B150M PRO GAMING

Motherboard

E11309
Revised Edition V2
January 2016

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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 components, 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 be exposed to moisture.
- 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 descriptions of the switches, jumpers, and connectors on the motherboard.

- **Chapter 2: BIOS Setup**

  This chapter discusses changing system settings through the BIOS Setup menus. Detailed descriptions for the BIOS parameters are also provided.

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 completing a task.

CAUTION: Information to prevent damage to the components when completing 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 mean 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 (+).

Package contents

Check your motherboard package for the following items.

Motherboard	ASUS Gaming Motherboard – B150M PRO GAMING
Cables	2 x Serial ATA 6.0 Gb/s cables
Accessories	1 x I/O Shield 1 x M.2 screw package 1 x PRO GAMING Cable Labels 1 x pack of cable ties
Application DVD	1 x Support DVD
Documentation	1 x User Guide

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

B150M PRO GAMING specifications summary

CPU	LGA1151 socket for 6th Generation Core™ i7/i5/i3/Pentium®/Celeron® Processors Supports Intel® 14nm CPU Supports Intel® Turbo Boost Technology 2.0* * **The Intel® Turbo Boost Technology 2.0 support depends on the CPU types.** * **Refer to www.asus.com for Intel® CPU support list.**
Chipset	Intel® B150 Chipset
Memory	4 x DIMMs, maximum 64GB, DDR4 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 for the Memory QVL (Qualified Vendors List).** * **Due to Intel chipset limitation, DDR4 2133 MHz and higher memory modules on XMP mode will run at the maximum transfer rate of DDR4 2133 MHz.**
Graphics	Integrated Graphics Processor - Intel® HD Graphics support VGA output support: HDMI Supports HDMI 1.4b with maximum resolution of 4096 x 2160 @24Hz Supports Intel® InTru™ 3D, Quick Sync Video, Clear Video HD Technology, and Insider™ Maximum shared memory of 1024 MB
Expansion slots	1 x PCI Express 3.0 x16 slot (at x16 mode) 2 x PCI Express 3.0 x1 slots

(continued on the next page)

B150M PRO GAMING specifications summary

Audio	**SupremeFX 8-Channel High Definition Audio CODEC*** - Supports Jack-detection and Front Panel MIC Jack-retasking - High quality 115dB SNR stereo playback output Audio Features: - SupremeFX Shielding™ Technology - Headphone AMP * **Use a chassis with HD audio module in the front panel to support an 8-channel audio output.**
Storage	**Intel® B150 Chipset** - 6 x SATA 6.0 Gb/s connectors - 1 x M.2 Socket 3 with M Key, type 2242/2260/2280 storage devices support (both SATA & PCIE 3.0 x 4 mode)* * **When the M.2 Socket 3 is operating in SATA mode, SATA port 1 will be disabled.**
LAN	Intel® Gigabit LAN Anti-surge LANGuard
USB	**Intel® B150 Chipset - supports ASUS USB 3.0 Boost** - 6 x USB 3.0/2.0 ports (2 ports at mid-board; 4 ports at back panel, blue) - 6 x USB 2.0/1.1 ports (2 ports at mid-board; 4 ports at back panel)
ASUS gaming features	**Gamer's Guardian** - DIGI+ VRM - DRAM Overcurrent Protection - ESD Guards on LAN, Audio, KB/MS and USB 3.0/2.0 ports - Highly Durable Components - Stainless Steel Back I/O - Q-Design (Q-Shield, Q-DIMM, Q-Slot) **Performance Level Up** - DIGI+ VRM - AI Suite 3 - Fan Xpert featuring Fan Auto Tuning function and multiple thermistors selection for optimized system cooling control - UEFI BIOS EZ Mode (CrashFree BIOS 3, EZ Flash 3) **ASUS Exclusive Features** - ASUS CPU-Z - USB 3.0 Boost featuring speedy USB 3.0 transmission - AI Charger - Disk Unlocker - Push Notice - Media Streamer

(continued on the next page)

B150M PRO GAMING specifications summary

Rear Panel I/O ports	1 x PS/2 keyboard/mouse combo port 1 x HDMI port 1 x LAN (RJ-45) port 4 x USB 3.0 ports 4 x USB 2.0 ports 8-channel audio I/O ports
Internal connectors	1 x 19-pin USB 3.0/2.0 connector supports additional 2 USB 3.0/2.0 ports 1 x USB 2.0/1.1 connector supports additional 2 USB 2.0/1.1 ports 1 x System panel connector 1 x Front panel audio connector (AAFP) 6 x SATA 6.0 Gb/s connectors (charcoal black) 1 x M.2 Socket 3 for M Key, type 2242/2260/2280 devices 1 x 4-pin CPU fan connector for both 3-pin (DC mode) and 4-pin (PWM mode) coolers control 1 x 4-pin Chassis fan connector for both 3-pin (DC mode) and 4-pin (PWM mode) coolers control 1 x COM connector 1 x TPM header 1 x 2-pin Clear CMOS jumper 1 x 24-pin EATX power connector 1 x 8-pin EATX 12V power connector
BIOS features	128 Mb Flash ROM, UEFI AMI BIOS, PnP, DMI 3.0, WfM 2.0, SM BIOS 3.0, ACPI 5.0, Multi-language BIOS, ASUS EZ Flash 3, CrashFree BIOS 3, F6 Q-fan Control, F3 My Favorites, F9 Quick Note, Last Modified Log, F12 PrintScreen function, and ASUS DRAM SPD (Serial Presence Detect) memory information
Manageability	WfM 2.0, DMI 3.0, WOL by PME, PXE
Support DVD	Drivers ASUS Utilities EZ Update Anti-virus software (OEM version)
OS support	Windows® 10* Windows® 8.1* Windows® 7 * **64-bit supported only**
Form factor	mATX form factor: 9.2” x 8.6” (23.4 cm x 21.8 cm)

Specifications are subject to change without notice.

Product Introduction

1

1.1 Before you proceed

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

- Unplug the power cord from the wall socket before touching any component.
- Before handling components, use a grounded wrist strap or touch a safely grounded object or a metal object, such as the power supply case, to avoid damaging them due to static electricity.
- Before you install or remove any component, ensure that the ATX power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, or components.

1.2 Motherboard overview

Before you install the motherboard, study the configuration of your chassis to ensure that the motherboard fits.

Unplug the power cord before installing or removing the motherboard. Failure to do so can cause you physical injury and damage to motherboard components.

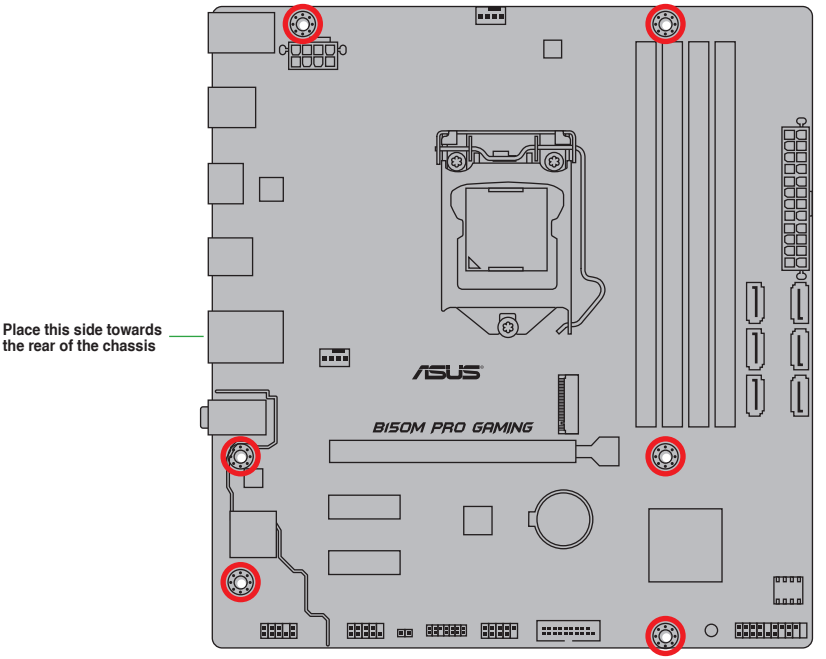
1.2.1 Placement direction

When installing the motherboard, place it into the chassis in the correct orientation. The edge with external ports goes to the rear part of the chassis as indicated in the image below.

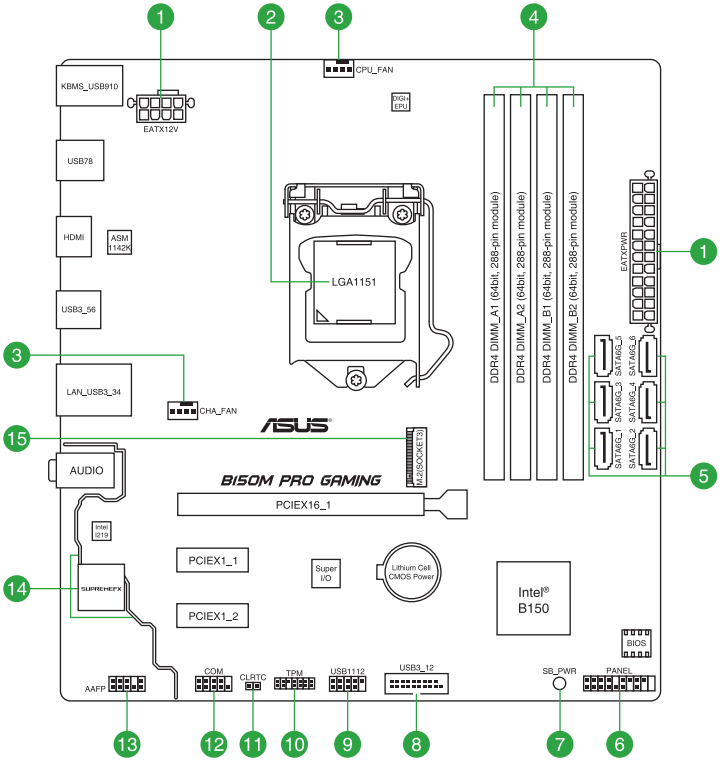
1.2.2 Screw holes

Place six (6) screws into the holes indicated by circles to secure the motherboard to the chassis.

Do not overtighten the screws! Doing so can damage the motherboard.



1.2.3 Motherboard layout



1.2.4 Layout contents

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5.	Intel® B150 Serial ATA 6.0 Gb/s connectors (7-pin SATA6G_1-6)	1-23
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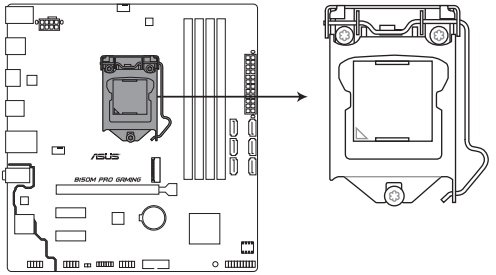
13.	Front panel audio connector (10-1 pin AAFP)	1-21
14.	SupremeFX LED	1-26
15.	M.2 Socket 3	1-16

1.3 Central Processing Unit (CPU)

This motherboard comes with a surface mount LGA1151 socket designed for 6th Generation Intel® Core™ i7 / i5 / i3, Pentium®, and Celeron® processors.

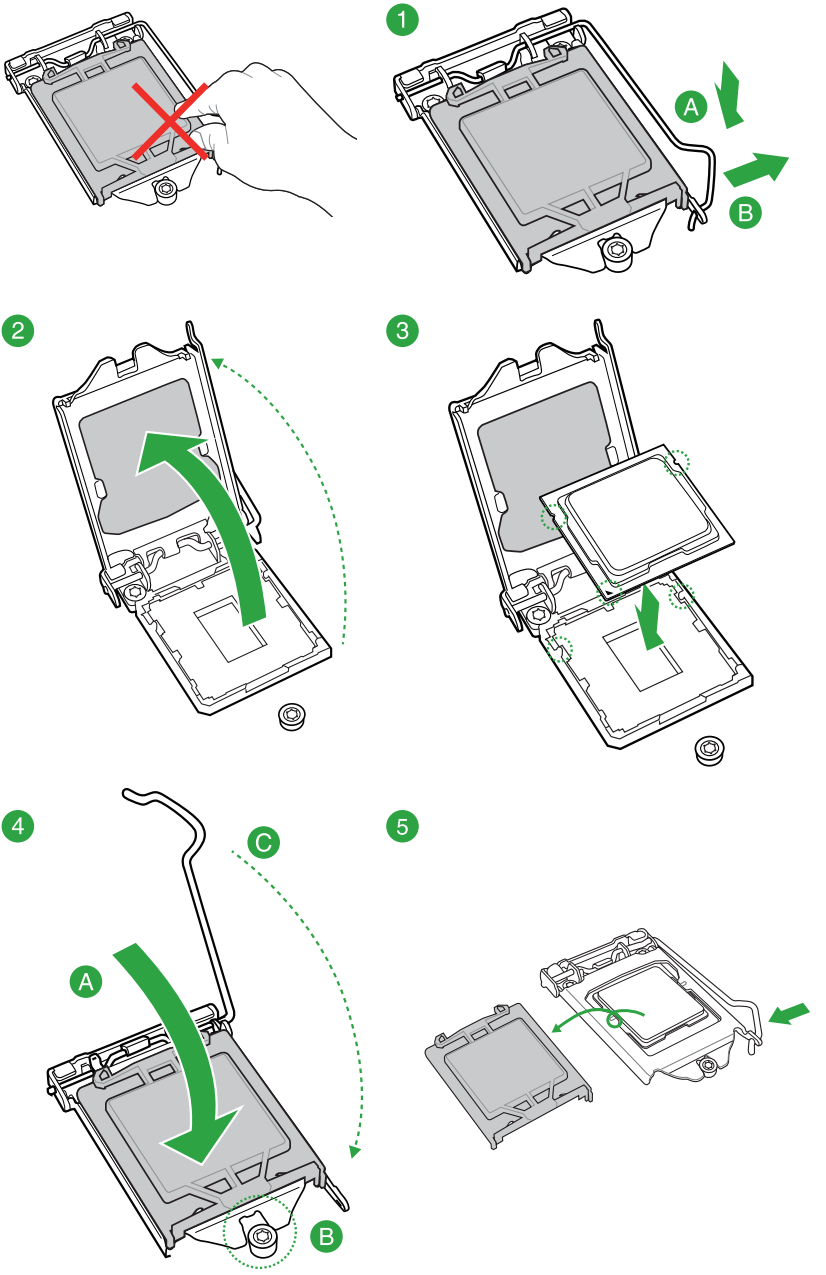


B150M PRO GAMING CPU LGA1151

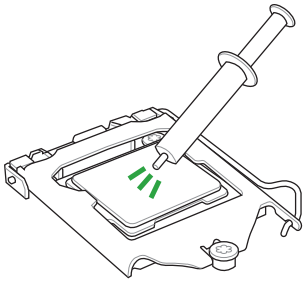
Unplug all power cables before installing the CPU.

