Crosshair V
Formula Series

Motherboard

E6522

First Edition
April 2011

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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.

FCC Radio Frequency (RF) Exposure Caution Statement

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. "The manufacture declares that this device is limited to Channels 1 through 11 in the 2.4GHz frequency by specified firmware controlled in the USA."

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. To maintain compliance with FCC RF exposure compliance requirements, please avoid direct contact to the transmitting antenna during transmitting. End users must follow the specific operating instructions for satisfying RF exposure compliance.

RF exposure warning

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Declaration of Conformity (R&TTE directive 1999/5/EC)

The following items were completed and are considered relevant and sufficient:

- Essential requirements as in [Article 3]
- Protection requirements for health and safety as in [Article 3.1a]
- Testing for electric safety according to [EN 60950]
- Protection requirements for electromagnetic compatibility in [Article 3.1b]
- Testing for electromagnetic compatibility in [EN 301 489-1] & [EN 301 489-17]
- Effective use of the radio spectrum as in [Article 3.2]
- Radio test suites according to [EN 300 328-2]

CE Marking

CE marking for devices without wireless LAN/Bluetooth

The shipped version of this device complies with the requirements of the EEC directives 2004/108/EC “Electromagnetic compatibility” and 2006/95/EC “Low voltage directive”.

CE marking for devices with wireless LAN/ Bluetooth

This equipment complies with the requirements of Directive 1999/5/EC of the European Parliament and Commission from 9 March, 1999 governing Radio and Telecommunications Equipment and mutual recognition of conformity.

Wireless Operation Channel for Different Domains

N. America	2.412-2.462 GHz	Ch01 through CH11
Japan	2.412-2.484 GHz	Ch01 through Ch14
Europe ETSI	2.412-2.472 GHz	Ch01 through Ch13

France Restricted Wireless Frequency Bands

Some areas of France have a restricted frequency band. The worst case maximum authorized power indoors are:

- 10mW for the entire 2.4 GHz band (2400 MHz–2483.5 MHz)
- 100mW for frequencies between 2446.5 MHz and 2483.5 MHz

Channels 10 through 13 inclusive operate in the band 2446.6 MHz to 2483.5 MHz.

There are few possibilities for outdoor use: On private property or on the private property of public persons, use is subject to a preliminary authorization procedure by the Ministry of Defense, with maximum authorized power of 100mW in the 2446.5–2483.5 MHz band. Use outdoors on public property is not permitted.

In the departments listed below, for the entire 2.4 GHz band:

- Maximum authorized power indoors is 100mW
- Maximum authorized power outdoors is 10mW

Departments in which the use of the 2400–2483.5 MHz band is permitted with an EIRP of less than 100mW indoors and less than 10mW outdoors:

01 Ain	02 Aisne	03 Allier	05 Hautes Alpes
08 Ardennes	09 Ariège	11 Aude	12 Aveyron
16 Charente	24 Dordogne	25 Doubs	26 Drôme
32 Gers	36 Indre	37 Indre et Loire	41 Loir et Cher
45 Loiret	50 Manche	55 Meuse	58 Nièvre
59 Nord	60 Oise	61 Orne	63 Puy du Dôme
64 Pyrénées Atlantique		66 Pyrénées Orientales	
67 Bas Rhin	68 Haut Rhin	70 Haute Saône	71 Saône et Loire
75 Paris	82 Tarn et Garonne		84 Vaucluse
88 Vosges	89 Yonne	90 Territoire de Belfort	
94 Val de Marne			

This requirement is likely to change over time, allowing you to use your wireless LAN card in more areas within France. Please check with ART for the latest information (www.art-telecom.fr)

Your WLAN Card transmits less than 100mW, but more than 10mW.

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.

Cet appareil numérique de la classe [B] est conforme à la norme NMB-003 du Canada.

IC Radiation Exposure Statement for Canada

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. To maintain compliance with IC RF exposure compliance requirements, please avoid direct contact to the transmitting antenna during transmitting. End users must follow the specific operating instructions for satisfying RF exposure compliance.

Operation is subject to the following two conditions:

- This device may not cause interference and
- This device must accept any interference, including interference that may cause undesired operation of the device.

To prevent radio interference to the licensed service (i.e. co-channel Mobile Satellite systems) this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment (or its transmit antenna) that is installed outdoors is subject to licensing.

The user is cautioned that this device should be used only as specified within this manual to meet RF exposure requirements. Use of this device in a manner inconsistent with this manual could lead to excessive RF exposure conditions.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

Country Code selection feature to be disabled for products marketed to the US/ CANADA.

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.
- The optical S/PDIF is an optional component (may or may not be included in your motherboard) and is defined as a CLASS 1 LASER PRODUCT.

INVISIBLE LASER RADIATION, AVOID EXPOSURE TO BEAM.

- Never dispose of the battery in fire. It could explode and release harmful substances into the environment.
- Never dispose of the battery with your regular household waste. Take it to a hazardous material collection point.
- Never replace the battery with an incorrect battery type.

- RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE.
- DISPOSE OF USED BATTERIES ACCORDING TO THE ABOVE BATTERY-RELATED INSTRUCTIONS.

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.

This motherboard should only be used in environments with ambient temperatures between 5ºC (41ºF) and 40ºC (104ºF).

- 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.

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>
Command	Means that you must type the command exactly as shown, then supply the required item or value enclosed in brackets. Example: At the DOS prompt, type the command line: afudos /iC5F.ROM

Crosshair V Formula specifications summary

CPU	AMD socket for AM3+ FX™/Phenom™ II/Athlon™ II/ Sempron™ 100 Series Processors Supports 32nm CPU, up to 8 cores AMD Cool 'n' Quiet™ Technology AMD 140W CPU Support
Chipset	AMD® 990FX / SB950
System Bus	Up to 5200 MT/s HyperTransport™ 3.0
Memory	Dual channel memory architecture 4 x DIMM, max. 32GB, DDR3 2133(O.C.)/2000(O.C.)/1800(O.C.)/1600/1333/1066 MHz, ECC and non-ECC, un-buffered memory *Refer to www.asus.com or user manual for the Memory QVL (Qualified Vendors Lists) **Due to OS limitation, when installing total memory of 4GB capacity or more, Windows® 32-bit operation system may only recognize less than 3GB. Hence, a total installed memory of less than 3GB is recommended.
Expansion Slots	3 x PCIe 2.0 x16 slots (dual @ x16; x16 x8 x8) 1 x PCIe 2.0 x16 (x4 speed) 1 x PCIe 2.0 x1 1 x PCI 2.2
Multi-GPU Technology	Supports 3-Way NVIDIA® SLI™ / AMD CrossFireX™ Technology
Storage	**SB950 South Bridge:** - 6 x SATA 6Gb/s ports with RAID 0, 1, 5, 10, red **ASMedia® controllers:** - 1 x SATA 6Gb/s port, red - 1 x eSATA 6Gb/s port, red
LAN	Intel® Ethernet Gigabit LAN
High Definition Audio	**SupremeFX X-Fi 2 built-in 8-channel High Definition Audio CODEC** - EAX® Advanced™ HD 5.0 - THX® TruStudio PRO™ - X-Fi® Xtreme Fidelity™ - Creative® ALchemy - Supports Blu-ray audio layer content protection - Supports 1 Optical S/PDIF out port at back I/O - Supports Jack-sensing, Multi-streaming, Front Panel Jack-Retasking

(continued on the next page)

Crosshair V Formula specifications summary

USB	**ASMedia® USB 3.0 controller** - 6 x USB 3.0/2.0 ports (4 at back I/O ; 2 at mid-board) **AMD® SB950 chipset** - 12 x USB 2.0/1.1 ports (8 ports at back I/O, black+white, 4 ports at mid-board)
ROG Exclusive Overclocking Features	**ROG Connect** - RC Poster - RC Remote - RC Diagram - GPU TweakIt GPU.DIMM Post BIOS Print GameFirst Extreme Tweaker **ROG Extreme Engine Digi+** - 8+2 phase CPU power design CPU Level Up MemOK! **Intelligent overclocking tools:** - ASUS TPU - O.C. Profile **Overclocking Protection:** - COP EX (Component Overheat Protection - EX) - Voltiminder LED - ASUS C.P.R.(CPU Parameter Recall)
Other Special Features	Core Unlocker ASUS Fan Xpert ASUS Q-Connector ASUS Q-Shield ASUS Q- LED (CPU, DRAM, VGA, Boot Device LEDs) Ai Charger+ ASUS EZ Flash 2 ASUS MyLogo 3
BIOS Features	32Mb Flash ROM, UEFI BIOS, PnP, DMI2.0, WfM2.0, SM BIOS 2.5, ACPI2.0a Multi-Language BIOS
Manageability	WOL by PME, WOR by PME, PXE
Back Panel I/O Ports	1 x PS/2 Keyboard/Mouse Combo port 1 x External SATA port 1 x LAN (RJ45) port 4 x USB 3.0/2.0 ports 8 x USB 2.0/1.1 ports (1 port can be switched to ROG Connect) 1 x S/PDIF Out (Optical) 8-channel Audio I/O 1 x Clr CMOS switch

(continued on the next page)

Crosshair V Formula specifications summary

Internal I/O Connectors	1 x USB 3.0/2.0 connector supports additional 2 USB 3.0/2.0 ports 2 x USB 2.0/1.1 connectors support additional 4 USB 2.0/1.1 ports 7 x SATA 6Gb/s connectors (Red) 8 x Fan connectors: 2 x CPU / 3 x Chassis / 3x Optional 8 x ProbeIt measurement points 3 x Thermal sensor connectors 1 x SPDIF_out connector 1 x 24-pin ATX power connector 1 x 8-pin ATX 12V power connector 1 x 4-pin ATX 12V power connector 1 x EZ Plug connector (4-pin Molex Power connector) 1 x En/Dis-able Clr CMOS header 1 x CPU Level Up button 1 x ROG Connect switch 1 x START (Power on) button 1 x RESET button 1 x Go button 1 x Audio front panel (AAFP) header 1 x System panel connector
Software	Drivers Sound Blaster® X-Fi 2 Utility Kaspersky® Anti-Virus DAEMON Tools Pro Standard ROG CPU-Z ASUS Utilities
Form Factor	ATX Form Factor, 12”x 9.6” (30.5cm x 24.4cm)

