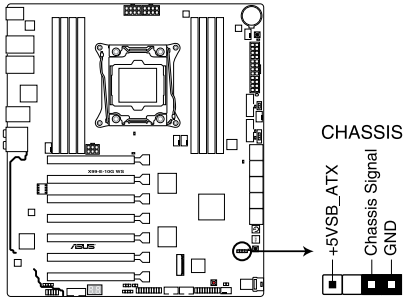
X99-E-10G WS U.2

Chapter 1

13. Chassis intrusion connector (4-1 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.

By default, the pin labeled “Chassis Signal” and “Ground” are shorted with a jumper cap. Remove the jumper caps and enable the related options in BIOS if you intend to use the chassis intrusion detection feature.

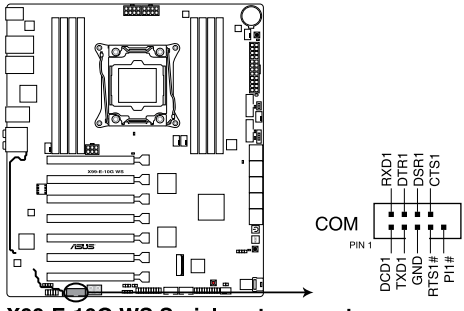


X99-E-10G WS Chassis intrusion connector

A message appears when you connect the sensor or switch at the first time or when you reconnect the sensor or switch to this connector. Reset the system to exit the message.

14. Serial port connector (10-1 pin COM)

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

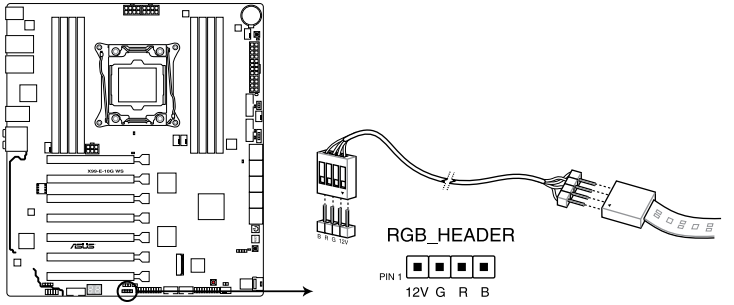


X99-E-10G WS Serial port connector

Chapter 1

15. RGB header (4-pin RGB_HEADER)

This connector is for RGB LED strips.



X99-E-10G WS RGB_HEADER connector

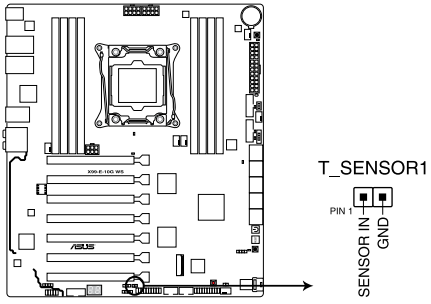
The RGB header supports 5050 RGB multi-color LED strips (12V/G/R/B), with a maximum power rating of 2A (12V), and no longer than 2 meters.

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. Make sure your LED stripe pins are in the exact order (12V/G/R/B), for more details, please contact your product vendor.

16. T_Sensor connector (2-pin T_SENSOR1)

This connector is for the thermistor cable that allows you to monitor the temperature of your motherboard's critical components and connected devices.



X99-E-10G WS T_SENSOR connector

The thermistor cable is purchased separately.

Chapter 1

Basic Installation

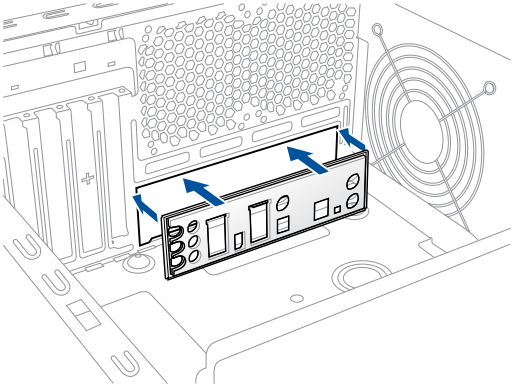
2

2.1 Building your PC system

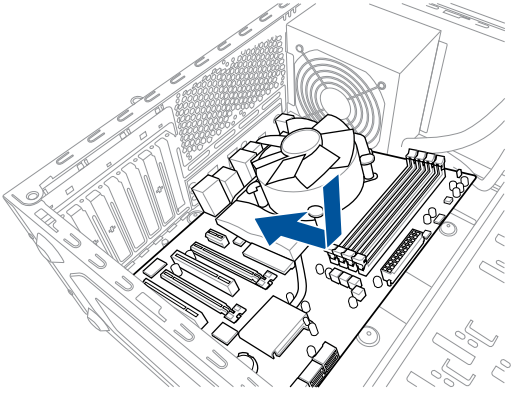
The diagrams in this section are for reference only. The motherboard layout may vary with models, but the installation steps are the same for all models.

2.1.1 Motherboard installation

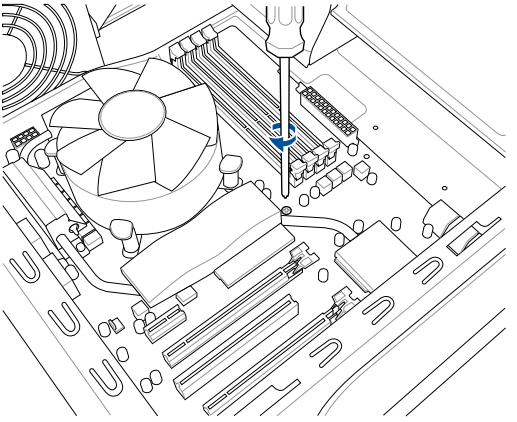
1. Install the ASUS Q-Shield to the chassis rear I/O panel.

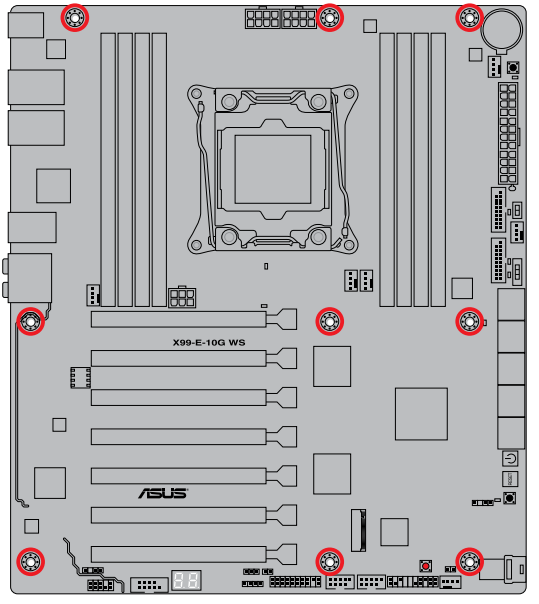


2. Place the motherboard into the chassis, ensuring that its rear I/O ports are aligned to the chassis' rear I/O panel.



3. Place nine (9) screws into the holes indicated by circles to secure the motherboard to the chassis.

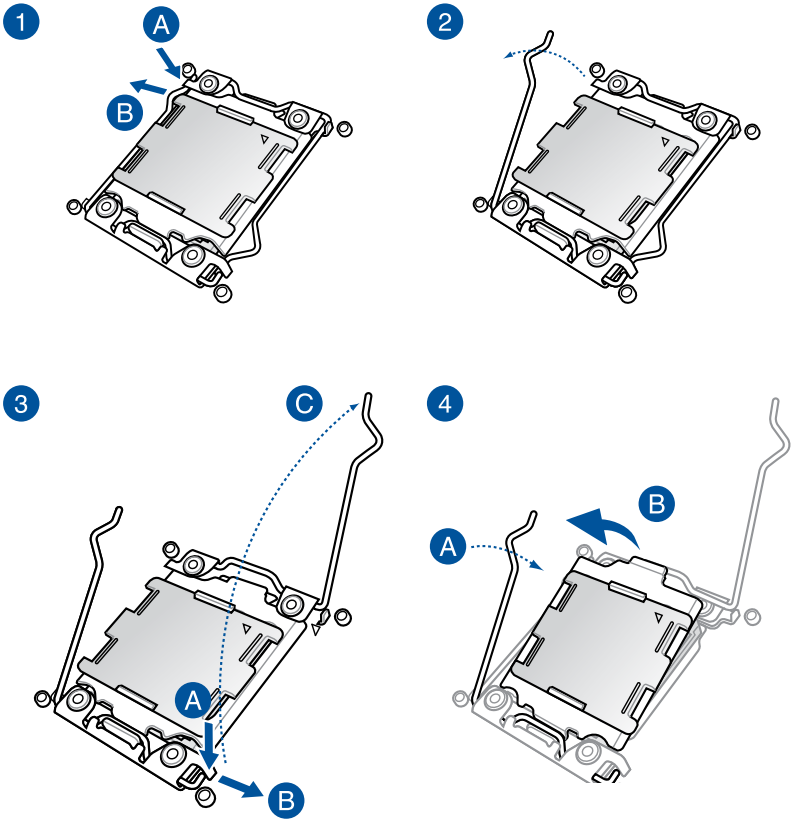




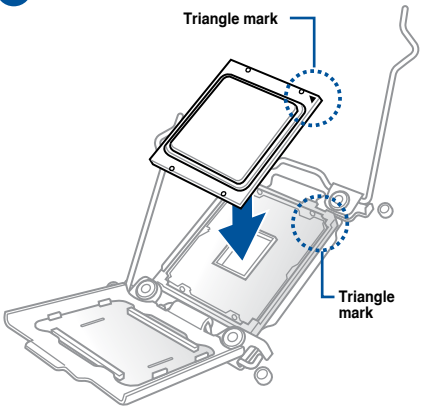
DO NOT overtighten the screws! Doing so can damage the motherboard.

2.1.2 CPU installation

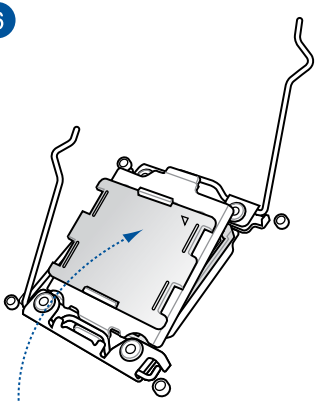
Please note the order in opening/ closing the double latch. Follow the instructions printed on the metal sealing hatch or the illustrations shown below in this manual. The plastic cap will pop up automatically once the CPU is in place and the hatch properly sealed down.



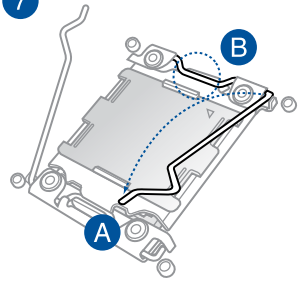
5



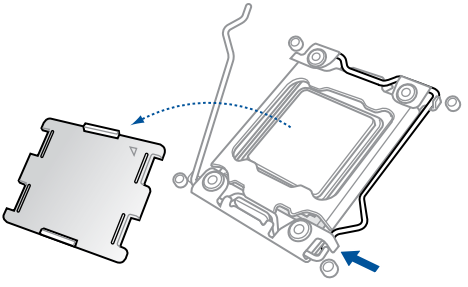
6



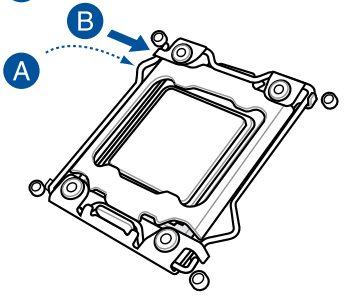
7



8

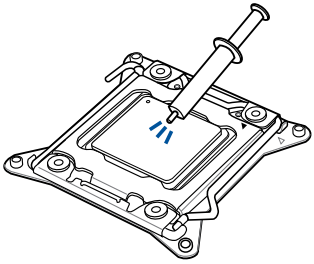


9



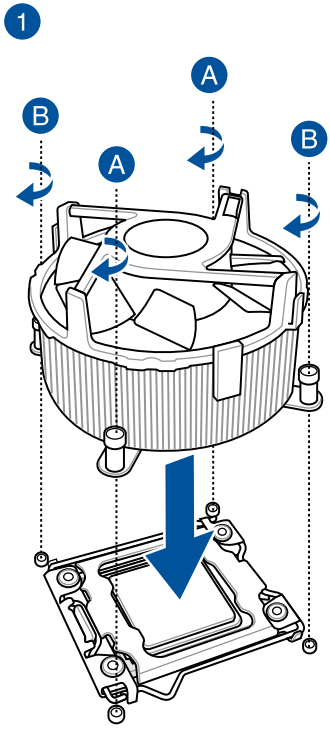
Chapter 2

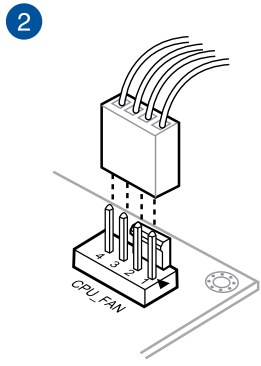
2.1.3 CPU heatsink and fan assembly installation



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

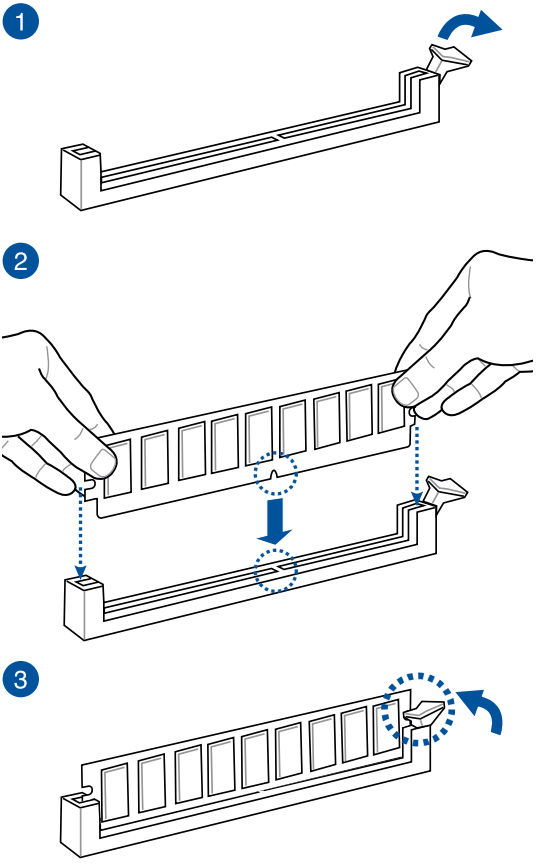
To install the CPU heatsink and fan assembly



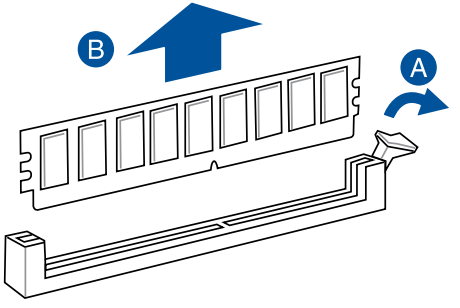


Chapter 2

2.1.4 DIMM installation

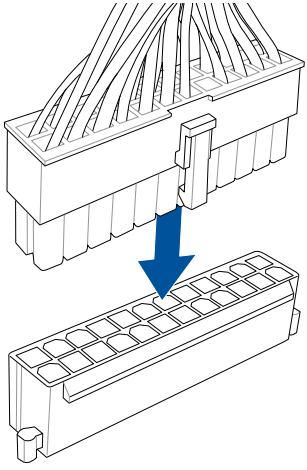


To remove a DIMM

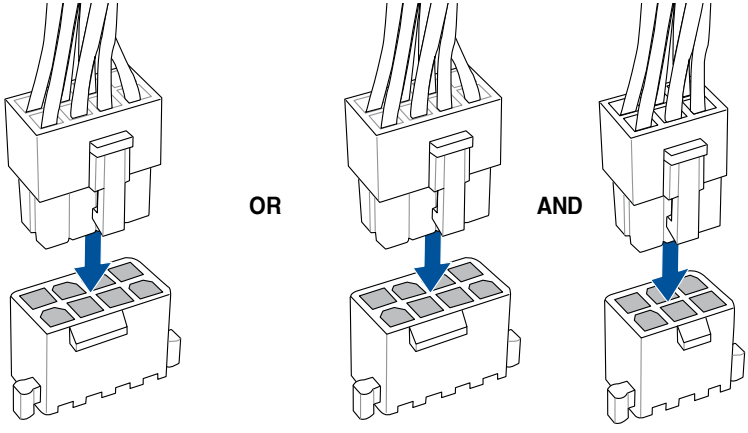


2.1.5 ATX Power connection

1

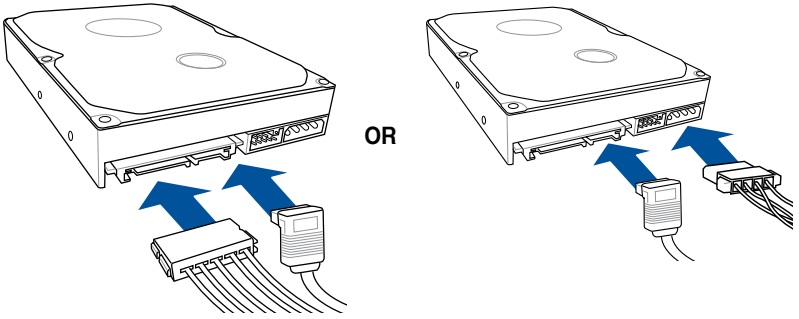


2

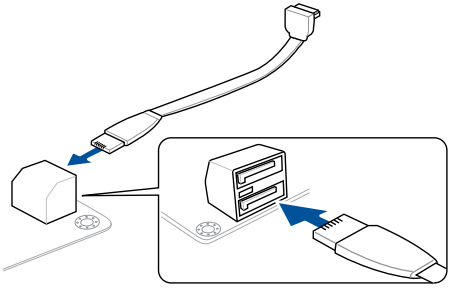


2.1.6 SATA device connection

1

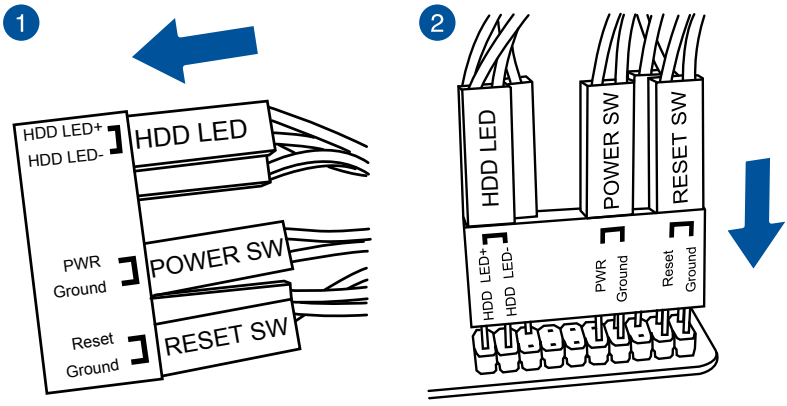


2

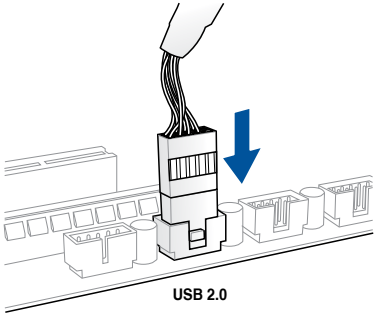


2.1.7 Front I/O Connector

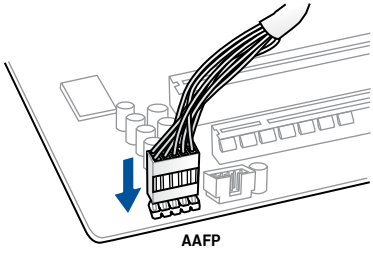
To install ASUS Q-Connector



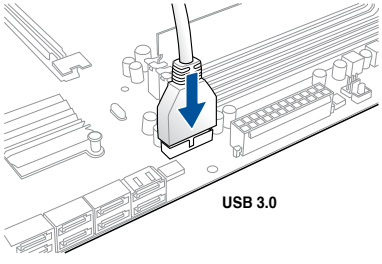
To install USB 2.0 connector



To install front panel audio connector



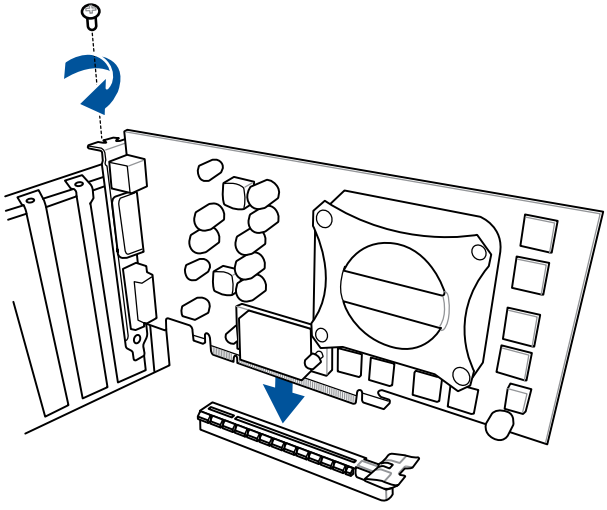
To install USB 3.0 connector



Chapter 2

2.1.8 Expansion Card installation

To install PCIe x16 cards



2.2 BIOS update utility

USB BIOS Flashback

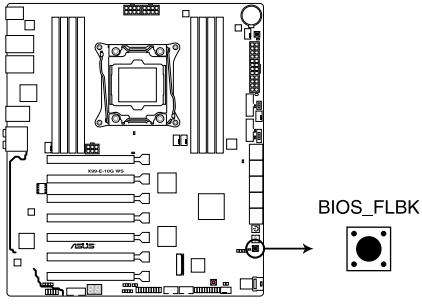
USB BIOS Flashback allows you to easily update the BIOS without entering the existing BIOS or operating system. Simply insert a USB storage device to the USB port (the USB port hole marked in green on the I/O shield) then press the USB BIOS Flashback button for three seconds to automatically update the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

To use USB BIOS Flashback:

1. Place the bundled support DVD to the optical drive and install the USB BIOS Flashback Wizard. Follow the onscreen instructions to complete the installation.
2. Insert the 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.
- Refer to section **2.3.1 Rear I/O connection** for the location of the USB port that supports USB BIOS Flashback.

3. Launch the USB BIOS Flashback Wizard to automatically download the latest BIOS version.
4. Shut down your computer.
5. On your motherboard, press the BIOS Flashback button for three seconds until the Flashback LED blinks three times, indicating that the BIOS Flashback function is enabled.



X99-E-10G WS BIOS_FLBK button

Refer to section **1.2.8 Onboard LEDs** for more information of the Flashback LED.

If the system fails to boot after flashing the BIOS, unplug the power core and restart the system.

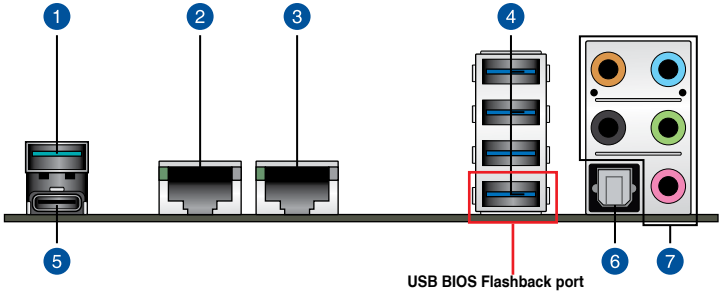
6. Wait until the light goes out, indicating that the BIOS updating process is completed.

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

- Do not unplug portable disk, power system, or press the CLR_CMOS button while BIOS update is ongoing, otherwise update will be interrupted. In case of interruption, please follow the steps again.
- If the light flashes for five seconds and turns into a solid light, this means that the BIOS Flashback is not operating properly. This may be caused by improper installation of the USB storage device and filename/file format error. If this scenario happens, please restart the system to turn off the light.
- Updating BIOS may have risks. If the BIOS program is damaged during the process and results to the system's failure to boot up, please contact your local ASUS Service Center.

2.3 Motherboard rear and audio connections

2.3.1 Rear I/O connection



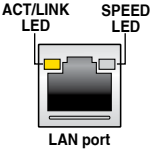
Rear panel connectors			
1.	USB 3.1 Type-A port EA1 (Supports USB 3.1 Boost)	5.	USB 3.1 Type-C port EC2 (Supports USB 3.1 Boost)
2.	Intel® 10G LAN port (LAN2)*	6.	Optical S/PDIF Out port
3.	Intel® 10G LAN port (LAN1)*	7.	Audio I/O ports**
4.	USB 3.0 ports 1234 (Supports USB 3.0 Boost)		

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

- The plugged USB 3.0 device may run on xHCI mode or EHCI mode, depending on the operating system's setting.
- USB 3.0 devices can only be used as data storage only.
- We strongly recommend that you connect USB 3.0 devices to USB 3.0 ports for faster and better performance for your USB 3.0 devices.
- Due to the design of the Intel® X99 series chipset, all USB devices connected to the USB 2.0 and USB 3.0 ports are controlled by the xHCI controller. Some legacy USB devices must update their firmware for better compatibility.

* 10G LAN ports LED indications

Activity Link LED		Speed LED	
Status	Description	Status	Description
Off	No link	Off	100 Mbps connection
Green	Linked	Orange	1 Gbps connection
Green (Blinking)	Data activity	Green	10 Gbps connection



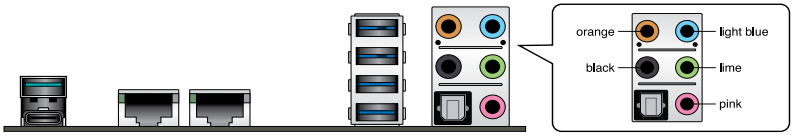
You can disable the LAN controllers in BIOS. Due to hardware design, the 10G LAN1 port's LEDs may continue to blink even when disabled.