- Ensure that you install the correct CPU designed for the LGA1151 socket only. DO NOT install a CPU designed for LGA1150, LGA1155 and LGA1156 sockets on the LGA1151 socket.
- 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.
- 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.

1.3.1 Installing the CPU

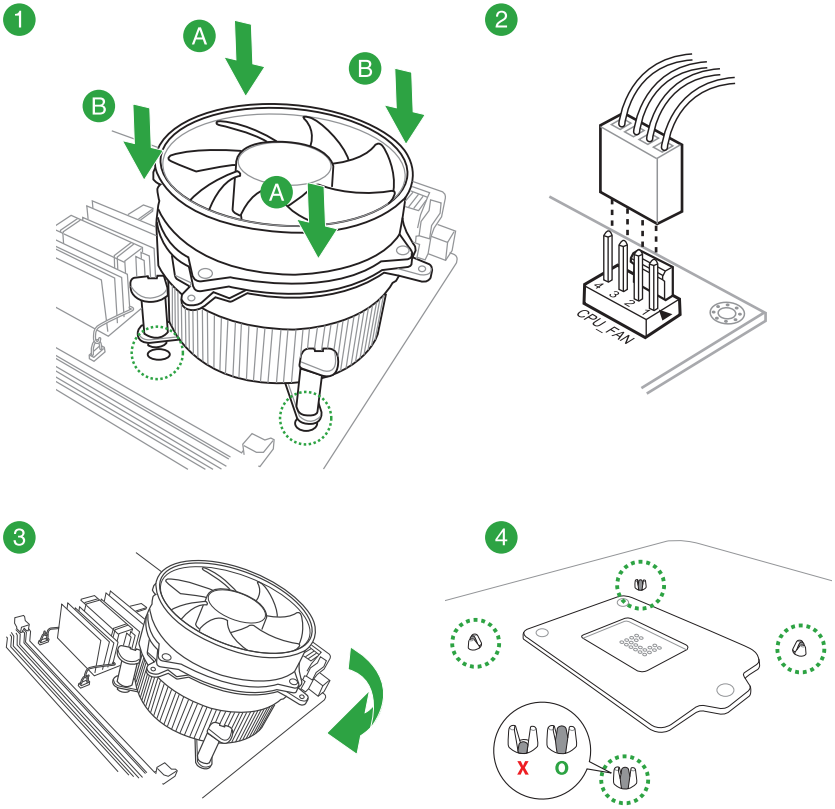


1.3.2 CPU heatsink and fan assembly installation

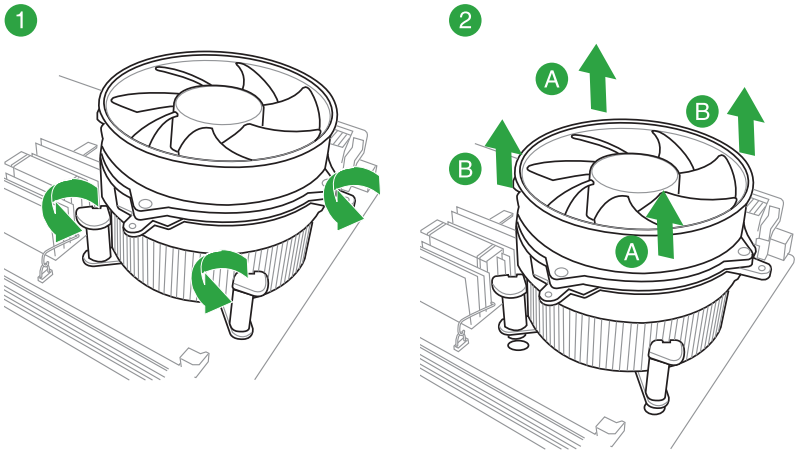


Apply the Thermal Interface Material to the CPU heatsink and CPU before you install the heatsink and fan if necessary.

To install the CPU heatsink and fan assembly



To uninstall the CPU heatsink and fan assembly

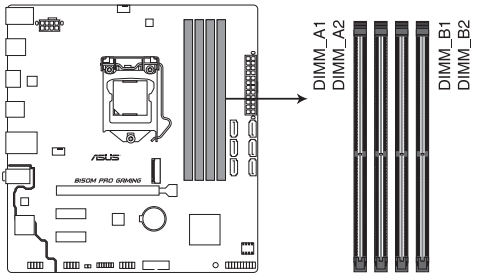


1.4 System memory

1.4.1 Overview

This motherboard comes with four Double Data Rate 4 (DDR4) Dual Inline Memory Module (DIMM) sockets.

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.



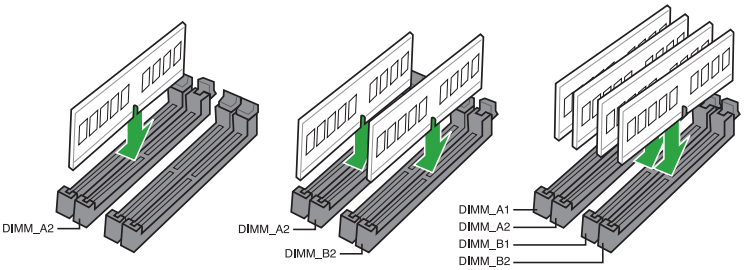
B150M PRO GAMING 288-pin DDR4 DIMM socket

Channel	Sockets
Channel A	DIMM_A1 & DIMM_A2
Channel B	DIMM_B1 & DIMM_B2

1.4.2 Memory configurations

You may install 2 GB, 4 GB, 8 GB, and 16 GB unbuffered non-ECC DDR4 DIMMs into the DIMM sockets. You can refer to the recommended memory population below.

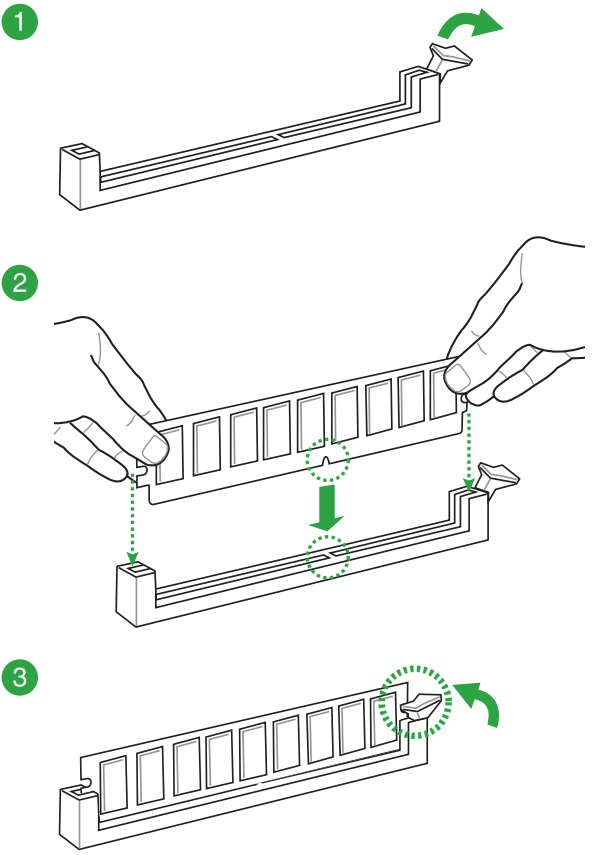
Recommended memory configurations



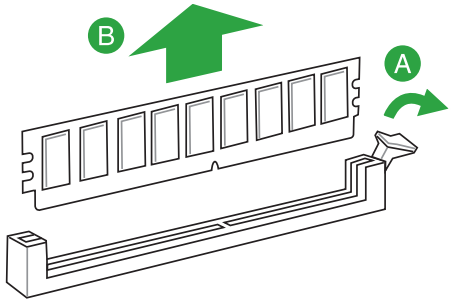
- You may install varying memory sizes in Channel A and Channel B. The system maps the total size of the lower-sized channel for the dual-channel configuration. Any excess memory from the higher-sized channel is then mapped for single-channel operation.
- Due to the memory address limitation on 32-bit 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:
  - Use a maximum of 3 GB system memory if you are using a 32-bit Windows® OS.
  - Install a 64-bit Windows® OS if you want to install 4GB or more on the motherboard.
  - For more details, refer to the Microsoft® support site at http://support.microsoft.com/kb/929605/en-us.
- According to Intel® CPU spec, DIMM voltage below 1.5V is recommended to protect the CPU.

- The default memory operation frequency is dependent on its Serial Presence Detect (SPD), which is the standard way of accessing information from a memory module. Under the default state, some memory modules for overclocking may operate at a lower frequency than the vendor-marked value. To operate at the vendor-marked or at a higher frequency, refer to section **2.5 Ai Tweaker menu** for manual memory frequency adjustment.
- Always install the DIMMS with the same CAS Latency. For an optimum compatibility, we recommend that you install memory modules of the same version or data code (D/C) from the same vendor. Check with the vendor to get the correct memory modules.
- For system stability, use a more efficient memory cooling system to support a full memory load (4 DIMMs) or overclocking condition.
- Visit the ASUS website at www.asus.com for the latest QVL.

1.4.3 DIMM installation



To remove a DIMM



1.5 Expansion slots

In the future, you may need to install expansion cards. The following sub-sections describe the slots and the expansion cards that they support.

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

1.5.1 Installing an expansion card

To install an expansion card:

1. Before installing the expansion card, read the documentation that came with it and make the necessary hardware settings for the card.
2. Remove the system unit cover (if your motherboard is already installed in a chassis).
3. Remove the bracket opposite the slot that you intend to use. Keep the screw for later use.
4. Align the card connector with the slot and press firmly until the card is completely seated on the slot.
5. Secure the card to the chassis with the screw you removed earlier.
6. Replace the system cover.

1.5.2 Configuring an expansion card

After installing the expansion card, configure it by adjusting the software settings.

1. Turn on the system and change the necessary BIOS settings, if any. See Chapter 2 for information on BIOS setup.
2. Assign an IRQ to the card.
3. Install the software drivers for the expansion card.

When using PCI cards on shared slots, ensure that the drivers support “Share IRQ” or that the cards do not need IRQ assignments. Otherwise, conflicts will arise between the two PCI groups, making the system unstable and the card inoperable.

1.5.3 PCI Express 3.0 x1 slots

This motherboard supports PCI Express x1 network cards, SCSI cards, and other cards that comply with the PCI Express specifications.

1.5.4 PCI Express 3.0 x16 slot

This motherboard supports PCI Express x16 graphic cards that comply with the PCI Express specifications.

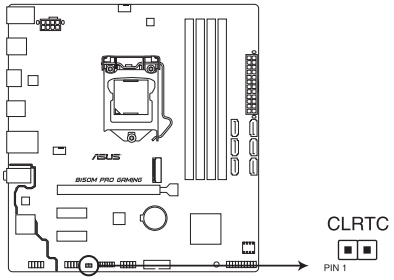
IRQ assignments for this motherboard

	A	B	C	D	E	F	G	H
HD Audio Controller	Shared	–	–	–	–	–	–	–
XHCI Controller	Shared	–	–	–	–	–	–	–
SATA Controller	Shared	–	–	–	–	–	–	–
LAN Controller	Shared	–	–	–	–	–	–	–
PCIE x16_1	Shared	–	–	–	–	–	–	–
PCIE x1_1	Shared	–	–	–	–	–	–	–
PCIE x1_2	–	–	Shared	–	–	–	–	–
M.2	Shared	–	–	–	–	–	–	–

1.6 Jumpers

1. Clear RTC RAM (2-pin CLRTC)

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



B150M PRO GAMING CLRTC

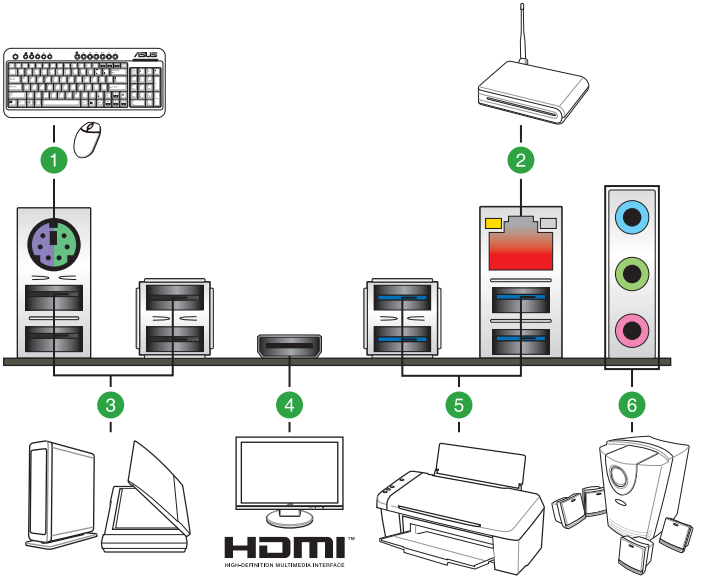
To erase the RTC RAM:

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

- If the steps above do not help, remove the onboard battery and short the two pins 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.