***Specifications are subject to change without notice.**

ROG ThunderBolt specifications summary

ThunderBolt LAN/ Audio Combo Card	**Dedicated Network Processing Unit (NPU)** - Advanced Game Detect™ - Visual Bandwidth Control™ - Application Blocking - Online Gaming PC Monitor™ - Bandwidth Tester - Game Networking DNA™ **Built-in 2-Channel High Quality DAC/ADC** - Output Signal-to-Noise Ratio (A-Weighted): 116dB - Output THD+N at 1KHz: 105dB - C-Media 6631 audio processor (Max. 192KHz/24-bit) - TI 6120A2 high fidelity headphone amplifier - Digital-to-Analog Converter: 120dB (Max. 192kHz/ 24-bit) - Analog-to-Digital Converter: 114dB (Max. 192KHz/24-bit) - Supports 3 Headphone Impedance Gain Modes (up to 300 ohms) - Fine-tuned Game Genre EQ Profiles - Xear™ Surround Headphone - Xear™ SingFX - Equalizer, Environment Effects, FlexBass, Smart Volume, Virtual Speaker Shifter - DS3D GX 1.0 OpenAL - Front-panel audio connector (AAFP) - Line-in, Line out, Optical S/PDIF out ports - USB 2.0 Interface

***ROG ThunderBolt is only available on selected model.**

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

1 Product introduction

Chapter summary

1

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 Crosshair V Formula 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 Crosshair V Formula
Card	*ROG ThunderBolt
Cables	1 x ROG Connect cable 1 x CrossFire Cable 1 x SLI Cable 3 x 2-in-1 SATA 6G cables *1 x USB to USB cable for ThunderBolt
Accessories	1 x 2-in-1 ASUS Q-Connector Kit 1 x 3-Way SLI Bridge 1 x Cable Ties Pack 1 x ROG Theme Label 1 x 12-in-1 ROG SATA Cable Label 1 x I/O Shield
Application DVD	ROG motherboard support DVD
Documentation	User guide *ROG ThunderBolt Audio Precision Test Report

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

*The ThunderBolt is only available on selected models.

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.

FX™/Phenom™ II/Athlon™ II/ Sempron™ 100 Series Processors (AM3+ CPU)

This motherboard supports latest AMD® Socket AM3+ multi-core processors with up to 8-core native CPU cores and delivers better overclocking capabilities with less power consumption. It features AMD Turbo CORE Technology 2.0 and accelerates data transfer rate up to 5200MT/s via HyperTransport™ 3.0 based system bus. This motherboard also supports AMD® CPUs in the new 32nm manufacturing process.

AMD 990FX Chipset

AMD 990FX Chipset is designed to support up to 5.2GT/s HyperTransport™ 3.0 (HT 3.0) interface speed and dual PCI Express™ 2.0 x16 graphics. It is optimized with AMD latest AM3+ and multi-core CPUs to provide excellent system performance and overclocking capabilities.

DDR3 2133(O.C.) Support

This motherboard supports DDR3 2133(O.C.) that provides faster data transfer rate and more bandwith to increase memory computing efficiency, enhancing system performance in 3D graphics and other memory demanding applications.

Refer to www.asus.com for the supported CPU models.

SLI/CrossFireX On-Demand

Why choose when you can have both?

SLI or CrossFireX? Fret no longer because with the ROG Crosshair V Formula, you'll be able to run both multi-GPU setups. The board features SLI/CrossFireX 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 devices for double speed and bandwidth which enhances system performance.

1.3.2 ROG ThunderBolt LAN/Audio Combo

Built-in Headphone Amp.

Sound GREATER

The ROG ThunderBolt is a dedicated LAN/audio combo card designed for gamers. With the ROG ThunderBolt's high sound quality and built-in amp, gamers can discover the enemy's position much easier and react earlier, making it just like another weapon in a gamer's arsenal! With fine-tuned background sound effects for popular game types and Xear 3D Surround tech, ROG ThunderBolt lets you hear better and win easier!

Dedicated NPU

Play FASTER

Even with a high-end CPU and GPU, FPS and MMORPGs can still become a laggy mess if the LAN performance sucks. Gamers yearn to keep gaming framerates solid. The ROG ThunderBolt has been designed from continual feedback from the PC gaming community. By enhancing the 2 key factors (Speed and Sound) that dominate your gaming experience, the advanced integration of the LAN/Audio combo ThunderBolt offers higher throughput and decreased latency is about to bring the best in-game experience to you!

Note: Network Processing Unit (NPU)

ROG ThunderBolt is only available on selected models.

1.3.3 ROG Intelligent Performance & Overclocking features

Extreme Engine Digi+

Powerful combination of analog and digital design elements

Extreme Engine Digi+ equipped with high performance digital VRM design can easily achieve the ultimate performance with adjustable CPU PWM frequency. It expedites heat dissipation and achieves better electric conduction keeping critical components reliable. Now you'll be able to push your spanking new CPU to the limit, hitting benchmark scores that others only dream of. Extreme Engine Digi+ balances the need for voltage and the desire for rock solid performance to bring the ultimate user experience.

ROG Connect

Plug and Overclock - Tweak it the hardcore way!

Monitor the status of your desktop PC and tweak its parameters in real-time via a notebook—just like a race car engineer—with ROG Connect. ROG Connect links your main system to a notebook through a USB cable, allowing you to view real-time POST code and hardware status readouts on your notebook, as well as make on-the-fly parameter adjustments at a purely hardware level. Diagram, power, reset button, flash BIOS through notebook. Refer to page 2-29 for details.

GameFirst

The speed you need to pwn

Low Internet latency allows you to frag more, and get fragged less. That's why ROG has introduced GameFirst, a feature that manages the flow of traffic according to your needs so that you can still listen to online music, download and upload files, and engage in Internet chats without sacrificing the low ping times you need to pwn your opponents.

iROG

Intelligent multiple control at hand

The iROG is a special IC which enables several ROG highlighted functions that gives users full disposal of the motherboard at any stage! This design allows advanced user control and management to be processed purely at a hardware level. iROG greatly increases fun during overclocking for PC enthusiasts and it offers 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 wanted to OC to, and the motherboard will do the rest! See the new CPU speed and enjoy that performance instantly. Overclocking is never as easy as this.

GPU.DIMM Post

Easily check the status of your graphics cards and memory in the BIOS!
Notice potential problems even before you enter the OS! Overclockers can save valuable minutes in detecting component failure under extreme conditions. With GPU.DIMM Post, quickly and easily check your graphics cards and memory DIMMs status in the BIOS, potentially keeping that record-breaking overclock!

BIOS Print

One click, easily share your BIOS settings
ROG offers a whole new UEFI BIOS feature to handle the demands of an overclocking experience. Rampage III Black Edition features ROG BIOS Print which allows users to easily share their BIOS settings to others with the press of a button. The days of using a camera to take BIOS screenshot are over.

ProbeIt

Get all hands-on with hardware-based overclocking

ProbeIt takes the guesswork out of locating the motherboard's measurement points, identifying them clearly in the form of 8 sets of detection points so you'll know exactly where to get quick yet accurate readings using a multitester.

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 your 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 Tweakers is the one stop shop to fine-tune your system to optimal performance. No matter if you're looking for frequency adjustment, over-voltage options, or memory timing settings, they're all here!

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, PCH, and Memory in a intuitive color-coded fashion. The voltiminder LED allows quick voltage monitoring for overclockers.

COP EX

Maximum OC with confidence with burn proof protection to chipsets and GPU!
The COP EX allows overclockers to increase chipset voltage 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.

Onboard Switches

No more shorting pins or moving jumpers
With an easy press during overclock, this exclusive onboard switch allows gamer to effortlessly fine-tune the performance without having to short the pins or moving jumpers!

SupremeFX X-Fi 2 Built-in

Play with ultra-real cinematic in-game surround sound!

SupremeFX X-Fi 2 delivers incredible gaming audio experiences to ROG die hards. It features EAX 5.0 and OpenAL for ultra-real cinematic in-game audio.
It even comes with THX TruStudio Pro, which makes games, music and movies sound way better! SupremeFX X-Fi 2 also implements gold-plated jacks and high quality capacitors to ensure high definition adventures in audio.

1.3.4 ASUS special features

ASUS TPU

The Ultimate O.C. Processor

Unleash your performance with ASUS' simple onboard switch or AI Suite II utility. The TPU chip offers precise voltage control and advanced monitoring through Auto Tuning and TurboV functions. Auto Tuning offers a user friendly way to automtically optimize the system for fast, yet stable clock speeds, while TurboV enables unlimited freedom to adjust CPU frequencies and ratios for optimized performance in diverse situations.

USB 3.0 Support

10X Faster Date Rates!

Experience ultra-fast data transfers at 4.8Gbps with USB 3.0—the latest connectivity standard. Built to connect easily with next generation components and peripherals, USB 3.0 transfers data 10X faster and is also backward compatible with USB 2.0 components.

SATA 6Gb/s Support

Experience the Future of Storage!

Supporting next-generation Serial ATA (SATA) storage interface, this motherboard delivers up to 6Gb/s data transfer rates. Additionally, get enhanced scalability, faster data retrieval, double the bandwidth of current bus systems.