** 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/Subwoofer	Center/Subwoofer
Black	–	Rear Speaker Out	Rear Speaker Out	Rear Speaker Out

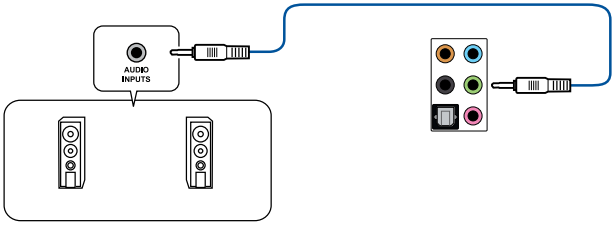
2.3.2 Audio I/O connections

Audio I/O ports

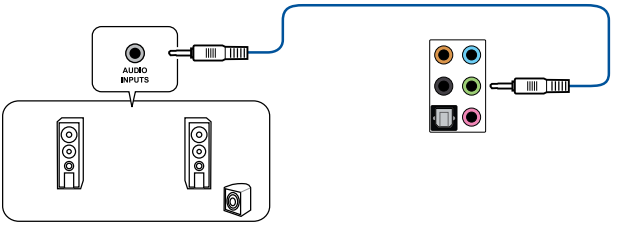


Connect to Headphone and Mic

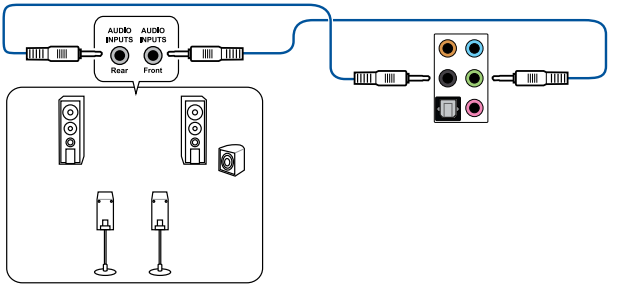
Connect to Stereo Speakers



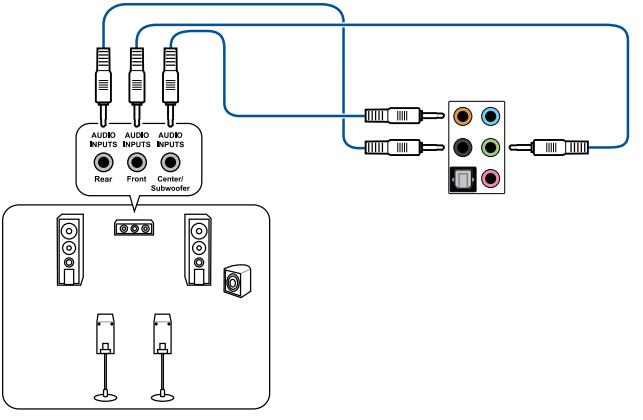
Connect to 2.1 channel Speakers



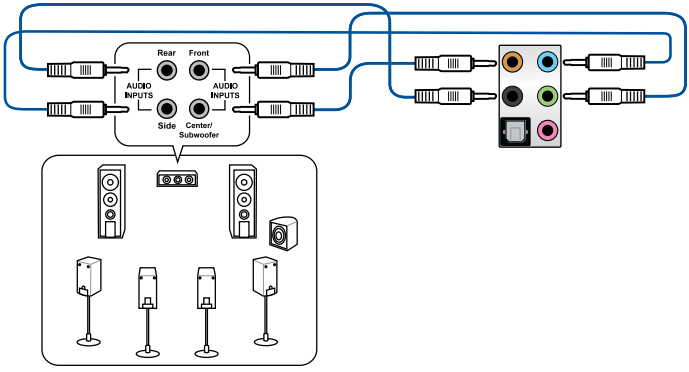
Connect to 4.1 channel Speakers



Connect to 5.1 channel Speakers



Connect to 7.1 channel Speakers



When the DTS UltraPC II function is enabled, ensure to connect the rear speaker to the light blue port.

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 **X99E10G.CAP** for this motherboard.

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> during the Power-On Self Test (POST). If you do not press <Delete>, 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 **1.2.6 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.

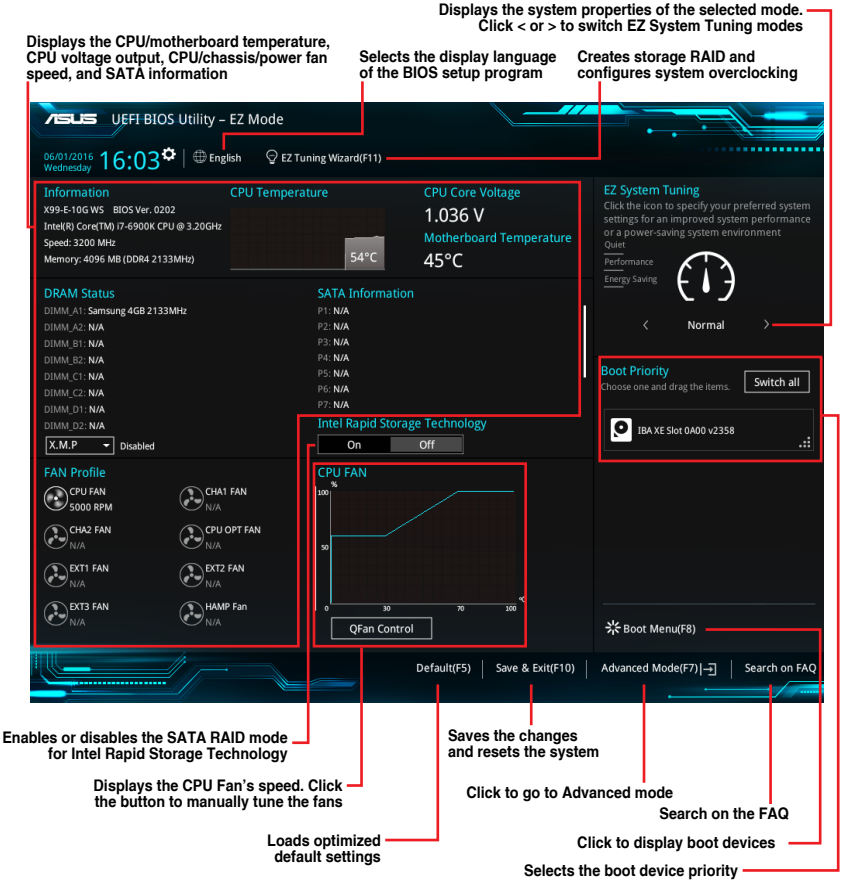
BIOS menu screen

The BIOS Setup program can be used under two modes: **EZ Mode** and **Advanced Mode**. You can change modes from the **Exit** menu or from the E**xit/Advanced Mode** screen.

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, click **Exit/Advanced Mode**, then select **Advanced Mode** or press <F7> hot key 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.

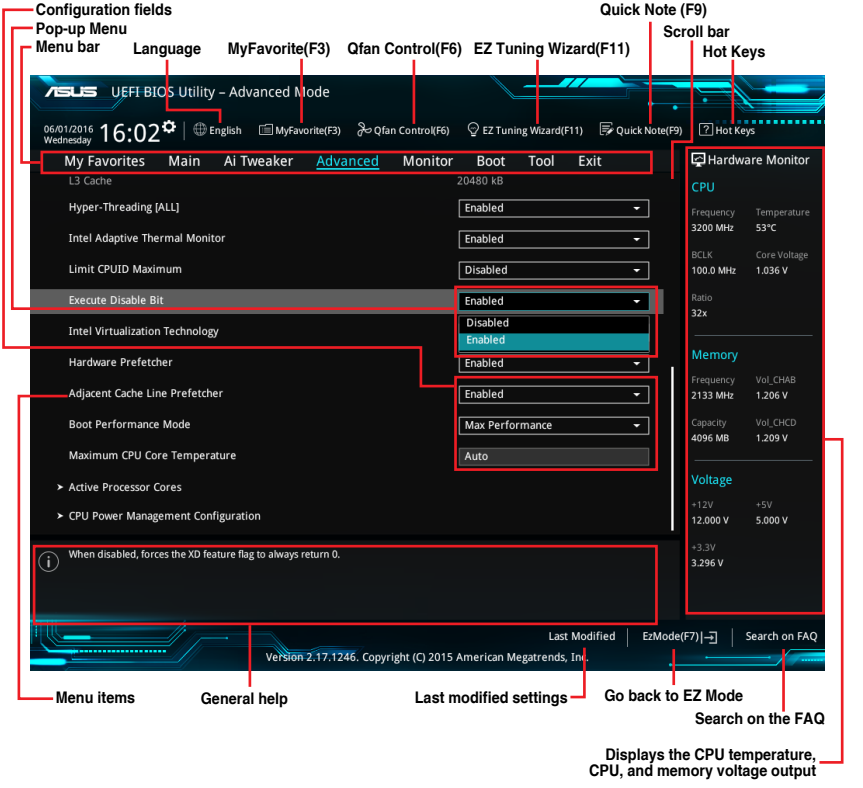


The boot device options vary depending on the devices you installed to the system.

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** or press F7 hotkey.



Menu bar

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

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

Menu items

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

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

Submenu items

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 the language that you want to display in your BIOS screen.

MyFavorites (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:

Quick Note (F9)

This button above the menu bar allows you to key in notes of the activities that you have done in BIOS.

- The Quick Note function does not support the following keyboard functions: delete, cut, copy, and paste.
- You can only use the alphanumeric characters to enter your notes.

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.

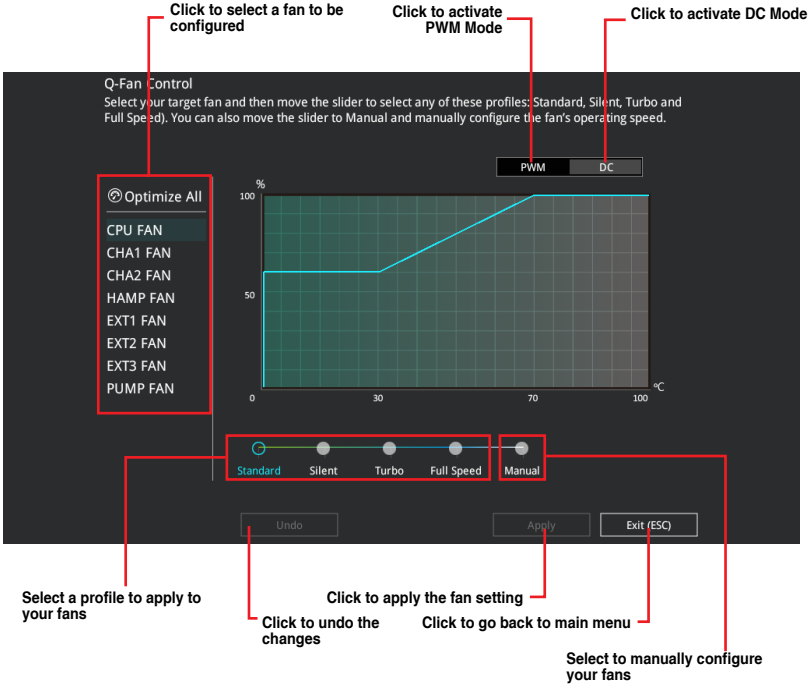
A configurable field is highlighted when selected. To change the value of a field, select it and press <Enter> to display a list of options.

Last Modified button

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

3.2.3 QFan Control

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



Configuring fans manually

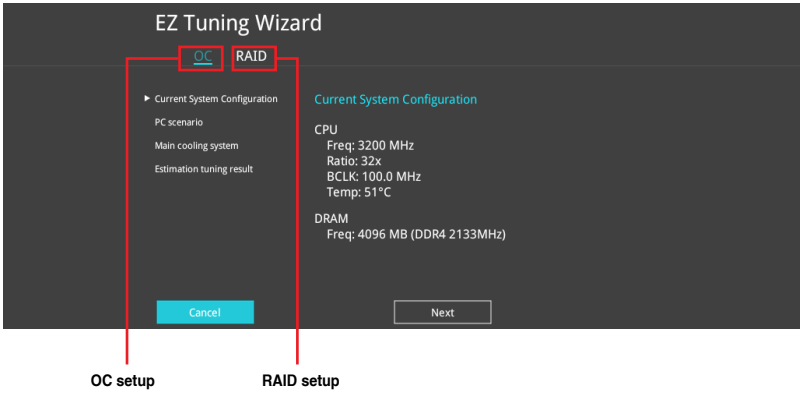
Select **Manual** from the list of profiles to manually configure your fans' operating speed.

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

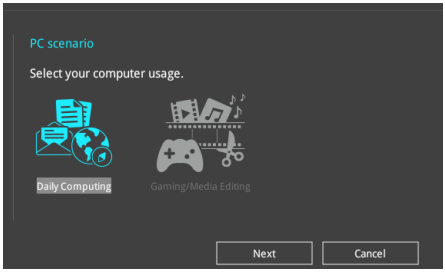
EZ Tuning Wizard allows you to easily overclock your CPU and DRAM, computer usage, and CPU fan to their best settings. You can also set RAID in your system using this feature.



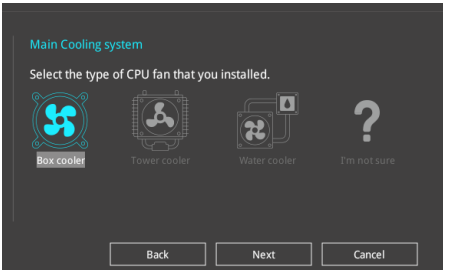
OC Tuning

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**.



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.

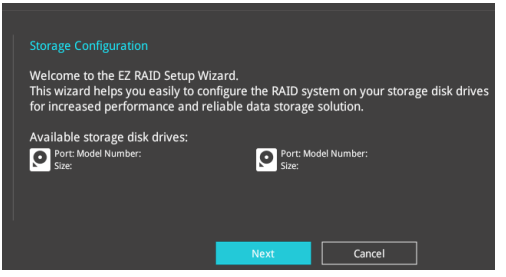
Creating RAID

To create RAID:

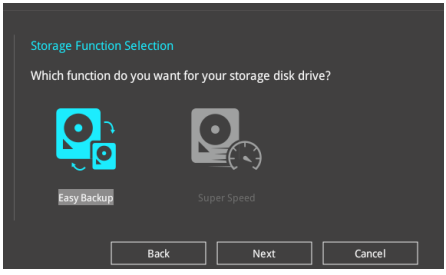
1. Press <F11> on your keyboard or click EZ Tuning Wizard(F11) from the BIOS screen to open EZ Tuning Wizard screen.
2. Click **RAID** then click **Next**.

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

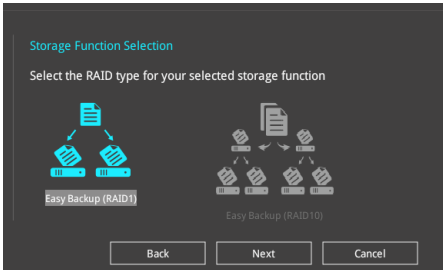
3. Check the available storage disk drives, then click **Next**.



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

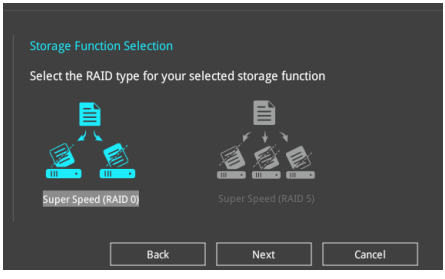


a. For Easy Backup, click **Next** then select from **Easy Backup (RAID 1)** or **Easy Backup (RAID 10)**.



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

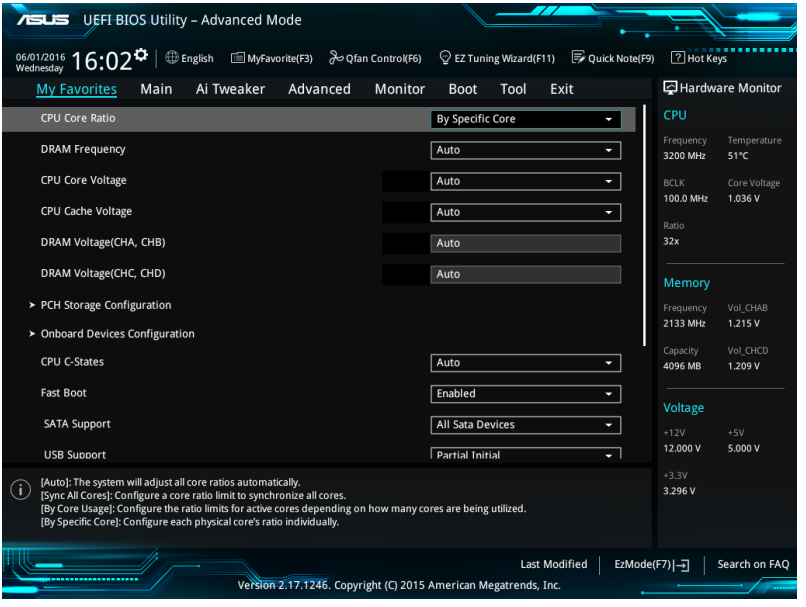
b. For Super Speed, click **Next** then select from **Super Speed (RAID 0)** or **Super Speed (RAID 5)**.



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.



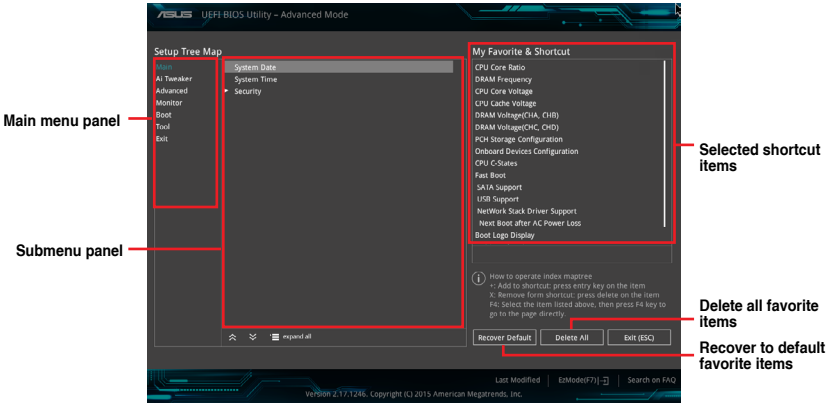
My Favorites comes with several performance, power saving, and fast boot related items by default. You can personalize this screen by adding or removing items.

Chapter 3

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.

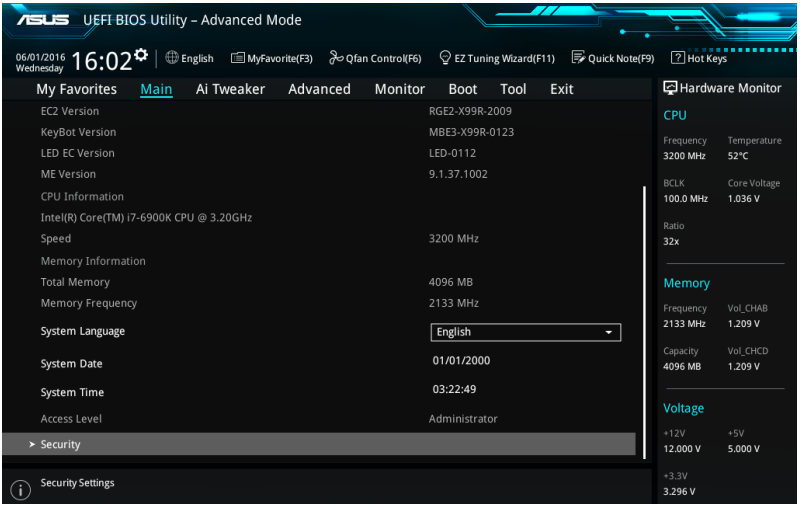
You cannot add the following items to My Favorite items:

- 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.

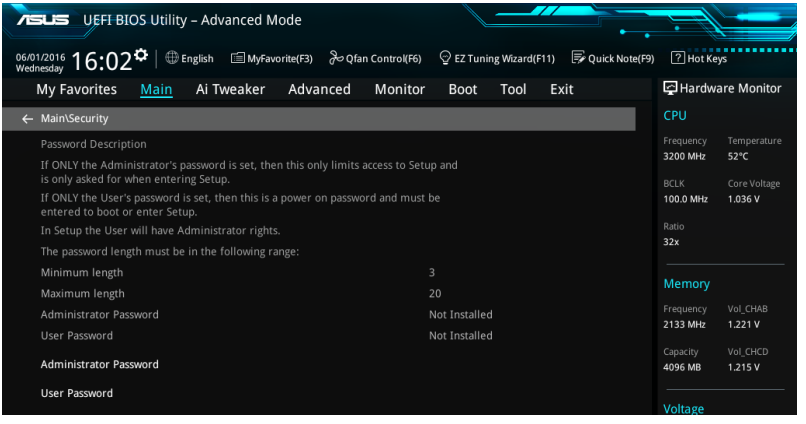
3.4 Main menu

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 **1.2.6 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]**.

Administrator Password

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

To set an administrator password:

1. Select the **Administrator Password** item and press <Enter>.
2. From the **Create New Password** box, key in a password, then press <Enter>.
3. Confirm the password when prompted.

To change an administrator password:

1. Select the **Administrator Password** item and press <Enter>.
2. From the **Enter Current Password** box, key in the current password, then press <Enter>.
3. From the **Create New Password** box, key in a new password, then press <Enter>.
4. Confirm the password when prompted.

To clear the administrator password, follow the same steps as in changing an administrator password, but press <Enter> when prompted to create/confirm the password. After you clear the password, the **Administrator Password** item on top of the screen shows **Not Installed**.

User Password

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

To set a user password:

1. Select the **User Password** item and press <Enter>.
2. From the **Create New Password** box, key in a password, then press <Enter>.
3. Confirm the password when prompted.

To change a user password:

1. Select the **User Password** item and press <Enter>.
2. From the **Enter Current Password** box, key in the current password, then press <Enter>.
3. From the **Create New Password** box, key in a new password, then press <Enter>.
4. Confirm the password when prompted.

To clear the user password, follow the same steps as in changing a user password, but press <Enter> when prompted to create/confirm the password. After you clear the password, the **User Password** item on top of the screen shows **Not Installed**.

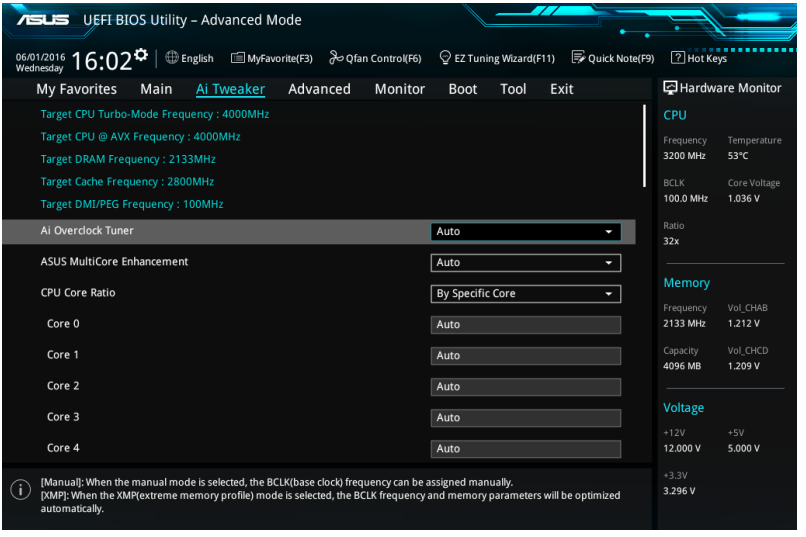
3.5 Ai Tweaker menu

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.

Scroll down to display other BIOS items.



Ai Overclock Tuner [Auto]

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

[Auto]	Loads the optimal settings for the system.
[Manual]	Allows you to individually set overclocking parameters.
[X.M.P.]	If you install memory modules supporting the eXtreme Memory Profile (X.M.P.) Technology, choose this item to set the profiles supported by your memory modules for optimizing the system performance.

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

When the Ai Overclock Tuner is set to **[Manual]** or **[XMP],** the following items appear.

CPU Strap [Auto]

This item is default set to auto for a corresponding BCLK (base clock) frequency adjustment. Manually select a strap value close to the target BCLK frequency for an extreme overclocking.

Configuration options: [Auto] [100MHz] [125MHz] [167MHz] [250MHz]

The following item appears only when you set the CPU Strap to **[100MHz]**, **[125MHz]**, **[167MHz]**, or **[250MHz]**.

Source Clock Tuner [Auto]

This item allows you to select the source clock based on the assigned CPU strap for a better overclocking capability.

Configuration options: [8Ohm dbl] [7Ohm dbl] [6Ohm dbl] [5Ohm dbl] [4Ohm dbl] [3Ohm dbl] [2Ohm dbl]

PLL Selection [Auto]

This is default set to LC PLL for a better stability. Select SB PLL when BCLK (base clock) frequency is far away from 100MHz, this may affect the functionality of other devices which need precise clock jitters.

Configuration options: [Auto] [LC PLL] [SB PLL]

Filter PLL [Auto]

This item allows you to select a high BCLK (base clock) mode when using a very high BCLK to improve the overclocking capability.

Configuration options: [Auto] [Low BCLK Mode] [High BCLK Mode]

BCLK Frequency [100.0]

This item allows you to set the BCLK (base clock) frequency to enhance the system performance. Use the <+> or <-> to adjust the value. The values range from 40.0 MHz to 500.0 MHz.

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

Initial BCLK Frequency [Auto]

This item allows you to set the initial BCLK (base clock) frequency to start overclocking from the assigned BCLK frequency. The frequency may not be less than 80.0 MHz. The values range from [BCLK frequency-15.0MHz] to [BCLK frequency]

When Ai Overclock Tuner is set to **[XMP]**, the XMP mode supported by the installed memory module is displayed.

ASUS MultiCore Enhancement [Auto]

[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 [By Specific Core]

This item allows you to set the CPU core ratio limit per core or synchronize automatically to all cores.

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

When the CPU Core Ratio is set to **[Sync All Cores]**, the following item appears:

1-Core Ratio Limit [Auto]
Select **[Auto]** to apply the CPU default Turbo Ratio setting or manually assign a 1-Core Limit value that must be higher than or equal to the 2-Core Ratio Limit.

When the CPU Core Ratio is set to **[By Core Usage]**, the following items appear:

1-Core Ratio Limit [Auto]
Select [Auto] to apply the CPU default Turbo Ratio setting or manually assign a 1-Core Limit value that must be higher than or equal to the 2-Core Ratio Limit.

2-Core Ratio Limit [Auto]
Select **[Auto]** to apply the CPU default Turbo Ratio setting or manually assign a 2-Core Limit value that must be higher than or equal to the 3-Core Ratio Limit.

If you assign a value for 2-Core Ratio Limit, do not set the 1-Core Ratio Limit to **[Auto]**.

3-Core Ratio Limit [Auto]
Select **[Auto]** to apply the CPU default Turbo Ratio setting or manually assign a 3-Core Limit value that must be higher than or equal to the 4-Core Ratio Limit.

If you assign a value for 3-Core Ratio Limit, do not set the 1-Core Ratio Limit and 2-Core Ratio Limit to **[Auto]**.

4-Core Ratio Limit [Auto]
Select **[Auto]** to apply the CPU default Turbo Ratio setting or manually assign a 4-Core Limit value that must be higher than or equal to the 5-Core Ratio Limit.

If you assign a value for 4-Core Ratio Limit, do not set the 1-Core Ratio Limit, 2-Core Ratio Limit, and 3-Core Ratio to **[Auto]**.

