SABERTOOTH
Z170 S

Motherboard

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Contents

Safety information

Electrical safety

- To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.

- When adding or removing devices to or from the system, ensure that the power cables for the devices are unplugged before the signal cables are connected. If possible, disconnect all power cables from the existing system before you add a device.

- Before connecting or removing signal cables from the motherboard, ensure that all power cables are unplugged.

- Seek professional assistance before using an adapter or extension cord. These devices could interrupt the grounding circuit.

- Ensure that your power supply is set to the correct voltage in your area. If you are not sure about the voltage of the electrical outlet you are using, contact your local power company.

- If the power supply is broken, do not try to fix it by yourself. Contact a qualified service technician or your retailer.

Operation safety

- Before installing the motherboard and adding devices on it, carefully read all the manuals that came with the package.

- Before using the product, ensure all cables are correctly connected and the power cables are not damaged. If you detect any damage, contact your dealer immediately.

- To avoid short circuits, keep paper clips, screws, and staples away from connectors, slots, sockets and circuitry.

- Avoid dust, humidity, and temperature extremes. Do not place the product in any area where it may become wet.

- Place the product on a stable surface.

- If you encounter technical problems with the product, contact a qualified service technician or your retailer.

About this guide

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

How this guide is organized

This guide contains the following parts:

- **Chapter 1: Product Introduction**

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

- **Chapter 2: Basic Installation**

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

- **Chapter 3: BIOS Setup**

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

- **Chapter 4: Software support**

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

- **Chapter 5: RAID support**

    This chapter describes the RAID configurations.

Where to find more information

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

1. **ASUS websites**

    The ASUS website provides updated information on ASUS hardware and software products. Refer to the ASUS contact information.

2. **Optional documentation**

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

Conventions used in this guide

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

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

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

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

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

Typography

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

SABERTOOTH Z170 S specifications summary

CPU	LGA1151 socket for 6th Generation Intel® Core™ i7/ i5/ i3/ Pentium® / Celeron® Processors
	Supports 14nm CPU
	Supports Intel® Turbo Boost Technology 2.0*
	* The support of these features depends on the CPU types.
	** Refer to www.asus.com for the complete CPU support list.
Chipset	Intel® Z170 Express Chipset
Memory	4 x DIMM, max. 64GB, DDR4 2400/2133 MHz, non-ECC, un-buffered memory
	Dual channel memory architecture
	Supports Intel® Extreme Memory Profile (XMP)
	* Hyper DIMM support is subject to the physical characteristics of individual CPUs. Please refer to Memory QVL (Qualified Vendors List) for details.
	** Refer to www.asus.com or this user guide for the complete Memory QVL (Qualified Vendors List).
Expansion slots	2 x PCI Express 3.0/2.0 x16 slots (single at x16 or dual at x8/x8 mode)
	1 x PCI Express 3.0/2.0 x16 slot* (max. at x4 mode, compatible with PCIe x1, x2 and x4 devices)
	3 x PCI Express 3.0/2.0 x1 slots
	* The PCIe x16_3 slot shares bandwidth with SATA6G_56. The PCIe x16_3 is default set at x2 mode.
VGA	Integrated Graphics Processor- Intel® HD Graphics support
	Multi-VGA output support: DisplayPort/HDMI port
	Supports DisplayPort 1.2* with max. resolution 4096 x 2160@24Hz / 3840 x 2160@60Hz
	Supports HDMI 1.4b with max. resolution 4096 x 2160@24Hz / 2560 x 1600@60Hz
	Supports Intel® InTru™ 3D/Quick Sync Video/Clear Video HD Technology/Insider™
	Maximum shared memory of 1024MB
	* DP 1.2 Multi-Stream Transport compliant, supports DP 1.2 monitor daisy chain up to 3 displays
Multi-GPU support	Supports NVIDIA® 2-Way/Quad-GPU SLI™ Technology (with 2 PCIex16 graphics card)
	Supports AMD® 3-Way/Quad-GPU CrossFireX™ Technology
LAN	Gigabit Intel LAN connection- 802.3az Energy Efficient Ethernet (EEE) appliance
	Intel® I219-V Gigabit LAN- Dual interconnect between the integrated Media Access Controller (MAC) and physical layer (PHY)
	TUF LANGuard
	ASUS Turbo LAN Utility

(continued on the next page)

SABERTOOTH Z170 S specifications summary

Storage	**Intel® Z170 Express Chipset with RAID 0, 1, 5, 10 and Intel Rapid Storage Technology 14 support*** - 2 x SATA Express ports (compatible with 4 x SATA 6.0 Gb/s ports) - 1 x M.2 Socket 3 with M Key, type 2242/2260/2280/22110 storage devices support (both SATA & PCIE mode)** - 6 x SATA 6.0 Gb/s ports (4 from SATA Express) - Supports Intel® Smart Response Technology*** ***** **Supports PCIE RAID configurations via onboard M.2 and PCIEX16_3 slot storages.** ****** **The M.2 socket shares SATA ports with SATA Express_1 port. Adjust BIOS settings to use an M.2 SATA device.** ******* **These functions will work depending on the CPU installed.**
Audio	**Realtek® ALC1150 8-Channel High Definition Audio CODEC** - Audio shielding ensures precision analog/digital separation and greatly reduced multi-lateral interference - Separate layer for left and right track, ensuring both sound deliver equal quality - Top notch audio sensation delivers according to the audio configuration - Audio Amplifier to enhance the highest quality sound for headphone and speakers - 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 - Supports Jack-Detection, Multi-streaming, and Front Panel Jack-Retasking - Optical S/PDIF out port at back I/O
USB	**Intel® Z170 Express Chipset supports ASUS USB 3.1 Boost** - 6 x USB 3.0/2.0 ports (4 ports @mid-board, 2 port @back panel, blue) - 8 x USB 2.0/1.1 ports (4 ports @mid-board, 4 port @back panel, black) **ASMedia® USB 3.1 controller supports ASUS USB 3.1 Boost and 3A power output** - 1 x USB 3.1/3.0/2.0 port @back panel (teal blue, Type A) - 1 x USB 3.1/3.0/2.0 port @back panel (Type C)

(continued on the next page)

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Exclusive TUF Features	**"Ultimate COOL!" Thermal Solution**
	- TUF Thermal Radar 2
	- TUF ICe
	"TUF ENGINE!" Power Design
	- 8+4 Digital Phase Power Design
	- TUF Components (10K Ti-Cap, TUF Alloy Chokes & MOSFET; certified by military-standard)
	- ASUS DIGI+ Power Control Utility
	"Safe & Stable!" Guardian Angel
	- TUF Detective 2
	- TUF ESD Guards 2
	- TUF LANGuard
	- MemOK!
Other Special Features	- USB 3.1 Boost featuring speedy USB 3.1 transmission
	- USB BIOS Flashback with USB BIOS Flashback Wizard for EZ BIOS download scheduling
	- ASUS UEFI BIOS EZ Mode featuring friendly graphics user interface
	- Turbo LAN to experience smooth online gaming with lower pings and less lags
	- AI Suite 3
	- ASUS Q-Connector
	- ASUS Q-Shield
	- ASUS Q-LED (CPU, DRAM, VGA, Boot Device LED)
	- ASUS Q-Slot
	- ASUS Q-DIMM
	- ASUS O.C. Profile
	- ASUS CrashFree BIOS 3
	- EZ Update
	- ASUS EZ Flash 3
	- Multi-language BIOS

SABERTOOTH Z170 S specifications summary

Back Panel I/O Ports	1 x DisplayPort
	1 x HDMI port
	1 x TUF Detective USB port
	1 x USB BIOS Flashback Button
	1 x Optical S/PDIF out
	1 x LAN (RJ45) ports
	1 x USB 3.1/3.0/2.0 ports (teal blue, Type A)
	1 x USB 3.1/3.0/2.0 ports (Type C)
	2 x USB 3.0/2.0 ports (blue, one port can be switched to USB BIOS Flashback)
	4 x USB 2.0/1.1 ports
	8-channel Audio I/O ports (5 x Audio jacks)
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 2242/2260/2280/22110 devices)
	2 x SATA Express connectors
	6 x SATA 6.0Gb/s connectors (4 x gray, from SATA Express ports; 2 x black)
	1 x CPU Fan connector (4-pin) for both 3-pin (DC mode) and 4-pin (PWM mode) CPU coolers control with auto detection support [Beige]
	1 x CPU OPT Fan connector (4-pin)
	1 x Water Pump header (4-pin)
	6 x Chassis Fan connectors (4-pin) for both 3-pin (DC mode) and 4-pin (PWM mode) coolers control
	2 x Assistant Fan connectors (1 x 3-pin, 1 x 4-pin)
	1 x Front panel audio connector (AAFP)
	1 x S/PDIF out header
	1 x Thunderbolt header (5-pin) for ASUS ThunderboltEX series support
	1 x TPM connector
	1 x 24-pin EATX Power connector
	1 x 8-pin EATX 12V Power connector
	1 x System Panel (Q-Connector)
	1 x MemOK! button
	1 x Clear CMOS header
	1 x DRCT(Direct Key) header
	3 x T_Sensor (Thermal Sensor) headers
	1 x 5-pin EXT_FAN (Extension Fan) connector

(continued on the next page)

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BIOS Features	128 Mb Flash ROM, UEFI AMI BIOS, PnP, DMI3.0, WfM2.0, SM BIOS 3.0, ACPI 5.0, Multi-language BIOS, ASUS EZ Flash 3, CrashFree BIOS 3, F11 EZ Tuning Wizard, F6 Qfan Control, F3 My Favorites, Quick Note, Last Modified log, F12 PrintScreen and ASUS DRAM SPD (Serial Presence Detect) memory information
Manageability	WfM 2.0, DMI 3.0, WOL by PME, PXE
Support DVD contents	Drivers
	ASUS Utilities
	EZ Update
	Anti-virus software (OEM version)
Operating System Support	Windows® 10*
	Windows® 8.1*
	Windows® 7
	*64-bit supported only
Form factor	ATX Form Factor, 12"x 9.6" (30.5 cm x 24.4 cm)

Specifications are subject to change without notice.

Package contents

Check your motherboard package for the following items:
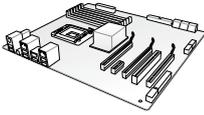
**ASUS SABERTOOTH Z170 S
motherboard**

**Technical documentations,
certification and warranty card**
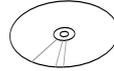
Support DVD
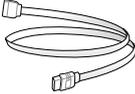
4 x Serial ATA 6.0 Gb/s cables

**1 x ASUS SLI™ bridge connector
(7 cm)**
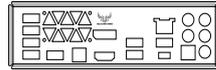
1 x ASUS Q-Shield

1 x ASUS Q-Connector kit

1 x CPU Installation Tool

1 x M.2 screws set
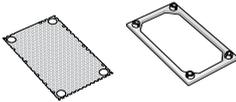
**1 x back I/O dust frame
1 x back I/O dust grid**

• 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
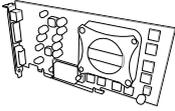
Graphics card (optional)

Phillips (cross) screwdriver

PC chassis

Power supply unit

Intel® LGA1151 CPU

Intel® LGA1151 compatible CPU Fan
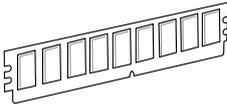
DIMM
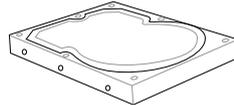
SATA hard disk drive
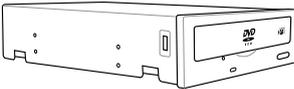
SATA optical disc drive (optional)

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

LGA1151 socket for the 6th Generation Intel® Core™ i7/Intel® Core™ i5/Intel® Core™ i3, Pentium® and Celeron® processors

This motherboard supports 6th generation Intel® Core™ i7/Intel® Core™ i5/Intel® Core™ i3, Pentium® , and Celeron® processors in the LGA1151 package. It provides great graphics and system performance with its GPU, dual-channel DDR4 memory slots and PCI Express 2.0/3.0 expansion slots.

Intel® Z170 Express Chipset

Intel® Z170 Express Chipset is a single chipset that supports the LGA1151 socket for the 6th generation Intel® Core™ i7/Intel® Core™ i5/Intel® Core™ i3, Pentium® , and Celeron® processors. It utilizes the serial point-to-point links, which increases bandwidth and enhances the system's performance. It natively supports up to ten USB 3.0 ports, six SATA 6 Gb/s ports, and M.2 Gen 3 X4 support for faster data retrieval.

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.

QUAD-GPU SLI and 3-WAY CrossFireX™ Support

The motherboard features Quad-GPU SLI and 3-Way AMD CrossfireX support that enables multi-GPU setup, giving you the full power of the latest graphics technologies.

SATA Express support

SATA Express provides faster data transfer speeds of up to 10Gb/s, allowing your system to catch up with the speed of the SSDs. It also features backward compatibility with up to two SATA drives of the same speed.

PCIe 3.0 x4 M.2 Support

With a 4x PCI Express 3.0/2.0 bandwidth, the M.2 can support up to 32 Gbit/s of data transfer speed. It is a perfect choice for the operating system or application drive, making your system and its installed apps work in a faster pace.

Complete USB 3.1 integration

This motherboard has the latest USB 3.1 connectivity built in with dual Type-A ports for the very fastest USB data transfers — that's up to 10Gb/s, or twice as fast as USB 3.0. The next-generation standard is completely backward-compatible with your existing USB devices, and you'll be all set for USB 3.1's breakneck speeds.

1.1.2 "Ultimate COOL" Thermal Solutions

Thermal Radar 2

Thermal Radar 2 uses multiple sensors to control motherboard temperatures, automatically adjusting fan speeds for better system stability and power efficiency. It also provides customizable fan management that displays real-time motherboard, CPU and VGA zone cooling status, and promotes extended system longevity, power saving solution, and noise reduction.

1.1.3   "TUF Engine" Power Design

Digital Power Control

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

TUF Components (Choke, 10K Ti-Cap. & MOSFET; certified by military-standard)

The motherboard's TUF components features military-standard robust TUF new chokes, titanium solid state capacitors, and MOSFETS. These TUF components support up to a massive 40A rated current, eliminates buzzing noise and vibration, and delivers better performance, and durability during the most extreme usage.

1.1.4   "Safe & Stable!" Guardian Angel

TUF Detective 2

TUF Detective 2 is a free companion app that puts detailed system information and a user-friendly interface at your fingertips - right on your smartphone or tablet. You are able to detect and diagnose errors and adjust your system operation with touchscreen ease. Moreover, you can control your fan and monitor your system wirelessly via the app. Your PC doesn't even need to be switched on for you to make use of the app!

TUF LANGuard

The TUF LANGuard socket has advanced signal-coupling technology and premium surface-mounted capacitors to improve throughput tested to military grade, TUF LANGuard is certified for tough duty to protect your motherboard from lightening strikes and static electricity.

TUF ESD Guards 2

TUF ESD (Electrostatic Discharge) Guards provides protection against electrostatic discharges, which can damage the motherboard's components. The ASUS exclusive Anti-Static chip and circuit design, and the I/O shield provide four times better protection and ensure the motherboard's lifespan.

MemOK!

MemOK!, the remarkable memory rescue tool, allows you to simply press a button to patch memory issues, ensure memory boot compatibility, determine fail-safe settings, and dramatically improve the system's bootup.

1.1.5   ASUS EZ DIY

ASUS UEFI BIOS (EZ Mode)

ASUS UEFI BIOS, a UEFI compliant architecture, offers the first mouse-controlled intuitive graphical BIOS interface that goes beyond the traditional keyboard-only BIOS controls, providing you with more flexibility, convenience, and easy to navigate UEFI BIOS than the traditional BIOS versions. It offers you with dual selectable modes and native support for hard drives larger than 2.2 TB.

ASUS UEFI BIOS includes the following new features:

- New EZ Flash 3 can update the latest BIOS via the internet, and from within the BIOS.

- New My Favorites function allows you to quickly access the frequently used items.

- New quick Note function allows you to take notes in the BIOS environment.

- New Last Modified log allows you to view all your modified settings.

- F12 BIOS snapshot hotkey.

ASUS Q-Design

ASUS Q-Design enhances your DIY experience. All of Q-Slot and Q-Shield design speed up and simplify the DIY process.

ASUS Q-shield

ASUS Q-Shield's special design makes it convenient and easy to install on your motherboard. With better electric conductivity, it ideally protects your motherboard against static electricity and shields it against EMI (Electronic Magnetic Interference).

ASUS Q-connector

ASUS Q-Connector is a unique adapter that allows you to easily connect or disconnect the chassis front panel cables to one module, eliminating the hassle of plugging one cable at a time and making the connection quick and accurate.

1.1.6 ASUS Exclusive Features

USB BIOS Flashback

USB BIOS Flashback offers a hassle-free updating solution for your ultimate convenience. Install a USB storage device containing the BIOS file, press the BIOS Flashback button for about three seconds, and the UEFI BIOS is automatically updated even without entering the existing BIOS or operating system. It also allows you to regularly check for UEFI BIOS updates, and download the latest BIOS automatically.

AI Suite 3

With its user-friendly interface, ASUS AI Suite 3 consolidates all the exclusive ASUS features into one simple-to-use software package. It allows you to supervise fan speed control, voltage and sensor readings. This all-in-one software offers diverse and easy to use functions, with no need to switch back and forth between different utilities.

1.1.7 Other special features

ErP Ready

The motherboard is European Union's Energy-related Products (ErP) ready, and ErP requires products to meet certain energy efficiency requirement in regards to energy consumptions. This is in line with ASUS vision of creating environment-friendly and energy-efficient products through product design and innovation to reduce carbon footprint of the product and thus mitigate environmental impacts.

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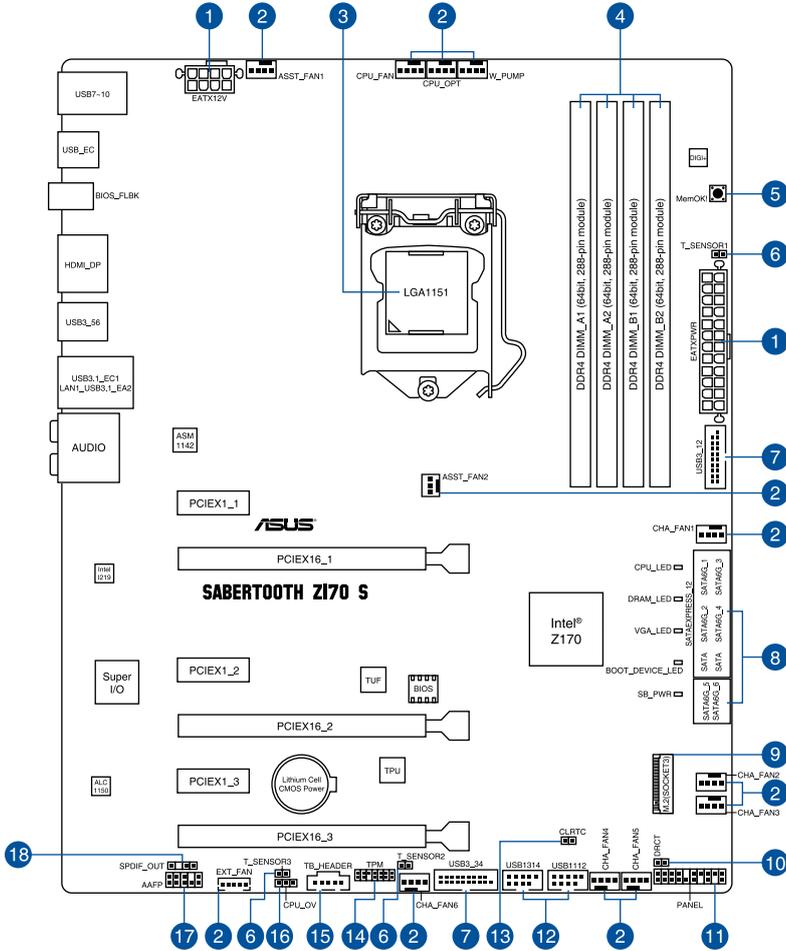
Refer to **1.2.9 Internal connectors** and **2.3.1 Rear I/O connection** for more information about rear panel connectors and internal connectors.

Layout contents

Connectors/Jumpers/Buttons and switches/Slots	Page
1. ATX power connectors (24-pin EATXPWR, 8-pin EATX12V)	1-30
2. CPU, water pump, CPU optional, assistant fan, extension, and chassis fan connectors (4-pin CPU_FAN; 4-pin W_PUMP; 4-pin CPU_OPT; 5-pin EXT_FAN; 4-pin CHA_FAN1-6; 4-pin ASST_FAN1; 3-pin ASST FAN2)	1-28
3. LGA1151 CPU socket	1-9
4. DDR4 DIMM slots	1-10
5. MemOK! button	1-20
6. Thermal Sensor connector (2-pin T_SENSOR1; T-SENSOR2; T-SENSOR3)	1-26
7. USB 3.0 connectors (20-1 pin USB3_12, USB3_34)	1-25
8. Intel® Serial ATA 6.0 Gb/s connectors (7-pin SATA6G_56 [black]; SATAEXPRESS12 [gray])	1-24
9. M.2 Socket 3	1-33
10. DirectKey connector (2-pin DRCT)	1-32
11. System panel connector (20-3 pin PANEL)	1-31
12. USB 2.0 connectors (10-1 pin USB1112; USB1314)	1-27
13. Clear RTC RAM (2-pin CLRTC)	1-21
14. TPM connector (20-1 pin TPM)	1-32
15. Thunderbolt header (5-pin TB_HEADER)	1-33
16. CPU Over Voltage jumper (3-pin CPU_OV)	1-22
17. Front panel audio connector (10-1 pin AAFP)	1-29
18. Digital audio connector (4-1 pin SPDIF_OUT)	1-26

1.2.3   Central Processing Unit (CPU)

The motherboard comes with a surface mount LGA1151 socket designed for the 6th Generation Intel® Core™ i7 / Intel® Core™ i5 / Intel® Core™ i3, Pentium®, and Celeron® processors.
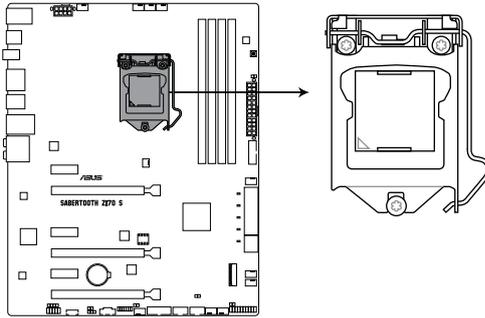
SABERTOOTH Z170 S CPU LGA1151

Ensure that you install the correct CPU designed for LGA1151 socket only. DO NOT install a CPU designed for other sockets on the LGA1151 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 LGA1151 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 four Double Data Rate 4 (DDR4) Dual Inline Memory Modules (DIMM) slots.

A DDR4 module is notched differently from a DDR, DDR2, or DDR3 module. DO NOT install a DDR, DDR2, or DDR3 memory module to the DDR4 slot.
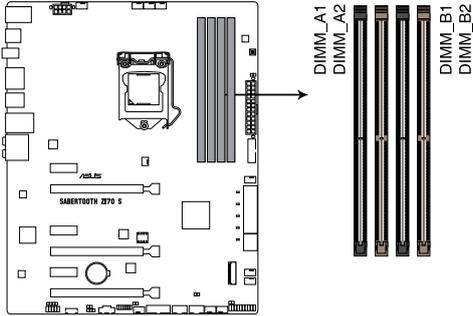
SABERTOOTH Z170 S 288-pin DDR4 DIMM socket

Recommended memory configurations
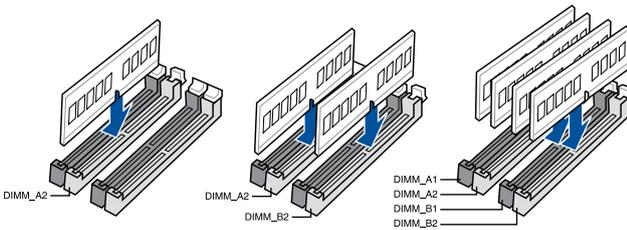
Memory configurations

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

Visit the ASUS website at www.asus.com for the latest QVL.

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

- 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.

- This motherboard does not support DIMMs made up of 512 Mb (64 MB) chips or less (Memory chip capacity counts in Megabit, 8 Megabit/Mb = 1 Megabyte/MB).

- When running XMP at DDR4 3200 MHz or higher, the system's stability depends on the CPU's capabilities.

- The default DIMM frequency depends on its Serial Presence Detect (SPD), which is the standard way of accessing information from a memory module. Under 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 (4 DIMMs) or overclocking condition.

- Always install DIMMs with the same CAS latency. For optimal compatibility, we recommend that you install memory modules of the same version or date code (D/C) from the same vendor. Check with the retailer to get the correct memory modules.

- Highly recommended to use 4-DIMM/2-DIMM kit for full DIMM configuration. Full DIMM support is subject to the physical characteristics of individual CPUs or Memory.

- Memory module with memory frequency higher than 2133 MHz and its corresponding timing or the loaded XMP Profile is not the JEDEC memory standard. The stability and compatibility of these memory modules depend on the CPU's capabilities and other installed devices.