1.7 Connectors

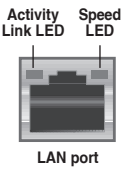
1.7.1 Rear panel connectors



1. **PS/2 keyboard/mouse combo port:** This port is for a PS/2 mouse or keyboard.
2. **LAN (RJ-45) port:** This port allows Gigabit connection to a Local Area Network (LAN) through a network hub.

LAN port LED indications

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



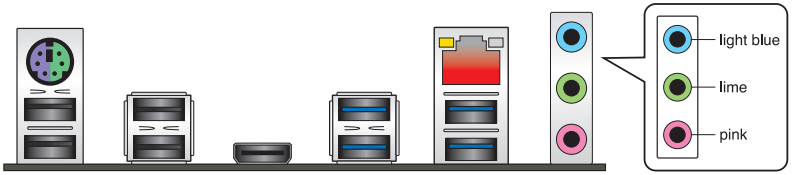
3. **USB 2.0 ports:** These 4-pin Universal Serial Bus (USB) ports are for USB 2.0/1.1 devices.

4. **HDMI port:** This port is for a High-Definition Multimedia Interface (HDMI) connector, and is HDCP compliant allowing playback of HD DVD, Blu-ray, and other protected content.

5. **USB 3.0 ports:** These 9-pin Universal Serial Bus (USB) ports are for USB 3.0 devices.

- USB 3.0 devices can only be used for data storage.
- We strongly recommend that you connect USB 3.0 devices to USB 3.0 ports for faster and better performance from your USB 3.0 devices.
- Due to the design of the Intel® 100 series chipset, all USB devices connected to the USB 2.0 and USB 3.0 ports are controlled by the xHCI controller. Some legacy USB devices must update their firmware for better compatibility.

6. **Audio I/O ports:** Refer to the table below for audio port definitions.



Line In port (light blue): This port connects to the tape, CD, DVD player, or other audio sources.

Line Out port (lime): This port connects to a headphone or a speaker. In the 4.1, 5.1, and 7.1 channel configurations, the function of this port becomes Front Speaker Out.

Microphone port (pink): This port connects to a microphone.

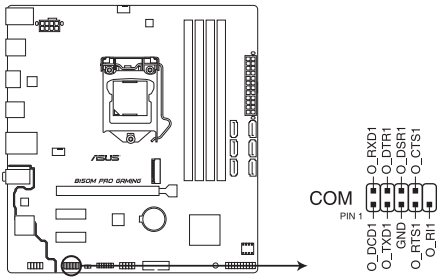
Audio 2, 4.1, 5.1, or 7.1-channel configuration

Port	Headset 2-channel	4.1-channel	5.1-channel	7.1-channel
Light Blue	Line In	Rear Speaker Out	Rear Speaker Out	Rear Speaker Out
Lime	Line Out	Front Speaker Out	Front Speaker Out	Front Speaker Out
Pink	Mic In	Mic In	Bass/Center	Bass/Center
Lime (Front Panel)	–	–	–	Side Speaker Out

1.7.2 Internal connectors

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

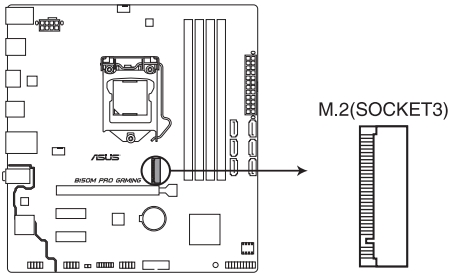
This connector is for a serial (COM) port. Connect the serial port module cable to this connector, and then install the module to a slot opening at the back of the system chassis.



B150M PRO GAMING Serial port connector

2. M.2 socket 3

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

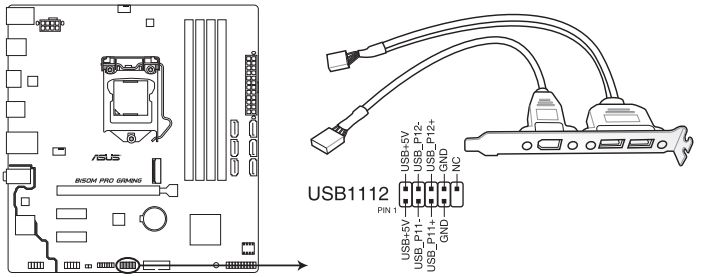


B150M PRO GAMING M.2(SOCKET3)

- This socket supports M Key and 2242/2260/2280 storage devices.
- When the M.2 Socket 3 is operating in SATA mode, SATA port 1 will be disabled.
- When using Intel® Desktop Responsiveness technologies with PCIe M.2 device, ensure to set up UEFI driver under RAID mode.

3. USB 2.0 connector (10-1 pin USB1112)

This connector is for USB 2.0 port. Connect the USB module cable to the connector, and then install the module to a slot opening at the back of the system chassis. This USB connector complies with USB 2.0 specifications and supports up to 480Mbps connection speed.



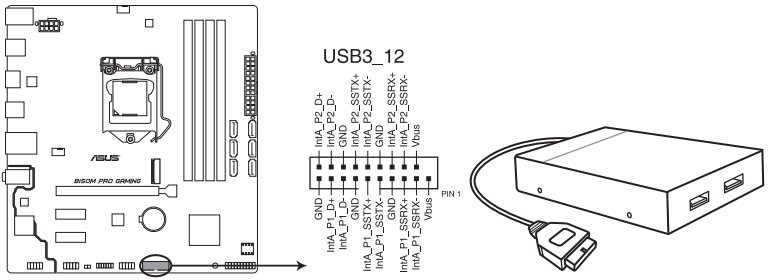
B150M PRO GAMING USB2.0 connector

Never connect a 1394 cable to the USB connectors. Doing so will damage the motherboard!

The USB 2.0 module is purchased separately.

4. USB 3.0 connector (20-1 pin USB3_12)

This connector allows 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 5Gbps, faster charging time for USB-chargeable devices, optimized power efficiency, and backward compatibility with USB 2.0.



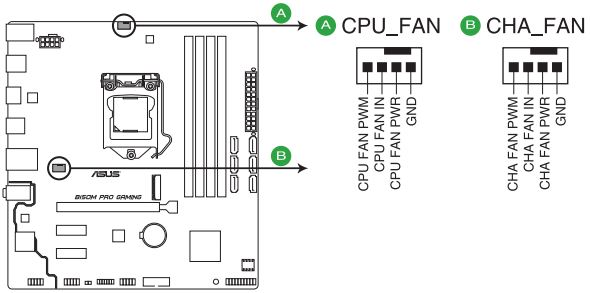
B150M PRO GAMING USB3.0 connector

The USB 3.0 module is purchased separately.

- These connectors are based on xHCI specification. We recommend you to install the related driver to fully use the USB 3.0 ports under Windows® 7.
- The plugged USB 3.0 device will run on xHCI mode.
- These USB 3.0 ports support native UASP transfer standard in Windows® 8 / Windows® 8.1 and Turbo Mode when using USB 3.0 Boost feature.

5. CPU and chassis fan connectors (4-pin CPU_FAN, 4-pin CHA_FAN)

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



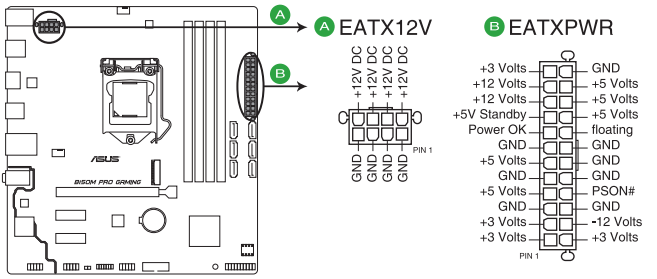
B150M PRO GAMING Fan connectors

- Do not forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan connectors!
- Ensure that the CPU fan cable is securely installed to the CPU fan connector.

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

6. 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.

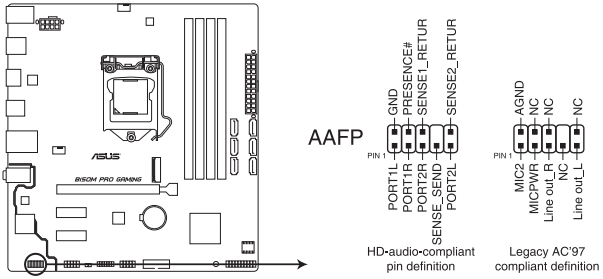


B150M PRO GAMING ATX power connectors

- For a fully configured system, we recommend that you use a power supply unit (PSU) that complies with ATX 12V Specification 2.0 (or later version) and provides a minimum power of 350W.
- DO NOT forget to connect the 4-pin/8-pin ATX +12V power plug. Otherwise, the system will not boot up.
- We recommend that you use a PSU with higher power output when configuring a system with more power-consuming devices or when you intend to install additional devices. The system may become unstable or may not boot up if the power is inadequate.

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

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

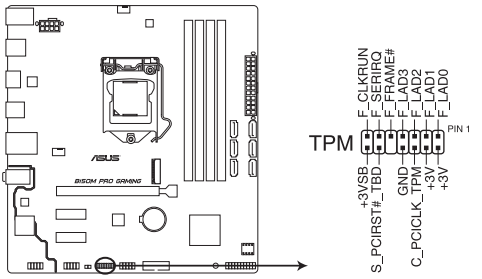


B150M PRO GAMING Analog front panel connector

- We recommend that you connect a high-definition front panel audio module to this connector to avail of the motherboard's high-definition audio capability.
- If you want to connect a high-definition front panel audio module to this connector, set the Front Panel Type item in the BIOS setup to [HD Audio]. By default, this connector is set to [HD Audio]. See section **2.6.7 Onboard Devices Configuration** for details.

8. TPM connector (14-1 pin TPM)

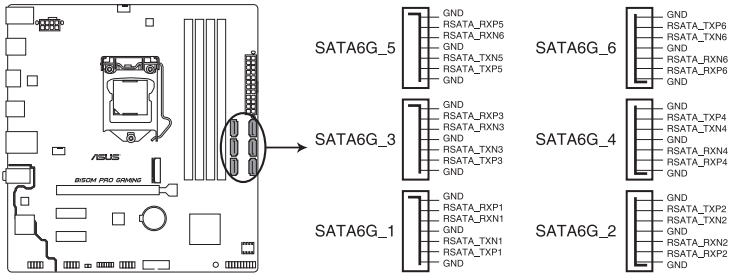
This connector supports a Trusted Platform Module (TPM) system, which securely stores keys, digital certificates, passwords and data. A TPM system also helps enhance the network security, protects digital identities, and ensures platform integrity.



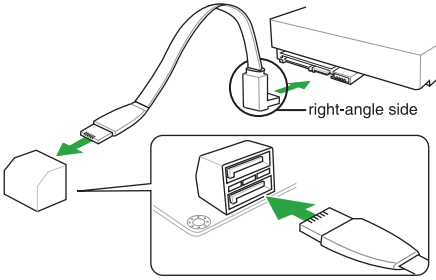
B150M PRO GAMING TPM connector

9. Intel® B150 Serial ATA 6.0Gb/s connectors (7-pin SATA6G_1-6)

These connectors connect to Serial ATA 6.0 Gb/s hard disk drives via Serial ATA 6.0 Gb/s signal cables.



B150M PRO GAMING Intel® SATA 6 Gb/s connectors

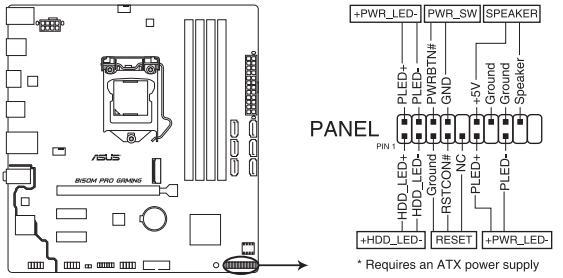


NOTE: Connect the right-angle side of SATA signal cable to SATA device. You may also connect the right-angle side of SATA cable to the onboard SATA port to avoid mechanical conflict with huge graphics cards.

When the M.2 Socket 3 is operating in SATA mode, SATA port 1 will be disabled. To use SATA port 1, please set in the BIOS.

10. System panel connector (20-5 pin PANEL)

This connector supports several chassis-mounted functions.



B150M PRO GAMING System panel connector

- **System power LED (4-pin +PWR_LED-)**

  This 4-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 PWR_SW)**

  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.

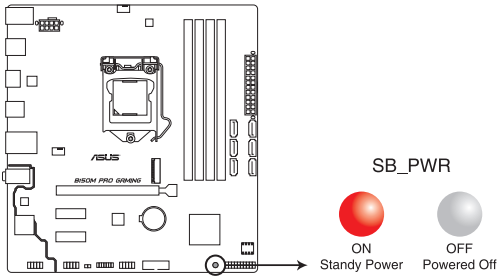
- **Reset button (2-pin RESET)**

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

1.8 Onboard LED

1. Standby Power LED (SB_PWR)

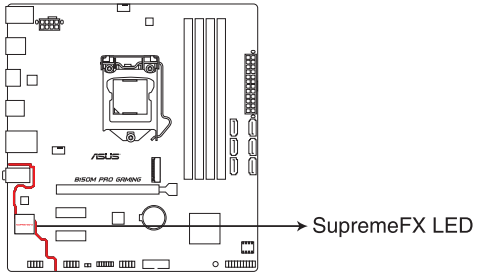
The motherboard comes with a standby power LED that lights up to indicate that the system is ON, in sleep mode, or in soft-off mode. This is a reminder that you should shut down the system and unplug the power cable before removing or plugging in any motherboard component. The illustration below shows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



B150M PRO GAMING Onboard LED

2. SupremeFX LED

The SupremeFX LED lights up in two ways to bring you an ultimate lighting effect. This LED also outlines the separation of the audio components from the rest of your motherboard.



B150M PRO GAMING SupremeFX LED Lighting

Lit mode	Description
Breathing mode	The LED blinks intermittently.
Still mode	The LED becomes solid red.