5-Core Ratio Limit [Auto]
Select **[Auto]** to apply the CPU default Turbo Ratio setting or manually assign a 5-Core Limit value that must be higher than or equal to the 6-Core Ratio Limit.

If you assign a value for 5-Core Ratio Limit, do not set the 1-Core Ratio Limit, 2-Core Ratio Limit, 3-Core Ratio, and 4-Core Ratio to **[Auto]**.

6-Core Ratio Limit [Auto]
Select **[Auto]** to apply the CPU default Turbo Ratio setting or manually assign a 6-Core Limit value.

If you assign a value for 6-Core Ratio Limit, do not set the 1-Core Ratio Limit, 2-Core Ratio Limit, 3-Core Ratio, 4-Core Ratio, and 5-Core Ratio to **[Auto]**.

7-Core Ratio Limit [Auto]
Select **[Auto]** to apply the CPU default Turbo Ratio setting or manually assign a 7-core ratio limit that must be higher than or equal to the 8-core ratio limit.

If you assign a value for 7-Core Ratio Limit, do not set the 1-Core Ratio Limit, 2-Core Ratio Limit, 3-Core Ratio Limit, 4-Core Ratio Limit, 5-Core Ratio Limit, and 6-Core Ratio Limit to **[Auto]**.

8-Core Ratio Limit [Auto]
Select **[Auto]** to apply the CPU default Turbo Ratio setting or manually assign a 8-core ratio limit that must be lower than or equal to the 7-core ratio limit.

If you assign a value for 7-Core Ratio Limit, do not set the 1-Core Ratio Limit, 2-Core Ratio Limit, 3-Core Ratio Limit, 4-Core Ratio Limit, 5-Core Ratio Limit, 6-Core Ratio Limit, and 7-Core Ratio Limit to **[Auto]**.

When the CPU Core Ratio is set to **[By Specific Core]**, the following items appear.

Core 0-7 [Auto]
This item allows you to key in the value of the ratio desired on each specific physical core.
Configuration options: [Auto] [12] - [80]

The asterisk sign (*) refers to the core with better overclocking headroom determined by Intel.

AVX Instruction Core Ratio Negative Offset [Auto]

This item allows you to get the ratio at which AVX applications run by subtracting the value from your core ratio.

Configuration options: [Auto] [1] - [31]

Min. CPU Cache Ratio [Auto]

This item allows you to set the minimum possible CPU cache ratio. Use the <+> and <-> keys to adjust the value.

Configuration options: [Auto] [8] - [33]

Max. CPU Cache Ratio [Auto]

This item allows you to set the maximum possible CPU cache ratio. Use the <+> and <-> keys to adjust the value.

Configuration options: [Auto] [8] - [33]

Internal PLL Overvoltage [Auto]

This item allows you to enable Internal PLL Overvoltage for K-SKU and X-SKU CPUs to get extreme overclocking capability.

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

BCLK Frequency : DRAM Frequency Ratio [Auto]

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

DRAM Frequency [Auto]

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] - [DDR4-4000MHz]

TPU [Keep Current Settings]

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]**.

EPU Power Saving Mode [Disabled]

The ASUS EPU (Energy Processing Unit) sets the CPU in its minimum power consumption settings. Enable this item to set lower CPU core/cache voltage and achieve the best energy saving condition.

Configuration options: [Disabled] [Enabled]

DRAM Timing Control

The sub-items in this menu allow you to set the DRAM timing control features. Use the <+> and <-> keys to adjust the value. To restore the default setting, type [auto] using the keyboard and press the <Enter> key.

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

Primary Timings

DRAM CAS# Latency [Auto]

Configuration options: [Auto] [1] – [31]

DRAM RAS# to CAS# Delay [Auto]

Configuration options: [Auto] [1] – [31]

DRAM RAS# PRE Time [Auto]

Configuration options: [Auto] [1] – [31]

DRAM RAS# ACT Time [Auto]

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

DRAM Command Rate [Auto]

Configuration options: [Auto] [Timing 1T] – [Timing 3T]

Secondary Timings

DRAM RAS# to RAS# Delay [Auto]

Configuration options: [Auto] [1] – [7]

DRAM RAS# to RAS# Delay L [Auto]

Configuration options: [Auto] [1] – [7]

DRAM REF Cycle Time [Auto]

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

DRAM Refresh Interval [Auto]

Configuration options: [Auto] [1] – [32767]

DRAM WRITE Recovery Time [Auto]

Configuration options: [Auto] [1] – [31]

DRAM READ to PRE Time [Auto]

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

DRAM FOUR ACT WIN Time [Auto]

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

DRAM WRITE to READ Delay [Auto]

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

DRAM WRITE to READ Delay L [Auto]

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

DRAM CKE Minimum Pulse Width [Auto]

Configuration options: [Auto] [4] – [8]

DRAM Write Latency [Auto]

Configuration options: [Auto] [1] – [31]

Third Timings

tRRDR [Auto]

Configuration options: [Auto] [1] - [7]

tRRDD [Auto]

Configuration options: [Auto] [1] - [7]

tWWDR [Auto]

Configuration options: [Auto] [1] - [7]

tWWDD [Auto]

Configuration options: [Auto] [1] - [7]

tRWDR [Auto]

Configuration options: [Auto] [1] - [7]

tWRDR [Auto]

Configuration options: [Auto] [1] - [7]

tWRDD [Auto]

Configuration options: [Auto] [1] - [7]

tRWSR [Auto]

Configuration options: [Auto] [1] - [7]

tCCD [Auto]

Configuration options: [Auto] [1] - [7]

tUWRDR [Auto]

Configuration options: [Auto] [1] - [3]

tRWDR2 [Auto]

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

tRWDD [Auto]

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

tRWSR2 [Auto]

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

tWRDD2 [Auto]

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

tCCDWR [Auto]

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

tCCD_L [Auto]

Configuration options: [Auto] [1] – [3]

RTL IOL control

DRAM RTL INIT Value [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHA D0 R0) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHA D0 R1) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHA D1 R0) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHA D1 R1) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHB D0 R0) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHB D0 R1) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHB D1 R0) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHB D1 R1) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHC D0 R0) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHC D0 R1) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHC D1 R0) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHC D1 R1) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHD D0 R0) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHD D0 R1) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHD D1 R0) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM RTL (CHD D1 R1) [Auto]
Configuration options: [Auto] [1] - [127]

DRAM IO-L (CHA D0 R0) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHA D0 R1) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHA D1 R0) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHA D1 R1) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHB D0 R0) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHB D0 R1) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHB D1 R0) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHB D1 R1) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHC D0 R0) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHC D0 R1) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHC D1 R0) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHC D1 R1) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHD D0 R0) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHD D0 R1) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHD D1 R0) [Auto]
Configuration options: [Auto] [1] - [255]

DRAM IO-L (CHD D1 R1) [Auto]
Configuration options: [Auto] [1] - [255]

IO control

MC Vref(CHA) [Auto]
Configuration options: [Auto] [50] - [99.911]

MC Vref(CHB) [Auto]
Configuration options: [Auto] [50] - [99.911]

MC Vref(CHC) [Auto]
Configuration options: [Auto] [50] - [99.911]

MC Vref(CHD) [Auto]
Configuration options: [Auto] [50] - [99.911]

DRAM Vref (CHA) [Auto]
Configuration options: [Auto] [60] - [99]

DRAM Vref (CHB) [Auto]
Configuration options: [Auto] [60] - [99]

DRAM Vref (CHC) [Auto]
Configuration options: [Auto] [60] - [99]

DRAM Vref (CHD) [Auto]
Configuration options: [Auto] [60] - [99]

CTL Vref (CHAB) Sign [+]
Configuration options: [+] [-]

CTL Vref (CHAB) [Auto]
Configuration options: [Auto] [0.00] - [0.20]

CTL Vref (CHCD) Sign [+]
Configuration options: [+] [-]

CTL Vref (CHCD) [Auto]
Configuration options: [Auto] [0.00] - [0.20]

Receiver DQ Pre-emphasis [Auto]
Configuration options: [Auto] [0.90] - [2.00]

Receiver DQ De-emphasis [Auto]
Configuration options: [Auto] [0.90] - [2.00]

Transmitter DQ De-emphasis [Auto]
Configuration options: [Auto] [0.90] - [2.00]

Receiver DQS Pre-emphasis [Auto]
Configuration options: [Auto] [0.90] - [3.20]

Receiver DQS De-emphasis [Auto]
Configuration options: [Auto] [0.90] - [3.20]

Transmitter DQS De-emphasis [Auto]
Configuration options: [Auto] [0.90] - [3.20]

Receiver CMD Pre-emphasis [Auto]
Configuration options: [Auto] [0.80] - [2.00]

Receiver CMD De-emphasis [Auto]
Configuration options: [Auto] [0.80] - [2.00]

Transmitter CMD De-emphasis [Auto]
Configuration options: [Auto] [0.80] - [2.00]

Receiver CLK Pre-emphasis [Auto]
Configuration options: [Auto] [1.00] - [2.00]

Receiver CLK De-emphasis [Auto]
Configuration options: [Auto] [1.00] - [2.00]

Transmitter CLK De-emphasis [Auto]
Configuration options: [Auto] [1.00] - [2.00]

Receiver CTL Pre-emphasis [Auto]
Configuration options: [Auto] [1.00] - [2.00]

Receiver CTL De-emphasis [Auto]
Configuration options: [Auto] [1.00] - [2.00]

Transmitter CTL De-emphasis [Auto]
Configuration options: [Auto] [1.00] - [2.00]

Receiver ODT Pre-emphasis [Auto]
Configuration options: [Auto] [1.00] - [2.00]

Receiver ODT De-emphasis [Auto]
Configuration options: [Auto] [1.00] - [2.00]

Transmitter ODT De-emphasis [Auto]
Configuration options: [Auto] [1.00] - [2.00]

MISC

DRAM Eventual Voltage(CHA, CHB/CHC, CHD) [Auto]

Allows you to set the voltage for the DRAM on the left.
Configuration options: [Auto] [0.800] - [1.900]

DRAM CLK Period [Auto]

This item allows you to set a DRAM clock period.
Configuration options: [Auto] [1] – [19]

Memory optimize Control [Auto]

This item allows you to optimize the memory control.
Configuration options: [Auto] [Disabled] [Enabled]

Enhanced Training(CHA/CHB/CHC/CHD) [Auto]

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

DRAM Training

MemTest [Auto]

This item allows you to enable or disable the memory testing.
Configuration options: [Auto] [Disabled] [Enabled]

Attempt Fast Boot [Auto]

This item allows the portion of the memory reference code to be skipped when possible to increase boot speed.
Configuration options: [Auto] [Disabled] [Enabled]

Attempt Fast Cold Boot [Auto]

This item allows the portion of the memory reference code to be skipped when possible to increase boot speed.
Configuration options: [Auto] [Disabled] [Enabled]

DRAM Training [Auto]

[Auto]	System automatically sets the status according to the installed DRAM.
[Ignore]	System ignores the DRAM training test function.
[Enabled]	System closes the DRAM channel when it has some issues.
[Smart]	System automatically trains the DRAM for better stability.

DRAM SPD Write [Disabled]

For advanced programming only. Enable DRAM SPD write to enable memory SMBus programming
Configuration options: [Disabled] [Enabled]

External Digi+ Power Control

CPU Load-line Calibration [Auto]

Load-line is defined by Intel® specification and affects CPU power voltage. The CPU working voltage decreases proportionally to CPU loading. Higher load-line calibration could get higher voltage and good overclocking performance, but increases the CPU and VRM thermal conditions. Select from levels 1 to 9 to adjust the CPU power voltage from 0% to 125%.
Configuration options [Auto] [Level 1] - [Level 9]

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

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

CPU VRM Switching Frequency [Auto]

This item affects the VRM transient response speed and the component thermal production. Select [Manual] to configure a higher frequency for a quicker transient response speed.
Configuration options: [Auto] [Manual]

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

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

Fixed CPU VRM Switching Frequency (KHz) [500]
This item allows you to set a higher frequency for a quicker transient response speed. Use the <+> or <-> to adjust the value. The values range from 300 KHz to 600 KHz with an interval of 50 KHz.

DO NOT remove the thermal module when the manual mode is selected. The thermal conditions should be monitored.

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

VRM Spread Spectrum [Auto]
This item allows to enhance the system stability.
Configuration options: [Auto] [Disabled] [Enabled]

CPU Power Phase Control [Auto]

This item allows you to set the power phase control of the CPU.
Configuration options: [Auto] [Standard] [Optimized] [Extreme] [Power Phase Response]

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

The following item appears only when you set the CPU Power Phase Control to **[Power Phase Response]**.

Power Phase Response [Fast]
This item allows you to set a faster phase response for the CPU to increase system performance or to slower phase response to decrease DRAM power efficiency.

Configuration options: [Ultra Fast] [Fast] [Medium] [Regular]

CPU Power Duty Control [T.Probe]

DIGI + VRM Duty Control adjusts the current of every VRM phase and the thermal conditions of every phase component.

[T. Probe] Select to maintain the VRM thermal balance.
[Extreme] Select to maintain the current VRM balance.

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

CPU Current Capability [Auto]

This item provides a total power range for CPU overclocking. A higher value setting provides higher power consumption delivery and extends the overclocking frequency range simultaneously.

Configuration options: [Auto] [100%] [110%] [120%] [130%] [140%]

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

CPU Power Thermal Control [115]

A higher temperature brings a wider CPU power thermal range and extends the overclocking tolerance to enlarge the overclocking potential. Use the <+> or <-> keys to adjust the value. The values depend on the CPU installed.

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

DRAM Current Capability(CHA, CHB/CHC, CHD) [100%]

This item adjusts the total power range for DRAM overclocking. Set a higher value to provide a wider total power range and extends the overclocking frequency range simultaneously.

Configuration options: [100%] [110%] [120%] [130%] [140%]

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

DRAM Switching Frequency(CHA, CHB/ CHC, CHD) [Auto]

This item affects the overclocking range and system stability. Set this item to **[Manual]** to manually set a fixed DRAM switching frequency for an increased overclocking range or enhanced system stability.

The following item appears only when you set the DRAM Switching Frequency(CHA, CHB/ CHC, CHD) to **[Manual]**.

Fixed DRAM-AB/CD Switching Frequency (KHz) [400]
This item allows you to set a higher frequency for an increased overclocking range or a lower frequency for an enhanced system stability. Use the <+> or <-> to adjust the value. The values range from 300 KHz to 550 KHz with an interval of 50 KHz.

DRAM Power Phase Control (CHA, CHB/CHC, CHD) [Standard]

This item allows you to enable/disable the DRAM power phase control.

Configuration options: [Optimized] [Standard] [Extreme]

Internal CPU Power Management

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

Enhanced Intel SpeedStep Technology [Enabled]

This item allows the operating system to dynamically adjust the processor voltage and cores frequency which decreases the average power consumption the average heat production.

Configuration options: [Disabled] [Enabled]

Turbo Mode [Enabled]

This item allows you to enable your core processor's speed to run faster than the base operating frequency when it is below operating power, current and temperature specification limit.

Configuration options: [Disabled] [Enabled]

The following items appear only when you set the Turbo Mode to **[Enabled]**.

Turbo Mode Parameters

Long Duration Package Power Limit [Auto]
Allows you to limit the Turbo Ratio's time duration that exceeds the TDP (Thermal Design Power) for maximum performance. Use the <+> or <-> keys to adjust the value.

Configuration options: [Auto] [1] - [4095]

Package Power Time Window [Auto]
Also known as Power Limit 1, this item allows you to maintain the time window for Turbo Ratio over TDP (Thermal Design Power). Use the <+> or <-> keys to adjust the value.

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

Short Duration Package Power Limit [Auto]
Also known as Power Limit 2, this item allows you to provide rapid protection when the package power exceeds the Power Limit 1. Use the <+> or <-> keys to adjust the value.

Configuration options: [Auto] [1] - [4095]

CPU Integrated VR current Limit [Auto]

This item allows you to set a higher current limit to prevent a frequency or power throttling when overclocking.

Configuration options: [Auto] [0.125] - [1023.875]

CPU Internal Power Fault Control

CPU Integrated VR Fault Management [Auto]

Disable this item to prevent tripping the Fully Integrated Voltage Regulator when doing over-voltage. We recommend you to disable this item when overclocking.

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

CPU Internal Power Configuration

CPU Integrated VR Efficiency Management [Auto]

[Auto]	Set to default mode
[High Performance]	Allow the FIVR (fully integrated voltage regulator) to work at high performance at all times.
[Balanced]	Improve power saving when the CPU is in a low power state.

Tweaker's Paradise

PLL Post Divider Adjust [Auto]

Set this item to **[Enabled]** when using a High base clock.
Configuration options: [Auto] [Enabled] [Disabled]

Internal PLL Voltage Prefix [+]

This item allows you to change the voltage prefix.
Configuration options: [+] [-]

Internal PLL Voltage Step Adjustment [Auto]

Increasing this item will help Core and Cache Overclock. Each step is around 25mv
Configuration options: [Auto] [0] - [15]

VCCU Voltage Offset Prefix [+]

This item allows you to change the offset value to positive or negative.
Configuration options: [+] [-]

VCCU Voltage Offset [Auto]

This item allows you to specify the offset voltage applied to the VCCU domain. Use the <+> and <-> keys to adjust the value.
Configuration options: [Auto] [1] - [1000]

CPU Input Boot Voltage [Auto]

Configuration options: [Auto] [0.800] - [2.700]

CPU Input Eventual Voltage [Auto]

This item allows you to set the speed at which each clock rises and falls.
Configuration options: [Auto] [0.800] - [2.700]]

Fully Manual Mode [Disabled]

Enable this item to configure the CPU related voltages. The ASUS-exclusive fully manual mode provides the best voltage adjusting ability. The CPU core, cache, and the system agent voltages can be adjusted separately without the restriction from the CPU.

Configuration options: [Disabled] [Enabled]

The following items appear only when you set Fully Manual Mode item to **[Disabled]**.

CPU System Agent Voltage Offset Mode Sign [+]

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

[–] Offset the CPU system agent voltage by a negative value.

CPU System Agent Voltage Offset [Auto]

This item allows you to configure the amount of voltage fed to the system agent of the CPU including the PCI-E controller and the PCU (power control unit). Configuring a high system agent voltage may enhance the overclocking capability. Use the <+> or <-> to adjust the value. The values have an interval of 0.001V.
Configuration options: [Auto] [0.001] - [0.999]

The following item appears only when you set the Fully Manual Mode to **[Enabled]**.

CPU System Agent Voltage [Auto]

This item allows you to configure the amount of voltage fed to the system agent of the CPU including the PCI-E controller and the PCU (power control unit). Configuring a high system agent voltage may enhance the overclocking capability. Use the <+> or <-> to adjust the value. The values have an interval of 0.003125V.
Configuration options: [Auto] [0.800000] - [2.000000]

CPU Core Voltage [Auto]

Configures the mode of voltage fed to the cores of the processor.

Configuration options: [Auto] [Manual Mode] [Offset Mode] [Adaptive Mode]

The following items appear only when you set the CPU Core Voltage to **[Manual Mode]**.

CPU Core Voltage Override [Auto]

Allows you to configure the CPU Core voltage. Use the <+> or <-> to adjust the value. The values have an interval of 0.001V.
Configuration options: [Auto] [0.001] - [1.920]

The following items appear only when you set the CPU Core Voltage to **[Offset Mode]**.

Offset Mode Sign [+]

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

CPU Core Voltage Offset [Auto]

This item allows you to configure the CPU core voltage offset value. Use the <+> or <-> to adjust the value. The values have an interval of 0.001V.
Configuration options: [Auto] [0.001] - [0.999]

The following items appear only when you set the CPU Core Voltage to **[Adaptive Mode]**.

Offset Mode Sign [+]

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

CPU Core Voltage Offset [Auto]

This item allows you to configure the CPU core voltage offset value. Use the <+> or <-> to adjust the value. The values have an interval of 0.001V.
Configuration options: [Auto] [0.001] - [0.999]

Additional Turbo Mode CPU Core Voltage [Auto]

This item allows you to configure the CPU core voltage offset value. Use the <+> or <-> to adjust the value. The values have an interval of 0.001V.
Configuration options: [Auto] [0.001] - [1.920]

CPU Cache Voltage [Auto]

Configures the mode of voltage fed to the uncores of the processor.
Configuration options: [Auto] [Manual Mode] [Offset Mode] [Adaptive Mode]

The following items appear only when you set the CPU Cache Voltage to **[Manual Mode]**.

CPU Cache Voltage Override [Auto]

Allows you to configure the CPU cache voltage. Use the <+> or <-> to adjust the value. The values have an interval of 0.001V.
Configuration options: [Auto] [0.001] - [1.920]

The following items appear only when you set the CPU Cache Voltage to **[Offset Mode]**.

Offset Mode Sign [+]

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

CPU Cache Voltage Offset [Auto]

This item allows you to configure the CPU cache voltage offset value. Use the <+> or <-> to adjust the value. The values have an interval of 0.001V.
Configuration options: [Auto] [0.001] - [0.999]

The following items appear only when you set the CPU Cache Voltage to **[Adaptive Mode]**.

Offset Mode Sign [+]

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

CPU Cache Voltage Offset [Auto]

This item allows you to configure the CPU cache voltage offset value. Use the <+> or <-> to adjust the value. The values have an interval of 0.001V.
Configuration options: [Auto] [0.001] - [0.999]

Additional Turbo Mode CPU Cache Voltage [Auto]

This item allows you to configure the CPU cache voltage offset value. Use the <+> or <-> to adjust the value. The values have an interval of 0.001V.
Configuration options: [Auto] [0.001] - [1.920]

CPU SVID Support [Auto]

Set this item to **[Disabled]** when overclocking. Disable this item to stop the CPU from communicating with the external voltage regulator.

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

CPU Input Voltage [Auto]

This item allows you configure the input voltage for the CPU by the external voltage regulator. Use the <+> or <-> to adjust the value. The values have an interval of 0.010V.

Configuration options: [Auto] [0.800] [2.700]

DRAM SVID Support [Auto]

Set this item to **[Disabled]** when overclocking. Disable this item to stop the CPU from communicating with the external voltage regulator.

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

DRAM Voltage(CHA, CHB) [Auto]

This item allows you to configure the voltage for the DRAM on the left. Use the <+> or <-> to adjust the value. The values have an interval of 0.010V.

Configuration options: [Auto] [0.800] - [1.900]

DRAM Voltage(CHC, CHD) [Auto]

This item allows you to configure the voltage for the DRAM on the right. Use the <+> or <-> to adjust the value. The values have an interval of 0.010V.

Configuration options: [Auto] [0.800] - [1.900]

PCH Core Voltage [Auto]

This item allows you to configure the core voltage for the PCH(platform controller hub). Use the <+> or <-> to adjust the value. The values have an interval of 0.00625V.

Configuration options: [Auto] [0.700] - [1.800]

PCH I/O Voltage [Auto]

This item allows you to configure the I/O voltage for the PCH(platform controller hub). Use the <+> or <-> to adjust the value. The values have an interval of 0.00625V.

Configuration options: [Auto] [1.200] - [2.200]

VCCIO CPU 1.05V Voltage [Auto]

Use the <+> or <-> to adjust the value. The values have an interval of 0.00625V.

Configuration options: [Auto] [0.700] - [1.800]

VCCIO PCH 1.05V Voltage [Auto]

Use the <+> or <-> to adjust the value. The values have an interval of 0.00625V.

Configuration options: [Auto] [0.700] - [1.800]

VTTDDR Voltage(CHA, CHB) [Auto]

This item allows you to configure the termination voltage for the DRAM on the left. Use the <+> or <-> to adjust the value. The values have an interval of 0.00625V.

Configuration options: [Auto] [0.20000] - [1.00000]

VTTDDR Voltage(CHC, CHD) [Auto]

This item allows you to configure the termination voltage for the DRAM on the right. Use the <+> or <-> to adjust the value. The values have an interval of 0.00625V.

Configuration options: [Auto] [0.20000] - [1.00000]

PLL Termination Voltage [Auto]

This item allows you to configure the PLL termination voltage. Use the <+> or <-> to adjust the value. The values have an interval of 0.006602V.

Configuration options: [Auto] [0.200000] - [1.797684]

PLL Reference Offset Mode Sign [+]

[+] Offset the PLL reference value by a positive value.

[–] Offset the PLL reference value by a negative value.

PLL Reference Offset Value [Auto]

This item allows you to configure the amount of voltage fed to the system agent of the CPU including the PCI-E controller and the PCU(power control unit). Configure a high system agent voltage may enhance the overclocking capability. Use the <+> or <-> to adjust the value.

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

CPU Spread Spectrum [Auto]

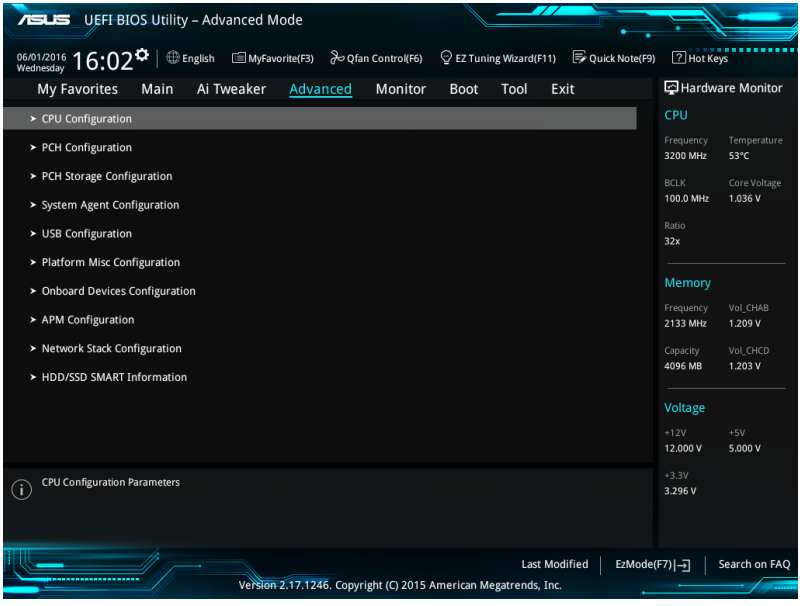
This item allows you to enhance the BCLK overclocking capability or reduce the EMI (electromagnetic disturbance) generated by the BCLK. Set this item to **[Enabled]** for EMI reduction, or set this item to **[Disabled]** to enhance BCLK overclocking.

Configuration options: [Auto] [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.