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.
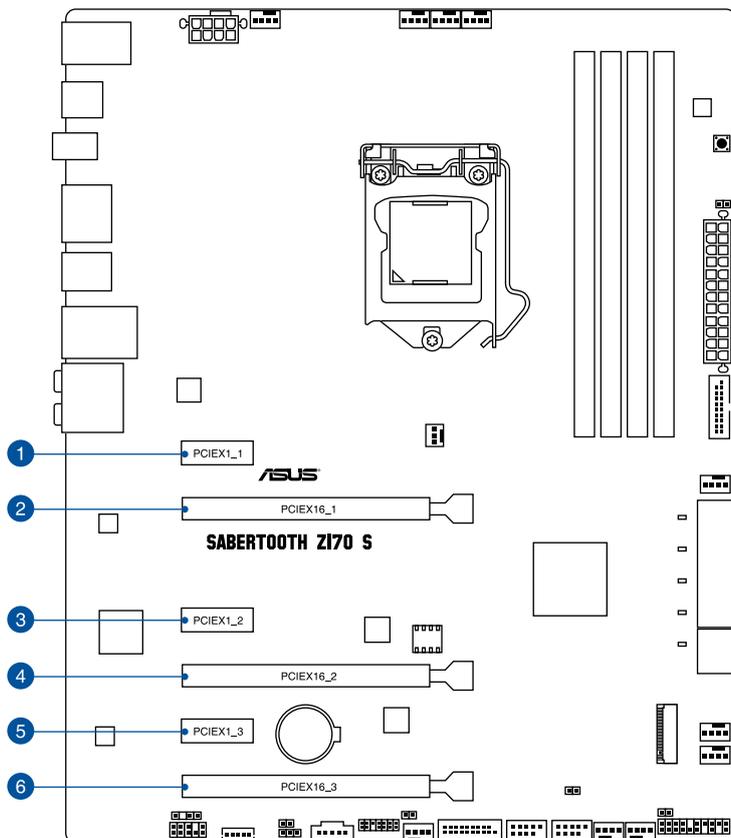
Slot No.	Slot Description
1	PCIE 3.0/2.0 x1_1 slot
2	PCIE 3.0/2.0 x16_1 slot
3	PCIE 3.0/2.0 x1_2 slot
4	PCIE 3.0/2.0 x16_2 slot
5	PCIE 3.0/2.0 x1_3 slot
6	PCIE 3.0/2.0 x16_3 slot

VGA configuration	PCI Express 3.0 operating mode	
	PCIe 3.0/2.0 x16_1	PCIe 3.0/2.0 x16_2
Single VGA/PCIe card	x16 (single VGA recommended)	N/A
Dual VGA/PCIe card	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_FAN1-6 when using multiple graphics cards for better thermal environment.

IRQ assignments for this motherboard

	A	B	C	D	E	F	G	H
PCIe x16_1	shared	-	-	-	-	-	-	-
PCIe x16_2	-	shared	-	-	-	-	-	-
PCIe x16_3	shared	-	-	-	-	-	-	-
PCIe x1_1	-	-	-	shared	-	-	-	-
PCIe x1_2	-	-	shared	-	-	-	-	-
PCIe x1_3	-	-	-	shared	-	-	-	-
SMBUS Controller	shared	-	-	-	-	-	-	-
Intel SATA Controller	shared	-	-	-	-	-	-	-
Intel LAN1(i219)	shared	-	-	-	-	-	-	-
Intel xHCI	shared	-	-	-	-	-	-	-
HD Audio	shared	-	-	-	-	-	-	-

1.2.6   Onboard buttons

1.   MemOK! button

Installing DIMMs that are not compatible with the motherboard may cause system boot failure, and the DRAM_LED near the MemOK! switch lights continuously. Press and hold the MemOK! button until the DRAM_LED starts blinking to begin automatic memory compatibility tuning for successful boot.
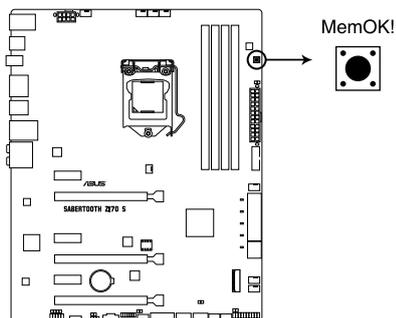
MemOK!

SABERTOOTH Z170 S 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 tests the next set of failsafe settings. The blinking speed of the DRAM_LED increases, indicating different test processes.

- Due to memory tuning requirement, the system automatically reboots when each timing set is tested. If the installed DIMMs still fail to boot after the whole tuning process, the DRAM_LED lights continuously. Replace the DIMMs with ones recommended in the Memory QVL (Qualified Vendors Lists) on the ASUS website 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 the ASUS website at www.asus.com after using the MemOK! function.

1.2.7 Jumpers

1. Clear RTC RAM (2-pin CLRTC)

This jumper allows you to clear the Real Time Clock (RTC) RAM in CMOS. You can clear the CMOS memory of date, time, and system setup parameters by erasing the CMOS RTC RAM data. The onboard button cell battery powers the RAM data in CMOS, which include system setup information such as system passwords.
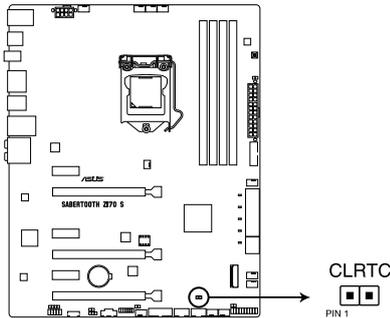
SABERTOOTH Z170 S CLRTC connector

To erase the RTC RAM:

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

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

3. Plug the power cord and turn ON the computer.

4. Hold down the **<Del>** key during the boot process and enter BIOS setup to re-enter data.

Except when clearing the RTC RAM, never short-circuit the CLRTC jumper. Shorting the CLRTC jumper will cause system boot failure!

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

• You do not need to clear the RTC when the system hangs due to overclocking. For system failure due to overclocking, use the CPU Parameter Recall (C.P.R.) feature. Shut down and reboot the system, then the BIOS automatically resets parameter settings to default values.

• Due to chipset behavior, AC power off is required to enable C.P.R. function. You must turn off and on the power supply or unplug and plug the power cord before rebooting the system.

2.	**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.

CPU_OV

Disable (default setting)   Enable

SABERTOOTH Z170 S CPU_OV setting
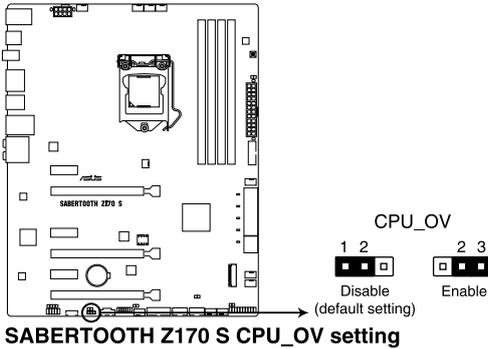
1.2.8 Onboard LEDs

1. POST State LEDs

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

☐ CPU_LED

☐ DRAM_LED

☐ VGA_LED
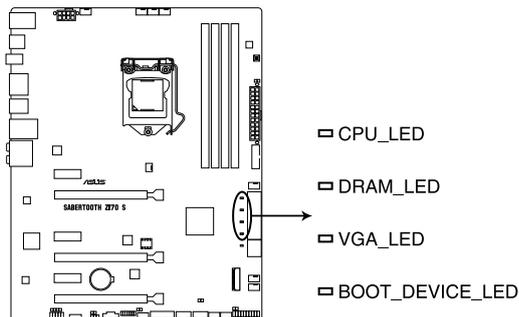
☐ BOOT_DEVICE_LED

SABERTOOTH Z170 S CPU/ DRAM/ BOOT_DEVICE/ VGA LED

2. Standby Power LED (SBPWR)

The motherboard comes with a standby power LED. The LED lights up to indicate that the system is ON, in sleep mode, or in soft-off mode. This is a reminder that you should shut down the system and unplug the power cable before removing or plugging in any motherboard component. The illustration below shows the location of the onboard LED.

SB_PWR

Blink
Standby Power

OFF
Powered Off
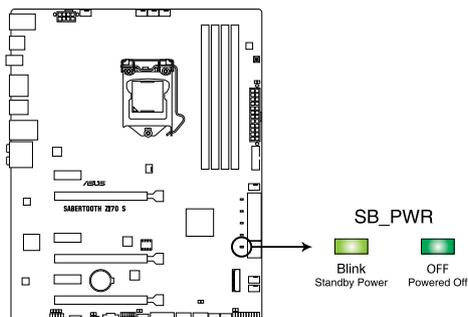
SABERTOOTH Z170 S Standby Power LED

The LED color might vary according to model.

1.2.9 Internal connectors

1. **Intel® Serial ATA 6.0 Gb/s connectors (7-pin SATA6G_56 [black]; SATAEXPRESS12 [gray])**

These connectors connect to Serial ATA 6.0 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® Z170 chipset.
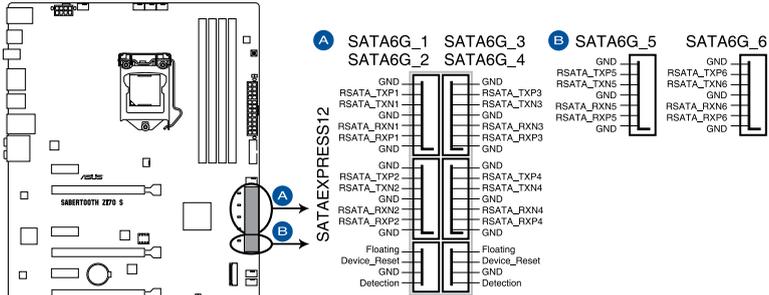
SABERTOOTH Z170 S Intel® SATA 6 Gb/s connectors
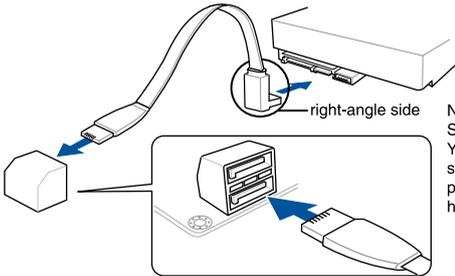
right-angle side

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

• 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**].

• Before creating a RAID set, refer to section **5.1 RAID configurations** or the manual bundled in the motherboard support DVD.

2.   **USB 3.0 connector (20-1 pin USB3_12, USB3_34)**

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.

SABERTOOTH Z170 S USB3.0 connectors
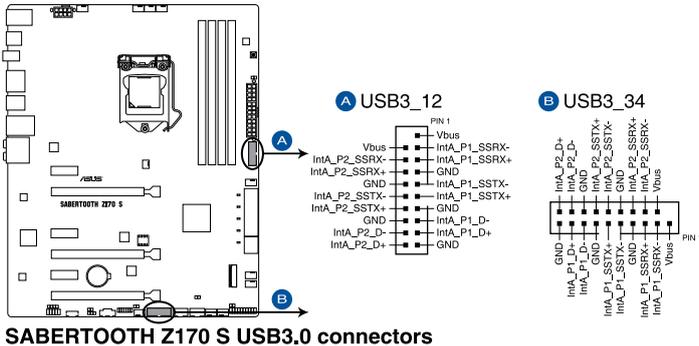
The USB 3.0 module is purchased separately.

- 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 and Turbo Mode when using USB 3.1 Boost feature.

3. **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.

SPDIF_OUT

SABERTOOTH Z170 S Digital audio connector
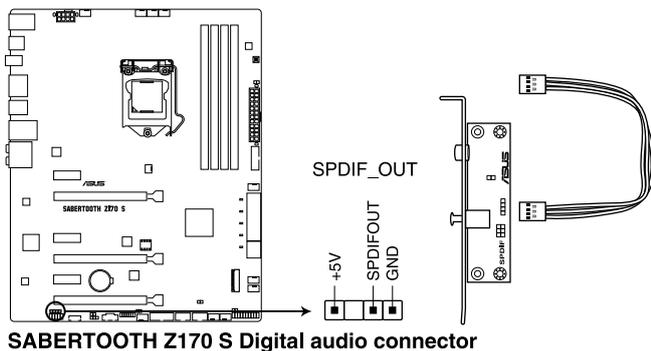
The S/PDIF module is purchased separately.

4. **Thermal Sensor connectors (2-pin T_SENSOR1; T_SENSOR2; T_SENSOR3)**

These connectors are for the thermistor cables that monitor the temperature of the devices and the critical components inside the motherboard. Connect the thermistor cable and place the sensor on the device or the motherboard's component to detect its temperature.

Ⓐ T_SENSOR1

Ⓑ T_SENSOR3   **Ⓒ T_SENSOR2**

SABERTOOTH Z170 S T_SENSOR connector
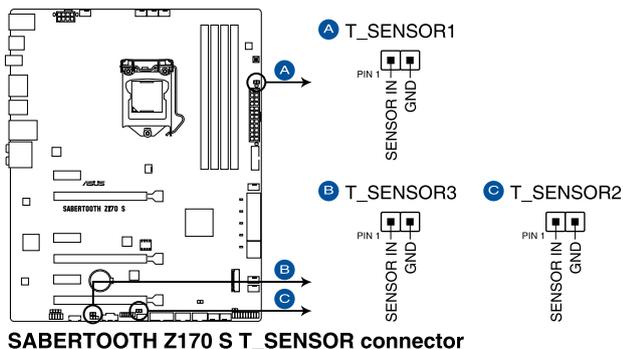
USB 2.0 connectors (10-1 pin USB1112; USB1314)

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 MBps connection speed.
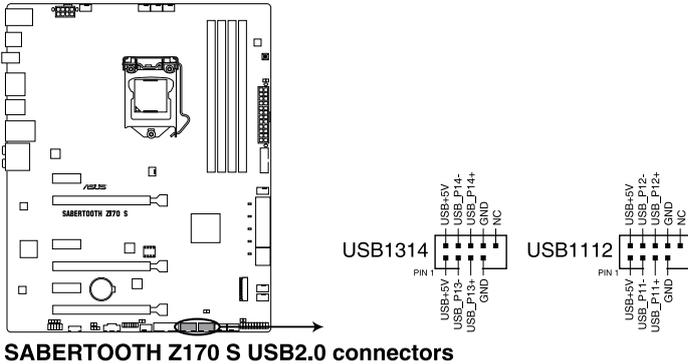
SABERTOOTH Z170 S USB2.0 connectors

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, dark brown) first, and then install the Q-Connector (USB) to the USB connector onboard if your chassis supports front panel USB ports.

The USB 2.0 module is purchased separately.

SABERTOOTH Z170 S   1-21

6. **CPU, water pump, CPU optional, assistant fan, extension, and chassis fan connectors (4-pin CPU_FAN; 4-pin W_PUMP; 4-pin CPU_OPT; 5-pin EXT_FAN; 4-pin CHA_FAN1-6; 4-pin ASST_FAN1; 3-pin ASST_FAN2)**

Connect the fan cables to the fan connectors on the motherboard.

A CPU_FAN

CPU FAN PWM
CPU FAN IN
CPU FAN PWR
GND

B W_PUMP

PUMP PWM
PUMP IN
PUMP PWR
GND

C CPU_OPT

CPU FAN PWM
CPU FAN IN
CPU FAN PWR
GND

D ASST_FAN1

+5V
CHA FAN IN
CHA FAN PWR
GND

E EXT_FAN

GND
Control2
Control1
Sense2
Sense1

F ASST_FAN2

Rotation
+12V
GND
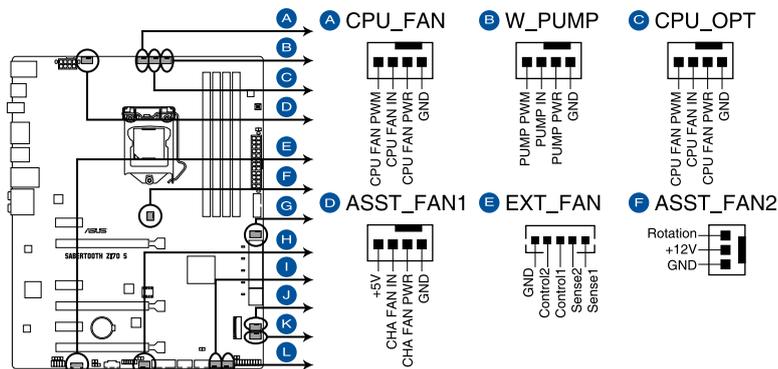
SABERTOOTH Z170 S Fan connectors

G CHA_FAN1

CHA FAN PWM
CHA FAN IN
CHA FAN PWR
GND

H CHA_FAN6

GND
CHA FAN PWR
CHA FAN IN
CHA FAN PWM

I CHA_FAN4

GND
CHA FAN PWR
CHA FAN IN
CHA FAN PWM

J CHA_FAN2

CHA FAN PWM
CHA FAN IN
CHA FAN PWR
GND

K CHA_FAN3

CHA FAN PWM
CHA FAN IN
CHA FAN PWR
GND

L CHA_FAN5

GND
CHA FAN PWR
CHA FAN IN
CHA FAN PWM
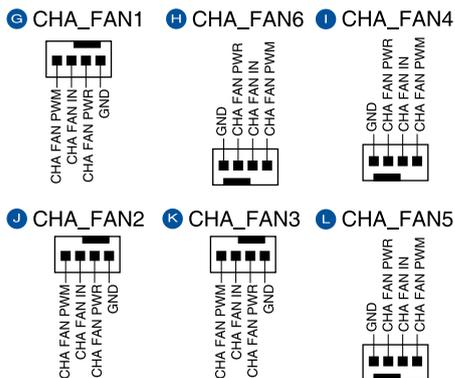
- DO NOT forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan connectors!

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

- The CPU_FAN connector supports the CPU fan of maximum 1A (12 W) fan power.

- The CPU_FAN, CHA_FAN and ASST_FAN connectors support the TUF Thermal Radar 2 feature.

- W_PUMP function support depends on water cooling device.

7. Front panel audio connector (10- 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.

AAFP

GND
PRESENCE#
SENSE1_RETUR
SENSE2_RETUR

PIN 1

PORT1L
PORT1R
PORT2R
SENSE_SEND
PORT2L

HD-audio-compliant
pin definition

AGND
NC
NC
NC

PIN 1

MIC2
MICPWR
Line out_R
NC
Line out_L

Legacy AC'97
compliant definition

SABERTOOTH Z170 S Analog front panel connector
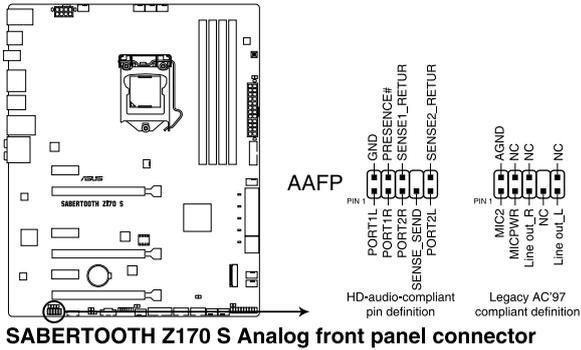
> • We recommend that you connect a high-definition front panel audio module to this connector to avail the motherboard's high-definition audio capability.
>
> • If you want to connect a high-definition or an AC`97 front panel audio module to this connector, set the Front Panel Type item in the BIOS setup to **[HD Audio]** or **[AC97]**.

8. **ATX power connectors (24-pin EATXPWR; 8-pin EATX12V)**

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.
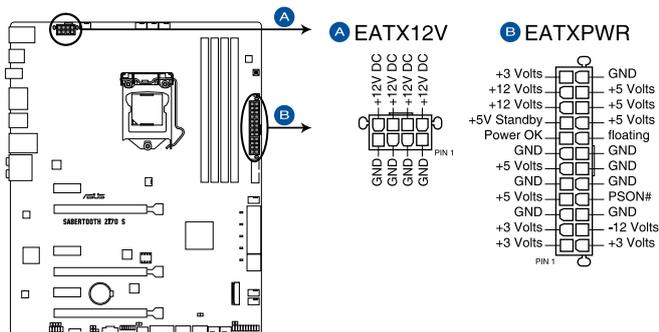
SABERTOOTH Z170 S ATX power connectors

- 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 4-pin/8-pin EATX12 V 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.

9.   **System panel connector (20-3 pin PANEL)**

This connector supports several chassis-mounted functions.
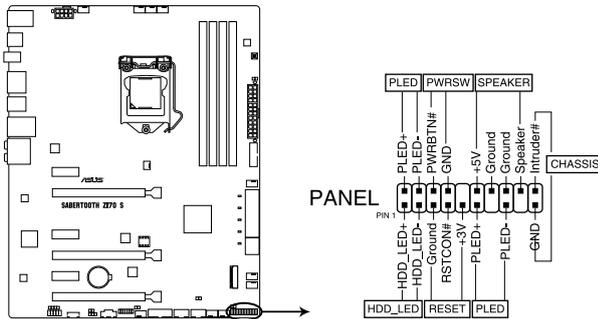
SABERTOOTH Z170 S System panel connector

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

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

- **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.

- **Chassis intrusion connector (2-pin CHASSIS)**

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

10. **TPM connector (14-1 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 the network security, protects digital identities, and ensures platform integrity.
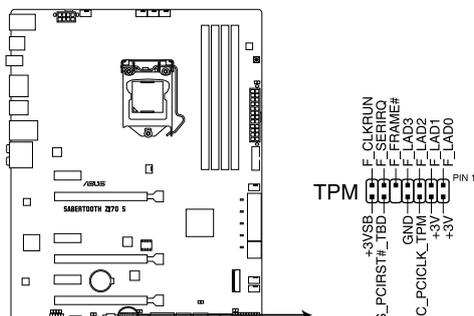
SABERTOOTH Z170 S TPM connector

11. **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.
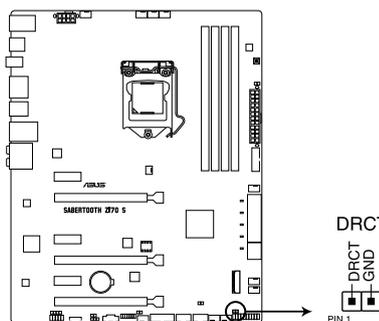
SABERTOOTH Z170 S DRCT connector

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.

12. Thunderbolt header (5-pin TB_HEADER)

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

SABERTOOTH Z170 S TB_HEADER connector
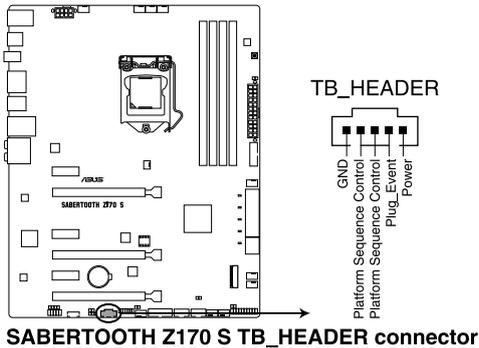
> The add-on Thunderbolt I/O card and Thunderbolt cables are purchased separately.

13. M.2 socket 3

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

SABERTOOTH Z170 S M.2(SOCKET3)
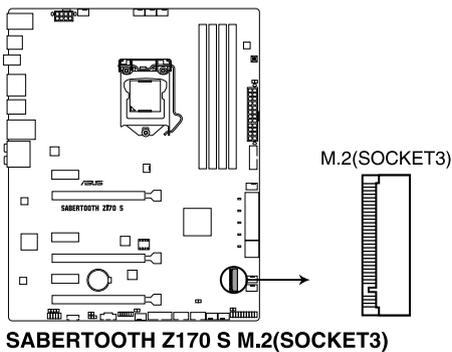
> • This socket supports M Key and type 2242/2260/2280/22110 storage devices.
>
> • The M.2 Socket 3 shares bandwidth with SATA Express_1 slot.

> The M.2 (NGFF) SSD module is purchased separately.

Basic Installation

2

2.1 Building your PC system

2.1.1 IO Cover installation

The SABERTOOTH Z170 S motherboard package can be installed with a 40 mm assistant fan for additional cooling solution and better airflow.

To install the 40 mm assistant fan:

1. Locate and remove the screw on the back I/O (A) then remove the back I/O fan cover lid (B). Keep the screws for later use.
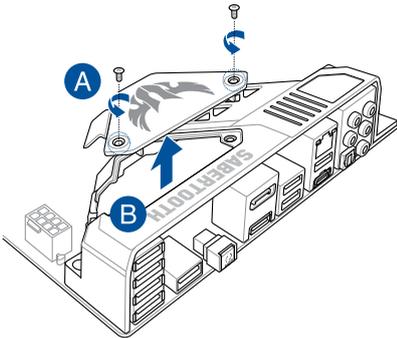
2. Position and install the 40 mm assistant fan* in an orientation such that the fan draws air into the chassis for optimal heat dissipation and air ventilation.

3. Match the two (2) screw holes on the 40 mm assistant fan with the two (2) screw holes on the cover lid and secure it with two (2) screws**.
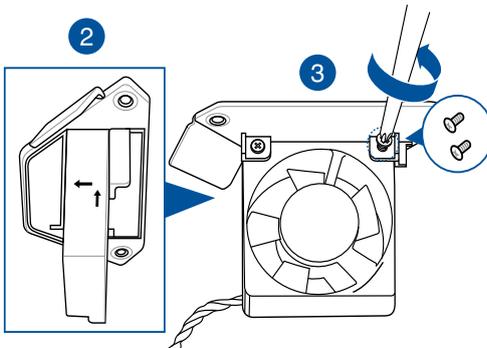
*   **The 40mm assistant fan is purchased separately.**

** **When purchasing your assistant fan, ensure to check with your vendor for the assistant fan screws.**

4.   Align and insert the cover lid and the assistant fan assembly into the IO Cover and secure it with the screw that you removed in step 1.

> Ensure to tuck the fan cable inside the cable corner slot.

5.   Connect the fan cable connector to the assistant fan (ASST_FAN1) header on the motherboard.

Fan cable corner slot
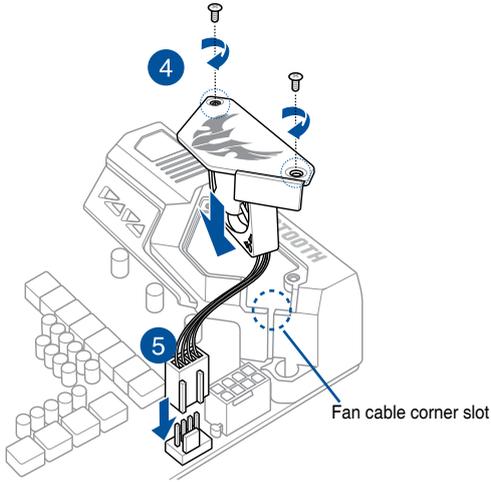
6.   Launch the Thermal Radar 2 utility on your computer to adjust the fan's behavior.