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 loading. The built-in variety of useful profiles offer flexible controls of fan speed to achieve a quiet and cool environment.

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.

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.

2 Hardware information

Chapter summary

2

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2.2 Motherboard overview 2-2
2.3 Building your computer system 2-32
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2.5 Turning off the computer 2-51

2.1 Before you proceed

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

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

2.2 Motherboard overview

2.2.1 Motherboard layout

2.2.2 Layout contents

Connectors/Jumpers/Switches/Slots		Page
1.	8-pin/4-pin ATX 12V power connectors; EZ PLUG	2-25
2.	AMD AM3+ CPU Socket	2-4
3.	CPU, chassis, and optional fan connectors (4-pin CPU_FAN; 4-pin CPU_OPT; 4-pin CHA_FAN1–3; 4-pin OPT_FAN1–3)	2-22
4.	DDR3 DIMM slots	2-5
5.	Go button	2-29
6.	Thermal sensor cable connectors (2-pin OPT_TEMP1–3)	2-23
7.	USB3.0 connectors (18-1 pin USB3_56)	2-21
8.	AMD SB950 Serial ATA connectors (7-pin SATA6G 1-6)	2-19
9.	Asmedia Serial ATA 6Gb/s connectors (7-pin SATA6G_E1)	2-20
10.	Clear RTC RAM (3-pin CLRTC_SW)	2-18
11.	System panel connector (20-8 pin PANEL)	2-26
12.	USB 2.0 connectors (10-1 pin USB910, USB1112)	2-20
13.	Reset switch	2-28
14.	Power-on switch	2-28
15.	CPU Level Up switch	2-30
16.	Front panel audio connector (10-1 pin AAFP)	2-24
17.	Digital audio connector (4-1 pin SPDIF_OUT)	2-23
18.	ROG connect switch (3-pin ROG)	2-29

Refer to 2.2.8 and 2.3.11 for more information about internal and rear panel connectors.

2.2.3 Central Processing Unit (CPU)

The motherboard comes with an AM3+ socket designed for AMD® Next Generation CPU up to 8-core, also compatible with AMD® socket AM3 for AMD® Phenom™ II/Athlon™ II/ Sempron™ 100 Series Processors.

CROSSHAIR V FORMULA CPU Socket AM3b

Ensure that all power cables are unplugged before installing the CPU.

Ensure that you use a CPU designed for the AM3+/AM3 socket. 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!

2.2.4 System memory

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

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

CROSSHAIR V FORMULA 240-pin DDR3 DIMM sockets

Memory configurations

You may install 512MB, 1GB, 2GB and 4GB unbuffered ECC and non-ECC DDR3 DIMMs into the DIMM sockets.

- You may install varying memory sizes in Channel A and Channel B. The system maps the total size of the lower-sized channel for the dual-channel configuration. Any excess memory from the higher-sized channel is then mapped for single-channel operation.
- We recommend that you install the memory modules from the red slots for better overclocking capability.
- Always install DIMMs with the same CAS latency. For optimum compatibility, we recommend that you obtain memory modules from the same vendor.
- When overclocking, some AMD CPU models may not support DDR3 1600 or higher frequency DIMMs.
- Due to the memory address limitation on 32-bit Windows OS, when you install 4GB or more memory on the motherboard, the actual usable memory for the OS can be about 3GB or less. For effective use of memory, we recommend that you do any of the following:
  - Use a maximum of 3GB system memory if you are using a 32-bit Windows OS.
  - Install a 64-bit Windows OS when you want to install 4GB or more on the motherboard.
    For more details, refer to the Microsoft® support site at http://support.microsoft.com/kb/929605/en-us.
- This motherboard does not support DIMMs made up of 512Mb (64MB) chips or less (Memory chip capacity counts in Megabit, 8 Megabit/Mb = 1 Megabyte/MB).

- The default memory operation frequency is dependent on its Serial Presence Detect (SPD), which is the standard way of accessing information from a memory module. Under the default state, some memory modules for overclocking may operate at a lower frequency than the vendor-marked value. To operate at the vendor-marked or at a higher frequency, refer to section 3.3 Extreme Tweaker menu for manual memory frequency adjustment.
- For system stability, use a more efficient memory cooling system to support a full memory load (4 DIMMs) or overclocking condition.

Crosshair V Formula Motherboard Qualified Vendors Lists (QVL)
DDR3 1333 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)	
								2 DIMM	4 DIMM
A-DATA	AD63I1B0823EV	2GB	SS	A-DATA	3CCA-1509A	-	-	•	•
A-DATA	AXDU1333GC2G9(XMP)	2GB	SS	-	-	9-9-9-24	1.25~1.35	•	•
Apacer	78.A1GC6.9L1	2GB	DS	Apacer	AM5D5808FEQSBG	9	-	•	•
Apacer	78.B1GDE.9L10C	4GB	DS	Apacer	AM5D5908CEHSBG	9	-	•	•
CORSAIR	TW3X4G1333C9A	4GB (2x 2GB)	DS	-	-	9-9-9-24	1.5	•	•
CORSAIR	CMX8GX3M2A1333C9(XMP)	8GB (2x 4GB)	DS	-	-	9-9-9-24	1.5	•	
Crucial	BL25664BN1337.16FF(XMP)	2GB	DS	-	-	7-7-7-24	1.65	•	•
Crucial	CT25664BA1339.16FF	2GB	DS	MICRON	D9KPT	9	-	•	•
ELPIDA	EBJ20UF8BCF0-DJ-F	2GB	SS	Elpida	J2108BCSE-DJ-F	-	-	•	•
ELPIDA	EBJ21UE8BDF0-DJ-F	2GB	DS	ELPIDA	J1108BDSE-DJ-F	-	-	•	•
G.SKILL	F3-10600CL9D-4GBNT	4GB (2x 2GB)	DS	G.SKILL	D3 128M8CE9 2GB	9-9-9-24	1.5	•	
G.SKILL	F3-10666CL8D-4GBHK(XMP)	4GB (2x 2GB)	DS	-	-	8-8-8-21	1.5	•	•
GEIL	GET316GB1333C9QC	16GB (4x 4GB)	DS	-	-	9-9-9-24	1.5	•	•
Hynix	HMT325U6BFR8C-H9	2GB	SS	Hynix	H5TQ2G83BFR	-	-	•	•
Hynix	HMT351U6BFR8C-H9	4GB	DS	Hynix	H5TQ2G83BFR	-	-	•	•
KINGMAX	FLFF65F-C8KM9	4GB	DS	Kingmax	KFC8FNMXF-BXX-15A	-	-		•
KINGSTON	KVR1333D3N9K2/4G	4GB (2x 2GB)	DS	KINGSTON	D1288JEMFPGD9U	-	1.5	•	•
MICRON	MT8JTF25664AZ-1G4D1	2GB	SS	Micron	D9LGK	-	-	•	•
MICRON	MT16JTF51264AZ-1G4D1	4GB	DS	Micron	D9LGK	-	-	•	•
OCZ	OCZ3G1333LV4GK	4GB (2x 2GB)	DS	-	-	9-9-9	1.65	•	•
PSC	PC310600U-9-10-A0	1GB	SS	PSC	A3P1GF3FGF	-	-	•	•
PSC	PC310600U-9-10-B0	2GB	DS	PSC	A3P1GF3FGF	-	-	•	•
SAMSUNG	M378B1G73AH0-CH9	8GB	DS	SAMSUNG	K4B4G0846A-HCH9	-	-	•	•
Transcend	TS512MLK64V3N (389889)	4GB	DS	Hynix	H5TQ2G83BFR	9	-	•	
Transcend	TS512MLK64V3N (574831)	4GB	DS	Micron	D9LGK	9	-	•	•
ACTICA	ACT4GHU64B8H1333H	4GB	DS	Hynix	H5TQ2G83AFR	-	-	•	•
ACTICA	ACT4GHU72D8H1333H	4GB	DS	Hynix	H5TQ2G83AFR(ECC)	-	-	•	•
BUFFALO	D3U1333-2G	2GB	DS	Elpida	J1108BFBG-DJ-F		-	•	•
BUFFALO	D3U1333-4G	4GB	DS	NANYA	NT5CB256M8BN-CG		-	•	•
EK Memory	EKM324L28BP8-I13	4GB (2 x 2GB)	DS	-	-	9	-	•	•
Elixir	M2F2G64CB88B7N-CG	2GB	SS	Elixir	N2CB2G808N-CG	-	-	•	•
Elixir	M2F4G64CB8HB5N-CG	4GB	DS	Elixir	N2CB2G808N-CG	-	-	•	•
GoodRam	GR1333D364L9/2G	2GB	DS	Qimonda	IDSH1G-03A1F1C-13H	-	-	•	•
KINGTIGER	F10DA2T1680	2GB	DS	KINGTIGER	KTG1333PS1208NST-C9	-	-	•	•
KINGTIGER	KTG2G1333PG3	2GB	DS	-	-	-	-	•	•
Patriot	PSD32G13332	2GB	DS	Prtriot	PM128M8D3BU-15	9	-	•	•
Patriot	PGS34G1333LLKA	4GB (2 x 2GB)	DS	-	-	7-7-7-20	1.7	•	•
Silicon Power	SP001GBLTE133S01	1GB	SS	NANYA	NT5CB128M8AN-CG	-	-	•	•
Silicon Power	SP002GBLTE133S01	2GB	DS	NANYA	NT5CB128M8AN-CG	-	-	•	•
Team	TXD31024M1333C7(XMP)	1GB	SS	Team	T3D1288LT-13	7-7-7-21	1.75	•	•
Team	TXD32048M1333C7-D(XMP)	2GB	DS	Team	T3D1288LT-13	7-7-7-21	1.5-1.6	•	•