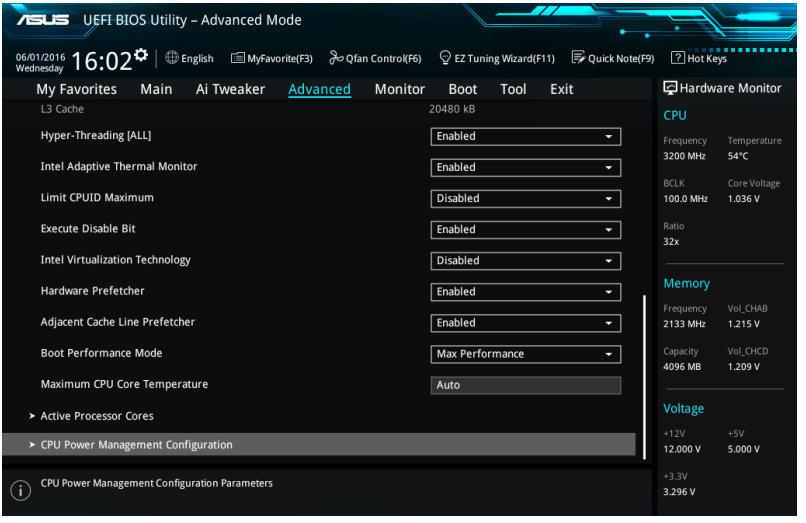


3.6.1 CPU Configuration

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.

Scroll up or down to display other BIOS items.



Hyper-Threading [ALL] [Enabled]

This item allows you to enable or disable the Hyper-Threading for logical processor threads.

Configuration options: [Disabled] [Enabled]

Intel Adaptive Thermal Monitor [Enabled]

This item allows you to protect the CPU by decreasing its frequency as it reaches the thermal throttle point. The thermal monitor includes TM1 (Thermal monitor 1), TM2 (Thermal monitor 2), and EMTTM (Enhanced Multi-threaded Thermal Monitoring).

Configuration options: [Disabled] [Enabled]

Limit CPUID Maximum [Disabled]

When set to **[Enabled]**, this item allows the legacy OS to boot even without support for CPUs with extended CPUID functions.

Configuration options: [Disabled] [Enabled]

Execute Disable Bit [Enabled]

Execute Disable prevents certain classes of malicious buffer overflow attacks when combined with a supporting OS (SuSE Linux 9.2, RedHat Enterprise 3 Update 3).

Configuration options: [Disabled] [Enabled]

Intel Virtualization Technology [Disabled]

When set to **[Enabled]**, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

Configuration options: [Disabled] [Enabled]

Hardware Prefetcher [Enabled]

This item allows the CPU to prefetch commands and data in the L2 cache, reduces the DRAM loading time and improves the system performance.

Configuration options: [Enabled] [Disabled]

Adjacent Cache Line Prefetcher [Enabled]

This item allows the mid level cache (L2) to prefetch adjacent cache lines, reducing the DRAM loading time and improves the system performance.

Configuration options: [Enabled] [Disabled]

Boot Performance Mode [Max Performance]

This item allows you to select the CPU performance state during system boot before the operating system takes control. The CPU runs at a selected performance ratio based on CPU configuration.

Configuration options: [Max Performance] [Max Efficient]

Maximum CPU Core Temperature [Auto]

This item allows you to set the maximum allowable temperature for CPU cores. The CPU will throttle or shutdown when it reaches this temperature to prevent damaging the cores.

Configuration options: [Auto] [60] - [120]

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

Active Processor Cores

The items in this menu allow you to enable or disable the cores of your CPU.

Active Processor Core (0-7) [Enabled]

Configuration options: [Enabled] [Disabled]

CPU Power Management Configuration

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

Enhanced Intel SpeedStep Technology [Enabled]

This item allows your system to adjust the CPU's voltage and cores frequency, resulting in decreased power consumption and heat production.

[Disabled] The CPU runs at its default speed.

[Enabled] The system controls the CPU speed.

Turbo Mode [Enabled]

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: [Disabled] [Enabled]

CPU C-states [Auto]

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

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

Enhanced C1 state [Enabled]
This item allows your CPU to reduce power consumption when the system is in idle mode.

Configuration options: [Disabled] [Enabled]

CPU C3 Report [Disabled]
This item allows you to disable or enable the CPU C3 report to the operating system.

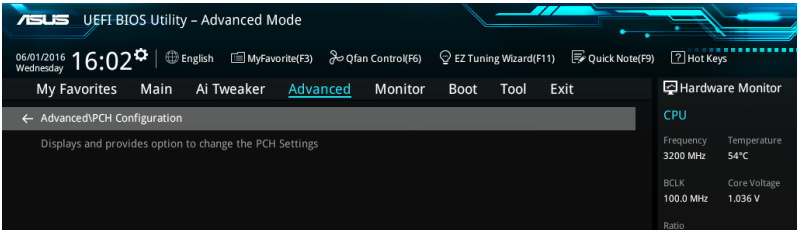
Configuration options: [Disabled] [Enabled]

CPU C6 Report [Enabled]
This item allows you to disable or enable the CPU C6 report to the operating system.

Configuration options: [Disabled] [Enabled]

Package C State limit [Auto]
This item allows you to set the a C-state support for the CPU package.
Configuration options: [Auto] [C0/C1 state] [C2 state] [C6(non Retention) state] [C6(Retention) state]

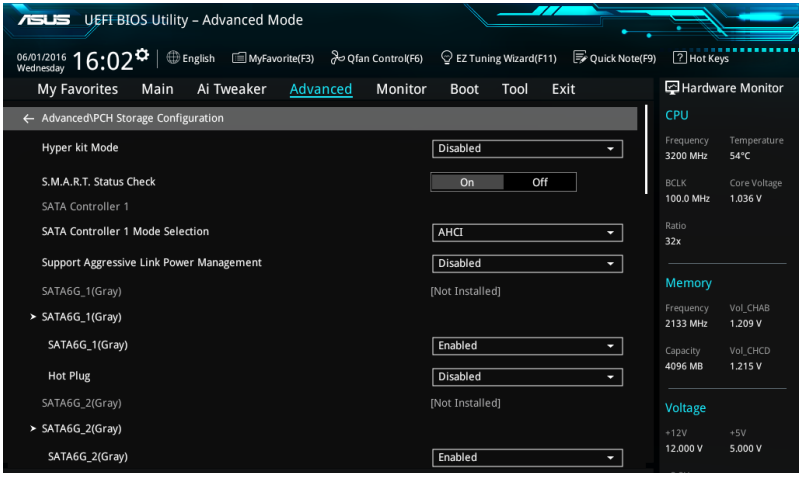
3.6.2 PCH Configuration



3.6.3 PCH Storage Configuration

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

Scroll up or down to display other BIOS items.



Hyper kit Mode [Disabled]

Disable this option for M.2 devices. Enable this option for “ASUS Hyper kit” card.

Configuration options: [Disabled] [Enabled]

S.M.A.R.T. Status Check [On]

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]

SATA Controller 1

SATA Controller 1 Mode Selection [AHCI]

This item allows you to set the SATA configuration.

[Disabled]	Disable the SATA function.
[IDE]	Use SATA hard disk as Parallel ATA storage devices
[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.
[RAID]	Set to [RAID] when you want to create a RAID configuration from the SATA hard disk drives.

The following items appear only when you set the SATA Controller 1 Mode Selection to **[RAID]** or **[AHCI]**.

Support Aggressive Link Power Management [Disabled]

This item is designed for LPM (link power management) support with a better energy saving conditions. When set to **[Enabled]**, the hot plug function of SATA ports are disabled.

Configuration options: [Disabled] [Enabled]

SATA6G_1(Gray) - SATA6G_6(Gray)

SATA6G_1(Gray) - SATA6G_6(Gray) [Enabled]

This item allows you to enable or disable the selected SATA port.

Configuration options: [Disabled] [Enabled]

Hot Plug [Disabled]

These items allows you to enable or disable SATA Hot Plug Support.

Configuration options: [Disabled] [Enabled]

SATA Controller 2

SATA Controller 2 Mode Selection [AHCI]

This item allows you to set the SATA configuration.

[Disabled]	Disable the SATA function.
[IDE]	Use SATA hard disk as Parallel ATA storage devices
[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.

Due to Intel® chipset specification, the SATA ports from controller 2 does not support Intel® Rapid Storage Technology including RAID configuration.

The following item appears only when you set the SATA Controller 2 Mode Selection to **[AHCI]**.

Support Aggressive Link Power Management [Disabled]

This item is designed for LPM (link power management) support with a better energy saving conditions. When set to [Enabled], the hot plug function of SATA ports are disabled.

Configuration options: [Disabled] [Enabled]

SATA6G_7(Black) - SATA6G_10(Black)

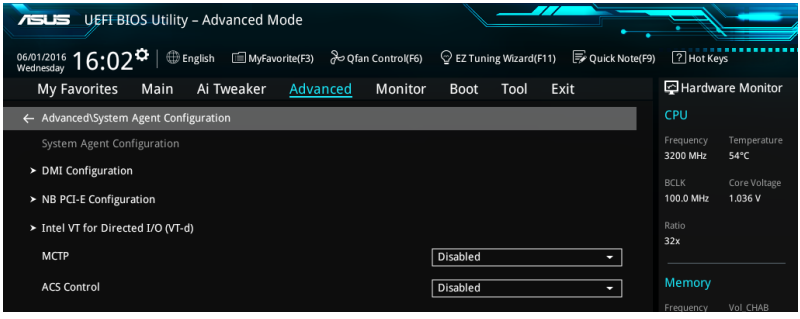
SATA6G_7(Black) - SATA6G_10(Black) [Enabled]

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

Hot Plug [Disabled]

These items allows you to enable or disable SATA Hot Plug Support.
Configuration options: [Disabled] [Enabled]

3.6.4 System Agent Configuration



DMI Configuration

Allows you to configure the DMI settings.

DMI Gen 2 [Enabled]

When enabled, this item allows the DMI (direct media interface) to run at PCI-E 2.0 speed.
Configuration options: [Disabled] [Enabled]

NB PCI-E Configuration

PCIEX16_1

PCIEX16_1 Link Speed [Auto]

Allows you to select the operating speed of the PCIEX16_1 speed.
Configuration options:

[Auto]	The system will automatically select the PCIEX16_1 slot speed.
[Gen1]	The PCIEX16_1 slot will run at PCI-E 1.0 speed.
[Gen2]	The PCIEX16_1 slot will run at PCI-E 2.0 speed.
[Gen3]	The PCIEX16_1 slot will run at PCI-E 3.0 speed.

PCIEX16_2

PCIEX16_2 Link Speed [Auto]

Allows you to select the operating speed of the PCIEX16_2 speed.
Configuration options:

[Auto] The system will automatically select the PCIEX16_2 slot speed.

[Gen1] The PCIEX16_2 slot will run at PCI-E 1.0 speed.

[Gen2] The PCIEX16_2 slot will run at PCI-E 2.0 speed.

[Gen3] The PCIEX16_2 slot will run at PCI-E 3.0 speed.

PCIEX16_3

PCIEX16_3 Link Speed [Auto]

Allows you to select the operating speed of the PCIEX16_3 speed.
Configuration options:

[Auto] The system will automatically select the PCIEX16_3 slot speed.

[Gen1] The PCIEX16_3 slot will run at PCI-E 1.0 speed.

[Gen2] The PCIEX16_3 slot will run at PCI-E 2.0 speed.

[Gen3] The PCIEX16_3 slot will run at PCI-E 3.0 speed.

PCIEX16_4

PCIEX16_4 Link Speed [Auto]

Allows you to select the operating speed of the PCIEX16_4 speed.
Configuration options:

[Auto] The system will automatically select the PCIEX16_4 slot speed.

[Gen1] The PCIEX16_4 slot will run at PCI-E 1.0 speed.

[Gen2] The PCIEX16_4 slot will run at PCI-E 2.0 speed.

[Gen3] The PCIEX16_4 slot will run at PCI-E 3.0 speed.

PCIEX16_5

PCIEX16_5 Link Speed [Auto]

Allows you to select the operating speed of the PCIEX16_5 speed.
Configuration options:

[Auto] The system will automatically select the PCIEX16_5 slot speed.

[Gen1] The PCIEX16_5 slot will run at PCI-E 1.0 speed.

[Gen2] The PCIEX16_5 slot will run at PCI-E 2.0 speed.

[Gen3] The PCIEX16_5 slot will run at PCI-E 3.0 speed.

PCIEX16_6

PCIEX16_6 Link Speed [Auto]

Allows you to select the operating speed of the PCIEX16_6 speed.
Configuration options:

[Auto]	The system will automatically select the PCIEX16_6 slot speed.
[Gen1]	The PCIEX16_6 slot will run at PCI-E 1.0 speed.
[Gen2]	The PCIEX16_6 slot will run at PCI-E 2.0 speed.
[Gen3]	The PCIEX16_6 slot will run at PCI-E 3.0 speed.

PCIEX16_7

PCIEX16_7 Link Speed [Auto]

Allows you to select the operating speed of the PCIEX16_7 speed.
Configuration options:

[Auto]	The system will automatically select the PCIEX16_7 slot speed.
[Gen1]	The PCIEX16_7 slot will run at PCI-E 1.0 speed.
[Gen2]	The PCIEX16_7 slot will run at PCI-E 2.0 speed.
[Gen3]	The PCIEX16_7 slot will run at PCI-E 3.0 speed.

Intel VT for Directed I/O (VT-d)

Intel VT for Directed I/O (VT-d) [Disabled]

Allows you to enable Virtualization Technology for Directed I/O (VT-d) by reporting the I/O device assignment to VMM through DMAR ACPI tables..
Configuration options: [Enabled] [Disabled]

MCTP [Disabled]

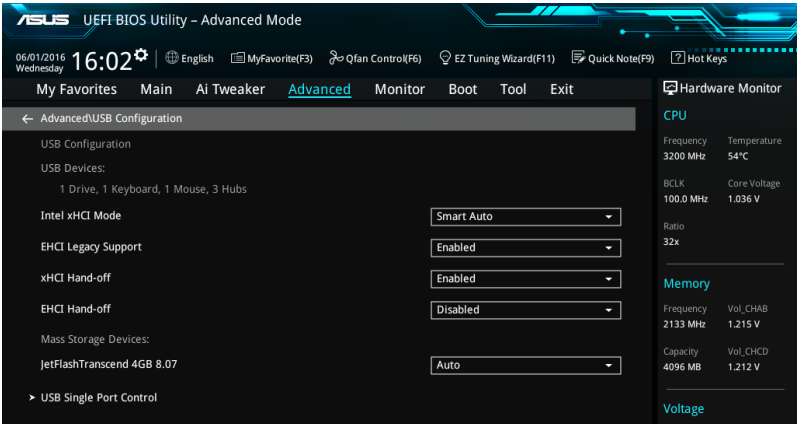
Configuration options: [Disabled] [Enabled]

ACS Control [Disabled]

Configuration options: [Disabled] [Enabled]

3.6.5 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**.

Intel xHCI Mode [Smart Auto]

[Smart Auto] Once the xHCI driver has been detected, the USB 3.0 mode will be supported during both POST and operating system.

[Auto] xHCI controller will be enabled and run at USB 3.0 mode when the xHCI driver is installed in the operating system.

[Enabled] Enable the xHCI controller.

[Disabled] Disable the xHCI controller.

EHCI Legacy Support [Enabled]

[Disabled] The USB 2.0 devices can be used only for the BIOS setup program. It cannot be recognized in boot devices list.

[Enabled] Enables the support for USB 2.0 devices on legacy operating systems (OS).

[Auto] Allows the system to detect the presence of USB 2.0 devices at startup. If detected, the USB controller legacy mode is enabled. If no USB device is detected, the legacy USB support is disabled.

xHCI Hand-off [Enabled]

This item is set to **[Enabled]** by default for the xHCI (extensible host controller interface) support by xHCI drivers in operating systems.

[Disabled] Support xHCI by xHCI drivers for operating systems with xHCI support.

[Enabled] Support xHCI by BIOS for operating systems without xHCI support.

EHCI Hand-off [Disabled]

This item is set to **[Disabled]** by default for the EHCI (enhanced host controller interface) support by EHCI drivers in operating systems.

[Disabled] Support EHCI by EHCI drivers for operating systems with EHCI support.

[Enabled] Support EHCI by BIOS for operating systems without EHCI support.

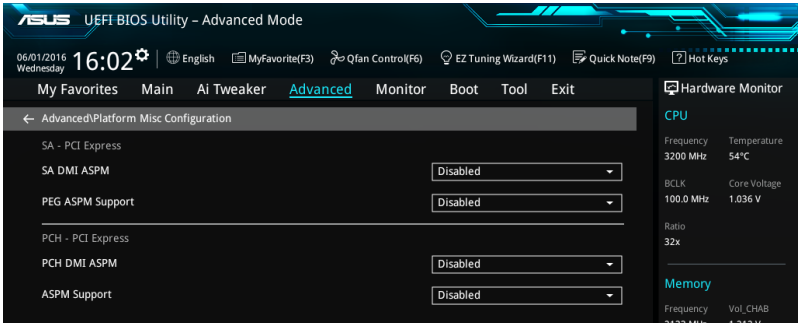
USB Single Port Control

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

Refer to section **1.2.2 Motherboard layout** for the location of the USB ports.

3.6.6 Platform Misc Configuration

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



SA - PCI Express

SA DMI ASPM [Disabled]

This item is used to enable or disable the ASPM(L1) support for the downstream devices.

Configuration options: [Auto] [Disabled] [L1 Only]

PEG ASPM Support [Disabled]

This item is used to enable or disable the ASPM support for all downstream devices.

Configuration options: [Disabled] [L1 Only]

PCH - PCI Express

PCH DMI ASPM [Disabled]

Configuration options: [Disabled] [Enabled]

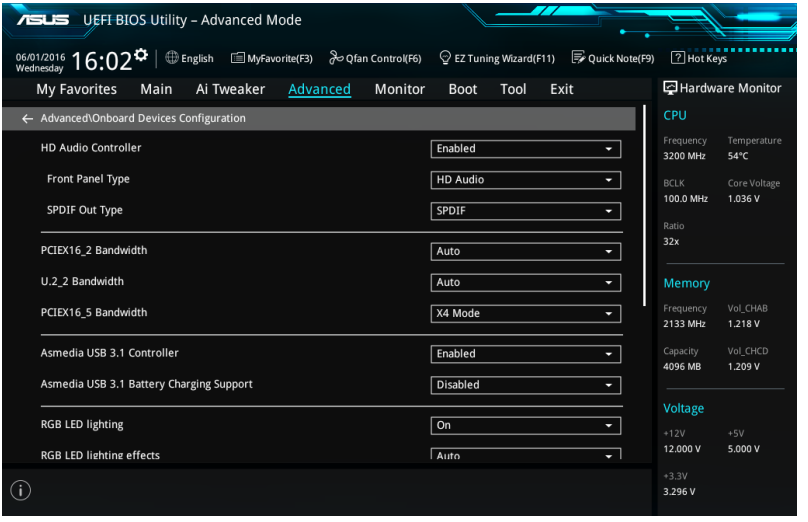
ASPM Support [Disabled]

This item is used to enable or disable the ASPM support for all downstream devices.

Configuration options: [Disabled] [L1 Only]

3.6.7 Onboard Devices Configuration

Scroll up or down to view other BIOS items.



HD Audio Controller [Enabled]

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

Configuration options: [Disabled] [Enabled]

The following items appear only when you set the HD Audio Controller to **[Enabled]**.

Front Panel Type [HD Audio]

This item allows you to set the front panel audio connector (AAFP) mode to legacy AC'97 or high-definition audio depending on the audio standard that the front panel audio module supports.

[HD Audio] Sets the front panel audio connector (AAFP) mode to high definition audio.

[AC97] Sets the front panel audio connector (AAFP) mode to legacy AC'97.

SPDIF Out Type [SPDIF]

[SPDIF] Sets to an SPDIF audio output.

[HDMI] Sets to an HDMI audio output.

Asmedia USB 3.1 Controller [Enabled]

This item allows you to disable or enable the ASMedia USB 3.1 controller.

Configuration options: [Disabled] [Enabled]

Asmedia USB 3.1 Battery Charging Support [Disabled]

This item allows you to disable or enable the ASMedia USB 3.1 battery charging support.

Configuration options: [Disabled] [Enabled]

RGB LED Lighting [On]

[Off] LEDs will not light up.

[On] LEDs will always light up at the S0(Working), S3(Sleep), and S5(Soft off), but not light up at the S5 state when “Erp Ready” is enabled.

RGB LED lighting effects [Auto]

This item allows you to set the RGB LED lighting effects.

Configuration options: [Default] [Auto] [Static] [Breathing] [Strobing] [Color Cycle]

- When the power is completely removed from your motherboard (G3 state), the RGB LED lighting effect will revert to the default setting the next time the motherboard is powered on.
- The following item appears only when you set the RGB LED lighting effects to **[Static]**, **[Breathing]**, or **[Strobing]**.

RGB LED lighting color

This item allows you to set the RGB LED lighting colors.

SSD M.2/U.2

[AUTO] Smart detect M.2/U.2.

[U.2] Smart detect U.2 only.

Intel LAN1 Controller [Enabled]

This item allows you to enable or disable the GbE Controller.

Configuration options: [Disabled] [Enabled]

The following item appears only when you set the Intel LAN1 Controller to **[Enabled]**.

Intel Lan1 PXE Option ROM [Disabled]

This item allows you launch Intel Lan1 PXE OPROM.

Configuration options: [Enabled] [Disabled]

Intel LAN2 Controller [Enabled]

This item allows you to enable or disable the Intel LAN2 Controller.

Configuration options: [Disabled] [Enabled]

The following item appears only when you set the Intel LAN2 Controller to **[Enabled]**.

Intel Lan2 PXE Option ROM [Disabled]

This item allows you launch Intel Lan2 PXE OPROM.

Configuration options: [Enabled] [Disabled]

Serial Port Configuration

Serial Port [On]

This port allows you to enable or disable Serial Port.

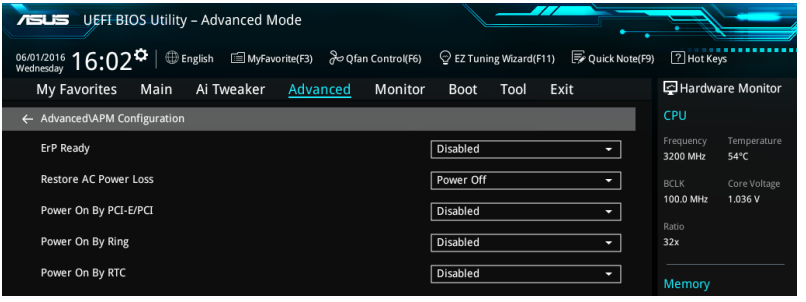
Configuration options: [On] [Off]

Change Settings [Auto]

Allows you to choose the setting for Super IO device.

Configuration options: [Auto] [IO=3F8h; IRQ=4] [IO=2F8h; IRQ=3] [IO=3E8h; IRQ=4] [IO=2E8h; IRQ=3]

3.6.8 APM Configuration



ErP Ready [Disabled]

This item allows you to switch off some power at S4+S5 or S5 to get the system ready for ErP requirement. When set to **[Enabled]**, all other PME options are switched off.

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

Restore AC Power Loss [Power Off]

This item allows your system to go to ON state, OFF state, or both states after an AC power loss. When setting your system to **[Last State]**, it goes to the previous state before the AC power loss.

Configuration options: [Power On] [Power Off] [Last State]

Power On By PCI-E/PCI [Disabled]

This item allows you to enable/disable the Wake-on-LAN function of the onboard LAN controller or other installed PCI-E LAN cards.

Configuration options: [Disabled] [Enabled]

Power On By Ring [Disabled]

[Disabled] Disables the Ring devices to generate a wake event.

[Enabled] Enables the Ring devices to generate a wake event.

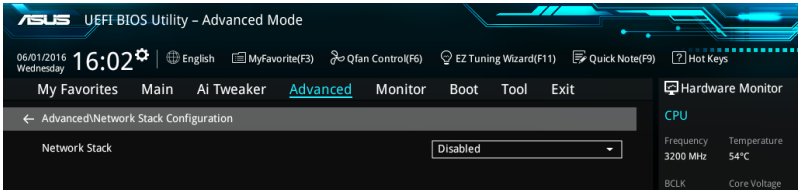
This item functions only if there is a serial port (COM1) connector on the motherboard.

Power On By RTC [Disabled]

This item allows you to enable/disable the RTC (Real-Time Clock) to generate a wake event and configure the RTC alarm date. When enabled, you can set the days, hours, minutes, or seconds to schedule an RTC alarm date.

Configuration options: [Disabled] [Enabled]

3.6.9 Network Stack Configuration



Network stack [Disabled]

This item allows you to disable or enable the UEFI network stack.

Configuration options: [Disabled] [Enabled]

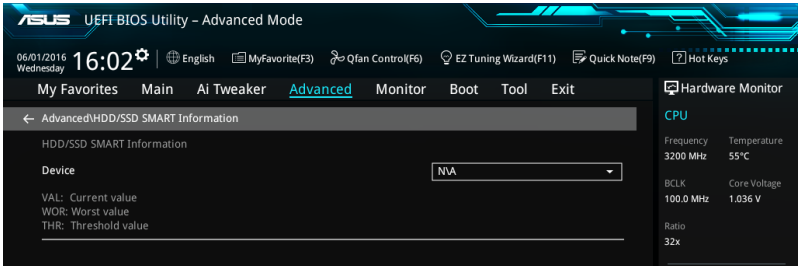
The following item appears only when you set the Network Stack to **[Enabled]**.

Ipv4/Ipv6 PXE Support [Enabled]

This item allows you to enable/disable the Ipv4/Ipv6 PXE wake event.
Configuration options: [Disabled] [Enabled]

3.6.10 HDD/SDD SMART Information

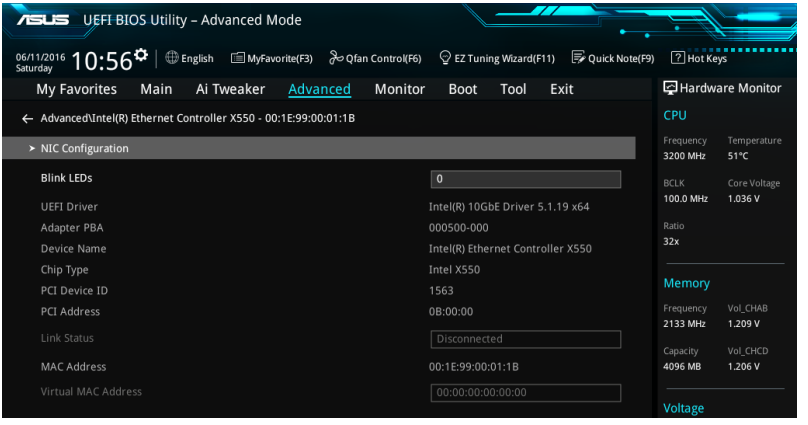
This menu displays the SMART information of the connected devices.