> For more information about the Thermal Radar 2 utility, refer to Chapter 4: Software Support.

2.1.2   Motherboard installation

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.

---

1.   Match and align four (4) holes of the back I/O dust grid and four (4) fasteners of the back I/O dust frame then attach the dust grid to the dust frame.

2.   Match and align the four (4) fasteners of the back I/O dust frame and grid assembly to the four (4) circular holes on the back I/O fan vent of the I/O shield then push to fasten the back I/O dust grid into the I/O shield with the back I/O dust frame.

Back I/O dust frame

Back I/O dust grid
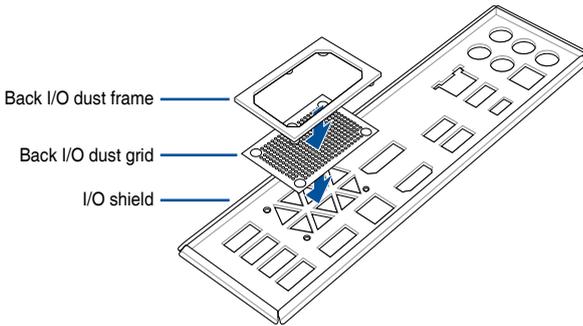
I/O shield

Clean your back I/O dust filter from time to time, especially when it is dirty, to ensure optimum airflow.

---

3.   Install the ASUS Q-Shield to the chassis rear I/O panel.
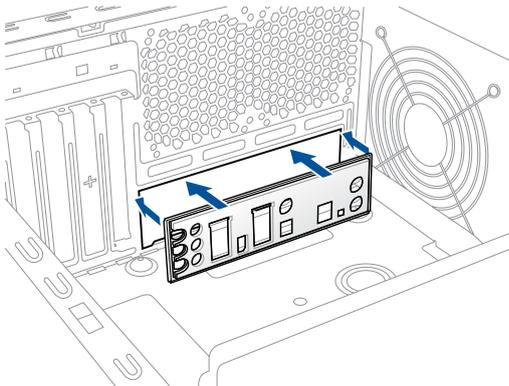
4.   Place the motherboard into the chassis, ensuring that its rear I/O ports are aligned to the chassis' rear I/O panel.
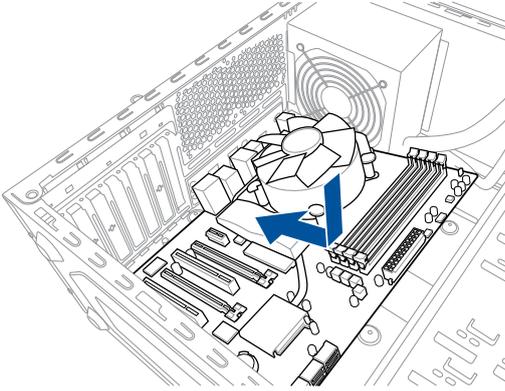
5.   Place nine (9) screws into the holes indicated by circles to secure the motherboard to the chassis.
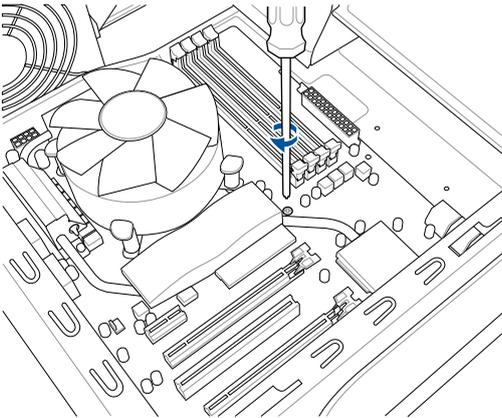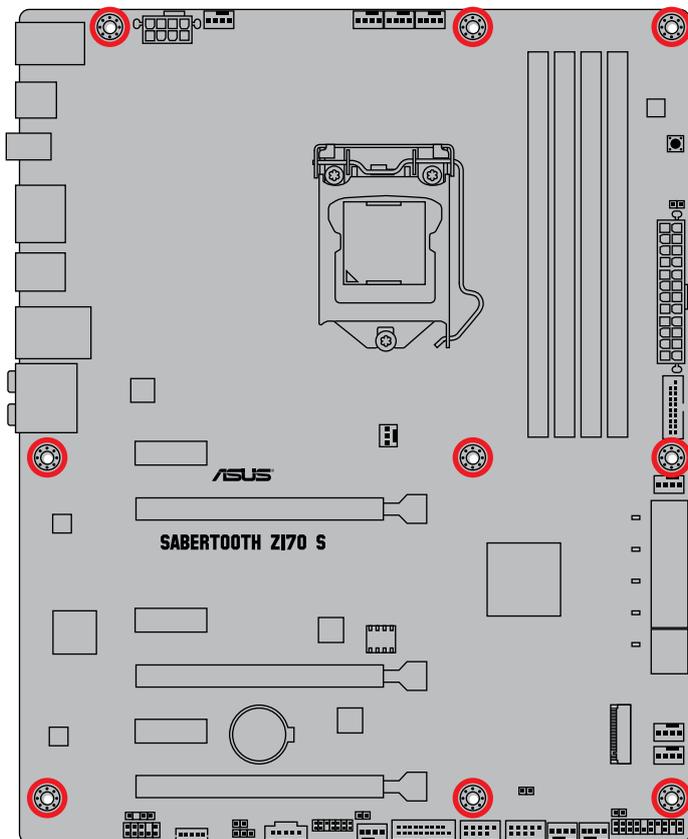
DO NOT over tighten the screws! Doing so can damage the motherboard.

2.1.3 CPU installation

> Ensure that you install the correct CPU designed for LGA1151 socket only. DO NOT install a CPU designed for LGA1155 and LGA1156 sockets on the LGA1151 socket.

Top of CPU

Bottom of CPU

Bottom of CPU

Top of CPU
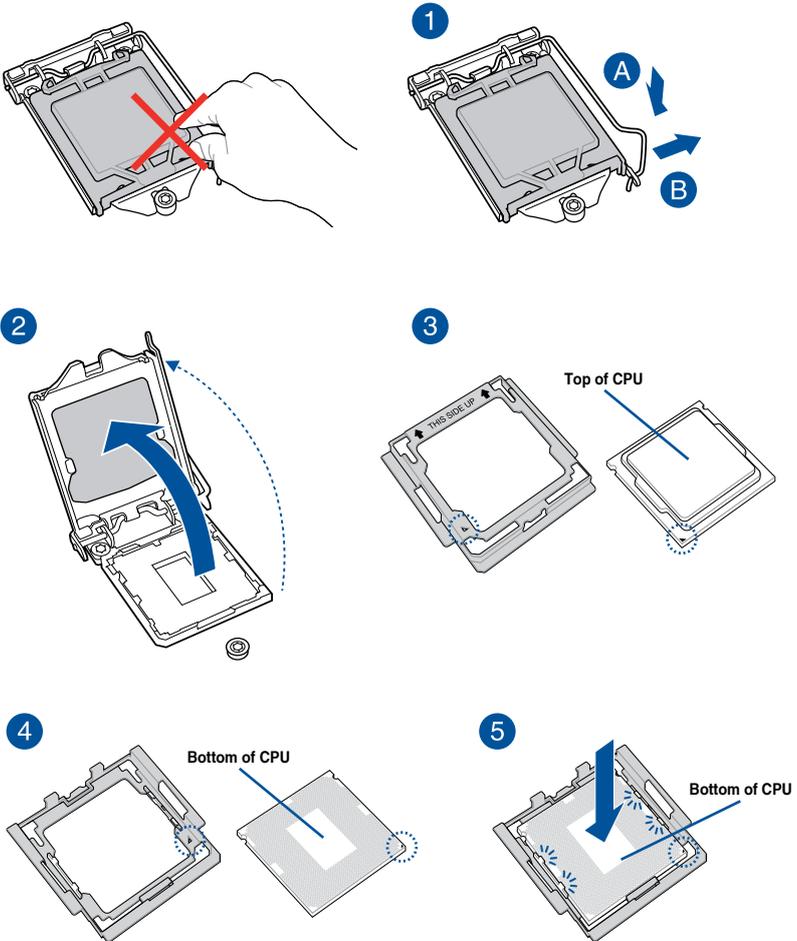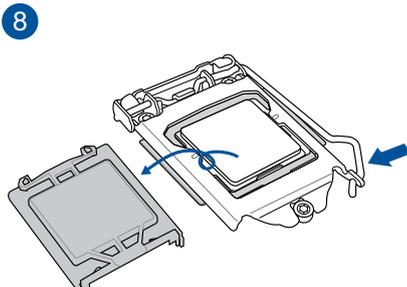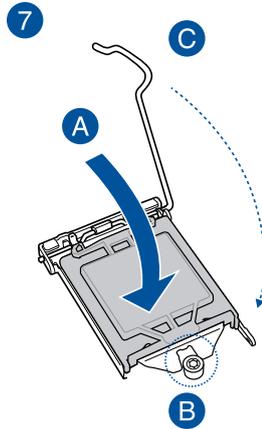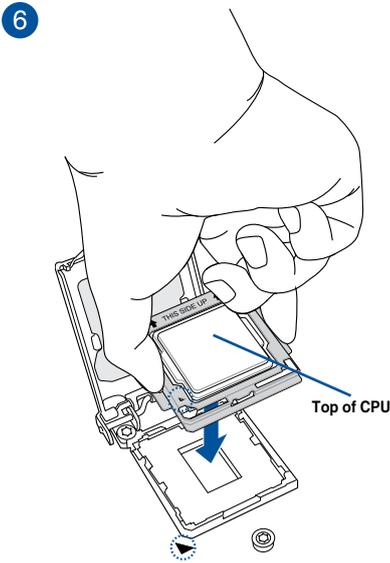
- Ensure that the CPU is firmly clicked into place before installing it onto the CPU socket on the motherboard.

- Use the CPU Installation Tool for installing the CPU only. DO NOT damage or bend the CPU Installation Tool.

- Always firmly hold both sides of the CPU Installation Tool when installing, removing, or picking up the CPU Installation Tool.

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

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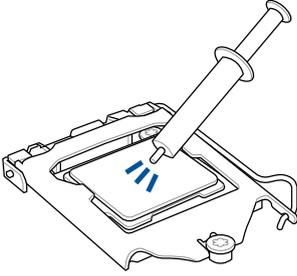
Apply the Thermal Interface Material to the CPU heatsink and CPU before you install the heatsink and fan, if necessary.

To install the CPU heatsink and fan assembly
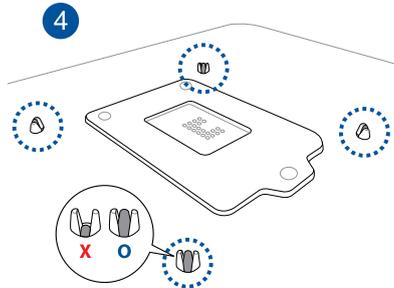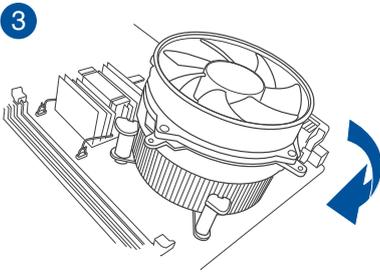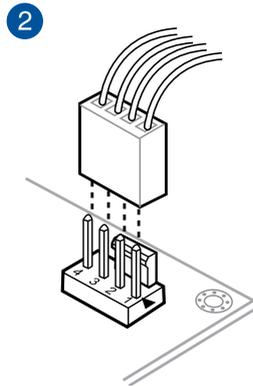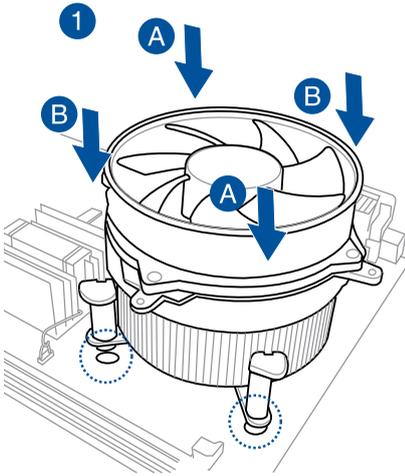
To uninstall the CPU heatsink and fan assembly
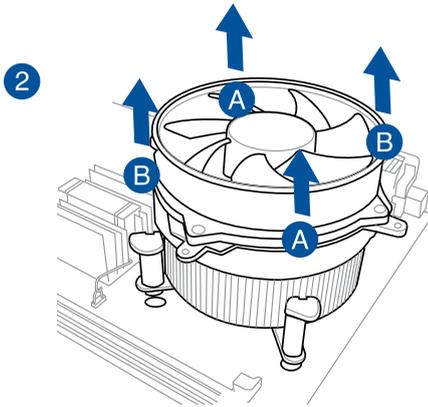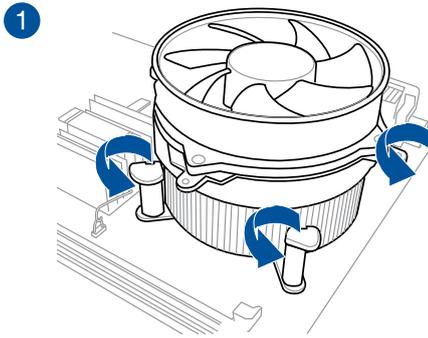
2.1.5   DIMM installation
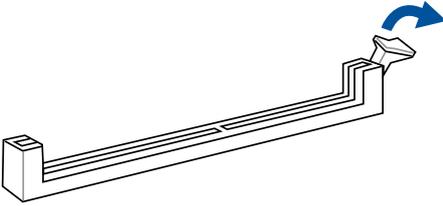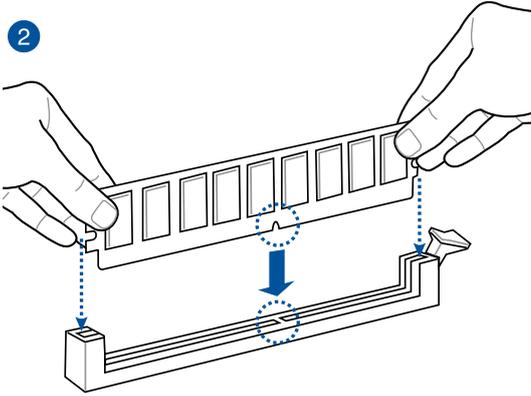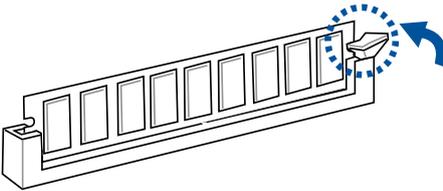
To remove a DIMM
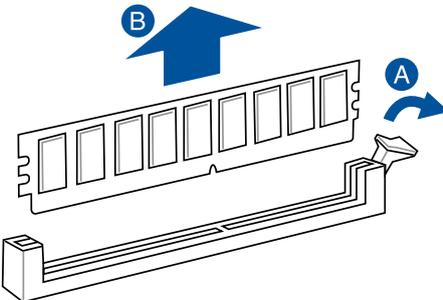
2.1.6 ATX Power connection
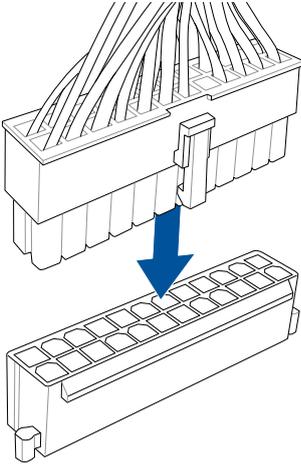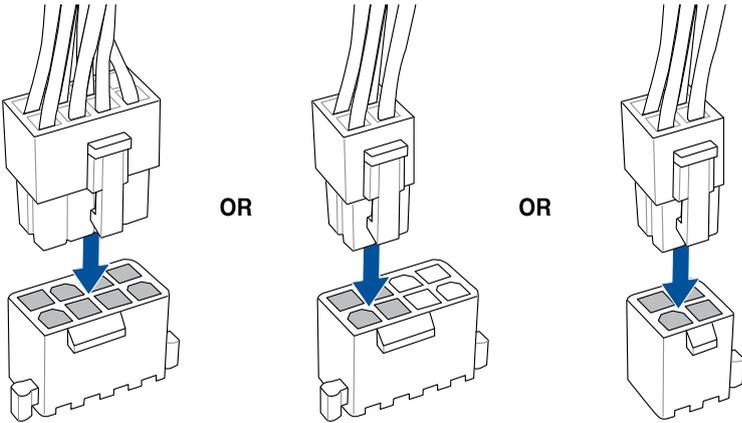
2.1.7   SATA device connection
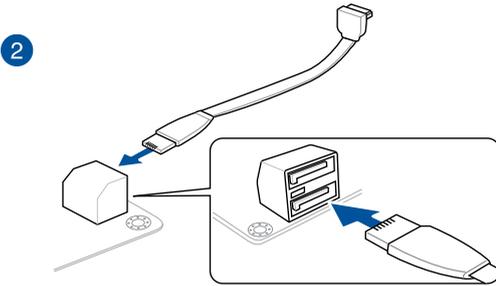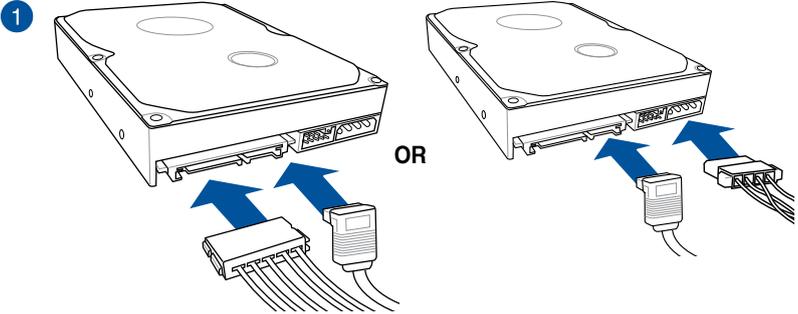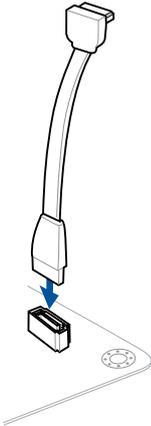
2.1.8   Front I/O Connector

To install ASUS Q-Connector
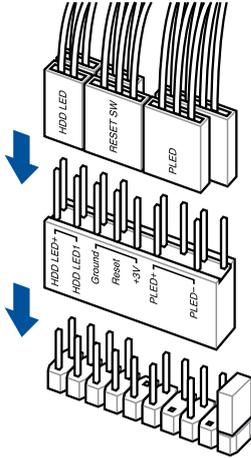
To install USB 2.0 connector

USB 2.0
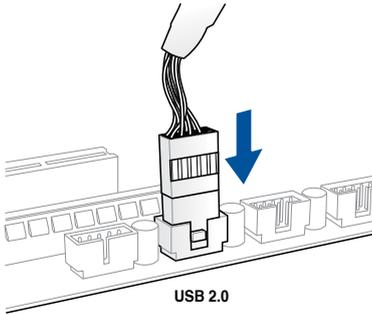
To install front panel audio connector

AAFP
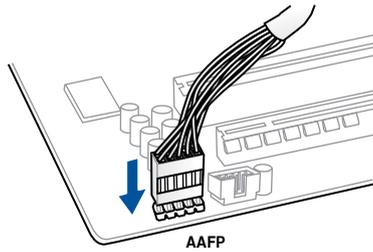
To install USB 3.0 connector

USB 3.0
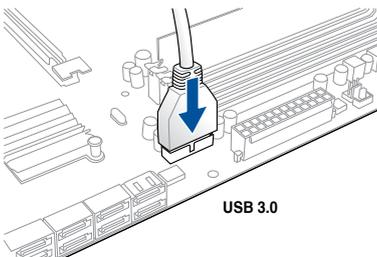
2.1.9　Expansion Card installation

To install PCIe x16 cards
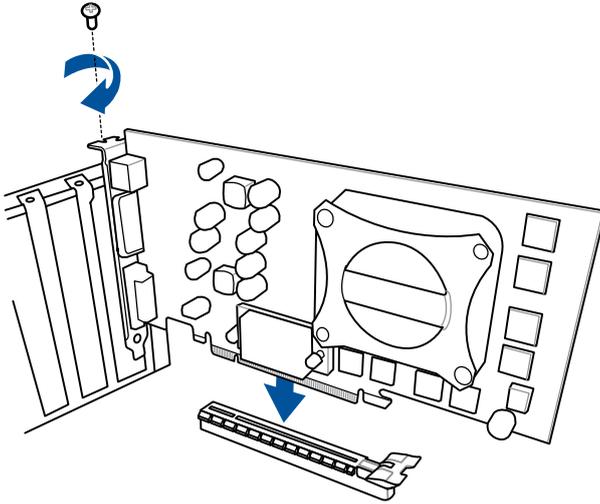
To install PCIe x1 cards
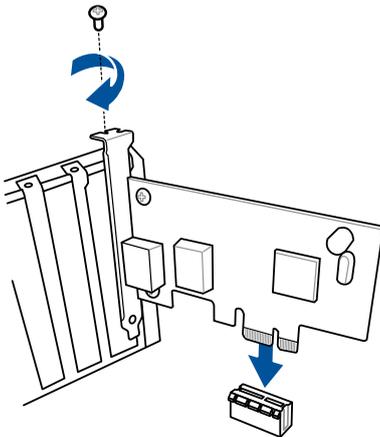
2.2 BIOS update utility

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, press the USB BIOS Flashback button for three seconds, and the BIOS is updated automatically.

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.

    Please ensure to use the BIOS file named **Z170STS.CAP**. Please refer to Chapter 3: BIOS setup for more information.

3. Launch the USB BIOS Flashback Wizard to automatically download the latest BIOS version.

4. Press the BIOS Flashback button for three seconds until a flashing light appears, which indicates that the BIOS Flashback function is enabled.

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

USB BIOS Flashback button   **USB BIOS Flashback port**
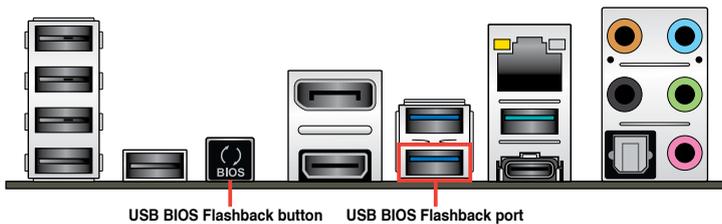
For more BIOS update utilities in BIOS setup, refer to the section **Updating BIOS** in Chapter 3.

- DO NOT unplug portable disk, power system, or use the CLR_CMOS jumper 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
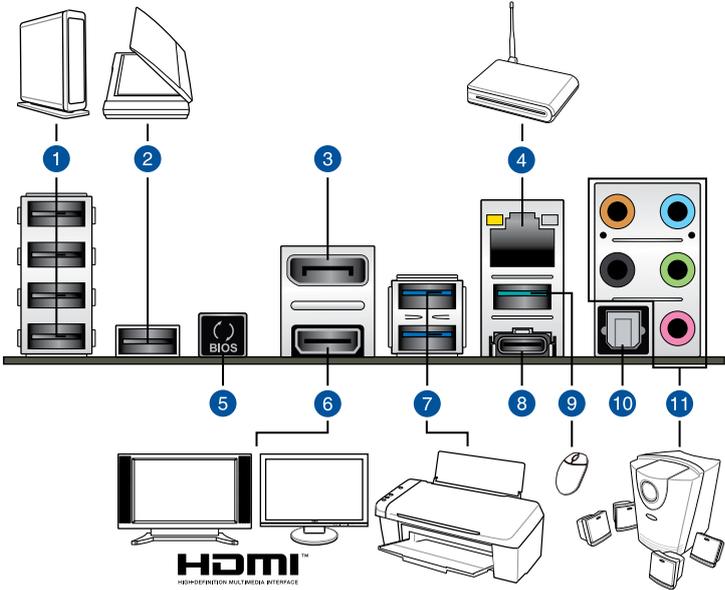
Rear panel connectors		
	7.	USB 3.0 ports 56 (supports USB 3.0 Boost, bottom port supports USB BIOS Flashback)
1. USB 2.0 ports 7-10		
2. TUF Detective port (supports TUF Detective 2 only)	8.	USB Type-C port (supports USB 3.1 Boost)
3. DisplayPort	9.	USB 3.1 port (supports USB 3.1 Boost)
4. Intel LAN port*	10.	Optical S/PDIF Out port
5. USB BIOS Flashback button	11.	Audio I/O ports**
6. HDMI port		

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

- USB 3.1/3.0 devices can only be used as data storage only.

- We strongly recommend that you connect your devices to ports with matching data transfer rate. Please connect your USB 3.0 devices to USB 3.0 ports and your USB 3.1 devices to USB 3.1 ports for faster and better performance for your devices.

- 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.

