

**Rampage II
GENE**

ASUS®

Motherboard

E4504

First Edition
February 2009

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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, and
- 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.

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.

Safety information

Electrical safety

- To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.
- When adding or removing devices to or from the system, ensure that the power cables for the devices are unplugged before the signal cables are connected. If possible, disconnect all power cables from the existing system before you add a device.
- Before connecting or removing signal cables from the motherboard, ensure that all power cables are unplugged.
- Seek professional assistance before using an adapter or extension cord. These devices could interrupt the grounding circuit.
- Ensure that your power supply is set to the correct voltage in your area. If you are not sure about the voltage of the electrical outlet you are using, contact your local power company.
- If the power supply is broken, do not try to fix it by yourself. Contact a qualified service technician or your retailer.

Operation safety

- Before installing the motherboard and adding devices on it, carefully read all the manuals that came with the package.
- Before using the product, ensure all cables are correctly connected and the power cables are not damaged. If you detect any damage, contact your dealer immediately.
- To avoid short circuits, keep paper clips, screws, and staples away from connectors, slots, sockets and circuitry.
- Avoid dust, humidity, and temperature extremes. Do not place the product in any area where it may become wet.
- Place the product on a stable surface.
- If you encounter technical problems with the product, contact a qualified service technician or your retailer.



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.

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.
- **Chapter 2: Hardware information**
This chapter lists the hardware setup procedures that you have to perform when installing system components. It includes description of the switches, jumpers, and connectors on the motherboard.
- **Chapter 3: BIOS setup**
This chapter tells how to change system settings through the BIOS Setup menus. Detailed descriptions of the BIOS parameters are also provided.
- **Chapter 4: Software support**
This chapter describes the contents of the support DVD that comes with the motherboard package and the software.
- **Chapter 5: Multiple GPU technology support**
This chapter describes how to install and configure multiple ATI® CrossFireX™ and NVIDIA® SLI™ graphics cards.
- **Appendix: Debug code table**
The Appendix lists the debug code table for the LCD Poster.

Where to find more information

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

1. **ASUS websites**
The ASUS website provides updated information on ASUS hardware and software products. Refer to the ASUS contact information.
2. **Optional documentation**
Your product package may include optional documentation, such as warranty flyers, that may have been added by your dealer. These documents are not part of the standard package.

Conventions used in this guide

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



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



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



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



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

Typography

Bold text

Indicates a menu or an item to select.

Italics

Used to emphasize a word or a phrase.

<Key>

Keys enclosed in the less-than and greater-than sign means that you must press the enclosed key.

Example: <Enter> means that you must press the Enter or Return key.

<Key1+Key2+Key3>

If you must press two or more keys simultaneously, the key names are linked with a plus sign (+).

Example: <Ctrl+Alt+D>

Rampage II GENE specifications summary

CPU	LGA1366 socket for Intel® Core™ i7 Processor Extreme Edition / Core™ i7 Processor Supports Intel® Dynamic Speed Technology * Refer to www.asus.com for Intel® CPU support list.
Chipset	Intel® X58 / ICH10R
System Bus	Up to 6.4GT/s; Intel® QuickPath Interconnect
Memory	Triple channel memory architecture 6 x DIMM, max. 24GB, DDR3 2000 (O.C.) / 1800 (O.C.) / 1600 (O.C.) / 1333 / 1066 MHz, non-ECC, un-buffered memory Supports Intel® Extreme Memory Profile (XMP) * Due to Intel spec definition, DIMMs of DDR3-1333 or above are out of spec. Refer to www.asus.com or this user manual for the Memory QVL (Qualified Vendors Lists).
Expansion Slots	2 x PCI Express 2.0 x16 slots at dual x16 speed 1 x PCI Express 2.0 x4 slot 1 x PCI 2.2 slot
Multi-GPU Technology	Supports NVIDIA® SLI™ Technology Supports ATI® CrossFireX™ Technology
Storage	Intel® ICH10R Southbridge: <ul style="list-style-type: none"> - 6 x SATA 3.0 Gb/s ports - Intel® Matrix Storage Technology supports RAID 0, 1, 5, and 10 JMicron® 363 controller: <ul style="list-style-type: none"> - 1 x Ultra DMA 133/100/66/33 for up to 2 PATA devices - 1 x External SATA 3.0 Gb/s port (SATA On-the-Go) - 1 x SATA 3.0 Gb/s port
LAN	Realtek® 8111C PCIe Gigabit LAN controller featuring AI NET 2
High Definition Audio	SupremeFX X-Fi onboard <ul style="list-style-type: none"> - 8-channel High Definition Audio CODEC - EAX® Advanced™ HD 4.0 - X-Fi CMSS®-3D - X-Fi Crystalizer™ - Creative ALchemy - Supports Optical S/PDIF Out port on rear
IEEE 1394	2 x IEEE 1394a ports (1 port at back I/O, 1 port onboard)

(continued on the next page)

Rampage II GENE specifications summary

USB	12 x USB 2.0 ports (6 ports at midboard; 6 ports at back panel)
ROG Exclusive Overclocking Features	<p>Power Design</p> <ul style="list-style-type: none"> - 8-phase CPU power - 2-phase QPI/DRAM power - 2-phase NB power - 2-phase Memory power <p>CPU Level Up</p> <p>Keyboard-Tweakit (adjustable frequency at 0.2MHz increment)</p> <p>Memory Level Up</p> <p>iROG</p> <p>Extreme Tweaker</p> <p>Loadline Calibration</p> <p>Intelligent overclocking tools:</p> <ul style="list-style-type: none"> - ASUS AI Booster Utility - ASUS O.C. Profile <p>Overclocking Protection:</p> <ul style="list-style-type: none"> - COP EX (Component Overheat Protection - EX) - Voltiminder LED - ASUS C.P.R. (CPU Parameter Recall)
Other Special Features	<p>MemOK!</p> <p>One DIMM latch</p> <p>External LCD Poster</p> <p>Onboard Switches: Power / Reset / Clr CMOS (at back panel)</p> <p>Q-Fan Plus</p> <p>ASUS EPU-6 Engine</p> <p>ASUS Fan Xpert</p> <p>ASUS Q-Connector</p> <p>ASUS EZ Flash 2</p> <p>ASUS CrashFree BIOS 3</p> <p>ASUS MyLogo 3™</p>
BIOS Features	16 Mb AMI BIOS, PnP, DMI 2.0, WfM 2.0, SM BIOS 2.4, ACPI 2.0a, Multi-Language BIOS
Manageability	WOL by PME, WOR by PME, Chassis Intrusion, PXE
Back Panel I/O Ports	<p>1 x PS/2 Keyboard port (purple)</p> <p>1 x S/PDIF (Optical)</p> <p>1 x External SATA port</p> <p>1 x IEEE1394a port</p> <p>1 x LAN (RJ45) port</p> <p>6 x USB 2.0/1.1 ports</p> <p>1 x Clr CMOS switch</p> <p>8-channel Audio I/O with gold-plated jack</p>

(continued on the next page)

Rampage II GENE specifications summary

Internal I/O Connectors	3 x USB connectors support additional 6 USB ports 1 x IDE connector for two devices 7 x SATA connectors 5 x Fan connectors: 1 x CPU / 2 x Chassis / 2 x Optional 2 x Thermal sensor connectors 1 x IEEE1394a connector 1 x LCD Poster connector 1 x Chassis Intrusion connector 24-pin EATX Power connector 8-pin EATX 12V Power connector 1 x En/Dis-able Clr CMOS header 1 x Front panel audio connector 1 x CD audio in 1 x System panel connector 1 x SPDIF_OUT connector
Software	Support DVD: - Drivers and applications Sound Blaster X-Fi utility Futuremark® 3DMark® 06 Advanced Edition Kaspersky® Anti-virus software ASUS TurboV utility ASUS PC Probe II ASUS Update ASUS AI Suite
Form Factor	microATX Form Factor, 9.6"x 9.6" (24.4 cm x 24.4 cm)

*Specifications are subject to change without notice.

This chapter describes the motherboard features and the new technologies it supports.

1 Product introduction

Chapter summary



1.1	Welcome!	1-1
1.2	Package contents.....	1-1
1.3	Special features.....	1-2

1.1 Welcome!

Thank you for buying an ROG Rampage II GENE motherboard!

The motherboard delivers a host of new features and latest technologies, making it another standout in the long line of ASUS quality motherboards!

Before you start installing the motherboard, and hardware devices on it, check the items in your package with the list below.

1.2 Package contents

Check your motherboard package for the following items.

Motherboard	ROG Rampage II GENE
Cables	1 x SLI cable 1 x Ultra DMA 133/100/66 cable 2 x Serial ATA signal cables
Accessories	1 x External LCD Poster 1 x 2-in-1 ASUS Q-Connector Kit 1 x I/O Shield 1 x Cable ties 1 x ROG theme label
Application DVD	ROG motherboard support DVD
Documentation	User guide



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

1.3 Special features

1.3.1 Product highlights

Republic of Gamers



The Republic of Gamers consists only the best of the best. We offer the best hardware engineering, the fastest performance, the most innovating ideas, and we welcome the best gamers to join in. In the Republic of Gamers, mercy rules are only for the weak, and bragging rights means everything. We believe in making statements and we excel in competitions. If your character matches our trait, then join the elite club, make your presence felt, in the Republic of Gamers.

Green ASUS



This motherboard and its packaging comply with the European Union's Restriction on the use of Hazardous Substances (RoHS). This is in line with the ASUS vision of creating environment-friendly and recyclable products/packaging to safeguard consumers' health while minimizing the impact on the environment.

Intel® Core™ i7 Processor Extreme Edition / Core™ i7 Processor support



This motherboard supports the latest Intel® Core™ i7 processors in LGA1366 package with integrated memory controller to support 3-channel (6 DIMMs) DDR3 memory. Supports Intel® QuickPath Interconnect (QPI) with a system bus of up to 6.4GT/s and a max bandwidth of up to 25.6GB/s. Intel® Core™ i7 processor is one of the most powerful and energy efficient CPUs in the world. See page 2-9 for details.

Intel® X58 Chipset



The Intel® X58 Express Chipset is the latest chipset designed to support latest Intel® Core™ i7 Processors and Intel's next generation system interconnect interface, Intel® QuickPath Interconnect (QPI), providing improved performance by utilizing serial point-to-point links, allowing increased bandwidth and stability. It also supports up to 36 PCI Express 2.0 lanes providing better graphics performance.

Triple-Channel DDR3 2000 (O.C.) MHz support



The motherboard supports DDR3 memory that features data transfer rates of 2000 (O.C.) / 1800 (O.C.) / 1600 / 1333 / 1066 MHz to meet the higher bandwidth requirements of the latest operation system, 3D graphics, multimedia, and Internet applications. The triple-channel DDR3 architecture triples the bandwidth of your system memory to boost system performance, eliminating bottlenecks with peak bandwidths of up to 43.2 GB/s. See page 2-15 for details.

SLI and CrossFireX on Demand



Why choose when you can have both?

SLI or CrossFireX? Fret no longer because with the ROG Rampage II GENE, you'll be able to run both multi-GPU setups. The board features SLI/CrossFire on Demand technology, supporting SLI or CrossFireX configuration. Whichever path you take, you can be assured of jaw-dropping graphics at a level previously unseen.



PCIe 2.0

Double Speed; Double Bandwidth

This motherboard supports the latest PCIe 2.0 device for double speed and bandwidth which enhances system performance. See page 2-25 for details.

1.3.2 ROG Intelligent Performance & Overclocking features

iROG



Intelligent multiple control at hand

iROG is a special IC which enables several ROG highlighted functions that give you full disposal of the motherboard at any stage! This design allows advanced user control and management to be processed at a hardware level. iROG greatly increases fun during overclocking for PC enthusiasts and it provides system maintenance and management with more control and efficiency.

CPU Level Up



A simple click for instant upgrade!

Ever wish that you could have a more expansive CPU? Upgrade your CPU at no additional cost with ROG's CPU Level Up! Simply pick the processor you want to OC to, and the motherboard will do the rest for you. See the new CPU speed and enjoy the performance instantly! Overclocking is never as easy as this. See page 3-12 and 4-26 for details.

MemOK!



Any memory is A-OK!

Memory compatibility is among the top concerns when it comes to computer upgrades. Worry no more, MemOK! is the fastest memory booting solution today. This remarkable memory rescue tool requires nothing but a push of a button to patch memory issues and get you system up and running in no time. The technology is able to determine failsafe settings that can dramatically improve system booting success.

Extreme Tweaker

One stop performance tuning shop

Extreme Tweaker is the one stop shop to fine-tune your system to optimal performance. No matter if you are looking for frequency adjustment, over-voltage options, or memory timing settings, they are all here! See page 3-11 for details.

Voltiminder LED

Friendly reminder on Voltage Settings

In the pursuit of extreme performance, overvoltage adjustment is critical but risky. Acting as the “red zone” of a tachometer, the Voltiminder LED displays the voltage status for CPU, NB, SB, and Memory in a intuitive color-coded fashion. The Voltiminder LED allows quick voltage monitoring for overclockers. See page 2-2 to 2-5 for details.

Component Overheat Protection-EX (COP EX)

Maximum OC with confidence with burn proof protection to chipsets and GPU!

The COP EX allows overclockers to increase chipset voltages without the worries of overheating. It can also be used to monitor and save an overheating GPU. The COP EX allows more freedom and less constraint for maximum performance achievement.

Loadline Calibration

Optimal power boost for extreme CPU overclocking!

Maintaining ample voltage support for the CPU is critical during overclocking. The Loadline calibration ensures stable and optimal CPU voltage under heavy loading. It helps overclockers enjoy the motherboard’s ultimate OC capabilities and benchmark scores.

1.3.3 ROG unique features

SupremeFX X-Fi features

Listen with Absolute HD Play in extreme fidelity!

SupremeFX X-Fi delivers an excellent high definition audio experience to the gamers of ROG. SupremeFX X-Fi features unique audio innovations for gamers to spot enemies in 3D environment during game play. SupremeFX X-Fi combines the technological quality design of SupremeFX and sound effect technology from Creative Labs® to offer games exceptional game sound with absolute quality. See page 2-29 and 4-11 for details.



External LCD Poster



Debug and read system problems with an new external look!

The new LCD Poster now posts critical POST information in an ever friendly and flexible external display. When system malfunction occurs, the LCD Poster automatically detects device failure and translates the errors on the LCD during POST. See page 2-42 and 3-30 for details.

Onboard Switches



No more shorting pins or moving jumpers

With an easy press during overlocking, this exclusive onboard switch allows gamers to effortlessly fine-tune the performance without having to short the pins or moving jumpers. See page 2-40 for details.

Q-Fan Plus



Optimized quietness and cooling for more devices!

The Q-Fan function automatically detects temperature and adjusts fan speed accordingly to achieve quiet and efficient cooling.

1.3.4 ASUS special features

ASUS Power Saving Solution

ASUS Power Saving solution intelligently and automatically provides balanced computing power and energy consumption.



ASUS EPU-6 Engine

System Level Energy Saving

The new ASUS EPU—the world's first power saving engine, has been upgraded to a new 6-engine version, which provides total system power savings by detecting current PC loadings and intelligently moderating power in real-time. With auto phase switching for components (which includes the CPU, VGA card, memory, chipset, drives and system fan), the EPU automatically provides the most appropriate power usage via intelligent acceleration and overlocking—helping save power and money. See page 4-27 for details.

ASUS EZ DIY

ASUS EZ DIY feature collection provides you easy ways to install computer components, update the BIOS or back up your favorite settings.

ASUS Q-Connector



The ASUS Q-Connector allows you to connect or disconnect chassis front panel cables in one easy step with one complete module. This unique adapter eliminates the trouble of plugging in one cable at a time, making connection quick and accurate. See page 2-39 for details.

ASUS O.C. Profile



The motherboard features the ASUS O.C. Profile that allows users to conveniently store or load multiple BIOS settings. The BIOS settings can be stored in the CMOS or a separate file, giving users freedom to share and distribute their favorite settings. See page 3-42 for details.

ASUS EZ Flash 2



EZ Flash 2 is a user-friendly BIOS update utility. Simply launch this tool and update BIOS using a USB flash disk without entering the OS. You can update your BIOS in a few clicks without preparing an additional floppy diskette or using an OS-based flash utility. See page 3-6 for details.

Kaspersky® Anti-Virus

The best protection from viruses and spyware

Kaspersky® Anti-Virus Personal offers premium antivirus protection for individual users and home offices. It is based on advanced antivirus technologies. The product incorporates the Kaspersky® Anti-Virus engine, which is renowned for malicious program detection rates that are among the industry's highest.

C.P.R. (CPU Parameter Recall)



When the system hangs due to overclocking failure, there is no need to open the system chassis to clear CMOS data. Simply reboot the system, and the BIOS automatically restores the CPU default settings for each parameter.



Due to the chipset behavior, AC power off is required before using C.P.R. function.

This chapter lists the hardware setup procedures that you have to perform when installing system components. It includes description of the jumpers and connectors on the motherboard.

Hardware 2 information

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2.1 Before you proceed

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



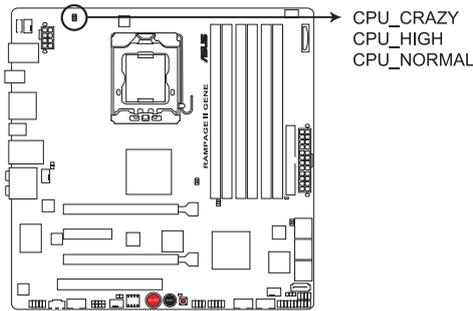
-
- Unplug the power cord from the wall socket before touching any component.
 - Use a grounded wrist strap or touch a safely grounded object or a metal object, such as the power supply case, before handling components to avoid damaging them due to static electricity.
 - Hold components by the edges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

Onboard LEDs

The motherboard comes with LEDs that indicate the voltage conditions of CPU, memory, northbridge, and southbridge. You may adjust the voltages in BIOS. There are also an LED for hard disk drive activity and an onboard switch for power status. For more information about voltage adjustment, refer to **3.3 Extreme Tweaker menu**.

1. CPU LED

The CPU LED has three voltage displays: CPU Voltage, CPU PLL Voltage and QPI/DRAM Core voltage; you can select the voltage to display in BIOS. Refer to the illustration below for the location of the CPU LED and the table below for LED definition.

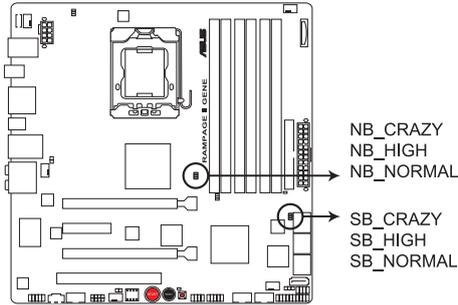


RAMPAGE II GENE CPU LED

	Normal (green)	High (yellow)	Crazy (red)
CPU Voltage	0.85000–1.5000	1.50625–1.59375	1.60000–
CPU PLL Voltage	1.81592–1.89542	1.90867–1.94842	1.96167–
QPI/DRAM Core Voltage	1.20000–1.39375	1.40000–1.65625	1.66250–

2. Northbridge/Southbridge LEDs

The northbridge and southbridge LEDs each have two different voltage displays. The northbridge LED displays either the IOH Voltage or the IOH PCIE Voltage. The southbridge LED shows either the ICH Voltage or the ICH PCIE Voltage. You can select the voltage to display in BIOS. Refer to the illustration below for the location of the northbridge/southbridge LEDs and the table below for LED definition.

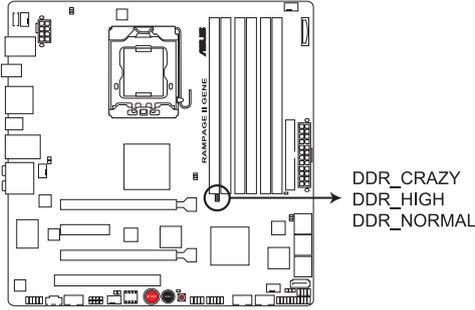


RAMPAGE II GENE North/South Bridge LED

	Normal (green)	High (yellow)	Crazy (red)
IOH Voltage	1.11341–1.39166	1.40491–1.64341	1.65666–
IOH PCIE Voltage	1.51106–1.69656	1.70981–1.84231	1.85556–
ICH Voltage	1.11341–1.59041	1.60366–1.84216	1.85541–
ICH PCIE Voltage	1.51106–1.61706	1.63031–1.80256	1.81581–

3. Memory LED

Refer to the illustration below for the location of the memory LED and the table below for LED definition.

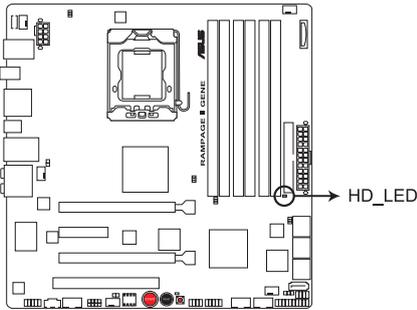


RAMPAGE II GENE DDR LED

	Normal (green)	High (yellow)	Crazy (red)
DRAM Bus Voltage	1.51106–1.72306	1.73631–2.31931	2.33256–

4. Hard Disk LED

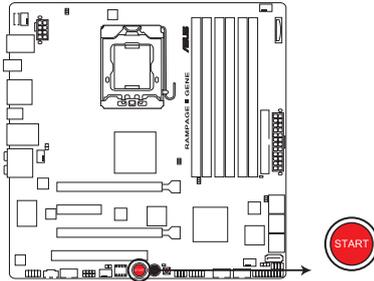
The hard disk LED is designed to indicate the hard disk activity. It blinks when data is being written into or read from the hard disk drive. The LED does not light up when there is no hard disk drive connected to the motherboard or when the hard disk drive does not function.



RAMPAGE II GENE Hard Disk LED

5. Power LED

The motherboard comes with a power-on switch 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 power-on switch.



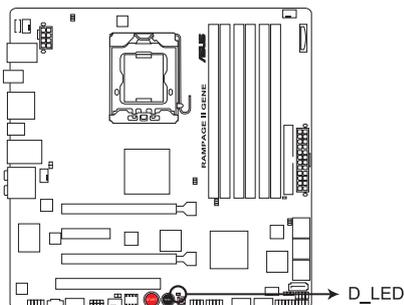
RAMPAGE II GENE Power on switch



When you turn on the ATX power supply, the **Power LED** flashes three times to indicate that the system is ready to boot. Wait till the flash stops before you press the power-on switch.

6. MemOK! LED

The MemOK! LED blinks while the system is loading failsafe settings for memory compatibility after pressing the MemOK! switch.



RAMPAGE II GENE D_LED

2.2.2 Layout contents

Connectors/Jumpers/Switches/Slots	Page
1. CPU, chassis, and optional fan connectors (4-pin CPU_FAN; 3-pin CHA_FAN1-2; 3-pin OPT_FAN1-2)	2-35
2. ATX power connectors (24-pin EATXPWR, 8-pin EATX12V)	2-37
3. LGA1366 CPU Socket	2-10
4. DDR3 DIMM slots	2-15
5. IDE connector (40-1 pin PRI_EIDE)	2-30
6. ICH10R Serial ATA connectors (7-pin SATA1-6 [blue])	2-31
7. JMicron JMB363® Serial ATA connector (7-pin SATA_E1 [black])	2-32
8. Clear RTC RAM (3-pin CLRTC_SW)	2-27
9. System panel connector (20-8 pin PANEL)	2-38
10. USB connectors (10-1 pin USB78; USB910; USB1112)	2-32
11. MemOK! switch	2-41
12. Reset switch	2-40
13. Power-on switch	2-40
14. Thermal sensor cable connectors (2-pin OPT_TEMP1-2)	2-36
15. Chassis intrusion connector (4-1 pin CHASSIS)	2-36
16. Digital audio connector (4-1 pin SPDIF_OUT)	2-33
17. IEEE 1394a port connector (10-1 pin IE1394_2)	2-33
18. Optical drive audio connector (4-pin CD)	2-34
19. Front panel audio connector (10-1 pin AAFP)	2-34



Refer to **2.7 Connectors** for more information about rear panel connectors and internal connectors.

2.2.3 Placement direction

When installing the motherboard, ensure that you 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.

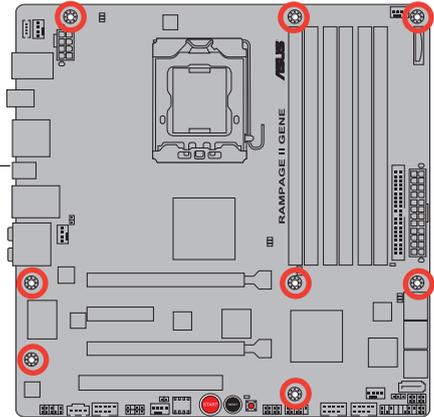
2.2.4 Screw holes

Place eight (8) 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.

Place this side towards the rear of the chassis



2.3 Central Processing Unit (CPU)

The motherboard comes with a surface mount LGA1366 socket designed for the Intel® Core™ i7 Processor Extreme Edition / Core™ i7 Processor.



-
- Ensure that all power cables are unplugged before installing the CPU.
 - Connect the chassis fan cable to the CHA_FAN1 connector to ensure system stability.
-

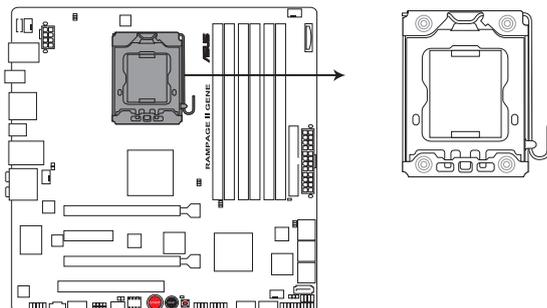


-
- Upon purchase of the motherboard, ensure that the PnP cap is on the socket and the socket contacts are not bent. Contact your retailer immediately if the PnP cap is missing, or if you see any damage to the PnP cap/socket contacts/motherboard components. ASUS will shoulder the cost of repair only if the damage is shipment/transit-related.
 - Keep the cap after installing the motherboard. ASUS will process Return Merchandise Authorization (RMA) requests only if the motherboard comes with the cap on the LGA1366 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.
-

2.3.1 Installing the CPU

To install a CPU:

1. Locate the CPU socket on the motherboard.



RAMPAGE II GENE CPU LGA1366 Socket

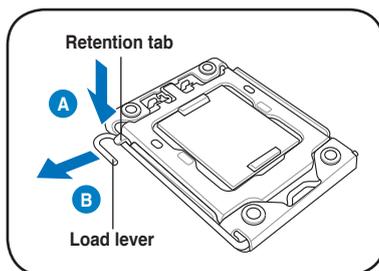


Before installing the CPU, ensure that the cam box is facing towards you and the load lever is on your left.

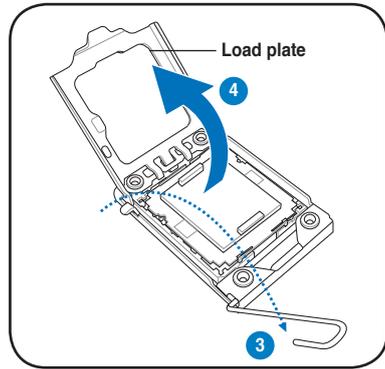
2. Press the load lever with your thumb (A), then move it to the left (B) until it is released from the retention tab.



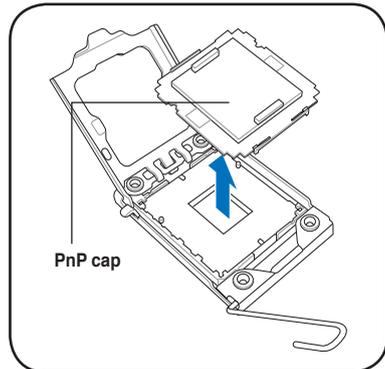
To prevent damage to the socket pins, do not remove the PnP cap unless you are installing a CPU.