NVM Express devices do not support SMART information.

3.6.11 Intel(R) Ethernet Controller - 00:1E:99:00:01:1B

This menu allows you to configure the parameters of the 10 Gigabit Ethernet device



NIC Configuration

The items in this menu allow you to configure the boot protocol, Wake-on LAN, link speed, and virtual LAN.

Link Speed [Auto Negotiated]

This item allows you to specify the port speed used for the selected boot protocol. Configuration options: [Auto Negotiated] [10 Mbps Half] [10 Mbps Full] [100 Mbps Half] [100 Mbps Full]

Wake On LAN [Enabled]

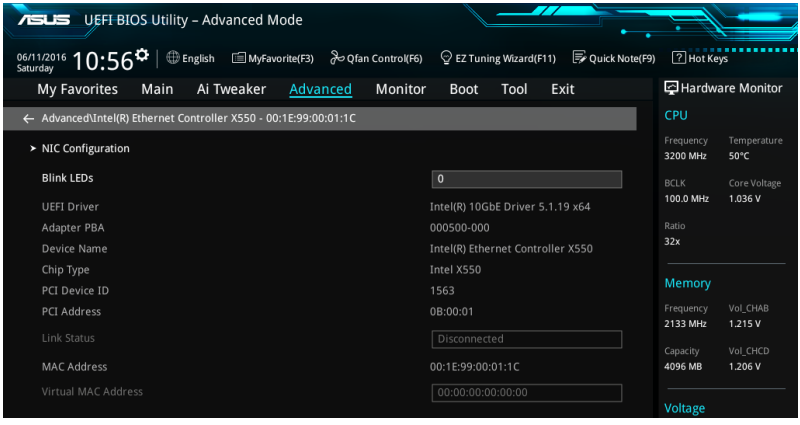
This item allows you enable/disable the server to be powered on using an in-band magic packet.

Blink LEDs [0]

This item allows you to identify the physical network port with the blinking associated LEDs. Use the number keys to key in the number. The values range from 0 to 15.

3.6.12 Intel(R) Ethernet Controller - 00:1E:99:00:01:1C

This menu allows you to configure the parameters of the 10 Gigabit Ethernet device



NIC Configuration

The items in this menu allow you to configure the boot protocol, Wake-on LAN, link speed, and virtual LAN.

Link Speed [Auto Negotiated]

This item allows you to specify the port speed used for the selected boot protocol. Configuration options: [Auto Negotiated] [10 Mbps Half] [10 Mbps Full] [100 Mbps Half] [100 Mbps Full]

Wake On LAN [Enabled]

This item allows you enable/disable the server to be powered on using an in-band magic packet.

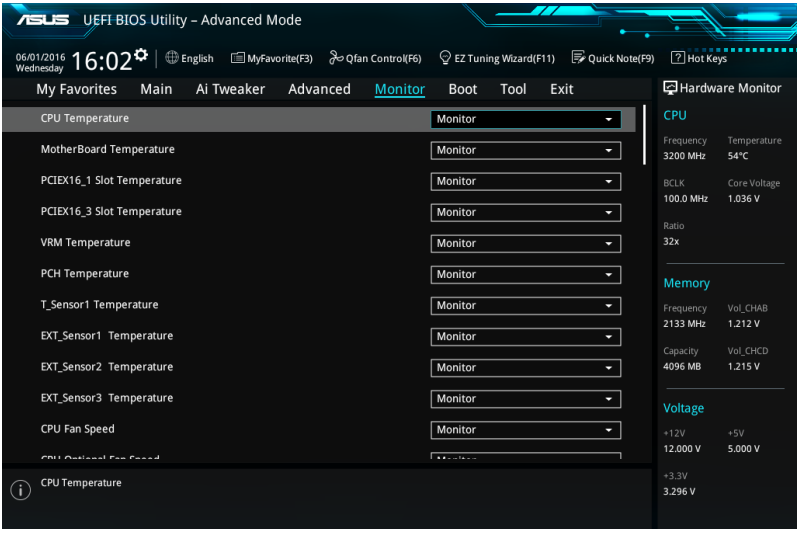
Blink LEDs [0]

This item allows you to identify the physical network port with the blinking associated LEDs. Use the number keys to key in the number. The values range from 0 to 15.

3.7 Monitor menu

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

Scroll up or down to view other BIOS items.



CPU Temperature, Motherboard Temperature, PCIEX16_1 slot Temperature, PCIEX16_3 slot Temperature, VRM Temperature, PCH Temperature, T_ Sensor1 Temperature [xxx°C/xxx°F]

The onboard hardware monitor automatically detects and displays the temperatures. Select **[Ignore]** if you do not wish to display the detected temperatures.

CPU Fan Speed, CPU Optional Fan Speed, Chassis Fan 1-2 Speed, Water Pump Speed, HAMP Fan Speed [xxxx RPM]

The onboard hardware monitor automatically detects and displays the fan speed in rotations per minute (RPM). If the fan is not connected to the motherboard, the field shows N/A. Select **[Ignore]** if you do not wish to display the detected speed.

CPU Core Voltage, 3.3V Voltage, 5V Voltage, 12V Voltage [x.xxxx V]

The onboard hardware monitor automatically detects the voltage output through the onboard voltage regulators. Select **[Ignore]** if you do not want to detect this item.

Optimize All

Click this item to automatically detect the lowest speed and configure the minimum duty cycle for each fan.

CPU Q-Fan Control [Auto]

This item allows you to set the CPU Q-Fan operating mode.

[Auto]	Detects the type of CPU fan installed and automatically switches the control modes.
[PWM Mode]	Enables the CPU Q-Fan control feature in PWM mode for 4-pin CPU fan.
[DC Mode]	Enables the CPU Q-Fan control feature in DC mode for 3-pin CPU fan.
[Disabled]	Disables the Q-Fan control.

The following items appear only when you set the CPU Q-Fan Control to **[Auto]**, **[PWM Mode]**, and **[DC Mode]**.

CPU Fan Step Up [0 sec]

This item allows you to set the value of the CPU fan step up.
Configuration options: [0 sec] [2.1 sec] [2.8 sec] [3.6 sec] [4.2 sec] [5.0 sec] [6.3 sec] [8.5 sec] [12 sec] [25 sec]

CPU Fan Step Down [0 sec]

This item allows you to set the value of the CPU fan step down.
Configuration options: [0 sec] [2.1 sec] [2.8 sec] [3.6 sec] [4.2 sec] [5.0 sec] [6.3 sec] [8.5 sec] [12 sec] [25 sec]

CPU Fan Speed Low Limit [200 RPM]

This item allows you to set the low limit warning for CPU Fan speed.
Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

CPU Fan Profile [Standard]

This item allows you to set the appropriate performance level of the CPU fan.

[Standard]	Set to make the CPU fan adjust automatically depending on the CPU temperature.
[Silent]	Set to minimize the fan speed for quiet CPU fan operation.
[Turbo]	Set to achieve maximum CPU fan speed.
[Manual]	Set to assign the detailed fan speed control parameters.

The following items appear only when you set the CPU Fan Profile to **[Manual]**.

CPU Upper Temperature
Use the <+> and <-> keys to adjust the upper limit of the CPU temperature. The values range from 25°C to 75°C. The CPU fan will operate at the maximum duty cycle when the CPU temperature is higher than the limit.

CPU Fan Max. Duty Cycle(%)
Use the <+> and <-> keys to adjust the maximum CPU fan duty cycle. The values range from 20% to 100%. When the CPU temperature reaches the upper limit, the CPU fan will operate at the maximum duty cycle.

CPU Middle Temperature
Use the <+> and <-> keys to adjust the CPU middle temperature. The values range from 25°C to 75°C.

CPU Fan Middle Duty Cycle(%)
Use the <+> or <-> keys to adjust the CPU fan middle duty cycle. The values range from 20% to 100%.

CPU Lower Temperature
Use the <+> or <-> keys to adjust the lower limit of the CPU temperature. The values range from 20°C to 75°C. The CPU fan will operate at the minimum duty cycle when the CPU temperature is lower than the limit.

CPU Fan Min. Duty Cycle(%)
Use the <+> and <-> keys to adjust the minimum CPU fan duty cycle. The values range from 20% to 100%. When the CPU temperature is lower than the lower limit, the CPU fan will operate at the minimum duty cycle.

Chassis Fan 1-2 Q-Fan Control [Auto]

[Disabled]	Disable the Chassis Q-Fan control feature.
[Auto]	Detect the type of Chassis Q-Fan installed and automatically switches the mode control.
[DC mode]	Enable the Chassis Q-Fan control in DC mode for 3-pin chassis fan.
[PWM mode]	Enable the Chassis Q-Fan control in PWM mode for 4-pin chassis fan.

The following items appear only when you set the Chassis Fan 1-2 Q-Fan Control to **[Auto]**, **[PWM Mode]**, and **[DC Mode]**.

Chassis Fan 1-2 Q-Fan Source [CPU]

The assignment fan will be controlled according to the selected temperature source.
Configuration options: [CPU] [MotherBoard] [PCIEX16_1 Slot] [PCIEX16_3 Slot] [VRM] [PCH] [T_SENSOR1] [EXT_Sensor1] [EXT_Sensor2] [EXT_Sensor3] [Multiple Sources]

- For EXT_Sensor1-3, connect a Thermistor cable to the EXT_TS1-3 header then place the other end to the component to get the temperature.
- For Multiple Sources, select up to three temperature sources and the fan will automatically change based on the highest temperature.
- ASUS FAN EXTENSION CARD is required to configure these items.

Chassis Fan 1-2 Step Up [0 sec]

This item allows you to set the value of the chassis fan step up.
Configuration options: [0 sec] [12 sec] [25 sec] [51 sec] [76 sec] [102 sec] [127 sec] [153 sec] [178 sec] [204 sec]

Chassis Fan 1-2 Step Down [0 sec]

This item allows you to set the value of the chassis fan fan step down.
Configuration options: [0 sec] [12 sec] [25 sec] [51 sec] [76 sec] [102 sec] [127 sec] [153 sec] [178 sec] [204 sec]

Chassis Fan 1-2 Fan Speed Low Limit [200 RPM]

This item allows you to disable or set the chassis fan warning speed.
Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

Chassis Fan 1-2 Profile [Standard]

This item allows you to set the appropriate performance level of the chassis fan.

[Standard] Sets to [Standard] to make the chassis fan automatically adjust depending on the chassis temperature.

[Silent] Sets to [Silent] to minimize the fan speed for quiet chassis fan operation.

[Turbo] Sets to [Turbo] to achieve maximum chassis fan speed.

[Manual] Sets to [Manual] to assign detailed fan speed control parameters.

The following items appear only when you set Chassis Fan 1-2 Profile to **[Manual]**.

Chassis Fan 1-2 Upper Temperature
Use the <+> or <-> keys to adjust the upper limit of the Chassis Fan 1-2 temperature. The values range from 20 to 75.

Chassis Fan 1-2 Max. Duty Cycle (%)
Use the <+> or <-> keys to adjust the maximum Chassis Fan 1-2 duty cycle. The values range from 20% to 100%. When the CPU temperature reaches the upper limit, the Chassis Fan 1-2 will operate at the maximum duty cycle.

Chassis Fan 1-2 Middle Temperature
Use the <+> or <-> keys to adjust the middle limit of the Chassis Fan 1-2 temperature. The values range from 20 to 75.

Chassis Fan 1-2 Middle. Duty Cycle (%)
Use the <+> or <-> keys to adjust the middle Chassis Fan 1-2 duty cycle. The values range from 20% to 100%. When the CPU temperature reaches the middle limit, the Chassis Fan 1-2 will operate at the middle duty cycle.

Chassis Fan 1-2 Lower Temperature
Use the <+> or <-> keys to adjust the lower limit of the Chassis Fan 1-2 temperature. The values range from 20 to 75. The Chassis Fan 1-2 will operate at the minimum duty cycle when the temperature is lower than the limit.

Chassis Fan 1-2 Min. Duty Cycle(%)
Use the <+> or <-> keys to adjust the minimum Chassis Fan 1-2 fan duty cycle. The values range from 0% to 100%. When the CPU temperature is under the limit, the Chassis Fan 1-2 will operate at the minimum duty cycle.

Water Pump Control [Disabled]

[Disabled] Disable the Water Pump control feature.

[Auto] Detect the type of Water Pump installed and automatically switches the mode control.

[DC mode] Enable the Water Pump control in DC mode for 3-pin Water Pump.

[PWM mode] Enable the Water Pump control in PWM mode for 4-pin Water Pump.

The following items appear only when you set the Water Pump Control to **[Auto]**, **[PWM Mode]**, and **[DC Mode]**.

Water Pump Temperature

Use the <+> and <-> keys to adjust the upper limit of the water pump. The values range from 45°C to 75°C. The water pump will operate at the maximum duty cycle when the CPU temperature is higher than the limit.

Water Pump Max. Duty Cycle(%)

Use the <+> and <-> keys to adjust the maximum water pump duty cycle. The values range from 60% to 100%. When the CPU temperature reaches the upper limit, the water pump will operate at the maximum duty cycle.

Water Pump Middle Temperature

Use the <+> and <-> keys to adjust the water pump middle temperature. The values range from 40°C to 75°C.

Water Pump Middle Duty Cycle(%)

Use the <+> or <-> keys to adjust the water pump middle duty cycle. The values range from 60% to 100%.

Water Pump Lower Temperature

Use the <+> or <-> keys to adjust the lower limit of the water pump temperature. The values range from 20°C to 75°C. The water pump will operate at the minimum duty cycle when the CPU temperature is lower than the limit.

Water Pump Min. Duty Cycle(%)

Use the <+> and <-> keys to adjust the minimum water pump duty cycle. The values range from 60% to 100%. When the CPU temperature is lower than the lower limit, the water pump will operate at the minimum duty cycle.

HAMP Fan Control [Auto]

This item allows you to set the HAMP Fan operating mode.

[Auto]	Detects the type of HAMP Fan installed and automatically switches the control modes.
[PWM Mode]	Enables the HAMP Fan Control feature in PWM mode for 4-pin HAMP Fan.
[DC Mode]	Enables the HAMP Fan Control feature in DC mode for 3-pin HAMP Fan.
[Disabled]	Disables the HAMP Fan Control.

The following items appear only when you set the HAMP Fan Q-Fan Control to **[Auto]**, **[PWM Mode]**, and **[DC Mode]**.

HAMP Fan Q-Fan Source [CPU]

The assignment fan will be controlled according to the selected temperature source.

Configuration options: [CPU] [MotherBoard] [PCIEX16_1 Slot] [PCIEX16_3 Slot] [VRM] [PCH] [T_SENSOR1] [EXT_Sensor1] [EXT_Sensor2] [EXT_Sensor3] [Multiple Sources]

- For EXT_Sensor1-3, connect a Thermistor cable to the EXT_TS1-3 header then place the other end to the component to get the temperature.
- For Multiple Sources, select up to three temperature sources and the fan will automatically change based on the highest temperature.
- ASUS FAN EXTENSION CARD is required to configure these items.

HAMP Fan Step Up [0 sec]

This item allows you to set the value of the HAMP fan step up.

Configuration options: [0 sec] [12 sec] [25 sec] [51 sec] [76 sec] [102 sec] [127 sec] [153 sec] [178 sec] [204 sec]

HAMP Fan Step Down [0 sec]

This item allows you to set the value of the HAMP fan step down.

Configuration options: [0 sec] [12 sec] [25 sec] [51 sec] [76 sec] [102 sec] [127 sec] [153 sec] [178 sec] [204 sec]

HAMP Fan Speed Low Limit [200 RPM]

This item allows you to disable or set the HAMP fan warning speed.

Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

HAMP Fan Profile [Standard]

This item allows you to set the appropriate performance level of the HAMP Fan.

[Standard]	Sets to [Standard] to make the chassis fan automatically adjust depending on the chassis temperature.
[Silent]	Sets to [Silent] to minimize the fan speed for quiet chassis fan operation.
[Turbo]	Sets to [Turbo] to achieve maximum chassis fan speed.
[Manual]	Sets to [Manual] to assign detailed fan speed control parameters.

The following items appear only when you set HAMP Fan Profile to **[Manual]**.

HAMP Fan Upper Temperature

Use the <+> or <-> keys to adjust the upper limit of the HAMP Fan temperature. The values range from 45°C to 75°C. The HAMP Fan will operate at the maximum duty cycle when the temperature source is higher than the limit.

HAMP Fan Max. Duty Cycle (%)

Use the <+> or <-> keys to adjust the maximum HAMP Fan duty cycle. The values range from 60% to 100%. When the temperature source reaches the upper limit, the HAMP Fan will operate at the maximum duty cycle.

HAMP Fan Middle Temperature

Use the <+> or <-> keys to adjust the middle limit of the HAMP Fan temperature. The values range from 40°C to 75°C.

HAMP Fan Middle. Duty Cycle (%)
Use the <+> or <-> keys to adjust the HAMP Fan middle duty cycle. The values range from 60% to 100%.

HAMP Fan Lower Temperature
Use the <+> or <-> keys to adjust the lower limit of the HAMP Fan temperature. The values range from 20°C to 75°C. The HAMP Fan will operate at the minimum duty cycle when the temperature source is lower than the limit.

Anti Surge Support [ON]

Enable this item for Over Voltage Protection (OVP) and Under Voltage Protection (UVP) functions. This causes the system to automatically shut down when the voltage exceeds the safe range that protects the motherboard's components.

Configuration options: [ON] [OFF]

Chassis Intrude Detect Support [ON]

This item allows you to enable or disable the chassis intrude detect feature.

Configuration options: [ON] [OFF]

CPU OVT LED Support [ON]

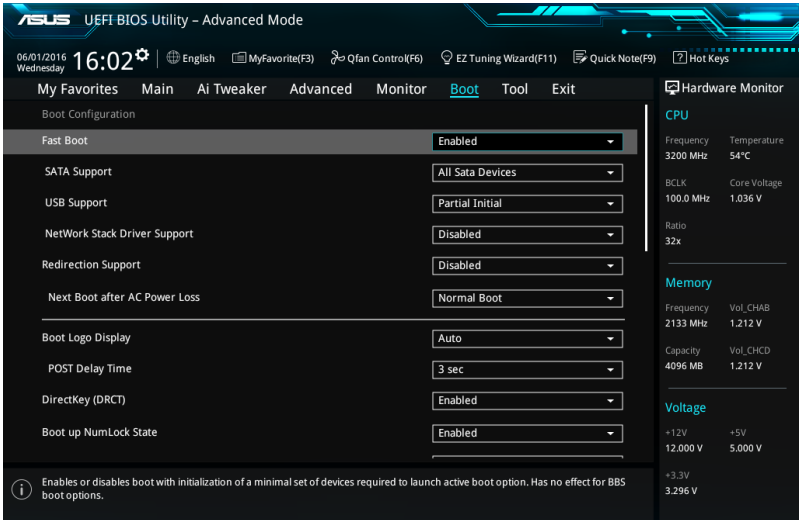
This item allows you to enable or disable the CPU OVT LED function.

Configuration options: [ON] [OFF]

3.8 Boot menu

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

Scroll up or down to view other BIOS items.



Boot Configuration

Fast Boot [Enabled]

[Disabled] This item allows your system to go back to its normal boot speed.

[Enabled] This item allows your system to accelerate the boot speed.

The following items appear only when you set the Fast Boot to **[Enabled]**.

SATA Support [All SATA Devices]

[Last Boot HDD Only] Only boot drives connected to a SATA ports are detected during POST.

[All SATA Devices] All devices connected to SATA ports are available during POST. This process extends the POST time.

[HDD Only] Only hard drives connected to SATA ports are detected during POST.

USB Support [Partial Initial]

[Disabled] All USB devices will not be available until OS boot up for a fastest POST time.

[Full Initial] All USB devices will be available during POST. This process will extend the POST time.

[Partial Initial] For a faster POST time, only USB ports with keyboard and mouse connections will be detected.

Network Stack Driver Support [Disabled]

[Disabled] Select to skip the network stack driver from loading during POST.

[Enabled] Select to load the network stack driver during POST.

Redirection Support [Disabled]

This item allows you to enable or disable redirection support.
Configuration options: [Enabled] [Disabled]

Next Boot after AC Power Loss [Normal Boot]

[Normal Boot] Returns to normal boot on the next boot after an AC power loss.

[Fast Boot] Accelerates the boot speed on the next boot after an AC power loss.

Boot Logo Display [Auto]

[Auto] Auto adjustments for Windows requirements.

[Full Screen] Maximize the boot logo size.

[Disabled] Hide the logo during POST.

The following items appears only when you set the Boot Logo Display item to **[Disabled]**.

Post Report [5 sec]

This item This item allows you to select a desired waiting time of the POST report from 0 to 10 seconds or until <ESC> is pressed.

The following items appears only when you set the Boot Logo Display item to **[Full Screen]** or **[Auto]**.

Post Delay Time [3 sec]

This item This item allows you to select a desired additional POST waiting time to easily enter the BIOS Setup. You can only execute the POST delay time during normal boot. The values range from 0 to 10 seconds.

DirectKey (DRCT) [Enabled]

[Disabled] The system will only turn on or off when the reset button is pressed.

[Enabled] Allow the system to turn on and go to the BIOS Setup directly when the reset button is pressed. Connect the 2-pin connector of the chassis reset button cable to the onboard DRCT header to support this function.

Boot up NumLock State [Enabled]

[Enabled] Set the power-on state of the NumLock to [On].

[Disabled] Set the power-on state of the NumLock to [Off].

Wait For 'F1' If Error [Enabled]

Enable this item for the system to pause until the F1 key is pressed when any error occurs.
Configuration options: [Disabled] [Enabled]

Option ROM Messages [Force BIOS]

This item allows you to set the display mode for Option ROM.

Configuration options: [Force BIOS] [Keep Current]

Above 4G Decoding [Disabled]

This item enables or disables 64-bit capable devices to be decoded in above 4G address space if your system supports 64-bit PCI Decoding.

Configuration options: [Enabled] [Disabled]

Setup Mode [EZ 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 [Enabled]

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

[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 Windows® secure update and secure boot.

The following items appear only when you set the Launch CSM to **[Enabled]**.

Boot Devices Control [UEFI and Legacy OPROM]
This item allows you to select the devices boot-up mode by the devices specification.

Configuration options: [UEFI and Legacy OPROM] [Legacy OPROM only] [UEFI only]

Boot from Network Devices [Legacy only]
This item allows you to select the type of the onboard LAN controllers and installed LAN cards.

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

Boot from Storage Devices [Legacy only]
This item allows you to select the type of storage devices that will run first during the system boot.

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

Boot from PCI-E/PCI Expansion Devices [Legacy only]
This item allows you to select the type of PCI-E/PCI expansion devices that will run first during the system boot.

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.

OS Type [Windows UEFI mode]

[Windows UEFI Mode] Execute the Microsoft secure boot check. Only check this option when booting on Windows UEFI mode or other Microsoft secure boot compliant operating systems.

[Other OS] Select this option to get the optimized functions when booting on Windows non-UEFI mode and Microsoft secure boot noncompliant operating systems.

The following item appears only when you set the OS Type to **[Other OS]**.

Enhanced Mode [Disabled]

Configuration options: [Disabled] [Enabled]

The Microsoft secure boot can only function properly on Windows UEFI mode.

Key Management

Install Default Secure Boot keys
This item allows you to load the default Security Boot keys, Platform key (PK), Key-exchange Key (KEK), Signature database (db), and Revoked Signatures (dbx). When the default Secure boot keys are loaded, the PK state will change from Unloaded mode to loaded mode. Save changes and reset the system for the change to take effect.

Clear Secure Boot keys
This item allows you to delete all the previously applied secure boot keys, including the PK (Platform Key), KEK (Key-Exchange Key), DB (signature database), and DBX (revoked signature database). All the secure boot keys states will change from loaded to unloaded. Save changes and reset the system for the change to take effect.

Save Secure Boot Keys
This item allows you to save all the secure boot keys to a USB storage device.

PK Management
Delete PK
This item allows you to delete the PK (Platform Key). Once the PK is deleted, the secure boot function will be disabled.

Load Default PK
[Yes] Load the default PK.

[No] Load the PK from a USB storage device.

Delete KEK
This item allows you to delete the KEK (Key-Exchange Key). Once the KEK is deleted, the DB (signature database) and the DBX (revoked signature database) will not be updateable in the operating system.

Load Default KEK
[Yes] Load the default KEK.

[No] Load the KEK from a USB storage device.

Append Default KEK
[Yes] Append the default KEK.

[No] Append the additional KEK from a USB storage device.

DB Management

Delete the db

This item allows you to delete the DB from the system. This operation may cause boot failures.

Load Default db

[Yes] Load the default DB.

[No] Load the DB from a USB storage device.

Append Default db

[Yes] Append the default DB.

[No] Append the DB from a USB storage device.

UEFI executable files include UEFI boot loaders, drivers, and applications.

DBX Management

Delete the dbx

This item allows you to delete the DBX from the system. This operation may expose the system to security threats.

Load Default dbx

[Yes] Load the default DBX.

[No] Load the DBX from a USB storage device.

Append Default dbx

[Yes] Append the default DBX.

[No] Append the DBX from a USB storage device.

UEFI executable files include UEFI boot loaders, drivers, and applications.

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.

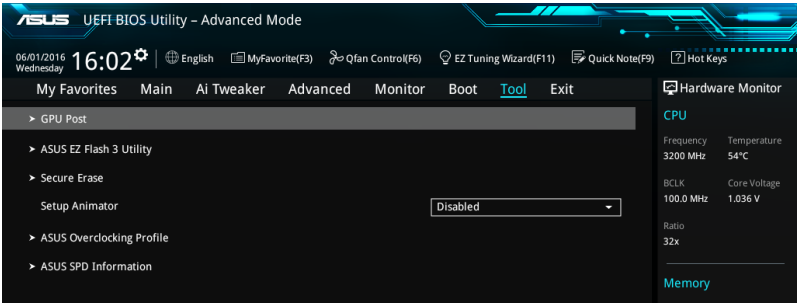
- To access Windows® OS in Safe Mode, press <F8> after POST (Windows® 8 not supported).
- To select the boot device during system startup, press <F8> when the ASUS Logo appears.

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 [Disabled]

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

Configuration options: [Disabled] [Enabled]

3.9.1 GPU Post

This item shows the installed graphics cards in the motherboard. It also suggests the configuration of graphic cards in the motherboard for the best performance.

3.9.2 ASUS EZ Flash 3 Utility

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 **[via Storage Devices(s)]** or **[via Internet]**, then press <Enter> to confirm your choice.

For more details, refer to section **3.11.2 ASUS EZ Flash 3**.