* LAN ports LED indications

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

```
ACT/LINK        SPEED
   LED           LED


         LAN port
```
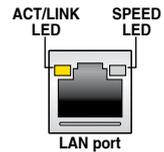
** Audio 2, 4, 6, or 8-channel configuration

Port	Headset 2-channel	4-channel	6-channel	8-channel
Light Blue	Line In	Line In	Line In	Line In or side speaker
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
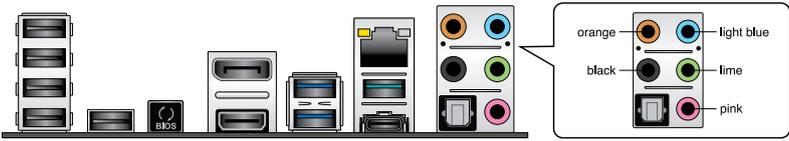
Connect to Headphone and Mic

Connect to Stereo Speakers
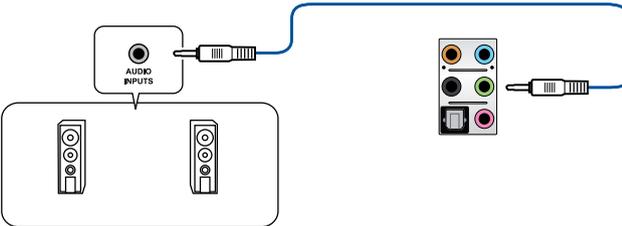
Connect to 2.1 channel Speakers
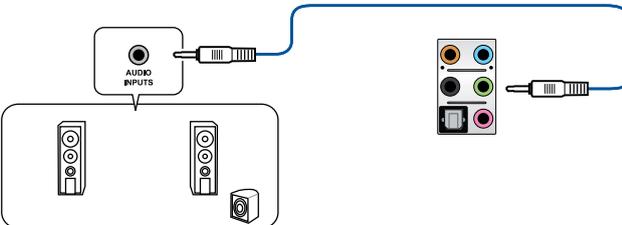
Connect to 4.1 channel Speakers
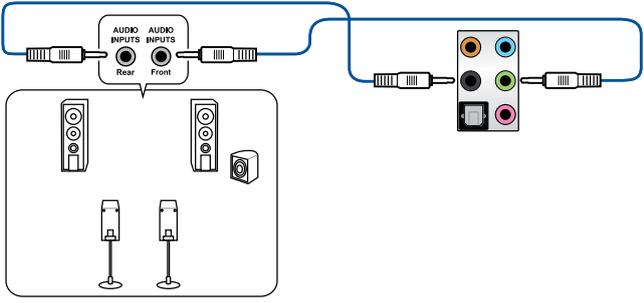
Connect to 5.1 channel Speakers
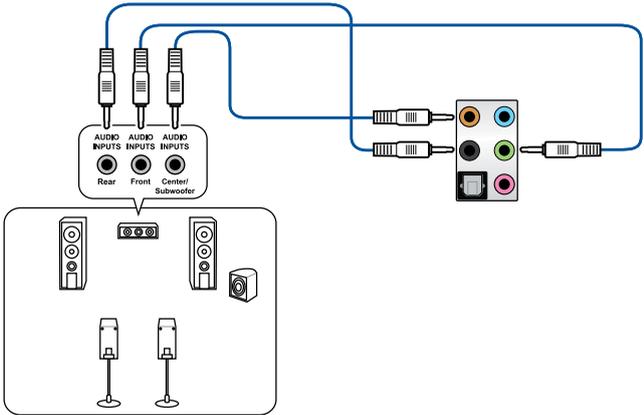
Connect to 7.1 channel Speakers
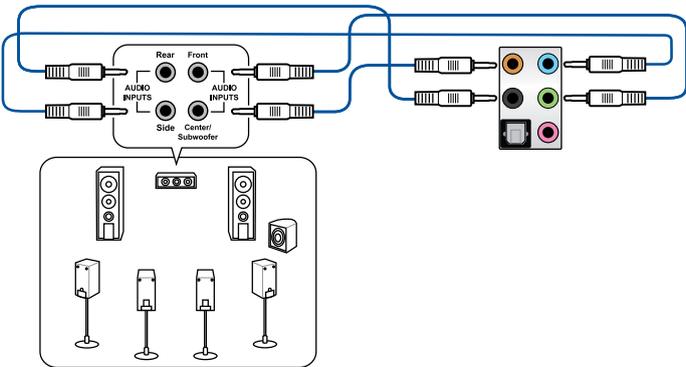
2.4   Starting up for the first time

1.   After making all the connections, replace the system case cover.

2.   Ensure that all switches are off.

3.   Connect the power cord to the power connector at the back of the system chassis.

4.   Connect the power cord to a power outlet that is equipped with a surge protector.

5.   Turn on the devices in the following order:

    a.   Monitor

    b.   External SCSI devices (starting with the last device on the chain)

    c.   System power

6.   After applying power, the system power LED on the system front panel case lights up. For systems with ATX power supplies, the system LED lights up when you press the ATX power button. If your monitor complies with the "green" standards or if it has a "power standby" feature, the monitor LED may light up or change from orange to green after the system LED turns on.

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

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

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

2.5   Turning off the computer

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

BIOS Setup

<div align="right">3</div>

3.1 Knowing BIOS

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

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

- An error message appears on the screen during the system bootup and requests you to run the BIOS Setup.

- You have installed a new system component that requires further BIOS settings or update.

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

> - When downloading or updating the BIOS file, rename it as **Z170STS.CAP** for this motherboard.
>
> - BIOS settings and options may vary due to different BIOS release versions. Please refer to the latest BIOS version for settings and options.

3.2 BIOS setup program

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

Entering BIOS at startup

To enter BIOS Setup at startup, press <Delete> 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 the **<F5>** hotkey. 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 **1.2.7 Jumpers** for information on how to erase the RTC RAM.

- The BIOS setup program does not support Bluetooth devices.

BIOS menu screen

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

3.2.1 EZ Mode

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

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

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

Displays the CPU/motherboard temperature, CPU voltage output, CPU/chassis/power fan speed, and SATA information

Selects the display language of the BIOS setup program

Creates storage RAID and configures system overclocking

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

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

Loads optimized default settings

Saves the changes and resets the system

Click to go to Advanced mode

Search on the FAQ

Click to display boot devices

Selects the boot device priority

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

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.

Configuration fields

Quick Note (F9)

Scroll bar

Menu bar **Language** **MyFavorite(F3)** **Qfan Control(F6)** **EZ Tuning Wizard(F11)**

Hot Keys

Sub-menu item **General help** **Last modified settings** **Go back to EZ Mode**

Menu items **Search on the FAQ**

Displays the CPU temperature, CPU, and memory voltage output

Menu bar

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

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

Menu items

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

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

Submenu items

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

Language

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

My Favorites (F3)

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

Refer to section **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 Q-Fan 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 top right corner 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   Q-Fan Control

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

Click to select a fan to be configured

Click to activate PWM Mode

Click to activate DC Mode

Select a profile to apply to your fans

Click to undo the changes

Click to apply the fan setting

Click to go back to main menu

Select to manually configure your fans

Configuring fans manually

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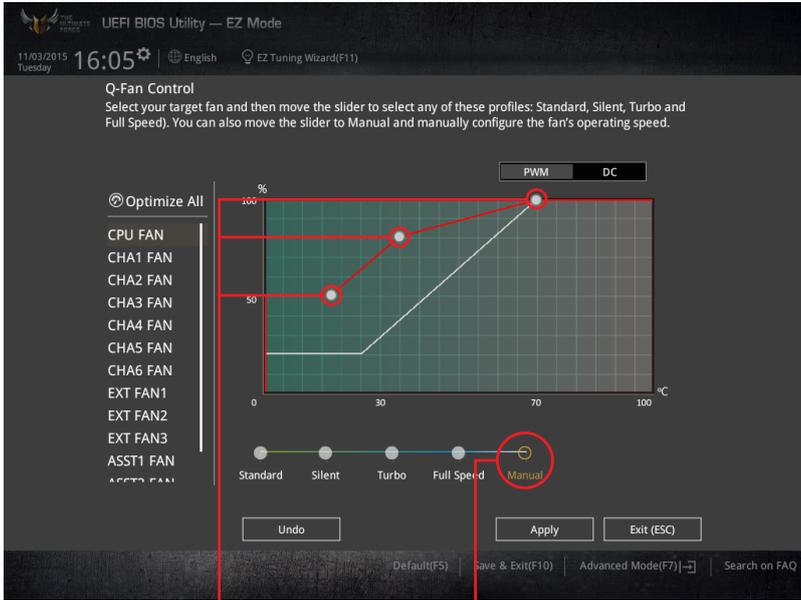
Speed points

Select to manually configure your fans

To configure your fans:

1. Select the fan that you want to configure and to view its current status.

2. Click and drag the speed points to adjust the fans' operating speed.

3. Click **Apply** to save the changes then click **Exit (ESC)**.

3.2.4 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 setup   RAID setup
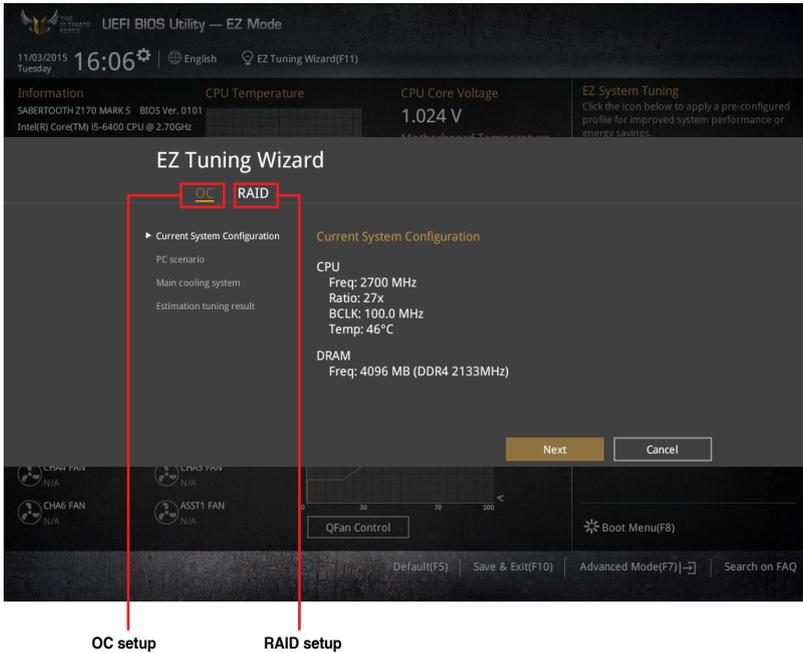
OC Tuning

To start OC Tuning:
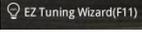
1. Press <F11> on your keyboard or click [EZ Tuning Wizard(F11)] from the BIOS screen to open EZ Tuning Wizard screen.

2. Click **OC** then click **Next**.

3. Select a PC scenario **Daily Computing** or **Gaming/Media Editing,** then click **Next**.
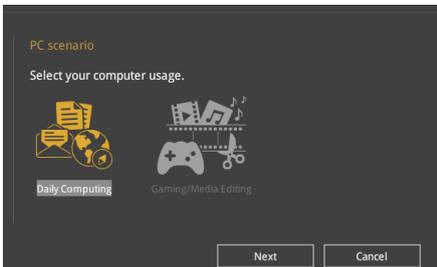
4.	Select a Main Cooling System **BOX cooler, Tower cooler, Water cooler,** or **I'm not sure,** then click **Next**.

Main Cooling system

Select the type of CPU fan that you installed.

Box cooler	Tower cooler	Water cooler	I'm not sure

Back	Next	Cancel

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

Port Selection

Please select the port that you want to set to [RAID] mode.

PCIE	SATA

PCIE mode	SATA mode

The SATA HDD/SSD will change from [AHCI] to [RAID] mode and the system will restart for this change to take effect. Changing the SATA mode may cause system boot failure, and system is not recoverable.

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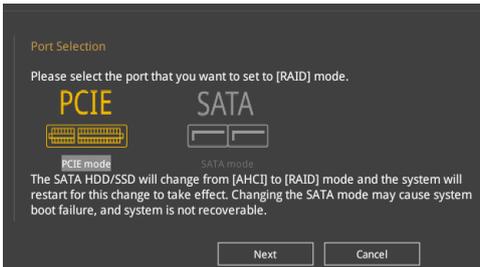
4.	Select the type of storage for your RAID, **Easy Backup** or **Super Speed**, then click **Next**.

a.	For Easy Backup, click **Next** then select from **Easy Backup (RAID1)** or **Easy Backup (RAID10)**.
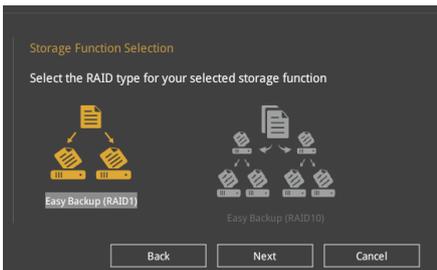
You can only select Easy Backup (RAID 10) if you connect four (4) HDDs.

b.	For Super Speed, click **Next** then select from **Super Speed (RAID0)** or **Super Speed (RAID5)**.

5.	After selecting the type of RAID, click **Next** then click **Yes** to continue the RAID setup.

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

3.3 My Favorites

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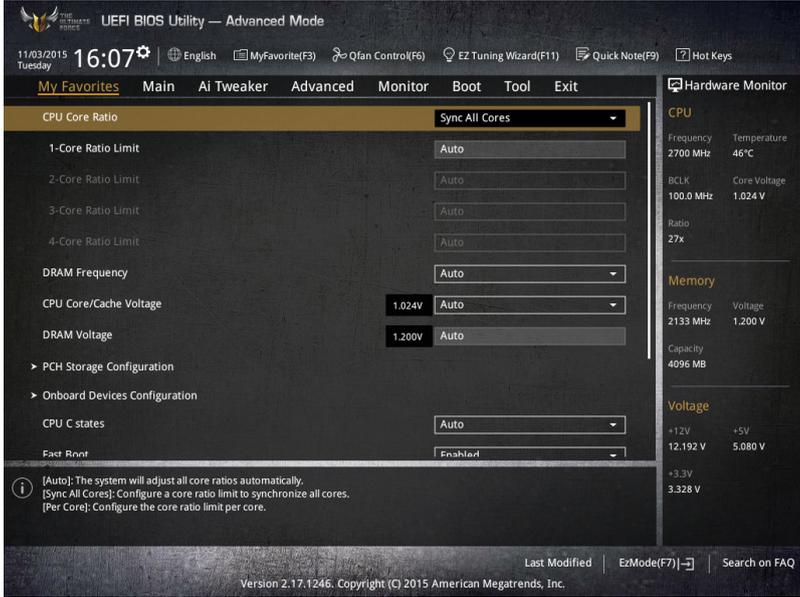
Adding items to My Favorites

To add BIOS items:

1. Press <F3> on your keyboard or click [☰ (F3)MyFavorite] from the BIOS screen to open Setup Tree Map screen.

2. On the Setup Tree Map screen, select the BIOS items that you want to save in My Favorites screen.

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

You cannot add the following items to My Favorite items:

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

4. Click **Exit (ESC)** or press <Esc> key to close Setup Tree Map screen.

5. Go to My Favorites menu to view the saved BIOS items.

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.
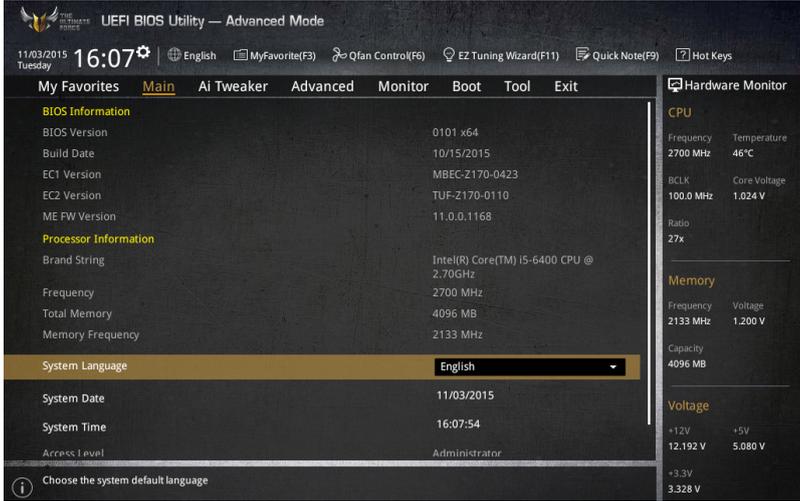
Security

The Security menu items allow you to change the system security settings.
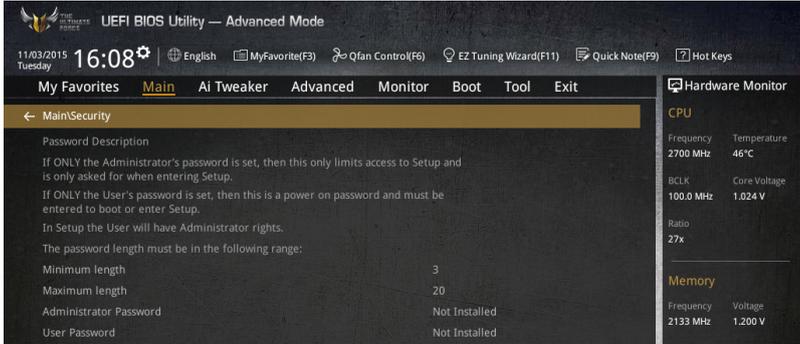
- If you have forgotten your BIOS password, erase the CMOS Real Time Clock (RTC) RAM to clear the BIOS password. See section **1.2.7 Jumpers** for information on the location of the CLRTC jumper.

- 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].**

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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.
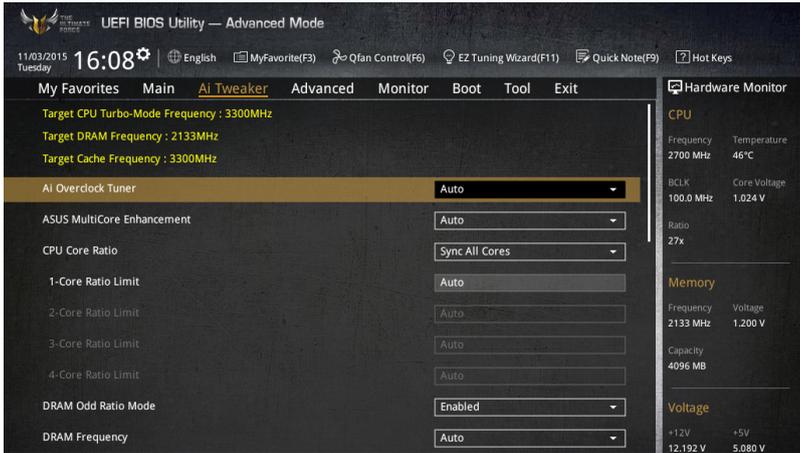
Ai Overclock Tuner [Auto]

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.

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

BCLK Frequency [100]

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 650.0 MHz.

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 [Sync All Cores]

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] [Per Core]

When the **CPU Core Ratio** is set to **[Synch 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 **[Per Core]**, 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.

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.

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.

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 3-Core Ratio Limit.

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

DRAM Odd ratio Mode [Enabled]

This item allows you to enable, disable or automatically set the odd ratio to provide better granularity.

Configuration options: [Disabled] [Enabled]

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] - [DDR4-4266MHz]

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]

CPU SVID Support [Auto]

Disable this item to stop the CPU from communicating with the external voltage regulator.

Configuration options: [Auto] [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.

Misc.

MRC Fast Boot [Auto]

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

DRAM CLK Period [Auto]

Configuration options: [Auto] [1] – [26]

Memory Scrambler [Enabled]

Set this item to enable or disable memory scrambler support.
Configuration options: [Enabled] [Disabled]

Channel A DIMM Control [Enable Both DIMMS]

Allows you to enable or disable the Channel A DIMM slots.
Configuration options: [Enable Both DIMMS] [Disable DIMM0] [Disable DIMM1]
[Disable Both DIMMS]

Channel B DIMM Control [Enable Both DIMMS]

Allows you to enable or disable the Channel B DIMM slots.
Configuration options: [Enable Both DIMMS] [Disable DIMM0] [Disable DIMM1]
[Disable Both DIMMS]

MCH Full Check [Auto]

Enable this item to enhance the stability of your system. Disable this item to enhance
the DRAM overclocking capability.
Configuration options: [Auto] [Enabled] [Disabled]

DLLBwEn [Auto]

Select values from 2 to 4 for best memory overclocking.
Configuration options: [Auto] [1] - [7]

DRAM SPD Write [Disabled]

Enable this item to enable 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 8 to adjust the CPU power voltage
from 0% to 100%.
Configuration options [Auto] [Level 1] - [Level 8]

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

> 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 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 you set the **CPU VRM Switching Frequency** to **[Manual]**.

Fixed CPU VRM Switching Frequency (KHz) [300]
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 you to enhance the system stability.
Configuration options: [Auto] [Disabled] [Enabled]

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 set the VRM thermal balance mode.
[Extreme]   Select to set the VRM current balance mode.

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

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 the **CPU Power Phase Control** is set to [**Power Phase Response**].

Power Phase Response [Fast]
This item allows you to select the power phase response speed.
Configuration options: [Regular] [Medium] [Fast] [Ultra Fast]

CPU Power Thermal Control [115]

Higher temperature provides a wider CPU power thermal range and extends the overclocking tolerance to enlarge the overclocking potential.
Configuration options: [115] - [136]

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

DRAM Current Capability [100%]
This item provides a total power range for DRAM overclocking. A higher value setting provides higher power consumption delivery and extends the overclocking frequency range simultaneously.
Configuration options: [100%] [110%] [120%] [130%]

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

DRAM Power Phase Control [Extreme]

This item allows you to set the power phase control of the DRAM.
Configuration options: [Optimized] [Extreme]

DRAM 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 you set the **DRAM Switching Frequency** to **[Manual]**.

Fixed DRAM Switching Frequency (KHz) [300]
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 500 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.

Boot Voltages

CPU Core/Cache Boot Voltage [Auto]

The voltage for CPU at initial boot.
Configuration options: [Auto] [0.600] - [1.700]

DMI Boot Voltage [Auto]

The voltage for DMI at initial boot.
Configuration options: [Auto] [0.300] - [1.900]

CPU System Agent Boot Voltage [Auto]

The voltage for CPU System Agent at initial boot.
Configuration options: [Auto] [0.7000] - [1.8000]

CPU VCCIO Boot Voltage [Auto]

The voltage for CPU VCCIO at initial boot.
Configuration options: [Auto] [0.7000] - [1.8000]

CPU Standby Boot Voltage [Auto]

The voltage for CPU Standby at initial boot.
Configuration options: [Auto] [0.7000] - [2.2000]

Internal CPU Power Management

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

Intel(R) SpeedStep(tm) [Auto]

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

Turbo Mode [Enabled]

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

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 <+> and <-> keys to adjust the value.
Configuration options: [Auto] [1] - [4095]

Package Power Time Window [Auto]
Also known as Power Limit 1, and allows you to maintain the time window for Turbo Ratio over TDP (Thermal Design Power). Use the <+> and <-> keys to adjust the value.
Configuration options: [Auto] [1] - [127]

Short Duration Package Power Limit [Auto]
Also known as Power Limit 2, and allows you to provide rapid protection when the package power exceeds the Power Limit 1. Use the <+> and <-> keys to adjust the value.
Configuration options: [Auto] [1] - [4095]

IA AC Load Line [Auto]

This item allows you to set the AC loadline defined in 1/100 mOhms. Use the <+> and <-> keys to adjust the value.
Configuration options: [Auto] [0.01] - [62.49]

IA DC Load Line [Auto]

This item allows you to set the DC loadline defined in 1/100 mOhms. Use the <+> and <-> keys to adjust the value.
Configuration options: [Auto] [0.01] - [62.49]

Tweaker's Paradise

FCLK Frequency [Auto]

Configuration options: [Auto] [Normal (800MHz)] [1 GHz] [400MHz]

Initial BCLK Frequency [Auto]

This item allows you to set the initial BCLK (base clock) frequency to start overclocking from the assigned BCLK frequency.
Configuration options: [Auto] [40.0 MHz] – [650.0 MHz]

BCLK Amplitude [Auto]

This item allows you to set the magnitude of the base clock driven for the processor.
Configuration options: [Auto] [700mV] [800mV] [900mV] [1000mV]

BCLK Slew Rate [Auto]

This item allows you to set the speed at which each clock rises and falls.
Configuration options: [Auto] [1.5V/ns] [2.5V/ns] [3.5V/ns] [4.5V/ns]

BCLK Spread Spectrum [Auto]

This item allows you to reduce the EMI. Disable to get more accurate base clocks.
Configuration options: [Auto] [Disabled] [-0.22] [-0.34] [-0.46] [+0.12] [+0.22] [+0.28] [+0.38] [+0.17]

BCLK Frequency Slew Rate [Auto]

This item allows you to set frequency update rate. Lower values speed up clock changes.
Configuration options: [Auto] [Disable] [32us/MHz] [64us/MHz] [128us/MHz] [512us/MHz]

VPPDDR Voltage [Auto]

Configuration options: [Auto] [1.865] - [3.135]

DMI Voltage [Auto]

Configuration options: [Auto] [0.300] - [1.900]

Internal PLL Voltage [Auto]

Configuration options: [Auto] [0.900] - [1.845]

CPU Core/Cache Current Limit Max. [Auto]

This item allows you to configure a higher current limit to prevent a frequency or power throttling when overclocking. Use the <+> and <-> keys to adjust the value.
Configuration options: [Auto] [0.00] - [255.50]

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]

Extreme Over-voltage [Disabled]

Enable this item to allow higher voltages for overclocking, but the CPU lifetime will not be guaranteed

Configuration options: [Disabled] [Enabled]

> This item can only be enabled when the onboard CPU_OV jumper is switched on.

CPU Core/Cache 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 item appears only when you set the **CPU Core/Cache Voltage** to **[Manual Mode]**.