3. Lift the load lever in the direction of the arrow to a 135° angle.
4. Lift the load plate with your thumb and forefinger to a 100° angle.



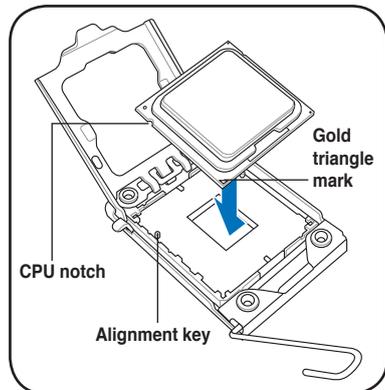
5. Remove the PnP cap from the CPU socket.



6. Position the CPU over the socket, ensuring that the gold triangle is on the bottom-left corner of the socket, and then fit the socket alignment key into the CPU notch.



The CPU fits in only one correct orientation. DO NOT force the CPU into the socket to prevent bending the connectors on the socket and damaging the CPU!



- 7. Apply several drops of thermal paste to the exposed area of the CPU that the heatsink will be in contact with, ensuring that it is spread in an even thin layer.



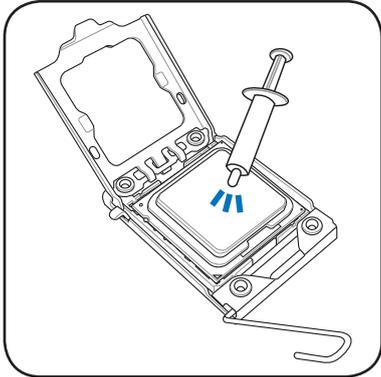
Some heatsinks come with pre-applied thermal paste. If so, skip this step.



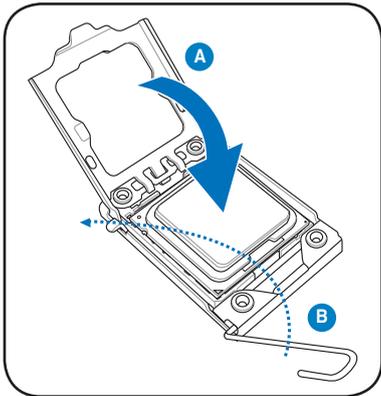
The thermal paste is toxic and inedible. If it gets into your eyes or touches your skin, ensure to wash it off immediately and seek professional medical help.



To prevent contaminating the paste, DO NOT spread the paste with your finger directly.



- 8. Close the load plate (A), and then push the load lever (B) until it snaps into the retention tab.



2.3.2 Installing the CPU heatsink and fan

The Intel® LGA1366 processor requires a specially designed heatsink and fan assembly to ensure optimum thermal condition and performance.



- When you buy a boxed Intel® processor, the package includes the CPU fan and heatsink assembly. If you buy a CPU separately, ensure that you use only Intel®-certified multi-directional heatsink and fan.
- Your Intel® LGA1366 heatsink and fan assembly comes in a push-pin design and requires no tool to install.



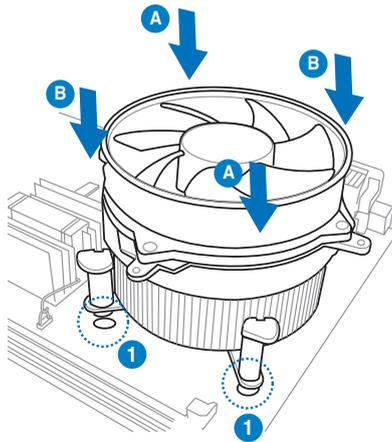
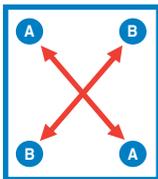
Ensure that you have installed the motherboard to the chassis before you install the CPU fan and heatsink assembly.



If you purchased a separate CPU heatsink and fan assembly, ensure that the Thermal Interface Material is properly applied to the CPU heatsink or CPU before you install the heatsink and fan assembly.

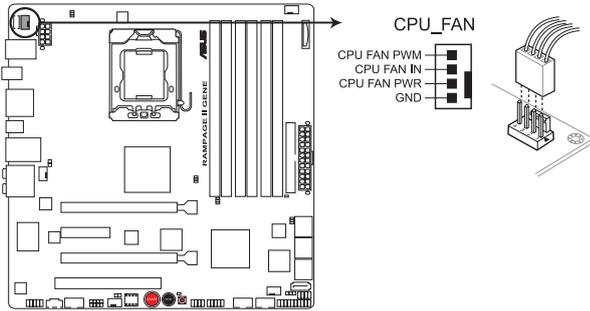
To install the CPU heatsink and fan:

1. Place the heatsink on top of the installed CPU, ensuring that the four fasteners match the holes on the motherboard.
2. Push down two fasteners at a time in a diagonal sequence to secure the heatsink and fan assembly in place.



Orient the heatsink and fan assembly such that the CPU fan cable is closest to the CPU fan connector.

3. Connect the CPU fan cable to the connector on the motherboard labeled CPU_FAN.



RAMPAGE II GENE CPU fan connector

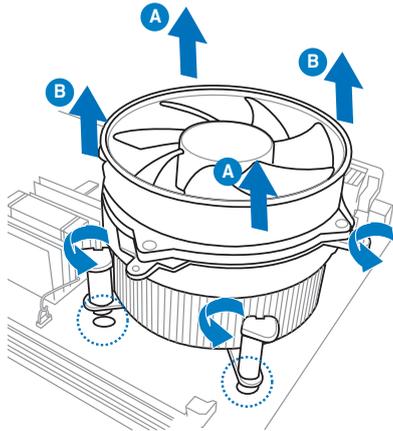
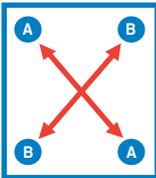


DO NOT forget to connect the CPU fan connector! Hardware monitoring errors can occur if you fail to plug this connector.

2.3.3 Uninstalling the CPU heatsink and fan

To uninstall the CPU heatsink and fan:

1. Disconnect the CPU fan cable from the connector on the motherboard.
2. Rotate each fastener counterclockwise.
3. Pull up two fasteners at a time in a diagonal sequence to disengage the heatsink and fan assembly from the motherboard.



4. Carefully remove the heatsink and fan assembly from the motherboard.

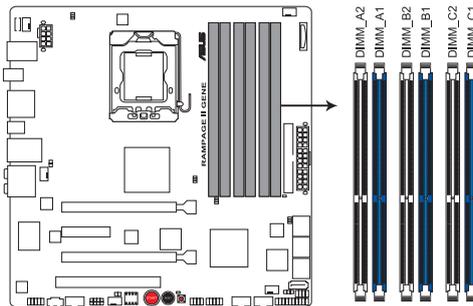
2.4 System memory

2.4.1 Overview

The motherboard comes with six Double Data Rate 3 (DDR3) Dual Inline Memory Modules (DIMM) sockets.

A DDR3 module has the same physical dimensions as a DDR2 DIMM but is notched differently to prevent installation on a DDR2 DIMM socket. DDR3 modules are developed for better performance with less power consumption.

The figure illustrates the location of the DDR3 DIMM sockets:



RAMPAGE II GENE 240-pin DDR3 DIMM sockets

Channel	Sockets
Channel A	DIMM_A1 and DIMM_A2
Channel B	DIMM_B1 and DIMM_B2
Channel C	DIMM_C1 and DIMM_C2

Recommended memory configuration for better performance

Mode	Sockets					
	DIMM_A2	DIMM_A1	DIMM_B2	DIMM_B1	DIMM_C2	DIMM_C1
2 DIMMs	-	Populated	-	Populated	-	-
3 DIMMs	-	Populated	-	Populated	-	Populated
4 DIMMs	Populated	Populated	-	Populated	-	Populated
6 DIMMs	Populated	Populated	Populated	Populated	Populated	Populated



Due to Intel CPU spec definition, the system will not boot if only one DIMM is installed in DIMM slot A2, B2, or C2. Follow the table above for recommended memory configuration.

2.4.2 Memory configurations

You may install 1GB, 2GB and 4GB unbuffered non-ECC DDR3 DIMMs into the DIMM sockets.



-
- You may install varying memory sizes in Channel A, Channel B and Channel C. The system maps the total size of the lower-sized channel for the dual-channel or triple-channel configuration. Any excess memory from the higher-sized channel is then mapped for single-channel operation.
 - Due to Intel spec definition, X.M.P. DIMMs and DDR3-1600 are supported for one DIMM per channel only.
 - According to Intel CPU spec, DIMMs with voltage requirement over 1.65V may damage the CPU permanently. We recommend you install the DIMMs with the voltage requirement below 1.65V.
 - Always install DIMMs with the same CAS latency. For optimum compatibility, we recommend that you obtain memory modules from the same vendor.
 - 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 install a 64-bit Windows OS when having 4GB or more memory installed on the motherboard.
 - This motherboard does not support DIMMs made up of 256 megabit (Mb) chips or less.



-
- The default memory operation frequency is dependent on its SPD. 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, see section **3.3 Extreme Tweaker menu** for manual memory frequency adjustment.
 - For system stability, use a more efficient memory cooling system to support a full memory load (6 DIMMs) or overclocking condition.
-

Rampage II GENE Motherboard Qualified Vendors Lists (QVL) DDR3-2000MHz capability

Vendor	Part No.	Size	SS/ DS	Chip Brand	Chip NO.	Timing Dimm(Bios)	Voltage	DIMM socket support (Optional)	
								A*	B*
Crucial	BL12864BE2009.8SFB1(EPP)	1GB	SS	N/A	Heat-Sink Package	9-9-9-28	1.9	•	
Crucial	BL12864BE2009.8SFB3(EPP)	1GB	SS	N/A	Heat-Sink Package	9-9-9-28 (1333-9-9-9-24)	2.0	•	
Crucial	BL12864BE2009.8SFB3(EPP)	1GB	SS	N/A	Heat-Sink Package	9-9-9-28 (1333-9-9-9-24)	2	•	•
Crucial	BL12864BE2009.8SFB3(EPP)	2GB	SS	N/A	Heat-Sink Package	9-9-9-28 (1333-9-9-9-24)	2	•	
G.SKILL	F3-16000CL9T-3GBDI-B(XMP)	3GB (Kit of 3)	SS	N/A	Heat-Sink Package	9-9-9-24 (2000-9-9-9-24)	1.65	•	
OCZ	OCZ3FXT20002GK	2GB (Kit of 2)	SS	N/A	Heat-Sink Package	8	1.9	•	•

Rampage II GENE Motherboard Qualified Vendors Lists (QVL) DDR3-1800MHz capability

Vendor	Part No.	Size	SS/ DS	Chip Brand	Chip NO.	Timing DIMM (BIOS)	Voltage	DIMM socket support (Optional)	
								A*	B*
CORSAIR	CM3X1024-1800C7DIN(XMP)	1GB	SS	N/A	Heat-Sink Package	7		•	
CORSAIR	BoxP/N:TW3X4G1800C8DF (CM3X2G1800C8D)Ver4.1	4GB (Kit of 2)	DS	N/A	Heat-Sink Package	8-8-8-24	1.80	•	
KINGSTON	KHX14400D3/1G	1GB	SS	N/A	Heat-Sink Package		1.9		•
KINGSTON	KHX14400D3K2/2GN(EPP)	2GB (Kit of 2)	SS	N/A	Heat-Sink Package		1.9	•	•
KINGSTON	KHX14400D3K3/3GX(XMP)	3GB (Kit of 3)	SS	N/A	Heat-Sink Package	(1333-9-9-9-24)	1.65	•	•
Transcend	TX1800KLU-2GK(XMP)	2GB (Kit of 2)	SS	N/A	Heat-Sink Package	8		•	•



Side(s): SS - Single-sided DS - Double-sided

DIMM support:

- **A***: Supports two (2) modules inserted into slot A1 and B1 as one pair of Dual-channel memory configuration.
- **B***: Supports three (3) modules inserted into the orange slots (A1, B1 and C1) as one set of Triple-channel memory configuration.



- ASUS exclusively provides hyper DIMM support function.
- Hyper DIMM support is subject to the physical characteristics of individual CPUs.
- Visit the ASUS website for the latest QVL.

Rampage II GENE Motherboard

Qualified Vendors Lists (QVL) DDR3-1600MHz capability

Vendor	Part No.	Size	SS/ DS	Chip	Chip NO.	Timing Dimm(Bios)	Voltage	DIMM socket support (Optional)			
								A*	B*	C*	D*
A-DATA	AD31600E001GMU(XMP)	3GB (Kit of 3)	SS	N/A	Heat-Sink Package	8-8-8-24 (1333-9-9-9-24)	1.65- 1.85	*	*	*	*
A-DATA	AD31600F002GMU(XMP)	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	7-7-7-20 (1333-9-9-9-24)	1.75- 1.85	*	*	*	*
CORSAIR	BoxP/N:TWIN3X2048-1600C7DHXIN (CM3X1024-1600C7DHXIN)(XMP)Ver3.1	2GB (Kit of 2)	SS	N/A	Heat-Sink Package	7-7-7-20 (1333-9-9-9-24)	1.80	*	*	*	*
CORSAIR	TR3X3G1600C8D(XMP)Ver2.1	3GB (Kit of 3)	SS	N/A	Heat-Sink Package	8-8-8-24 (1601-8-8-8-24)	1.65	*	*		
CORSAIR	TR3X3G1600C9(XMP)Ver1.1	3GB (Kit of 3)	SS	N/A	Heat-Sink Package	9-9-9-24 (1601-9-9-9-24)	1.65	*	*		
CORSAIR	BoxP/N:TW3X4G1600C9DHXNV (CM3X2G1600C9DHXNV)Ver4.1	4GB (Kit of 2)	DS	N/A	Heat-Sink Package	(1333-9-9-9-24)	1.80	*	*	*	
CORSAIR	BoxP/N:TWIN3X4096-1600C7DHXIN (CM3X2048-1600C7DHXIN)Ver3.1	4GB (Kit of 2)	DS	N/A	Heat-Sink Package	(1601-7-7-7-20)	1.90	*	*	*	
CORSAIR	TR3X6G1600C8D(XMP)Ver2.1	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	8-8-8-24 (1601-8-8-8-24)	1.65	*	*	*	
CORSAIR	TR3X6G1600C9(XMP)Ver2.1	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	9-9-9-24 (1333-9-9-9-24)	1.65	*	*	*	
Crucial	BL12864BA1608.8SFB(XMP)	1GB	SS	N/A	Heat-Sink Package	(1601-8-8-8-24)	1.8	*	*	*	*
G.SKILL	F3-12800CL7D-2GBHZ	2GB (Kit of 2)	SS	N/A	Heat-Sink Package	(1601-7-7-7-18)	1.9	*	*	*	*
G.SKILL	F3-12800CL9D-2GBNQ	2GB (Kit of 2)	SS	N/A	Heat-Sink Package	(1333-9-9-9-24)	1.6		*	*	*
G.SKILL	F3-12800CL7D-4GBPI	4GB (Kit of 2)	DS	N/A	Heat-Sink Package	7-7-7-18 (1333-9-9-9-24)	1.9	*			
G.Skill	F3-12800CL8T-6GBHK(XMP)	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	8-8-8-21 (1333-8-8-8-21)	1.6- 1.65	*	*	*	*
G.SKILL	F3-12800CL9T-6GBNQ	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	9-9-9-24 (1601-9-9-9-24)	1.5-1.6	*	*	*	*
KINGSTON	KHX12800D3LLK3/3GX(XMP)	3GB (Kit of 3)	SS	N/A	Heat-Sink Package	(1333-9-9-9-24)	1.65	*	*	*	
KINGSTON	KHX12800D3K2/4G	4GB (Kit of 2)	SS	N/A	Heat-Sink Package	(1066-7-7-7-20)	1.9	*	*	*	
KINGSTON	KHX12800D3LLK/6GX(XMP)	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	1600-8-8-8-20	1.65	*	*	*	*
OCZ	OCZ3P1600EB1G	1GB	SS	N/A	Heat-Sink Package	7-6-6-24 (1333-7-7-7-20)		*			
OCZ	OCZ3T1600XM2GK(XMP)	2GB (Kit of 2)	SS	N/A	Heat-Sink Package	(1601-8-8-8-28)		*	*	*	*
OCZ	OCZ3G1600LV3GK	3GB (Kit of 3)	SS	N/A	Heat-Sink Package	8-8-8 (1066-7-7-7-20)	1.65	*	*	*	*
OCZ	OCZ3P16004GK	4GB (Kit of 2)	DS	N/A	Heat-Sink Package	7-7-7 (1333-7-7-7-20)	1.9		*		
OCZ	OCZ3P1600EB4GK	4GB (Kit of 2)	DS	N/A	Heat-Sink Package	7-7-6 (1333-7-7-7-20)	1.8	*	*	*	*
OCZ	OCZ3G1600LV6GK	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	8-8-8 (1066-7-7-7-20)	1.65	*	*		
Aeneon	AXH760UD10-16H	1GB	SS	N/A	Heat-Sink Package	(1601-9-9-9-28)		*	*	*	*
Aeneon	AXH860UD20-16H	2GB	DS	N/A	Heat-Sink Package	(1601-9-9-9-28)		*	*	*	*

Rampage II GENE Motherboard Qualified Vendors Lists (QVL) DDR3-1600MHz capability (continued)

Vendor	Part No.	Size	SS/ DS	Chip	Chip NO.	Timing Dimm(Bios)	Voltage	DIMM socket support (Optional)			
								A*	B*	C*	D*
Cell Shock	CS322271	2GB (Kit of 2)	DS	N/A	Heat-Sink Package	7-7-7-14 (1066-7-7-7-20)	1.7-1.9	•	•	•	
Elixir	M2F2G64CB8HA4N-DG	2GB	DS	Elixir	N2CB1G80AN- DG	9 (1333-9-9-9-28)		•	•	•	•
Mushkin	996657	4GB (Kit of 2)	DS	N/A	Heat-Sink Package	7-7-7-20		•	•	•	•
Patriot	PVT33G1600ELK	3GB (Kit of 3)	SS	N/A	Heat-Sink Package	9-9-9-24 (1066-7-7-7-20)	1.65	•	•	•	
Patriot	PVS34G1600LLKN	4GB (Kit of 2)	DS	N/A	Heat-Sink Package	7-7-7-20 (1066-7-7-7-20)	2.0	•	•	•	•
Patriot	PVT36G1600ELK	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	9-9-9-24 (1066-7-7-7-20)	1.65	•	•	•	•
Patriot	PVT36G1600ELK	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	9-9-9-24 (1600-7-7-7-20)	1.65	•	•	•	•

Rampage II GENE Motherboard Qualified Vendors Lists (QVL) DDR3-1333MHz capability

Vendor	Part No.	Size	SS/ DS	Chip Brand	Chip NO.	Timing DIMM (BIOS)	Voltage	DIMM socket support (Optional)			
								A*	B*	C*	D*
A-DATA	AD31333E002G0U	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	7-7-7-20 (1333-9-9-9-24)	1.65- 1.85	•	•	•	•
Apacer	78.01GC6.420	1GB	SS	ELPIDA	J1108BABG-DJ-E	(1333-9-9-9-24)		•	•	•	•
Apacer	78.01GC8.422	1GB	SS	ELPIDA	J1108BABG-DJ-E(ECC)	(1333-9-9-9-24)		•	•	•	•
Apacer	78.A1GC6.421	2GB	DS	ELPIDA	J1108BABG-DJ-E	(1333-9-9-9-24)		•	•	•	•
Apacer	78.A1GC8.423	2GB	DS	ELPIDA	J1108BABG-DJ-E(ECC)	(1333-9-9-9-24)		•	•	•	•
CORSAIR	TR3X3G1333C9 (Ver2.1)	3GB (Kit of 3)	SS	N/A	Heat-Sink Package	9-9-9-24 (1333-9-9-9-24)	1.5	•	•	•	•
CORSAIR	CM3X1024-1333C9DHX	1GB	DS	N/A	Heat-Sink Package	(1333-9-9-9-24)	1.1	•	•		
CORSAIR	Box/P/N:TWIN3X2048-1333C9 (CM3X1024-1333C9)Ver1.1	2GB (Kit of 2)	DS	N/A	Heat-Sink Package	9-9-9-24 (1066-7-7-7-20)	1.70	•	•	•	•
CORSAIR	TR3X6G1333C9 (Ver2.1)	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	9-9-9-24 (1333-9-9-9-24)	1.5	•	•	•	•
Crucial	CT12864BA1339.8SFB	1GB	SS	MICRON	D9GTS	(1333-9-9-9-24)		•	•	•	•
Crucial	CT12864BA1339.8SFD	1GB	SS	MICRON	MT&J12864AY-1G4D1	(1333-9-9-9-24)		•	•	•	•
Crucial	CT25664BA1339.16SFD	2GB	DS	MICRON	D9JNM	(1333-9-9-9-24)		•	•	•	•
ELPIDA	EBJ10UE8BAW0-DJ-E	1GB	SS	ELPIDA	J1108BABG-DJ-E	9 (1333-9-9-9-24)		•	•	•	•
ELPIDA	EBJ11UD8BAFA-DJ-E	1GB	DS	ELPIDA	J5308BASE-DJ-E	(1333-9-9-9-24)		•			
ELPIDA	EBJ21UE8BAW0-DJ-E	2GB	DS	ELPIDA	J1108BABG-DJ-E	9 (1333-9-9-9-24)		•	•	•	•
G.SKILL	F3-10600CL7D-2GBPI	2GB (Kit of 2)	SS	N/A	Heat-Sink Package	(1337-7-7-7-18)	1.65	•	•	•	
G.SKILL	F3-10600CL8D-2GBHK	2GB (Kit of 2)	SS	N/A	Heat-Sink Package	(1337-8-8-8-22)	1.65	•	•	•	•

Rampage II GENE Motherboard

Qualified Vendors Lists (QVL) DDR3-1333MHz capability (continued)

Vendor	Part No.	Size	SS/ DS	Chip Brand	Chip NO.	Timing DIMM (BIOS)	Voltage	DIMM socket support (Optional)			
								A*	B*	C*	D*
G.SKILL	F3-10600CL9D-2GBNQ	2GB (Kit of 2)	DS	N/A	Heat-Sink Package	(1333-9-9-9-24)	1.5- 1.65	*	*	*	*
G.Skill	F3-10666CL7T-6GBPK(XMP)	2GB	DS	N/A	Heat-Sink Package	7-7-7-18 (1333-7-7-7-18)	1.5-1.6	*	*	*	*
G.Skill	F3-10666CL8D-4GBHK(XMP)	4GB (Kit of 2)	DS	N/A	Heat-Sink Package	8-8-8-21 (1333-7-7-7-20)	1.5-1.6	*	*	*	*
G.SKILL	F3-10666CL9T-6GBNQ	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	9-9-9-24 (1333-9-9-9-24)	1.5	*	*	*	*
Hynix	HMT112U6BFR8C-H9	1GB	SS	Hynix	HSTQ1G83BFR	9 (1333-9-9-9-24)		*	*		
KINGMAX	FLFD45F-B8EE9	1GB	SS	ELPIDA	J1108BASE-DJ-E	(1333-9-9-9-24)		*	*	*	*
KINGSTON	KVR1333D3N9/1G	1GB	SS	ELPIDA	J1108BASE-DJ-E	(1333-9-9-9-24)	1.5	*	*	*	*
KINGSTON	KVR1333D3N9/2G	2GB	DS	ELPIDA	J1108BASE-DJ-E	(1333-9-9-9-24)	1.5	*	*	*	*
MICRON	MT8JTF12864AY-1G4BYTES	1GB	SS	MICRON	Z9HWR	(1333-9-9-9-24)		*	*		
MICRON	MT16JTF25664AY-1G4BYTES	2GB	DS	MICRON	Z9HWR	(1333-9-9-9-24)		*	*	*	*
OCZ	OCZ3RPX1333EB2GK	1GB	SS	N/A	Heat-Sink Package	(1066-6-5-5-20)		*	*	*	
OCZ	OCZ3P13332GK	1GB	DS	N/A	Heat-Sink Package	7-7-7-20 (1333-9-9-9-24)		*			
OCZ	OCZ3G13334GK	4GB (Kit of 2)	DS	N/A	Heat-Sink Package	9 (1066-8-9-9-20)	1.7		*		
OCZ	OCZ3G1333LV6GK	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	9-9-9 (1066-7-7-7-20)	1.65	*	*		
OCZ	OCZ3P1333LV6GK	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	7-7-7 (1066-7-7-7-20)	1.65	*	*	*	*
Qimonda	IMSH2GU13A1F1C-13H	2GB	DS	Qimonda	IDSH1G-03A1F1C-13H	9 (1333-9-9-9-24)		*	*	*	*
SAMSUNG	M378B2873DZ1-CH9	1GB	SS	SAMSUNG	K4B1G0846D	9 (1333-9-9-9-24)		*	*	*	*
SAMSUNG	M391B2873DZ1-CH9	1GB	SS	SAMSUNG	K4B1G0846D(ECC)	9 (1333-9-9-9-24)		*	*		
SAMSUNG	M378B5673DZ1-CH9	2GB	DS	SAMSUNG	K4B1G0846D	9 (1333-9-9-9-24)		*	*	*	*
SAMSUNG	M391B5673DZ1-CH9	2GB	DS	SAMSUNG	K4B1G0846D(ECC)	9 (1333-9-9-9-24)		*	*	*	*
Transcend	TS128MLK64V3U	1GB	SS	SAMSUNG	K4B1G0846D	9 (1333-9-9-9-24)		*	*	*	*
Transcend	TS256MLK64V3U	2GB	DS	SAMSUNG	K4B1G0846D	9 (1333-9-9-9-24)		*	*	*	
Aeneon	AEH760UD00-13H	1GB	DS	AENEON	AEH93R13H	(1333-9-9-9-24)		*			
Asint	SLY3128M8-EDJ	1GB	SS	Asint	DDRIII1208-DJ	(9-9-9-24)		*	*	*	*
Asint	SLZ3128M8-EDJ	2GB	DS	Asint	DDRIII1208-DJ	(9-9-9-24)		*	*	*	*
ASUS	N/A	1GB	DS	N/A	Heat-Sink Package	(1333-9-9-9-24)		*	*	*	
Elixir	M2F2G64CB8HA4N-CG	2GB	DS	Elixir	N2CB1G80AN-CG	(1333-9-9-9-24)		*	*	*	
Patriot	PDC32G1333LLK	1GB	SS	PATRIOT	Heat-Sink Package	7 (1337-7-7-7-20)	1.7	*	*	*	*
Patriot	PVT33G1333ELK	3GB (Kit of 3)	SS	N/A	Heat-Sink Package	9-9-9-24 (1066-7-7-7-20)	1.65	*	*	*	*
Patriot	PVT36G1333ELK	6GB (Kit of 3)	DS	N/A	Heat-Sink Package	9-9-9-24 (1066-7-7-7-20)	1.65	*	*	*	*

Rampage II GENE Motherboard Qualified Vendors Lists (QVL) DDR3-1067MHz capability

Vendor	Part No.	Size	SS/ DS	Chip Brand	Chip NO.	Timing DIMM (BIOS)	Voltage	DIMM socket support (Optional)			
								A*	B*	C*	D*
CORSAIR	CM3X1024-1066C7	1GB	DS	N/A	Heat-Sink Package	7	1.1	.	.	.	.
Crucial	CT12864BA1067.8SFB	1GB	SS	MICRON	Z9HWQ	7		.	.	.	.
Crucial	CT12864BA1067.8SFD	1GB	SS	MICRON	D9JNL	7		.	.	.	.
Crucial	CT25664BA1067.16SFD	2GB	DS	MICRON	D9JNL	7		.	.	.	.
ELPIDA	EBJ10UE8BAW0-AE-E	1GB	SS	ELPIDA	J1108BAGD-DJ-E	7(1066-7-7-7-20)		.	.	.	.
ELPIDA	EBJ11RD8BAFA-AE-E	1GB	DS	ELPIDA	J5308BASE-AC-E(ECC)	7		.	.	.	.
ELPIDA	EBJ21UE8BAW0-AE-E	2GB	DS	ELPIDA	J1108BAGD-DJ-E	7(1066-7-7-7-20)		.	.	.	.
Hynix	HMT112U6AFP8C-G7N0	1GB	SS	HYNIX	H5TQ1G83AFP7C	7		.	.	.	.
Hynix	HYMT112U64ZNF8-G7	1GB	SS	HYNIX	HY5TQ1G831ZNF7-G7	7		.	.	.	.
Hynix	HMT125U6AFP8C-G7N0	2GB	DS	HYNIX	H5TQ1G83AFP7C	7		.	.	.	.
Hynix	HYMT125U64ZNF8-G7	2GB	DS	HYNIX	HY5TQ1G831ZNF7-G7	7		.	.	.	.
KINGSTON	KVR1066D3N7/1G	1GB	DS	ELPIDA	J5308BASE-AC-E		1.5	.	.	.	.
KINGSTON	KVR1066D3N7/2G	2GB	DS	SAMSUNG	K4B1G0846C-ZCF8		1.5	.	.	.	.
MICRON	MT8JTF12864AY-1G1D1	1GB	SS	MICRON	7VD22	7		.	.	.	.