3.9.3 Secure Erase

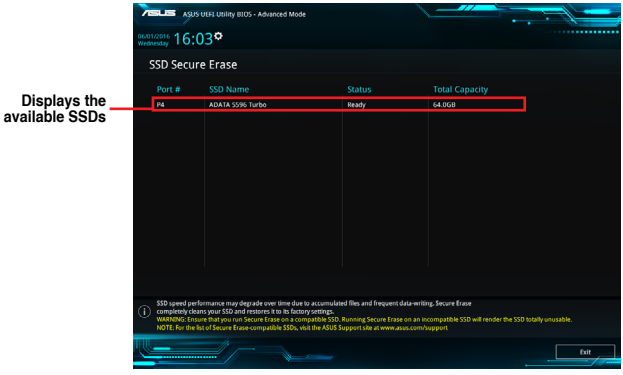
SSD speeds may lower over time as with any storage medium due to data processing. Secure Erase completely and safely cleans your SSD, restoring it to factory performance levels.

Secure Erase is only available in AHCI mode. Ensure to set the SATA mode to AHCI. Click **Advanced** > **PCh Storage Configuration** > **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 **1.2.2 Motherboard layout** of this manual.

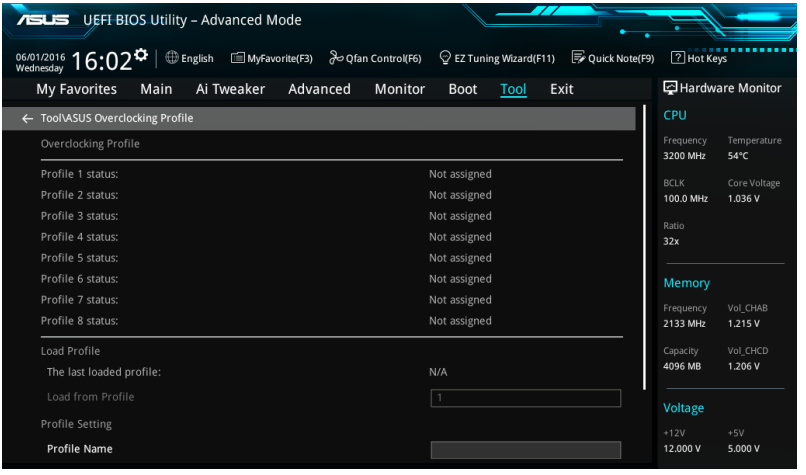


Status definition:

- **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.

3.9.4 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

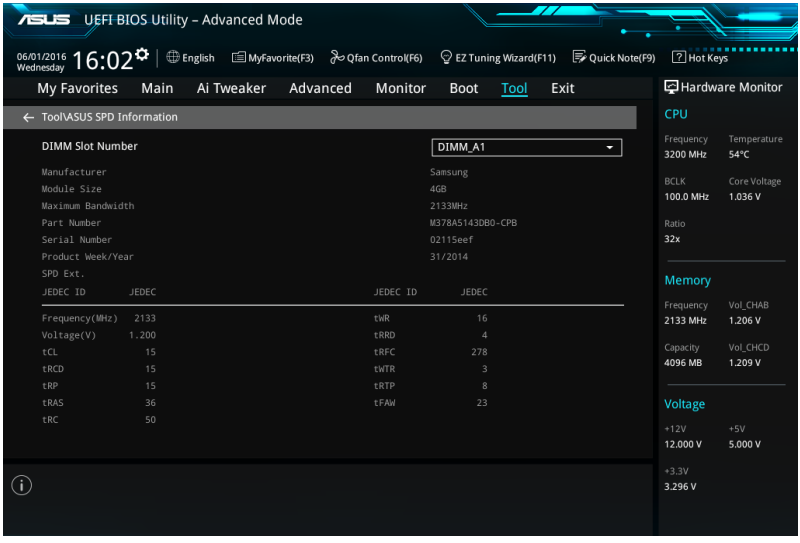
This item allows you to save the current BIOS settings to the BIOS Flash, and create a profile. Key in a profile number from one to eight, press <Enter>, and then select **Yes**.

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.

3.9.5 ASUS SPD Information

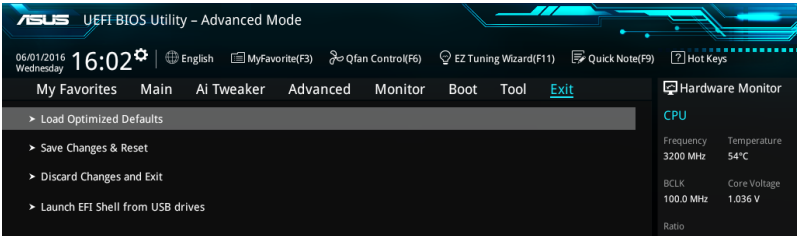
This item allows you to view the DRAM SPD information.



Chapter 3

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

3.11 Updating BIOS

The ASUS website publishes the latest BIOS versions to provide enhancements on system stability, compatibility,and performance. However, BIOS updating is potentially risky. If there is no problem using the current version of BIOS, DO NOT manually update the BIOS. Inappropriate BIOS updating may result to system's failure to boot. Carefully follow the instructions in this chapter to update your BIOS when necessary.

Visit http://www.asus.com to download the latest BIOS file for this motherboard.

The following utilities allow you to manage and update the motherboard BIOS setup program.

1. EZ Update: Updates the BIOS in Windows® environment.
2. ASUS EZ Flash 3: Updates the BIOS using a USB flash drive.
3. ASUS CrashFree BIOS 3: Restores the BIOS using the motherboard support DVD or a USB flash drive when the BIOS file fails or gets corrupted.

3.11.1 EZ Update

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

- EZ Update requires an Internet connection either through a network or an ISP (Internet Service Provider).
- This utility is available in the support DVD that comes with the motherboard package.

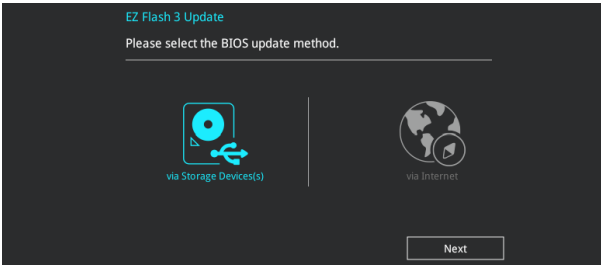
3.11.2 ASUS EZ Flash 3

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

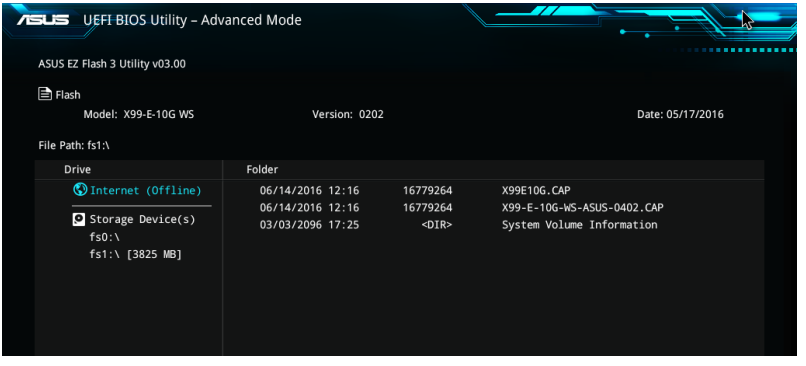
Updating through the Internet varies per region and Internet conditions. Check your local Internet connection before updating through the Internet.

To update the BIOS by USB:

1. Enter the Advanced Mode of the BIOS setup program. Go to the Tool menu to select **ASUS EZ Flash 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.

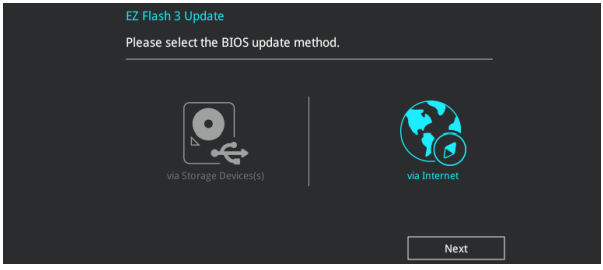


- This function can support devices such as a USB flash disk with FAT 32/16 format and single partition only.
- DO NOT shut down or reset the system while updating the BIOS to prevent system boot failure!

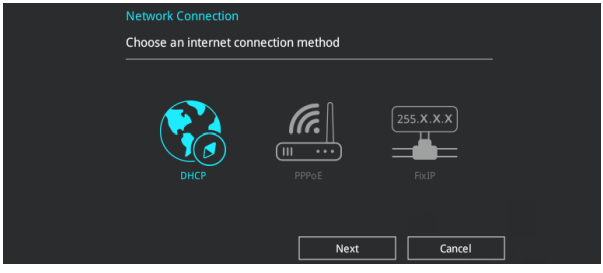
Ensure to load the BIOS default settings to ensure system compatibility and stability. Select the Load Optimized Defaults item under the Exit menu. See section **3.10 Exit Menu** for details.

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 Utility** and press <Enter>.
2. Select **via Internet.**



3. Press the Left/Right arrow keys to select an Internet connection method, and then press <Enter>.



4. Follow the onscreen instructions to complete the update.
5. Reboot the system when the update process is done.

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

3.11.3 ASUS CrashFree BIOS 3

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

The BIOS file in the motherboard support DVD may be older than the BIOS file published on the ASUS official website. If you want to use the newer BIOS file, download the file at https://www.asus.com/support/ and save it to a USB flash drive.

Recovering the BIOS

To recover the BIOS:

1. Turn on the system.
2. Insert the motherboard support DVD to the optical drive, or the USB flash drive containing the BIOS file to the USB port.
3. The utility automatically checks the devices for the BIOS file. When found, the utility reads the BIOS file and enters ASUS EZ Flash 3 automatically.
4. The system requires you to enter BIOS Setup to recover the BIOS setting. To ensure system compatibility and stability, we recommend that you press <F5> to load default BIOS values.

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

Software Support

4

4.1 Installing an operating system

- This motherboard supports 32-bit/64-bit Windows® 7, 32-bit/64-bit Windows® 8.1, and 32-bit/64-bit Windows ®10 operating systems (OS).
- Motherboard settings and hardware options vary. Use the setup procedures presented in this chapter for reference only. Refer to your OS documentation for detailed information.

4.2 Support DVD information

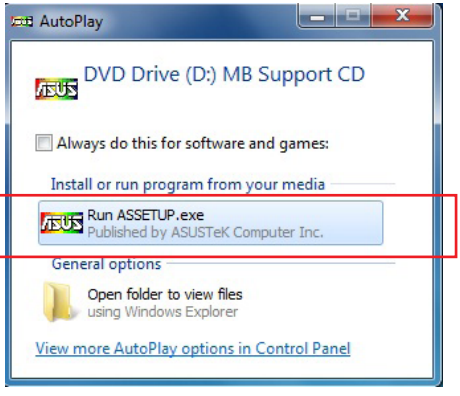
The contents of the support DVD are subject to change at any time without notice. Visit www.asus.com for updates.

4.2.1 Running the support DVD

Ensure that you have an Administrator account before running the support DVD in Windows® 7, Windows® 8.1, or Windows® 10 OS.

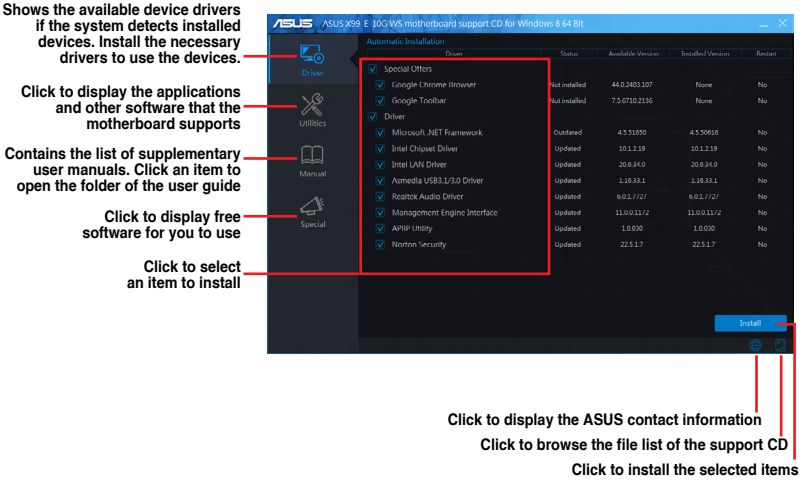
To run the support DVD:

1. Place the Support DVD into the optical drive.
2. In the **AutoPlay** dialog box, click **Run ASSETUP.exe.**



If **Autorun** is NOT enabled in your computer, browse the contents of the support DVD to locate the file **SETUP.EXE** from the **BIN** folder. Double-click the **ASSETUP.EXE** to run the support DVD.

Support DVD main menu



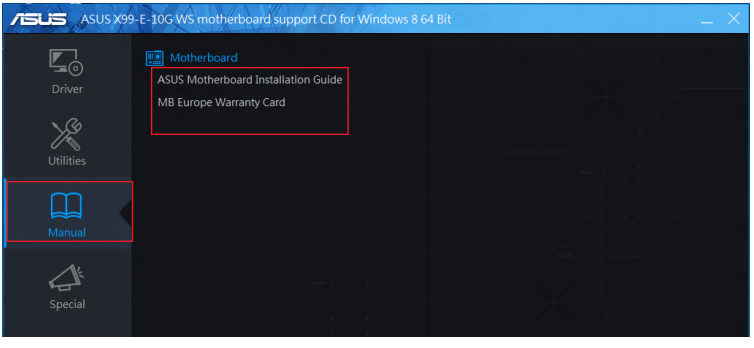
4.2.2 Obtaining the software manuals

The software manuals are included in the support DVD. Follow the instructions below to get the necessary software manuals.

The software manual files are in Portable Document Format (PDF). Install the Adobe® Acrobat® Reader from the **Utilities** tab before opening the files.

To read about your motherboard's software manual:

1. Run the Support DVD.
2. In the Support DVD main menu, click the **Manual** tab.
3. Click the software manual that you wish to read.



Chapter 4

4.3 Software information

Most of the applications in the support DVD have wizards that will conveniently guide you through the installation. View the online help or readme file that came with the software application for more information.

4.4 AI Suite 3

AI Suite 3 is an all-in-one interface that integrates several ASUS utilities and allows you to launch and operate these utilities simultaneously.

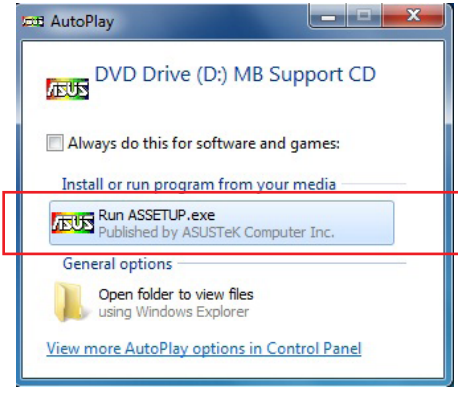
Installing AI Suite 3

Ensure that you have an Administrator account before installing AI Suite 3 in Windows® 7, Windows® 8.1, or Windows® 10 OS.

To install AI Suite 3 on your computer:

Windows® 7 OS

1. Place the Support DVD into the optical drive.
2. In the **AutoPlay** dialog box, click **Run ASSETUP.exe** then select the **Utilities** tab



3. From the **Utilities** tab, check **AI Suite 3** and select **Install,** then follow the succeeding onscreen instructions.

Windows® 8.1 / Windows® 10 OS

1. Place the Support DVD into the optical drive then follow onscreen instructions.
2. From the **ASUS motherboard support DVD** main menu, select the **Utilities** tab and check **AI Suite 3** and select **Install.**
3. Follow the succeeding onscreen instructions.

   If the **ASUS motherboard support DVD** main menu did not appear, try the following steps:

   a. Go to the **Start Screen** then click the **Desktop** app.

   b. On the lower left corner of the Desktop, click **File Explorer**  then select your DVD drive and double-click the **Setup** application.

Launching AI Suite 3

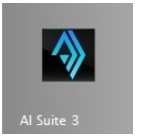
Windows® 7 OS

From the Desktop, click **Start** > **All Programs** > **ASUS** > **AI Suite 3** > **AI Suite 3.**

You can also launch AI Suite 3 in Windows® 7 by clicking  on the Notification area.

Windows® 8.1 / Windows® 10 OS

To launch AI Suite 3 in Windows® 8.1 / Windows® 10, tap the **AI Suite 3** app on the Start Screen (or if you're using a mouse, click the **AI Suite 3** app on the Start screen).

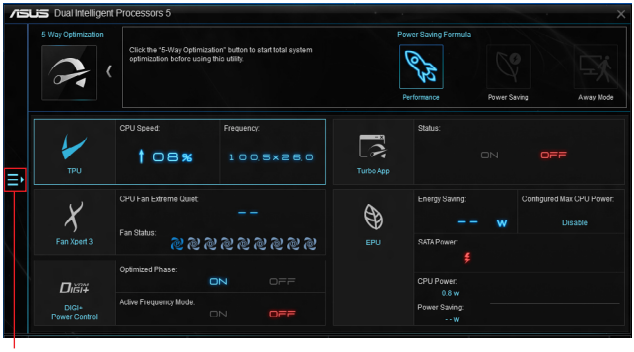


AI Suite 3 Main menu

The AI Suite 3 main menu gives you easy-access controls and insight to what's going on with your computer - allowing you to optimize performance settings while at the same time ensuring system stability.

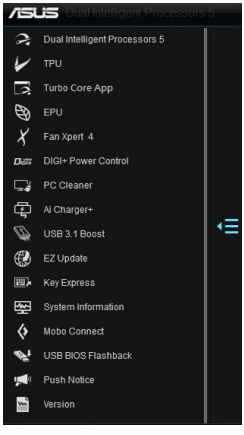
The AI Suite main menu includes is a quick-access menu bar that allows you to swiftly launch any of the integrated ASUS utilities. Click on the left of the menu to launch the menu bar.

The AI Suite 3 screenshots in this section are for reference only and can vary depending on motherboard model..



Click to launch AI Suite 3 menu bar

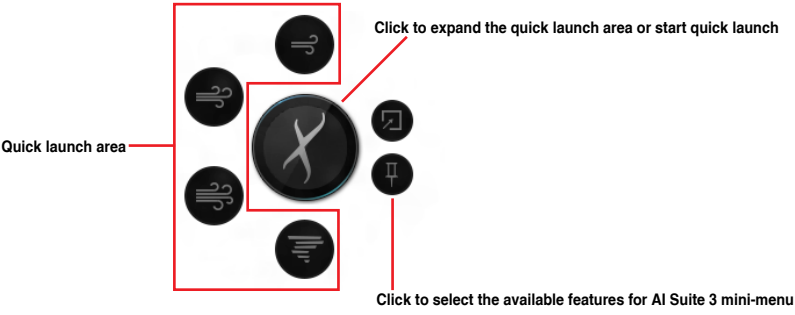
AI Suite 3 main menu bar



- Some functions in the AI Suite 3 main menu in this user guide may vary depending on the motherboard model.
- Refer to the software manual in the support DVD or visit the ASUS website at www.asus.com for detailed software configuration.

AI Suite 3 mini-menu

The AI Suite 3 mini-menu appears on the desktop and can be conveniently accessed and moved around. The AI Suite 3 mini-menu allows you to quickly access the important items in the AI Suite 3.



Chapter 4

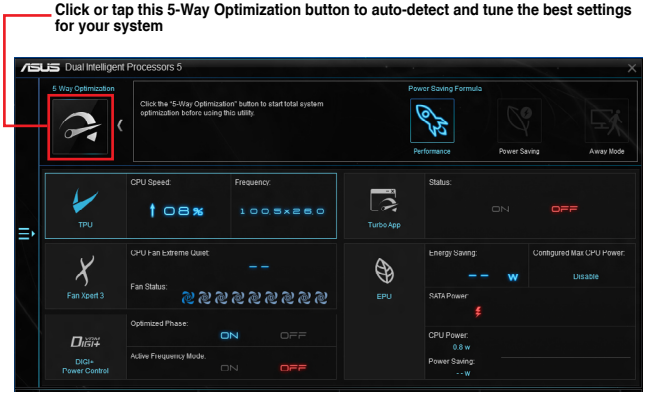
4.4.1 Dual Intelligent Processors 5

ASUS Dual Intelligent Processors 5 combines TPU, EPU, DIGI+ Power Control, Fan Xpert 4, and Turbo App functions to push the system's performance to its optimal potential. It automatically balances the system's performance, power saving, levels, and fan settings via the user-friendly AI Suite 3 utility.

5-Way Optimization

The 5-Way Optimization function dynamically optimizes your PC based on real-time usage to provide the best system status. It covers the essential areas such as CPU performance, energy saving, stable digital power, cool and quiet fan control, and includes tailored settings for your apps to ensure your PC is ready for gaming, entertainment, productivity, or just about anything.

5-Way Optimization screen



DO NOT remove your fan during the tuning process.

4.4.2 TPU (Turbo Processing Unit)

TPU allows you to manually adjust the CPU frequency, core ratio, DRAM frequency, and related voltages for enhanced system stability and performance boost.

Refer to the CPU documentation before adjusting CPU voltage settings. Setting a high voltage may damage the CPU permanently and setting a low voltage may lead to an unstable system.

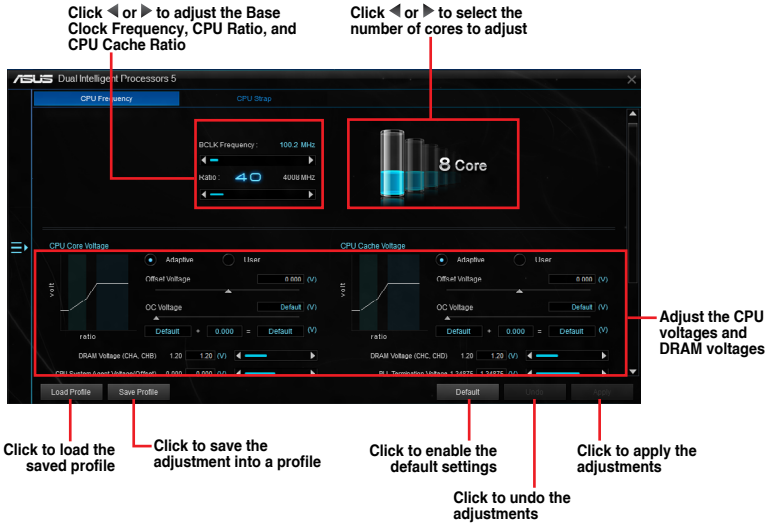
For system stability, the TPU settings are not saved in the BIOS and are not loaded during system bootup. Save your overclocking settings as a TPU profile and manually load this profile after system bootup.

Launching TPU on your computer

To launch TPU, click or tap on the top-right corner of the AI Suite 3 main menu, then select **TPU**.

Using TPU

CPU Frequency

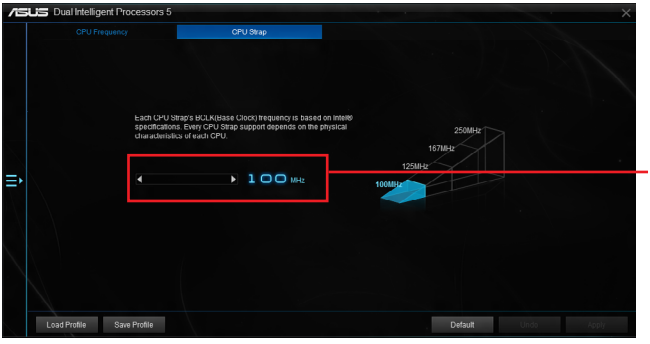


- Set the CPU Core Ratio item in BIOS to **[Auto]** before using the CPU Frequency in TPU. Refer to section **3.5 Ai Tweaker menu** in the BIOS chapter of your motherboard user manual for details.
- The CPU Frequency bars show the status of the CPU cores, which vary with your CPU model.

Chapter 4

CPU Strap

This item allows you to adjust the CPU Strap's BLCK (Base Clock) frequency.



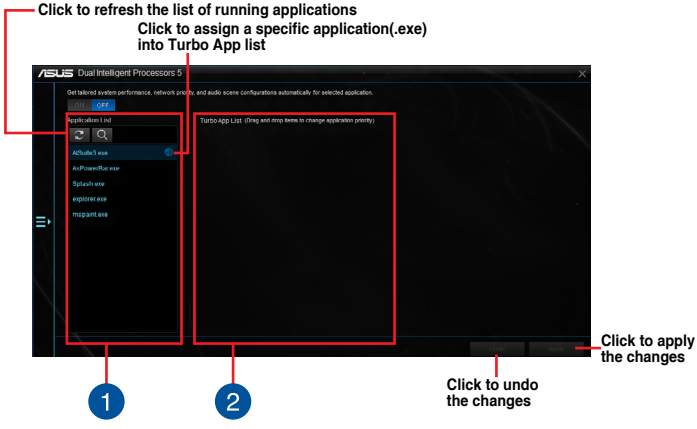
4.4.3 Turbo App

Turbo App allows you customize the system performance, network priority, and audio setting of an application.

When an application is on the Turbo App List, you can allocate the CPU frequency, assign a network priority, and define the audio setting of the selected application.

Launching Turbo App on your computer

To launch Turbo App, click or tap on the top-right corner of the AI Suite 3 main menu, then select **Turbo App**.



1 **Applications list pane**
Displays all the running applications on your system.

2 **Turbo App List pane**
Displays the applications added to the Turbo App List. Click the icon for more settings.

*** Only applications on the Turbo App List can be configured.**

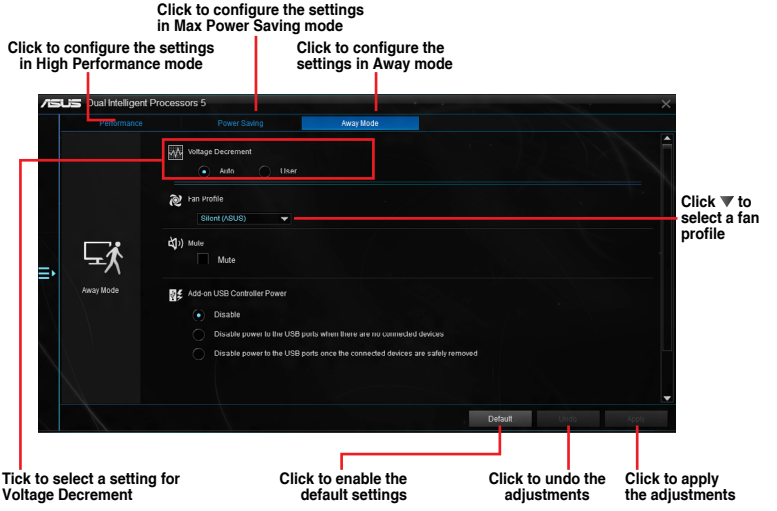
4.4.4 EPU (Energy Processing Unit)

EPU is a real-time system power-saving chip that automatically detects the current system load and intelligently moderates power usage. It offers a total system-wide energy optimization, reduces fan noise, and extends the lifespan of your hardware components.