You can turn off the SupremeFX LED or change the lit modes from the BIOS or the LED Control app in Ai Suite 3. To change the setting in BIOS, go to **Advanced** > **Onboard Devices Configuration** > **Audio LED Lighting** item. See section **2.6.7 Onboard Devices Configuration** for details.

1.9 Software support

1.9.1 Installing an operating system

This motherboard supports Windows® 7 (32-bit / 64-bit), Windows® 8.1 (64-bit) and Windows® 10 (64-bit) Operating Systems (OS). Always install the latest OS version and corresponding updates to maximize the features of your hardware.

Motherboard settings and hardware options vary. Refer to your OS documentation for detailed information.

1.9.2 Support DVD information

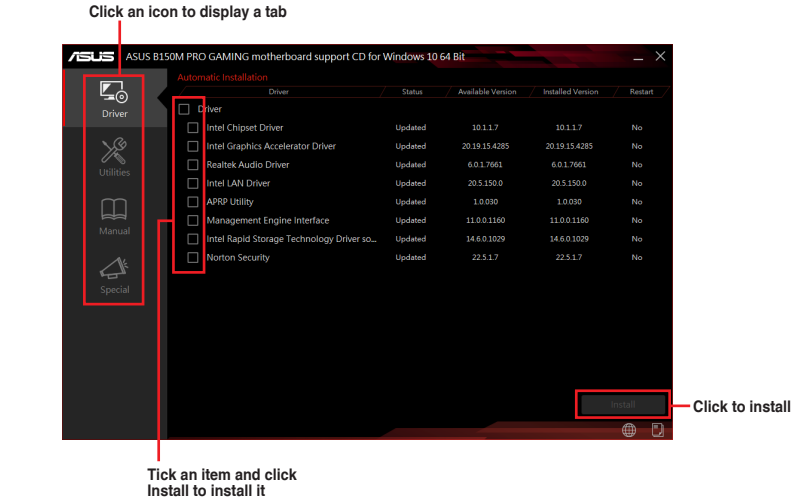
The Support DVD that comes with the motherboard package contains the drivers, software applications, and utilities that you can install to avail all motherboard features.

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.

To run the Support DVD:

Place the Support DVD into the optical drive. If Autorun is enabled in your computer, the DVD automatically displays the lists of the unique features of your ASUS motherboard. Click the **Driver**, **Utilities**, **Manual**, or **Special** tabs to display their respective menus.

The following screenshot is for reference only.



If Autorun is NOT enabled in your computer, browse the contents of the Support DVD to locate the file Setup.exe in the root folder. Double-click the Setup.exe to run the DVD.

BIOS Setup

2

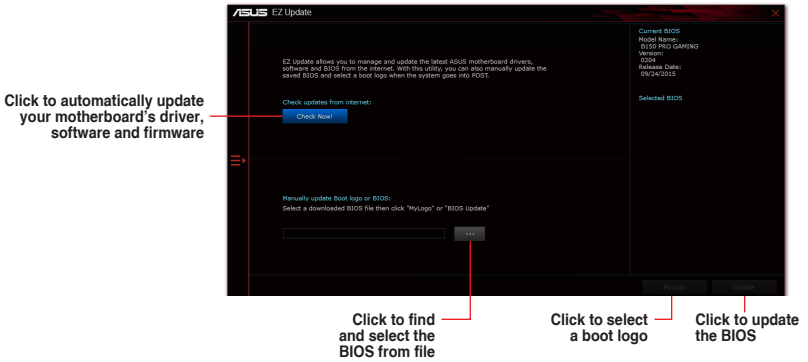
2.1 Managing and updating your BIOS

Save a copy of the original motherboard BIOS file to a USB flash disk in case you need to restore the BIOS in the future. Copy the original motherboard BIOS using the ASUS Update utility.

2.1.1 EZ Update

EZ Update is a utility that allows you to automatically update your motherboard's softwares, drivers and the BIOS version easily. With this utility, you can also manually update the saved BIOS and select a boot logo when the system goes into POST.

To launch EZ Update, click **EZ Update** on the AI Suite 3 main menu bar.

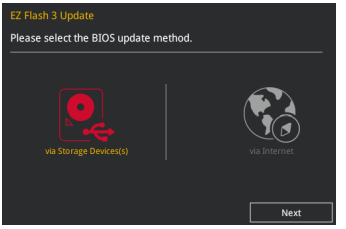


EZ Update requires an Internet connection either through a network or an ISP (Internet Service Provider).

2.1.2 ASUS EZ Flash 3

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

- Load the BIOS default settings to ensure system compatibility and stability. Select the **Load Optimized Defaults** item under the Exit menu. See section **2.10 Exit Menu** for details.
- Check your Internet connection before updating the BIOS via the Internet.



To update the BIOS using EZ Flash 3:

1. Enter the **Advanced Mode** of the BIOS setup program. Go to the **Tool** menu to select **ASUS EZ Flash 3 Utility** and press <Enter> to enable it.
2. Follow the steps below to update the BIOS via a storage device or Internet.

   Via Storage Device:

   a) Insert the USB flash disk that contains the latest BIOS file to the USB port, then select **via Storage Device**.

   b) Press <Tab> to switch to the **Drive** field.

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

   d) Press <Tab> to switch to the **Folder Info** field.

   e) Press the Up/Down arrow keys to find the BIOS file, and then press <Enter> to perform the BIOS update process.
3. Reboot the system when the update process is done.

- ASUS EZ Flash 3 supports USB 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!

2.1.3 ASUS CrashFree BIOS 3 utility

The ASUS CrashFree BIOS 3 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 updated BIOS file.

- Before using this utility, rename the BIOS file in the removable device to **B150MPG.CAP**.
- The BIOS file in the support DVD may not be the latest version. Download the latest BIOS file from the ASUS website at www.asus.com.

Recovering the BIOS

To recover the BIOS:

1. Turn on the system.
2. Insert the support DVD to the optical drive or the USB flash drive that contains 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 utility automatically.
4. The system requires you to enter BIOS Setup to recover BIOS settings. 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!

2.1.4 ASUS BIOS Updater

ASUS BIOS Updater allows you to update the BIOS in DOS environment.

The screenshots in this section are for reference only.

Before updating BIOS

- Prepare the motherboard support DVD and a USB flash drive.
- Download the latest BIOS file and BIOS Updater from https://www.asus.com/support/ and save them in your USB flash drive.

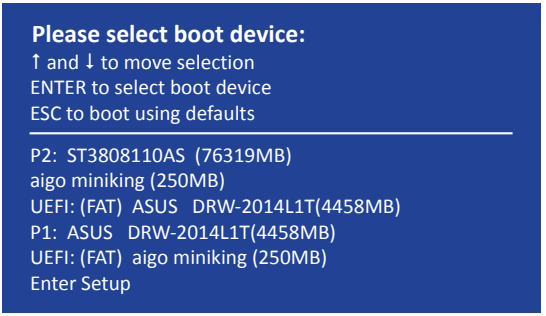
NTFS is not supported under FreeDOS environment. Ensure that your USB flash drive is in single partition and in FAT32/16 format.

- Turn off the computer.
- Ensure that your computer has a DVD optical drive.

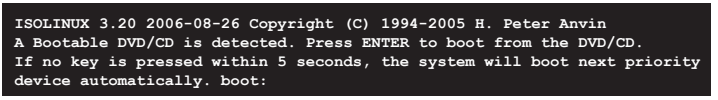
Booting the system in DOS environment

To boot the system in DOS:

1. Insert the USB flash drive with the latest BIOS file and BIOS Updater to the USB port.
2. Boot your computer then press <F8> to launch the select boot device screen.
3. When the select boot device screen appears, insert the Support DVD into the optical drive then select the optical drive as the boot device.



4. When the booting message appears, press <Enter> within five (5) seconds to enter FreeDOS prompt.



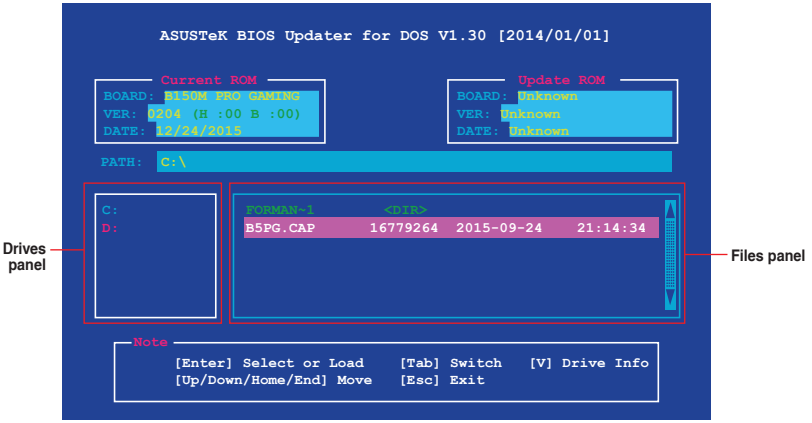
5. On the FreeDOS prompt, type **d:** then press <Enter> to switch the disk from Drive C (optical drive) to Drive D (USB flash drive).

Updating the BIOS file

To update the BIOS file:

1. On the FreeDOS prompt, type **bupdater /pc /g** and press <Enter>.

2. On the BIOS Updater screen, press <Tab> to switch from Files panel to Drives panel then select **D:**.



3. Press <Tab> to switch from Drives panel to Files panel then press <Up/Down> or <Home/End> keys to select the BIOS file and press <Enter>.

4. After the BIOS Updater checks the selected BIOS file, select **Yes** to confirm the BIOS update.

The BIOS Backup feature is not supported due to security regulations.

5. Select **Yes** then press <Enter>. When BIOS update is done, press <ESC> to exit BIOS Updater.

6. Restart your computer.

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** BIOS menu. See section **2.10 Exit Menu** for details.

2.2 BIOS setup program

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

To enter BIOS Setup at startup:

Press <Delete> or <F2> during the Power-On Self Test (POST). If you do not press <Delete> or <F2>, POST continues with its routines.

To enter BIOS Setup after POST:

- Press <Ctrl>+<Alt>+<Del> 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.

Using the power button, reset button, or the <Ctrl>+<Alt>+<Del> keys to force reset from a running operating system can cause damage to your data or system. We recommend you always shut down the system properly from the operating system.

- The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.
- Visit the ASUS website at www.asus.com to download the latest BIOS file for this motherboard.
- Ensure that a mouse is connected to your motherboard if you want to use the mouse to control the BIOS setup program.
- If the system becomes unstable after changing any BIOS setting, load the default settings to ensure system compatibility and stability. Select the **Load Optimized Defaults** item under the Exit menu or press hotkey F5. See section **2.10 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 **1.6 Jumpers** for information on how to erase the RTC RAM.

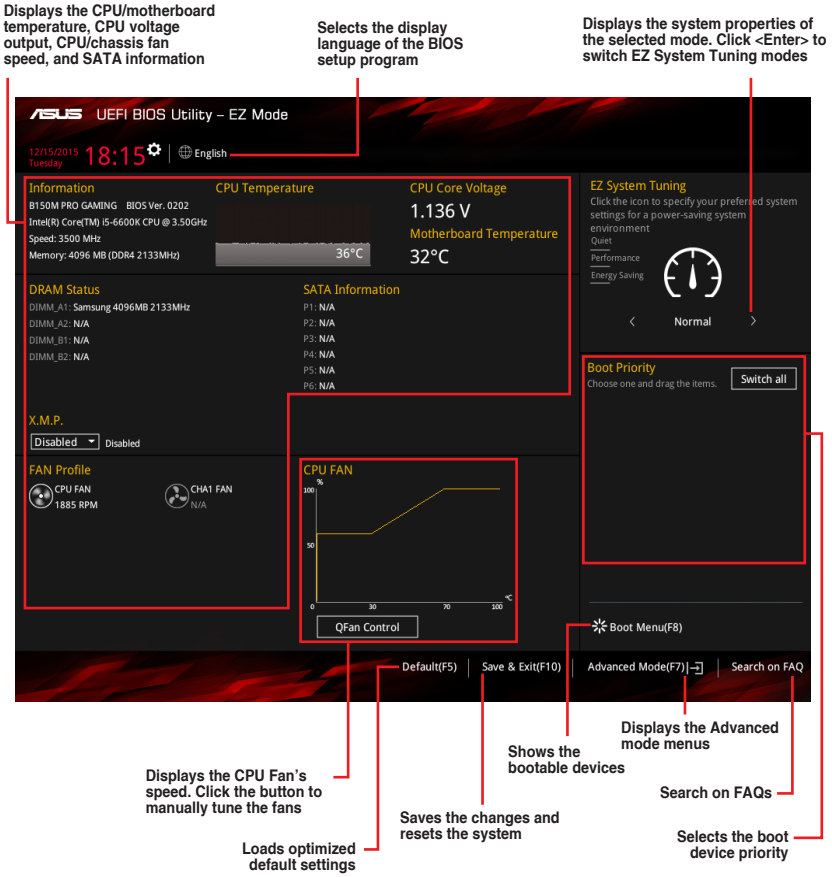
BIOS menu screen

The BIOS setup program can be used under two modes: **EZ Mode** and **Advanced Mode**. Press <F7> to change between the two modes.

2.2.1 EZ Mode

By default, the EZ Mode screen appears when you enter the BIOS setup program. The EZ Mode provides you an overview of the basic system information, and allows you to select the display language, system performance mode, fan profile and boot device priority. To access the Advanced Mode, click **Advanced Mode(F7)** or press <F7>.

The default screen for entering the BIOS setup program can be changed. Refer to the **Setup Mode** item in section **2.8 Boot menu** for details.