Side(s): SS - Single-sided DS - Double-sided

DIMM support:

- **A*:** Supports two (2) modules inserted into slot A1 and B1 as one pair of Dual-channel memory configuration.
- **B*:** Supports three (3) modules inserted into the orange slots (A1, B1 and C1) as one set of Triple-channel memory configuration.
- **C*:** Supports four (4) modules inserted into the orange slots (A1, B1 and C1) and the black slot A2 as one set of Triple-channel memory configuration.
- **D*:** Supports six (6) modules inserted into both the orange slots and the black slots as two set of Triple-channel memory configuration.



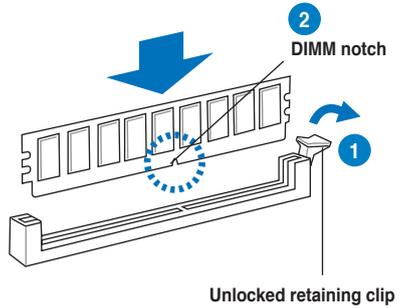
- According to Intel spec definition, DDR3-1600 is supported for one DIMM per channel only. ASUS exclusively provides two DDR3-1600 DIMM support for each memory channel.
- Visit the ASUS website for the latest QVL.

2.4.3 Installing a DIMM



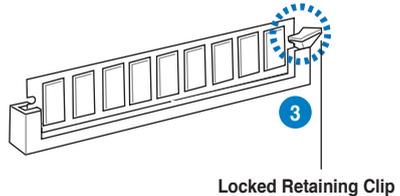
Ensure to unplug the power supply before adding or removing DIMMs or other system components. Failure to do so may cause severe damage to both the motherboard and the components.

1. Unlock a DIMM socket by pressing the retaining clip outward.
2. Align a DIMM on the socket such that the notch on the DIMM matches the break on the socket.



A DIMM is keyed with a notch so that it fits in only one direction. DO NOT force a DIMM into a socket to avoid damaging the DIMM.

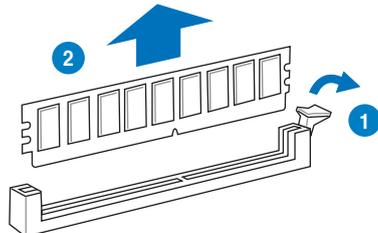
3. Firmly insert the DIMM into the socket until the retaining clip snaps back in place and the DIMM is properly seated.



2.4.4 Removing a DIMM

Follow these steps to remove a DIMM.

1. Press the retaining clip outward to unlock the DIMM.



Support the DIMM lightly with your fingers when pressing the retaining clips. The DIMM might get damaged when it flips out with extra force.

2. Remove the DIMM from the socket.

2.5 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.



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

2.5.1 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.

2.5.2 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 3 for information on BIOS setup.
2. Assign an IRQ to the card. Refer to the tables on the next page.
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. Refer to the table on the next page for details.

2.5.3 Interrupt assignments

Standard interrupt assignments

IRQ	Priority	Standard function
0	1	System Timer
1	2	Keyboard Controller
2	–	Redirect to IRQ#9
4	12	Communications Port (COM1)*
5	13	IRQ Holder for PCI Steering*
6	14	Reserved
7	15	Reserved
8	3	System CMOS/Real Time Clock
9	4	IRQ Holder for PCI Steering*
10	5	IRQ Holder for PCI Steering*
11	6	IRQ Holder for PCI Steering*
12	7	Reserved
13	8	Numeric Data Processor
14	9	Primary IDE Channel

* These IRQs are usually available for PCI devices.

IRQ assignments for this motherboard

IOH

	24	25	26	27	28	29	30	31
PCIE16_1	shared	–	–	–	–	–	–	–
PCIE16_2	–	–	–	–	–	–	shared	–

ICH

	A	B	C	D	E	F	G	H
PCIE4_1	shared	–	–	–	–	–	–	–
LAN	–	–	shared	–	–	–	–	–
PCI_1	shared	–	–	–	–	–	–	–
USB controller 1	–	–	–	–	–	–	–	shared
USB controller 2	–	–	–	shared	–	–	–	–
USB controller 3	–	–	shared	–	–	–	–	–
USB controller 4	shared	–	–	–	–	–	–	–
USB controller 5	–	–	–	–	–	shared	–	–
USB controller 6	–	–	–	shared	–	–	–	–
USB 2.0 controller 1	–	–	–	–	–	–	–	shared
USB 2.0 controller 2	–	–	shared	–	–	–	–	–
SATA controller 1	–	–	–	–	shared	–	–	–
SATA controller 2	–	–	–	–	shared	–	–	–
Audio Azalia	–	–	–	–	–	–	shared	–

2.5.4 PCI slot

The PCI slot supports cards such as a LAN card, SCSI card, USB card, and other cards that comply with PCI specifications. Refer to the figure below for the location of the slot.

2.5.5 PCI Express x4 slot

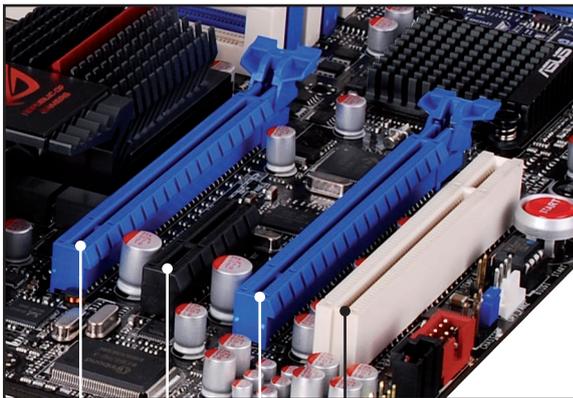
This motherboard supports PCI Express x4 network cards, SCSI cards and other cards that comply with the PCI Express specifications. Refer to the figure below for the location of the slots.



Install a PCIe x4 or PCIe x1 device to a PCIe x4 slot prior to a PCIe x16 slot.

2.5.6 PCI Express 2.0 x16 slots

This motherboard has two PCI Express 2.0 x16 slots that support PCI Express x16 2.0 graphic cards complying with the PCI Express specifications. Refer to the figure below for the location of the slots.



PCI slot
PCI Express 2.0 x16_2 slot
PCI Express x4 slot
PCI Express 2.0 x16_1 slot



-
- In single VGA card mode, use first the PCIe 2.0 x16_1 slot for a PCI Express x16 graphics card to get better performance.
 - In CrossFireX™ or SLI™ mode, use the PCIe 2.0 x16_1 and PCIe 2.0 x16_2 (blue) slots for PCI Express x16 graphics cards to get better performance.
 - We recommend that you provide sufficient power when running CrossFireX™ or SLI™ mode. **See page 2-37 for details.**
 - Connect a chassis fan to the motherboard connector labeled CHA_FAN1/2 when using multiple graphics cards for better thermal environment. See page 2-35 for details.
-

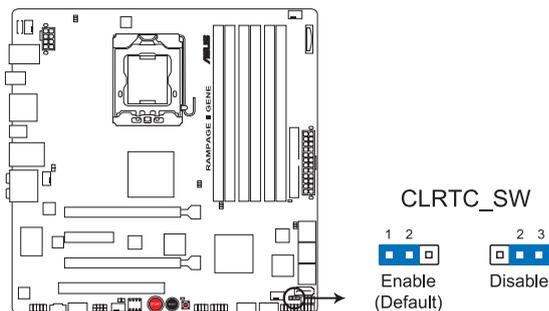
2.6 Jumper

Clear RTC RAM (3-pin CLRTC_SW)

This jumper allows you to enable the **clr CMOS** switch on the back I/O. You can clear the CMOS memory and system setup parameters by erasing the CMOS RTC RAM data. The **clr CMOS** switch on the back I/O helps you easily clear the system setup information such as system passwords.

To erase the RTC RAM:

1. Press down the **clr CMOS** switch on the back I/O.
2. Hold down the key during the boot process and enter BIOS setup to re-enter data.



RAMPAGE II GENE Clear RTC RAM

clr CMOS switch behavior

System power state	G3*	S5*	S0 (DOS mode)	S0 (OS mode)	S1	S3	S4
Clearing CMOS	•	•	•**				

*G3: Power off without +5VSB power (AC power loss); S5: Power off with +5VSB power

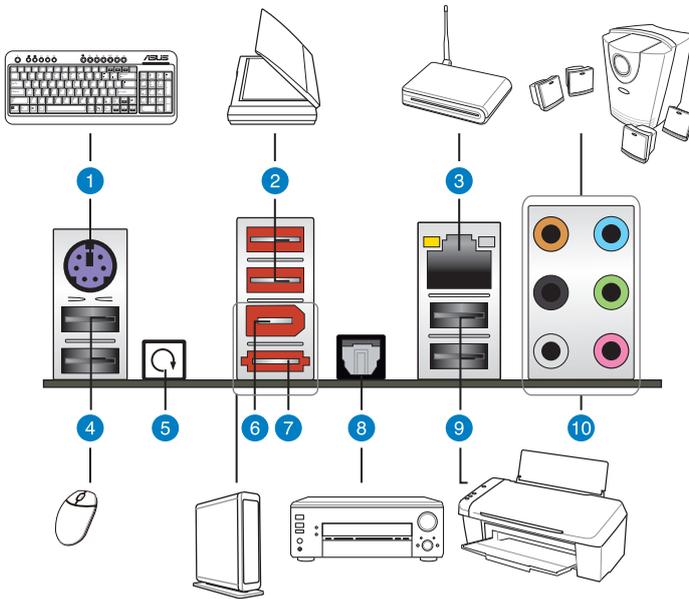
**The system shuts down immediately.



- The **clr CMOS** switch will not function if the CLRTC_SW jumper is moved to the Disable position, but the shutdown function in S0 mode (DOS mode) still works.
- Ensure to re-enter your previous BIOS settings after you clear the CMOS.
- You do not need to clear the RTC when the system hangs due to CPU overclocking. With the C.P.R. (CPU Parameter Recall) feature, shut down and reboot the system so the BIOS can automatically reset CPU parameter settings to default values. If the system hangs due to overclocking of memory timing or chipset voltage and the power button fails to function, pressing down the **clr CMOS** switch will shut down the system and clear CMOS simultaneously.

2.7 Connectors

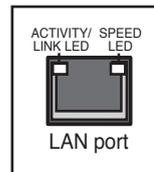
2.7.1 Rear panel connectors



1. **PS/2 keyboard port (purple).** This port is for a PS/2 keyboard.
2. **USB 2.0 ports 3 and 4.** These 4-pin Universal Serial Bus (USB) ports are available for connecting USB 2.0 devices.
3. **LAN (RJ-45) port.** This port allows Gigabit connection to a Local Area Network (LAN) through a network hub. Refer to the table below for the LAN port LED indications.

LAN port LED indications

Activity/Link	Speed LED	Description
OFF	OFF	Soft-off Mode
YELLOW*	OFF	During Power ON/OFF
YELLOW*	ORANGE	100 Mbps connection
YELLOW*	GREEN	1 Gbps connection



* Blinking

4. **USB 2.0 ports 5 and 6.** These 4-pin Universal Serial Bus (USB) ports are available for connecting USB 2.0 devices.
5. **Clear CMOS switch.** Press the clear CMOS switch to clear setup information when the system hangs due to overclocking.

6. **IEEE 1394a port.** This 6-pin IEEE 1394a port provides high-speed connectivity for audio/video devices, storage peripherals, PCs, or portable devices.
7. **External SATA port.** This port connects to an external Serial ATA hard disk drive.



- DO NOT insert a SATA connector into this external SATA port.
- To enable hot-plugging, set the **Controller Mode** item in the BIOS setting to [AHCI], and then reboot the system. See section **3.5.3 Onboard Device Configuration** for details.

8. **Optical S/PDIF Out port.** This port connects an external audio output device via an optical S/PDIF cable.
9. **USB 2.0 ports 1 and 2.** These 4-pin Universal Serial Bus (USB) ports are available for connecting USB 2.0 devices.
10. **Audio I/O ports.** These ports connect to a 2, 4, 6, or 8-channel audio system.



Refer to the audio configuration table on the next page for the function of the audio ports in 2, 4, 6, or 8-channel configuration.

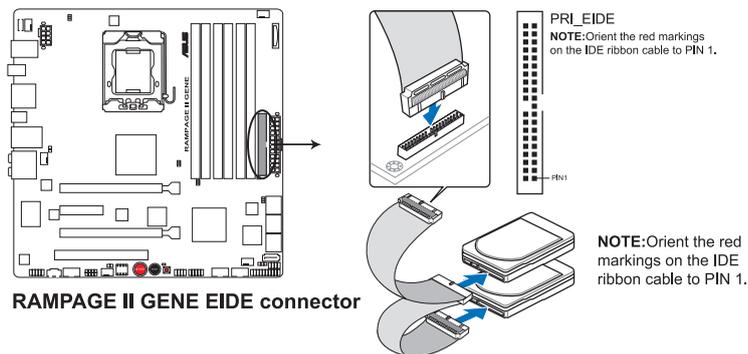
Audio 2, 4, 6, or 8-channel configuration

Port	Headset 2-channel	4-channel	6-channel	8-channel
Light Blue	Line In	Line In	Line In	Line In
Lime	Line Out	Front Speaker Out	Front Speaker Out	Front Speaker Out
Pink	Mic In	Mic In	Mic In	Mic In
Orange	–	–	Center/Subwoofer	Center/Subwoofer
Black	–	Rear Speaker Out	Rear Speaker Ou	Rear Speaker Out
Gray	–	–	–	Side Speaker Out

2.7.2 Internal connectors

1. IDE connector (40-1 pin PRI_EIDE)

The onboard IDE connector is for the Ultra DMA 133/100/66 signal cable. There are three connectors on each Ultra DMA 133/100/66 signal cable: blue, black, and gray. Connect the blue connector to the motherboard's IDE connector, then select one of the following modes to configure your device.



	Drive jumper setting	Mode of device(s)	Cable connector
Single device	Cable-Select or Master	-	Black
Two devices	Cable-Select	Master	Black
		Slave	Gray
	Master	Master	Black or gray
	Slave	Slave	



- Pin 20 on the IDE connector is removed to match the covered hole on the Ultra DMA cable connector. This prevents incorrect insertion when you connect the IDE cable.
- Use the 80-conductor IDE cable for Ultra DMA 133/100/66 IDE devices.

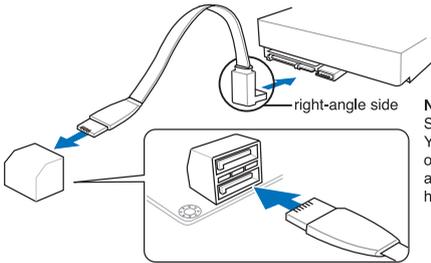
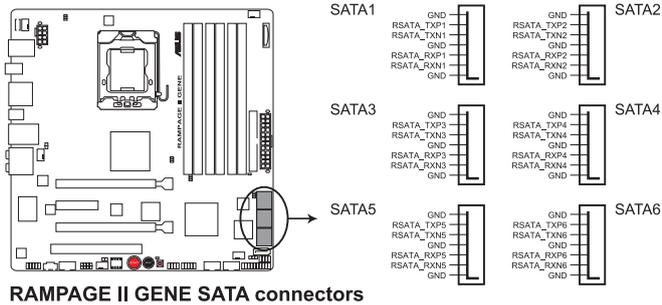


If any device jumper is set as "Cable-Select," ensure all other device jumpers have the same setting.

2. ICH10R Serial ATA connectors (7-pin SATA 1-6 [blue])

These connectors are for the Serial ATA signal cables for Serial ATA hard disk drives and optical disc drives.

If you installed Serial ATA hard disk drives, you can create a RAID 0, 1, 5, and 10 configuration with the Intel® Matrix Storage Technology through the onboard Intel® ICH10R RAID controllers.



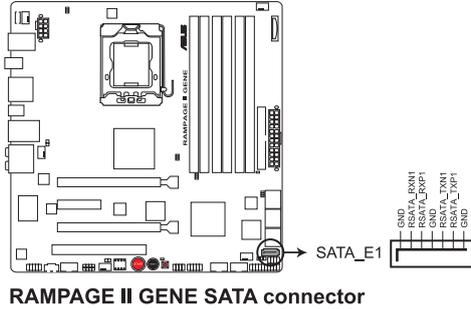
NOTE: Connect the right-angle side of SATA signal cable to SATA device. You may also connect the right-angle side of SATA cable to the onboard SATA port to avoid mechanical conflict with huge graphics cards.



- These connectors are set to Standard IDE mode by default. In Standard IDE mode, you can connect Serial ATA boot/data hard disk drives to these connectors. If you intend to create a Serial ATA RAID set using these connectors, set the **Configure SATA as** item in the BIOS to [RAID]. See section 3.4.5 **Storage Configuration** for details.
- You must install Windows® XP Service Pack 1 or later version before using Serial ATA hard disk drives. The Serial ATA RAID feature is available only if you are using Windows® XP SP1 or later version.
- When using hot-plug and NCQ, set the **Configure SATA as** in the BIOS to [AHCI]. See section 3.4.5 **Storage Configuration** for details.

3. JMicron JMB363® Serial ATA connector (7-pin SATA_E1 [black])

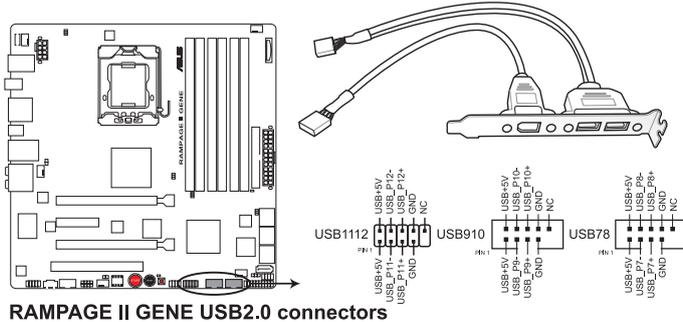
This connector is for a Serial ATA signal cable for an external Serial ATA hard disk drive.



To enable hot-plugging, set the **Controller Mode** item in the BIOS setting to [AHCI], and then reboot the system. See section 3.5.3 **Onboard Device Configuration** for details.

4. USB connectors (10-1 pin USB78; USB910; USB1112)

These connectors are for USB 2.0 ports. Connect the USB module cable to any of these connectors, then install the module to a slot opening at the back of the system chassis. These USB connectors comply with USB 2.0 specification that supports up to 480 Mbps connection speed.



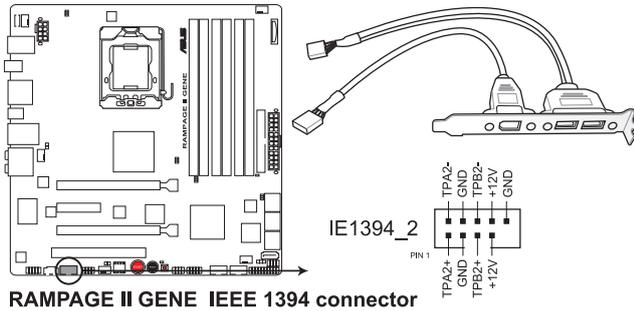
Never connect a 1394 cable to the USB connectors. Doing so will damage the motherboard!



You can connect the USB cable to ASUS Q-Connector (USB, blue) first, and then install the Q-Connector (USB) to the USB connector onboard.

5. IEEE 1394a port connector (10-1 pin IE1394_2)

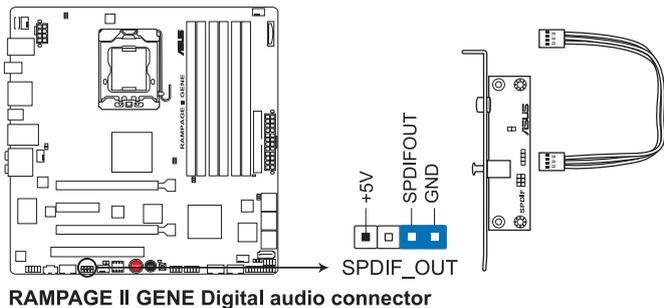
This connector is for an IEEE 1394a port. Connect the IEEE 1394a module cable to this connector, then install the module to a slot opening at the back of the system chassis.



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

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

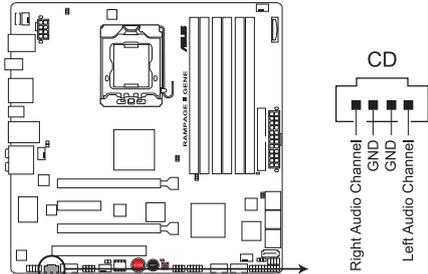
This connector is for an additional Sony/Philips Digital Interface (S/PDIF) port(s). Connect the S/PDIF Out module cable to this connector, then install the module to a slot opening at the back of the system chassis.



The S/PDIF module is purchased separately.

7. Optical drive audio connector (4-pin CD)

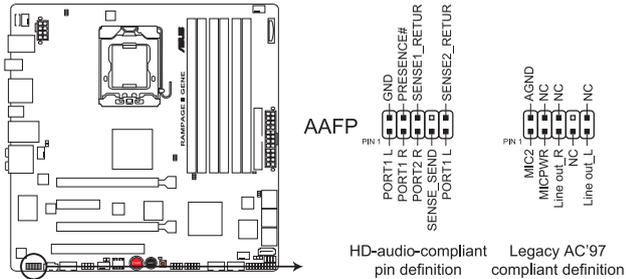
These connectors allow you to receive stereo audio input from sound sources such as a CD-ROM, TV tuner, or MPEG card.



RAMPAGE II GENE Internal audio connector

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

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



RAMPAGE II GENE Analog front panel connector



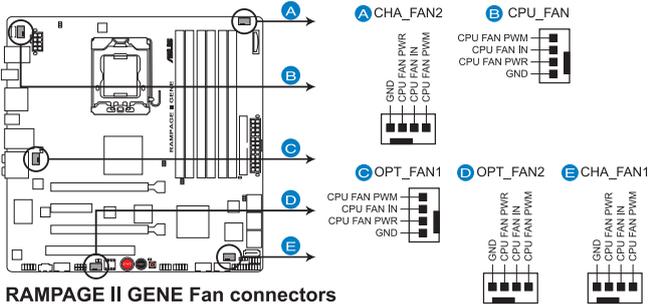
- We recommend that you connect a high-definition front panel audio module to this connector to avail of the motherboard's high-definition audio capability.
- If you want to connect a high-definition front panel audio module to this connector, set the **Front Panel Type** item in the BIOS setup to [HD Audio]; if you want to connect an AC'97 front panel audio module to this connector, set the item to [AC97]. By default, this connector is set to [HD Audio].

9. CPU, chassis, and optional fan connectors (4-pin CPU_FAN, 3-pin CHA_FAN1–2, 3-pin OPT_FAN1–2)

The fan connectors support cooling fans of 350 mA–2000 mA (24 W max.) or a total of 1 A–7 A (84 W max.) at +12V. Connect the fan cables to the fan connectors on the motherboard, ensuring that the black wire of each cable matches the ground pin of the connector.



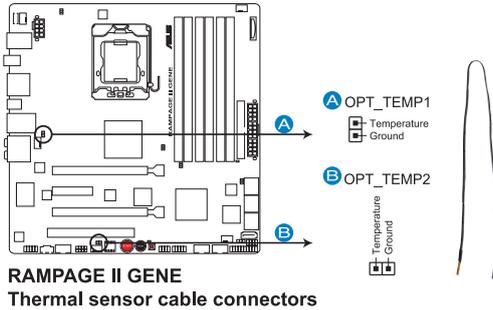
DO NOT forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! DO NOT place jumper caps on the fan connectors!



If you install two VGA cards, we recommend that you plug the chassis fan cable to the motherboard connector labeled OPT_FAN1/2 for better thermal environment.

10. Thermal sensor cable connectors (2-pin OPT_TEMP1/2)

These connectors are for temperature monitoring. Connect the thermal sensor cables to these connectors and place the other ends to the devices which you want to monitor temperature. The optional fan1/2 can work with the temperature sensors for a better cooling effect.

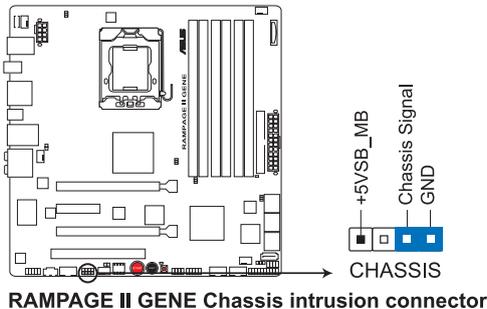


Enable **OPT FAN1/2 overheat protection** in BIOS if you connect thermal sensor cables to these connectors. Refer to page 3-34 for details.

11. Chassis intrusion connector (4-1 pin CHASSIS)

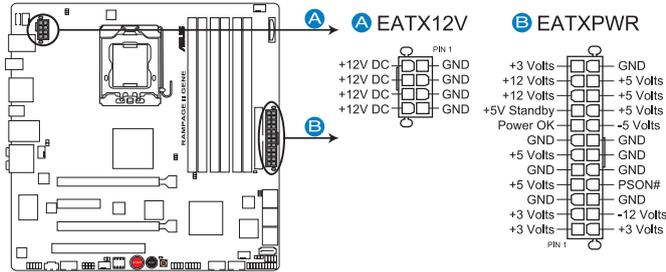
This connector is for a chassis-mounted intrusion detection sensor or switch. Connect one end of the chassis intrusion sensor or switch cable to this connector. The chassis intrusion sensor or switch sends a high-level signal to this connector when a chassis component is removed or replaced. The signal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

By default, the pin labeled “Chassis Signal” and “Ground” are shorted with a jumper cap. Remove the jumper caps only when you intend to use the chassis intrusion detection feature.



12. 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.



RAMPAGE II GENE ATX power connectors



- Ensure to remove the cap on the EATX12V connector before connecting an 8-pin EPS +12V power plug.
- Use only an 8-pin EPS +12V power plug for the EATX12V connector.



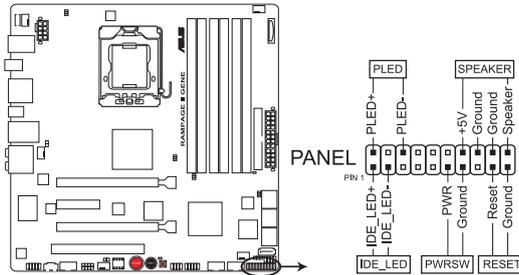
- For a fully configured system, we recommend that you use a power supply unit (PSU) that complies with ATX 12 V Specification 2.0 (or later version) and provides a minimum power of 600 W.
- Do not forget to connect the 8-pin EATX12 V power plug; otherwise, the system will not boot.
- Use of a PSU with a higher power output is recommended when configuring a system with more power-consuming devices. The system may become unstable or may not boot up if the power is inadequate.
- If you are uncertain about the minimum power supply requirement for your system, refer to the Recommended Power Supply Wattage Calculator at <http://support.asus.com/PowerSupplyCalculator/PSCalculator.aspx?SLanguage=en-us> for details.
- If you want to use two high-end PCI Express x16 cards, use a PSU with 1000W power or above to ensure the system stability.