Crosshair V Formula Motherboard Qualified Vendors Lists (QVL)
DDR3 1600 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)	
								2 DIMM	4 DIMM
A-DATA	AX3U1600GC4G9(XMP)	4GB	DS	-	-	9-9-9-24	1.55~1.75		•
A-DATA	AX3U1600XC4G79(XMP)	4GB	DS	-	-	7-9-7-21	1.55~1.75	•	•
CORSAIR	HX3X12G1600C9(XMP)	12GB (6x 2GB)	DS	-	-	9-9-9-24	1.6	•	•
CORSAIR	CMZ16GX3M4A1600C9(XMP)	16GB (4x 4GB)	DS	-	-	9-9-9-24	1.5	•	•
CORSAIR	CMG4GX3M2A1600C6	4GB (2x 2GB)	DS	-	-	6-6-6-18	1.65	•	•
CORSAIR	CMD4GX3M2B1600C8	4GB (2x 2GB)	DS	-	-	8-8-8-24	1.65		•
CORSAIR	CMG4GX3M2A1600C6	4GB (2x 2GB)	DS	-	-	6-6-6-18	1.65	•	
CORSAIR	CMX4GX3M2A1600C8(XMP)	4GB (2x 2GB)	DS	-	-	8-8-8-24	1.65	•	•
CORSAIR	CMG4GX3M2A1600C7(XMP)	4GB (2 x 2GB)	DS	-	-	7-7-7-20	1.65	•	
CORSAIR	CMP6GX3M3A1600C8(XMP)	6GB (3x 2GB)	DS	-	-	8-8-8-24	1.65	•	•
CORSAIR	CMP6GX3M3A1600C8(XMP)	6GB (3x 2GB)	DS	-	-	8-8-8-24	1.65	•	•
CORSAIR	CMX6GX3M3C1600C7(XMP)	6GB (3x 2GB)	DS	-	-	7-8-7-20	1.65	•	•
CORSAIR	CMZ8GX3M2A1600C8(XMP)	8GB (2x 4GB)	DS	-	-	8-8-8-24	1.5	•	•
CORSAIR	CMZ8GX3M2A1600C9(XMP)	8GB (2x 4GB)	DS	-	-	9-9-9-24	1.5	•	•
CORSAIR	CMX8GX3M4A1600C9(XMP)	8GB (4 x 2GB)	DS	-	-	9-9-9-24	1.65	•	
Crucial	BL12864BN1608.8FF(XMP)	2GB (2x 1GB)	SS	-	-	8-8-8-24	1.65	•	•
Crucial	BL25664BN1608.16FF(XMP)	2GB	DS	-	-	8-8-8-24	1.65	•	•
G.SKILL	F3-12800CL9D-4GBNQ(XMP)	4GB (2x 2GB)	DS	-	-	9-9-9-24	1.5	•	
G.SKILL	F3-12800CL7D-4GBECO(XMP)	4GB (2 x 2GB)	DS	-	-	7-8-7-24	-	•	
G.SKILL	F3-12800CL7D-4GBRH(XMP)	4GB (2 x 2GB)	DS	-	-	7-7-7-24	1.65	•	•
G.SKILL	F3-12800CL8D-4GBRM(XMP)	4GB (2 x 2GB)	DS	-	-	8-8-8-24	1.6	•	•
G.SKILL	F3-12800CL9D-4GBECO(XMP)	4GB (2 x 2GB)	DS	-	-	9-9-9-24	1.35	•	•
G.SKILL	F3-12800CL7D-8GBRH(XMP)	8GB (2x 4GB)	DS	-	-	7-8-7-24	1.6	•	•
G.SKILL	F3-12800CL9D-8GBRL(XMP)	8GB (2x 4GB)	DS	-	-	9-9-9-24	1.5	•	•
G.SKILL	F3-12800CL9D-8GBSR2(XMP)	8GB (2x 4GB)	DS	-	-	9-9-9-24	1.25	•	•
G.SKILL	F3-12800CL8D-8GBECO(XMP)	8GB (2x4GB)	DS	-	-	8-8-8-24	1.35	•	•
GEIL	GET316GB1600C9QC(XMP)	16GB (4x 4GB)	DS	-	-	9-9-9-28	1.6	•	•
GEIL	GUP34GB1600C7DC(XMP)	4GB (2x 2GB)	DS	-	-	7-7-7-24	1.6	•	•
GEIL	GVP38GB1600C8QC(XMP)	8GB (4x 2GB)	DS	-	-	8-8-8-28	1.6	•	•
KINGMAX	FLGD45F-B8MF7(XMP)	1GB	SS	-	-		-	•	•
KINGSTON	KHX1600C9D3K6/24GX(XMP)	24GB (6x 4GB)	DS	-	-	9	1.65	•	
KINGSTON	KHX1600C7D3K2/4GX(XMP)	4GB (2x 2GB)	DS	-	-	-	1.65	•	•
KINGSTON	KHX1600C8D3K2/4GX(XMP)	4GB (2x 2GB)	DS	-	-	8	1.65	•	•
KINGSTON	KHX1600C9D3K2/4GX(XMP)	4GB (2x 2GB)	DS	-	-	-	1.65	•	•
KINGSTON	KHX1600C9D3K2/4GX(XMP)	4GB (2x 2GB)	DS	-	-	-	1.65	•	•
Kingston	KHX1600C9D3X1K2/4G	4GB (2x 2GB)	DS	-	-	-	1.65	•	
KINGSTON	KHX1600C9D3X2K2/4GX(XMP)	4GB (2x 2GB)	DS	-	-	9	1.65	•	•
KINGSTON	KHX1600C9D3T1K3/6GX(XMP)	6GB (3x 2GB)	DS	-	-	-	1.65		•
OCZ	OCZ3OB1600LV4GK	4GB (2 x 2GB)	DS	-	-	9-9-9	1.65		•
OCZ	OCZ3X1600LV4GK(XMP)	4GB (2 x 2GB)	DS	-	-	8-8-8	1.65	•	•
OCZ	OCZ3G1600LV6GK	6GB (3 x 2GB)	DS	-	-	8-8-8	1.65	•	
OCZ	OCZ3X1600LV6GK(XMP)	6GB (3 x 2GB)	DS	-	-	8-8-8	1.65	•	•
OCZ	OCZ3X1600LV6GK(XMP)	6GB (3 x 2GB)	DS	-	-	8-8-8	1.65	•	•
Super Talent	WP160UX4G8(XMP)	4GB (2 x 2GB)	DS	-	-	8	-	•	
Super Talent	WP160UX4G9(XMP)	4GB (2 x 2GB)	DS	-	-	9	-	•	•
Super Talent	WB160UX6G8(XMP)	6GB (3 x 2GB)	DS	-	-	-	-	•	•
Super Talent	WB160UX6G8(XMP)	6GB (3 x 2GB)	DS	-	-	8	-	•	•
AEXEA	AXA3PS2G1600S18V(XMP)	2GB	DS	-	-	-	1.65		•
AEXEA	AXA3PS4GK1600S18V(XMP)	4GB (2x 2GB)	DS	-	-	-	1.65	•	•
Asint	SLZ3128M8-EGJ1D(XMP)	2GB	DS	Asint	3128M8-GJ1D	-	-	•	•
EK Memory	EKM324L28BP8-I16(XMP)	4GB (2x 2GB)	DS	-	-	9	-	•	•
Elixir	M2P2G64CB8HC9N-DG(XMP)	2GB	DS	-	-	-	-	•	•
GoodRam	GR1600D364L9/2G	2GB	DS	GoodRam	GF1008KC-JN	-	-	•	•
KINGTIGER	KTG2G1600PG3(XMP)	2GB	DS	-	-	-	-		
Mushkin	998805(XMP)	6GB (3x 2GB)	DS	-	-	6-8-6-24	1.65	•	•
Patriot	PX7312G1600LLK(XMP)	12GB (3x 4GB)	DS	-	-	8-9-8-24	1.65	•	
Patriot	PGS34G1600LLKA2	4GB (2x 2GB)	DS	-	-	8-8-8-24	1.7	•	•
Patriot	PGS34G1600LLKA	4GB (2x 2GB)	DS	-	-	7-7-7-20	1.7	•	•
PATRIOT	PGS34G1600LLKA	4GB (2 x 2GB)	DS	-	-	7-7-7-20	1.7	•	
Patriot	PX538G1600LLK(XMP)	8GB (2x 4GB)	DS	-	-	8-9-8-24	1.65	•	•
Team	TXD31024M1600C8-D(XMP)	1GB	SS	Team	T3D1288RT-16	8-8-8-24	1.65	•	•
Team	TXD32048M1600HC8-D(XMP)	2GB	DS	Team	T3D1288RT-16	8-8-8-24	1.65	•	•

Crosshair V Formula Motherboard Qualified Vendors Lists (QVL) DDR3 1800 MHz capability

Vendors	Part No.	Size	SS/ DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)		
								1 DIMM	2 DIMM	4 DIMM
G.SKILL	F3-14400CL6D-4GBFLS(XMP)	4GB(2 x 2GB)	DS	-	-	6-8-6-24	1.65	•	•	•
G.SKILL	F3-14400CL9D-4GBRL(XMP)	4GB(2 x 2GB)	DS	-	-	9-9-9-24	1.6	•		•
KINGSTON	KHX1800C9D3T1K3/6GX(XMP)	6GB(3 x 2GB)	DS	-	-	-	1.65	•	•	•

Crosshair V Formula Motherboard Qualified Vendors Lists (QVL) DDR3 1866 MHz capability