Launching EPU on your computer

To launch EPU, click or tap on the top-right corner of the AI Suite 3 main menu, then select **EPU**.

Using EPU



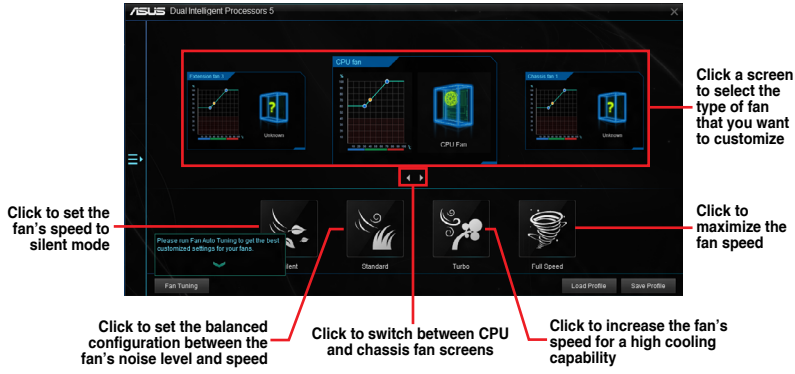
- When you enable Configured Max CPU Power for advanced energy saving condition, the CPU frequency may display 800 MHz in the Windows® OS information of your computer. However, the true CPU frequency varies depending on the wattage that you manually set. You can adjust the CPU wattage from the lowest base on your preferred default value.
- Configured Max CPU Power may decrease the total power delivery to the CPU and affects the CPU performance under system heavy load. To restore your system to its default settings, reboot your computer.

4.4.5 Fan Xpert 4

ASUS Fan Xpert 4 provides customizable settings of your fans for a cooler and quieter computing environment. With its fan Auto Tuning feature, ASUS Fan Xpert 4 automatically tweaks the settings of CPU and chassis fans to achieve their best cooling performance. ASUS Fan Xpert 4 also supports hardware level PWM/DC combo mode for the CPU, chassis fans, and fans connected to the fan extension card. You can also reduce the CPU fan speed below the default minimum for a noiseless operation during light loads.

Launching Fan Xpert 4 on your computer

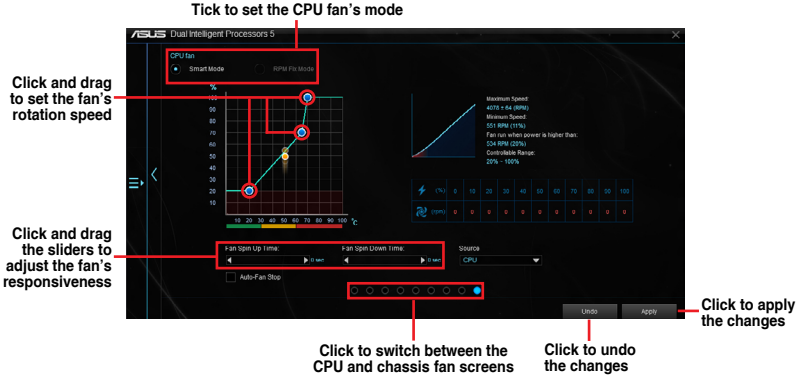
To launch Fan Xpert 4, click or tap on the top-right corner of the AI Suite 3 main menu, then select **Fan Xpert 4**.



Customizing the fan settings

Smart Mode

Smart Mode allows you to customize the fans' rotation speeds and responsiveness based on your system's temperature.

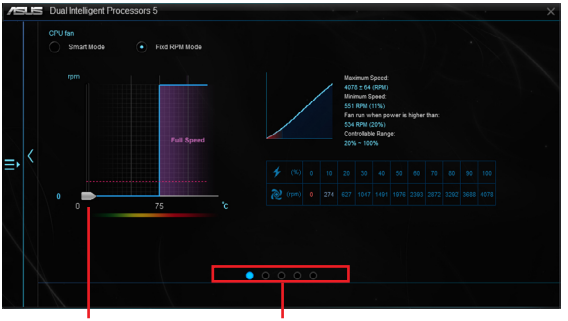


The Extreme Quiet Mode allows you to configure the CPU fan speed control range to its extreme low setting when using a PWM CPU fan.

Chapter 4

RPM Mode

RPM Mode allows you to set the fan speed when the CPU temperature is below 75ºC.



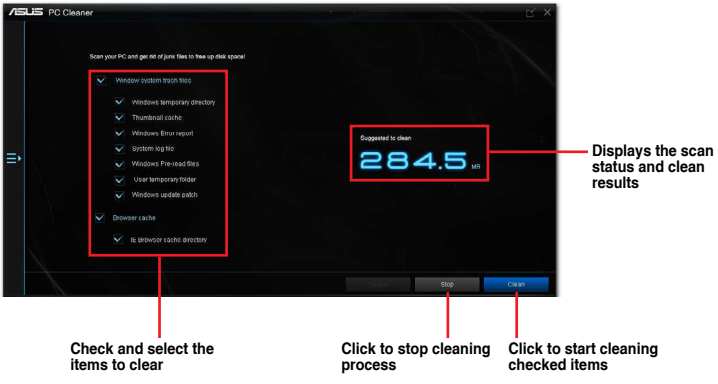
- When the CPU temperature reaches 75ºC, the fan will automatically run at full speed to protect the CPU.
- The Fan Xpert 4 may not be able to detect the fan speed if your fan is installed with an external control kit for rotation speed.
- Fan Xpert 4 does not support 2-pin fans. If you install a 2-pin fan, it can only run at its full speed.
- If the CPU or chassis fans have been changed, the Fan Auto Tuning process should be repeated.

4.4.6 PC Cleaner

PC Cleaner allows you to clean the system junk files by scanning and deleting selected files.

Launching PC Cleaner on your computer

To launch PC Cleaner, click or tap on the top-right corner of the AI Suite 3 main menu, then select **PC Cleaner**.



4.4.7 DIGI+ Power Control

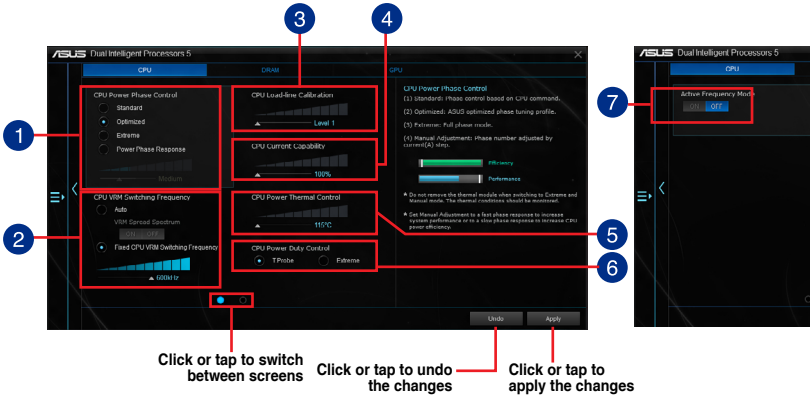
ASUS DIGI+ Power Control features the revolutionary and innovative digital VRM and DRAM Voltage controllers. These controllers offers ultra-precise memory and voltage tuning for optimal system efficiency, stability and performance.

The following screens are for reference only. Configuration options varies depending on the motherboard model.

Launching DIGI+ Power Control on your computer

To launch DIGI+ Power Control, click or tap on the top-right corner of the AI Suite 3 main menu, then select **DIGI+ Power Control**.

Adjusting the CPU Power



1. **CPU Power Phase Control**
   Increase the phase number under a heavy system load to get more transient and better thermal performance. Reduce the phase number under a light system load to increase the VRM efficiency.

2. **CPU VRM Switching Frequency**
   Enables spread spectrum to enhance system stability.

3. **CPU Load-line Calibration**
   It allows you to adjust the voltage range to control the CPU Load-line. Adjust to a high value for system performance or to a low value for power efficiency.

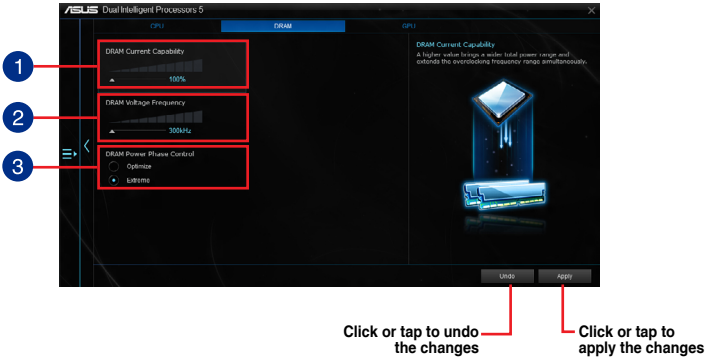
4. **CPU Current Capability**
   CPU Current Capability provides a wider total power range for overclocking. A higher value brings a wider total power range and extends the overclocking frequency range simultaneously.

5. **CPU Power Thermal Control**
   A higher temperature brings a wider CPU power thermal range and extends the overclocking tolerance to enlarge the overclocking potential.

6 **CPU Power Duty Control**
CPU Power Duty Control adjusts the current of every VRM phase and the thermal conditions of every phase component.

7 **Active Frequency Mode**
Active Frequency Mode allows you to enhance the power saving condition of the CPU. Click **ON** to get a quicker transient response while saving the CPU power.

Adjusting the DRAM Power



1 **DRAM Voltage Frequency**
Allows you to adjust the DRAM switching frequency to stabilize the system or to increase the overclocking range.

2 **DRAM Current Capability**
A higher value brings a wider total power range and extends the overclocking frequency range simultaneously.

3 **DRAM Power Phase Control**
Select **Extreme** for full phase mode to increase system performance or select **Optimized** for ASUS optimized phase tuning profile to increase the DRAM power efficiency.

- The actual performance boost may vary depending on your CPU specification.
- Ensure that the cooling modules are properly installed in your motherboard to monitor the thermal conditions.

4.4.8 Ai Charger+

Ai Charger+ allows you to fast-charge your portable BC 1.1* mobile devices on your computer's USB port three times faster than the standard USB devices**.

Ai Charger+ is available only in selected motherboard models.

Launching Ai Charger+ on your computer

To launch Ai Charger+, click or tap on the top-right corner of the AI Suite 3 main menu, then select **Ai Chager+**.

Ai Charger+ screen

- * Check the manufacturer if your USB device is a Battery Charging Specification 1.1 (BC 1.1) compliant or compatible device.
- ** Actual charging speeds may vary depending on the charging rate and specifications of your USB device.
- To ensure normal charging function, disconnect and reconnect your USB device every time you enable or disable Ai Charger+.
- Ai Charger+ does not support USB hubs, USB extension cables, and generic USB cables.

4.4.9 USB 3.1 Boost

USB 3.1 Boost technology supports UASP (USB Attached SCSI Protocol) that automatically speeds up the transfer rates of your USB storage devices.

Launching USB 3.1 Boost on your computer

To launch USB 3.1 Boost, click or tap on the top-right corner of the AI Suite 3 main menu, then select **USB 3.1 Boost**.

Using the USB 3.1 Boost

Ensure to connect your USB 3.0 or 3.1 device to the USB ports that support USB 3.1 Boost. Refer to **2.3.1 Rear I/O connection** section for more details.

- USB 3.1 Boost automatically detects the USB devices that support UASP. For a list of UASP-supported USB devices, visit the ASUS website at www.asus.com.
- The data transfer speed varies with USB devices. For a higher data transfer performance, use a USB 3.1 device.

4.4.10 EZ Update

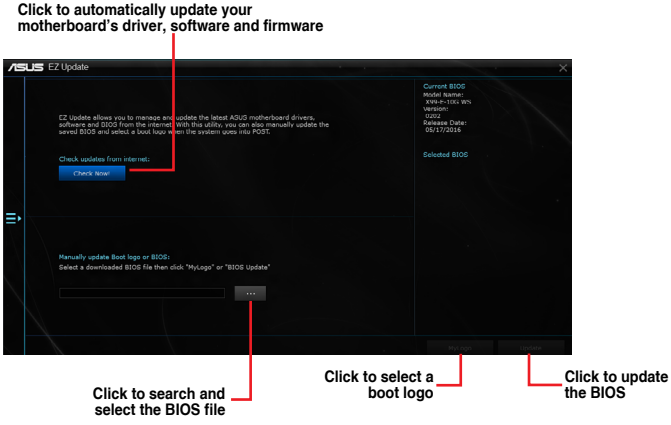
EZ Update is a utility that allows you to automatically update your motherboard's software, drivers, or BIOS.

With this utility, you can also manually update the BIOS and select the boot logo that will display during POST.

Launching EZ Update on your computer

To launch EZ Update, click or tap on the top-right corner of the AI Suite 3 main menu, then select **EZ Update**.

EZ Update screen



4.4.11 System Information

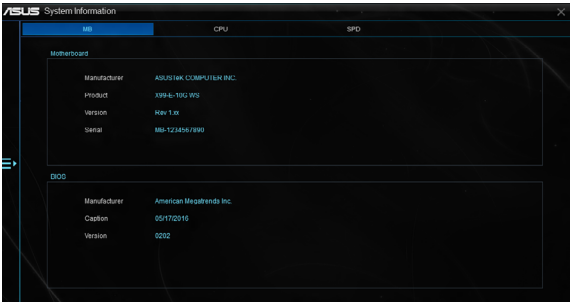
This utility displays the detailed information and settings of the installed motherboard, CPU, and memory.

Launching System Information on your computer

To launch System Information, click or tap on the top-right corner of the AI Suite 3 main menu, then select **System Information**.

Viewing the motherboard information

Click the **MB** tab to view the motherboard's information.



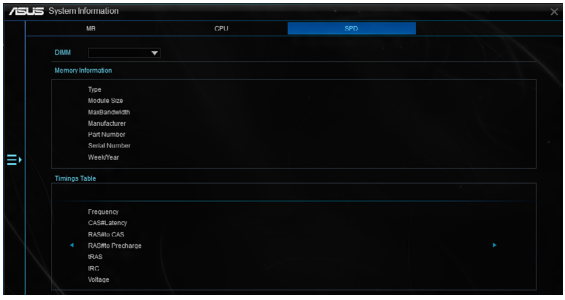
Viewing the CPU information

Click the **CPU** tab to view the processor's information.

Chapter 4

Viewing the SPD information

Click the **SPD** tab to view the memory's information.



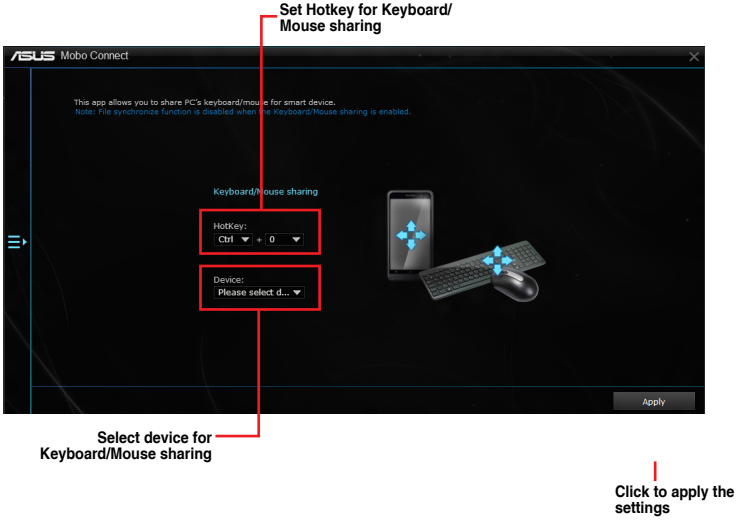
4.4.12 Mobo Connect

Mobo Connect allows you to share the PC's keyboard/mouse for smart devices, or stream audio playback from your smart device yo the PC.

Launching Mobo Connect on your computer

To launch Mobo Connect, click or tap on the top-right corner of the AI Suite 3 main menu, then select **Mobo Connect**.

Mobo Connect screen



4.4.13 USB BIOS Flashback

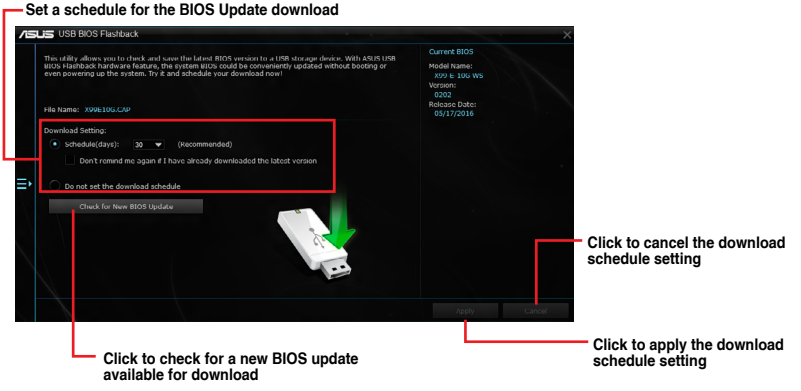
USB BIOS Flashback allows you to check and save the latest BIOS version to a USB storage device. Use this utility to quickly check for the latest available BIOS and set the BIOS download schedule.

Launching USB BIOS Flashback on your computer

To launch USB BIOS Flashback, click or tap on the top-right corner of the AI Suite 3 main menu, then select **USB BIOS Flashback**.

USB BIOS Flashback is available only in selected motherboard models.

Using USB BIOS Flashback



Scheduling the BIOS download

1. In the Download Setting field, tick **Schedule (days)** then select the number of days for the BIOS download schedule.
2. Click **Apply** to save the BIOS download schedule. Click **Cancel** to cancel the download schedule.

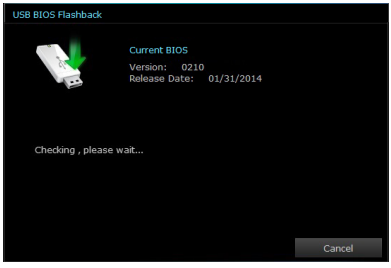
Downloading the latest BIOS

Before you start downloading, ensure that you have installed the USB storage device to your computer's USB port that supports USB BIOS Flashback. Refer to section **2.3.1 Rear I/O connection** of this user guide for more details.

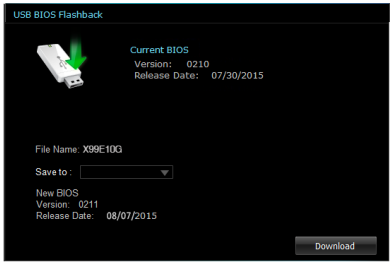
To download the updated BIOS:

1. From the USB BIOS Flashback screen, Click **Check for New BIOS Update**.

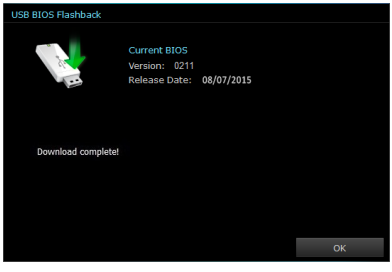
   Wait for the system to check the latest BIOS version.



2. After the utility detects a new BIOS, Click from the Save to: field, select the USB flash drive, then Click **Download**.



3. After the download is complete, Click **OK**.



4.4.14 Push Notice

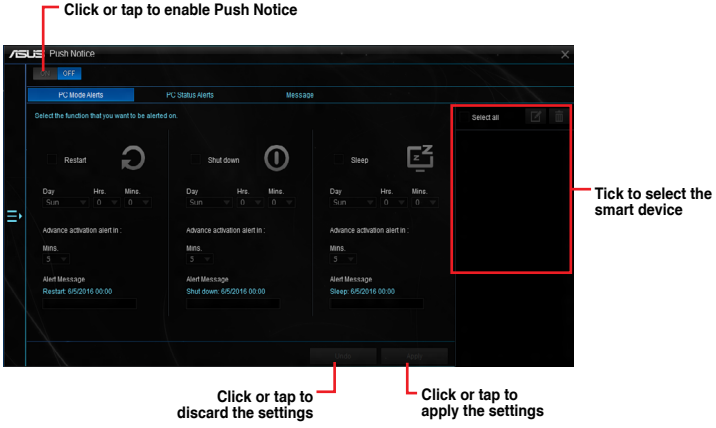
This utility allows you get the detailed status of your system to your smart device. You can also send messages to your smart device using this utility.

Before using this utility, ensure that you pair your computer with your smart device. For pairing information, refer to section **Pairing your computer and smart device**.

Launching Push Notice on your computer

To launch Push Notice, click or tap on the top-right corner of the AI Suite 3 main menu, then select **Push Notice**.

Push Notice screen



You can also enable the Push Notice via the Push Notice shortcut on the lower-right corner of your screen. To do this, click or tap << then click or tap then select .

Pairing your computer and smart device

To pair your computer and smart device:

1. On your smart device, tap Push Notice to launch Push Notice.
2. Tap **Push Scan** then tap the name of your computer that you want to pair with.

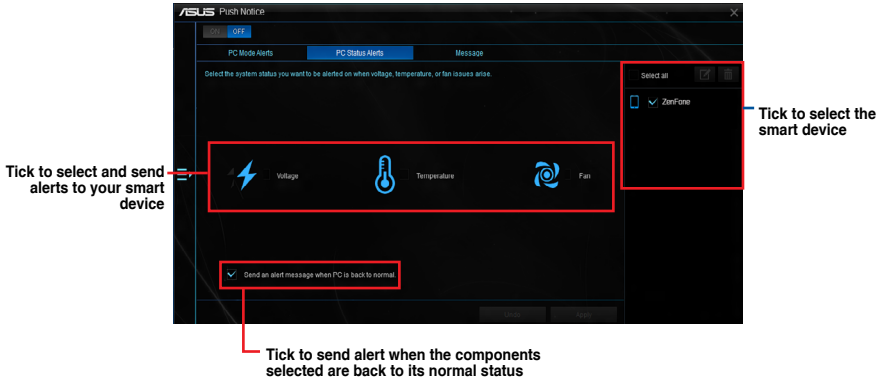
To pair your computer and smart device, ensure that both are connected to the same wireless network.

Setting up PC Mode alerts of your computer

This feature allows you to restart, shut down, or put your computer to sleep mode and sends an alert to your smart device.

Setting up PC Status alerts

This feature allows you to send alerts of the unusual activities of the voltage, temperature, and fan settings of your computer to your smart device.

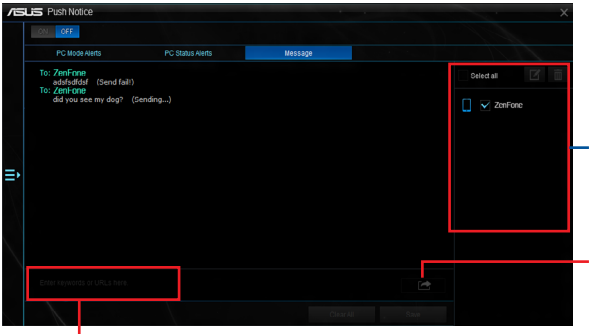


Chapter 4

Sending messages to your smart device

This feature allows you to send messages to your smart device.

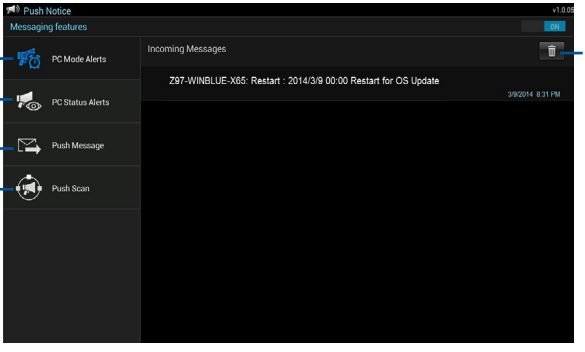
You can also send messages via the Push Notice messaging shortcut on the lower-right corner of your screen. To do this, click or tap << then click or tap  then select  .



Viewing your computer status on your smart device

Tap  on your smart device to launch Push Notice.

Push Notice



Chapter 4

4.5 Audio configurations

The Realtek® audio CODEC provides 8-channel audio capability to deliver the ultimate audio experience on your computer. The software provides Jack-Sensing function, S/PDIF Out support, and interrupt capability. The CODEC also includes the Realtek® proprietary UAJ® (Universal Audio Jack) technology for all audio ports, eliminating cable connection errors, and giving users plug and play convenience.

Follow the installation wizard to install the Realtek® Audio Driver from the support DVD that came with the motherboard package.

If the Realtek® audio software is correctly installed, you will find the Realtek® HD Audio Manager icon on the taskbar. Double-click or tap on the icon to display the Realtek® HD Audio Manager.

Realtek® HD Audio Manager

Realtek® HD Audio Manager with DTS Studio Sound™ for Windows® 10 / Windows® 8.1 / Windows® 7

Chapter 4

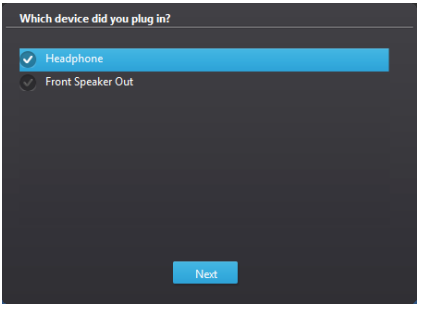
Selecting an audio output

Realtek HD Audio Manager allows you to select the type of audio output depending on the output device that you are using.

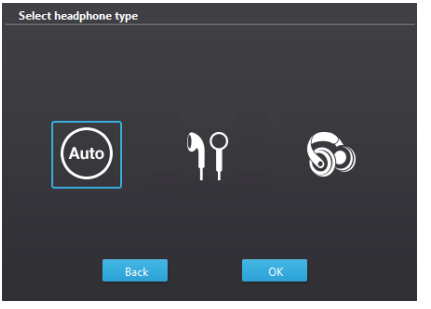
To select an audio output:

1. Insert the audio device's jack to the Line Out (lime) port. If the audio device's jack is already inserted to the corresponding port, Click on the Realtek HD Audio Manager.

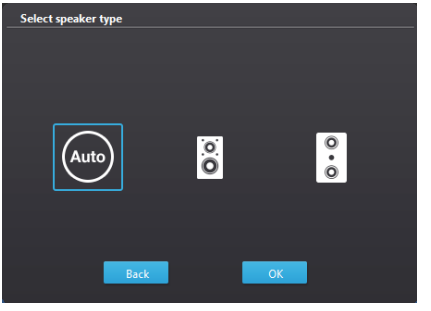
2. On the pop-up window, tick the audio device that you plugged to the Line Out port then Click **Next**.



   a. If you select **Headphone**, Click to select the type of headphone installed then Click **OK**.



   b. If you select **Front Speaker Out,** Click to select the type of speaker installed then Click **OK**.