CPU Core Voltage Override [Auto]

Allows you to configure the CPU Core voltage.
Configuration options: [Auto] [0.600] - [1.700]

> The following items appear only when you set the **CPU Core/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 Core Voltage Offset [Auto]

This item allows you to configure the CPU core voltage offset value.
Configuration options: [Auto] [-0.635] - [0.635]

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

Offset Mode Sign [-]

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

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

Additional Turbo Mode CPU Core Voltage [Auto]

This item allows you to configure the CPU core voltage offset value.
Configuration options: [Auto] [0.250] - [1.920]

Offset Voltage [Auto]

This item allows you to configure the CPU core voltage offset value.
Configuration options: [Auto] [0.001] - [0.999]

DRAM Voltage [Auto]

Configuration options: [Auto] [1.000] - [2.000]

CPU VCCIO Voltage [Auto]

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

CPU System Agent Voltage [Auto]

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

PCH Core Voltage [Auto]

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

CPU Standby Voltage [Auto]

Configuration options: [Auto] [0.800] - [1.800]

DRAM REF Voltage Control

DRAM CTRL REF Voltage on CHA/CHB [Auto]

Configures the DRAM reference voltage on the control lines. The reference voltage will
be the DRAM voltage times the configured value.
Configuration options: [Auto] [0.39500] - [0.63000]

DRAM DATA REF Voltage on CHA/CHB DIMM0/1 Rank0/1 BL0-7 [Auto]

Configures the DRAM Data REF Voltage.
Configuration options: [Auto] [0] - [63]

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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.
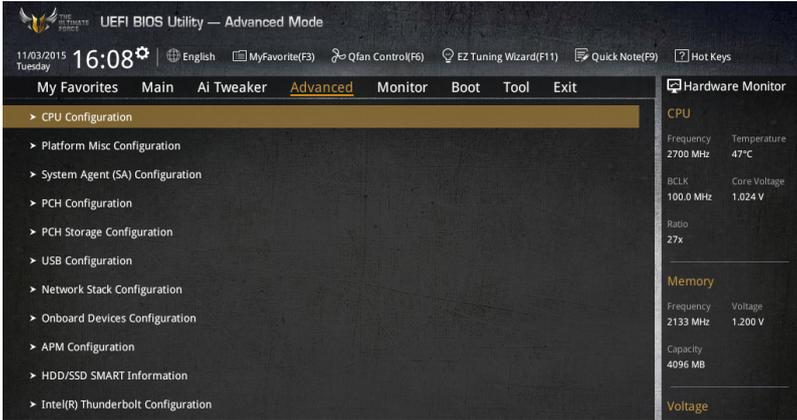
3.6.1 CPU Configuration

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.

Active Processor Cores [All]

This item allows you to select the number of CPU cores to activate in each processor package.

Configuration options: [All] [1] [2] [3]

Intel Virtualization Technology [Enabled]

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: [Disabled] [Enabled]

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: [Disabled] [Enabled]

Boot Performance Mode [Auto]

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: [Auto] [Max Non-Turbo Performance] [Max Battery] [Turbo Performance]

CPU Power Management Configuration

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

Intel SpeedStep(tm) [Auto]

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

[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: [Enabled] [Disabled]

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 C-States [Enabled]
When enabled, CPU will switch to minimum speed when all cores enter C-State.
Configuration options: [Enabled] [Disabled]

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

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

Configuration options: [Enabled] [Disabled]

CPU C7 Report [CPU C7s]

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This item allows you to disable or enable the CPU C7 report to the operating system.

Configuration options: [Disabled] [CPU C7] [CPU C7s]

CPU C8 Report [Enabled]
This item allows you to disable or enable the CPU C8 report to the operating system.

Configuration options: [Enabled] [Disabled]

Package C State Limit [Auto]
This item allows you to set the a C-state limit for the CPU package.
Configuration options: [Auto] [Enabled] [C0/C1] [C2] [C3] [C6] [C7] [C7s] [C8]

CFG Lock [Disabled]

This item allows you to disable or enable the CFG Lock.
Configuration options: [Enabled] [Disabled]

3.6.2   Platform Misc Configuration

The items in this menu allow you to configure the platform-related features.
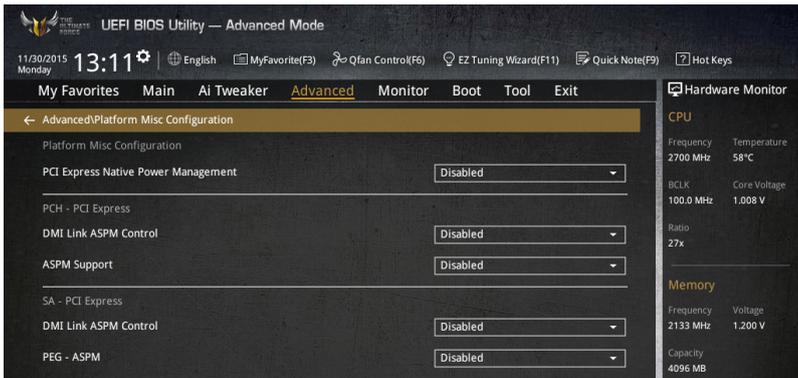
PCIE Native Power Management [Disabled]

This item allows you to enhance the power saving feature of PCI Express and perform ASPM operations in the operating system.

Configuration options: [Disabled] [Enabled]

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

Native ASPM [Disabled]

[Enabled]   Windows® Vista OS controls the ASPM (active state power management) support for devices.

[Disabled]   BIOS controls the ASPM support for the device.

PCH - PCI Express

DMI Link ASPM Control [Disabled]

This item allows you to control the Active State Power Management on both NB (NorthBridge) side and SB (SouthBridge) side of the DMI Link.

Configuration options: [Disabled] [Enabled]

ASPM Support [Disabled]

This item allows you to select the ASPM state for energy-saving conditions.

Configuration options: [Disabled] [L0s] [L1] [L0sL1] [Auto]

SA - PCI Express

DMI Link ASPM Control [Disabled]

This item allows you to control the Active State Power Management on both CPU and PCH (platform controller hub) Both DMI link ASPM control items of the CPU and PCH sides must be enabled for the ASPM to take effect.

Configuration options: [Disabled] [L1]

PEG - ASPM [Disabled]

This item allows you to select the ASPM state for energy-saving conditions, or use the ASUS optimized energy saving profile.

Configuration options: [Disabled] [Auto] [ASPM L0s] [ASPM L1] [ASPM L0sL1]

3.6.3   System Agent (SA) Configuration
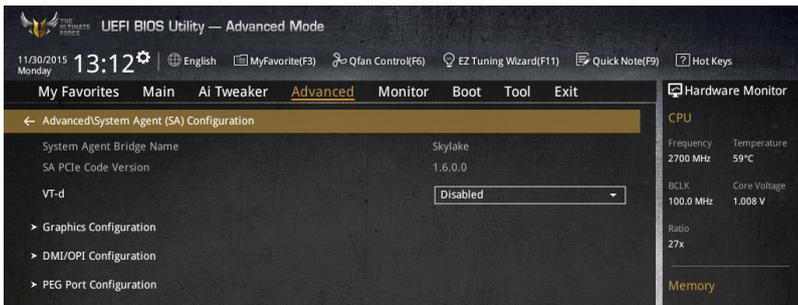
VT-d [Disabled]

Allows you to enable virtualization technology function on memory control hub.

Configuration options: [Enabled] [Disabled]

Graphics Configuration

This item allows you to select a primary display from CPU and PCIe graphical devices.

Primary Display [Auto]

This item allows you to select the primary display from CPU and PCIe devices.
Configuration options: [Auto] [IGFX] [PEG] [PCIE]

iGPU Multi-Monitor [Disabled]

This item allows you to enable the iGPU Multi-Monitor. The iGPU shared system memory size is fixed 64 MB.
Configuration options: [Disabled] [Enabled]

DMI/OPI Configuration

This item allows you to control various DMI (direct media interface) functions.

DMI Max Link Speed [Auto]

Set this item to **[Enabled]** to set DMI speed.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

PEG Port Configuration

This item allows you to configure the PEG Port settings.

PCIEx16_1 Link Speed [Auto]

This item allows you to configure the PCIEx16_1 slot.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

PCIEx16_2 Link Speed [Auto]

This item allows you to configure the PCIEx16_2 slot.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

3.6.4   PCH Configuration
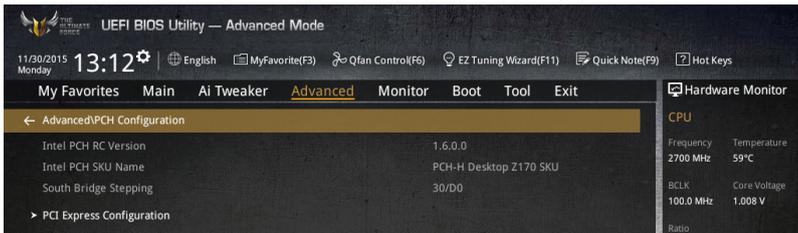
PCI Express Configuration

This item allows you to configure the PCI Express slots.

PCIe Speed [Auto]

This item allows your system to automatically select the PCI Express port speed.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

3.6.5 PCH Storage Configuration

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

Scroll down to display the other BIOS items.
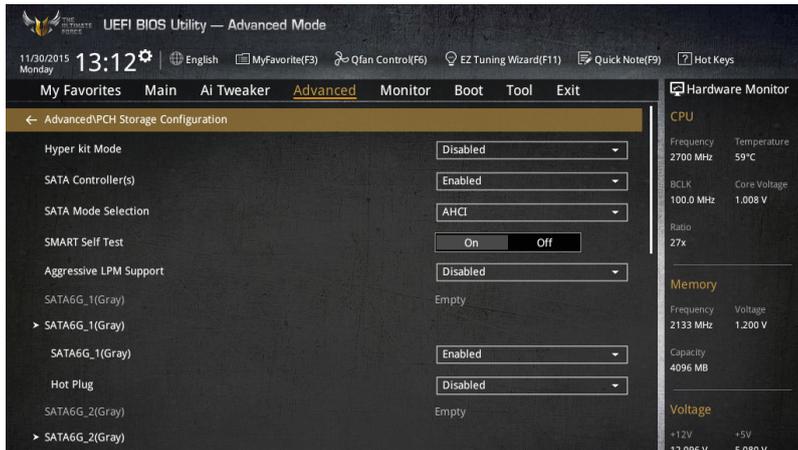
Hyper kit Mode [Disabled]

This item allows you to enable or disable M.2 devices. Enable this option for "ASUS Hyper kit" card.

Configuration options: [Disabled] [Enabled]

SATA Controller(s) [Enabled]

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

Configuration options: [Disabled] [Enabled]

SATA Mode Selection [AHCI]

This item allows you to set the SATA configuration.

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

[RAID]   Set to [RAID] when you want to create a RAID configuration from the SATA hard disk drives.

> The following item appears only when you set the SATA Mode Selection to **[RAID]**.

M.2 PCIE Storage RAID Support [Disabled]

This item allows you to enable or disable PCIE port to SATA for RAID Remapping.
Configuration options: [Disabled] [Enabled]

SATA Express_1 PCIE Storage RAID Support [Disabled]

This item allows you to enable or disable PCIE port to SATA for RAID Remapping.
Configuration options: [Disabled] [Enabled]

PCIEX16_3 PCIE Storage RAID Support [Disabled]

This item allows you to enable or disable PCIE port to SATA for RAID Remapping.
Configuration options: [Disabled] [Enabled]

SMART Self Test [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]

Aggressive LPM Support [Disabled]

This item is designed for LPM (link power management) support with a better energy saving conditions. When disabled, 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 appears only when the SATA Mode Selection is set to [**AHCI**] and allows you to enable or disable SATA Hot Plug Support.
Configuration options: [Disabled] [Enabled]

3.6.6   USB Configuration

The items in this menu allow you to change the USB-related features.
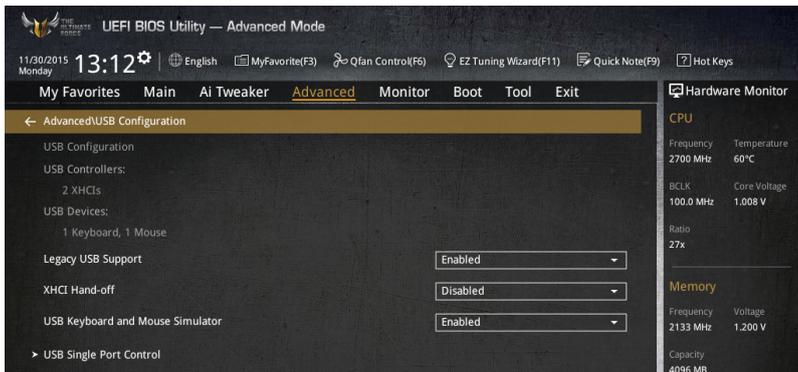
> The **Mass Storage Devices** item shows the auto-detected values. If no USB device is detected, the item shows **None**.

Legacy USB Support [Enabled]

[Enabled]	Your system supports the USB devices in legacy operating systems.
[Disabled]	Your USB devices can be used for BIOS setup only and cannot be recognized in the boot devices list.
[Auto]	Your system automatically detects the presence of USB devices at startup. If any USB devices are detected, the legacy USB support is enabled.

XHCI Hand-off [Disabled]

[Enabled]	Enables the support for operating systems without an XHCI hand-off feature.
[Disabled]	Disables the XHCI Hand-off support.

USB Keyboard and Mouse Simulator [Enabled]

[Enabled]	Enables the support for operating systems without a USB keyboardf and mouse feature to simulate a USB keyboard and mouse in Windows 7.
[Disabled]	Disables the USB Keyboard and Mouse Simulator.

> Ensure to install USb driver in your system before you disable this item.

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.

3.6.7   Network Stack Configuration
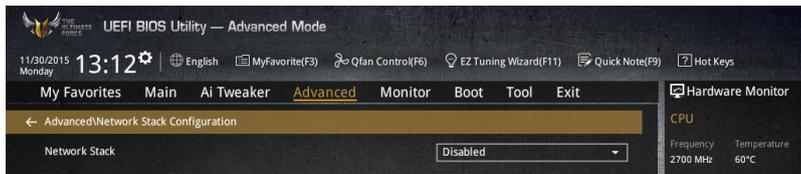
Network stack [Disable]

This item allows you to disable or enable the UEFI network stack.
Configuration options: [Disable] [Enable]

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

Ipv4/Ipv6 PXE Support [Enabled]

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

3.6.8   Onboard Devices Configuration

Scroll down to view the other BIOS items.
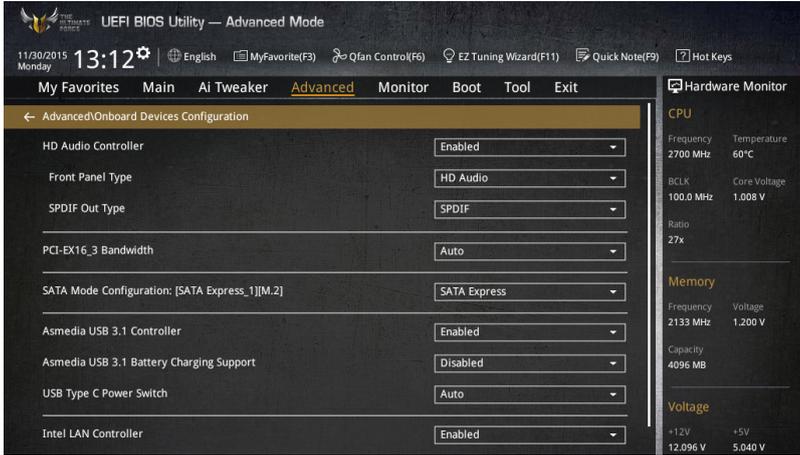
HD Audio Controller [Enabled]

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.

PCI-EX16_3 Bandwidth [Auto]

[Auto]   Run at X2 mode with SATA6G_56 enabled.

[X4 mode]   Run at X4 mode for higher performance with SATA6G_56 disabled.

SATA Mode Configuration: [SATA Express_1] [M.2]

[M.2]   SATA mode will be switched to M.2. SATA Express can only support PCIE devices.

[SATA Express]   SATA mode will be switched to SATA Express. M.2 can only support PCIE devices.

Asmedia USB 3.1 Controller [Enabled]

This item allows you to disable or enable the Intel® USB 3.1 controller of your system.

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]

USB Type C Power Switch [Auto]

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

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

Intel LAN Controller [Enabled]

This item allows you to enable or disable the Intel LAN1/2 controllers.

Configuration options: [Disabled] [Enabled]

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

Intel PXE Option ROM [Disabled]

This item allows you to enable or disable the PXE OptionRom of the Intel® LAN controller.
Configuration options: [Enabled] [Disabled]

3.6.9   APM Configuration
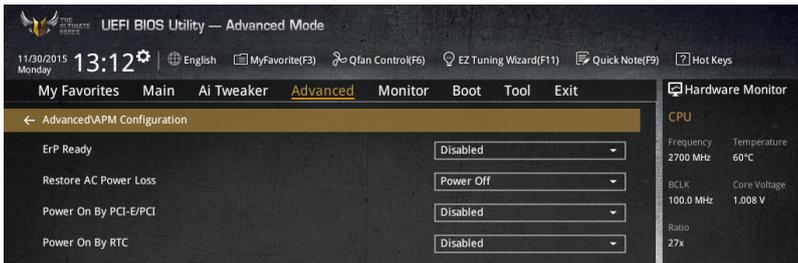
ErP Ready [Disabled]

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 Off] [Power On] [Last State]

Power On By PCI-E/PCI [Disabled]

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

Configuration options: [Disabled] [Enabled]

Power On By RTC [Disabled]

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

Configuration options: [Disabled] [Enabled]

3.6.10   HDD/SSD SMART Information

This menu displays the SMART information of the connected devices.
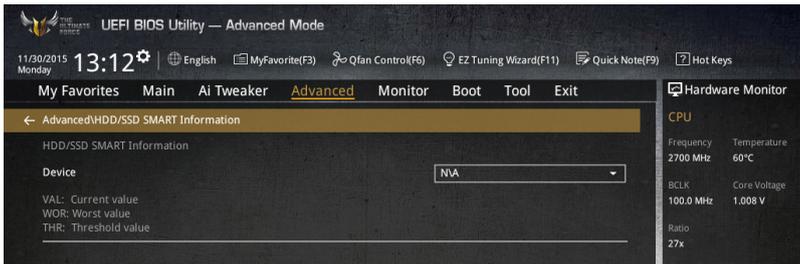
3.6.11   Intel(R) Thunderbolt Configuration
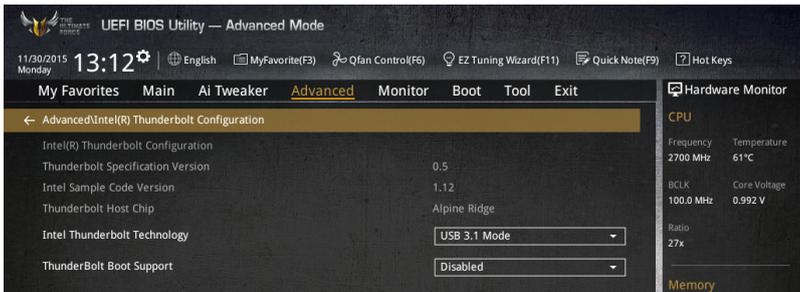
Intel Thunderbolt Technology [USB 3.1 Mode]

This item allows you to enable or disable the Intel® Thunderbolt Function.

Configuration options: [Disabled] [USB 3.1 Mode] [Enabled]

ThunderBolt Boot Support [Disabled]

This item allows you to enable or disable Thunderbolt attached device as a bootable device.

Configuration options: [Disabled] [Enabled]

3.7   Monitor menu

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

Scroll down to display the other BIOS items.

Thermal Radar Temperature / CPU Temperature / EXT_SENSOR1-3 Temperature [xxx°C/xxx°F]

The onboard hardware monitor automatically detects and displays the CPU, thermal radar, and EXT_SENSOR1-3 temperatures. Select **[Ignore]** if you do not wish to display the detected temperatures.

CPU Fan Speed, CPU Optional Fan Speed, Water Pump Speed, Chassis Fan 1-6 Speed, ASST Fan 1-2 Speed, Extension Fan 1-3 Speed [xxxx RPM] or [Ignore] / [N/A]

The onboard hardware monitor automatically detects and displays the CPU, chassis, and power 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

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.

Qfan Configuration

Qfan Tuning

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

CPU Q-Fan Control [Auto]

[Auto]   Detect the type of CPU fan installed and automatically switches the mode control.

[PWM Mode]   Enable the CPU Q-Fan control feature in PWM mode for 4-pin CPU fan.

[DC Mode]   Enable the CPU Q-Fan control feature in DC mode for 3-pin CPU fan.

[Disabled]   Disable the Q-Fan control.

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] [4.5 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] [4.5 sec] [5.0 sec] [6.3 sec] [8.5 sec] [12 sec] [25 sec]

CPU Fan Speed Lower 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 [70]
Use the <+> or <-> keys to adjust the upper limit of the CPU temperature. The values range from 25 to 75.

CPU Fan Max. Duty Cycle (%) [100]
Use the <+> or <-> 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 [25]
Use the <+> or <-> keys to adjust the middle limit of the CPU temperature. The values range from 20 to 75.

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CPU Fan Middle. Duty Cycle (%) [20]

Use the <+> or <-> 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 Lower Temperature [20]

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

CPU Fan Min. Duty Cycle(%) [20]

Use the <+> or <-> keys to adjust the minimum CPU fan duty cycle. The values range from 0% to 100%. When the CPU temperature is under the limit, the CPU fan will operate at the minimum duty cycle.

Chassis Fan(s) Configuration

Chassis Fan 1-6 Q-Fan Control [DC Mode]

[Disabled]   Disable the Chassis Q-Fan control feature.

[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.

Chassis Fan 1-6 Q-Fan Source [CPU]

The assignment fan will be controlled according to the selected temperature source.
Configuration options: [CPU] [MotherBoard] [PCH Core] [VCORE] [VCORE(BACK)] [DRAM] [PCH] [USB3.1] [PCIE-1] [PCIE-2] [T_Sensor1] [T_Sensor2] [T_Sensor3]

> For T_Sensor1-3, connect a Thermistor cable to the T_SENSOR1-3 header then place the other end to the component to get the temperature.

Chassis Fan 1-6 Step Up [0 sec]

This item allows you to set the value of the CPU 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 1-6 Step Down [0 sec]

This item allows you to set the value of the CPU 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 1-6 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 1-6 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 four items appear only when you set Chassis Fan 1-6 Profile to **[Manual].**

> ### *Chassis Fan 1-6 Upper Temperature [70]*
> Use the <+> or <-> keys to adjust the upper limit of the Chassis Fan 1-6 temperature. The values range from 20 to 75.
>
> ### *Chassis Fan 1-6 Max. Duty Cycle (%) [100]*
> Use the <+> or <-> keys to adjust the maximum Chassis Fan 1-6 duty cycle. The values range from 20% to 100%. When the CPU temperature reaches the upper limit, the Chassis Fan 1-6 will operate at the maximum duty cycle.
>
> ### *Chassis Fan 1-6 Middle Temperature [45]*
> Use the <+> or <-> keys to adjust the middle limit of the Chassis Fan 1-6 temperature. The values range from 20 to 75.
>
> ### *Chassis Fan 1-6 Middle. Duty Cycle (%) [60]*
> Use the <+> or <-> keys to adjust the maximum Chassis Fan 1-6 duty cycle. The values range from 20% to 100%. When the CPU temperature reaches the upper limit, the Chassis Fan 1-6 will operate at the maximum duty cycle.
>
> ### *Chassis Fan 1-6 Lower Temperature [40]*
> Use the <+> or <-> keys to adjust the lower limit of the Chassis Fan 1-6 temperature. The values range from 20 to 75. The Chassis Fan 1-6 will operate at the minimum duty cycle when the temperature is lower than the limit.
>
> ### *Chassis Fan 1-6 Min. Duty Cycle(%) [60]*
> Use the <+> or <-> keys to adjust the minimum Chassis Fan 1-6 fan duty cycle. The values range from 0% to 100%. When the CPU temperature is under the limit, the Chassis Fan 1-6 fan will operate at the minimum duty cycle.
>
> ### *Allow Fan Stop [Disabled]*
> This item allow the fan to run at 0% duty cycle when the temperature of the source is dropped below the lower temperature.
>
> Configuration options: [Disabled] [Enabled]

Asst. Fan(s) Configuration

ASST Fan 1-2 Q-Fan Control [DC Mode]

[Disabled]   Disable the Assistant Fan Q-Fan control feature.

[DC mode]   Enable the Assistant Fan Q-Fan control in DC mode for 3-pin chassis
                   fan.

[PWM mode]   Enable the Assistant Fan Q-Fan control in PWM mode for 4-pin
                   chassis fan.

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

The assignment fan will be controlled according to the selected temperature source.
Configuration options: [CPU] [MotherBoard] [PCH Core] [VCORE] [VCORE(BACK)]
[DRAM] [PCH] [USB3.1] [PCIE-1] [PCIE-2] [T_Sensor1] [T_Sensor2] [T_Sensor3]

> For T_Sensor1-3, connect a Thermistor cable to the T_SENSOR1-3 header then place the
> other end to the component to get the temperature.

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

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

ASST Fan 1-2 Profile [Standard]

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

[Standard]   Set to make the assistant fan adjust automatically depending on the
                   CPU temperature.

[Silent]   Set to minimize the fan speed for quiet assistant fan operation.

[Turbo]   Set to achieve maximum assistant fan speed.

[Manual]   Set to assign the detailed fan speed control parameters.

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

> ***ASST Fan 1-2 Upper Temperature [70]***
> Use the <+> or <-> keys to adjust the upper limit of the Assistant Fan 1-2
> temperature. The values range from 20 to 75.
>
> ***ASST Fan 1-2 Max. Duty Cycle (%) [100]***
> Use the <+> or <-> keys to adjust the maximum Assistant Fan 1-2 duty
> cycle. The values range from 20% to 100%. When the CPU temperature
> reaches the upper limit, the Assistant Fan 1-2 will operate at the maximum
> duty cycle.
>
> ***ASST Fan 1-2 Middle Temperature [45]***
> Use the <+> or <-> keys to adjust the middle limit of the Assistant Fan 1-2
> temperature. The values range from 20 to 75.
>
> ***ASST Fan 1-2 Middle. Duty Cycle (%) [60]***
> Use the <+> or <-> keys to adjust the maximum Assistant Fan 1-2 duty
> cycle. The values range from 20% to 100%. When the CPU temperature
> reaches the upper limit, the Assistant Fan 1-2 will operate at the maximum
> duty cycle.

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ASST Fan 1-2 Lower Temperature [40]
Use the <+> or <-> keys to adjust the lower limit of the Assistant Fan 1-2 temperature. The values range from 20 to 75. The Assistant Fan 1-2 will operate at the minimum duty cycle when the temperature is lower than the limit.