Vendors	Part No.	Size	SS/ DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)		
								1 DIMM	2 DIMM	4 DIMM
CORSAIR	CMZ8GX3M2A1866C9(XMP)	8GB (2x 4GB)	DS	-	-	9-10-9-27	1.5	•	•	•
G.SKILL	F3-15000CL9D-4GBRH (XMP)	4GB(2 x 2GB)	DS	-	-	9-9-9-24	1.65	•	•	•
G.SKILL	F3-15000CL9D-4GBTD(XMP)	4GB(2 x 2GB)	DS	-	-	9-9-9-24	1.65	•	•	•
G.SKILL	F3-14900CL9D-8GBSR(XMP)	8GB (2x 4GB)	DS	-	-	9-10-9-28	1.5	•	•	•
KINGSTON	KHX1866C9D3T1K3/3GX(XMP)	3GB (3x 1GB)	SS	-	-	-	1.65	•	•	•
OCZ	OCZ3RPR1866C9LV3GK	3GB (3x 1GB)	DS	-	-	9-9-9	1.65	•		
OCZ	OCZ3G1866LV4GK	4GB (2x 2GB)	DS	-	-	10-10-10	1.65	•	•	
OCZ	OCZ3P1866C9LV6GK	6GB(3 x 2GB)	DS	-	-	9-9-9	1.65	•		
Super Talent	W1866UX2G8(XMP)	2GB(2 x 1GB)	SS	-	-	8-8-8-24	-	•		
Team	TXD32048M1866C9(XMP)	2GB	DS	Team	T3D1288RT-16	9-9-9-24	1.65	•	•	•

Crosshair V Formula Motherboard Qualified Vendors Lists (QVL) DDR3 2000 MHz capability

Vendors	Part No.	Size	SS/ DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)		
								1 DIMM	2 DIMM	4 DIMM
A-DATA	AX3U2000GB2G9B(XMP)	2GB	DS	-	-	9-11-9-27	1.55~1.75	•		
A-DATA	AX3U2000GC4G9B(XMP)	4GB	DS	-	-	9-11-9-27	1.55~1.75	•	•	
Apacer	78.AAGD5.9KD(XMP)	6GB (3 x 2GB)	DS	-	-	9-9-9-27	-	•		
CORSAIR	CMT6GX3M3A2000C8(XMP)	6GB (3x 2GB)	DS	-	-	8-9-8-24	1.65	•		
G.SKILL	F3-16000CL9D-4GBRH(XMP)	4GB (2 x 2GB)	DS	-	-	9-9-9-24	1.65	•	•	
G.SKILL	F3-16000CL9D-4GBTD(XMP)	4GB (2 x 2GB)	DS	-	-	9-9-9-24	1.65	•	•	
G.SKILL	F3-16000CL9T-6GBPS(XMP)	6GB (3 x 2GB)	DS	-	-	9-9-9-24	1.65	•		
G.SKILL	F3-16000CL9T-6GBTD(XMP)	6GB (3 x 2GB)	DS	-	-	9-9-9-24	1.6	•		
G.SKILL	F3-16000CL7Q-8GBFLS(XMP)	8GB (4 x 2GB)	DS	-	-	7-9-7-24	1.65	•		•
GEIL	GUP34GB2000C9DC(XMP)	4GB (2x 2GB)	DS	-	-	9-9-9-28	1.65	•	•	
GEIL	GE38GB2000C9QC(XMP)	8GB (4 x 2GB)	DS	-	-	9-9-9-28	1.65	•		
KINGSTON	KHX2000C9AD3T1K3/ 3GX(XMP)	3GB (3x 1GB)	SS	-	-	-	1.65	•		
KINGSTON	KHX2000C9AD3T1K2/ 4GX(XMP)	4GB (2x 2GB)	DS	-	-	9	1.65	•		
KINGSTON	KHX2000C9D3T1K2/ 4GX(XMP)	4GB (2x 2GB)	DS	-	-	-	1.65	•		
KINGSTON	KHX2000C9AD3T1K3/ 6GX(XMP)	6GB (3x 2GB)	DS	-	-	9	1.65	•		
KINGSTON	KHX2000C9AD3T1K3/ 6GX(XMP)	6GB (3x 2GB)	DS	-	-	-	1.65	•		
KINGSTON	KHX2000C9AD3W1K3/ 6GX(XMP)	6GB (3x 2GB)	DS	-	-	9	1.65	•		
OCZ	OCZ3B2000LV6GK	6GB (3 x 2GB)	DS	-	-	7-8-7	1.65	•		
Transcend	TX2000KLN-8GK (388375)(XMP)	4GB	DS	-	-		1.6	•	•	
AEXEA	AXA3ES2G2000LG28V(XMP)	2GB	DS	-	-	-	1.65	•		
AEXEA	AXA3ES4GK2000LG28V(XMP)	4GB (2x 2GB)	DS	-	-	-	1.65		•	
Patriot	PX7312G2000ELK(XMP)	12GB (3x 4GB)	DS	-	-	9-11-9-27	1.65	•	•	
Team	TXD32048M2000C9(XMP)	2GB	DS	Team	T3D1288RT-20	9-9-9-24	1.5	•		
Team	TXD32048M2000C9-L(XMP)	2GB	DS	Team	T3D1288RT-20	9-9-9-24	1.6	•		

Crosshair V Formula Motherboard Qualified Vendors Lists (QVL) DDR3 2133 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)	
								2 DIMM	4 DIMM
G.SKILL	F3-17066CL7D-4GBPIS	4GB (2 x 2GB)	DS	-	-	7-10-7-27	1.65	•	

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

- **1 DIMM:** Supports one (1) module inserted into any slot as Single-channel memory configuration.
- **2 DIMMs**: Supports one pair of modules inserted into either the red or the black slots as one pair of Dual-channel memory configuration.
- **4 DIMMs:** Supports four (4) modules inserted into both the red or the black slots as two pairs of Dual-channel memory configuration.

- When installing total memory of 4GB capacity or more, Windows 32-bit operation system may only recognize less than 3GB. Hence, a total installed memory of less than 3GB is recommended.
- The default DIMM frequency depends on its Seriel Presence Detect (SPD), which is the standard way of accessing information from a memory module. Under the default state, some memory modules for overclocking may operate at a lower frequency than the vendor-marked value.

2.2.5 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.

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.

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.

PCI Express x1 slots

This motherboard has one PCI Express x1 slot that supports a PCI Express x1 card complying with the PCI Express specifications. Refer to the figure below for the location of the slot.

PCI Express x16 slots

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

VGA configuration	PCI Express operating mode		
	PCIe x16_1	PCIe x8/x1_2	PCIe x16/x8_3
Single VGA/PCIe card	x16 (Recommend for single VGA)	N/A	x16 (Single VGA)
Dual VGA/PCIe card	x16	x1	x16
Triple VGA/PCIe card	x16	x8	x8

- In single VGA card mode, use first the PCIe 2.0 x16_1 slot or PCIe 2.0 x16/x8_3 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/x8_3 slots for PCI Express x16 graphics cards to get better performance.
- Use the PCIe x16_1, PCIe x8/x1_2, and PCIe x16/x8_3 slots for 3-Way SLI or CrossFireX™ mode.
- If you install a PCIe x16 graphics card on to the PCIe x16_1 slot, a PCIe device with a bandwidth faster than x8 link to the PCIe x16/x8_3 slot, and a PCIe device with a bandwidth slower than x4 link to the PCIe x8/x1_2 slot, the three PCIe x16 slots will work at x16, x16, x1 link as the default.
- If you install a PCIe x16 graphics card on to the PCIe x16_1 slot, a PCIe device with a bandwidth slower than x8 link to the PCIe x16/x8_3 slot, and a PCIe device with a bandwidth faster than x4 link to the PCIe x8/x1_2 slot, the three PCIe x16 slots will work at x16, x8, x8 link as the default.
- You may manually reassign the link width of PCIe x8/x1_2 and PCIe x16/x8_3 slots in BIOS settings. See page 3-18 for details.
- We recommend that you provide sufficient power when running CrossFireX™ or SLI™ mode.
- Connect a chassis fan to the motherboard connector labeled CHA_FAN1/2/3 when using multiple graphics cards for better thermal environment.

IRQ assignments for this motherboard

	A	B	C	D	E	F	G	H
Intel 82583V	–		–	–	–	–	shared	–
ASM1061	–	–	–	–	shared	–	–	–
ASM1403 USB3.0_1	–	–	–	shared	–	–	–	–
ASM1403 USB3.0_2	–	–	shared	–	–	–	–	–
ASM1403 USB3.0_3	shared	–	–	–	–	–	–	–
Onchip SATA Controller	–	–	–	shared	–	–	–	–
Onchip USB_1	–	–	shared	–	–	–	–	–
Onchip USB_2	–	–	shared	–	–	–	–	–
Onchip Azaliz	shared	–	–	–	–	–	–	–
PCI Slot	–	–	–	–	shared	–	–	–
PCIE_X16_1	shared	–	–	–	–	–	–	–
PCIE_X8/X1_2	–	–	–	–	shared	–	–	–
PCIE_X16/X8_3	shared	–	–		–	–	–	–
PCIE_X4_4	shared	–	–	–	–	–	–	–
PCIE_X1_1	–	–	–	–	–	–	–	shared

2.2.6 Onboard LEDs

The motherboard comes with a set of 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/NB, and VDDA Voltage 2.5V; 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.

2. **Memory LED**

   The Memory LED has two voltage displays: DDR and VDDR. Refer to the illustration below for the location of the memory LED and the table below for LED definition.

3. **Northbridge/Southbridge LEDs**

   Northbridge and southbridge LEDs each have two different voltage displays. The northbridge LED displays the NB voltage, the NB 1.8V voltage or the VDDPCIE The southbridge LED shows either the SB voltage or the HT 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.