PSU suggested list

PSU suggested list
SilverStone ST1000
Seasonic SS-600HT
Thermaltake W0083RE
Thermaltake PUREPower-600AP
Silverstone SST-ST75ZF
EnerMAX EG701AX-VE (E)(24P)

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

This connector supports several chassis-mounted functions.



RAMPAGE II GENE System panel connector

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

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

- **Hard disk drive activity LED (2-pin IDE_LED)**

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

- **System warning speaker (4-pin SPEAKER)**

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

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

This connector is for the system power button. Pressing the power button turns the system on or puts the system in sleep or soft-off mode depending on the BIOS 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.

ASUS Q-Connector (system panel)

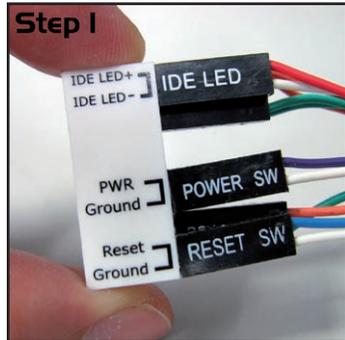
You can use the ASUS Q-Connector to connect/disconnect chassis front panel cables in a few steps. Refer to the instructions below to install the ASUS Q-Connector.

1. Connect the front panel cables to the ASUS Q-Connector.

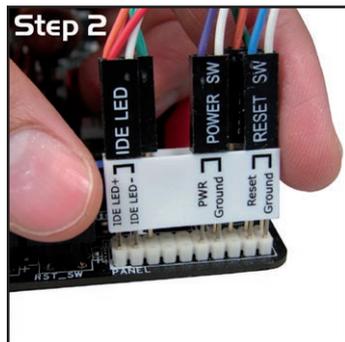
Refer to the labels on the Q-Connector to know the detailed pin definitions, then match them to the respective front panel cable labels.



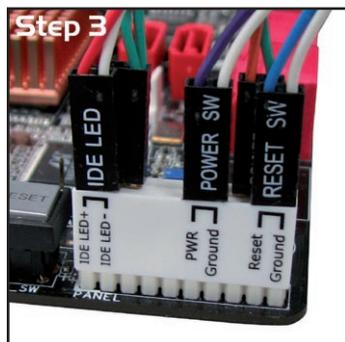
The labels of the front panel cables may differ from chassis made by different manufacturers.



2. Install the ASUS Q-Connector to the system panel connector, ensuring the orientation matches the labels on the motherboard.



3. The front panel functions are now enabled. The figure shows the Q-Connector properly installed on the motherboard.

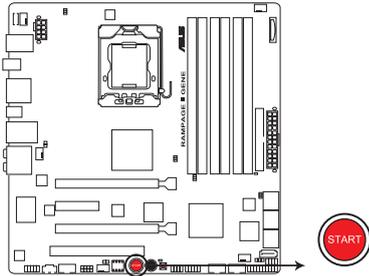


2.7.3 Onboard switches

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

1. Power-on switch

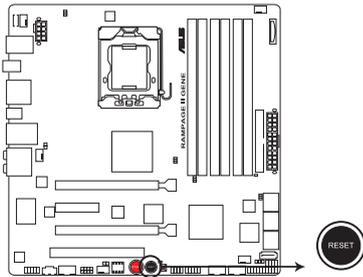
Press the power-on switch to wake/power up the system.



RAMPAGE II GENE Power on switch

2. Reset switch

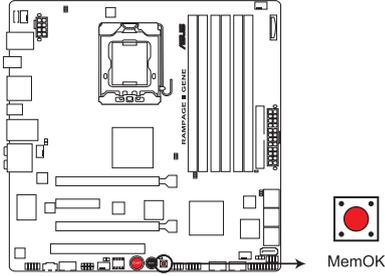
Press the reset switch to reboot the system.



RAMPAGE II GENE Reset switch

3. MemOK! switch

Press the MemOK! switch to load failsafe settings for memory compatibility and improving system boot success.



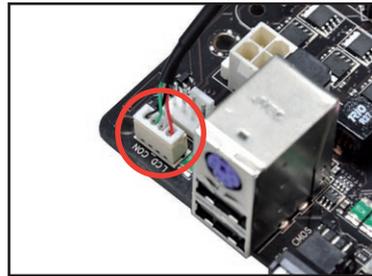
RAMPAGE II GENE MemOK switch

2.7.4 Installing I/O shield and LCD Poster

1. Install the I/O shield to the chassis by snapping it in place from inside.
2. Orient the motherboard and install it to the chassis. Ensure that the motherboard external ports fit the shield openings.



3. Thread the LCD Poster cable through the back I/O shield opening until the stopper fits the opening.
4. Locate and connect the LCD Poster cable to the **LCD_CON** connector.



5. Place the LCD Poster on the chassis or to wherever you like.



2.8 Starting up for the first time

1. After making all the connections, replace the system case cover.
2. Be sure that all switches are off.
3. Connect the power cord to the power connector at the back of the system chassis.
4. Connect the power cord to a power outlet that is equipped with a surge protector.
5. Turn on the devices in the following order:
 - a. Monitor
 - b. External SCSI devices (starting with the last device on the chain)
 - c. System power
6. After applying power, the system power LED on the system front panel case lights up. For systems with ATX power supplies, the system LED lights up when you press the ATX power button. If your monitor complies with “green” standards or if it has a “power standby” feature, the monitor LED may light up or switch between orange and green after the system LED turns on.

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

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

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

2.9 Turning off the computer

2.9.1 Using the OS shut down function

If you are using Windows® Vista™:

1. Click the **Start** button then select **Shut Down**.
2. The power supply should turn off after Windows® shuts down.

If you are using Windows® XP:

1. Click the **Start** button then select **Turn Off Computer**.
2. Click the **Turn Off** button to shut down the computer.
3. The power supply should turn off after Windows® shuts down.

2.9.2 Using the dual function power switch

While the system is ON, pressing the power switch for less than four seconds puts the system to sleep mode or to soft-off mode, depending on the BIOS setting.

Pressing the power switch for more than four seconds lets the system enter the soft-off mode regardless of the BIOS setting. Refer to section **3.6 Power Menu** in Chapter 3 for details.

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

BIOS setup **3**

3.1	Managing and updating your BIOS	3-1
3.2	BIOS setup program	3-6
3.3	Extreme Tweaker menu	3-9
3.4	Main menu	3-18
3.5	Advanced menu	3-22
3.6	Power menu	3-30
3.7	Boot menu	3-35
3.8	Tools menu	3-39
3.9	Exit menu	3-43

3.1 Managing and updating your BIOS

The following utilities allow you to manage and update the motherboard Basic Input/Output System (BIOS) setup.

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

Refer to the corresponding sections for details on these utilities.



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

3.1.1 ASUS Update utility

The ASUS Update is a utility that allows you to manage, save, and update the motherboard BIOS in Windows® environment. The ASUS Update utility allows you to:

- Save the current BIOS file
- Download the latest BIOS file from the Internet
- Update the BIOS from an updated BIOS file
- Update the BIOS directly from the Internet, and
- View the BIOS version information.

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



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

Installing ASUS Update

To install ASUS Update:

1. Place the support DVD in the optical drive. The Drivers menu appears.
2. Click the Utilities tab, then click Install ASUS Update VX.XX.XX.
3. The ASUS Update utility is copied to your system.

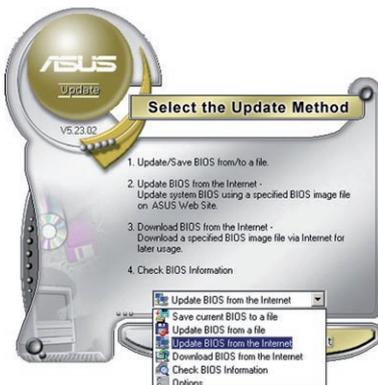
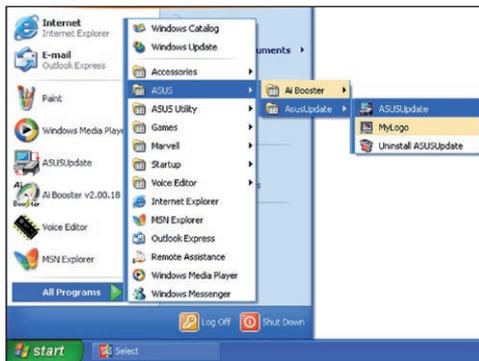


Quit all Windows® applications before you update the BIOS using this utility.

Updating the BIOS through the Internet

To update the BIOS through the Internet:

1. Launch the ASUS Update utility from the Windows® desktop by clicking **Start > Programs > ASUS > ASUSUpdate > ASUSUpdate**. The ASUS Update main window appears.



2. Select **Update BIOS** from the Internet option from the drop-down menu, then click **Next**.



3. Select the ASUS FTP site nearest you to avoid network traffic, or click **Auto Select**. Click **Next**.

- From the FTP site, select the BIOS version that you wish to download. Click **Next**.
- Follow the screen instructions to complete the update process.



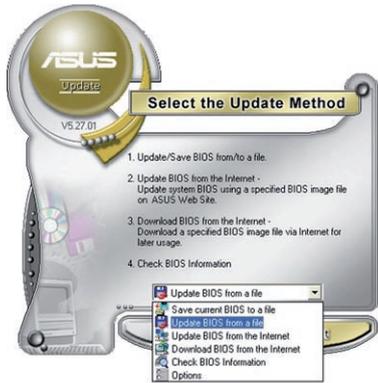
The ASUS Update utility is capable of updating itself through the Internet. Always update the utility to avail all its features.



Updating the BIOS through a BIOS file

To update the BIOS through a BIOS file:

- Launch the ASUS Update utility from the Windows® desktop by clicking **Start > Programs > ASUS > ASUSUpdate > ASUSUpdate**. The ASUS Update main window appears.
- Select **Update BIOS** from a file option from the drop-down menu, then click **Next**.



- Locate the BIOS file from the Open window, then click **Open**.
- Follow the screen instructions to complete the update process.



3.1.2 ASUS EZ Flash 2 utility

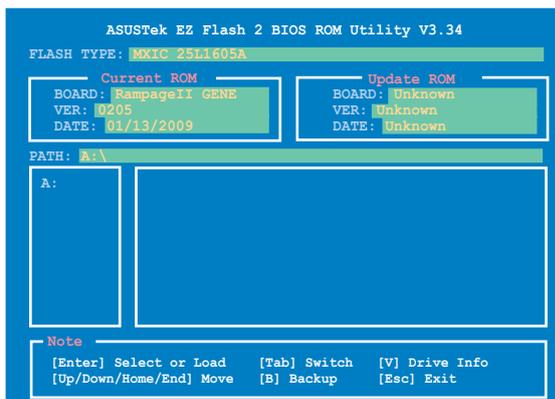
The ASUS EZ Flash 2 feature allows you to update the BIOS without having to use a DOS-based utility. The EZ Flash 2 utility is built in the BIOS chip so it is accessible by pressing <Alt> + <F2> during the Power-On Self Tests (POST).



Before you start using this utility, download the latest BIOS from the ASUS website at www.asus.com.

To update the BIOS using EZ Flash 2

1. Insert the USB flash disk that contains the latest BIOS file to the USB port, and then launch EZ Flash 2 in any of these two ways:
 - Press <Alt> + <F2> during POST to display the following.
 - Enter the BIOS setup program. Go to the **Tools** menu to select **EZ Flash 2** and press <Enter> to enable it.



2. Press <Tab> to switch between drives until the correct BIOS file is found. When found, EZ Flash 2 performs the BIOS update process and automatically reboots the system when done.



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



Ensure to load the BIOS default settings to ensure system compatibility and stability. Select the **Load Setup Defaults** item under the **Exit** menu. See section **3.9 Exit Menu** for details.

3.1.3 ASUS CrashFree BIOS 3 utility

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



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

Recovering the BIOS

To recover the BIOS

1. Turn on the system.
2. Insert the motherboard support DVD to the optical drive, or the USB flash drive containing the BIOS file to the USB port.
3. The utility automatically checks the devices for the BIOS file. When found, the utility reads the BIOS file and starts flashing the corrupted BIOS file.
4. Turn off the system after the utility completes the updating process and power on again.
5. The system requires you to enter BIOS Setup to recover BIOS setting. To ensure system compatibility and stability, we recommend that you press <F2> to load default BIOS values.



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

3.2 BIOS setup program

This motherboard supports two programmable firmware chips that you can update using the provided utility described in section 3.1 **Managing and updating your BIOS**.

Use the BIOS Setup program when you are installing a motherboard, reconfiguring your system, or prompted to “Run Setup.” This section explains how to configure your system using this utility.

Even if you are not prompted to use the Setup program, you can change the configuration of your computer in the future. For example, you can enable the security password feature or change the power management settings. This requires you to reconfigure your system using the BIOS Setup program so that the computer can recognize these changes and record them in the CMOS RAM of the firmware chip.

The firmware chip on the motherboard stores the Setup utility. When you start up the computer, the system provides you with the opportunity to run this program. Press during the Power-On Self-Test (POST) to enter the Setup utility; otherwise, POST continues with its test routines.

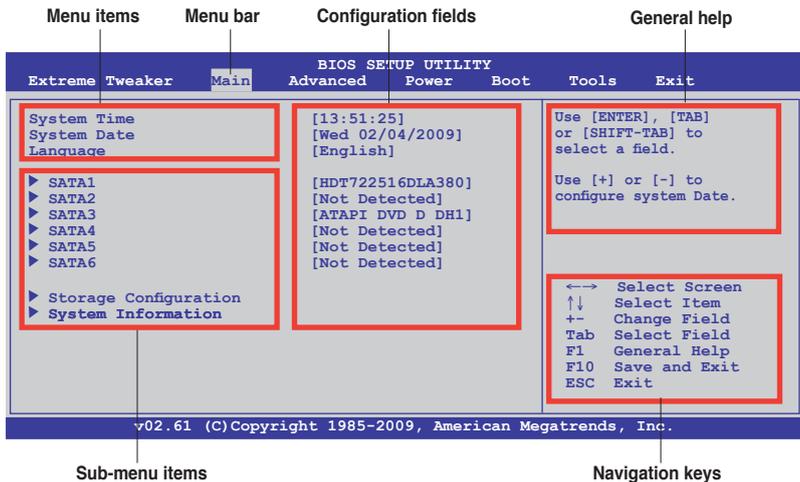
If you wish to enter Setup after POST, restart the system by pressing <Ctrl+Alt+Delete>, or by pressing the reset button on the system chassis. You can also restart by turning the system off and then back on. Do this last option only if the first two failed.

The Setup program is designed to make it as easy to use as possible. Being a menu-driven program, it lets you scroll through the various sub-menus and make your selections from the available options using the navigation keys.



-
- The default BIOS settings for this motherboard apply for most conditions to ensure optimum performance. If the system becomes unstable after changing any BIOS settings, load the default settings to ensure system compatibility and stability. Select the **Load Setup Defaults** item under the Exit Menu. See section 3.9 **Exit Menu**.
 - 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 (www.asus.com) to download the latest BIOS file for this motherboard.
-

3.2.1 BIOS menu screen



3.2.2 Menu bar

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

- Extreme Tweaker** For changing the overclocking settings
- Main** For changing the basic system configuration
- Advanced** For changing the advanced system settings
- Power** For changing the advanced power management (APM) configuration
- Boot** For changing the system boot configuration
- Tools** For Configuring options for special functions
- Exit** For selecting the exit options and loading default settings

To select an item on the menu bar, press the right or left arrow key on the keyboard until the desired item is highlighted.

3.2.3 Navigation keys

At the bottom right corner of a menu screen are the navigation keys for that particular menu. Use the navigation keys to select items in the menu and change the settings.



Some of the navigation keys differ from one screen to another.

3.2.4 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 (Advanced, Power, Boot, and Exit) on the menu bar have their respective menu items.

3.2.5 Submenu items

A solid triangle before each item on any menu screen means that the item has a submenu. To display the submenu, select the item and press <Enter>.

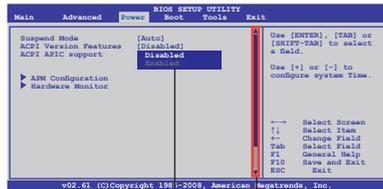
3.2.6 Configuration fields

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 enclosed in brackets, and is highlighted when selected. To change the value of a field, select it then press <Enter> to display a list of options. Refer to 3.2.7 Pop-up window.

3.2.7 Pop-up window

Select a menu item then press <Enter> to display a pop-up window with the configuration options for that item.



Scroll bar
Pop-up window

3.2.8 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.

3.2.9 General help

At the top right corner of the menu screen is a brief description of the selected item.

3.3 Extreme Tweaker menu

The Extreme Tweaker menu items allow you to configure overclocking-related items.



Take caution when changing the settings of the Extreme Tweaker menu items. Incorrect field values can cause the system to malfunction.



The default values of the following items vary depending on the CPU and memory modules you install on the motherboard.

```
BIOS SETUP UTILITY
Extreme Tweaker  Main  Advanced  Power  Boot  Tools  Exit

Configure System Performance Settings
Target CPU Frequency: 2660MHz
Target DRAM Frequency: 1066MHz

Tuning Mode [Extreme OC]
CPU Level Up [Auto]
Memory Level Up [Auto]
AI Overclock Tuner [Auto]
Ratio Status: (Min:12, Max: 20)
Ratio Actual Value:20
CPU Ratio Setting [Auto]
  CPU Configuration
DRAM Frequency [Auto]
  DRAM Timing Control

EPU II Phase Control [Full Phase]
CPU Load-Line Calibration [Auto]
QPI Load-Line Calibration [Disabled]

Tuning Mode is the BIOS menu switch for different purpose.
Extreme OC offers the max tuning degree of freedom to the extreme.
Gaming provides the major tuning settings for system performance boot.

←→ Select Screen
↑↓ Select Item
+- Change Field
F1 General Help
F10 Save and Exit
ESC Exit

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```

Scroll down to display the following items:

```
BIOS SETUP UTILITY
Extreme Tweaker  Main  Advanced  Power  Boot  Tools  Exit

CPU Differential Amplitude [Auto]
NB OCP [Enabled]
DRAM OCP [Enabled]
*** Please key in numbers or select voltage! ***
Extreme OV [Disabled]
Current Voltage: 1.184V 1.819V 1.230V
CPU Temperature: 43.5°C/110°F
CPU Voltage [Auto]
CPU PLL Voltage [Auto]
QPI/DRAM Core Voltage [Auto]
Current Voltage: 1.085V 1.508V 1.111V 1.508V
NB/SB Temperature: 45°C/113°F 52°C/125.5°F
IOH Voltage [Auto]
IOH PCIE Voltage [Auto]
ICH Voltage [Auto]
ICH PCIE Voltage [Auto]
Current Voltage: 1.508V
DRAM Bus Voltage [Auto]
  DRAM REF Voltages

Read POST Code from LCD Poster/iROG Control Plus
Debug Mode [String]
Keyboard TweakIt Control [Disabled]

***** Spread Spectrum and Clock Skew *****
CPU Spread Spectrum [Auto]
PCIE Spread Spectrum [Auto]
CPU Clock Skew [Auto]
IOH Clock Skew [Auto]

←→ Select Screen
↑↓ Select Item
+ Change Option
F1 General Help
F10 Save and Exit
ESC Exit

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```

Configure System Performance Settings



The configuration options may vary depending on your CPU/memory model.

3.3.1 Tuning Mode [Extreme OC]

The Tuning Mode item is the Extreme Tweaker menu item switch for different purpose. The **Extreme OC** mode offers the maximum tuning degree of freedom to the extreme. The **Gaming** mode provides the major tuning settings for system performance boost. Configuration options: [Extreme OC] [Gaming]

3.3.2 CPU Level Up [Auto]

Allows you to select a CPU level, and the related parameters will be automatically adjusted according to the selected CPU level. If you want to manually configure the settings in detail, set **Ai Overclock Tuner** to [Manual] after selecting a CPU level. Configuration options: [Auto] [i7-940-2.93G] [i7-965-3.20G] [i7-crazy-3.60G] [i7-crazy-4.00G]

3.3.3 Memory Level Up [Auto]

Allows you to select a memory level, and the related parameters will be automatically adjusted according to the selected memory level. If you want to manually configure the settings in detail, set **Ai Overclock Tuner** to [Manual] after selecting a memory level.

Configuration options: [Auto] [DDR3-1600MHz] [DDR3-1800MHz] [DDR3-2000MHz]



You are allowed to select either a CPU level or a memory level at one time.

3.3.4 Ai Overclock Tuner [Auto]

Allows selection of CPU/memory overclocking options to achieve desired CPU/memory internal frequency. Select any of the preset overclocking configuration options:

Manual	Allows you to individually set overclocking parameters.
Auto	Loads the standard settings for the system.
X.M.P.	Loads the optimal settings for the system.
CPU Level Up	Allows you to select a CPU level, and the related parameters will be adjusted automatically.
Memory Level Up	Allows you to select a memory level, and the related parameters will be adjusted automatically.
ROG Memory Profile	Allows you to select a memory profile, and the related parameters will be adjusted automatically.



The following two items appear when you set **Ai Overclock Tuner** to [Manual].

OC From CPU Level Up [Auto]

After you select a CPU level and set **Ai Overclock Tuner** to [Manual], the related parameters will be adjusted accordingly.

Configuration options: [Auto] [i7-940-2.93G] [i7-965-3.20G] [i7-crazy-3.60G] [i7-crazy-4.00G]

OC From Memory Level Up [Auto]

After you select a memory level and set **Ai Overclock Tuner** to [Manual], the related parameters will be adjusted accordingly.

Configuration options: [Auto] [DDR3-1600MHz] [DDR3-1800MHz] [DDR3-2000MHz]



The following item appears only when you set **Ai Overclock Tuner** to [X.M.P].

eXtreme Memory Profile [Disabled]

Allows you to select the memory profile during overclocking between [Profile #1] (high performance) and [Profile #2] (high frequency).

Configuration options: [Disabled] [Profile #1] [Profile #2]



The following item appears only when you set **Ai Overclock Tuner** to [ROG Memory Profile].

R.O.G. Memory Profile [Speedy]

Allows you to select the memory profile mode supported by your memory module. Configuration options: [Speedy] [Flying] [Lightning]

3.3.5 CPU Ratio Setting [Auto]

Allows you to adjust the ratio between CPU Core Clock and BCLK Frequency. Use the <+> and <-> keys to adjust the value. The valid value ranges differently according to your CPU model.

3.3.6 CPU Configuration

The items in this menu show the CPU-related information that the BIOS automatically detects. Refer to **section 3.5.1** for details.



The following two items appear only when you set the **Ai Overclock Tuner** item to [Manual] or [X.M.P].

BCLK Frequency [XXX]

Allows you to adjust the Internal Base Clock (BCLK). Use the <+> and <-> keys to adjust the value. You can also type the desired value using the numeric keypad. The values range from 100 to 500.

PCIe Frequency [XXX]

Allows you to set the PCI Express frequency. Use the <+> and <-> keys to adjust the PCIe frequency. You can also type the desired value using the numeric keypad. The values range from 100 to 200.

3.3.7 DRAM Frequency [Auto]

Allows you to set the DDR3 operating frequency.

Configuration options: [Auto] [DDR3-800MHz] [DDR3-1066MHz] [DDR3-1333MHz] [DDR3-1600MHz] [DDR3-1866MHz] [DDR3-2133MHz]



The **DRAM Frequency** configuration options vary with the **BCLK Frequency** item settings.



A very high DRAM frequency may cause the system to become unstable! If this happens, revert to the default setting.

3.3.8 DRAM Timing Control

The items in this menu allow you to set the DRAM timing control features.



The configuration options for some of the following items vary depending on the DIMMs you install on the motherboard.

1st Information: 6-6-6-15-4-36-6-3-16-4 (These values are auto-detected)

DRAM CAS# Latency [Auto]

Configuration options: [Auto] [3 DRAM Clock] – [11 DRAM Clock]

DRAM RAS# to CAS# Delay [Auto]

Configuration options: [Auto] [3 DRAM Clock] – [10 DRAM Clock]

DRAM RAS# PRE Time [Auto]

Configuration options: [Auto] [3 DRAM Clock] – [10 DRAM Clock]

DRAM RAS# ACT Time [Auto]

Configuration options: [Auto] [3 DRAM Clock] – [31 DRAM Clock]

DRAM RAS# to RAS# Delay [Auto]

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

DRAM REF Cycle Time [Auto]

Configuration options: [Auto] [30 DRAM Clock] [36 DRAM Clock] [48 DRAM Clock] [60 DRAM Clock] [72 DRAM Clock] [82 DRAM Clock] [88 DRAM Clock] [90 DRAM Clock] [100 DRAM Clock] [110 DRAM Clock]

DRAM WRITE Recovery Time [Auto]

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

DRAM READ to PRE Time [Auto]

Configuration options: [Auto] [3 DRAM Clock] – [15 DRAM Clock]

DRAM FOUR ACT WIN Time [Auto]

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

DRAM Back-To-Back CAS# Delay [Auto]

Configuration options: [Auto] [4 DRAM Clock] – [32 DRAM Clock]

2nd Information: 1N-66-0-0 (These values are auto-detected)

DRAM Timing Mode [Auto]

Configuration options: [Auto] [1N] [2N] [3N]

DRAM Round Trip Latency on CHA/B/C [Auto]

[Auto] [Advance 15 Clock]–[Advance 1 Clock] [Normal]

[Delay 1 Clock]–[Delay 15 Clock]

3rd Information: 6-6-13-9-9-9-7-6-4-7-7-4 (These values are auto-detected)

DRAM WRITE to READ Delay(DD) [Auto]

Configuration options: [Auto] [1 DRAM Clock] – [8 DRAM Clock]

DRAM WRITE to READ Delay(DR) [Auto]

Configuration options: [Auto] [1 DRAM Clock] – [8 DRAM Clock]

DRAM WRITE to READ Delay(SR) [Auto]

Configuration options: [Auto] [10 DRAM Clock] – [22 DRAM Clock]

DRAM READ to WRITE Delay(DD) [Auto]

Configuration options: [Auto] [2 DRAM Clock] – [14 DRAM Clock]

DRAM READ to WRITE Delay(DR) [Auto]

Configuration options: [Auto] [2 DRAM Clock] – [14 DRAM Clock]

DRAM READ to WRITE Delay(SR) [Auto]

Configuration options: [Auto] [2 DRAM Clock] – [14 DRAM Clock]

DRAM READ to READ Delay(DD) [Auto]

Configuration options: [Auto] [2 DRAM Clock] – [9 DRAM Clock]

DRAM READ to READ Delay(DR) [Auto]

Configuration options: [Auto] [2 DRAM Clock] – [9 DRAM Clock]

DRAM READ to READ Delay(SR) [Auto]

Configuration options: [Auto] [4 DRAM Clock] [6 DRAM Clock]

DRAM WRITE to WRITE Delay(DD) [Auto]

Configuration options: [Auto] [2 DRAM Clock] – [9 DRAM Clock]

DRAM WRITE to WRITE Delay(DR) [Auto]

Configuration options: [Auto] [2 DRAM Clock] – [9 DRAM Clock]

DRAM WRITE to WRITE Delay(SR) [Auto]

Configuration options: [Auto] [4 DRAM Clock] [6 DRAM Clock]

3.3.9 EPU II Phase Control [Full Phase]

Configuration options: [Auto] [Normal] [Full Phase]

3.3.10 CPU Load-Line Calibration [Auto]

Allows you to select the CPU Load-Line mode. Set to [Disabled] to follow Intel specifications, or to [Enabled] to improve CPU Vdroop directly.