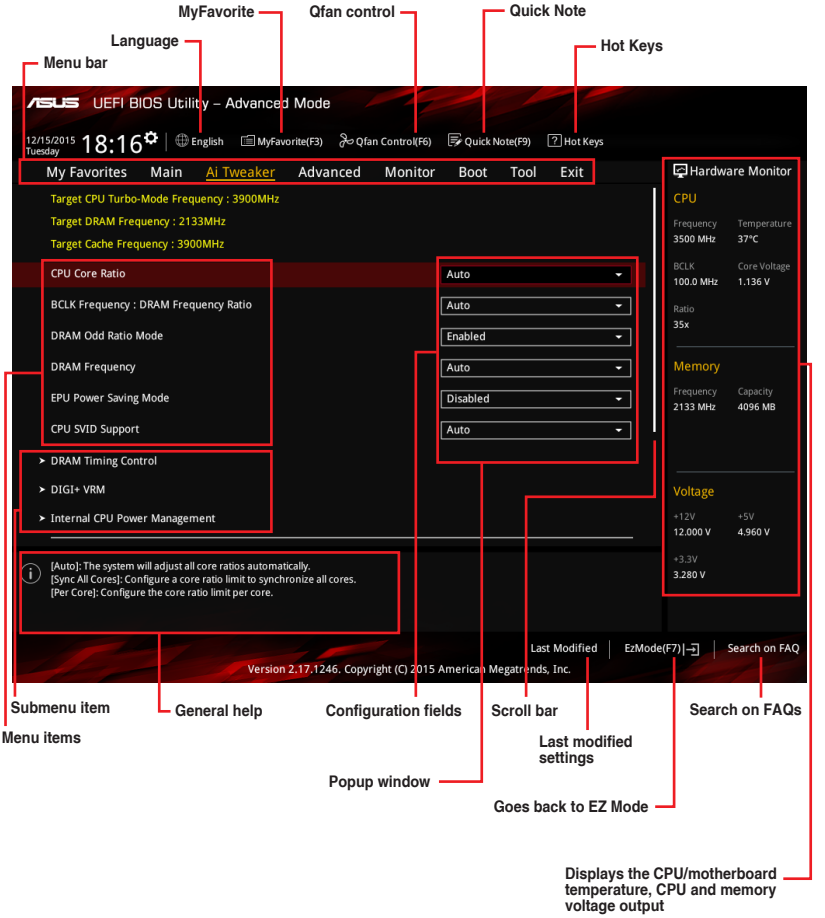


The boot device options vary depending on the devices you installed to the system.

2.2.2 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 access the EZ Mode, click **EzMode(F7)** or press <F7>.



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 sub-menu. 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.

MyFavorites(F3)

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

Refer to section **2.3 My Favorites** for more information.

QFan 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 **2.2.3 QFan Control** for more information.

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.

Search on FAQ

Move your mouse over this button to show a QR code. Scan this QR code with your mobile device to connect to the ASUS BIOS FAQ web page. You can also scan the QR code below.

Scroll bar

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

General help

At the bottom left 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.

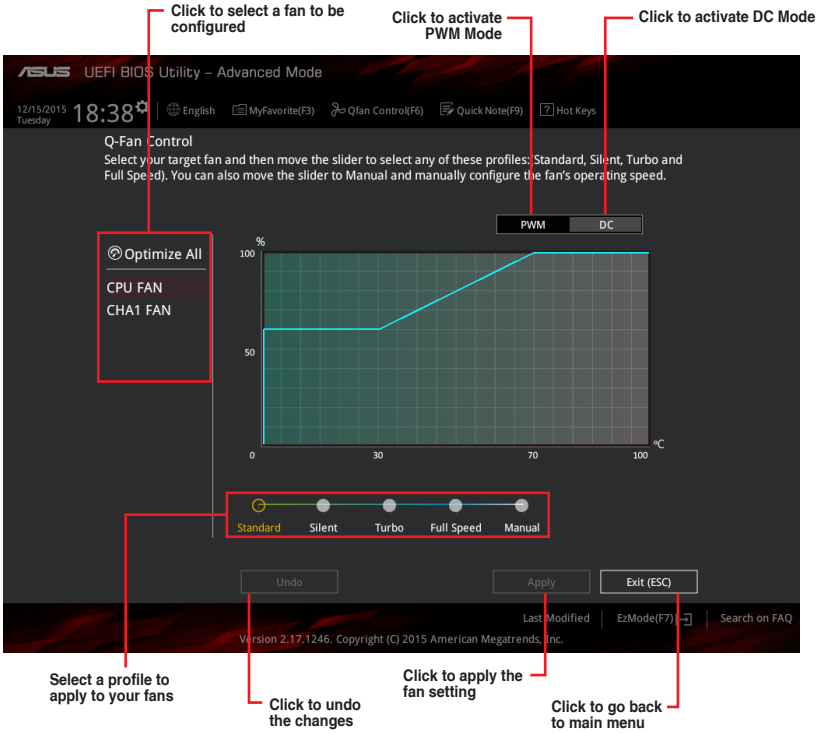
A configurable field is highlighted when selected. To change the value of a field, select it and press <Enter> to display a list of options.

Last Modified button

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

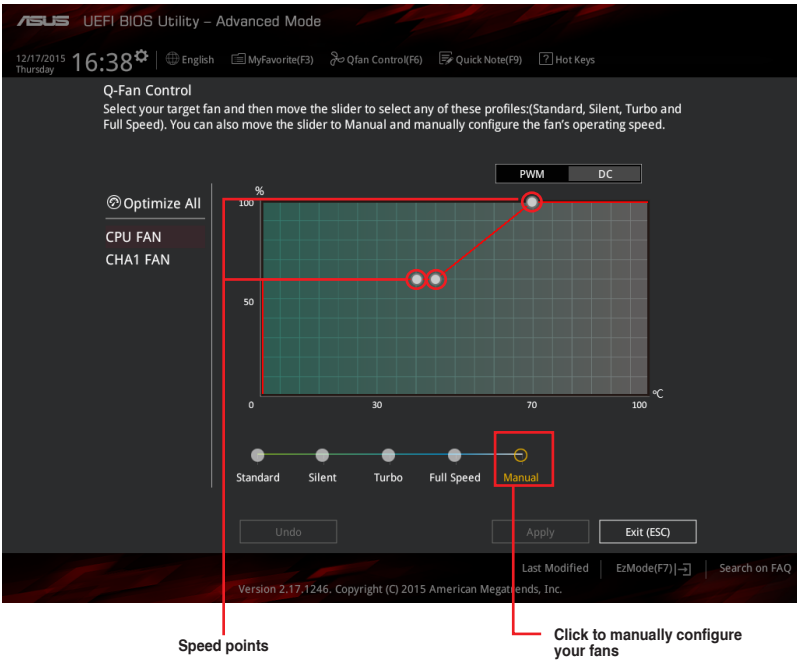
2.2.3 QFan Control

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



Configuring fans manually

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

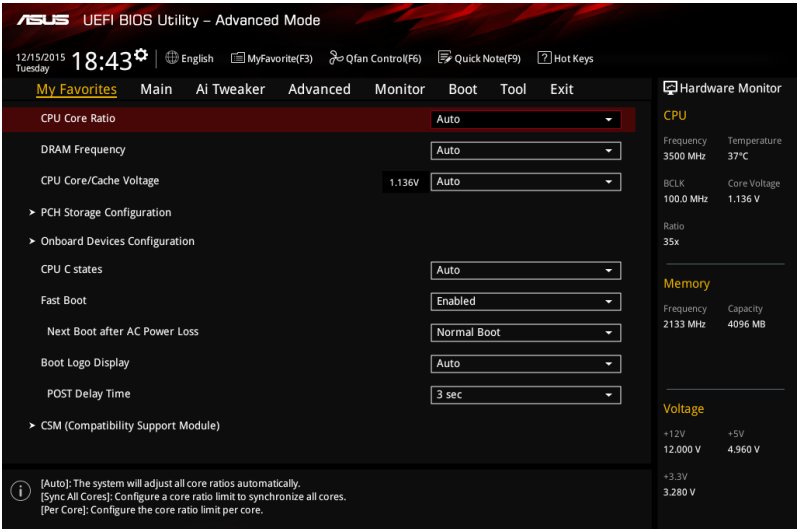


To configure your fans:

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

2.3 My Favorites

My Favorites is your personal space where you can easily save and access your favorite BIOS items.

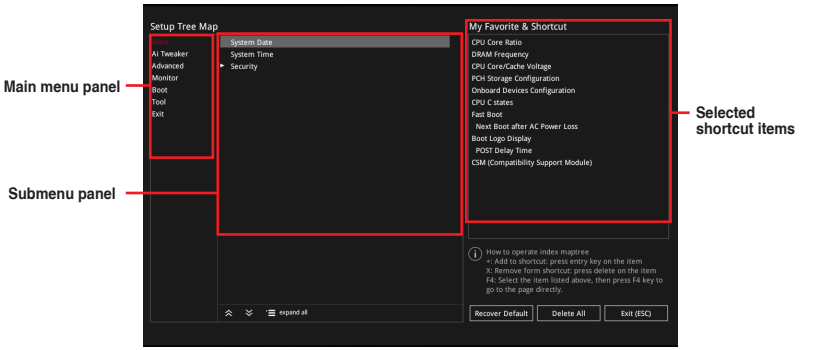


My Favorites comes with several performance, power saving, and fast boot related items by default. You can personalize this screen by adding or removing items.

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 MyFavorites screen.



3. Select an item from main menu panel, and then click the submenu that you want to save as favorite from the submenu panel and click +.

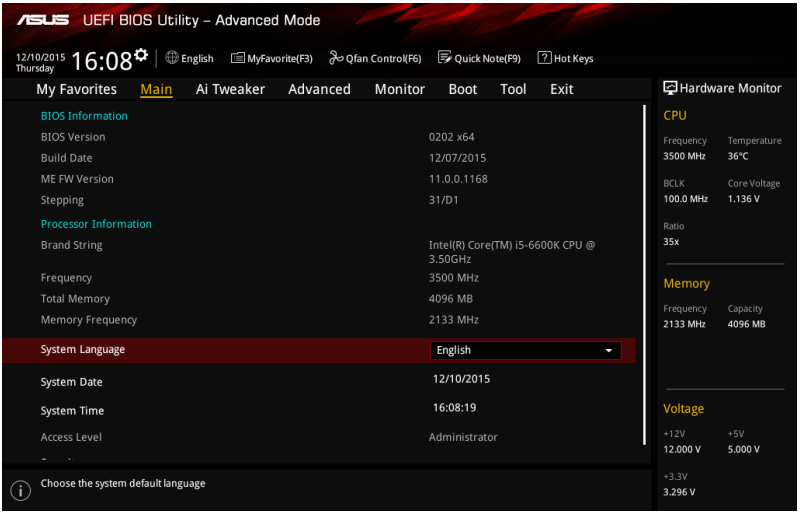
You cannot add the following items to My Favorite items:

- User-managed items such as language and boot order

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.

2.4 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.



2.4.1 Language [English]

Allows you to choose the BIOS language version from the options.
Configuration options: [English] [Français] [简体中文] [繁體中文] [日本語] [Deutsch] [Español] [Русский] [Korean]

2.4.2 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 **1.6 Jumpers** for information on how to erase the RTC RAM.
- The **Administrator Password** and **User Password** items on 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.

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, and then press <Enter>.
3. From the **Confirm New Password** box, key in your password again to confirm the password, and then click **OK**.

To change an administrator password:

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

To clear the administrator password, follow the same steps as in changing an administrator password, but click **OK** 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 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, and then press <Enter>.
3. From the **Confirm New Password** box, key in your password again to confirm the password, and then click **OK**.

To change a user password:

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

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

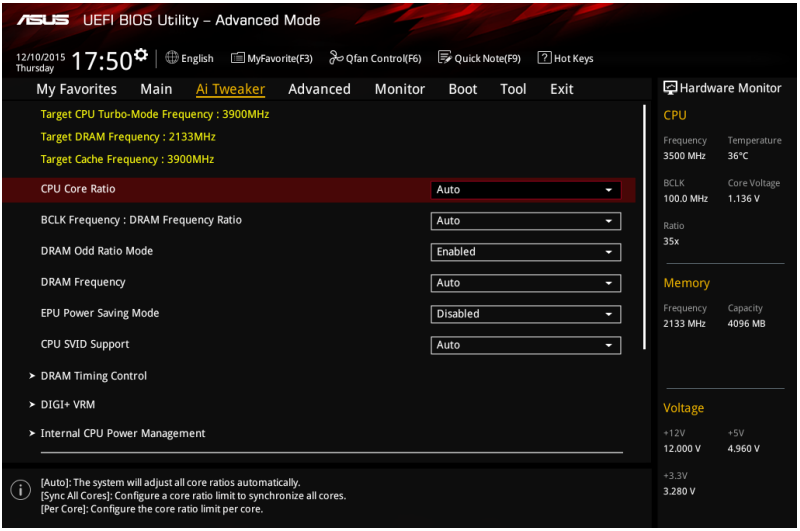
2.5 Ai Tweaker menu

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.



2.5.1 CPU Core Ratio [Auto]

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 [Sync All Cores] or [Per Core], the following items appear.

1-Core Ratio Limit [Auto]

Configure the 1-core ratio limit that must be higher than or equal to the 2-core ratio limit.

2-Core Ratio Limit [Auto]

Configure the 2-core ratio limit that must be higher than or equal to the 3-core ratio limit. The 1-core ratio limit must not be set to [Auto].

3-Core Ratio Limit [Auto]

Configure the 3-core ratio limit that must be higher than or equal to the 4-core ratio limit. The 1-core and 2-core ratio limit must not be set to [Auto].

4-Core Ratio Limit [Auto]

Configure the 4-core ratio limit that must be lower than or equal to the 3-core ratio limit. The 1-core, 2-core, and 3-core ratio limit must not be set to [Auto].

2.5.2 BCLK Frequency: DRAM Frequency Ratio [Auto]

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

[100:133] The BCLK frequency to DRAM frequency ratio will be set to 100:133.

[100:100] The BCLK frequency to DRAM frequency ratio will be set to 100:100.