CROSSHAIR V FORMULA CPU/ NB/ DDR/ SB LED

	Normal (green)	High (yellow)	Crazy (red)
CPU Voltage (default)	by CPU–1.36875	1.3750–1.49375	1.5–by CPU
CPU/NB Voltage	by CPU–1.36875	1.3750–1.49375	1.5–by CPU
VDDA Voltage 2.5V	2.20000–2.76875	2.77500–3.00625	3.01250–3.18750
NB Voltage	0.80000–1.59375	1.60000–1.84375	1.85000-2.00000
NB 1.8 Voltage	1.80200-1.89475	1.90800-1.94775	1.96100-3.00775
VDD PCIE Voltage	1.11300-1.59000	1.60325-1.84175	1.85500-2.00075
SB Voltage	1.11300-1.44425	1.45750-1.69600	1.70925-1.802
HT Voltage	0.80000–1.39375	1.40000-1.65000	1.65625-2.00000
DRAM BUS 1.5V Voltage	1.20000-1.72500	1.73125-2.32500	2.33125-2.90000
VDDR Voltage	1.20500-1.39125	1.40450-1.65625	1.66950-1.802

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.

CROSSHAIR V FORMULA Hard Disk LED

5. **GO LED**

Blinking: Indicates that MemOK! is enabled before POST.

Lighting: Indicates that the system loads the preset profile (GO_Button file) for temporary overclocking when in OS.

CROSSHAIR V FORMULA GO_LED

6. **Q LED**

Q LEDs check key components (CPU, DRAM, VGA card, and booting devices) in sequence during motherboard booting process. If an error is found , the corresponding LED will continue lighting until the problem is solved. This user-friendly design provides an intuitional way to locate the root problem within a second.

CROSSHAIR V FORMULA CPU/ DRAM/ VGA/ BOOT_DEVICE LED

7. 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.

CROSSHAIR V FORMULA Power on switch

2.2.7 Jumpers

1. Clear RTC RAM (3-pin CLRTC)

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

CROSSHAIR V FORMULA Clear RTC RAM

To erase the RTC RAM

1. Turn OFF the computer and unplug the power cord.
2. Move the jumper cap from pins 1-2 (default) to pins 2-3. Keep the cap on pins 2-3 for about 5–10 seconds, then move the cap back to pins 1-2.
3. Plug the power cord and turn ON the computer.
4. Hold down the <Del> key during the boot process and enter BIOS setup to re-enter data.

Except when clearing the RTC RAM, never remove the cap on CLRTC jumper default position. Removing the cap will cause system boot failure!

- If the steps above do not help, remove the onboard battery and move the jumper again to clear the CMOS RTC RAM data. After the CMOS clearance, reinstall the battery.
- You do not need to clear the RTC when the system hangs due to overclocking. For system failure due to overclocking, use the C.P.R. (CPU Parameter Recall) feature. Shut down and reboot the system so the BIOS can automatically reset parameter settings to default values.
- Due to the chipset behavior, AC power off is required to enable C.P.R. function. You must turn off and on the power supply or unplug and plug the power cord before rebooting the system.

2.2.8 Internal connectors

1. AMD SB950 Serial ATA connectors (7-pin SATA6G_1-6)

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 onboard AMD® SB950 RAID controllers.

CROSSHAIR V FORMULA AMD® SATA 6.0 Gb/s connectors

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

- These connectors are set to AHCI mode by default. In AHCI 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 **SATA Port1-4** item in the BIOS to [RAID]. See section **3.5.3 Storage Configuration** for details.
- Before creating a RAID set, refer to section **4.4 RAID configurations** or the manual bundled in the motherboard support DVD.
- You must install Windows® XP Service Pack 2 or later versions before using Serial ATA hard disk drives. The Serial ATA RAID feature is available only if you are using Windows® XP SP2 or later versions.
- When using hot-plug and NCQ, set the **SATA Port1-4** in the BIOS to [AHCI]. See section **3.5.3 Storage Configuration** for details.

2. Asmedia® Serial ATA 6Gb/s connectors (7-pin SATA6G_E1)

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

CROSSHAIR V FORMULA SATA_E1 connector

3. USB 2.0 connectors (10-1 pin USB910 and USB1112)

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

CROSSHAIR V FORMULA USB2.0 connectors

You can connect the USB 2.0 cable to ASUS Q-Connector (USB, blue) first, and then install the Q-Connector (USB) to the USB 2.0 connector onboard.

4. USB 3.0 connectors (18-1 pin USB3_56)

These connectors are for USB 3.0 ports. Connect the USB 3.0 module cables to these connectors, then install the modules to slots opening at the back of the system chassis.

CROSSHAIR V FORMULA USB3.0 connector

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

5. **CPU, chassis, and optional fan connectors (4-pin CPU_FAN, 4-pin CPU_OPT, 4-pin CHA_FAN1–3, 4-pin OPT_FAN1–3)**

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!

CROSSHAIR V FORMULA Fan connectors

If you install two VGA cards, we recommend that you plug the chassis fan cable to the motherboard connector labeled OPT_FAN1/2/3 for better thermal environment.

6. Thermal sensor cable connectors (2-pin OPT_TEMP1/2/3)

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 fan1/2/3 can work with the temperature sensors for a better cooling effect.

CROSSHAIR V FORMULA Thermal sensor cable connectors

Enable **OPT FAN1/2/3 overheat protection** in BIOS if you connect thermal sensor cables to these connectors.

7. 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.

CROSSHAIR V FORMULA Digital audio connector

The S/PDIF module and the thermal sensor cable are purchased separately.

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.

CROSSHAIR V FORMULA 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. ATX power connectors (8-pin EATX12V, 4-pin EATX12V_1, 24-pin EATXPWR, 4-pin EZ_PLUG)

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.

CROSSHAIR V FORMULA ATX power connectors

- For a fully configured system, we recommend that you use a power supply unit (PSU) that complies with ATX 12 V Specification 2.0 (or later version) and provides a minimum power of 600 W.
- Do not forget to connect the 8-pin EATX12V power plug; otherwise, the system will not boot.
- Connect the 4-pin EZ_PLUG power plugs to ensure sufficient power supply when you install multiple graphics cards.
- 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. Refer to the Appendix for the certified 500W power supply or above.
- 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.

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

This connector supports several chassis-mounted functions.

CROSSHAIR V FORMULA 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.

11. ASUS Q-Connector (system panel)

Use the ASUS Q-Connector to connect/disconnect the chassis front panel cables.

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, and then match them to their respective front panel cable labels.

The labels on the front panel cables may vary depending on the chassis model.

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 is properly installed on the motherboard.

2.2.9 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.

CROSSHAIR V FORMULA Power on switch

2. Reset switch

Press the reset switch to reboot the system.

CROSSHAIR V FORMULA Reset switch

3. GO button

Press the GO button before POST to enable MemOK! or press it to quickly load the preset profile (GO_Button file) for temporary overclocking when in OS.

CROSSHAIR V FORMULA GO_BUTTON

4. ROG Connect switch

Use the ROG Connect switch to enable/disable the ROG Connect fuctions.

CROSSHAIR V FORMULA ROG CONNECT

5. **CPU Level Up switch**

Use the CPU Level Up switch to overclock immediately with OC profile presets in Windows environment without the hassle of entering BIOS.

CROSSHAIR V FORMULA CPU_LEVEL_UP switch

2.2.10 ProbeIt

The ROG ProbeIt feature provides a nice touch for your convenient and accurate OC settings. No time wasted fumbling around on the complicated motherboard layout, the clearly marked area gives you easier access to the measure points when a multitester is employed for more accurate measurements during your busy overclocking work.

Refer to the following illustration for ProbeIt location.

CROSSHAIR V FORMULA ProbeIt

Using ProbeIt

You may connect the multitester to the motherboard as shown on Figure 1, or use the ProbeIt cable to connect to the motherboard as shown on Figure 2.

Figure 1

Figure 2

The photos above are for reference only, the actual motherboard layout and measure points location may differ by models.

2.3 Building your computer system

2.3.1 Additional tools and components to build a PC system

1 bag of screws	**Philips (cross) screwdriver**
PC chassis	**Power supply unit**
AMD AM3+/AM3 CPU	**AMD AM3+ compatible CPU Fan**
DIMM	**SATA hard disk drive**
SATA optical disc drive (optional)	**Graphics card**

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

2.3.2 CPU installation

The AM3+ socket has a different pinout from the AM2+/AM2 socket. Ensure you use a CPU designed for the AM3+ socket. 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!

1

2

2.3.3 CPU heatsink and fan assembly installation

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

2.3.3 To install the CPU heatsink and fan assembly

1

2

3

4

5

2.3.4 DIMM installation

1

2

3

To remove a DIMM

2.3.5 Motherboard installation

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

1

2

3

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

2.3.6 ATX Power connection

1

2

OR

OR

2.3.7 SATA device connection

1

2

OR

2.3.8 Front I/O Connector

To install ASUS Q-Connector

To install USB Connector

To install front panel audio connector

2.3.9 Expension Card installation

To install PCIe x16 cards

To install PCIe x1 cards

To install PCI cards

2.3.10 ROG ThunderBolt Installation

Combing a dedicated Network Processing Unit (NPU) and a built-in headphone amplifier, ThunderBolt provides you with a best solution to online games, a maximum game performance and less lag problems.

Installing ThunderBolt

1. Locate the most suitable PCIe x1 or PCIe x16 slot for the ThunderBolt. You can either install ThunderBolt to the PCIe x1 slot or the PCIe x16 slot.

2. Align the card connector with the slot and press firmly until the card sits on the slot completely.

3. Connect the USB cable to the onboard USB connector.

4. Connect the 4-pin molex power connector to the ThunderBolt.

- Ensure to connect the AAFP cable from the chassis front panel to the ThunderBolt AAFP connector.
- Install the ThunderBolt on the PCIE x16/x8 slot for a better LAN performance.
- ROG ThunderBolt is only available on selected model.