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

3.3.11 QPI Load-Line Calibration [Disabled]

Allows you to select the QPI Load-Line mode. Set to [Disabled] to follow Intel specifications, or to [Enabled] to improve QPI Vdroop directly.

Configuration options: [Disabled] [Enabled]

3.3.12 CPU Differential Amplitude [Auto]

Different AMP might enhance BCLK overclocking ability.

Configuration options: [Auto] [700mV] [800mV] [900mV] [1000mV]

3.3.13 NB OCP [Enabled]

This item allows you to enable or disable the NorthBridge over current protect function. Configuration options: [Disabled] [Enabled]

3.3.14 DRAM OCP [Enabled]

This item allows you to enable or disable the DRAM over current protect function.

Configuration options: [Disabled] [Enabled]

3.3.15 Extreme OV [Disabled]

When set to [Enabled], you can choose high level voltage to overclock, but not guaranteed CPU life. Configuration options: [Disabled] [Enabled]



The following eight (8) items are adjusted by typing the desired values using the numeric keypad and press the <Enter> key. You can also use the <+> and <-> keys to adjust the value. To restore the default setting, type [auto] using the keyboard and press the <Enter> key.

3.3.16 CPU Voltage [Auto]

Allows you to select the CPU VCore voltage. The text color in the configuration field corresponds to the onboard CPU LED color, both of which indicate voltage condition. When you set the **CPU LED Selection** item to [Vcore], the onboard CPU LED displays CPU VCore voltage condition. Refer to page 2-2 for CPU LED definition. The values range from 0.85000V to 2.50000V with a 0.00625V interval.



The CPU voltage could be set only up to 1.8V when the **Extreme OV** item is set to [Disabled].



Refer to the CPU documentation before setting the CPU VCore voltage. Setting a high voltage may damage the CPU permanently, and setting a low voltage may make the system unstable.

3.3.17 CPU PLL Voltage [Auto]

Allows you to select the CPU PLL voltage. The text color in the configuration field corresponds to the onboard CPU LED color, both of which indicate voltage condition. When you set the **CPU LED Selection** item to [CPU PLL], the onboard CPU LED displays CPU PLL voltage condition. Refer to page 2-2 for CPU LED definition. The values range from 1.81592V to 2.50492V with a 0.01325V interval.

3.3.18 QPI/DRAM Core Voltage [Auto]

Allows you to select the QPI/DRAM Core voltage. The text color in the configuration field corresponds to the onboard CPU LED color, both of which indicate voltage condition. When you set the **CPU LED Selection** item to [QPI/DRAM Core], the onboard CPU LED displays QPI/DRAM Core voltage condition. Refer to page 2-2 for CPU LED definition. The values range from 1.20000V to 2.50000V with a 0.00625V interval.



The QPI/DRAM Core voltage could be set only up to 1.8V when the **Extreme OV** item is set to [Disabled].

3.3.19 IOH Voltage [Auto]

Allows you to set the I/O Hub (IOH) voltage. The values range from 1.11341V to 2.19991V with a 0.01325V interval.

3.3.20 IOH PCIE Voltage [Auto]

Allows you to set the IOH PCIE voltage. The values range from 1.51106V to 2.78306V with a 0.01325V interval.

3.3.21 ICH Voltage [Auto]

Allows you to set the I/O Controller Hub (ICH) voltage. The values range from 1.11341V to 2.00116V with a 0.01325V interval.

3.3.22 ICH PCIE Voltage [Auto]

Allows you to set the ICH PCIE voltage. The values range from 1.51106V to 2.05431V with a 0.01325V interval.

3.3.23 DRAM Bus Voltage [Auto]

Allows you to set the DRAM voltage. The values range from 1.51106V to 2.50481V with a 0.01325V interval.



- The values of the **CPU Voltage**, **CPU PLL Voltage**, **QPI/DRAM Core Voltage**, **IOH Voltage**, **IOH PCIE Voltage**, **ICH Voltage**, **ICH PCIE Voltage**, and **DRAM Bus Voltage** items are labeled in different color, indicating the risk levels of high voltage settings. Refer to below table for details.
- The system may need better cooling system to work stably under high voltage settings.

	Blue	Yellow	Red
CPU Voltage	0.85000–1.5000	1.50625–1.59375	1.60000–
CPU PLL Voltage	1.81592–1.89542	1.90867–1.94842	1.96167–
QPI/DRAM Core Voltage	1.20000–1.39375	1.40000–1.65625	1.66250–
IOH Voltage	1.11341–1.39166	1.40491–1.64341	1.65666–
IOH PCIE Voltage	1.51106–1.69656	1.70981–1.84231	1.85556–
ICH Voltage	1.11341–1.59041	1.60366–1.84216	1.85541–
ICH PCIE Voltage	1.51106–1.61706	1.63031–1.80256	1.81581–
DRAM Bus Voltage	1.51106–1.72306	1.73631–2.31931	2.33256–

3.3.24 DRAM REF Voltages

The items in this menu allow you to set the DRAM Reference Voltage.

DRAM DATA REF Voltage on CHA/B/C [Auto]

Allows you to set the DRAM DATA Reference Voltage on Channel A/B/C.

DRAM CTRL REF Voltage on CHA/B/C [Auto]

Allows you to set the DRAM Control Reference Voltage on Channel A/B/C.

3.3.25 Debug Mode [String]

Allows you to select the debug mode. Configuration options: [String] [Code]

3.3.26 Keyboard TweakIt Control [Disabled]

Allows you to enable or disable the keyboard TweakIt control.

Configuration options: [Disabled] [Enabled]

3.3.27 CPU Spread Spectrum [Auto]

Set to [Disabled] to enhance BCLK overclocking ability or [Auto] for EMI control.

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

3.3.28 PCIE Spread Spectrum [Auto]

Set to [Disabled] to enhance PCIE overclocking ability or [Auto] for EMI control.

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

3.3.29 CPU Clock Skew [Auto]

Adjusting this item may help enhancing BCLK overclocking ability. You may need to adjust the **IOH Clock Skew** item at the same time.

Configuration options: [Auto] [Normal] [Delay 100ps]–[Delay 1500ps]

3.3.30 IOH Clock Skew [Auto]

Adjusting this item may help enhancing BCLK overclocking ability. You may need to adjust the **CPU Clock Skew** item at the same time.

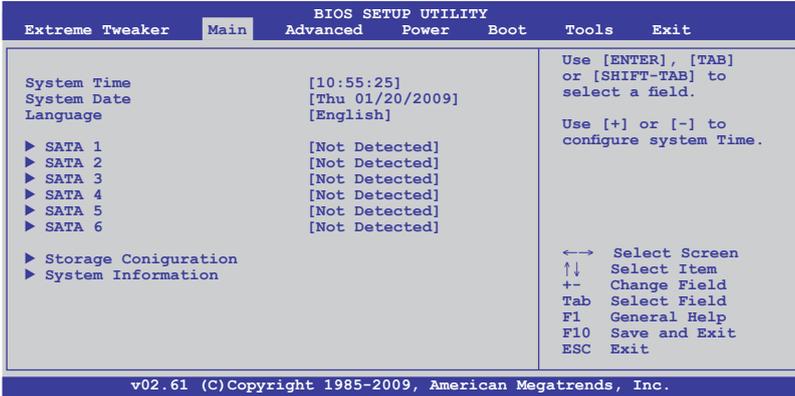
Configuration options: [Auto] [Normal] [Delay 100ps]–[Delay 1500ps]

3.4 Main menu

When you enter the BIOS Setup program, the Main menu screen appears, giving you an overview of the basic system information.



Refer to section 3.2.1 **BIOS menu screen** for information on the menu screen items and how to navigate through them.



3.4.1 System Time [xx:xx:xx]

Allows you to set the system time.

3.4.2 System Date [Day xx/xx/xxxx]

Allows you to set the system date.

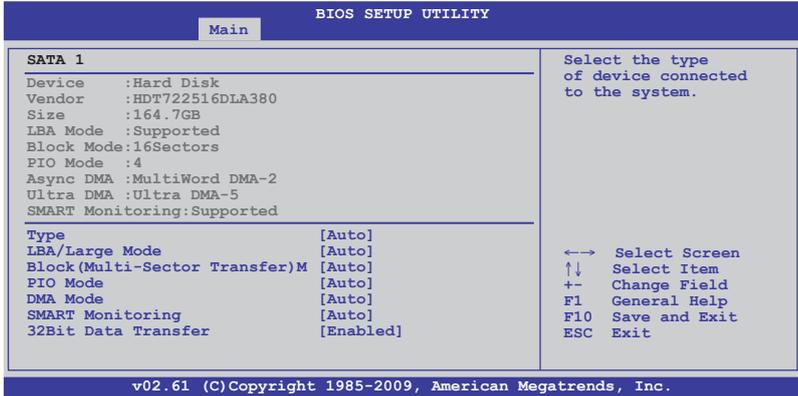
3.4.3 Language [English]

Allows you to choose the BIOS language version from the options.

Configuration options: [Chinese BIG5] [Chinese (GB)] [Japanese] [Français] [Deutsch] [English]

3.4.4 SATA 1-6

While entering Setup, the BIOS automatically detects the presence of Serial ATA devices. There is a separate sub-menu for each SATA device. Select a device item then press <Enter> to display the SATA device information.



The BIOS automatically detects the values opposite the dimmed items (Device, Vendor, Size, LBA Mode, Block Mode, PIO Mode, Async DMA, Ultra DMA, and SMART monitoring). These values are not user-configurable. These items show [Auto] if no IDE device is installed in the system.

Type [Auto]

Selects the type of SATA drive. Setting to [Auto] allows automatic selection of the appropriate SATA device type. Select [CDROM] if you are specifically configuring a CD-ROM drive. Select [ARMD] (ATAPI Removable Media Device) if your device is either a ZIP, LS-120, or MO drive.

Configuration options: [Not Installed] [Auto] [CDROM] [ARMD]

LBA/Large Mode [Auto]

Enables or disables the LBA mode. Setting to [Auto] enables the LBA mode if the device supports this mode, and if the device was not previously formatted with LBA mode disabled. Configuration options: [Disabled] [Auto]

Block (Multi-sector Transfer) M [Auto]

Enables or disables data multi-sectors transfers. When set to [Auto], the data transfer from and to the device occurs multiple sectors at a time if the device supports multi-sector transfer feature. When set to [Disabled], the data transfer from and to the device occurs one sector at a time.

Configuration options: [Disabled] [Auto]

PIO Mode [Auto]

Selects the PIO mode. Configuration options: [Auto] [0] [1] [2] [3] [4]

DMA Mode [Auto]

Selects the DMA mode. Configuration options: [Auto]

SMART Monitoring [Auto]

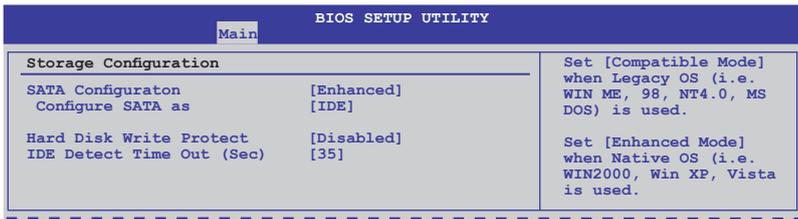
Sets the Smart Monitoring, Analysis, and Reporting Technology. Configuration options: [Auto] [Disabled] [Enabled]

32Bit Data Transfer [Enabled]

Enables or disables 32-bit data transfer. Configuration options: [Disabled] [Enabled]

3.4.5 Storage Configuration

The items in this menu allow you to set or change the configurations for the SATA devices installed in the system. Select an item then press <Enter> if you want to configure the item.



SATA Configuration [Enhanced]

Configuration options: [Disabled] [Compatible] [Enhanced]

Configure SATA as [IDE]

Sets the configuration for the Serial ATA connectors supported by the Southbridge chip.

If you want to use the Serial ATA hard disk drives as Parallel ATA physical storage devices, keep the default setting [IDE].

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

If you want to create a RAID 0, RAID 1, RAID 5, RAID 10, or the Intel® Matrix Storage Technology configuration from the Serial ATA hard disk drives, set this item to [RAID].

Hard Disk Write Protect [Disabled]

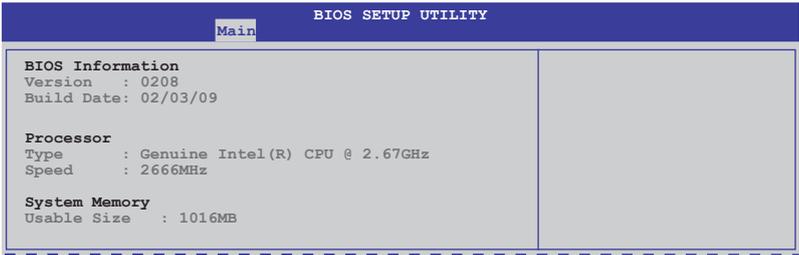
Disables or enables device write protection. This will be effective only if device is accessed through BIOS. Configuration option: [Disabled] [Enabled]

SATA Detect Time Out (Sec) [35]

Selects the time out value for detecting ATA/ATAPI devices.
Configuration options: [0] [5] [10] [15] [20] [25] [30] [35]

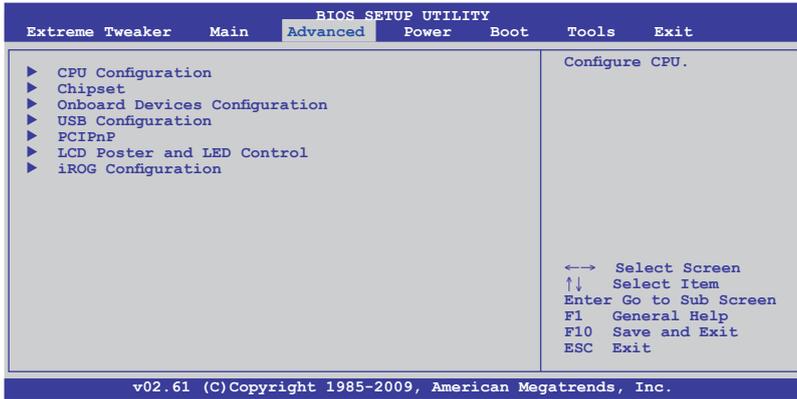
3.4.6 System Information

This menu gives you an overview of the general system specifications. The BIOS automatically detects the items in this menu.



3.5 Advanced menu

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

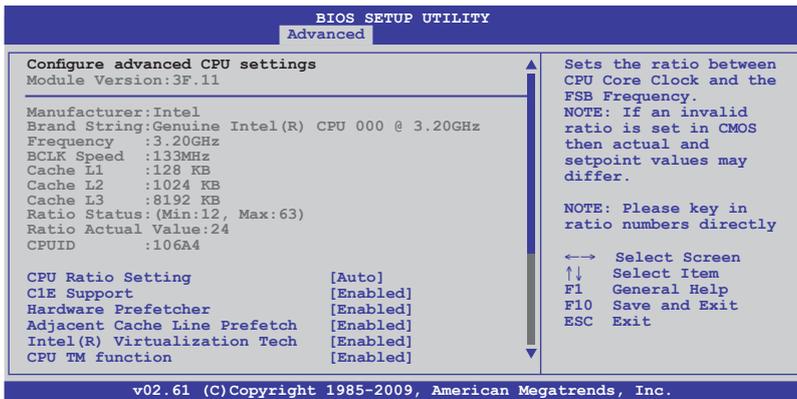


3.5.1 CPU Configuration

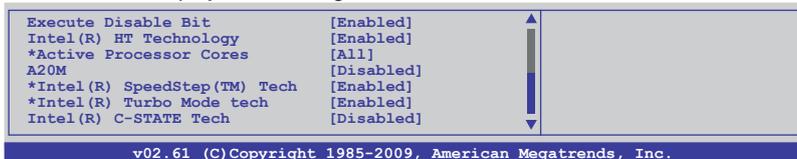
The items in this menu show the CPU-related information that the BIOS automatically detects.



The items shown in this screen may be different due to the CPU you installed.



Scroll down to display the following items:



CPU Ratio Setting [Auto]

Allows you to adjust the ratio between CPU Core Clock and BCLK Frequency. Use the <+> and <-> keys to adjust the value. The valid value ranges differently according to your CPU model.

C1E Support [Enabled]

Allows you to enable or disable Enhanced Halt State support.
Configuration options: [Disabled] [Enabled]

Hardware Prefetcher [Enabled]

Allows you to enable or disable the Hardware Prefetcher function.
Configuration options: [Disabled] [Enabled]

Adjacent Cache Line Prefetch [Enabled]

Allows you to enable or disable the Adjacent Cache Line Prefetch function.
Configuration options: [Disabled] [Enabled]

Intel(R) Virtualization Tech [Enabled]

The Intel® Virtualization Technology allows a hardware platform to run multiple operating systems separately and simultaneously, enabling one system to virtually function as several systems. Configuration options: [Disabled] [Enabled]

CPU TM Function [Enabled]

This function enables the overheated CPU to throttle the clock speed to cool down.
Configuration options: [Disabled] [Enabled]

Execute Disable Bit [Enabled]

Allows you to enable or disable the No-Execution Page Protection Technology. Setting this item to [Disabled] forces the XD feature flag to always return to zero (0).
Configuration options: [Disabled] [Enabled]

Intel(R) HT Technology [Enabled]

Allows you to enable or disable the Intel Hyper-Threading Technology function. When disabled, only one thread per activated core is enabled.
Configuration options: [Enabled] [Disabled]

***Active Processor Cores [All]**

Allows you to choose the number of CPU cores to activate in each processor package. Configuration options: [All] [1] [2]

A20M [Disabled]

Legacy OSes and APs may need A20M enabled.
Configuration options: [Disabled] [Enabled]

*Intel(R) SpeedStep(TM) Tech [Enabled]

When set to [Disabled], the CPU runs at its default speed. When set to [Enabled], the CPU speed is controlled by the operating system.

Configuration options: [Disabled] [Enabled]

*Intel(R) TurboMode tech [Enabled]

Turbo mode allows processor cores to run faster than marked frequency in specific condition. Configuration options: [Disabled] [Enabled]

Intel(R) C-STATE Tech [Disabled]

Allows you enable or disable the Intel® C-STATE Technology. When enabled, the CPU idle is set to C2/C3/C4. Configuration options: [Disabled] [Enabled]



The following item appears only when you set **Intel(R) C-STATE Tech** to [Enabled].

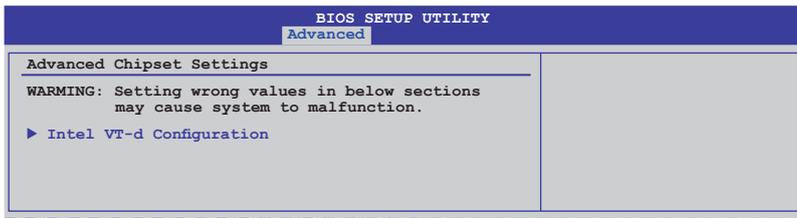
C State package limit setting [Auto]

Allows you to select the C State package limit setting.

Configuration options: [Auto] [C1] [C3] [C6] [C7]

3.5.2 Chipset

The Chipset menu allows you to change the advanced chipset settings. Select an item then press <Enter> to display the sub-menu.



Intel VT-d Configuration



Intel VT-d [Disabled]

Allows you to enable or disable the Intel Virtualization Technology for Directed I/O. Configuration options: [Disabled] [Enabled]

3.5.3 Onboard Device Configuration

BIOS SETUP UTILITY	
Advanced	
Onboard Device Configuration	
Onboard Device	[Standard]
High Definition Audio	[Enabled]
Front Panel Type	[HD Audio]
J-Micron eSATA/PATA Controller	[Enabled]
Controller Mode	[IDE]
Realtek LAN	[Enabled]
LAN Boot ROM	[Disabled]
Onboard 1394 Controller	[Enabled]

Get your best overclocking record! "Onboard Device" is to disable all the unnecessary devices when you want to reach you best overclocking record. But it will keep 1 lan port alive to submit your score.

Onboard Device [Standard]

Allows you to disable all the onboard device controllers except the LAN controller.
Configuration options: [Standard] [Disabled]

High Definition Audio [Enabled]

Allows you to enable or disable the High Definition Audio Controller.
Configuration options: [Enabled] [Disabled]

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. Configuration options: [AC97] [HD Audio]

J-Micron eSATA/PATA Controller [Enabled]

Allows you to enable or disable the onboard JMicron eSATA/PATA controller.
Configuration options: [Enabled] [Disabled]

Controller Mode [IDE]

This item appears only when you enable the previous item.
Configuration options: [IDE] [AHC]

If you want to use the hard disk drive as a Parallel ATA physical storage device, keep the default setting [IDE].

If you want the hard disk drive to use the Advanced Host Controller Interface (AHC), set this item to [AHC].

Realtek LAN [Enabled]

Allows you to enable or disable the onboard LAN controller.
Configuration options: [Enabled] [Disabled]

Onboard LAN Boot ROM [Disabled]

This item appears only when you enable the previous item.
Configuration options: [Disabled] [Enabled]

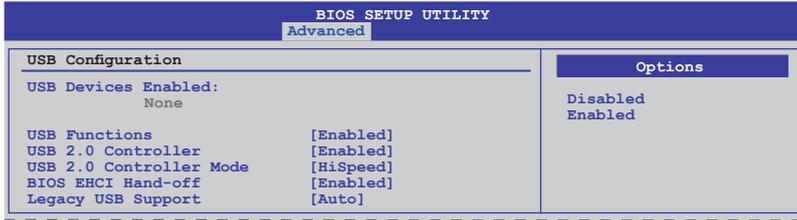
Onboard 1394 Controller [Enabled]

Allows you to enable or disable the onboard IEEE 1394a controller.

Configuration options: [Enabled] [Disabled]

3.5.4 USB Configuration

The items in this menu allow you to change the USB-related features. Select an item then press <Enter> to display the configuration options.



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

USB Functions [Enabled]

Allows you to enable or disable the USB functions. The following sub-items appear when this item is set to [Enabled]. Configuration options: [Disabled] [Enabled]



The following items appear only when you set **USB Functions** to [Enabled].

USB 2.0 Controller [Enabled]

Allows you to enable or disable the USB 2.0 controller.

Configuration options: [Enabled] [Disabled]

USB 2.0 Controller Mode [HiSpeed]

Allows you to set the USB 2.0 controller mode to HiSpeed (480 Mbps) or FullSpeed (12 Mbps). Configuration options: [FullSpeed] [HiSpeed]



The **USB 2.0 Controller Mode** item appears only when you enable the **USB 2.0 Controller**.

BIOS EHCI Hand-off [Enabled]

Allows you to enable the support for operating systems without an EHCI hand-off feature. Configuration options: [Disabled] [Enabled]

Legacy USB Support [Auto]

Allows you to enable or disable the support for legacy USB devices. Setting to [Auto] allows the system to detect the presence of USB devices at startup. If detected, the USB controller legacy mode is enabled. If no USB device is detected, the legacy USB support is disabled.

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

3.5.5 PCI PnP

The PCI PnP menu items allow you to change the advanced settings for PCI/PnP devices.



Take caution when changing the settings of the PCI PnP menu items. Incorrect field values can cause the system to malfunction.



Plug And Play O/S [No]

When set to [No], BIOS configures all the devices in the system. When set to [Yes] and if you install a Plug and Play operating system, the operating system configures the Plug and Play devices not required for boot.

Configuration options: [No] [Yes]

3.5.6 LCD Poster and LED Control

BIOS SETUP UTILITY	
Advanced	
LCD Poster and LED Control	
LCD Poster Backlight	[Turn Off]
LCD Poster Backlight (S5)	[Turn Off]
LCD Poster Mode	[Current Time]
All LED Control	[Enabled]
Voltiminder LED	[Enabled]
CPU LED Selection	[CPU]
NB LED Selection	[IOH]
SB LED Selection	[ICH]

Turn On/Turn Off LCD Poster when system is working

LCD Poster Backlight [Turn Off]

Allows you to turn on/off the LCD Poster backlight when the system is working.
Configuration options: [Turn On] [Turn Off]

LCD Poster Backlight (S5) [Turn Off]

Allows you to turn on/off the LCD Poster backlight when the system is in soft-off state. Configuration options: [Turn Off] [Turn On]

LCD Poster Mode [Current Time]

Allows the LCD Poster to display either hardware information or time.
Configuration options: [Current Time] [HWM Information]



The following item becomes configurable when you set **LCD Poster Mode** to [HWM Information].

HWM Select Mode

Allows you to select which hardware information to display on the LCD Poster. Configuration options: [All Voltage] [All Temperature] [All Fan Speed]

All LED Control [Enabled]

Allows you to enable or disable the onboard LEDs control.
Configuration options: [Enabled] [Disabled]



The following items appear only when you set **All LED Control** to [Enabled].

Voltiminder LED [Enabled]

Allows you to enable or disable the onboard Voltiminder LED.
Configuration options: [Enabled] [Disabled]



The following items appear only when you set **Voltiminder LED** to [Enabled].

CPU LED Selection [CPU]

Allows you to switch the onboard CPU LED display between CPU voltage [CPU], CPU PLL voltage [CPU PLL] and QPI/DRAM Core voltage [QPI/DRAM Core].
Configuration options: [CPU] [CPU PLL] [QPI/DRAM Core]

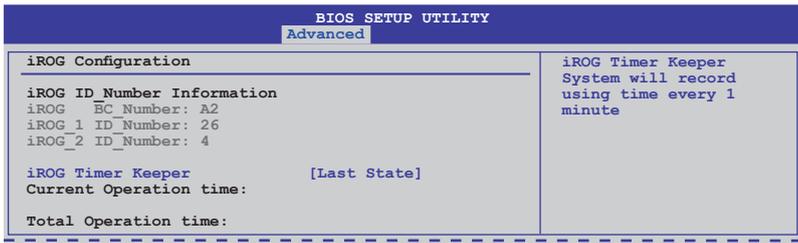
NB LED Selection [IOH]

Allows you to switch the onboard northbridge LED display between I/O Hub voltage [IOH] and IOH PCIE voltage [IOH PCIE].
Configuration options: [IOH] [IOH PCIE]

SB LED Selection [ICH]

Allows you to switch the onboard southbridge LED display between I/O Controller Hub voltage [ICH] and ICH PCIE voltage [ICH PCIE].
Configuration options: [ICH] [ICH PCIE]

3.5.7 iROG Configuration

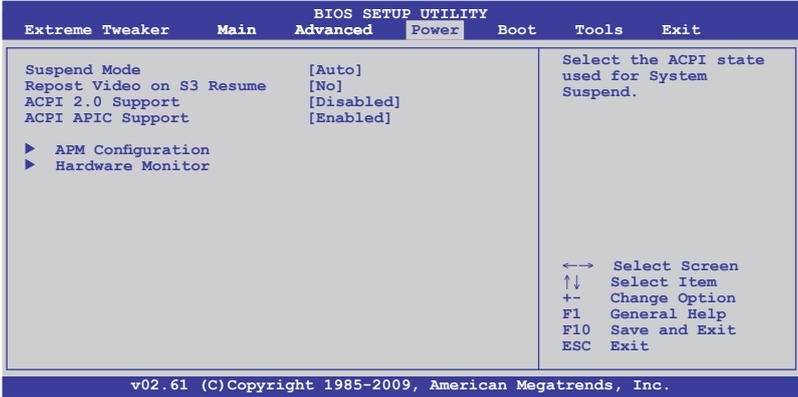


iROG Timer Keeper [Last State]

Allows you to set the iROG Time Keeper operation mode.
Configuration options: [Last State] [Disabled] [Enabled]

3.6 Power menu

The Power menu items allow you to change the settings for the Advanced Power Management (APM). Select an item then press <Enter> to display the configuration options.