2.5.3 DRAM Odd Ratio Mode [Enabled]

This item allows you to enable availability of odd DRAM ratios for improved granularity. Configuration options: [Enabled] [Disabled]

2.5.4 DRAM Frequency [Auto]

This item allows you to select the DRAM 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] [DDR4-933MHz] [DDR4-1066MHz] [DDR4-1200MHz] [DDR4-1333MHz] [DDR4-1400MHz] [DDR4-1500MHz] [DDR4-1600MHz] [DDR4-1700MHz] [DDR4-1733MHz] [DDR4-1800MHz] [DDR4-1866MHz] [DDR4-1900MHz] [DDR4-2000MHz] [DDR4-2100MHz] [DDR4-2133MHz] [DDR4-2200MHz] [DDR4-2266MHz] [DDR4-2300MHz] [DDR4-2400MHz] [DDR4-2500MHz] [DDR4-2533MHz] [DDR4-2600MHz] [DDR4-2666MHz] [DDR4-2700MHz] [DDR4-2800MHz] [DDR4-2900MHz] [DDR4-2933MHz] [DDR4-3000MHz] [DDR4-3066MHz] [DDR4-3100MHz] [DDR4-3200MHz] [DDR4-3333MHz] [DDR4-3466MHz] [DDR4-3600MHz] [DDR4-3733MHz] [DDR4-3866MHz] [DDR4-4000MHz] [DDR4-4133MHz] [DDR4-4266MHz]

Selecting a very high memory frequency may cause the system to become unstable! If this happens, revert to the default setting.

2.5.5 EPU Power Saving Mode [Disabled]

The ASUS EPU (Energy Processing Unit) applies settings for minimum system power consumption. Enable this item to apply lower CPU Core/Cache Voltage and help save energy consumption.
Configuration options: [Disabled] [Enabled]

2.5.6 CPU SVID Support [Auto]

Disable this item to prevent the CPU from communicating with the external voltage regulator.
Configuration options: [Auto] [Disabled] [Enabled]

2.5.7 DRAM Timing Control

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

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

2.5.8 DIGI+ VRM

CPU Load-line Calibration [Auto]

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

Performance is dependent on the CPU specification. Do not remove the VRM heatsink.

CPU Current Capability [Auto]

Allows you to configure the total power range, and extends the overclocking frequency range simultaneously.
Configuration options: [Auto] [100%] [110%] [120%] [130%] [140%]

Configure higher values when overclocking or when using high current demanding stress tests.

CPU VRM Switching Frequency [Auto]

This item affects the VRM transient response and VRM component temperatures. Setting a higher switching frequency will result in better transient response at the expense of higher VRM temperature.
Configuration options: [Auto] [Manual]

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

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

Fixed CPU VRM Switching Frequency(KHz) [300]

This item allows you to set a higher frequency for a quicker transient response speed. Use the <+> and <-> keys to adjust the value. The values range from 250KHz to 500KHz with a 50KHz interval.

CPU Power Duty Control [T.Probe]

This item allows you to adjust the duty cycle of each VRM phase based upon current and/or temperature.

[T. Probe] Sets the buck controller to balance VRM FET temperatures.

[Extreme] Sets the buck controller to balance per phase current.

CPU Power Phase Control [Auto]

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

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

2.5.9 Internal CPU Power Management

Intel(R) SpeedStep(tm) [Auto]

This item allows the operating system to dynamically adjust the processor voltage and cores frequency, resulting to a decreased average power consumption and decreased average heat production.
Configuration options: [Auto] [Disabled] [Enabled]

Turbo Mode [Enabled]

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

- The following items appear only when you set the **Turbo Mode** to [Enabled].
- The **Turbo Mode** is only available on selected CPU models.

Turbo Mode Parameters

Long Duration Package Power Limit [Auto]

Allows you to limit the Turbo Ratio's time duration that exceeds the TDP (Thermal Design Power) for maximum performance. Use the <+> or <-> keys to adjust the value. The values range from 1W to 4095W.

Package Power Time Window [Auto]

Also known as Power Limit 1, this item allows you to maintain the time window for Turbo Ratio over TDP (Thermal Design Power). Use the <+> or <-> keys to adjust the value. The values range from 1 to 127 in seconds.

Short Duration Package Power Limit [Auto]

Also known as Power Limit 2, this item allows you to provide rapid protection when the package power exceeds the Power Limit 1. Use the <+> or <-> keys to adjust the value. The values range from 1W to 4095W.

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. The values range from 0 mOhms to 62.49 mOhms.

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. The values range from 0 mOhms to 62.49 mOhms.

2.5.10 CPU Core/Cache Current Limit Max. [Auto]

Allows you to set a higher current limit to prevent a frequency or power throttling when overclocking. Use the <+> or <-> keys to adjust the value. The values range from 0.00A to 255.50A with a 0.25A interval.

2.5.11 Min. CPU Cache Ratio [Auto]

Allows you to set the minimum possible CPU cache ratio. Use the <+> or <-> keys to adjust the value. The values range from 8 to 39 with a 1 interval.

2.5.12 Max. CPU Cache Ratio [Auto]

Allows you to set the maximum possible CPU cache ratio. Use the <+> or <-> keys to adjust the value. The values range from 8 to 39 with a 1 interval.

2.5.13 CPU Core/Cache Voltage [Auto]

This item allows you to configure the amount of voltage fed to the CPU cores.
Configuration options: [Auto] [Manual Mode] [Offset Mode]

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

CPU Core Voltage Override [Auto]

Allows you to set the input voltage for the CPU by the external voltage regulator. Use the <+> or <-> keys to adjust the value. The values range from 0.600V to 1.700V with a 0.005V interval.

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

Offset Mode Sign [+]

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

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

CPU Core Voltage Offset [Auto]

Use the <+> or <-> keys to adjust the value. The values range from 0.005V to 0.635V with a 0.005V interval.

2.5.14 DRAM REF Voltage Control

DRAM CTRL REF Voltage [Auto]

Allows you to set the DRAM reference voltage on the control lines. Use the <+> or <-> keys to adjust the value. The values range from 0.39500V to 0.63000V with a 0.00500V interval.

DRAM DATA REF Voltage on CHB [Auto]

Allows you to set the DRAM reference voltage on the data lines of channel B. Use the <+> or <-> keys to adjust the value. The values range from 0.39500V to 0.63000V with a 0.00500V interval.

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

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

DRAM DATA REF Voltage on CHA DIMM0 Rank1 BL0-7 [Auto]

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

DRAM DATA REF Voltage on CHA DIMM1 Rank0 BL0-7 [Auto]

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

DRAM DATA REF Voltage on CHA DIMM1 Rank1 BL0-7 [Auto]

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

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

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

DRAM DATA REF Voltage on CHB DIMM0 Rank1 BL0-7 [Auto]

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

DRAM DATA REF Voltage on CHB DIMM1 Rank0 BL0-7 [Auto]

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

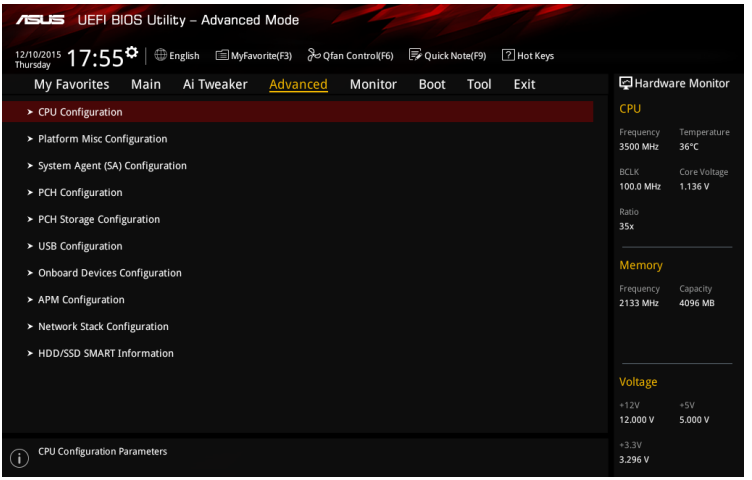
DRAM DATA REF Voltage on CHB DIMM1 Rank1 BL0-7 [Auto]

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

2.6 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.



2.6.1 CPU Configuration

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

The items shown in submenu may be different due to the CPU you 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 [Disabled]

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

Hardware Prefetcher [Enabled]

This item allows you to turn on or turn off the MLC streamer prefetcher.
Configuration options: [Disabled] [Enabled]

Adjacent Cache Line Prefetch [Enabled]

This item allows you to turn on or turn off the prefetching of adjacent cache lines.
Configuration options: [Disabled] [Enabled]

CPU Power Management Configuration

This item allows you to configure CPU power management.

Intel® SpeedStep™ [Auto]

This item allows the operating system to dynamically adjust the processor voltage and cores frequency, resulting to a decreased average power consumption and decreased average heat production.
Configuration options: [Auto] [Disabled] [Enabled]

Turbo Mode [Enabled]

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

CPU C states [Auto]

This item allows you to enable or disable CPU C states.
Configuration options: [Auto] [Disabled] [Enabled]

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

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

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

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

CPU C7 Report [CPU C7s]
This item allows you to enable or disable the CPU C7 report to the operating system.
Configuration options: [Disabled] [CPU C7] [CPU C7s]

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

Package C State limit [Auto]

This item allows you to set the Package C State limit.
Configuration options: [C0/C1] [C2] [C3] [C6] [C7] [C7s] [C8] [Auto]

CFG lock [Disabled]

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

2.6.2 Platform Misc Configuration

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

PCI Express 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 items appear only when you set the **PCI Express Native Power Management** to [Enabled].

Native ASPM [Disabled]

[Disabled]	BIOS controls the ASPM support for the device.
[Enabled]	Windows® Vista OS controls the ASPM support for the device.

PCH - PCI Express options

DMI Link ASPM Control [Disabled]

This item allows you to enable or disable the control the Active State Power Management on SA side of the DMI Link.
Configuration options: [Disabled] [Enabled]

ASPM Support [Disabled]

This item allows you to set the ASPM level.
Configuration options: [Disabled] [L0s] [L1] [L0sL1] [Auto]

SA - PCI Express options

DMI Link ASPM Control [Disabled]

This item allows you to enable or disable the control the Active State Power Management on SA side of the DMI Link.
Configuration options: [Disabled] [L1]

PEG - ASPM [Disabled]

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

2.6.3 System Agent (SA) Configuration

Graphics Configuration

Allows you to select the primary display from CPU and PCIE graphics devices.

Primary Display [Auto]

Allows you to select the primary display from CPU and PCIE graphics devices.
Configuration options: [Auto] [CPU Graphics] [PCIE]

iGPU Multi-Monitor [Disabled]

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

DMI/OPI Configuration

Allows you to control various DMI functions.

DMI Max Link Speed [Auto]

Allows you to configure the DMI speed.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

PEG Port Configuration

Allows you to configure the PEG Port settings.

PCIEX16_1 Link Speed [Auto]

Allows you to configure the PCIEX16 speed for slot 1.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

Memory Configuration

Allows you to configure the memory configuration parameters.

Memory Remap [Enabled]

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

2.6.4 PCH Configuration

This item allows you to configure the PCH parameters.

PCI Express Configuration

PCIe Speed [Auto]

Allows you to configure the PCI Express port speed.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

2.6.5 PCH Storage Configuration

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

Hyper Kit Mode [Disabled]

Disables this option for M.2 devices. Enables this option for ASUS Hyper kit card.
Configuration options: [Disabled] [Enabled]

SATA Controller(s) [Enabled]

Enables or disables the onboard SATA device.
Configuration options: [Enabled] [Disabled]

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

Aggressive LPM Support [Disabled]

This item allows you to enable PCH to aggressively enter power link state.
Configuration options: [Enabled] [Disabled]

SMART Self Test [On]

This item allows you to run SMART Self Test on all HDDs during POST.
Configuration options: [On] [Off]

SATA6G_1-6 (Charcoal black) [Enabled]

This item allows you to enable or disable the SATA6G_1-6 port.
Configuration options: [Disabled] [Enabled]

Hot Plug [Disabled]

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

2.6.6 USB Configuration

The items in this menu allow you to change the USB-related features.

The **USB Devices** item shows the auto-detected values. If no USB device is detected, the item shows **None**.

Legacy USB Support [Enabled]

[Enabled] Enables Legacy USB support.

[Disabled] Keeps USB devices available only for EFI applications.

[Auto] Disables legacy support if no USB devices are connected.

XHCI Hand-off [Disabled]

[Enabled] Enables the support for operating systems without XHCI hand-off support.

[Disabled] Disables the XHCI hand-off support.

USB Single Port Control

The sub-items in this menu allow you to set the USB Port Disable Override features.

USB3_1-6, USB7-10 [Enabled]

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

Refer to section **1.2.3 Motherboard layout** for the location of the USB ports.

2.6.7 Onboard Devices Configuration

HD Audio Controller [Enabled]

[Disabled] Disables the HD Audio Device.

[Enabled] Enables the HD Audio Device.

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

Front Panel Type [HD Audio]

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.

Audio LED Lighting [Breathing Mode]

Allows you to set the behavior of the audio LED.
Configuration options: [Disabled] [Still Mode] [Breathing Mode]

M.2/SATA6G_1 Configuration [Auto]

Configuration options: [Auto] [Manual]

The following item appears only when you set the **M.2/SATA6G_1 Configuration** to [Manual].

M.2 and SATA6G_1 SATA Mode Configuration [SATA6G_1]

M.2 shares SATA mode with SATA6G_1 port. Change this item before installing M.2 SATA devices.

[SATA6G_1] SATA mode will be switched to SATA6G_1. M.2 can only support PCIE devices.

[M.2] SATA mode will be switched to M.2. SATA6G_1 will be disabled.

Intel LAN Controller [Enabled]

[Disabled] Disables the GbE Controller.

[Enabled] Enables the GbE Controller.

Intel PXE Option ROM [Off]

This item appears only when you set the Intel LAN Controller to [Enabled] and allows you to enable or disable the PXE Option Rom of the Intel LAN controller.
Configuration options: [On] [Off]

Charging USB devices in Power State S5 [Enabled]

[Disabled] Disables this function.