2.3.12 Rear panel connectors

Rear panel connectors	
1. PS/2 keyboard/Mouse Combo port	7. External SATA port
2. USB 2.0 ports 1 and 2	8. Optical S/PDIF Out port
3. USB 3.0 ports 3 and 4	9. USB 2.0 ports 3 and 4
4. LAN (RJ-45) port*	10. USB 2.0 ports 5, 6, 7 and 8 (1 port can be switched to ROG Connect)
5. USB 3.0 ports 1 and 2	11. Audio ports
6. Clear CMOS switch	

To use hot-plug, set the **Controller Mode** in the BIOS settings to [AHCI] mode. See section **3.5.6 Onboard Devices Configuration** for details.

* LAN port LED indications

Activity/Link	Speed LED	Description
OFF	OFF	Soft-off Mode
Yellow Blinking	OFF	10 Mbps connection or suspend
Yellow Blinking	ORANGE	100 Mbps connection
Yellow Blinking	GREEN	1 Gbps connection

2.3.13 Audio I/O connections

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 Out	Rear Speaker Out
Gray	–	–	–	Side Speaker Out

Audio I/O ports

Connect to Headphone and Mic

Connect to Stereo / 2.1-channel Speakers

Connect to 4.1-channel Speakers

Connect to 5.1-channel Speakers

Connect to 7.1-channel Speakers

2.4 Starting up for the first time

1. After making all the connections, replace the system case cover.
2. 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.

2.5 Turning off the computer

2.5.1 Using the OS shut down function

If you are using Windows® Vista™/ Windows® 7:

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.

2.5.2 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.

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

3 BIOS setup

Chapter summary

3

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3.1 Knowing BIOS

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

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

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

3.2 BIOS setup program

A BIOS setup program is provided for BIOS item modification. When you start up the computer, the system provides you with the opportunity to run this program. Press <Del> 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, press <Ctrl> + <Alt> + <Delete>, or press the reset button on the system chassis to restart the system. You can also turn the system off and then turn it back on to restart the system. Do this last option only if the first two failed.

- The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.
- Ensure that a USB mouse is connected to your motherboard if you want to use the mouse to control the BIOS setup program.
- If the system becomes unstable after changing any BIOS setting, load the default settings to ensure system compatibility and stability. Select the Load Optimized Defaults item under the Exit menu. See section 3.9 Exit Menu for details.
- If the system fails to boot after changing any BIOS setting, try to clear the CMOS and reset the motherboard to the default value. See section **2.3.11 Rear panel connectors** for information on how to erase the RTC RAM.

The BIOS 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 submenus and select from the available options using a keyboard or a USB mouse.

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

3.2.1 EZ Mode

The EZ Mode provides you an overview of the basic system information, and allows you to select the display language, system performance mode and boot device priority. To access the Advanced Mode, click **Exit/Advanced Mode**, then select **Advanced Mode**.

The default screen for entering the BIOS setup program can be changed. Refer to the **Setup Mode** item in section **3.7 Boot memu** for details.

- The boot device options vary depending on the devices you installed to the system.
- The **Boot Menu(F8)** button is available only when the boot device is installed to the system.

3.2.2 Advanced Mode

By default, the Advanced Mode appears when you enter the BIOS setup program. The Advanced Mode provides advanced options for experienced end-users to configure the BIOS settings. The figure below shows an example of the Advanced Mode. Refer to the following sections for the detailed configurations.

To access the EZ Mode, click **Exit**, then select **ASUS EZ Mode**.

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
Monitor	For displaying the system temperature, power status, and changing the fan settings.
Boot	For changing the system boot configuration
Tool	For configuring options for special functions
Exit	For selecting the exit options and loading default settings

Menu items

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

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

Back button

This button appears when entering a submenu. Press <Esc> or use the USB mouse to click this button to return to the previous menu screen.

Submenu items

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

Pop-up window

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

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.

Navigation keys

At the bottom right corner of the menu screen are the navigation keys for the BIOS setup program. Use the navigation keys to select items in the menu and change the settings. Use <F12> key to capture the BIOS screen and save it to the removable storage device.

General help

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

Configuration fields

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

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

3.3 Extreme Tweaker menu

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

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

The configuration options for this section vary depending on the CPU and DIMM model you installed on the motherboard.

Scroll down to display the following items:

Scroll down to display the following items:

Ai Overclock Tuner [Auto]

Allows you to select the CPU overclocking options to achieve the desired CPU internal frequency. Select any of these preset overclocking configuration options:

[Auto]	Loads the optimal settings for the system.
[Manual]	Allows you to individually set overclocking parameters.
[D.O.C.P.]	Allows you to select a DRAM voltage.

OC Tuner [CANCEL]

OC Tuner automatically overclocks the frequency and voltage of CPU and DRAM. Configuration options: [CANCEL] [OK]

CPU Ratio [Auto]

Allows you to manually adjust the maximum non-CPB CPU ratio. Use <+> and <-> keys to adjust the value. The valid value ranges vary according to your CPU model.

Memory Frequency [Auto]

Allows you to set the memory operating frequency. Configuration options: [DDR3-800MHz] [DDR3-1066MHz] [DDR3-1333MHz] [DDR3-1600MHz]

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

CPU/NB Frequency [Auto]

Sets the ratio between northbridge (in CPU) Clock and the CPU Bus frequency. Configuration options: [Auto] [1400MHz] [1600MHz] [1800MHz] [2000MHz] [2200MHz] [2400MHz] [2600MHz] [2800MHz] [3000MHz] [3200MHz]

HT Link Speed [Auto]

Allows you to set the HyperTransport link speed.
Configuration options: [Auto] [800MHz] [1000MHz] [1200MHz] [1400MHz] [1600MHz] [1800MHz] [2000MHz]

CPU Spread Spectrum [Auto]

[Auto]	Automatic configuration.
[Disabled]	Enhances the BCLK overclocking ability.
[Enabled]	Sets to [Enabled] for EMI control.

PCIE Spread Spectrum [Auto]

[Auto]	Automatic configuration.
[Disabled]	Enhances the PCIE overclocking ability.
[Enabled]	Sets to [Enabled] for EMI control.

EPU Power Saving Mode [Disabled]

Allows you to enable or disable the EPU power saving function.
Configuration options: [Disabled] [Enabled]

DRAM Timing Control

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

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

DRAM Driving Control

DCT0 Information:

CKE drive strength [Auto]
Configuration options: [Auto] [1x] [1.25x] [1.5x] [2x]

CS/ODT drive strength [Auto]
Configuration options: [Auto] [1x] [1.25x] [1.5x] [2x]

ADDR/CMD drive strength [Auto]
Configuration options: [Auto] [1x] [1.25x] [1.5x] [2x]

MEMCLK drive strength [Auto]
Configuration options: [Auto] [0.75x] [1x] [1.25x] [1.5x]

Data drive strength [Auto]
Configuration options: [Auto] [0.75x] [1x] [1.25x] [1.5x]

DQS drive strength [Auto]
Configuration options: [Auto] [0.75x] [1x] [1.25x] [1.5x]

Processor ODT [Auto]
Configuration options: [Auto] [240 ohms +/- 20%] [120 ohms +/- 20%] [60 ohms +/- 20%]

DCT1 Information:

CKE drive strength [Auto]
Configuration options: [Auto] [1x] [1.25x] [1.5x] [2x]

CS/ODT drive strength [Auto]
Configuration options: [Auto] [1x] [1.25x] [1.5x] [2x]

ADDR/CMD drive strength [Auto]
Configuration options: [Auto] [1x] [1.25x] [1.5x] [2x]

MEMCLK drive strength [Auto]
Configuration options: [Auto] [0.75x] [1x] [1.25x] [1.5x]

Data drive strength [Auto]
Configuration options: [Auto] [0.75x] [1x] [1.25x] [1.5x]

DQS drive strength [Auto]
Configuration options: [Auto] [0.75x] [1x] [1.25x] [1.5x]

Processor ODT [Auto]
Configuration options: [Auto] [240 ohms +/- 20%] [120 ohms +/- 20%] [60 ohms +/- 20%]

GPU.DIMM Post

The sub-items in this menu display the status of the installed VGA cards and memory. The field shows N/A if there's no device installed on that slot.

DIGI + VRM/Power Control

CPU Load-line Calibration [Auto]

Load-line is defined by Intel VRM spec and affects CPU voltage. The CPU working voltage will decrease proportionally to CPU loading. Higher Load-line calibration would get higher voltage and better overclocking performance, but increase the CPU and VRM thermal. This item allows you to adjust the voltage range from the following percentages to boost the system performance: 0% (Regular), 25% (Medium), 50% (High), 75% (Ultra High) and 100% (Extreme).
Configuration options: [Auto] [Regular] [Medium] [High] [Ultra High] [Extreme]

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

CPU/NB Load Line Calibration [Auto]

Allows you to select the CPU/NB Load-Line mode.
Configuration options: [Auto] [Regular] [High] [Extreme]

CPU Voltage Over-Current Protection [Auto]

This item provides wider total power range for overclocking. A higher value brings a wider total power range and extends the overclocking frequency range simultaneously.
Configuration options: [Auto] [100%] [110%] [120%] [130%] [140%] [Disabled]

Do not remove the thermal module while changing the DIGI+ VRM related parrameters . The thermal conditions should be monitored.

Some of the following 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.