3.6.1 Suspend Mode [Auto]

Allows you to select the Advanced Configuration and Power Interface (ACPI) state to be used for system suspend.

Configuration options: [S1 (POS) Only] [S3 Only] [Auto]

3.6.2 Repost Video on S3 Resume [No]

Determines whether to invoke VGA BIOS POST on S3/STR resume.

Configuration options: [No] [Yes]

3.6.3 ACPI 2.0 Support [Disabled]

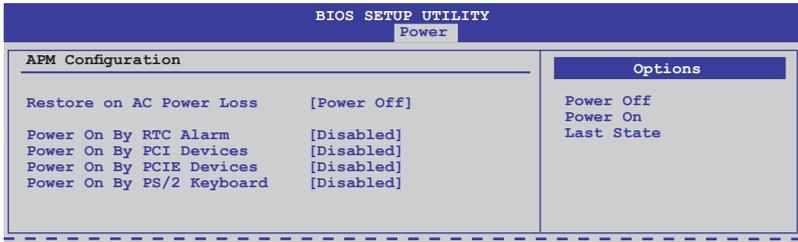
Specifies the Advanced Configuration and Power Interface (ACPI) version supported. Configuration options: [Disabled] [Enabled]

3.6.4 ACPI APIC Support [Enabled]

Allows you to enable or disable the Advanced Configuration and Power Interface (ACPI) support in the Advanced Programmable Interrupt Controller (APIC). When set to Enabled, the ACPI APIC table pointer is included in the RSDT pointer list.

Configuration options: [Disabled] [Enabled]

3.6.5 APM Configuration



Restore On AC Power Loss [Power Off]

When set to Power Off, the system goes into off state after an AC power loss. When set to Power On, the system goes on after an AC power loss. When set to Last State, the system goes into either off or on state, whatever the system state was before the AC power loss.

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

Power On By RTC Alarm [Disabled]

Allows you to enable or disable RTC to generate a wake event. When this item is set to Enabled, the items **RTC Alarm Date (Days)** / **System Time** will become user-configurable with set values. Configuration options: [Disabled] [Enabled]

Power On By PCI Devices [Disabled]

Allows you to enable or disable the PME to wake up from S5 by PCI devices. Configuration options: [Disabled] [Enabled]

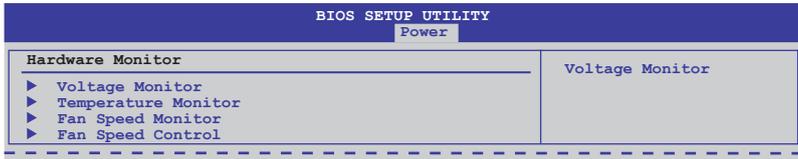
Power On By PCIE Devices [Disabled]

Allows you to enable or disable the PCIE devices to generate a wake event. Configuration options: [Disabled] [Enabled]

Power On By PS/2 Keyboard [Disabled]

Allows you to enable or disable the Power On by PS/2 keyboard function. This feature requires an ATX power supply that provides at least 1A on the +5VSB lead. Configuration options: [Disabled] [Enabled]

3.6.6 Hardware Monitor



Voltage Monitor

CPU Voltage; CPU PLL Voltage; QPI/DRAM Core Voltage; IOH Voltage; IOH PCIE Voltage; ICH Voltage; ICH PCIE Voltage; DRAM Bus Voltage; 3.3V Voltage; 5V Voltage; 12V Voltage

The onboard hardware monitor automatically detects the voltage output through the onboard voltage regulators.

Temperature Monitor

CPU Temperature; MB Temperature; NB Temperature; SB Temperature; OPT FAN1/2 Temperature [xxx°C/xxx°F]

The onboard hardware monitor automatically detects and displays the CPU, northbridge, southbridge, motherboard, power, and the assigned devices temperatures. Select [Ignored] if you do not wish to display the detected temperatures.

NB overheat protection; SB overheat protection [90°C]

The system automatically shuts down when the northbridge or southbridge chipset is heated over the set temperature to protect it from damage. Configuration options: [Disabled] [70°C] [80°C] [90°C] [100°C]

OPT FAN1/2 overheat protection [90°C]

Allows you to set the temperature over which the system automatically shuts down when any of the thermal sensor cables connected to the motherboard detects device overheat to protect the device from damage. Configuration options: [Disabled] [70°C] [80°C] [90°C] [100°C]

Fan Speed Monitor

CPU Fan; Chassis Fan1/2; OPT Fan1/2 Speed [xxxxRPM] or [Ignored] / [N/A]

The onboard hardware monitor automatically detects and displays the CPU fan, chassis fan, power fan, and optional fan speed in rotations per minute (RPM). If any of the fans is not connected to the motherboard, the field shows [N/A]. These items are not user-configurable.

Fan Speed Control

BIOS SETUP UTILITY	
Power	
Fan Speed Control	
CPU Q-Fan Control	[Disabled]
Chassis Q-Fan Control	[Disabled]
OPTFan1 Control	[Disabled]
OPTFan2 Control	[Disabled]
CPU Q-Fan Control	

CPU Q-Fan Control [Disabled]

Allows you to enable or disable the CPU Q-fan control feature.

Configuration options: [Disabled] [Enabled]



The following item appears when you enable **CPU Q-Fan Control**.

CPU Fan Profile [Standard]

Allows you to set the appropriate performance level of the ASUS Q-Fan. When set to [Standard], the CPU fan automatically adjusts depending on the CPU temperature. Set this item to [Silent] to minimize fan speed for quiet CPU fan operation, or [Turbo] to achieve maximum CPU fan speed.

Configuration options: [Standard] [Silent] [Turbo]

Chassis Q-Fan Control [Disabled]

Allows you to enable or disable the chassis Q-fan control feature.

Configuration options: [Disabled] [Enabled]



The following item appears when you enable **Chassis Q-Fan Control**.

Chassis Fan Profile [Standard]

Allows you to set the appropriate performance level of the ASUS Q-Fan. When set to [Standard], the chassis fan automatically adjusts depending on the chassis temperature. Set this item to [Silent] to minimize fan speed for quiet chassis fan operation, or [Turbo] to achieve maximum chassis fan speed.

Configuration options: [Standard] [Silent] [Turbo]

OPTFan1/2 Control [Disabled]

Allows you to select the optional fan control mode. When this item is set to [Duty Mode], you can configure the **OPTFan1/2 Duty** item. If you set this item to [User Mode], you are allowed to configure the **OPTFan1/2 Low Speed Temp** and **OPTFan1/2 Full Speed Temp** item.

Configuration options: [Disabled] [Duty Mode] [User Mode]



You need to connect the thermal sensor cables to the OPT_TEMP1/2 connectors to enable this function.

OPTFan1/2 Duty [50%]

Allows you to set the fan duty cycle. This item appears when the **OPTFan1/2 Control** item is set to [Duty Mode].

Configuration options: [40%] [50%] [60%] [70%] [80%] [90%]

OPTFan1/2 Low Speed Temp [25°C]

Allows you to set the temperature at which the power fan rotates at low speed.

This item appears when the **OPTFan1/2 Control** item is set to [User Mode].

Configuration options: [25°C] [30°C] [35°C] [40°C]

OPTFan1/2 Full Speed Temp [60°C]

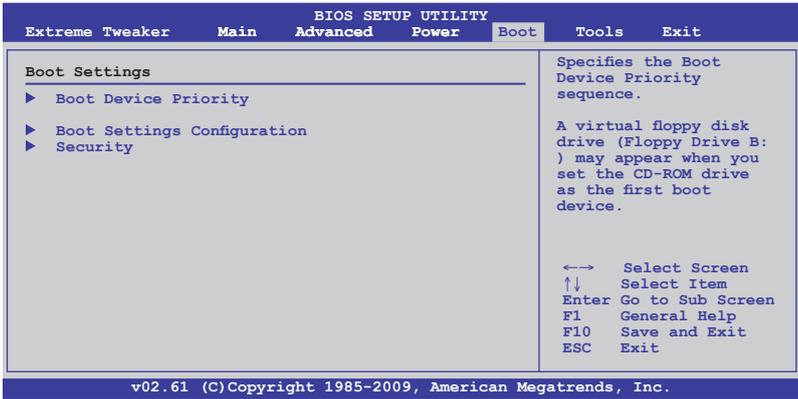
Allows you to set the temperature at which the power fan rotates at full speed.

This item appears when the **OPTFan1/2 Control** item is set to [User Mode].

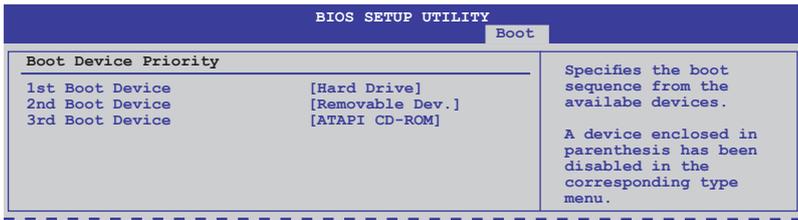
Configuration options: [60°C] [70°C] [80°C] [90°C]

3.7 Boot menu

The Boot menu items allow you to change the system boot options. Select an item then press <Enter> to display the sub-menu.



3.7.1 Boot Device Priority



1st–xxth Boot Device [xxx Drive]

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. Configuration options: [xxx Drive] [Disabled]

3.7.2 Boot Settings Configuration

BIOS SETUP UTILITY		Boot
Boot Settings Configuration		
Quick Boot	[Enabled]	Allows BIOS to skip certain tests while booting. This will decrease the time needed to boot the system.
Full Screen Logo	[Enabled]	
AddOn ROM Display Mode	[Force BIOS]	
Bootup Num-Lock	[On]	
Wait for 'F1' if Error	[Enabled]	
Hit 'DEL' Message Display	[Enabled]	

Quick Boot [Enabled]

Enabling this item allows the BIOS to skip some power on self tests (POST) while booting to decrease the time needed to boot the system. When set to [Disabled], BIOS performs all the POST items. Configuration options: [Disabled] [Enabled]

Full Screen Logo [Enabled]

This allows you to enable or disable the full screen logo display feature. Configuration options: [Disabled] [Enabled]



Set this item to [Enabled] to use the ASUS MyLogo3™ feature.

AddOn ROM Display Mode [Force BIOS]

Sets the display mode for option ROM. Configuration options: [Force BIOS] [Keep Current]

Bootup Num-Lock [On]

Allows you to select the power-on state for the NumLock. Configuration options: [Off] [On]

Wait for 'F1' If Error [Enabled]

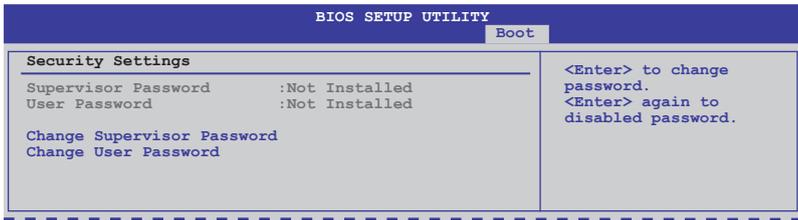
When set to Enabled, the system waits for the F1 key to be pressed when error occurs. Configuration options: [Disabled] [Enabled]

Hit 'DEL' Message Display [Enabled]

When set to Enabled, the system displays the message "Press DEL to run Setup" during POST. Configuration options: [Disabled] [Enabled]

3.7.3 Security

The Security menu items allow you to change the system security settings. Select an item then press <Enter> to display the configuration options.



Change Supervisor Password

Select this item to set or change the supervisor password. The Supervisor Password item on top of the screen shows the default Not Installed. After you set a password, this item shows Installed.

To set a Supervisor Password:

1. Select the Change Supervisor Password item and press <Enter>.
2. From the password box, type a password composed of at least six letters and/or numbers, then press <Enter>.
3. Confirm the password when prompted.

The message "Password Installed" appears after you successfully set your password.

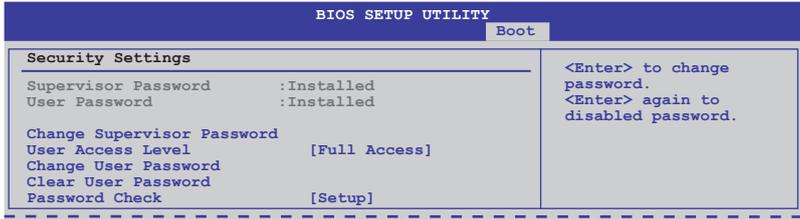
To change the supervisor password, follow the same steps as in setting a user password.

To clear the supervisor password, select the Change Supervisor Password then press <Enter>. The message "Password Uninstalled" appears.



If you forget your BIOS password, you can clear it by erasing the CMOS Real Time Clock (RTC) RAM. See section **2.6 Jumper** for information on how to erase the RTC RAM.

After you have set a supervisor password, the other items appear to allow you to change other security settings.



User Access Level [Full Access]

This item allows you to select the access restriction to the Setup items. Configuration options: [No Access] [View Only] [Limited] [Full Access]

- [No Access] prevents user access to the Setup utility.
- [View Only] allows access but does not allow change to any field.
- [Limited] allows changes only to selected fields, such as Date and Time.
- [Full Access] allows viewing and changing all the fields in the Setup utility.

Change User Password

Select this item to set or change the user password. The User Password item on top of the screen shows the default Not Installed. After you set a password, this item shows Installed.

To set a User Password:

1. Select the Change User Password item and press <Enter>.
2. On the password box that appears, type a password composed of at least six letters and/or numbers, then press <Enter>.
3. Confirm the password when prompted.

The message “Password Installed” appears after you set your password successfully.

To change the user password, follow the same steps as in setting a user password.

Clear User Password

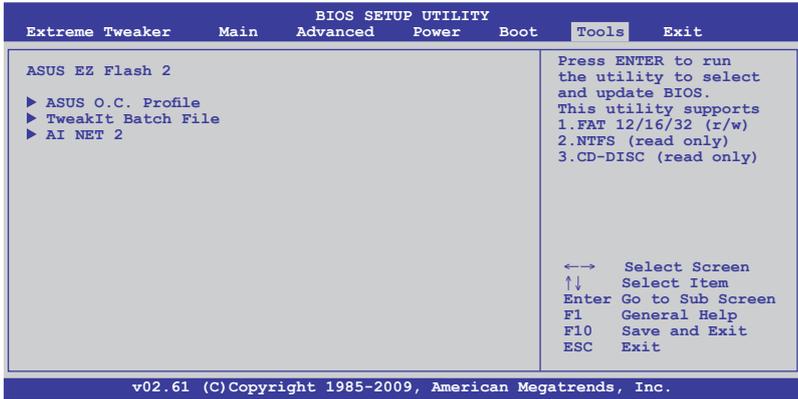
Select this item to clear the user password.

Password Check [Setup]

When set to [Setup], BIOS checks for user password when accessing the Setup utility. When set to [Always], BIOS checks for user password both when accessing Setup and booting the system. Configuration options: [Setup] [Always]

3.8 Tools menu

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

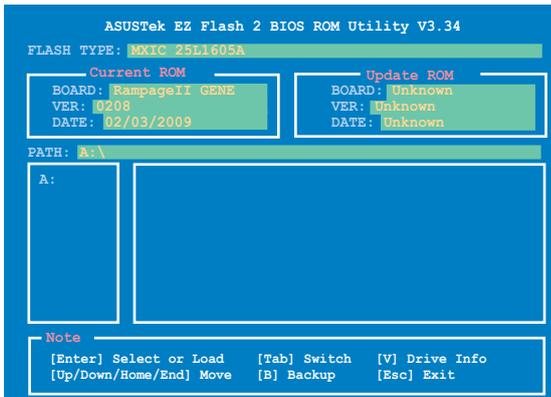


3.8.1 ASUS EZ Flash 2

Allows you to run ASUS EZ Flash 2. When you press <Enter>, a confirmation message appears. Use the left/right arrow key to select between [Yes] or [No], then press <Enter> to confirm your choice.

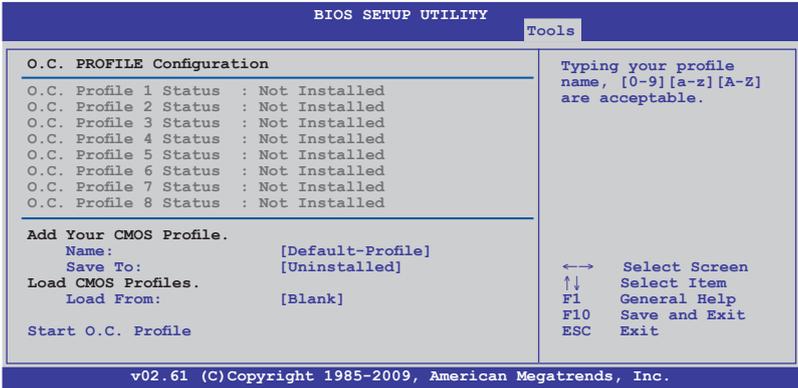


For more details, refer to [section 3.1.2 ASUS EZ Flash 2 utility](#).



3.8.2 ASUS O.C. Profile

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



Add Your CMOS Profile

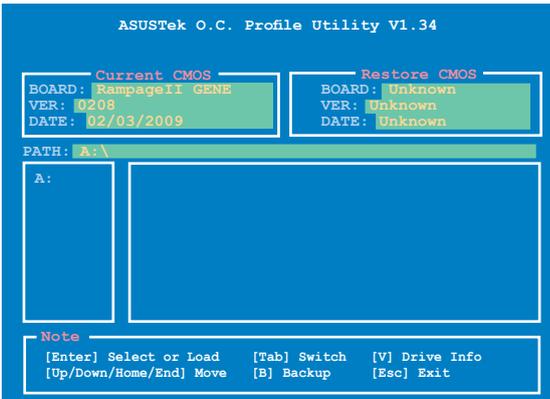
Allows you to save the current BIOS file to the BIOS Flash. In the Name sub-item, type your profile name and press <Enter>, and then choose a profile number to save your CMOS settings in the Save to sub-item.

Load CMOS Profiles

Allows you to load the previous BIOS settings saved in the BIOS Flash. Press <Enter>, and choose a profile to load.

Start O.C. Profile

Allows you to run the utility to save and load CMOS. Press <Enter> to run the utility.

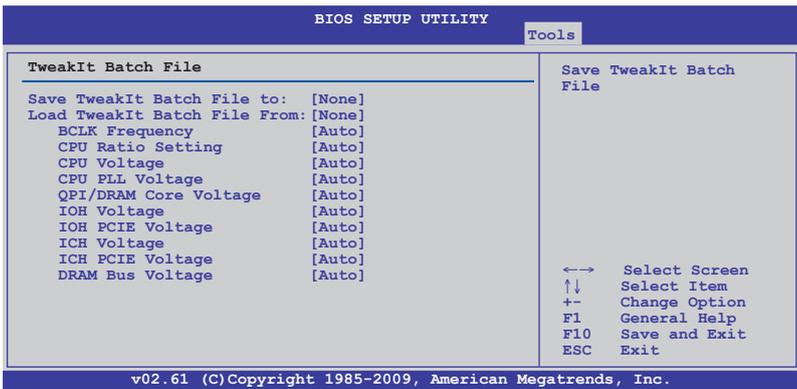




- This function supports devices such as a USB flash disk (FAT 32/16 format) or a floppy disk with single partition only.
- DO NOT shut down or reset the system while updating the BIOS to prevent the system boot failure!
- We recommend that you update the BIOS file only coming from the same memory/CPU configuration and BIOS version.
- Only the CMO file can be loaded.

3.8.3 TweakIt Batch File

This menu allows you to set the TweakIt batch files, and load the desired TweakIt batch file.



Save TweakIt Batch File to:

Allows you to save the adjusted values for specific items as a TweakIt batch file.
Configuration options: [None] [File 1] [File 2]

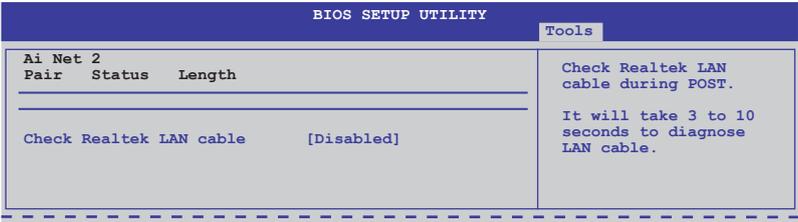
Load TweakIt Batch File to:

Allows you to load the desired TweakIt batch file.
Configuration options: [None] [File 1] [File 2]

BCLK Frequency; CPU Ratio Setting; CPU Voltage; CPU PLL Voltage; QPI/DRAM Core Voltage; IOH Voltage; IOH PCIE Voltage; ICH Voltage; ICH PCIE Voltage; DRAM Bus Voltage

Allows you to use the <+> and <-> keys to adjust the values for each item. Refer to **3.3 Extreme Tweaker** Menu for details.

3.8.4 AI NET 2

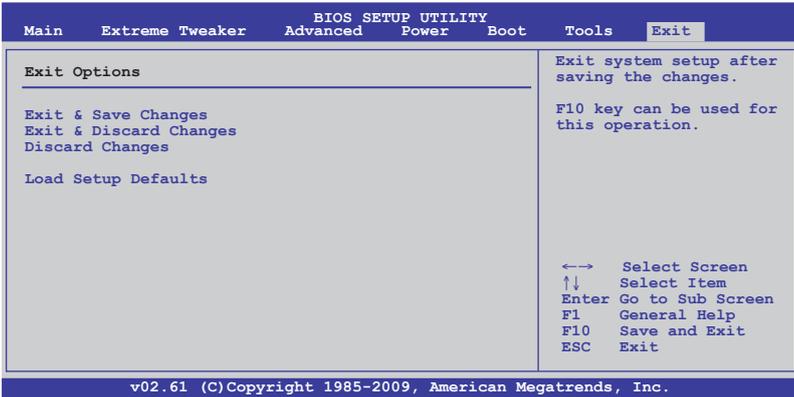


Check Realtek LAN cable [Disabled]

Enables or disables checking of the LAN cable during the Power-On Self-Test (POST). Configuration options: [Disabled] [Enabled]

3.9 Exit menu

The Exit menu items allow you to load the optimal or failsafe default values for the BIOS items, and save or discard your changes to the BIOS items.



Pressing <Esc> does not immediately exit this menu. Select one of the options from this menu or <F10> from the legend bar to exit.

Exit & Save Changes

Once you are finished making your selections, choose this option from the Exit menu to ensure the values you selected are saved to the CMOS RAM. An onboard backup battery sustains the CMOS RAM so it stays on even when the PC is turned off. When you select this option, a confirmation window appears. Select YES to save changes and exit.



If you attempt to exit the Setup program without saving your changes, the program prompts you with a message asking if you want to save your changes before exiting. Press <Enter> to save the changes while exiting.

Exit & Discard Changes

Select this option only if you do not want to save the changes that you made to the Setup program. If you made changes to fields other than System Date, System Time, and Password, the BIOS asks for a confirmation before exiting.

Discard Changes

This option allows you to discard the selections you made and restore the previously saved values. After selecting this option, a confirmation appears. Select YES to discard any changes and load the previously saved values.

Load Setup Defaults

This option allows you to load the default values for each of the parameters on the Setup menus. When you select this option or if you press <F5>, a confirmation window appears. Select YES to load default values. Select Exit & Save Changes or make other changes before saving the values to the non-volatile RAM.

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

4 Software support

4.1	Installing an operating system	4-1
4.2	Support DVD information	4-1
4.3	Software information	4-9
4.4	RAID configurations	4-33
4.5	Creating a RAID driver disk.....	4-40

4.1 Installing an operating system

This motherboard supports Windows® XP/64-bit XP/Vista 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. Use the setup procedures presented in this chapter for reference only. Refer to your OS documentation for detailed information.
- Ensure that you install Windows® XP Service Pack 2 or later versions before installing the drivers for better compatibility and system stability.

4.2 Support DVD information

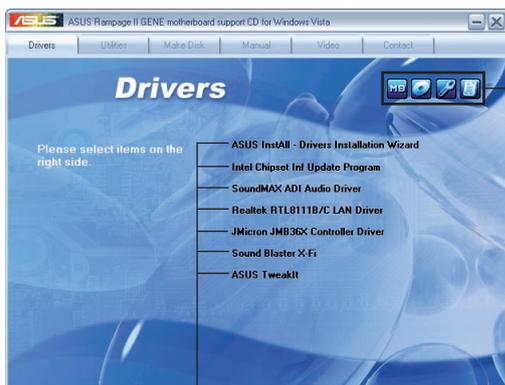
The support DVD that came with the motherboard package contains the drivers, software applications, and utilities that you can install to avail all motherboard features.



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

4.2.1 Running the support DVD

Place the support DVD to the optical drive. The DVD automatically displays the Drivers menu if Autorun is enabled in your computer.



Click an icon to display support DVD/motherboard information

Click an item to install



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

4.2.2 Drivers menu

The drivers menu shows the available device drivers if the system detects installed devices. Install the necessary drivers to activate the devices.



ASUS InstAll - Drivers Installation Wizard

Launches the ASUS InstAll driver installation wizard.

Intel Chipset Inf Update Program

Installs the Intel® chipset inf update program.

SoundMAX ADI Audio Driver

Installs the SoundMAX® audio driver and application.

Realtek RTL8111B/C LAN Driver

Installs the Realtek® Gigabit Ethernet Driver.

JMicron JMB36X Controller Driver

Installs the JMicron® JMB36X controller driver.

Sound Blaster X-Fi

Installs the Sound Blaster X-Fi driver and utility.

ASUS TweakIt

Installs the ASUS TweakIt driver and utility.

4.2.3 Utilities menu

The Utilities menu shows the applications and other software that the motherboard supports.



Click to display the next screen



Click to display the previous screen

ASUS InstAll - Installation Wizard for Utilities

Installs all of the utilities through the Installation Wizard.

ASUS Update

The ASUS Update utility allows you to update the motherboard BIOS in Windows® environment. This utility requires an Internet connection either through a network or an Internet Service Provider (ISP).

ASUS PC Probe II

This smart utility monitors the fan speed, CPU temperature, and system voltages, and alerts you of any detected problems. This utility helps you keep your computer in healthy operating condition.

ASUS AI Suite

Installs the ASUS AI Suite.

ASUS AI Direct Link

The ASUS AI Direct Link provides up to 70% transferring speed improvement when compared to traditional USB 2.0 and is the easiest and fastest way for users to enjoy large-sized data exchange of files such as movies, music, etc.

ASUS TurboV

Installs ASUS TurboV, the advanced overclocking tool for extreme O.C. record.

ASUS EPU-6 Engine

Installs the ASUS EPU-6 Engine driver and utility.

Adobe Reader 8

Installs the Adobe® Reader that allows you to open, view, and print documents in Portable Document Format (PDF).

Anti-Virus Utility

The anti-virus application scans, identifies, and removes computer viruses. View the online help for detailed information.

3DMark06 Software

Installs the Futuremark® 3DMark06 system benchmark application.

Corel MediaOne Starter

Installs the Corel MediaOne Starter application to easily manage, edit share and protect your multimedia data.

Ulead Burn.Now

Installs the Ulead Burn.Now application for Audio DVD, CD and data disc creation.

Ulead PhotoImpact 12 SE

Installs the Ulead PhotoImpact 12 SE software.

Winzip 11

Installs the Winzip utility for easy file-compression and protection.

4.2.4 Make disk menu

The Make disk menu contains items to create the Intel ICH10R driver disk.



Intel ICH10R 32/64 bit AHCI/RAID Driver

Allows you to create an ICH10R 32/64bit AHCI/RAID driver disk.