RAID Support

5

Windows® 10 32-bit does not support RAID.

5.1 RAID configurations

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

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 **5.2 Creating a RAID driver disk** for details.

5.1.1 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.

5.1.2 Installing Serial ATA hard disks

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

To install the SATA hard disks for a RAID configuration:

1. Install the SATA hard disks into the drive bays.
2. Connect the SATA signal cables.
3. Connect a SATA power cable to the power connector on each drive.

5.1.3 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 Controller Mode Selection item to **[RAID Mode]**.
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.

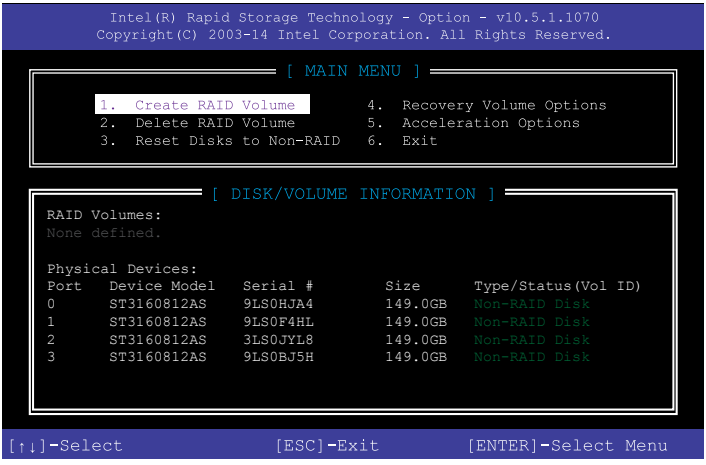
Refer to Chapter 3 for details on entering and navigating through the BIOS Setup

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

5.1.4 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.

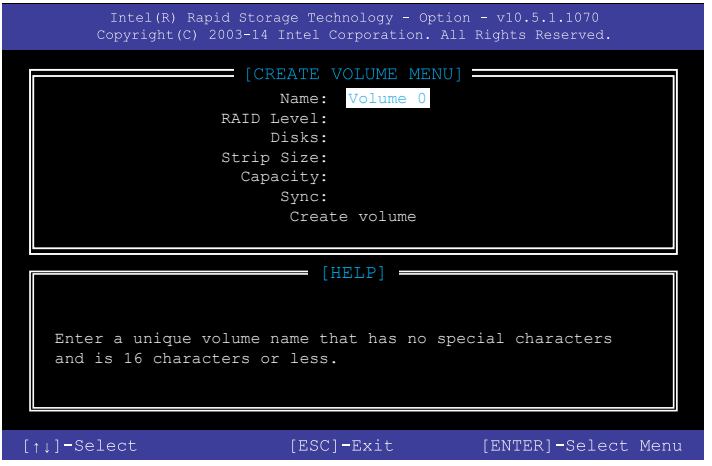
The RAID BIOS setup screens shown in this section are for reference only and may not exactly match the items on your screen.

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

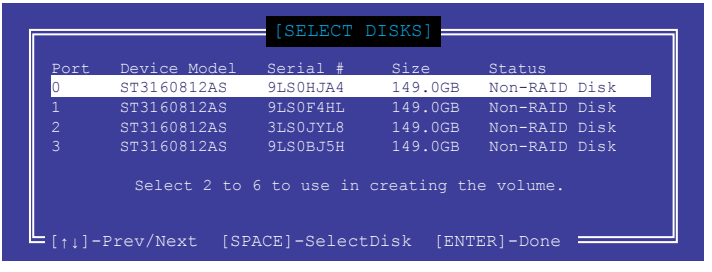
Creating a RAID set

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 4KB to 128KB. The following are typical values:

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

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:

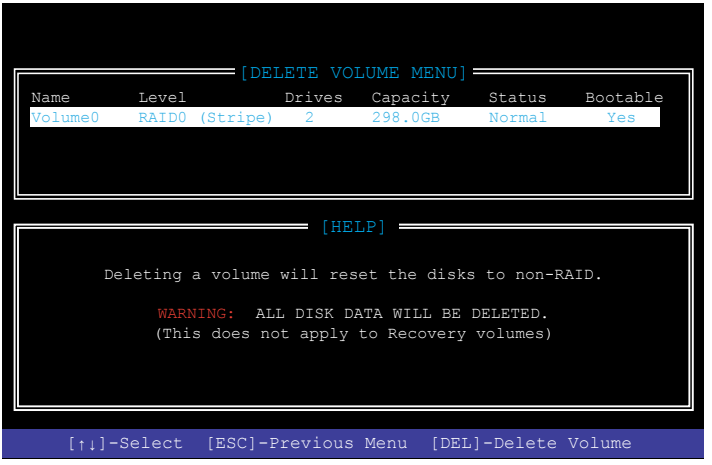
9. Press <Y> to create the RAID volume and return to the main menu, or <N> to go back to the **CREATE VOLUME** menu.

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:



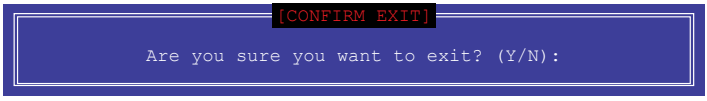
2. Use the up/down arrow key to select the RAID set you want to delete, and then press <Delete>. The following warning message appears:

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 **5. Exit**, then press <Enter>. The following warning message appears:



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

5.2 Creating a RAID driver disk

5.2.1 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 support USB drive with RAID driver into the USB port, 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.

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

Multiple GPU Support

6

6.1 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.

6.1.1 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 at 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 at http://game.amd.com for the latest certified graphics card and the supported 3D application list.

6.1.2 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:

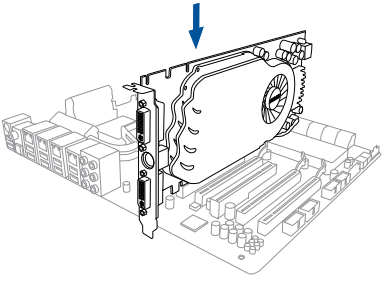
1. Close all current applications.
2. Go to **Control Panel > Programs and Features**.
3. Select your current graphics card driver/s.
4. Select **Uninstall**.
5. Turn off your computer.

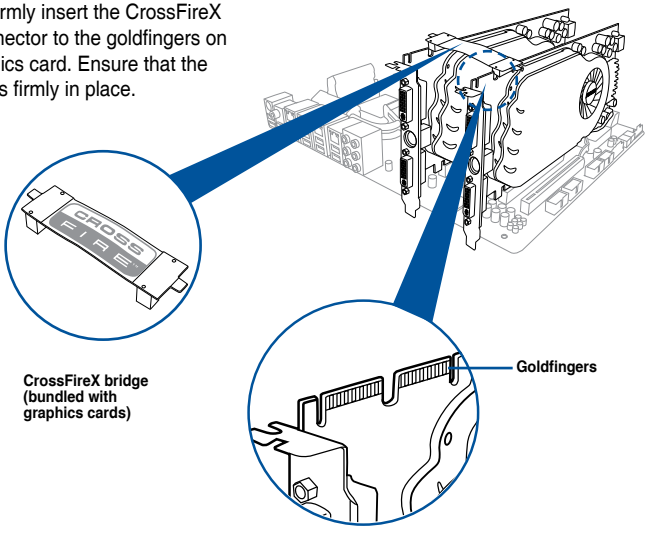
6.1.3 Installing two CrossFireX™ graphics cards

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.





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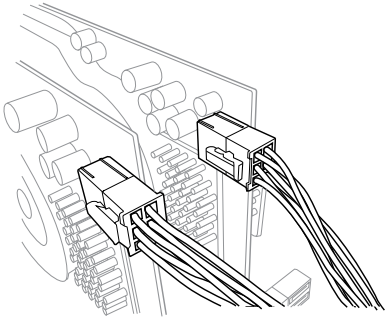
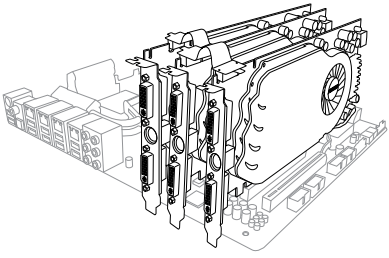
5. Connect two independent auxiliary power sources from the power supply to the two graphics cards separately.
6. Connect a VGA or a DVI cable to the graphics card.



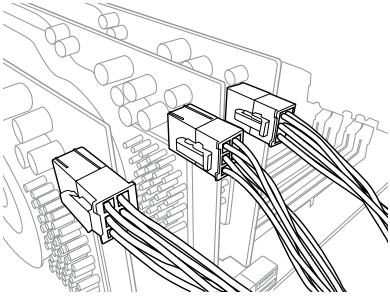
6.1.4 Installing three CrossFireX™ graphics cards

To install three CrossFire™ graphics cards:

1. Prepare three CrossFireX-ready graphics cards.
2. Insert the three graphics card into the PCIEX16 slots. If your motherboard has more than three 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 two CrossFireX™ bridge connectors to the goldfingers on each graphics card. Ensure that the connectors are firmly in place.



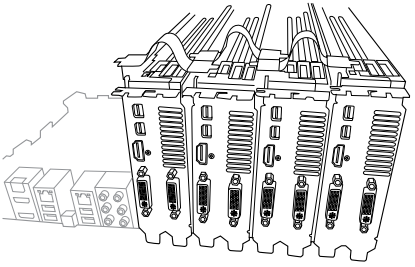
5. Connect three independent auxiliary power sources from the power supply to the three graphics cards separately.
6. Connect a VGA or a DVI cable to the graphics card.



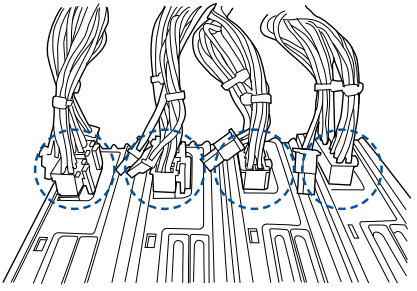
6.1.5 Installing four CrossFireX™ graphics cards

To install four CrossFire™ graphics cards:

1. Prepare four CrossFireX-ready graphics cards.
2. Insert the four graphics cards into the 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 three CrossFireX bridge connectors to the goldfingers on each graphics card. Ensure that the connectors are firmly in place.



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



Chapter 6

6.1.6 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.

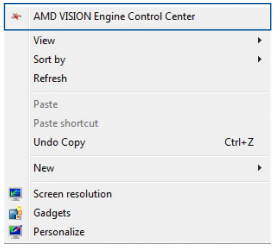
6.1.7 Enabling the AMD® CrossFireX™ technology

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:

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

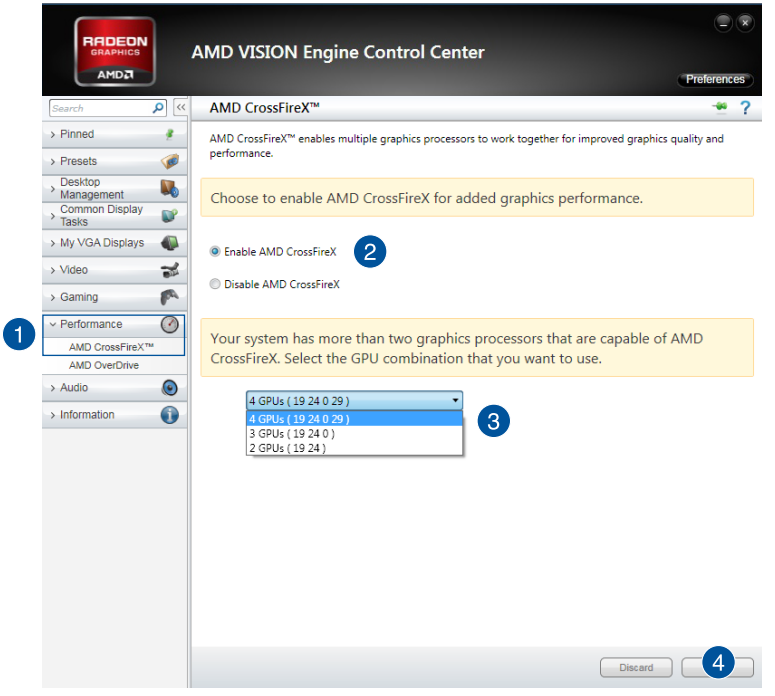


Chapter 6

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.



6.2 NVIDIA® SLI® technology

The motherboard supports the NVIDIA® SLI® (Scalable Link Interface) technology that allows you to install multi-graphics processing units (GPU) graphics cards. Follow the installation procedures in this section.

6.2.1 Requirements

- In SLI mode, you should have two identical SLI-ready graphics cards that are NVIDIA® certified.
- Ensure that your graphics card driver supports the NVIDIA SLI technology. Download the latest driver from the NVIDIA website at www.nvidia.com.
- Ensure that your power supply unit (PSU) can provide at least the minimum power required by your system.

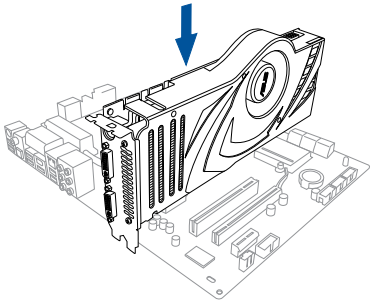
- We recommend that you install additional chassis fans for better thermal environment.
- Visit the NVIDIA zone website at http://www.nzone.com for the latest certified graphics card and supported 3D application list.

6.2.2 Installing two SLI-ready graphics cards

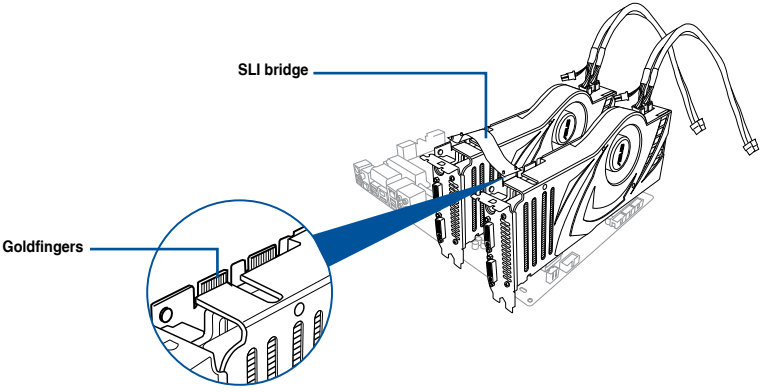
The following pictures are for reference only. The graphics cards and the motherboard layout may vary with models, but the installation steps remain the same.

To install two SLI-ready graphics cards:

1. Prepare two SLI-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 SLI bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.
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.

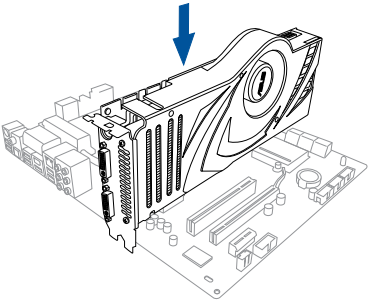


6.2.3 Installing three SLI-ready graphics cards

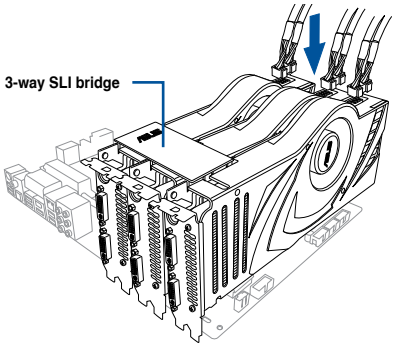
Refer to the documentation that came with your graphics card package to install the device drivers.

To install three SLI-ready graphics cards:

1. Prepare three SLI-ready graphics cards.
2. Insert the three graphics cards into the PCIEX16 slots. If your motherboard has more than two PCIEX16 slots, refer to Chapter 1 in this user manual for locations of the PCIEX16 slots recommended for multi-graphics card installation.
3. Ensure that the cards are properly seated on the slots.



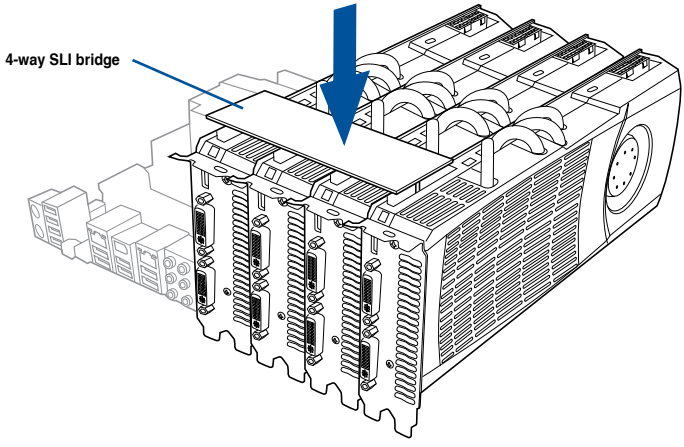
4. Align and firmly insert the 3-way SLI bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.
5. Connect three independent auxiliary power sources from the power supply to the three graphics cards separately.
6. Connect a VGA or a DVI cable to the graphics card.



6.2.4 Installing four SLI-ready graphics cards

To install four SLI-ready graphics cards:

1. Prepare four SLI-ready graphics cards.
2. Insert the four graphics cards 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 4-way SLI bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.
5. Connect four independent auxiliary power sources from the power supply to the four graphics cards separately.
6. Connect a VGA or a DVI cable to the graphics card.



6.2.5 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 NVIDIA® SLI® technology. Download the latest driver from the NVIDIA website at www.nvidia.com.

6.2.6 Enabling the NVIDIA® SLI® technology

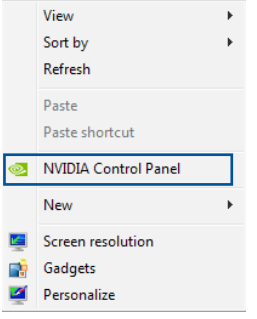
After installing your graphics cards and the device drivers, enable the SLI feature in NVIDIA® Control Panel under the Windows® 7 operating system.

Launching the NVIDIA Control Panel

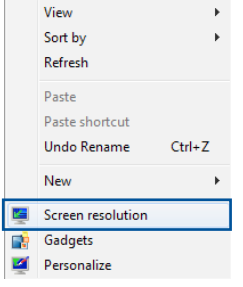
You can launch the NVIDIA Control Panel by the following two methods:

A. Right click on the empty space of the Windows® desktop and select **NVIDIA Control Panel**.

The NVIDIA Control Panel window appears (See Step B3).

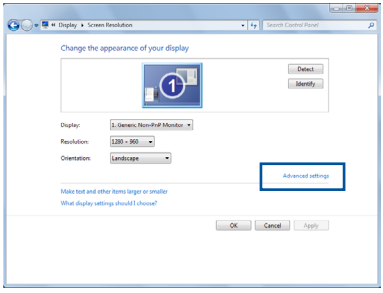


B1. If you cannot see the NVIDIA Control Panel item in step (A), select **Screen Resolution**.

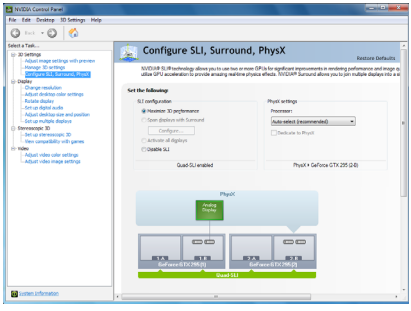


Chapter 6

B2. From the Screen Resolution window, click **Advanced settings**.

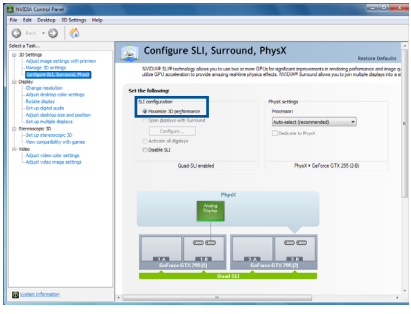


B3. The NVIDIA Control Panel window appears.



Enabling SLI settings

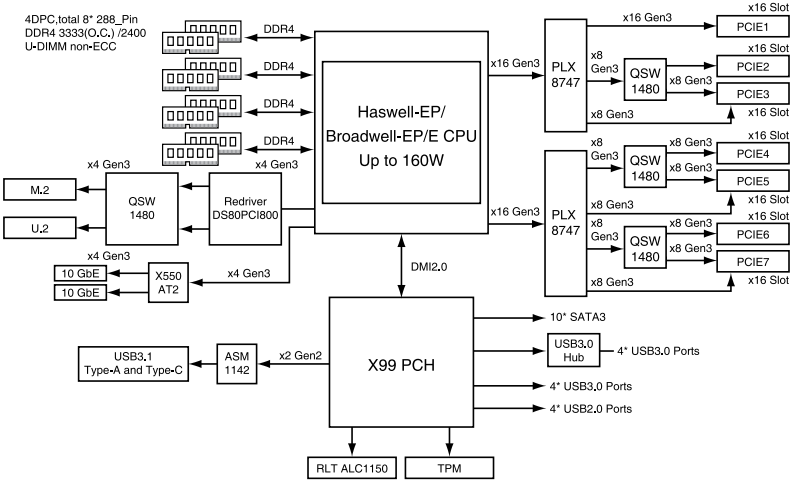
From the NVIDIA Control Panel window, select **Configure SLI**, **Surround**, **PhysX**. In the **Quad-SLI enabled**, click **Maximize 3D Performance SLI** to set the display for viewing SLI rendered content. When done, click **Apply**.



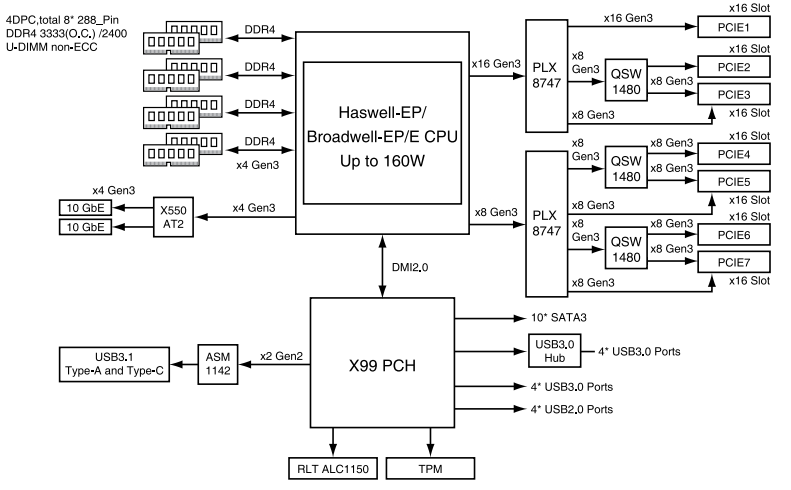
Appendix

X99-E-10G WS block diagram

40-lane CPU



28-lane CPU



Notices

Federal Communications Commission Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- 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 to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The use of shielded cables for connection of the monitor to the graphics card is required to assure compliance with FCC regulations. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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

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

CAN ICES-3(B)/NMB-3(B)

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

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

CAN ICES-3(B)/NMB-3(B)

VCCI: Japan Compliance Statement

Class B ITE

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

取扱説明書に従って正しい取り扱いをして下さい。

ＶＣＣＩ－Ｂ

KC: Korea Warning Statement

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

*당해 무선설비는 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없습니다.

Appendix

REACH

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

RF Equipment Notices

CE: European Community Compliance Statement

The equipment complies with the RF Exposure Requirement 1999/519/EC, Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0–300 GHz). This wireless device complies with the R&TTE Directive.

Wireless Radio Use

This device is restricted to indoor use when operating in the 5.15 to 5.25 GHz frequency band.

Exposure to Radio Frequency Energy

The radiated output power of the Wi-Fi technology is below the FCC radio frequency exposure limits. Nevertheless, it is advised to use the wireless equipment in such a manner that the potential for human contact during normal operation is minimized.

FCC Bluetooth Wireless Compliance

The antenna used with this transmitter must not be co-located or operated in conjunction with any other antenna or transmitter subject to the conditions of the FCC Grant.

Bluetooth Industry Canada Statement

This Class B device meets all requirements of the Canadian interference-causing equipment regulations.

Cet appareil numérique de la Class B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

NCC: Taiwan Wireless Statement

無線設備的警告聲明
經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更射頻、加大功率或變更原設計之特性及功能。低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信指依電信法規定作業之無線通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

於 5.25GHz 至 5.35GHz 區域內操作之
無線設備的警告聲明
工作頻率 5.250 ～ 5.350GHz 該頻段限於室內使用。

Japan RF Equipment Statement

屋外での使用について

本製品は、5GHz帯域での通信に対応しています。電波法の定めにより5.2GHz、5.3GHz帯域の電波は屋外で使用が禁じられています。

法律および規制遵守

本製品は電波法及びこれに基づく命令の定めるところに従い使用してください。日本国外では、その国の法律または規制により、本製品の使用ができないことがあります。このような国では、本製品を運用した結果、罰せられることがありますが、当社は一切責任を負いかねますのでご了承ください。

Google™ License Terms

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Română ASUSTeK Computer Inc. declară că acest dispozitiv se conformează cerințelor esențiale și altor prevederi relevante ale directivelor conexe. Textul complet al declarației de conformitate a Uniunii Europene se găsește la: www.asus.com/support

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

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

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

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

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

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

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

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

ASUS contact information

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Web site	https://www.asus.com

Technical Support

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Fax	+86-21-5866-8722, ext. 9101#
Online support	https://www.asus.com/support/Product/ContactUs/Services/questionform/?lang=en

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Fax	+1-510-608-4555
Web site	https://www.asus.com/us/

Technical Support

Support fax	+1-812-284-0883
Telephone	+1-812-282-2787
Online support	https://www.asus.com/support/Product/ContactUs/Services/questionform/?lang=en-us

ASUS COMPUTER GmbH (Germany and Austria)

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Fax	+49-2102-959931
Web site	https://www.asus.com/de

Technical Support

Telephone	+49-2102-5789555
Support Fax	+49-2102-959911
Online support	https://www.asus.com/support/Product/ContactUs/Services/questionform/?lang=de-de

DECLARATION OF CONFORMITY

Per FCC Part 2 Section 2. 1077(a)

Responsible Party Name: **Asus Computer International**

Address: **800 Corporate Way, Fremont, CA 94539.**

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

hereby declares that the product

Product Name : Motherboard

Model Number : X99-E-10G WS

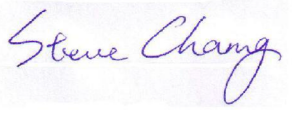
Conforms to the following specifications:

☒ FCC Part 15, Subpart B, Unintentional Radiators

Supplementary Information:

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

Representative Person's Name : **Steve Chang / President**

Signature : 

Date : **May. 27, 2016**

Ver. 140331

Appendix