ASST Fan 1-2 Min. Duty Cycle(%) [60]
Use the <+> or <-> keys to adjust the minimum Assistant Fan 1-2 duty cycle. The values range from 0% to 100%. When the CPU temperature is under the limit, the Assistant Fan 1-2 will operate at the minimum duty cycle.

Allow Fan Stop [Disabled]
This item allow the fan to run at 0% duty cycle when the temperature of the source is dropped below the lower temperature.

Configuration options: [Disabled] [Enabled]

Ext. Fan(s) Configuration

ASUS FAN EXTENSION CARD is required to configure these items

Extension Fan 1-3 Q-Fan Control [DC Mode]

[Disabled]	Disable the Extension Fan Q-Fan control feature.
[DC mode]	Enable the Extension Fan Q-Fan control in DC mode for 3-pin chassis fan.
[PWM mode]	Enable the Extension Fan Q-Fan control in PWM mode for 4-pin chassis fan.

Extension Fan 1-3 Q-Fan Source [CPU]

The assignment fan will be controlled according to the selected temperature source.
Configuration options: [CPU] [MotherBoard] [PCH Core] [VCORE] [VCORE(BACK)] [DRAM] [PCH] [USB3.1] [PCIE-1] [PCIE-2] [T_Sensor1] [T_Sensor2] [T_Sensor3] [EXT_Sensor1] [EXT_Sensor2] [EXT_Sensor3]

> 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.

Extension Fan 1-3 Fan Speed Low Limit [200 RPM]

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

Extension Fan 1-3 Profile [Standard]

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

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

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

Extension Fan 1-3 Upper Temperature [70]
Use the <+> or <-> keys to adjust the upper limit of the Extension Fan 1-3 temperature. The values range from 20 to 75.

Extension Fan 1-3 Max. Duty Cycle (%) [100]
Use the <+> or <-> keys to adjust the maximum Extension Fan 1-3 duty cycle. The values range from 20% to 100%. When the CPU temperature reaches the upper limit, the Extension Fan 1-3 will operate at the maximum duty cycle.

Extension Fan 1-3 Middle Temperature [45]
Use the <+> or <-> keys to adjust the middle limit of the Extension Fan 1-3 temperature. The values range from 20 to 75.

Extension Fan 1-3 Middle. Duty Cycle (%) [60]
Use the <+> or <-> keys to adjust the maximum Extension Fan 1-3 duty cycle. The values range from 20% to 100%. When the CPU temperature reaches the upper limit, the Extension Fan 1-3 will operate at the maximum duty cycle.

Extension Fan 1-3 Lower Temperature [40]
Use the <+> or <-> keys to adjust the lower limit of the Extension Fan 1-3 temperature. The values range from 20 to 75. The Extension Fan 1-3 will operate at the minimum duty cycle when the temperature is lower than the limit.

Extension Fan 1-3 Min. Duty Cycle(%) [60]
Use the <+> or <-> keys to adjust the minimum Extension Fan 1-3 duty cycle. The values range from 0% to 100%. When the CPU temperature is under the limit, the Extension Fan 1-3 will operate at the minimum duty cycle.

Allow Fan Stop [Disabled]
This item allow the fan to run at 0% duty cycle when the temperature of the source is dropped below the lower temperature.

Configuration options: [Disabled] [Enabled]

Water Pump Control [Disabled]

[Disabled]   Disable the Water Pump control feature.

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

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

> The following items appear only when you set the Water Pump Control to **[DC mode]** or **[PWM mode].**

Water Pump Upper Temperature [70]
Use the <+> or <-> keys to adjust the upper limit of the Water Pump temperature. The values range from 20 to 75.

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

Water Pump Middle Temperature [45]
Use the <+> or <-> keys to adjust the middle limit of the Water Pump temperature. The values range from 20 to 75.

Water Pump Middle. Duty Cycle (%) [100]

Use the <+> or <-> keys to adjust the maximum Water Pump duty cycle. The values range from 20% to 100%. When the CPU temperature reaches the upper limit, the Water Pump will operate at the maximum duty cycle.

Water Pump Lower Temperature [40]

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

Water Pump Min. Duty Cycle(%) [100]

Use the <+> or <-> keys to adjust the minimum Water Pump duty cycle. The values range from 0% to 100%. When the CPU temperature is under the limit, the Water Pump will operate at the minimum duty cycle.

Fan Overtime [1 minutes]

This item allows you to set the time (in minutes) that the assistant fans will run prior to system shutdown.

Configuration options: [Disabled] [1 minutes] [3 minutes] [5 minutes] [10 minutes]

Anti Surge Support [On]

Enable this item for Over Voltage Protection (OVP) and Under Voltage Protection (UVP) functions.

Configuration options: [On] [Off]

Chassis Intrude Detect Support [Off]

Enable this item for chassis intrude detection functions.

Configuration options: [On] [Off]

Chassis Intrude Detect Support [On]

[On]   All the QLEDs will be turned on after POST.

[Off]   Set the QLEDs behavior as default.

3.8 Boot menu

The Boot menu items allow you to change the system boot options and boot device priority.
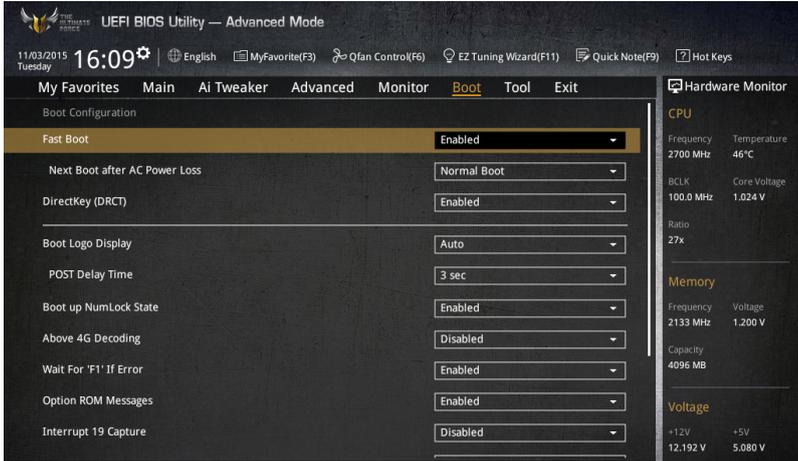
Fast Boot [Enabled]

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

[Enabled]   Allows your system to accelerate the boot speed.

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

Next Boot after AC Power Loss [Normal Boot]

[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.

DirectKey (DRCT) [Enabled]

[Disabled]   Disables the DirectKey button. The system will only power on or off when you press the DirectKey button.

[Enabled]   Allows the system to power on and go to the BIOS Setup directly when you press the Reset button. Connect the 2-pin connector of the chassis reset buton cable to the onboard DRCT header.

Boot Logo Display [Auto]

[Auto]   Sets the boot logo to display during POST.

[Full Screen]   Sets the boot logo display in full screen during POST.

[Disabled]   Disables the boot logo display during POST.

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

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Post Delay Time [3 sec]

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.

This feature only works when set under normal boot.

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

Post Report [5 sec]

This item allows you to select a desired POST report waiting time.
Configuration options: [1 sec] - [10 sec] [Until Press ESC]

Boot up NumLock State [Enabled]

This item allows you to enable or disable power-on state of the NumLock.

Configuration options: [Disabled] [Enabled]

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]

Wait For 'F1' If Error [Enabled]

This item allows your system to wait for the <F1> key to be pressed when error occurs.

Configuration options: [Disabled] [Enabled]

Option ROM Messages [Enabled]

[Enabled]   The Option ROM Messages will be shown during the POST.

[Disabled]   Only the ASUS logo will be shown during the POST.

Interrupt 19 Capture [Disabled]

[Enabled]   Execute the trap right away.

[Disabled]   Execute the trap during legacy boot.

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.
[Enabled]	For better compatibility, enable the CSM to fully support the non-UEFI driver add-on devices or the Windows® UEFI mode.
[Disabled]	Disable the CSM to fully support the non-UEFI driver add-on devices or the Windows® UEFI mode.

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

Boot Devices Control [UEFI and Legacy OPROM]
This item allows you to select the type of devices that you want to boot.
Configuration options: [UEFI and Legacy OPROM] [Legacy OPROM only]
[UEFI only]

Boot from Network Devices [Legacy only]
This item allows you to select the type of network devices that you want to launch.
Configuration options: [Legacy only] [UEFI driver first] [Ignore]

Boot from Storage Devices [Legacy only]
This item allows you to select the type of storage devices that you want to launch.
Configuration options: [Legacy only] [UEFI driver first] [Ignore]

Boot from PCI-E/PCI Expansion Devices [Legacy only]
This item allows you to select the type of PCI-E/PCI expansion devices that you want to launch.
Configuration options: [Legacy only] [UEFI driver first]

Secure Boot

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

OS Type [Windows UEFI mode]

[Windows UEFI Mode]	This item allows you to select your installed operating system. Execute the Microsoft® Secure Boot check. Only select this option when booting on Windows® UEFI mode or other Microsoft® Secure Boot compliant OS.
[Other OS]	Get the optimized function when booting on Windows® non-UEFI mode. Microsoft® Secure Boot only supports Windows® UEFI mode.

Key Management

Clear Secure Boot keys

This item allows you to clear all default Secure Boot keys.

Save Secure Boot Keys

This item allows you to save the PK (Platform Keys) to a USB storage device.

PK Management

Set New Key

This item allows you to load the downloaded PK from a USB storage device.

> The PK file must be formatted as a UEFI variable structure with time-based authenticated variable.

Delete Key

This item allows you to delete the PK from your system. Once the PK is deleted, all the system's Secure Boot keys will not be active.
Configuration options: [Yes] [No]

KEK Management

> Key-exchange Key (KEK) refers to Microsoft® Secure Boot Key-Enrollment Key (KEK).

Set New Key

Allows you to load the downloaded KEK from a USB storage device.

Append Key

Allows you to load the additional KEK from a storage device for an additional db and dbx loaded management.

Delete Key

Allows you to delete the KEK from your system.
Configuration options: [Yes] [No]

> The KEK file must be formatted as a UEFI variable structure with time-based authenticated variable.

DB Management

Set New Key

Allows you to load the downloaded db from a USB storage device.

Append Key

Allows you to load the additional db from a storage device so that more images can be loaded securely.

Delete Key

Allows you to delete the db file from your system.
Configuration options: [Yes] [No]

> The db file must be formatted as a UEFI variable structure with time-based authenticated variable.

DBX Management

Set New Key

Allows you to load the downloaded dbx from a USB storage device.
Configuration options: [Yes] [No]

Append Key

Allows you to load the additional dbx from a storage device so that more db's images cannot be loaded.

Delete Key

Allows you to delete the dbx file from your system.

> The dbx file must be formatted as a UEFI variable structure with time-based authenticated variable.

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.

Chapter 3

3.9 Tool menu

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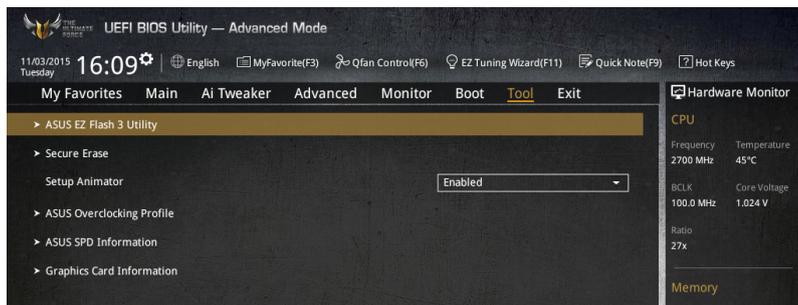
Setup Animator

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

Configuration options: [Disabled] [Enabled]

3.9.1 ASUS EZ Flash 3 Utility

This item allows you to run ASUS EZ Flash 3. When you press <Enter>, a confirmation message appears. Use the left/right arrow key to select between [Yes] or [No], then press <Enter> to confirm your choice.

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

3.9.2 Secure Erase

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

Secure Erase is only available in AHCI mode. Ensure to set the SATA mode to AHCI. Click **Advanced > SATA 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 of this manual.

Displays the available SSDs

ASUS UEFI Utility BIOS - Advanced Mode

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Saturday

SSD Secure Erase

Port #	SSD Name	Status	Total Capacity
P1	ADATA SS96 Turbo	Frozen	64.0GB

SSD speed performance may degrade over time due to accumulated files and frequent data-writing. Secure Erase completely cleans your SSD and restores it to its factory settings.
WARNING: Ensure that you run Secure Erase on a compatible SSD. Running Secure Erase on an incompatible SSD will render the SSD totally unusable.
NOTE: For the list of Secure Erase-compatible SSDs, visit the ASUS Support site at www.asus.com/support.

Exit

Status definition:

• **Frozen.** The frozen state is the result of a BIOS protective measure. The BIOS guards drives that do not have password protection by freezing them prior to booting. If the drive is frozen, a power off or hard reset of your PC must be performed to proceed with the Secure Erase.

• **Locked.** SSDs might be locked if the Secure Erase process is either incomplete or was stopped. This may be due to a third party software that uses a different password defined by ASUS. You have to unlock the SSD in the software before proceeding with Secure Erase.

Chapter 3

3.9.3 ASUS Overclocking Profile

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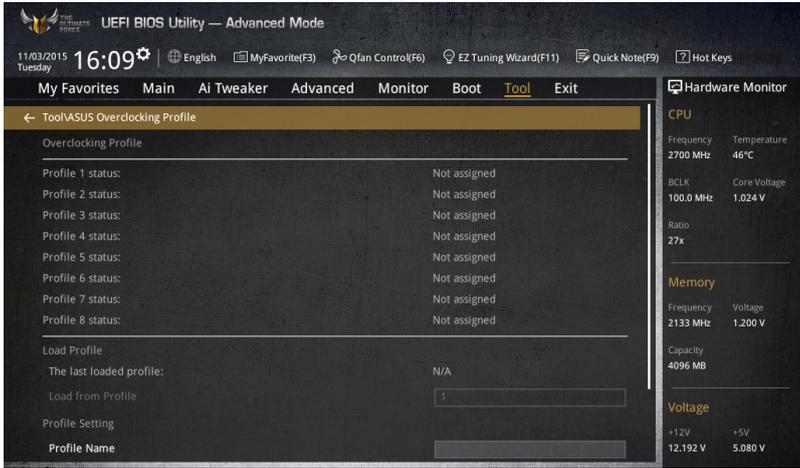
Load from Profile

This item allows you to load the previous BIOS settings saved in the BIOS Flash. Key in the profile number that saved your BIOS settings, press <Enter>, and then select **Yes**.

- DO NOT shut down or reset the system while updating the BIOS to prevent the system boot failure!
- We recommend that you update the BIOS file only coming from the same memory/ CPU configuration and BIOS version.

Profile Name

This item allows you to key in a profile name.

Save to Profile

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

Load/Save Profile from/to USB Drive

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

3.9.4 ASUS SPD Information

This item allows you to view the DRAM SPD information.

3.9.5 Graphics Card Information

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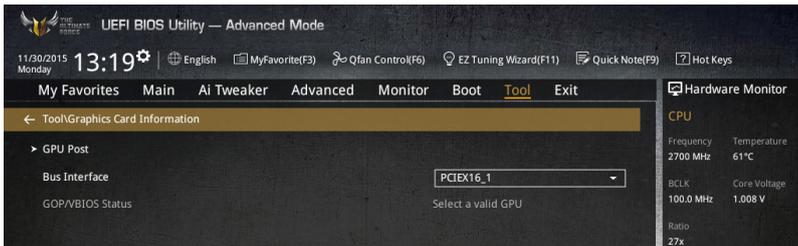
GPU Post

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

Bus Interface [PCIEX16_1]

This item allows you to select the bus interface.

Configuration options: [PCIEX16_1]

3.10 Exit menu

The Exit menu items allow you to load the optimal default values for the BIOS items, and save or discard your changes to the BIOS items. You can access the EZ Mode from the Exit menu.
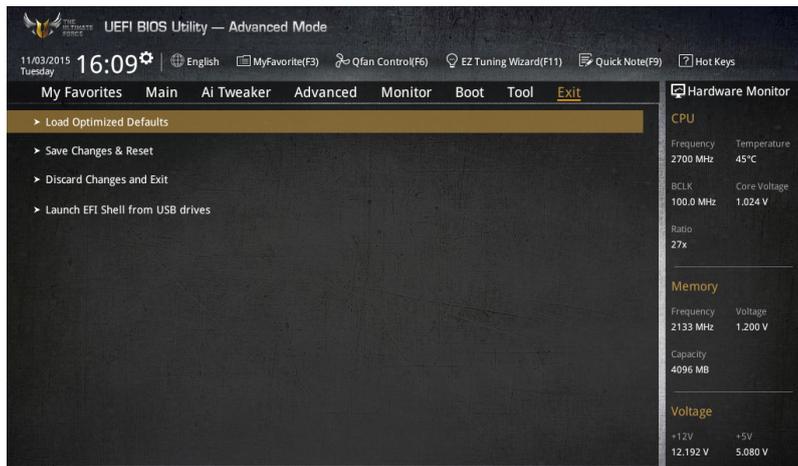
Load Optimized Defaults

This option allows you to load the default values for each of the parameters on the Setup menus. When you select this option or if you press <F5>, a confirmation window appears. Select **OK** to load the default values.

Save Changes & Reset

Once you are finished making your selections, choose this option from the Exit menu to ensure the values you selected are saved. When you select this option or if you press <F10>, a confirmation window appears. Select **OK** to save changes and exit.

Discard Changes & Exit

This option allows you to exit the Setup program without saving your changes. When you select this option or if you press <Esc>, a confirmation window appears. Select **Yes** to discard changes and exit.

Launch EFI Shell from USB drives

This 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.   Updates the BIOS via Internet or using a USB 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.

4.   ASUS BIOS Updater: Updates the BIOS in DOS environment using the motherboard support DVD and a USB flash disk drive.

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.

- Refer to section **4.4.2 EZ Update** of this user guide for more information.

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 **by USB.**

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.
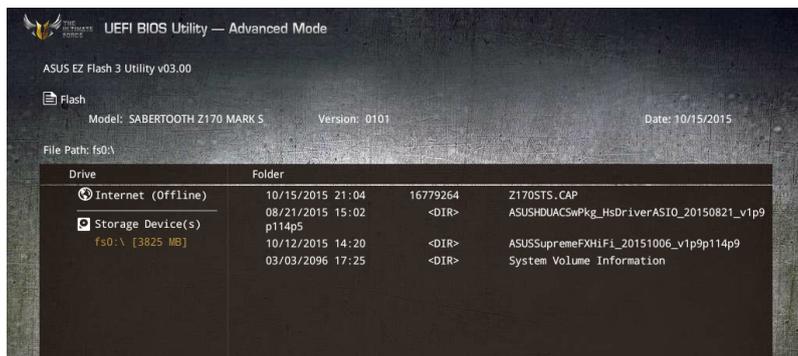
- This function can support devices such as a USB flash disk with FAT 32/16 format and single partition only.

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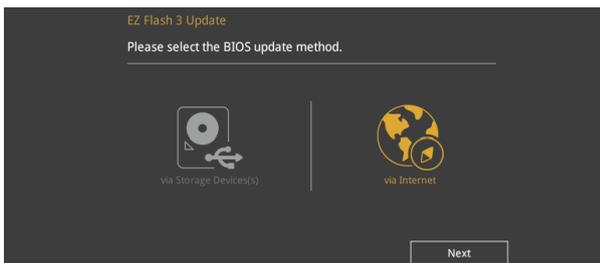
3. Press the Left/Right arrow keys to select an Internet connection method, and then press <Enter>.

4. Follow the onscreen instructions to complete the update.

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

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

3.11.3 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, 64-bit Windows® 8.1, and 64-bit Windows® 10 operating systems (OS).

- Motherboard settings and hardware options vary. The setup procedures presented in this chapter are for reference only. Refer to Windows® operating system documentation for detailed information.

4.1.1 Windows® 7 and USB 3.0 driver for 100 Series

Based on the chipset specification, the 100 series requires USB 3.0 drivers to be preloaded in order to use USB keyboard/mouse during Windows® 7 installation. This section is a guide on preloading USB 3.0 drivers and installing Windows® 7.

Method 1: Using SATA ODD & USB devices

Load USB 3.0 drivers using the ASUS support DVD and install Windows® 7 using a USB device.

Requirement:

- 1 x ASUS support DVD

- 1 x Windows® 7 installation source

- 1 x SATA ODD

- 1 x USB device (ODD or storage)

The USB storage device requires 8 GB or more capacity. It is recommended to format the storage device before use.

1. Insert the Windows® 7 installation DVD into a USB ODD, or copy all files on the Windows® 7 installation DVD to a USB storage device on a working system.

2. Connect the USB ODD or USB storage device to your 100 series platform.

3. Insert the ASUS support DVD into a SATA ODD on your 100 series platform.

4. Power on your system and press F8 during POST (Power-On Self Test) to enter the boot screen.

5.   Select the USB ODD or USB storage device as the boot device.
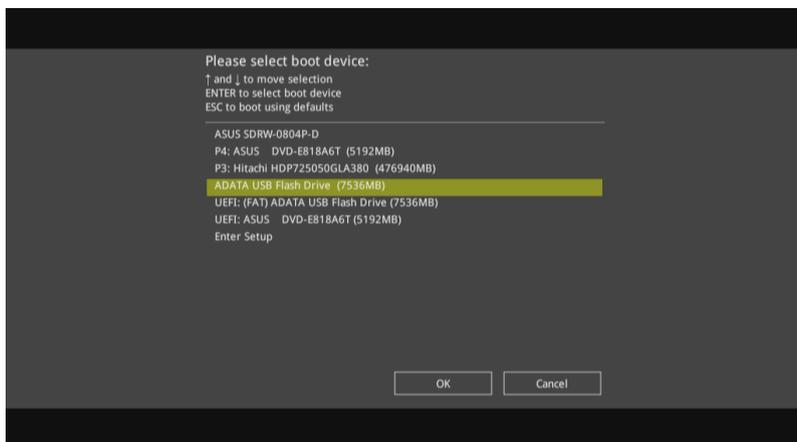
6.   The USB 3.0 driver will be loaded automatically during installation startup.
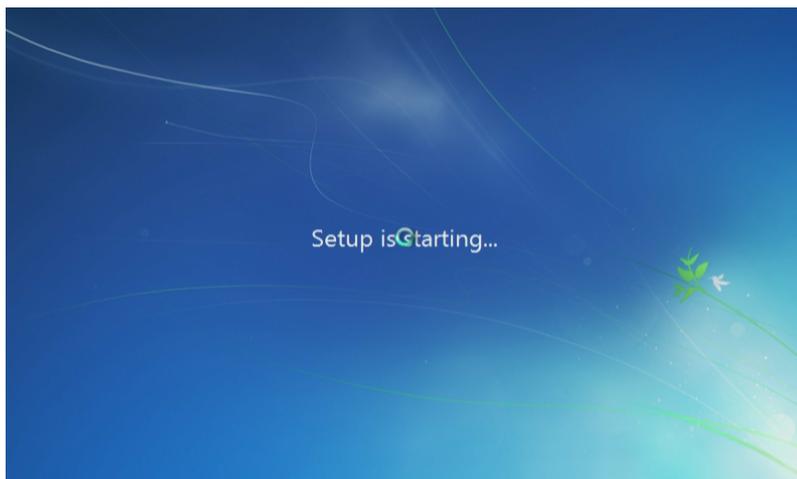
The "Setup is starting..." screen will show up if the USB 3.0 driver is loaded correctly.

7.   Follow the onscreen instructions to complete the Windows® 7 installation.

Method 2: Using a modified Windows® 7 ISO

Load USB 3.0 drivers and install Windows® 7 using a modified Windows® 7 installation DVD.

Requirement:

- 1 x ASUS support DVD
- 1 x Windows® 7 installation source
- 1 x Working system (PC or notebook)
- 1 x SATA ODD

1. On your working system, create an ISO image file of the Windows® 7 installation source using a third-party ISO software.

2. Copy both "Auto_Unattend.xml" and "Auto_Unattend" folder from the root directory of the ASUS supporting DVD to your system.

3. Edit the ISO file and add both "Auto_Unattend.xml" and "Auto_Unattend" folder into the ISO file.

4. Burn this ISO file onto an empty DVD to create a modified Windows® 7 installation DVD.

5. Insert the modified Windows® 7 installation DVD into an ODD on your 100 series platform.

6. Power on your system and press F8 during POST (Power-On Self Test) to enter the boot screen.

7. Select the ODD as the boot device.

8. The USB 3.0 driver will be loaded automatically during installation startup.

> The "Setup is starting..." screen will show up if the USB 3.0 driver is loaded correctly.

9. Follow the onscreen instructions to complete the Windows® 7 installation.

Chapter 4

Method 3: Using ASUS EZ Installer

Use the ASUS EZ Installer to create a modified Windows® 7 installation source.

Requirement:

- 1 x ASUS support DVD
- 1 x Windows® 7 installation DVD
- 1 x Working system (PC or notebook)
- 1 x SATA ODD
- 1 x USB storage device (8 GB or more)

1. Insert the Windows® 7 installation DVD.

2. Launch the ASUS EZ Installer located on the ASUS support DVD.

3. Select a method of creating a modified Windows® 7 installation file:

   - Windows® 7 OS disk to USB storage device

     - Select **Windows 7 OS disk to USB storage device** then click **Next**.
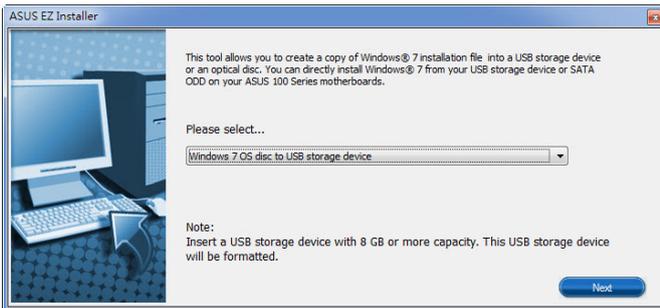
     - Check **I agree** and then click **Next**.
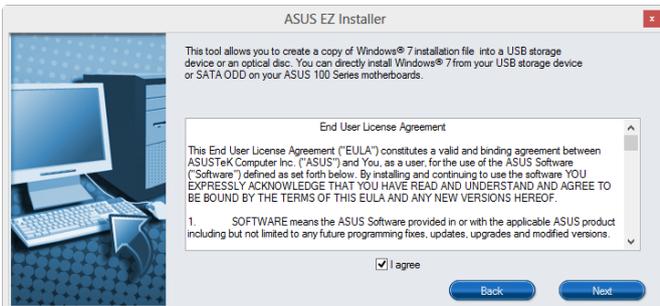
- Select the source of the Windows® 7 installation disk then click **Next**.