JMicron JMB36X 32/64 bit RAID/AHCI Driver

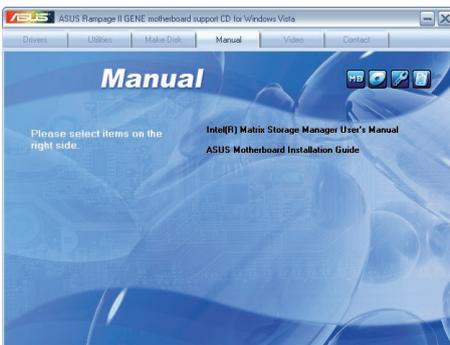
Allows you to create a JMicron® JMB36X RAID/AHCI driver disk for 32/64bit system.

4.2.5 Manual menu

The Manuals menu contains a list of supplementary user manuals. Click an item to open the folder of the user manual.



Most user manual files are in Portable Document Format (PDF). Install the Adobe® Acrobat® Reader from the Utilities menu before opening a user manual file.



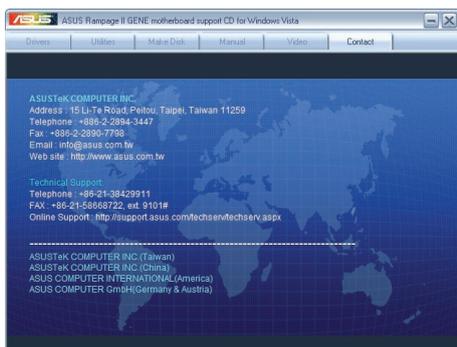
4.2.6 Video menu

Click the Video tab to display a list of video clips. Click the video titles to watch ROG users' outstanding performances with ROG motherboards.



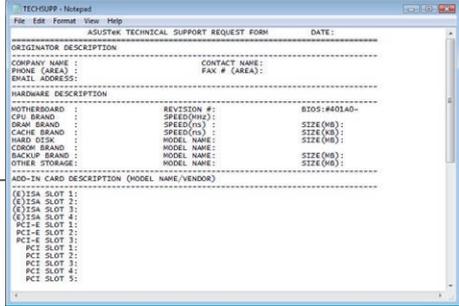
4.2.7 ASUS Contact information

Click the Contact tab to display the ASUS contact information. You can also find this information on the inside front cover of this user guide.



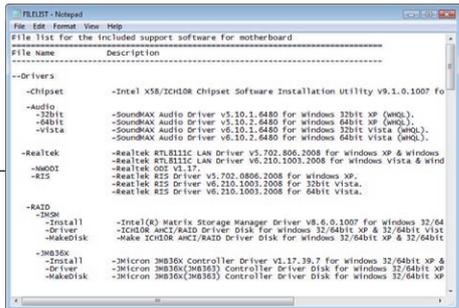
Technical support form

Displays the ASUS Technical Support Request Form that you have to fill out when requesting technical support.



Filelist

Displays the contents of the support DVD and a brief description of each in text format.



4.3 Software information

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

4.3.1 ASUS MyLogo3™

The ASUS MyLogo3™ utility lets you customize the boot logo. The boot logo is the image that appears on screen during the Power-On Self-Tests (POST). The ASUS MyLogo3™ is automatically installed when you install the ASUS Update utility from the support DVD. See section 4.2.3 **Utilities menu** for details.



- Before using the ASUS MyLogo3™, use the ASUS Update utility to make a copy of your original BIOS file, or obtain the latest BIOS version from the ASUS website. See section 3.1.1 **ASUS Update utility**.
- Ensure that the BIOS item Full Screen Logo is set to [Enabled] if you wish to use ASUS MyLogo3™. See section 3.7.2 **Boot Settings Configuration**.
- You can create your own boot logo image in GIF file formats.

To launch the ASUS MyLogo3™:

1. Launch the ASUS Update utility. Refer to section 3.1.1 **ASUS Update utility** for details.
2. Select **Options** from the drop down menu, then click **Next**.
3. Check the option **Launch MyLogo** to replace system boot logo before flashing BIOS, then click **Next**.
4. Select **Update BIOS** from a file from the drop down menu, then click **Next**.
5. When prompted, locate the new BIOS file, then click **Next**. The ASUS MyLogo window appears.
6. From the left window pane, select the folder that contains the image you intend to use as your boot logo.



- 7. When the logo images appear on the right window pane, select an image to enlarge by clicking on it.



- 8. Adjust the boot image to your desired size by selecting a value on the Ratio box.



- 9. When the screen returns to the ASUS Update utility, flash the original BIOS to load the new boot logo.
- 10. After flashing the BIOS, restart the computer to display the new boot logo during POST.

4.3.2 Sound Blaster X-Fi audio utility

With the SupremeFX X-Fi technology supported, you will be able to enjoy excellent audio quality and experience realistic sound effects through the ADI AD2000B audio codec and Sound Blaster X-Fi interface. Activating X-Fi's CMSS3D, Crystalizer, and EAX will deliver accurate virtual surround sound and enhanced audio dynamics, which amount to ultimate gaming experience.

To install Sound Blaster X-Fi:

1. Place the support DVD to the optical drive. The Drivers installation tab appears if your computer has an enabled Autorun feature.
2. Click the **Drivers** tab and click **SoundMAX ADI Audio Driver**.
3. Follow the screen instructions to complete installation.
4. Click the support DVD **Utilities** tab and click **Sound Blaster X-Fi**.
5. Follow the screen instructions to complete installation.



You need to install SoundMAX ADI Audio Driver to use Sound Blaster X-Fi audio utility.

If the Sound Blaster X-Fi audio utility is successfully installed, you will find the **Volume Panel** icon on the notification area.



Click the Volume Panel icon to display a list of Creative® media utilities that help you manage and play your media files. Click **Help** in each utility control panel to know more about them.



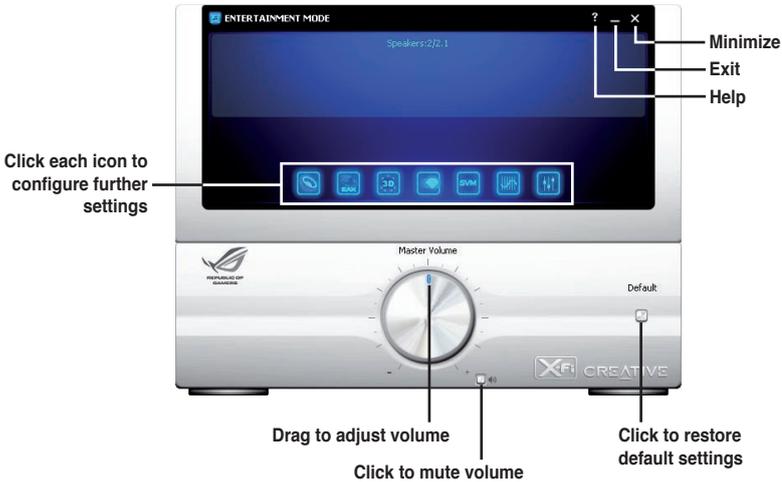
Double-click the Volume Panel icon to launch the Mixer control panel.

Click **Main Display**  Main Display to go to the Main Panel.



Main Panel

The Main Panel displays all the features and functions the SupremeFX X-Fi supports. Click each icon to configure the following settings (from left to right): Speakers and Headphone, EAX Effects, X-Fi CMSS-3D, X-Fi Crystalizer, Smart Volume Management, Graphic Equalizer, and Mixer.



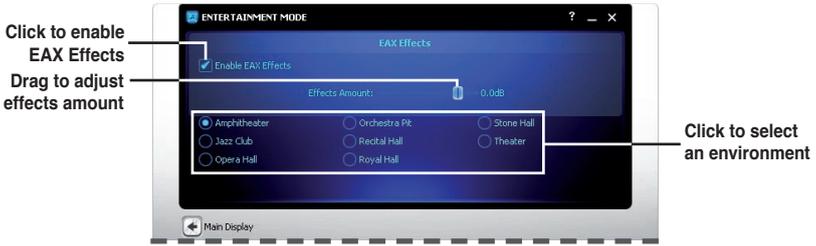
Speakers and Headphone Panel

This panel allows you to configure speakers/headphone settings including bass management and speaker volume. You can also test each speaker channel.



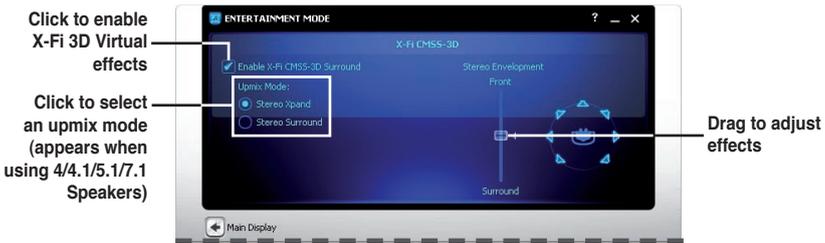
EAX Effects Panel

This panel contains environment effects that you can select to obtain a sense of realism during interactive 3D games.



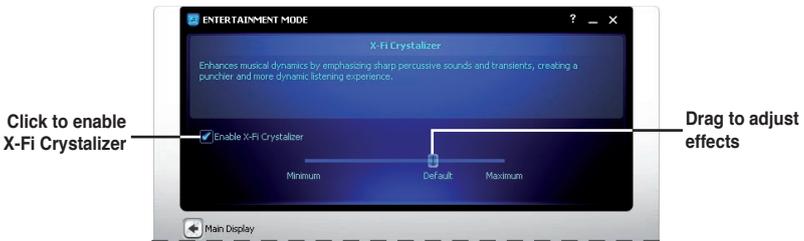
X-Fi CMSS-3D Panel

This panel allows you to configure 3D virtual surround effects.



X-Fi Crystalizer Panel

Enable X-Fi Crystalizer to obtain more audio dynamics.



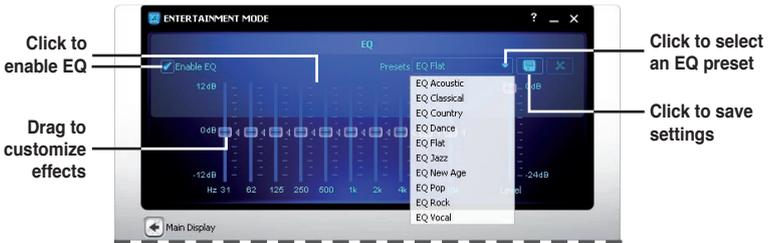
Smart Volume Management Panel

Enable Smart Volume Management (SVM) to avoid large volume fluctuations.



Graphic Equalizer Panel

This panel allows you to customize equalizer settings or select an EQ presets.



Mixer Panel

This panel allows you to select a recording device and adjust recording/playback devices volume.



4.3.3 ASUS PC Probe II

PC Probe II is a utility that monitors the computer's vital components, and detects and alerts you of any problem with these components. PC Probe II senses fan rotations, CPU temperature, and system voltages, among others. Because PC Probe II is software-based, you can start monitoring your computer the moment you turn it on. With this utility, you are assured that your computer is always at a healthy operating condition.

Installing PC Probe II

To install PC Probe II on your computer:

1. Place the support DVD to the optical drive. The Drivers installation tab appears if your computer has an enabled Autorun feature.



If Autorun is not enabled in your computer, browse the contents of the support DVD to locate the setup.exe file from the ASUS PC Probe II folder. Double-click the **setup.exe** file to start installation.

2. Click the **Utilities** tab, then click **ASUS PC Probe II**.
3. Follow the screen instructions to complete installation.

Launching PC Probe II

You can launch the PC Probe II right after installation or anytime from the Windows® desktop.

To launch the PC Probe II from the Windows® desktop, click **Start > All Programs > ASUS > PC Probe II > PC Probe II v1.xx.xx**. The PC Probe II main window appears.

After launching the application, the PC Probe II icon appears in the Windows® taskbar. Click this icon to close or restore the application.

Using PC Probe II

Main window

The PC Probe II main window allows you to view the current status of your system and change the utility configuration. By default, the main window displays the Preference section. You can close or restore the Preference section by clicking on the triangle on the main window right handle.



Click to close the Preference panel

Hardware monitor panels

The hardware monitor panels display the current value of a system sensor such as fan rotation, CPU temperature, and voltages.

The hardware monitor panels come in two display modes: hexagonal (large) and rectangular (small). When you check the Enable Monitoring Panel option from the Preference section, the monitor panels appear on your computer's desktop.



Large display



Small display

Changing the monitor panels position

To change the position of the monitor panels in the desktop, click the arrow down button of the Scheme options, then select another position from the list box. Click OK when finished.



Moving the monitor panels

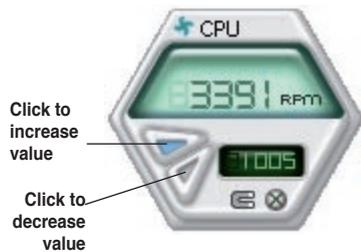
All monitor panels move together using a magnetic effect. If you want to detach a monitor panel from the group, click the horseshoe magnet icon. You can now move or reposition the panel independently.



Adjusting the sensor threshold value

You can adjust the sensor threshold value in the monitor panel by clicking the  or  buttons. You can also adjust the threshold values using the Config window.

You cannot adjust the sensor threshold values in a small monitoring panel.



Monitoring sensor alert

The monitor panel turns red when a component value exceeds or is lower than the threshold value. Refer to the illustrations below.



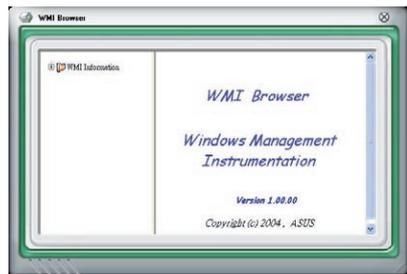
Large display



Small display

WMI browser

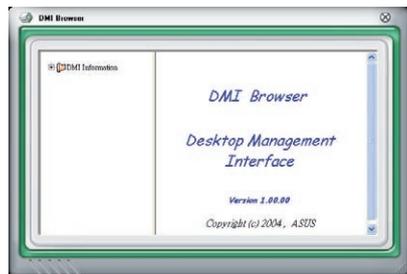
Click **WMI** to display the WMI (Windows Management Instrumentation) browser. This browser displays various Windows® management information. Click an item from the left panel to display on the right panel. Click the plus sign (+) before WMI Information to display the available information.



You can enlarge or reduce the browser size by dragging the bottom right corner of the browser.

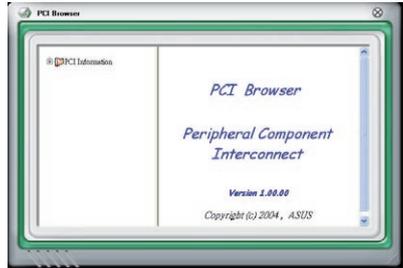
DMI browser

Click **DMI** to display the DMI (Desktop Management Interface) browser. This browser displays various desktop and system information. Click the plus sign (+) before DMI Information to display the available information.



PCI browser

Click **PCI** to display the PCI (Peripheral Component Interconnect) browser. This browser provides information on the PCI devices installed on your system. Click the plus sign (+) before the PCI Information item to display available information.

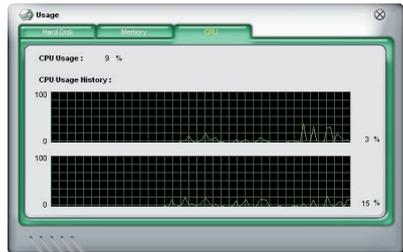


Usage

The Usage browser displays real-time information on the CPU, hard disk drive space, and memory usage. Click **USAGE** to display the Usage browser.

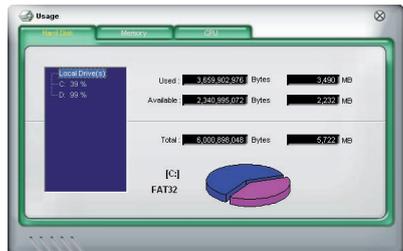
CPU usage

The CPU tab displays real-time CPU usage in line graph representation. If the CPU has an enabled Hyper-Threading, two separate line graphs display the operation of the two logical processors.



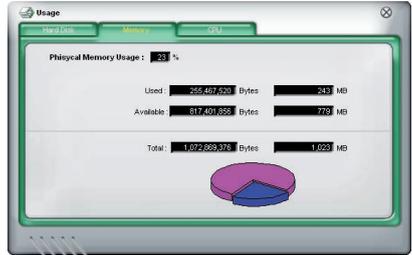
Hard disk drive space usage

The Hard Disk tab displays the used and available hard disk drive space. The left panel of the tab lists all logical drives. Click a hard disk drive to display the information on the right panel. The pie chart at the bottom of the window represents the used (blue) and the available HDD space.



Memory usage

The Memory tab shows both used and available physical memory. The pie chart at the bottom of the window represents the used (blue) and the available physical memory.



Configuring PC Probe II

Click  to view and adjust the sensor threshold values.

The Config window has two tabs: Sensor/Threshold and Preference. The Sensor/Threshold tab enables you to activate the sensors or to adjust the sensor threshold values. The Preference tab allows you to customize sensor alerts, or change the temperature scale.

Enabled	Sensor Name	Nominal Value	Current Value	Threshold
<input checked="" type="checkbox"/>	CPU		43	60 °C
<input checked="" type="checkbox"/>	MB		34	45 °C

Loads the default threshold values for each sensor

Applies your changes

Cancel or ignores your changes

Loads your saved configuration

Saves your configuration

4.3.4 ASUS AI Suite

ASUS AI Suite allows you to launch EPU-6 Engine, TurboV, Fan Xpert, CPU Level Up, and AI Nap utilities easily.

Installing AI Suite

To install AI Suite on your computer:

1. Place the support DVD to the optical drive. The Drivers installation tab appears if your computer has an enabled Autorun feature.
2. Click the Utilities tab, then click **AI Suite**.
3. Follow the screen instructions to complete installation.

Launching AI Suite

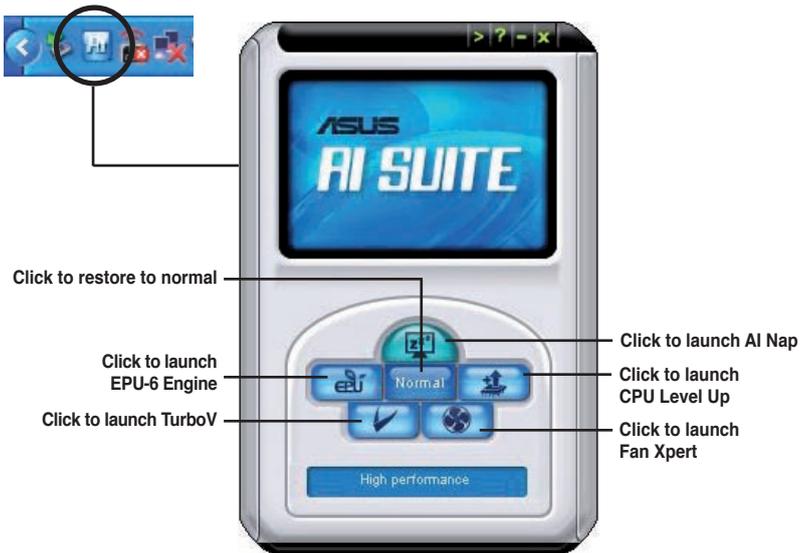
You can launch AI Suite right after installation or anytime from the Windows® desktop.

To launch AI Suite from the Windows® desktop, click **Start > All Programs > ASUS > AI Suite > AI Suite v1.xx.xx**. The AI Suite main window appears.

After launching the application, the AI Suite icon appears in the Windows® taskbar. Click this icon to close or restore the application.

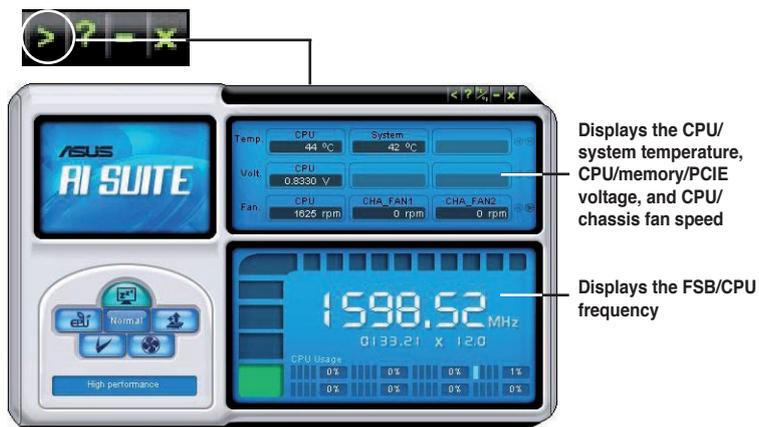
Using AI Suite

Click the EPU-6 Engine, TurboV, Fan Xpert, CPU Level Up, or AI Nap icon to launch the utility, or click the Normal icon to restore the system to normal state.



Other feature buttons

Click  on right corner of the main window to open the monitor window.



Click  on right corner of the expanded window to switch the temperature from degrees Centigrade to degrees Fahrenheit.

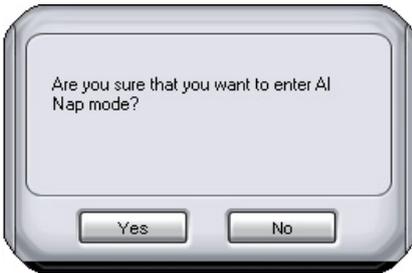


4.3.5 ASUS AI Nap

This feature allows you to minimize the power consumption of your computer whenever you are away. Enable this feature for minimum power consumption and a more quiet system operation.

After installing AI Suite from the bundled support DVD, you can launch the utility by double-clicking the AI Suite icon on the Windows OS taskbar and click the AI Nap button on the AI Suite main window.

Click **Yes** on the confirmation screen.



To exit AI Nap mode, press the system power or mouse button then click **Yes** on the confirmation screen.



To switch the power button functions from AI Nap to shutting down, just right click the **AI Suite** icon on the OS taskbar, select **AI Nap** and click **Use power button**. Unclick the the item to switch the function back.

4.3.6 ASUS Fan Xpert

Asus Fan Xpert intelligently allows you to adjust both the CPU and chassis fan speeds according to different ambient temperatures caused by different climate conditions in different geographic regions and your PC's system loading. The built-in variety of useful profiles offer flexible controls of fan speed to achieve a quiet and cool environment.

Install AI Suite from the bundled support DVD. To launch the ASUS Fan Xpert utility, double-click the **AI Suite** icon on the Windows® notification bar and click the **Fan Xpert** button on the AI Suite main window.

Click the dropdown list button and display the fan types. Select **CPU Fan** or **Chassis Fan**.



Fan profile modes

- **Disable:** Select this mode to disable the **Fan Xpert** function.
- **Standard:** This mode makes the fan adjust speed in moderate pattern.
- **Silent:** This mode minimizes fan speed for quiet fan operation.
- **Turbo:** This mode boosts the fan to achieve maximal fan speed for the best cooling effect.
- **Intelligent:** This mode automatically adjusts the CPU fan speed with the ambient temperature.
- **Stable:** This mode keeps the CPU fan at the same speed to avoid noise caused by the unsteady fan rotation. However, the fan will speed up when the temperature exceeds 70°C.
- **User:** This mode allows you to change the CPU fan profile under certain limitation.



For **Chassis Fan**, only Disable/Standard/Silent/Turbo modes could be selected.



Click to close the Calibration window

The image shows the ASUS Fan Xpert calibration window. On the left, there is a graph with a blue line and several data points. To the right of the graph is a table with fan speed percentages and corresponding RPM values. Below the table is a 'Calibrate' button. At the bottom of the window are 'Apply' and 'Cancel' buttons. A note at the bottom right explains that if the CPU temperature is too high, the fan will keep full speed for protection.

100%	N/A rpm
90%	N/A rpm
80%	N/A rpm
70%	N/A rpm
60%	N/A rpm
50%	N/A rpm
40%	N/A rpm
30%	N/A rpm
20%	N/A rpm

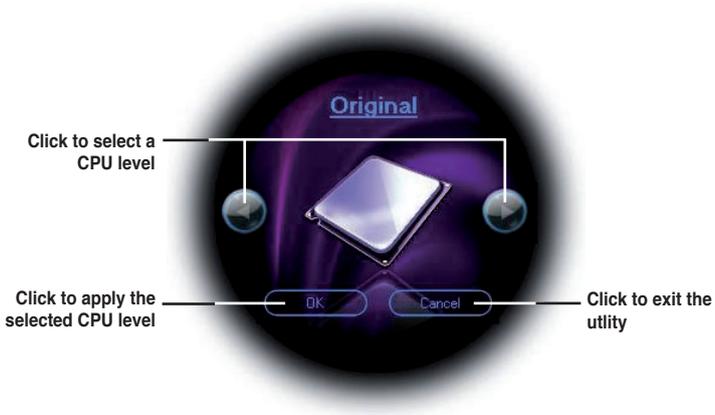
Note: If the CPU temperature is too high, CPU Fan will keep full speed for CPU protection. So the result of calibration is not correct.

Click to get the calibration between the fan rotation and fan speed ratio

4.3.7 CPU Level Up

The CPU Level Up allows you to overclock immediately with OC profile presets in Windows® environment without the hassle of entering BIOS.

After installing AI Suite from the bundled Support DVD, launch the utility by double-clicking the AI Suite icon on the Windows® OS taskbar and click the CPU Level Up button on the AI Suite main window.



4.3.8 ASUS EPU-6 Engine

ASUS EPU-6 Engine is an energy-efficient tool that satisfies different computing needs. This utility provides four modes that you can select to enhance system performance or save power. Selecting Auto mode will have the system shift modes automatically according to current system status. You can also customize each mode by configuring settings like CPU frequency, vCore Voltage, and Fan Control.

Installing 6 Engine

To install 6 Engine on your computer:

1. Place the support DVD to the optical drive. The Drivers installation tab appears if your computer has an enabled Autorun feature.
2. Click the **Drivers** tab and then click **ASUS EPU-Six Engine**.
3. Follow the screen instructions to complete installation.

Launching 6 Engine

Launch 6 Engine by double-clicking the 6 Engine icon on the Windows® notification area.



The first time you launch 6 Engine, the following message will appear, asking you to run Calibration first. Running calibration allows the system to detect CPU properties to optimize power management.



Click **Run Calibration** and wait for a few seconds. Then, the 6 Engine main menu appears.

6 Engine main menu

The screenshot shows the ASUS 6 Engine main menu. At the top, there are two callout boxes: one for 'CPU' showing 'Current CPU Power: 2.50' and 'Total CPU Energy Saving: 15.711143 x 10⁻³ kWh', and another for 'VGA' with a warning message: 'No VGA detected, please install supported VGA card! VGA DDC has been disabled automatically. For install and enable, ASUS SmartCenter.' Below these is the main interface with icons for CPU, VGA, Chipset, Memory, H.D.D., and Fan. A 'Reduced CO2 Emission' bar shows '0.000 mg' and 'Since 2007/04/17 03:39'. A 'Current' button is next to it. The bottom section shows 'Mode Setting' with 'High Performance' selected, and 'Current Status' with a 'Tranquility' icon. There are buttons for 'Auto', 'Turbo', 'High Performance', 'Medium Power Saving', and 'Max. Power Saving'. A 'Calibrate' button is also present. The bottom right has 'Reliability', 'Performance', 'Convenience', 'Energy Saving', and an 'Exit' button.

Displays CPU Power and Total CPU Energy Saving

Displays the following message if no VGA power saving engine is detected.