[Enabled] Charges USB devices even when the system is in Power State S5.

Serial Port Configuration

The sub-items in this menu allow you to set the serial port parameters.

Serial Port [On]

Allows you to enable or disable the serial port (COM).
Configuration options: [On] [Off]

Change Settings [IO=3F8h; IRQ=4]

This item appears only when you set the **Serial Port** to [On] and allows you to select an optimal setting for Super IO device.
Configuration options: [IO=3F8h; IRQ=4] [IO=2F8h; IRQ=3]
[IO=3E8h; IRQ=4] [IO=2E8h; IRQ=3]

2.6.8 APM Configuration

ErP Ready [Disabled]

Allows BIOS to switch off some power at S4/S5 to get the system ready for ErP requirement. When set to [Enabled], all other PME options will be switched off.
Configuration options: [Disabled] [Enable(S4+S5)] [Enable(S5)]

Restore AC Power Loss [Power Off]

[Power On] The system goes into on state after an AC power loss.

[Power Off] The system goes into off state after an AC power loss.

[Last State] The system goes into either off or on state, whatever the system state was before the AC power loss.

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 Ring [Disabled]

[Disabled] Disables Ring to generate a wake event.

[Enabled] Enables Ring to generate a wake event.

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]

2.6.9 Network Stack Configuration

Network Stack [Disabled]

This item allows you to enable or disable the UEFI Network Stack.
Configuration options: [Disabled] [Enabled]

The following two items appear 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 Boot Support.
Configuration options: [Disabled] [Enabled]

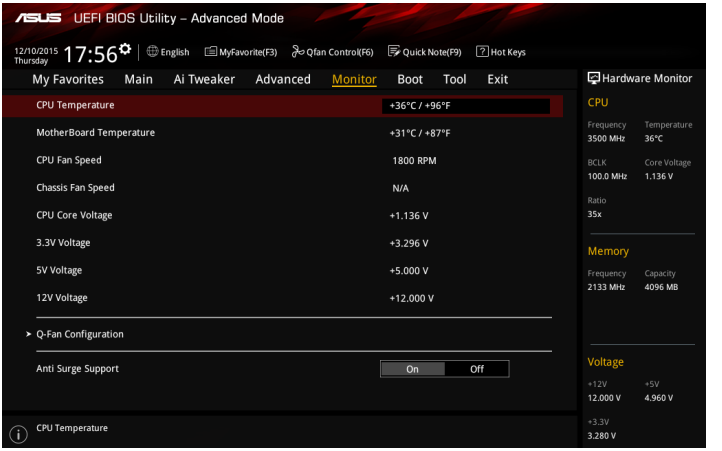
2.6.10 HDD/SSD SMART Information

This menu displays the SMART information of the connected devices.

2.7 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.



2.7.1 CPU/MotherBoard Temperature [xxx°C/xxx°F]

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

2.7.2 CPU/Chassis Fan Speed [xxxx RPM]

The onboard hardware monitor automatically detects and displays the CPU fan and chassis fan speed in RPM (rotations per minute). 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.

2.7.3 CPU Core/3.3V/5V/12V Voltage

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

2.7.4 Q-Fan Configuration

The subitems in this menu allows you to configure the Q-Fan features.

Qfan Tuning

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

CPU Q-Fan Control [Auto]

[Disabled] Disables the CPU Q-Fan control.

[Auto] Detects the type of CPU fan installed and automatically switch the control modes.

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

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

CPU Fan Speed Lower Limit [200 RPM]

This item allows you to select the lower speed limit for the CPU fan. A warning message will appear when the limit is reached.
Configuration options: [Ignore] [100 RPM] [200 RPM] [300 RPM] [400 RPM] [500 RPM]

CPU Fan Profile [Standard]

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

[Standard] Select [Standard] to enable the CPU fan to adjust automatically depending on the CPU temperature.

[Silent] Select [Silent] to decrease the fan speed for quiet CPU fan operation.

[Turbo] Select [Turbo] to run the CPU fan at the maximum speed.

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

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

CPU Upper Temperature [70]
Use the <+> and <-> keys to adjust the upper limit of the CPU temperature. The values range from 20°C to 75°C. The CPU upper temperature cannot be lower than the CPU lower temperature.

CPU Fan Max. Duty Cycle (%) [100]
Use the <+> and <-> keys to adjust the maximum CPU fan duty cycle. The values range from 60% to 100%. The CPU fan will operate at the maximum duty cycle when the CPU temperature reaches the CPU upper temperature. The CPU fan max. duty cycle cannot be lower than the CPU fan min. duty cycle.

CPU Middle Temperature [45]
Use the <+> or <-> keys to set the value for CPU Middle Temperature. The range of the values depends on the CPU installed.

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

CPU Lower Temperature [40]
Use the <+> or <-> keys to adjust the CPU fan lower temperature. The values range from 20°C to 75°C.

CPU Fan Min. Duty Cycle (%) [60]
Use the <+> and <-> keys to adjust the minimum CPU fan duty cycle. The values range from 60% to 100%. The CPU fan will operate at the minimum duty cycle when the CPU temperature is lower than the CPU lower temperature.

Chassis Fan Q-Fan Control [DC Mode]

[Disabled] Disables the chassis Q-Fan control.

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

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

The following items appear only when you set the **Chassis Fan Q-Fan Control** to [PWM Mode] or [DC Mode].

Chassis Fan 1 Q-Fan Source [CPU]

This item controls the assigned fan according to the selected temperature source.
Configuration options: [CPU] [MotherBoard]

Chassis Fan 1 Speed Low Limit [600 RPM]

This item allows you to select the lower speed limit for the chassis fan 1. A warning message will appear when the limit is reached.
Configuration options: [Ignore] [200RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

Chassis Fan Profile [Standard]

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

[Standard] Select [Standard] to enable the chassis fan to adjust automatically depending on the chassis temperature.

[Silent] Select [Silent] to decrease the fan speed for quiet chassis fan operation.

[Turbo] Select [Turbo] to run the chassis fan at the maximum speed.

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

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

Chassis Fan Upper Temperature [70]
Use the <+> or <-> keys to adjust the upper limit of the chassis fan temperature. The values range from 45°C to 75°C.

Chassis Fan Max. Duty Cycle (%) [100]
Use the <+> or <-> keys to set the maximum chassis fan duty cycle and source temperature upper limit. The values range from 60% to 100%. When source temperature reaches the upper limit, the chassis fan will operate at the maximum duty cycle.

Chassis Fan 1 Middle Temperature [45]
Use the <+> or <-> keys to set the value for Chassis Fan Middle Temperature.

Chassis Fan 1 Middle Duty Cycle (%) [60]
Use the <+> or <-> keys to adjust the chassis fan middle duty cycle. The values range from 60% to 100%.

Chassis Fan Lower Temperature [40]
Use the <+> or <-> keys to configure the chassis fan lower temperature. The values range from 20°C to 75°C.

Chassis Fan Min. Duty Cycle (%) [60]
Use the <+> or <-> keys to adjust the minimum chassis fan duty cycle when source temperature is 40 degree or below. The values range from 60% to 100%.

Allow Fan Stop [Disabled]

This item allows the fan to run at 0% duty cycle when the temperature of the source is dropped below the lower temperature.
Configuration options: [Disabled] [Enabled]

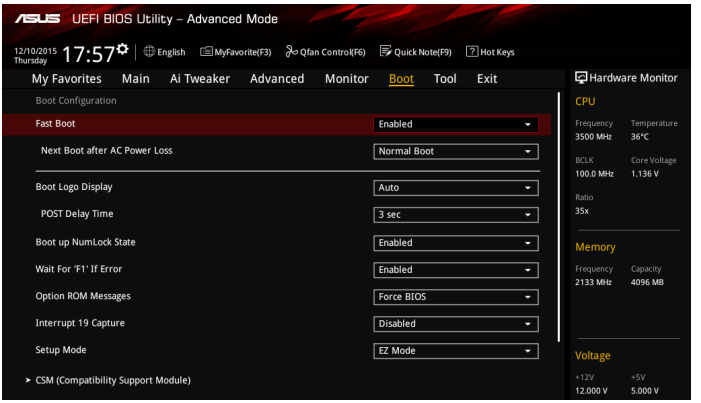
2.7.5 Anti Surge Support [On]

This item allows you to enable or disable the Anti Surge function.
Configuration options: [On] [Off]

2.8 Boot menu

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

Scroll down to display the other BIOS items.



2.8.1 Fast Boot [Enabled]

[Disabled] Select to return to normal boot speed.

[Enabled] Select to accelerate the boot speed.

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.

2.8.2 Boot Logo Display [Auto]

[Auto] Auto adjustment for Windows requirements.

[Full Screen] Maximize the boot logo size.

[Disabled] Hide the logo during POST.

POST Delay Time [3 sec]

This item appears only when you set Boot Logo Display to [Auto] and [Full Screen]. This item allows you to select the additional waiting time before the POST to easily enter the BIOS setup. The POST delay time is only recommended to be set during a normal system boot. The value ranges from 0 to 10 seconds.

2.8.3 Boot up NumLock State [Enabled]

This item allows you to enable or disable the keyboard numlock during the system boot. Configuration options: [Enabled] [Disabled]

2.8.4 Wait for 'F1' If Error [Enabled]

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

2.8.5 Option ROM Messages [Force BIOS]

[Force BIOS] The third-party ROM messages will be displayed during POST.

[Keep Current] Disables the ROM messages and displays only the ASUS logo during POST.

2.8.6 Interrupt 19 Capture [Disabled]

Enable this item to allow the option ROMs to trap the interrupt 19.
Configuration options: [Enabled] [Disabled]

2.8.7 Setup Mode [EZ Mode]

This item allows you to go to Advanced Mode or EZ Mode of the BIOS after POST.
Configuration options: [Advanced Mode] [EZ Mode]

2.8.8 CSM (Compatibility Support Module)

Allows you to configure the CSM (Compatibility Support Module) items to fully support the various graphics, bootable devices, and add-on devices for a better compatibility.

Launch CSM [Enabled]

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

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

[Disabled] Disable the CSM to fully support the Windows security update and secure boot.

The following four items appear when you set Launch CSM to [Enabled].

Boot Device Control [UEFI and Legacy OPROM]

Allows you to select the devices boot-up mode by the devices specification.
Configuration options: [UEFI and Legacy OPROM] [Legacy OPROM only] [UEFI only]

Boot from Network Devices [Legacy only]

Allows you to select the type of the onboard LAN controllers and installed LAN cards.
Configuration options: [Ignore] [Legacy only] [UEFI driver first]

Boot from Storage Devices [Legacy only]

Allows you to run the selected type first during the system boot.
Configuration options: [Ignore] [Legacy only] [UEFI driver first]

Boot from PCI-E/PCI Expansion Devices [Legacy only]

Allows you to run the selected type of PCI-E/PCI Expansion devices first during the system boot.
Configuration options: [Legacy only] [UEFI driver first]

2.8.9 Secure Boot

Allows you to configure the Windows secure boot settings and manage the secure boot keys.

OS Type [Windows UEFI mode]

Allows you to select your installed operating system.

[Windows UEFI mode]	This item allows you to 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]	This item allows you to get the optimized functions when booting on Windows non-UEFI mode and Microsoft secure boot non-compliant OS.

Key Management

This allows you to manage the Secure Boot keys.

Install Default Secure Boot Keys

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

Save Secure Boot Keys

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

PK Management

The PK (Platform Key) locks and secures the firmware from any non-permissible changes. The system verifies the PK before your system enters the OS.

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

Delete Key
Allows you to delete the PK from your system. Once the PK is deleted, all the system's secure boot keys will not be active.

The PK file must be formatted as a Public Key Certificate or UEFI variable structure with time-based authenticated variable.

KEK Management

The KEK (Key-Exchange Key) manages the DB (signature database) and DBX (revoked signature database).

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.

The KEK file must be formatted as a Public Key Certificate or UEFI variable structure with time-based authenticated variable.

Delete Key
Allows you to delete the KEK from your system.

DB Management

The DB (signature database) lists the signers or images of UEFI applications, operating system loaders, and UEFI drivers that you can load on the single computer.

Set New Key
Allows you to load the downloaded DB 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.

The KEK file must be formatted as a Public Key Certificate or UEFI variable structure with time-based authenticated variable.

Delete Key
Allows you to delete the KEK from your system.

DBX Management

The DBX (revoked signature database) lists the forbidden images of DB items that are no longer trusted and cannot be loaded.

Set New Key
Allows you to load the downloaded DBX 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.

The KEK file must be formatted as a Public Key Certificate or UEFI variable structure with time-based authenticated variable.

Delete Key
Allows you to delete the KEK from your system.

2.8.10 Boot Option Priorities

These items specify the boot device priority sequence from the available devices. The number of device items that appears on the screen depends on the number of devices installed in the system.

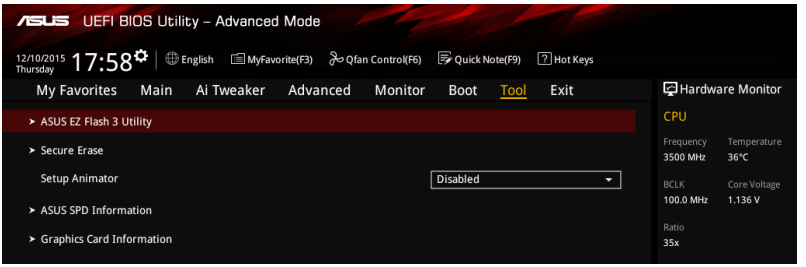
- To access Windows® OS in Safe Mode, press <F8 > after POST (Windows® 8 not supported).
- To select the boot device during system startup, press <F8> when ASUS Logo appears.

2.8.11 Boot Override

These items display 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.

2.9 Tool menu

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



2.9.1 ASUS EZ Flash 3 Utility

Allows you to run ASUS EZ Flash 3. Press <Enter> to launch the ASUS EZ Flash 3 screen.