- Select the USB storage device and click **next**.

Click the refresh icon if the USB storage device is not displayed.

- Click **Yes** to clear the contents on the USB storage device and create a bootable USB device.

Make sure to backup contents on the USB storage device, as it will be formatted.

- Once completed, click **OK** to finish.

- **Windows® 7 OS disk to ISO file**

    - Select **Windows 7 OS disk to ISO file** then click **Next**.
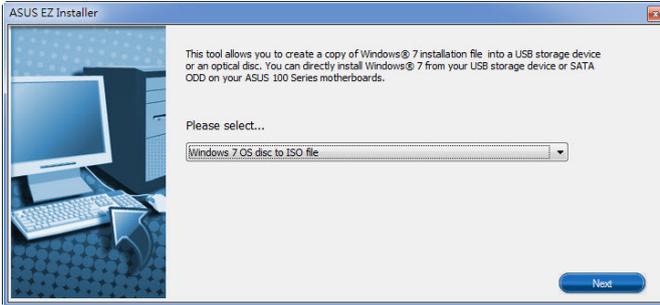
    - Check **I agree** and then click **Next**.

    - Select the source of the Windows® 7 installation disk then click **Next**.

Chapter 4
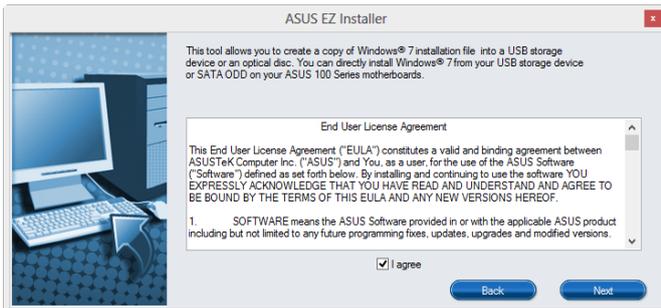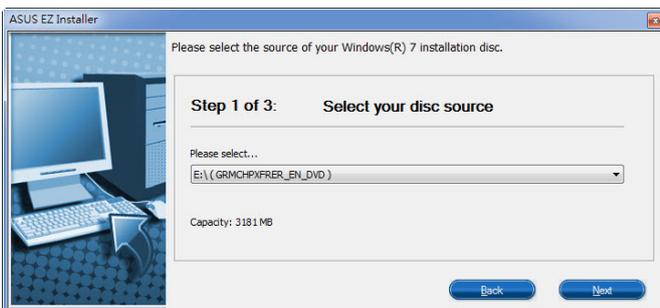
- Select the folder to save the modified Windows® 7 installation ISO file and click **Next**.
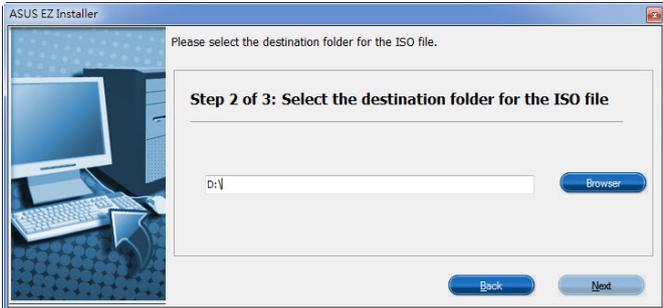
- Once completed, click OK to finish.

- Burn this ISO file onto an empty DVD to create a modified Windows® 7 installation DVD.

4. Insert the modified Windows® 7 installation DVD into an ODD or connect the USB storage device with modified Windows® 7 installation files onto your 100 series platform.

5. Power on your system and press F8 during POST (Power-On Self Test) to enter the boot screen.

6. Select the ODD or USB storage device as the boot device.

7. The USB 3.0 driver will be loaded automatically during installation startup.

The "Setup is starting..." screen will show up if the USB 3.0 driver is loaded correctly.

8. Follow the onscreen instructions to complete the Windows® 7 installation.

Chapter 4

4.2 Support DVD information

The contents of the support DVD are subject to change at any time without notice. Visit the ASUS website at 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 operating systems.

To run the support DVD:

1. Place the Support DVD into the optical drive.

2. In the **AutoPlay** dialog box, click or tap **Run ASSETUP.EXE**.
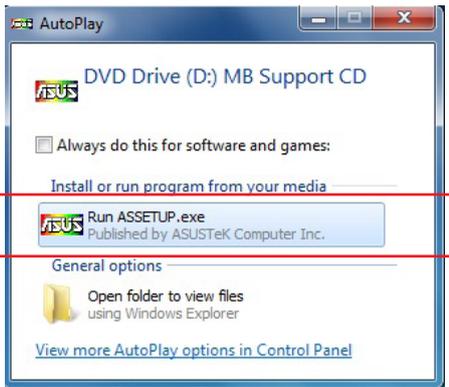
If the **AutoPlay** dialog box does not appear, browse the contents of the support DVD and double-click or tap **\\bin\ASSETUP.EXE** to launch the **ASUS motherboard support DVD** main menu.

Support DVD main menu

Shows the available device drivers if the system detects installed devices. Install the necessary drivers to use the devices.

Click to display the applications and other software that the motherboard supports

Contains the list of supplementary user manuals. Click an item to open the folder of the user guide

Click to display product related information
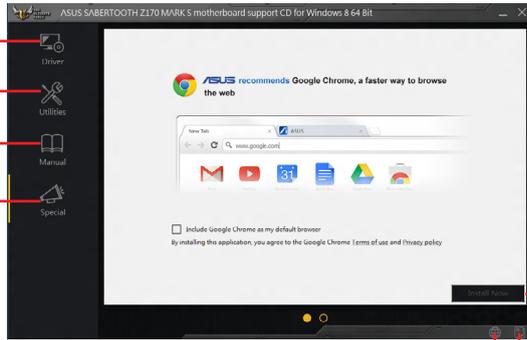
Click to display the ASUS contact information

Click to browse the file list of the suport CD

Click to install the selected items

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.
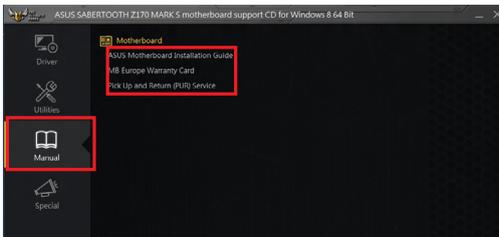
> The screenshots in this section are for reference only. The actual software manuals containing in the support DVD vary by models.

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 operating systems.

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 or tap **Run ASSETUP.exe** then select the **Utilities** tab.

3.   From the **Utilities** tab, click or tap **AI Suite 3** then follow the succeeding onscreen instructions.

Windows® 8.1 and 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 click or tap **AI Suite 3**.

3.   Follow the succeeding onscreen instructions.

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

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

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

Launching AI Suite 3

Windows® 7 OS

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

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

Windows® 8.1 and Windows® 10 OS

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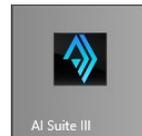
AI Suite 3 Main menu

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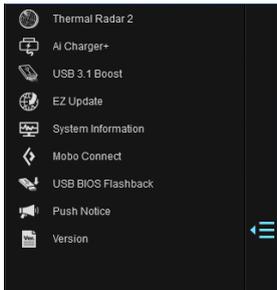
> • Some functions in the AI Suite 3 main menu in this user guide may vary depending on the motherboard model.
>
> • Refer to the software manual in the support DVD or visit the ASUS website at www.asus.com for detailed software configuration.

Thermal Radar 2

Thermal Radar 2 lets you control fans, monitor your graphics card temperature and other key components in real time, or auto-tune your thermal settings.

Thermal Tuning

This function optimizes your system's cooling solution based on your system's current thermal settings. It allows you to configure your CPU, chassis, and the exclusive TUF Turbo fan to achieve the best balance between cooling performance and low noise.
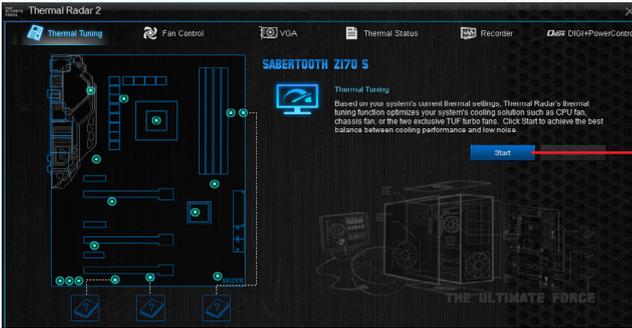
Click or tap to automatically start the Thermal Tuning process

Fan Control

Allows you to configure the settings of the fans installed on your system. You can also load or save a fan's profile to tune the thermal condition of your system.

Click or tap to load saved profiles

Click or tap to switch between items

Click or tap to save the settings of the new profile

Fan Overtime settings

VGA

Allows you to configure the thermal settings of an installed ASUS graphics card.

> • The VGA tab on Thermal Radar 2 appears only when you install an optional ASUS graphics card into your system.
>
> • The VGA feature of Thermal Radar 2 supports ASUS NVidia 700/900 Series and AMD R7/R9 Series graphics card only.

VGA - Auto Mode

The system loads the optimal values for the graphic card's thermal settings.

Click to load a saved profile

Click to save a new profile

VGA - Smart Mode

Manually adjust the acceleration and deceleration time of the graphic card's fans.

Click to apply changes

Click to undo changes
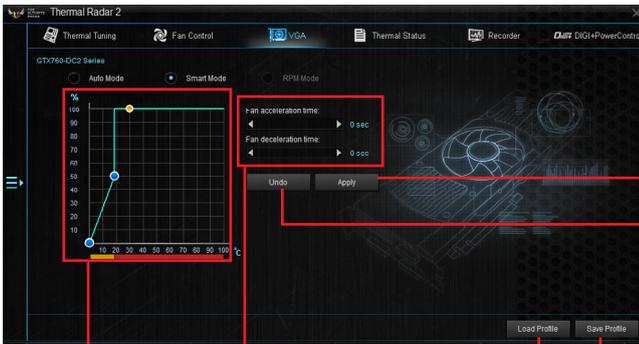
Displays the graph of the thermal settings

Click the sliders to adjust the settings

Click to load a saved profile

Click to save a new profile

VGA - RPM Mode

Allows you to manually adjust the fan's speed (in rpm).
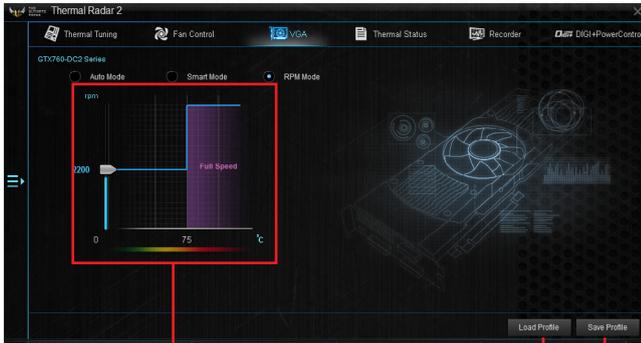
**Move the slider up or down
to adjust the settings**

**Click to load a
saved profile**

**Click to save a new
profile**

Thermal Status

Displays the current status of the thermal condition of your system.
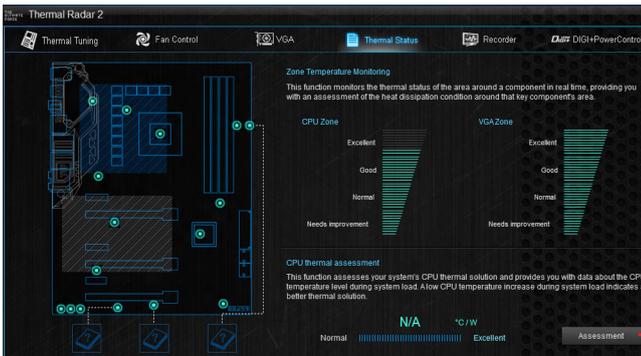
**Click or tap to run
the assessment
report of your
current thermal
settings.**

Recorder

Displays and monitors the status of the thermal setting and condition of your system.
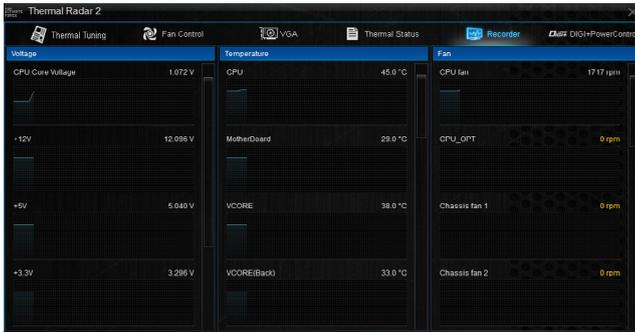
Click or tap to scroll down/up

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.

Click or tap to go the CPU configurations screen

Click or tap to go the DRAM configurations screen

Chapter 4

DIGI+PowerControl - CPU
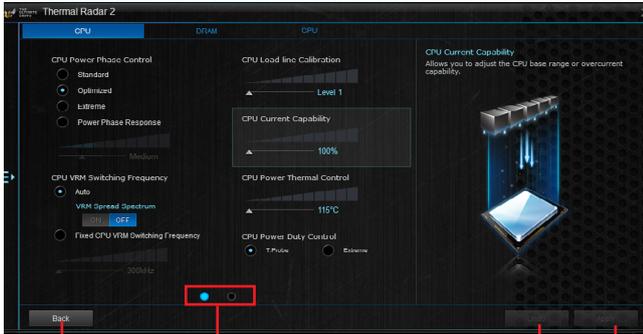
Click or tap to go back to the previous screen

Click or tap to switch between items

Click or tap to undo the changes

Click or tap to apply the changes

DIGI+PowerControl - DRAM
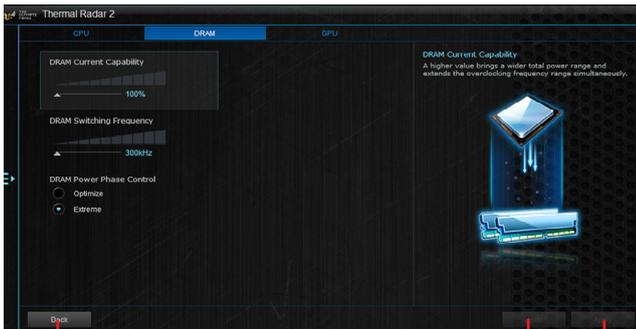
Click or tap to go back to the previous screen

Click or tap to undo the changes

Click or tap to apply the changes

DIGI+PowerControl - GPU

Click or tap to go back
to the previous screen

Click or tap to undo
the changes

Click or tap to apply
the changes

4.4.1 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**.

Launching Ai Charger+

To launch Ai Charger+, click ![icon] on the left of the AI Suite 3 main menu, then select **Ai Charger+**.

> Ai Charger+ is available only in selected motherboard models.

Ai Charger+ screen
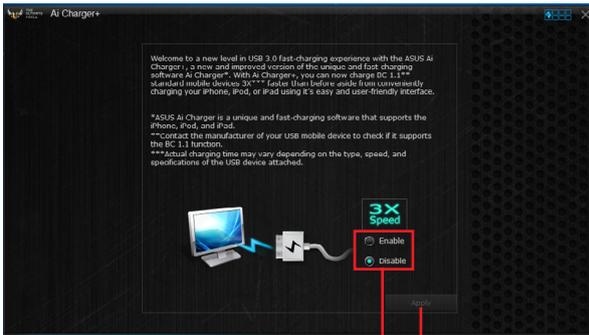
Tick to enable or disable Ai Charger+   **Click or tap to apply the selection**

> - * 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.

4.4.2 EZ Update

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

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

Launching EZ Update

To launch EZ Update, click on the left of the AI Suite 3 main menu, then select **EZ Update**.

Using EZ Update

Click or tap to automatically update your
motherboard driver, software and firmware

Click or tap to search and
select the BIOS file

Click or tap to select a
boot logo

Click or tap to
update the BIOS

Manually update the BIOS and selecting a boot logo

Click or tap to search an image file for your boot logo

Click or tap to go back to
EZ Update main screen

Click or tap to proceed the updating
BIOS and boot logo
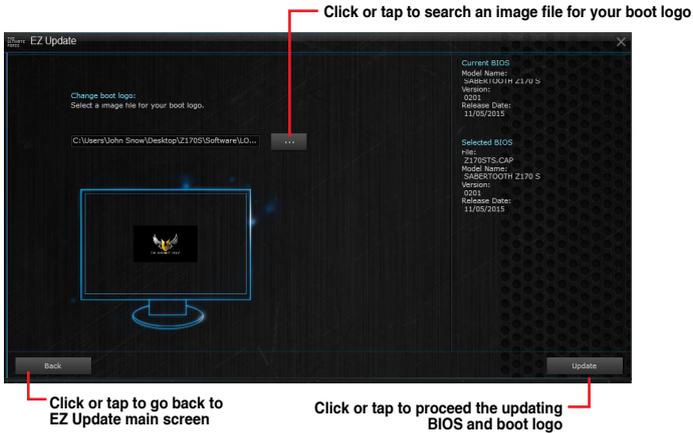
After you click or tap **BIOS Update** button, click or tap **Flash** to update the BIOS and upload the boot logo in your system.

4.4.3   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

To launch USB BIOS Flashback, click 📋 on the left 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

Set a schedule for the BIOS Update download

Click or tap to cancel the download schedule setting

Click or tap to apply the download schedule setting

Click or tap to check for a new BIOS update available for download

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 or tap **Apply** to save the BIOS download schedule. Click or tap **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 or tap **Check for New BIOS Update**.

    Wait for the system to check the latest BIOS version.
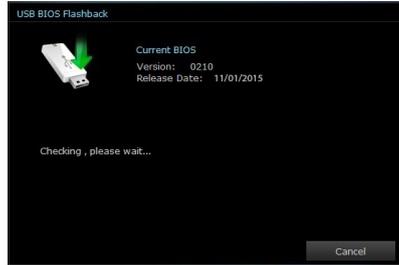
2. After the utility detects a new BIOS, click or tap ⬇ from the Save to: field, select the USB flash drive, then click or tap **Download**.
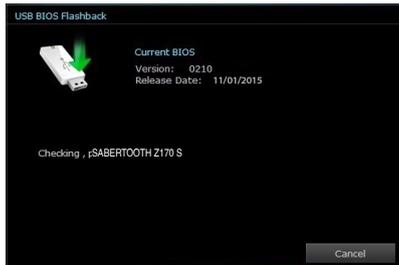
3. After the download is complete, click or tap **OK**.
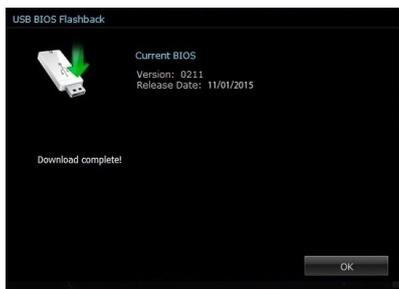
4.4.4 Push Notice

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 [icon] on the left of the AI Suite 3 main menu, then select **Push Notice**.

Push Notice screen

Click or tap to enable or disable Push Notice

Tick to select the smart device

Click or tap to discard the settings

Click or tap to apply the settings

> 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 [icon] then select [icon].

Pairing your computer and smart device

To pair your computer and smart device:

1. On your smart device, tap [Push Notice icon] 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.

Tick these to enable mode alerts

Set the day and time to enable the PC modes

Set the minutes to send the alert before the PC mode/s activation

Key in your messages for more information

Tick to select the 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.

Tick to select and send alerts to your smart device

Tick to select the smart device

Tick to send alert when the components selected are back to its normal status

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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 💬 .
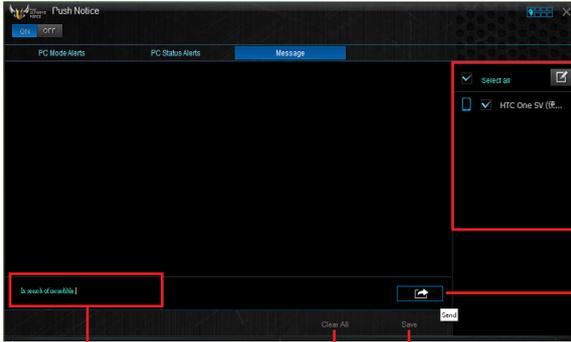
Tick to select the smart device

Click or tap to send your message

Click or tap to key in your message

Click to clear all the text on the text box

Click to save the text message

Viewing your computer status on your smart device

Tap ⊚ on your smart device to launch Push Notice.

Push Notice

Tap to view PC mode alerts

Tap to view PC status alerts

Tap to view PC sent messages

Tap to scan more host computers
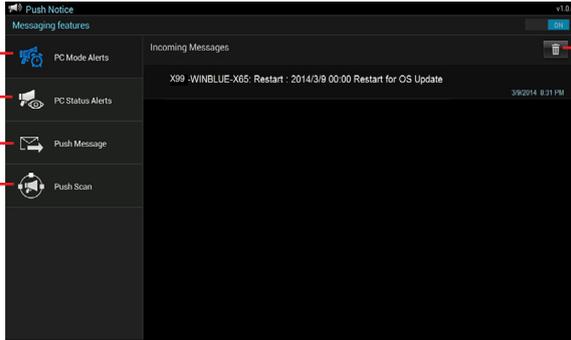
Tap to delete PC alerts

Chapter 4

4.4.5   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

To launch USB 3.1 Boost, cclick ![icon] on the left of the AI Suite 3 main menu, then select **USB 3.1 Boost**.

Using the USB 3.1 Boost

Click or tap to enable the USB device's normal data transfer rate

Click or tap to enable UASP or Turbo Mode for a faster data transfer rate

Click or tap to select a USB device

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

- USB 3.1 Boost automatically detects the USB 3.1/3.0 devices that support UASP.

- The data transfer speed varies with USB devices. For a higher data transfer performance, use a USB 3.1 device.

4.4.6   System Information

This utility allows you get the detailed information of the motherboard, CPU, and memory settings.

Launching the System Information

To launch System Information, click ⬛ on the left of the AI Suite 3 main menu, then select **System Information**.

Viewing the motherboard information

Click or tap the **MB** tab to view the motherboard's information.
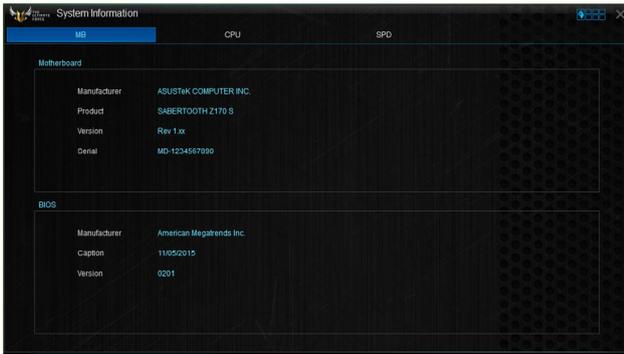
Viewing the CPU information

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

Viewing the SPD information

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

4.4.7   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

To launch Mobo Connect, click [icon] on the left of the AI Suite 3 main menu, then select **Mobo Connect.**

4.4.8 Version

Displays the installed software or utilities and their current version.

4.5 Turbo LAN

Turbo LAN is a network traffic shaping technology that lowers lag and helps reduce delays during data transfers or when playing online games. It allows you to set programs or application's network priorities to currently running games or applications.

Turbo LAN features an intuitive user interface and an Advance Mode that tweakers can use to configure hardcore controls or settings.

To launch Turbo LAN, click or tap [icon] the on the desktop.

Displays the Network Adapter information

Displays the current connection and bandwidth usage status

Adjust the slider to set a program or application's priority

Click to delete an application or program on the list

Click to view the programs under these utilities

Click to open Advanced Mode

Click to open an item
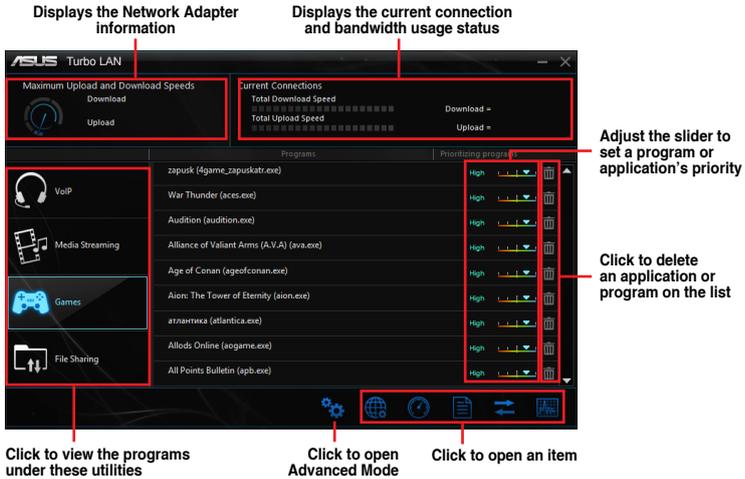
Using the Advance Mode

The Advance Mode allows you to configure the priorities of your programs or applications or configure your network device.

To go to the Advanced Mode, click or tap [icon].