Lights up when power saving engine is activated

Displays the amount of CO2 reduced

***Shifts between the display of Total and Current CO2 reduced**

Displays current mode

Auto Mode

Turbo Mode

High Performance Mode

Medium Power Saving Mode

Max. Power Saving Mode

Runs calibration

Displays the system properties of each mode

Exits the utility

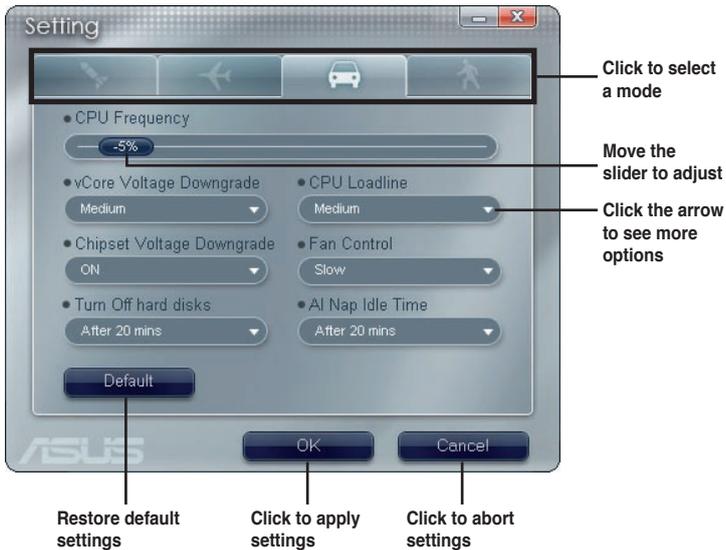
Advanced settings for each mode (refer to the next page for further information)



- * Click **Current**  to show the CO2 that has been reduced since you click the **Renew** button .
- * Click **Total**  to show the total CO2 that has been reduced since you launched 6 Engine.

Advanced settings menu

Click **Setting** () from the 6 Engine main menu to display configuration options in each mode. Some options in certain modes are dimmed, meaning that they are not available.



Configuration options in Advanced settings menu

The following lists the configuration options and their definitions in Advanced settings menu.

- **CPU Frequency:** Raises or lowers CPU frequency to a certain percentage.
- **vCore Voltage Downgrade:** Lowers CPU vCore voltage.
 - **High:** Downgrades voltage to the highest level for CPU power saving.
 - **Medium:** Downgrades voltage to the medium level.
 - **Small:** Downgrades voltage to the minimum level.
- **Chipset Voltage Downgrade:** Turns on/off chipset voltage.
- **Turn Off hard disks:** Turns off hard disk drives when they are not accessed after a certain time.
- **CPU Loadline:** Sets up the CPU loadline to manage CPU power saving.
 - **Light:** Saves CPU power to the minimum level.
 - **Medium:** Saves CPU power to the medium level.
 - **Heavy:** Saves CPU power to the highest level.

- **Fan Control:** Adjusts fan speeds to reduce noise and save system power.
 - **Quiet:** Lowers CPU fan speed and shuts off two chassis fans.
 - **Slow:** Lowers CPU fan and two chassis fan speeds.
- **AI Nap Idle Time:** Enters AI Nap mode after a certain time during system idle process.

Refer to the following table for the configuration options in each mode.

Configuration options	Turbo Mode	High Performance Mode	Medium Power Saving Mode	Maximum Power Saving Mode
CPU Frequency	Overclocking +1% to +30%	N/A	Downclocking -1% to -50%	Downclocking -1% to -50%
vCore Voltage Downgrade	N/A	N/A	Small/Medium/High	Small/Medium/High
Chipset Voltage Downgrade	N/A	N/A	On/Off	On/Off
Turn Off hard disks	Never/After 3 mins–After 5 hours			
CPU Loadline	N/A	N/A	Light/Medium/Heavy	Light/Medium/Heavy
Fan Control	N/A	N/A	Keep Bios Setting/Slow	Keep Bios Setting/Quiet
AI Nap Idle Time	Never/After 3 mins–After 5 hours			



The TweakIt function is disabled when 6-Engine is set to Auto Mode. To enable TweakIt function, set 6-Engine to other mode option. Or, you may click the TweakIt icon on the Windows® notification area and click **Unlock** to enable the TweakIt function.



Ensure that you've installed TweakIt driver from the bundled Support DVD.

4.3.9 ASUS TurboV

ASUS TurboV allows you to overclock the CPU frequency, CPU voltage, QPI/ Memory controller voltage, and DRAM voltage in Windows® environment and takes effect in real-time without exiting and rebooting the OS.



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



- For system stability, all changes made in ASUS TurboV will not be saved to BIOS settings and will not be kept on the next system boot. Use the **Save Profile** function to save your customized overclocking settings and manually load the profile after Windows starts.
- For system stability, set ASUS EPU 6-Engine to **High Performance Mode** while using ASUS TurboV.

To launch ASUS TurboV

1. Install the ASUS TurboV utility from the motherboard support DVD.
2. Click **start > All Programs > ASUS > TurboV > TurboV**.

Save the current settings as a profile

Shows more settings

Default settings **Target settings**

Applies all changes immediately

Undoes all changes without applying

Voltage Adjustment bars



Overclocking tips:

- For advanced overclockability, adjust first the **Extreme Tweaker** items in BIOS, and then proceed more detailed adjustments using TurboV.
- The **BCLK Frequency** setting in BIOS affects the adjustable range of CPU Frequency in TurboV.

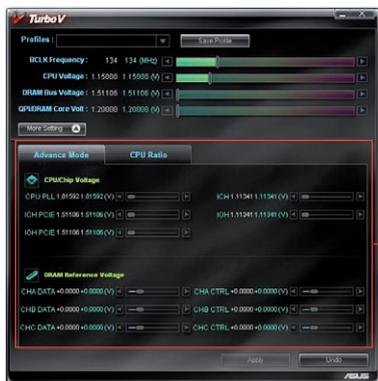
For advanced overclocking: Set BCLK Frequency in BIOS to 200MHz or above for an adjustment range from 200MHz to 500MHz in TurboV.

For general overclocking: Set BCLK Frequency in BIOS below 200MHz for an adjustment range from 100MHz to 250MHz in TurboV.

Advanced settings menu

Click **More Setting** from the TurboV main screen to display detailed configuration options for CPU/chip voltage, DRAM Reference voltage, and CPU ratio.

Advance Mode



Advanced CPU and DRAM voltage settings

CPU Ratio Mode



Adjusts CPU core ratio

Displays CPU frequency



- Only Intel® Core™ i7 Extreme Edition processors support the CPU Ratio function.
- Set the **CPU Ratio Setting** BIOS item to [Auto] before using the CPU Ratio function in TurboV. See page 3-25 for details.
- The value shown in CPU Ratio Mode may be higher than your CPU default setting. This is due to Intel's Dynamic Speed Technology of automatic CPU ratio overlocking. You may turn off this feature in BIOS for manual CPU ratio adjustment. See page 3-25 for details.

4.4 RAID configurations

The motherboard comes with the Intel® ICH10R Southbridge controller that supports RAID 0, RAID 1, RAID 10, and RAID 5 for six independent Serial ATA channels.

4.4.1 RAID definitions

RAID 0 (Data striping) optimizes two identical hard disk drives to read and write data in parallel, interleaved stacks. Two hard disks perform the same work as a single drive but at a sustained data transfer rate, double that of a single disk alone, thus improving data access and storage. Use of two new identical hard disk drives is required for this setup.

RAID 1 (Data mirroring) copies and maintains an identical image of data from one drive to a second drive. If one drive fails, the disk array management software directs all applications to the surviving drive as it contains a complete copy of the data in the other drive. This RAID configuration provides data protection and increases fault tolerance to the entire system. Use two new drives or use an existing drive and a new drive for this setup. The new drive must be of the same size or larger than the existing drive.

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

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

Intel® Matrix Storage. The Intel® Matrix Storage technology supported by the ICH10R chip allows you to create a RAID 0, RAID 1, RAID 5, and RAID 10 function to improve both system performance and data safety. You can also combine two RAID sets to get higher performance, capacity, or fault tolerance provided by the difference RAID function. For example, RAID 0 and RAID 1 set can be created by using only two identical hard disk drives.



If you want to boot the system from a hard disk drive included in a created RAID set, copy first the RAID driver from the support DVD to a floppy disk before you install an operating system to the selected hard disk drive. Refer to section **4.5 Creating a RAID driver disk** for details.

4.4.2 Installing Serial ATA hard disks

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

To install the SATA hard disks for a RAID configuration:

1. Install the SATA hard disks into the drive bays.
2. Connect the SATA signal cables.
3. Connect a SATA power cable to the power connector on each drive.

4.4.3 Setting the RAID item in BIOS

You must enable the RAID function in the BIOS Setup before creating RAID set(s) using SATA HDDs. To do this:

1. Enter the BIOS Setup during POST.
2. Go to the **Main** menu > **Storage Configuration**, and then press <Enter>.
3. Set the **Configure SATA as** item to [RAID].
4. Save your changes, and then exit the BIOS Setup.



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

4.4.4 Intel® Matrix Storage Manager option ROM utility

The Intel® Matrix Storage Manager Option ROM utility allows you to create RAID 0, RAID 1, RAID 10 (RAID 0+1), and RAID 5 set(s) from Serial ATA hard disk drives that are connected to the Serial ATA connectors supported by the Southbridge.

To enter the Intel® Matrix Storage Manager option ROM utility:

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

```
Intel(R) Matrix Storage Manager option ROM v8.0.0.1038 ICH10R wRAID5
Copyright(C) 2003-08 Intel Corporation. All Rights Reserved.

[ MAIN MENU ]
1. Create RAID Volume
2. Delete RAID Volume
3. Reset Disks to Non-RAID
4. Exit

[ DISK/VOLUME INFORMATION ]

RAID Volumes:
None defined.

Physical Disks:
Port Drive Model Serial # Size Type/Status (Vol ID)
0 ST3160812AS 9LS0H5A4 149.0GB Non-RAID Disk
1 ST3160812AS 9LS0F4HL 149.0GB Non-RAID Disk
2 ST3160812AS 3LS0JYL8 149.0GB Non-RAID Disk
3 ST3160812AS 9LS0B55H 149.0GB Non-RAID Disk

[↑↓]-Select [ESC]-Exit [ENTER]-Select Menu
```

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



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

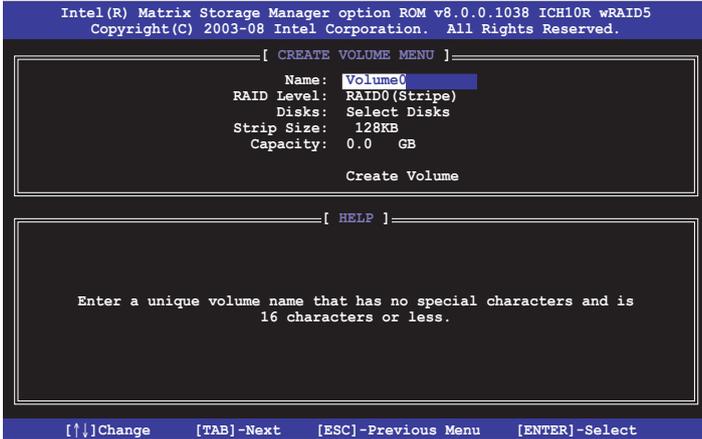


The utility supports maximum four hard disk drives for RAID configuration.

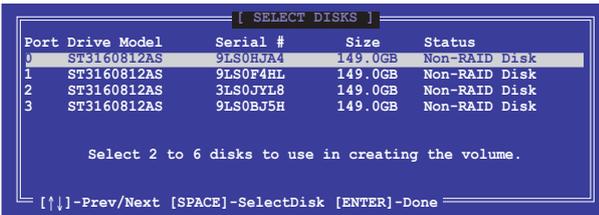
Creating a RAID set

To create a RAID set

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



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



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

6. Use the up/down arrow key to select the stripe size for the RAID array (for RAID 0, 10 and 5 only), and then press <Enter>. The available stripe size values range from 4 KB to 128 KB. The following are typical values:
RAID 0: 128KB
RAID 10: 64KB
RAID 5: 64KB



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

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



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

Deleting a RAID set



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

To delete a RAID set

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

```
Intel(R) Matrix Storage Manager option ROM v8.0.0.1038 ICH10R wRAID5
Copyright(C) 2003-08 Intel Corporation. All Rights Reserved.

[ DELETE VOLUME MENU ]

Name      Level      Drives    Capacity  Status    Bootable
Volume0   RAID0(Stripe)  2         298.0GB   Normal    Yes

[ HELP ]

Deleting a volume will reset the disks to non-RAID.
WARNING: ALL DISK DATA WILL BE DELETED.

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

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

```
[ DELETE VOLUME VERIFICATION ]

ALL DATA IN THE VOLUME WILL BE LOST!

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

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

Exiting the Intel® Matrix Storage Manager

To exit the utility

1. From the utility main menu, select **4. Exit**, and then press <Enter>. The following warning message appears.



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

4.5 Creating a RAID driver disk

A floppy disk with the RAID driver is required when installing Windows® XP/Vista and later operating system on a hard disk drive that is included in a RAID set. For Windows Vista user, you can create a RAID driver disk with a floppy disk drive or a USB flash disk drive.

4.5.1 Creating a RAID driver disk without entering the OS

To create a RAID/SATA driver disk without entering the OS:

1. Boot your computer.
2. Press during POST to enter the BIOS setup utility.
3. Set the optical drive as the primary boot device.
4. Insert the support DVD into the optical drive.
5. Save changes and exit BIOS.
6. When the **Make Disk** menu appears, press <a> or to create a 32/64bit **Intel ICH10R RAID driver disk**.
7. Insert a formatted floppy disk into the floppy drive then press <Enter>.
8. Follow the succeeding screen instructions to complete the process.

4.5.2 Creating a RAID driver disk in Windows®

To create a RAID driver disk in Windows®:

1. Start Windows®.
2. Place the motherboard support DVD into the optical drive.
3. Go to the **Make disk** menu, and then click **Intel ICH10R 32/64 bit RAID Driver Disk** to create an Intel® ICH10R RAID driver disk.
4. Insert a floppy disk into the floppy disk drive.
5. Follow the succeeding screen instructions to complete the process.



Write-protect the floppy disk to avoid computer virus infection.

To install the RAID driver in Windows® XP:

1. During the OS installation, the system prompts you to press the F6 key to install third-party SCSI or RAID driver.
2. Press <F6>, and then insert the floppy disk with RAID driver into the floppy disk drive.
3. When prompted to select the SCSI adapter to install, ensure that you select **Intel(R) SATA RAID Controller (Desktop ICH10R)**.
4. Follow the succeeding screen instructions to complete the installation.

To install the RAID driver in Windows® Vista™:

1. Insert the floppy disk/USB device with RAID driver into the floppy disk drive/USB port.
2. During the OS installation, select **Intel(R) SATA RAID Controller (Desktop ICH10R)**.
3. Follow the succeeding screen instructions to complete the installation.

This chapter describes how to install and configure multiple ATI® CrossFireX™ and NVIDIA® SLI™ graphics cards.

5 Multiple GPU technology support

5.1	ATI® CrossFireX™ technology	5-1
5.2	NVIDIA® SLI™ technology	5-5

5.1 ATI® CrossFireX™ technology

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

5.1.1 Requirements

- You should have two identical CrossFireX-ready graphics cards or one CrossFireX-ready dual-GPU graphics card that are ATI® certified.
- Ensure that your graphics card driver supports the ATI CrossFireX technology. Download the latest driver from the AMD website (www.amd.com).
- Ensure that your power supply unit (PSU) can provide at least the minimum power required by your system. See page 2-37 for details.



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

5.1.2 Before you begin

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

To uninstall existing graphics card drivers

1. Close all current applications.
2. For Windows XP, go to **Control Panel > Add/Remove Programs**.
For Windows Vista, go to **Control Panel > Programs and Features**.
3. Select your current graphics card driver/s.
4. For Windows XP, select **Add/Remove**.
For Windows Vista, select **Uninstall**.
5. Turn off your computer.

5.1.3 Installing CrossFireX graphics cards

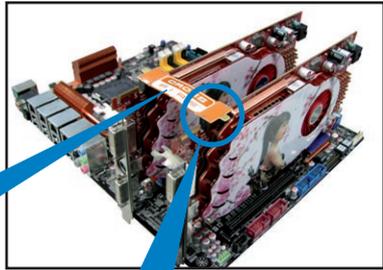


The following pictures are for reference only. The graphics cards and the motherboard layout may vary with models, but the installation steps remain the same.

1. Prepare two CrossFireX-ready graphics cards.
2. Insert the two graphics card into the PCIEX16 slots.
3. Ensure that the cards are properly seated on the slots.



4. Align and firmly insert the CrossFireX bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.

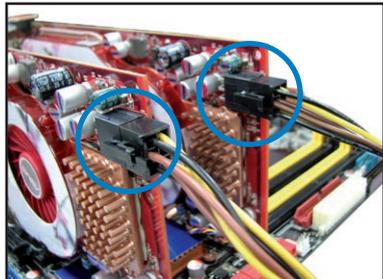


CrossFireX bridge



Goldfingers

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



5.1.4 Installing the device drivers

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



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

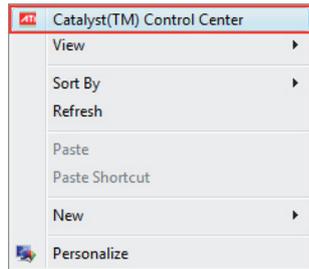
5.1.5 Enabling the ATI® CrossFireX™ technology

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

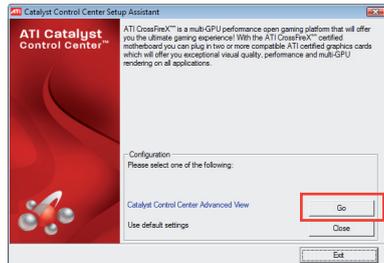
Launching the ATI Catalyst Control Center

To launch the ATI Catalyst Control Center

1. Right-click on the Windows® desktop and select **Catalyst(TM) Control Center**. You can also right-click the ATI icon in the Windows notification area and select **Catalyst Control Center**.



2. The **Catalyst Control Center Setup Assistant** appears when the system detects the existence of multi-graphics cards. Click **Go** to continue to the **Catalyst Control Center Advanced View** window.



Enabling CrossFireX settings

1. In the Catalyst Control Center window, click **Graphics Settings > CrossFireX > Configure**.
2. From the Graphics Adapter list, select the graphics card to act as the display GPU.
3. Select **Enable CrossFireX**.
4. Click **Apply**, and then click **OK** to exit the window.



5.2 NVIDIA® SLI™ technology

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

5.2.1 Requirements

- You should have two identical SLI-ready graphics cards that are NVIDIA® certified.
- Ensure that your graphics card driver supports the NVIDIA SLI technology. Download the latest driver from the NVIDIA website (www.nvidia.com).
- Ensure that your power supply unit (PSU) can provide at least the minimum power required by your system. See page 2-37 for details.



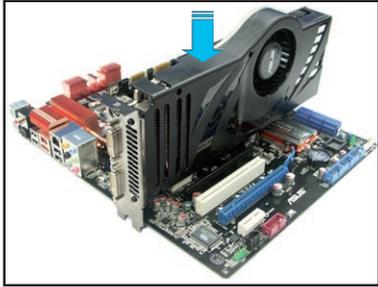
-
- We recommend that you install additional chassis fans for better thermal environment.
 - Visit the NVIDIA zone website (<http://www.nzone.com>) for the latest certified graphics card and supported 3D application list.
-

5.2.2 Installing SLI-ready graphics cards

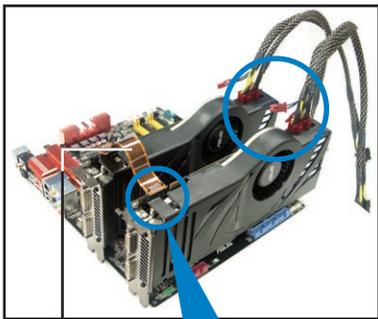


The following pictures are for reference only. The graphics cards and the motherboard layout may vary with models, but the installation steps remain the same.

1. Prepare two SLI-ready graphics cards.
2. Insert the two graphics card into the PCIEX16 slots.
3. Ensure that the cards are properly seated on the slots.

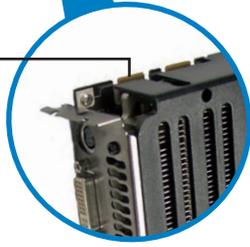


4. Align and firmly insert the SLI bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.
5. Connect two independent auxiliary power sources from the power supply to the two graphics cards separately.
6. Connect a VGA or a DVI cable to the graphics card.



SLI bridge

Goldfingers



5.2.3 Installing the device drivers

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



Ensure that your PCI Express graphics card driver supports the NVIDIA® SLI™ technology. Download the latest driver from the NVIDIA website (www.nvidia.com).

5.2.4 Enabling the NVIDIA® SLI™ technology

After installing your graphics cards and the device drivers, enable the SLI feature in NVIDIA® Control Panel under the Windows® Vista™ operating system.

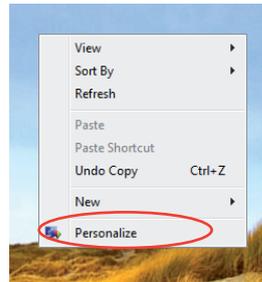
Launching the NVIDIA Control Panel

You can launch the NVIDIA Control Panel by the following two methods.

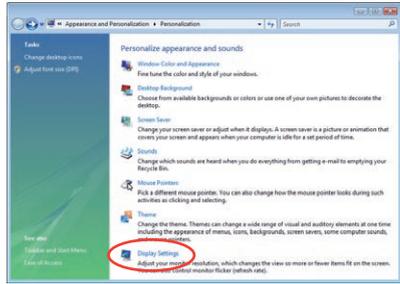
- A. Right click on the empty space of the Windows® desktop and select **NVIDIA Control Panel**.
The NVIDIA Control Panel window appears (See Step B5 on page 5-9).



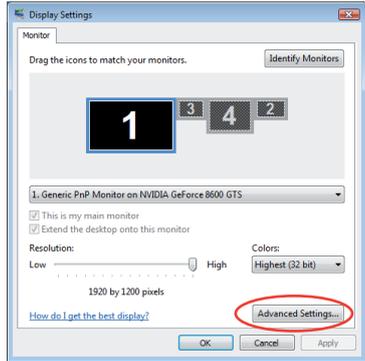
- B1. If you cannot see the NVIDIA Control Panel item in step (A), select **Personalize**.



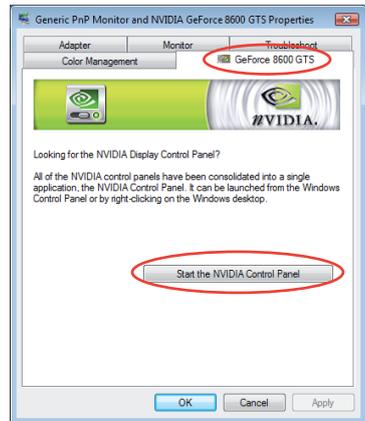
B2. From the **Personalization** window, select **Display Settings**.



B3. From the Display Settings dialog box, click **Advanced Settings**.



B4. Select the **NVIDIA GeForce** tab, and then click **Start the NVIDIA Control Panel**.



The Appendix lists the debug code table
for the LCD Poster.

Debug code table



Chapter summary



Debug code table.....A-1

Debug code table

Code	Description
CPU INIT	CPU Initiation
DET CPU	Test CMOS R/W functionality.
CHIPINIT	Early chipset initialization: -Disable shadow RAM -Disable L2 cache -Program basic chipset registers
DET DRAM	Detect memory -Auto-detection of DRAM size, type and ECC. -Auto-detection of L2 cache
DC FCODE	Expand compressed BIOS code to DRAM
EFSHADOW	Call chipset hook to copy BIOS back to E000 & F000 shadow RAM.
INIT IO	Initialize IO devices.
INIT HWM	Initialize Hardware Monitor.
CLR SCRN	1. Blank out screen 2. Clear CMOS error flag
INIT8042	1. Clear 8042 interface 2. Initialize 8042 self-test
ENABLEKB	1. Test special keyboard controller for Super I/O chips. 2. Enable keyboard interface.
DIS MS	1. Disable PS/2 mouse interface (optional). 2. Auto detect ports for keyboard & mouse followed by a port & interface swap (optional). 3. Reset keyboard for Super I/O chips.
R/W FSEG	Test F000h segment shadow to see whether it is R/W-able or not. If test fails, keep beeping the speaker.
DET FLASH	Auto detect flash type to load appropriate flash R/W codes into the run time area in F000 for ESCD & DMI support.
TESTCMOS	Use walking 1's algorithm to check out interface in CMOS circuitry. Also set real-time clock power status, and then check for override.
PRG CHIP	Program chipset default values into chipset.
INIT CLK	Initialize clock generator.
CHECKCPU	Detect CPU information including brand, type and CPU level (586 or 686).
INTRINIT	Initial interrupts vector table.
INITINT9	Initialize INT 09 buffer
CPUSPEED	1. Program CPU internal MTRR (Pentium class CPU) for 0-640K memory address. 2. Initialize the APIC for Pentium class CPU. 3. Program early chipset according to CMOS setup. Example: onboard IDE controller. 4. Measure CPU speed. 5. Invoke video BIOS.
VGA BIOS	Initialize VGA BIOS
TESTVRAM	1. Initialize multi-language 2. Put information on screen display, including BIOS logo, CPU type, CPU speed .
RESET KB	Reset keyboard.

Debug code table

Code	Description
8254TEST	Test 8254
8259MSK1	Test 8259 interrupt mask bits for channel 1.
8259MSK2	Test 8259 interrupt mask bits for channel 2.
8259TEST	Test 8259 functionality.
COUNTMEM	Calculate total memory by testing the last double word of each 64K page.
MP INIT	<ol style="list-style-type: none"> 1. Program MTRR of M1 CPU 2. Initialize L2 cache for P6 class CPU & program CPU with proper cacheable range. 3. Initialize the APIC for P6 class CPU. 4. On MP platform, adjust the cacheable range to smaller one in case the cacheable ranges between each CPU are not identical.
USB INIT	Initialize USB
TEST MEM	Test all memory (clear all extended memory to 0)
SHOW MP	Display number of processors (multi-processor platform)
PNP LOGO	Display PnP logo
ONBD IO	Initialize Onboard IO devices.
EN SETUP	Okay to enter Setup utility.
MSINSTAL	Initialize PS/2 Mouse
CHK ACPI	Prepare memory size information for function call: INT 15h ax=E820h
EN CACHE	Turn on L2 cache
SET CHIP	Program chipset registers according to items described in Setup & Auto-configuration table.
AUTO CFG	Assign resources to devices.
INIT FDC	<ol style="list-style-type: none"> 1. Initialize floppy controller 2. Set up floppy related fields in 40:hardware.
DET IDE	Detect & install all IDE devices: HDD, LS120, ZIP, CDROM.
COM/LPT	Detect serial ports & parallel ports.
DET FPU	Detect & install co-processor
CPU CHG	New CPU installed
EZ FLASH	Execute EZ Flash
CPR FAIL	CPR error
FAN FAIL	Fan error
UCODEERR	UCODE error
FLOPYERR	Floppy error
KB ERROR	Keyboard error
HD ERR	HDD error
CMOS ERR	CMOS error
MS ERROR	Mouse error
SMARTERR	HDD smart function error
HM ERROR	Hard monitor error
AINETERR	AI NET error
CASEOPEN	Case open

Debug code table

Code	Description
PASSWORD	Clear EPA or customization logo. 1. Call chipset power management hook. 2. Recover the text fond used by EPA logo (not for full screen logo) 3. If password is set, ask for password.
USB FINAL	Initialize PnP boot devices 1. USB final Initialization 2. NET PC: Build SYSID structure 3. Switch screen back to text mode 4. Set up ACPI table at top of memory. 5. Invoke ISA adapter ROMs 6. Assign IRQs to PCI devices 7. Initialize APM 8. Clear noise of IRQs.
INIT ROM	Initialize device option ROMs.
NUM LOCK	1. Program daylight saving 2. Update keyboard LED & typematic rate
UPDT DMI	1. Build MP table 2. Build & update ESCD 3. Set CMOS century to 20h or 19h 4. Load CMOS time into DOS timer tick 5. Build MSIRQ routing table.
INT 19H	Boot attempt (INT 19h)