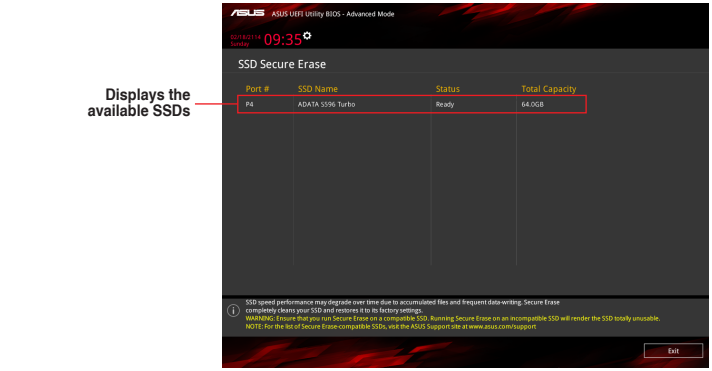
For more details, see section **2.1.2 ASUS EZ Flash 3**.

2.9.2 Secure Erase

SSD speed performance may degrade over time due to accumulated files and frequent data-writing. Secure Erase completely cleans your SSD and restore it to its factory settings.

Ensure that you run Secure Erase on a compatible SSD. Running Secure Erase on an incompatible SSD will render the SSD totally unusable.

- For the list of Secure Erase-compatible SSDs, visit the ASUS Support site at https://www.asus.com/support/.
- It may take a while to erase the contents of your SSD 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 **1.2.3 Motherboard layout** of this manual.



Status definition:

- **Frozen:** The frozen state is the result of a BIOS protective measure. The BIOS guards drives that do not have password protection by freezing them prior to booting. If the drive is frozen, a power off or hard reset of your PC must be performed to proceed with the Secure Erase.
- **Locked:** SSDs might be locked if the Secure Erase process is either incomplete or being 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.

2.9.3 Setup Animator [Disabled]

Enables or disables the Setup Animator.
Configuration options: [Enabled] [Disabled]

2.9.4 ASUS SPD Information

DIMM Slot Number [DIMM_A1]

Displays the Serial Presence Detect (SPD) information of the DIMM module installed on the selected slot.
Configuration options: [DIMM_A1] [DIMM_A2] [DIMM_B1] [DIMM_B2]

2.9.5 Graphics Card Information

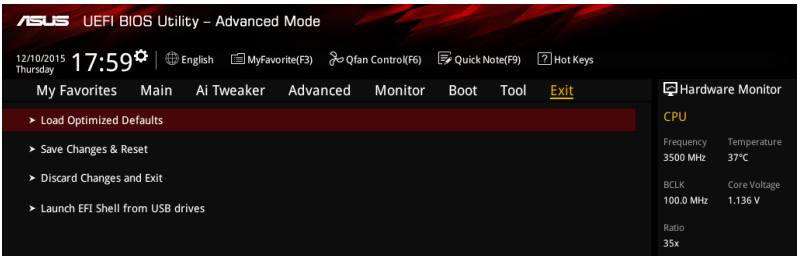
This item displays the information about the graphics card installed in your system.

GPU Post

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

2.10 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.



Load Optimized Defaults

This option allows you to restore or load default values for all the setup options. When you select this option or if you press <F5>, a confirmation window appears. Select OK to load the default values.

Save Changes & Reset

This option allows you to reset the system after saving the changes. When you select this option or if you press <F10>, a confirmation window appears. Select OK to save changes and reset.

Discard Changes and Exit

This option allows you to exit system setup without saving any changes. When you select this option or if you press <Esc>, a confirmation window appears. Select OK to discard changes and exit.

Launch EFI Shell from USB drives

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

2.11 Installing an operating system

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.

2.11.1 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.

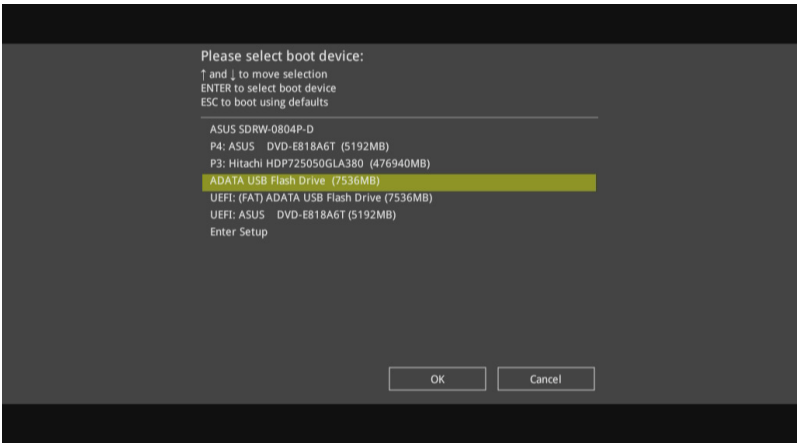
Requirement:

- 1 x ASUS support DVD
- 1 x Windows® 7 installation source
- 1 x SATA ODD
- 1 x USB device (ODD or storage)

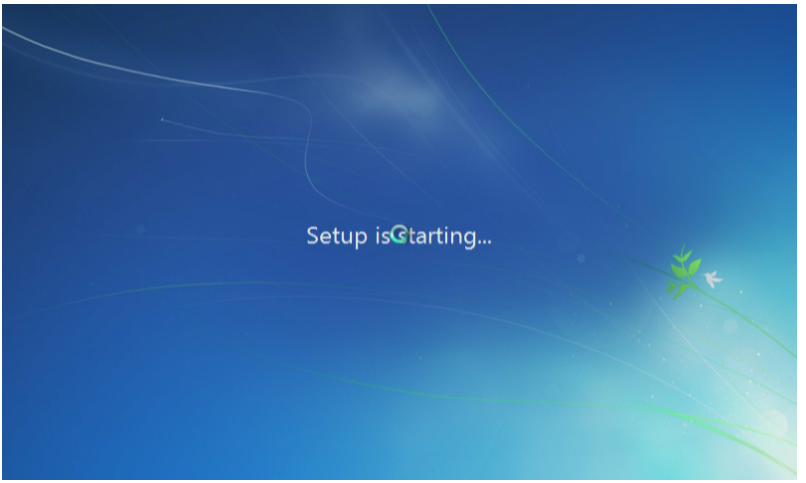
The USB storage device requires 8GB or more capacity. It is recommended to format the storage device before use.

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.

Method 3: Using ASUS EZ Installer

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

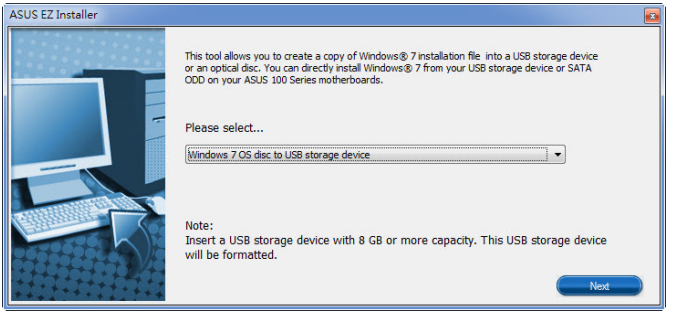
Requirement:

- 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 (8GB or more)

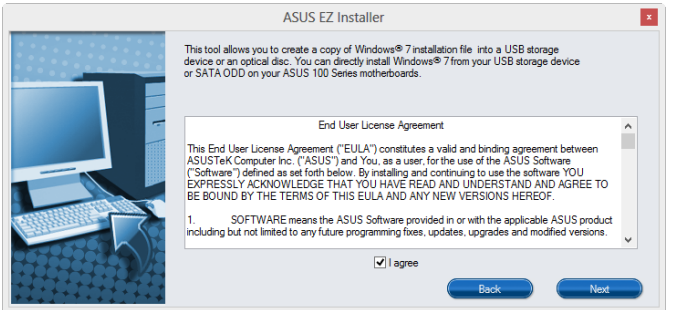
1. Insert the Windows® 7 installation DVD.
2. Launch the ASUS EZ Installer located on the ASUS support DVD.
3. Select a method of creating a modified Windows® 7 installation file:

Windows® 7 OS disk to USB storage device

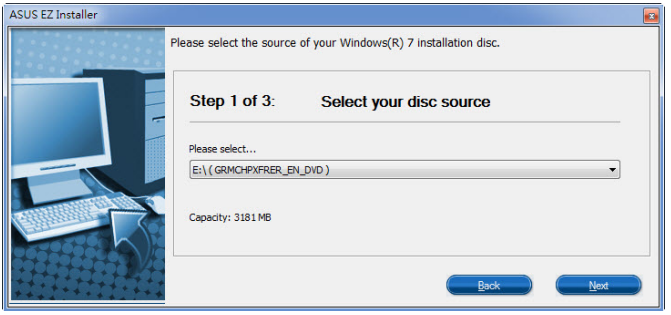
- Select **Windows 7 OS disk to USB storage device** and then click **Next**.



- Check **I agree** and then click **Next**.



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



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

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

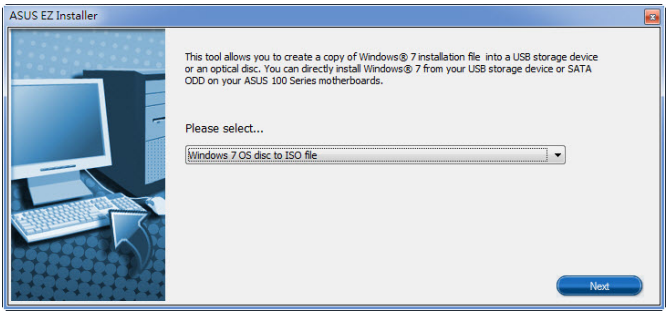
- Click **Yes** to clear the contents on the USB storage device and create a bootable USB device.

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

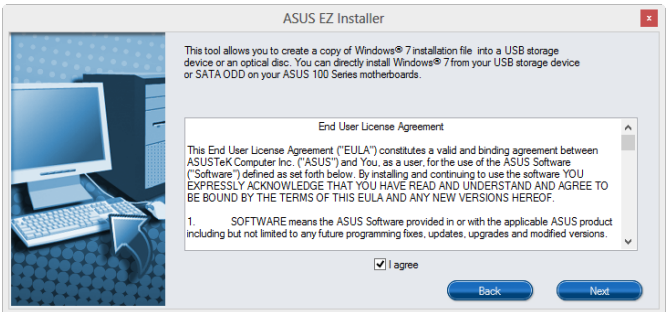
- Once completed, click **OK** to finish.

Windows® 7 OS disk to ISO file

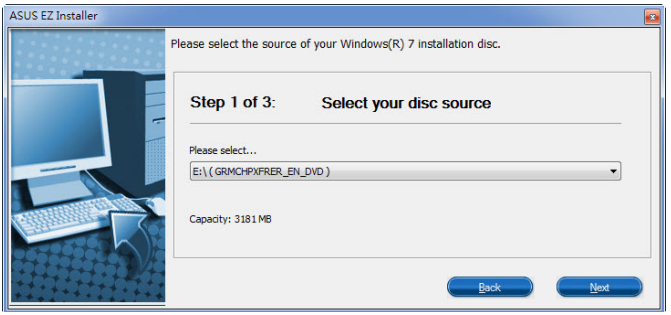
- Select **Windows 7 OS disk to ISO file** and then click **Next**.



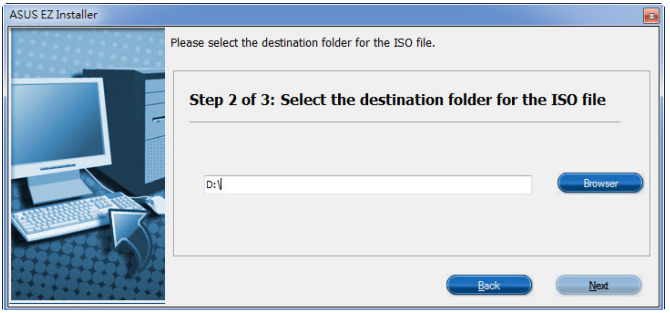
- Check **I agree** and then click **Next**.



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



- 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.

Appendices

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.

Cet 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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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.

Русский 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 Līdz 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.

ASUS contact information

ASUSTeK COMPUTER INC.

Address	4F, No. 150, Li-Te Rd., Peitou, Taipei 112, Taiwan
Telephone	+886-2-2894-3447
Fax	+886-2-2890-7798
Web site	www.asus.com/

Technical Support

Telephone	+86-21-38429911
Fax	+86-21-5866-8722, ext. 9101#
Online support	http://qr.asus.com/techserv

ASUS COMPUTER INTERNATIONAL (America)

Address	800 Corporate Way, Fremont, CA 94539, USA
Telephone	+1-510-739-3777
Fax	+1-510-608-4555
Web site	http://www.asus.com/us/

Technical Support

Support fax	+1-812-284-0883
Telephone	+1-812-282-2787
Online support	http://qr.asus.com/techserv

ASUS COMPUTER GmbH (Germany and Austria)

Address	Harkort Str. 21-23, D-40880 Ratingen, Germany
Fax	+49-2102-959911
Web site	http://www.asus.com/de
Online contact	http://eu-rma.asus.com/sales

Technical Support

Telephone	+49-1805-010923
Support Fax	+49-2102-959911
Online support	http://qr.asus.com/techserv

DECLARATION OF CONFORMITY

Per FCC Part 2 Section 2. 1077(a)

Responsible Party Name: Asus Computer International

Address: 800 Corporate Way, Fremont, CA 94539.

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

hereby declares that the product

Product Name : Motherboard

Model Number : B150M PRO GAMING

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. 28, 2015**

Ver. 140331

EC Declaration of Conformity

IN SEARCH OF INCREDIBLE

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 :	**B150M PRO GAMING**

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 Ver. 151028

☒CE marking

(EC conformity marking)

Position : **CEO**

Name : **Jerry Shen**

Signature :

Declaration Date: 28/12/2015

Year to begin affixing CE marking: 2015