The Advanced Mode contains the following utilities:

- **Preferences:** Allows you to control the network's traffic to optimize the program's performance, favor ping time, and avoid packet loss.
- **Protocols:** Allows you to set priority to the network adapter and its protocol to reduce delay during data transfer, and maintain the speed of Internet access.
- **Programs:** Allows you to set priority to the programs or applications.
- **Traffic Shaping:** Allows you set the priority to the network adapter and its protocol to reduce delay during data transfer and speeds up the Internet access.
- **Adapter Info:** Displays the information about the installed network adapter in your system.
- **Online Budgets:** Allows you to set an online budget time to your network adapters.
- **Traffic Analysis:** Allows you to assign protocols and programs in one set.

4.6 TUF Detective 2

TUF Detective 2 allows you to remotely manage and control your computer using your Android mobile device. It also provides relevant system information.

To use TUF Detective 2:

1. Connect your mobile device to the TUF Detective port located at the rear panel.

2. On your mobile device, download and install the TUF Detective app.

> Download the TUF Detective app from Play Store or use the QR code to find the app.

3. Launch the TUF Detective app to remotely control and manage your computer.
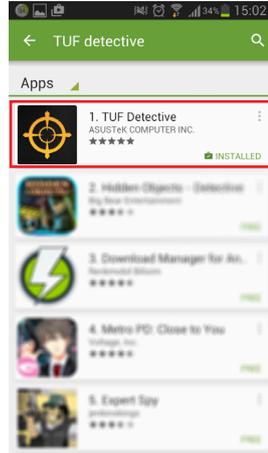
Select this App to install TUF Detective in your mobile phone.

Scan the QR code to find the app.

4.6.1 Post

The Post page provides the POST (Power-On Self Test) status..
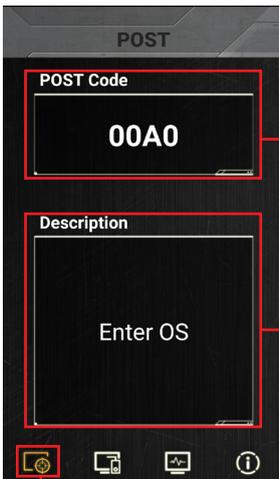
Code for the POST status

Details about the POST status.

Post

4.6.2 Control

The Control page allows you to remotely control the functions of your computer.

Control

Tap the **POWER** button and select **Yes** to power your computer on or off.

Tap the **RESTART** button and select **Yes** to restart your computer.
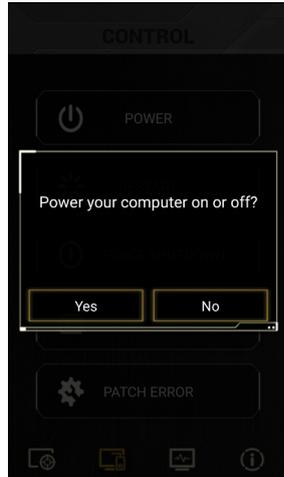
Tap **FORCE SHUTDOWN** to force the system to shutdown without saving data.

Tap **CLEAR CMOS** and select **Yes** to clear the CMOS RTC RAM data.

Tap **PATCH ERROR** and select **Yes** to automatically repair your computer.
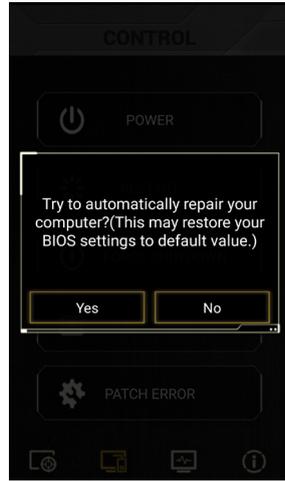
4.6.3 Monitor

The Monitor page allows you to monitor voltage, temperature, and fan speed.

Tap the triangle icon to monitor the voltage.
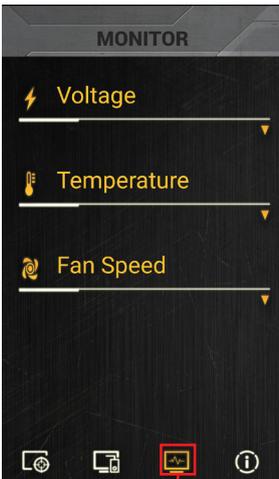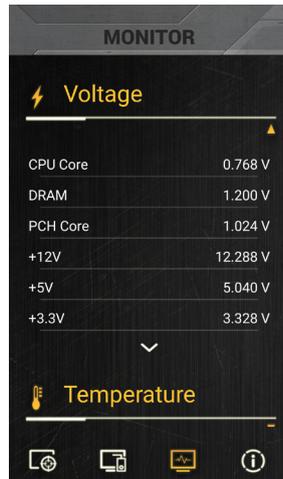
Monitor

Tap the triangle icon to monitor the temperature.
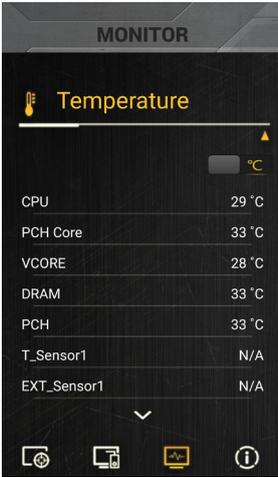
Tap the triangle icon to monitor the fan speed.

4.6.4 Information

The Information page provides you with important details about the system such as the model name, BIOS version, product number, operating time, CPU information, and DRAM information.

Information

4.7   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

Configuration option tabs (vary with the audio devices connected)

Advanced settings

Set default device button

Control settings panel

Analog and digital connector status
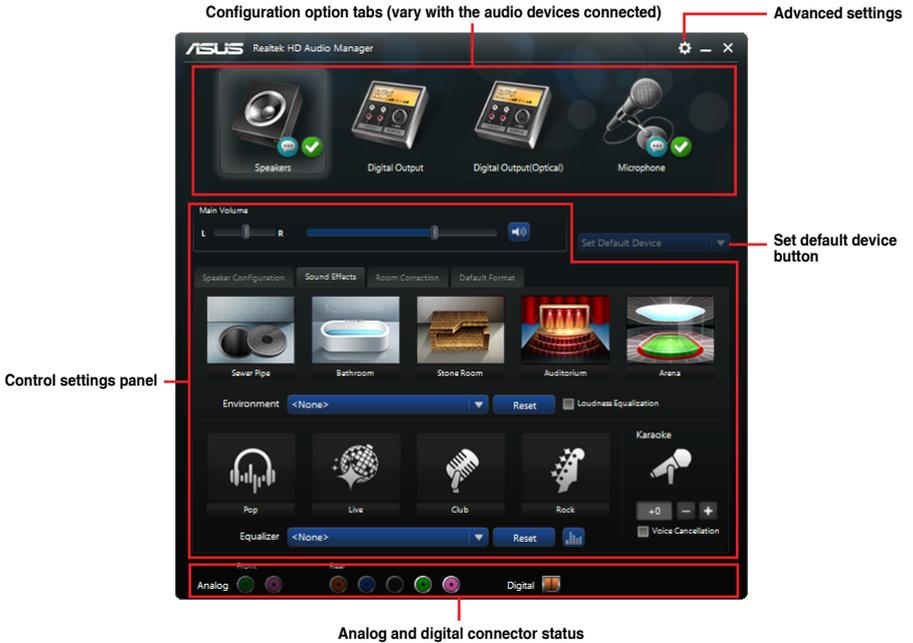
Selecting an audio output

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 or tap ⊙ 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 or tap **Next**.
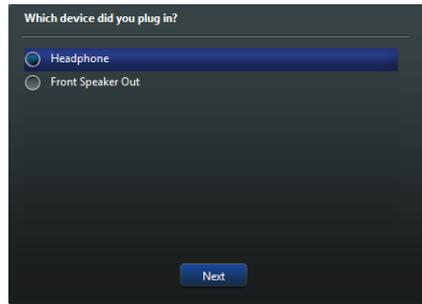
a.   If you select **Headphone**, click or tap to select the type of headphone installed then click or tap **OK**.
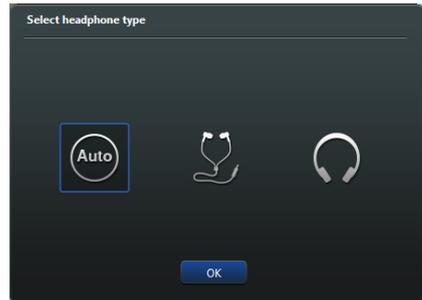
b.   If you select **Front Speaker Out,** click or tap to select the type of speaker installed then click or tap **OK**.

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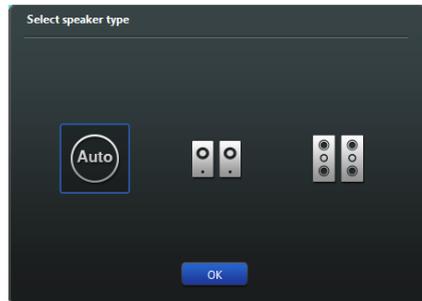
RAID Configurations

<div align="right">5</div>

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.

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

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

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 Setting the RAID item in BIOS

You must enable the RAID function in the BIOS Setup before creating RAID sets using SATA HDDs. To do this:

1. Enter the BIOS Setup during POST.

2. Go to the **Advanced** menu > **SATA Configuration**, and then press <Enter>.

3. Set the SATA Mode item to [RAID Mode].

4. Save your changes, and then exit the BIOS Setup.

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.

```
       Intel(R) Rapid Storage Technology - Option ROM - v10.5.1.1070
       Copyright(C) 2003-10 Intel Corporation.  All Rights Reserved.
   ┌───────────────────────────── [ MAIN MENU ] ─────────────────────────────┐
   │     1. Create RAID Volume          4. Recovery Volume Options            │
   │     2. Delete RAID Volume          5. Acceleration Options               │
   │     3. Reset Disks to Non-RAID     6. Exit                               │
   └──────────────────────────────────────────────────────────────────────────┘
   ┌───────────────────────── [ DISK/VOLUME INFORMATION ] ────────────────────┐
   │  RAID Volumes:                                                            │
   │  None defined.                                                           │
   │                                                                          │
   │  Physical Devices:                                                       │
   │  Port Device Model    Serial #              Size   Type/Status(Vol ID)   │
   │  0    ST3160812AS     9LS0HJA4           149.0GB   Non-RAID Disk          │
   │  1    ST3160812AS     9LS0F4HL           149.0GB   Non-RAID Disk          │
   │  2    ST3160812AS     3LS0JYL8           149.0GB   Non-RAID Disk          │
   │  3    ST3160812AS     9LS0BJ5H           149.0GB   Non-RAID Disk          │
   └──────────────────────────────────────────────────────────────────────────┘
   [↑↓]-Select                  [ESC]-Exit           [ENTER]-Select 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:

```
      Intel(R) Rapid Storage Technology - Option ROM - v10.5.1.1070
      Copyright(C) 2003-10 Intel Corporation.  All Rights Reserved.
                          [ CREATE VOLUME MENU ]
                              Name:  Volume0
                        RAID Level:
                             Disks:
                        Strip Size:
                          Capacity:
                              Sync:
                          Create volume

                              [ HELP ]

        Enter a unique volume name that has no special characters and is
        16 characters or less.




[↑↓]-Select                    [ESC]-Exit            [ENTER]-Select Menu
```
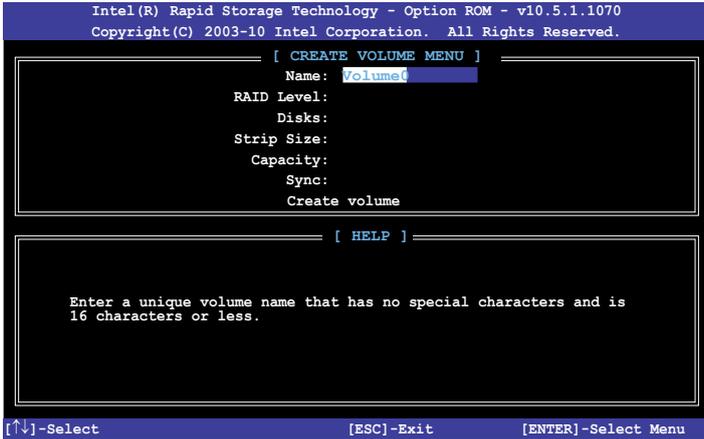
2. Enter a name for the RAID set and press <Enter>.

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:

```
                          [ SELECT DISKS ]
     Port Drive Model      Serial #        Size   Status
     0    ST3160812AS      9LS0HJA4       149.0GB  Non-RAID Disk
     1    ST3160812AS      9LS0F4HL       149.0GB  Non-RAID Disk
     2    ST3160812AS      3LS0JYL8       149.0GB  Non-RAID Disk
     3    ST3160812AS      9LS0BJ5H       149.0GB  Non-RAID Disk


        Select 2 to 6 disks to use in creating the volume.
     [↑↓]-Prev/Next [SPACE]-SelectDisk [ENTER]-Done
```
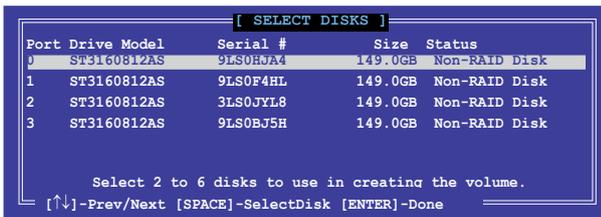
5.   Use the up/down arrow key to select a drive, and then press <Space> to select. A small triangle marks the selected drive. Press <Enter> after completing your selection.

6.   Use the up/down arrow key to select the stripe size for the RAID array (for RAID 0, 10 and 5 only),and then press <Enter>. The available stripe 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 stripe size for server systems, and a higher stripe 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:

```
        WARNING: ALL DATA ON SELECTED DISKS WILL BE LOST.
        Are you sure you want to create this volume? (Y/N):
```

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:

```
══════════════════════ [ DELETE VOLUME MENU ] ══════════════════════
    Name        Level          Drives       Capacity      Status    Bootable
    Volume0     RAID0(Stripe)    2            298.0GB       Normal      Yes



═════════════════════════════ [ HELP ] ═════════════════════════════

         Deleting a volume will reset the disks to non-RAID.

             WARNING: ALL DISK DATA WILL BE DELETED.
                (This does not apply to Recovery volumes)



    [↑↓]-Select         [ESC]-Previous Menu      [DEL]-Delete Volume
```

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:

```
════════════════ [ DELETE VOLUME VERIFICATION ] ════════════════

              ALL DATA IN THE VOLUME WILL BE LOST!
            (This does not apply to Recovery volumes)

    Are you sure you want to delete volume "Volume0"? (Y/N):
```

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:

```
┌──────────────────────[ CONFIRM EXIT ]──────────────────────┐
│                                                             │
│              Are you sure you want to exit? (Y/N):          │
│                                                             │
└─────────────────────────────────────────────────────────────┘
```

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

5.2   Installing the RAID driver during Windows® OS installation

To install the RAID driver for Windows® OS:

1.   During the OS installation, click **Load Driver** to allow you to select the installation media containing the RAID driver.

2.   Insert the USB flash drive with RAID driver into the USB port or the support DVD into the optical drive, and then click **Browse**.

3.   Click the name of the device you've inserted, go to **Drivers** > **RAID**, and then select the RAID driver for the corresponding OS version. Click **OK**.

4.   Follow the succeeding screen instructions to complete the installation.

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

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

Appendix

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 manufacturer's 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.

IC: Canadian Compliance Statement

Complies with the Canadian ICES-003 Class B specifications. This device complies with RSS 210 of Industry Canada. This Class B device meets all the requirements of the Canadian interference-causing equipment regulations.

This device complies with Industry Canada license 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.

Cut appareil numérique de la Classe B est conforme à la norme NMB-003 du Canada. Cet appareil numérique de la Classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Cet appareil est conforme aux normes CNR exemptes de licence d'Industrie Canada. Le fonctionnement est soumis aux deux conditions suivantes :

(1) cet appareil ne doit pas provoquer d'interférences et

(2) cet appareil doit accepter toute interférence, y compris celles susceptibles de provoquer un fonctionnement non souhaité de l'appareil.

Canadian Department of Communications Statement

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

This class B digital apparatus complies with Canadian ICES-003.

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.

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.

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Appendix

English AsusTek Inc. hereby declares that this device is in compliance with the essential requirements and other relevant provisions of CE Directives. Please see the CE Declaration of Conformity for more details.

Français AsusTek Inc. déclare par la présente que cet appareil est conforme aux critères essentiels et autres clauses pertinentes des directives européennes. Veuillez consulter la déclaration de conformité CE pour plus d'informations.

Deutsch AsusTek Inc. erklärt hiermit, dass dieses Gerät mit den wesentlichen Anforderungen und anderen relevanten Bestimmungen der CE-Richtlinien übereinstimmt. Weitere Einzelheiten entnehmen Sie bitte der CE-Konformitätserklärung.

Italiano AsusTek Inc. con la presente dichiara che questo dispositivo è conforme ai requisiti essenziali e alle altre disposizioni pertinenti alle direttive CE. Per maggiori informazioni fate riferimento alla dichiarazione di conformità CE.

Компания ASUS заявляет, что это устройство соответствует основным требованиям и другим соответствующим условиям европейских директив. Подробную информацию, пожалуйста, смотрите в декларации соответствия.

Български С настоящото AsusTek Inc. декларира, че това устройство е в съответствие със съществените изисквания и другите приложими постановления на директивите CE. Вижте CE декларацията за съвместимост за повече информация.

Hrvatski AsusTek Inc. ovim izjavljuje da je ovaj uređaj sukladan s bitnim zahtjevima i ostalim odgovarajućim odredbama CE direktiva. Više pojedinosti potražite u CE izjavi o sukladnosti.

Čeština Společnost AsusTek Inc. tímto prohlašuje, že toto zařízení splňuje základní požadavky a další příslušná ustanovení směrnic CE. Další podrobnosti viz Prohlášení o shodě CE.

Dansk AsusTek Inc. Erklærer hermed, at denne enhed er i overensstemmelse med hovedkravene and andre relevante bestemmelser i CE-direktiverne. Du kan læse mere i CE-overensstemmelseserklæring.

Nederlands AsusTek Inc. verklaart hierbij dat dit apparaat compatibel is met de essentiële vereisten en andere relevante bepalingen van CE-richtlijnen. Raadpleeg de CE-verklaring van conformiteit voor meer details.

Eesti Käesolevaga kinnitab AsusTek Inc., et see seade vastab CE direktiivide oluliste nõuetele ja teistele asjakohastele sätetele. Vt üksikasju CE vastavusdeklaratsioonist.

Suomi AsusTek Inc. vakuuttaa täten, että tämä laite on CE-direktiivien olennaisten vaatimusten ja muiden asiaan kuuluvien lisäysten mukainen. Katso lisätietoja CE-vaatimustenmukaisuusvakuutuksesta.

Ελληνικά Με το παρόν, η AsusTek Inc. Δηλώνει ότι αυτή η συσκευή συμμορφώνεται με τις θεμελιώδεις απαιτήσεις και άλλες σχετικές διατάξεις των Οδηγιών της ΕΕ. Για περισσότερες λεπτομέρειες ανατρέξτε στην Δήλωση Συμμόρφωσης ΕΕ.

Magyar Az AsusTek Inc. ezennel kijelenti, hogy a készülék megfelel a CE-irányelvek alapvető követelményeinek és ide vonatkozó egyéb rendelkezéseinek. További részletekért tekintse meg a CE-megfelelőségi nyilatkozatot.

Latviski Lidz ar šo AsusTek Inc. paziņo, ka šī ierīce atbilst būtiskajām prasībām un citiem saistošajiem nosacījumiem, kas norādīti CE direktīvā. Lai uzzinātu vairāk, skatiet CE Atbilstības deklarāciju.

Lietuvių Šiuo dokumentu bendrovė „AsusTek Inc." pareiškia, kad šis įrenginys atitinka pagrindinius CE direktyvų reikalavimus ir kitas susijusias nuostatas. Daugiau informacijos rasite CE atitikties deklaracijoje.

Norsk AsusTek Inc. erklærer herved at denne enheten er i samsvar med hovedsaklige krav og andre relevante forskrifter i CE-direktiver. Du finner mer informasjon i CE-samsvarserklæringen.

Polski Niniejszym AsusTek Inc. deklaruje, że to urządzenie jest zgodne z istotnymi wymaganiami oraz innymi powiązanymi zaleceniami Dyrektyw CE. W celu uzyskania szczegółów, sprawdź Deklarację zgodności CE.

Português A AsusTek Inc. declara que este dispositivo está em conformidade com os requisitos essenciais e outras disposições relevantes das Diretivas da CE. Para mais detalhes, consulte a Declaração de Conformidade CE.

Română Prin prezenta, AsusTek Inc. declară faptul că acest dispozitiv respectă cerințele esențiale și alte prevederi relevante ale directivelor CE. Pentru mai multe detalii, consultați declarația de conformitate CE.

Srpski AsusTek Inc. ovim izjavljuje da je ovaj uređaj u saglasnosti sa ključnim zahtevima i drugim relevantnim odredbama CE Direktiva. Molimo vas, pogledajte CE Deklaraciju o usklađenosti za više detalja.

Slovensky Spoločnosť AsusTek Inc. týmto prehlasuje, že toto zariadenie vyhovuje príslušným požiadavkám a ďalším súvisiacim ustanoveniam smerníc ES. Viac podrobností si pozrite v prehlásení o zhode ES.

Slovenščina AsusTek Inc. tukaj izjavlja, da je ta naprava skladna s temeljnimi zahtevami in drugimi relevantnimi določili direktiv CE. Za več informacij glejte Izjavo CE o skladnosti.

Español Por la presente, AsusTek Inc. declara que este dispositivo cumple los requisitos básicos y otras disposiciones relevantes de las directivas de la CE. Consulte la Declaración de conformidad de la CE para obtener más detalles.

Svenska AsusTek Inc. förklarar härmed att denna enhet är i överensstämmelse med de grundläggande kraven och andra relevanta bestämmelser i CE-direktiven. Se CE-försäkran om överensstämmelse för mer information.

Українська AsusTek Inc. заявляє, що цей пристрій відповідає основним вимогам відповідних Директив ЄС. Будь ласка, див. більше подробиць у Декларації відповідності нормам ЄС.

Türkçe AsusTek Inc., bu aygıtın temel gereksinimlerle ve CE Yönergelerinin diğer ilgili koşullarıyla uyumlu olduğunu beyan eder. Daha fazla ayrıntı için lütfen CE Uygunluk Beyanına bakın.

Bosanski AsusTek Inc. ovim potvrđuje da je ovaj uređaj usklađen s osnovnim zahtjevima i drugim relevantnim propisima Direktiva EK. Za više informacija molimo pogledajte Deklaraciju o usklađenosti EK.

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Online support	http://www.asus.com/de/support

Appendix

EC Declaration of Conformity

Ver. 151028

We, the undersigned,

Manufacturer:	ASUSTeK COMPUTER INC.
Address:	4F, No. 150, LI-TE Rd., PEITOU, TAIPEI 112, TAIWAN
Authorized representative in Europe:	ASUS COMPUTER GmbH
Address, City:	HARKORT STR. 21-23, 40880 RATINGEN
Country:	GERMANY

declare the following apparatus:

Product name :	Motherboard
Model name :	SABERTOOTH Z170 S

conform with the essential requirements of the following directives:

☒**2004/108/EC-EMC Directive**
☒ EN 55022:2010+AC:2011	☒ EN 55024:2010
☒ EN 61000-3-2:2014	☒ EN 61000-3-3:2013
☐ EN 55013:2001+A1:2003+A2:2006	☒ EN 55020:2007+A11:2011

☐**1999/5/EC-R&TTE Directive**
☐ EN 300 328 V1.8.1(2012-06)	☐ EN 301 489-1 V1.9.2(2011-09)
☐ EN 300 440-1 V1.6.1(2010-08)	☐ EN 301 489-3 V1.6.1(2013-12)
☐ EN 300 440-2 V1.4.1(2010-08)	☐ EN 301 489-4 V2.1.1(2013-12)
☐ EN 301 511 V9.0.2(2003-03)	☐ EN 301 489-7 V1.3.1(2005-11)
☐ EN 301 908-1 V6.2.1(2013-04)	☐ EN 301 489-9 V1.4.1(2007-11)
☐ EN 301 908-2 V6.2.1(2013-10)	☐ EN 301 489-17 V2.2.1(2012-09)
☐ EN 301 908-13 V6.2.1(2014-02)	☐ EN 301 489-24 V1.5.1(2010-09)
☐ EN 301 893 V1.7.1(2012-06)	☐ EN 301 357-2 V1.4.1(2008-11)
☐ EN 300 330-2 V1.5.1(2010-02)	☐ EN 302 291-2 V1.1.1(2005-07)
☐ EN 50360:2001/A1:2012	☐ EN 302 623 V1.1.1(2009-01)
☐ EN 62479:2010	☐ EN 50566:2013/AC:2014
☐ EN 62311:2008	☐ EN 50385:2002

☒**2006/95/EC-LVD Directive**
| ☒ EN 60950-1: 2006 / A12: 2011 | ☐ EN 60065:2002 / A12: 2011 |
| ☒ EN 60950-1: 2006 / A2: 2013 | |

☐**2009/125/EC-ErP Directive**
| ☐ Regulation (EC) No. 1275/2008 | ☐ Regulation (EC) No. 278/2009 |
| ☐ Regulation (EC) No. 642/2009 | ☐ Regulation (EU) No. 617/2013 |

☒**2011/65/EU-RoHS Directive**
☒**CE marking**

(EC conformity marking)

Position : **CEO**
Name : **Jerry Shen**

Declaration Date: 07/12/2015
Year to begin affixing CE marking: 2015

Signature : _____

DECLARATION OF CONFORMITY

Per FCC Part 2 Section 2. 1077(a)

Ver. 140331

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 :	**SABERTOOTH Z170 S**

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 : _____**Dec. 07, 2015**_____

Appendix