CPU/NB Over-Current Protection [Auto]

This item provides wider total power range for overclocking. A higher value brings a wider total power range and extends the overclocking frequency range simultaneously.
Configuration options: [Auto] [100%] [110%] [120%] [130%]

CPU PWM Phase Control [Extreme]

Phase number is the number of woorking VRM phase. Increasing phase number under heavy system loading to get more transient and better thermal performance. Reducing phase number under light system loading to increase VRM efficiency

[Standard]	Proceeds phase control depending on the CPU loading.
[Optimized]	Loads the ASUS optimized phase tuning profile.
[Extreme]	Proceeds the full phase mode.
[Manual Adjustment]	Allows manual adjustment

VRM Over Temperature Protection [Enabled]

CPU Voltage Frequency [Auto]

Allows you to select the CPU Voltage Frequency.
Configuration options: [Auto] [Manual]

VRM Fixed Frequency Mode [300]
This item appears only when you set the CPU Voltage Frequency item to [Manual] and allows you to set a fixed VRM frequency. Use the <+> and <-> keys to adjust the value. The values range from 300k Hz to 500k Hz with a 10k Hz interval.

CPU PWM mode [Extreme]

[T.Probe]	Maintains the VRM thermal balance.
[Extreme]	Maintains the VRM current balance.

Extreme OV [Disabled]

[Enabled] Enables the Extreme OV function.

[Disabled] Disables this function.

CPU & CPU/NB Voltage mode [Manual Mode]

[Manual Mode] Allows you to set a fixed CPU voltage.

[Offset Mode] Allows you to set the Offset voltage.

CPU Manual Voltage [Auto]

This item appears only when you set the CPU & NB Voltage item to [Manual Mode] and allows you to set a fixed CPU voltage. The values range depends on your CPU.

CPU/NB Manual Voltage [Auto]

This item appears only when you set the CPU & NB Voltage item to [Manual Mode] and allows you to set a fixed CPU/NB voltage. The values range depends on your CPU.

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

CPU VDDA Voltage [Auto]

Allows you to set the CPU VDDA voltage. The values range from 2.20000V to 3.18750V with a 0.00625V interval. The text color in the configuration field indicates voltage condition.

DRAM Voltage [Auto]

Allows you to set the DRAM voltage. The values range from 1.20V to 2.90V with a 0.00625V interval.

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.

VDDR [Auto]

Allows you to set the VDDR voltage. The values range from 1.20575V to 1.80200V with a 0.01325V interval.

DRAM VREFDQ [Auto]

Allows you to set the DRAM VREFDQ Voltage. The values range from 0.5900V to 0.9750V with a 0.0025V interval.

DRAM VREFCA [Auto]

Allows you to set the DRAM VREFCA Voltage. The values range from 0.5900V to 0.9750V with a 0.0025V interval.

DRAM VREFCA on CPU [Auto]

Allows you to set the DRAM VREFCA on CPU Voltage. The values range from 0.5900V to 0.9750V with a 0.0025V interval.

DRAM Voltage Switching Frequency [Auto]

Allows you to switch DRAM voltage frequency. Configuration options: [Auto] [1] [2x]

DRAM Voltage Over-Current Protection [Auto]

Configuration options: [Enabled] [Disabled]

NB Voltage [Auto]

Allows you to set the North Bridge voltage. The values range from 0.80000V to 2.00000V with a 0.00625V interval.

NB HT Voltage [Auto]

Allows you to set the NB HT voltage. The values range from 0.80000V to 2.00000V with a 0.00625V interval.

NB 1.8V Voltage [Auto]

Allows you to set the NB 1.8V voltage. The values range from 1.80200V to 3.00775V with a 0.01325V interval.

VDD PCIE [Auto]

Allows you to set the VDD PCIE voltage. The values range from 1.11300V to 2.00075V with a 0.01325V interval. The text color in the configuration field indicates voltage condition.

SB Voltage [Auto]

Allows you to set the SB voltage. The values range from 1.11300V to 1.80200V with a 0.01325V interval.

NB Voltage Switching Frequency [Auto]

Allows you to switch NB voltage frequency. Configuration options: [Auto] [1] [2x]

NB 1.8V Switching Frequency [Auto]

Allows you to switch NB 1.8V voltage frequency. Configuration options: [Auto] [1] [2x]

VDD PCIE Switching Frequency [Auto]

Allows you to switch VDD PCIE voltage frequency. Configuration options: [Auto] [1] [2x

3.4 Main menu

The Main menu screen appears when you enter the Advanced Mode of the BIOS Setup program. The Main menu provides you an overview of the basic system information, and allows you to set the system date, time, language, and security settings.

3.4.1 System Language [English]

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

3.4.2 System Date [Day xx/xx/xxxx]

Allows you to set the system date.

3.4.3 System Time [xx:xx:xx]

Allows you to set the system time.

3.4.4 Security

The Security menu items allow you to change the system security settings.

- If you have forgotten your BIOS password, erase the CMOS Real Time Clock (RTC) RAM to clear the BIOS password. See section **2.3.11 Rear panel connectors** for information on how to erase the RTC RAM.
- The **Administrator** or **User Password** items on top of the screen show the default **Not Installed**. After you set a password, these items show **Installed**.

Administrator Password

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

To set an administrator password:

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

To change an administrator password:

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

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

User Password

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

To set a user password:

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

To change a user password:

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

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

3.5 Advanced menu

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

Be cautious when changing the settings of the Advanced menu items. Incorrect field values can cause the system to malfunction.

3.5.1 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.

Cool‘n’Quiet [Disabled]

[Enabled] Enables the AMD Cool’n’Quiet function.

[Disabled] Disables this function.

C1E [Disabled]

[Enabled] Enables the C1E support function. This item should be enabled in order to enable the Enhanced Halt Sate.

[Disabled] Disables this function.

SVM [Enabled]

[Enabled] Enables AMD virtualization in CPU. This secure virtual mode will let you run multiple operation system on the same physical hardware by decoupling operation system and physical hardware with the hypervisor layer.

[Disabled] Disables this function.

3.5.2 North Bridge Configuration

IOMMU [Disabled]

Configuration options: [Disabled] [64MB]

Memory Configuration

Bank Interleaving [Auto]
Allows you to enable Memory Bank Interleaving fuction. Configuration options: [Auto] [Disabled]

Channel Interleaving [Auto]
Allows you to enable Memory Channel Interleaving fuction. Configuration options: [Auto] [Disabled]

ECC Mode [Disabled]
Allows you to enable or disable the ECC Mode.
Configuration options: [Enabled] [Disabled]

Power Down Enable [Disabled]
Allows you to enable or disable DDR power down mode.
Configuration options: [Enabled] [Disabled]

Memory Hole Remapping [Enabled]
Allows you to enable or disable Memory Hole Remapping fuction.
Configuration options: [Enabled] [Disabled]

DCT Unganged Mode [Enabled]
Allows you to select unganged DRAM mode (64-bit width).
[Enabled]: Unganged mode.
[Disabled]: Ganged mode.

Initiate Graphic Adapter [PEG/PCI]

Allows you to decide which graphics controller to use as the primary boot device.
Configuration options: [PCI/PEG] [PEG/PCI]

3.5.3 SATA Configuration

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

Onchip SATA Channel [Enabled]

Configuration options: [Disabled] [Disabled]

SATA Port1-Port4 [AHCI]

Allows you to set the SATA configuration. This item appears only when you set the OnChip SATA Channel item to [Enabled].

[IDE] Set to [IDE] when you want to use the Serial ATA hard disk drives as Parallel ATA physical storage devices.

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

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

SATA Port5-Port6 [AHCI]

Allows you to set the SATA configuration. This item appears only when you set the OnChip SATA Channel item to [Enabled].

[IDE] Set to [IDE] when you want to use the Serial ATA hard disk drives as Parallel ATA physical storage devices.

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

You can only set SATA Port5-Port6 to [IDE] if Port1-Port4 is set to [IDE]

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

S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) is a monitor system. When read/write of your hard disk errors occur, this feature allows the hard disk to report warning messages during the POST.
Configuration options: [Disabled] [Enabled]

SATA Hot Plug on PORT1-6 [Disabled]

Allows you to set SATA Hot Plug on PORT1-6 to external SATA port.
Configuration options: [Disabled] [Enabled]

3.5.4 USB Configuration

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

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

Legacy USB Support [Enabled]

[Disabled] The USB devices can be used only for the BIOS setup program.

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

[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.

Legacy USB3.0 Support [Enabled]

[Enabled] Enables the support for USB 3.0 devices on legacy operating systems (OS).

[Disabled] Disables the function.

EHCI Hand-off [Disabled]

[Disabled] Disables the function.

[Enabled] Enables the support for operating systems without an EHCI hand-off feature.

SB USB Configuration

The sub-items in this menu allow you to set the SB USB Configuration.

OHCI HC (Bus 0 Dev 18 Fn 0) [Enabled]
Enable or disable OHCI USB1.1 Controller. Configuration options: [Disabled] [Enabled]

OHCI HC (Bus 0 Dev 19 Fn 0) [Enabled]
Enable or disable OHCI USB1.1 Controller. Configuration options: [Disabled] [Enabled]

OHCI HC (Bus 0 Dev 22 Fn 0) [Enabled]
Enable or disable OHCI USB1.1 Controller. Configuration options: [Disabled] [Enabled]

OHCI HC (Bus 0 Dev 20 Fn 5) [Enabled]
Enable or disable OHCI USB1.1 Controller. Configuration options: [Disabled] [Enabled]

USB PORT 0-13 [Enabled]
Enable or disable USB port 0-13. Configuration options: [Disabled] [Enabled]

USB PORT FL0-FL1 [Enabled]
Enable or disable USB port FL0-FL1. Configuration options: [Disabled] [Enabled]

USB Device Wakeup From S3 or S4 [Enabled]
Enable or disable USB Device Wakeup From S3 or S4 funtion. Configuration options: [Disabled] [Enabled]

3.5.5 CPU Core Configuration

ASUS Core Unlocker [Disabled]

Allows you to enable ASUS Core Unlocker to get full computing power of processor.Configuration options: [Disabled] [Enabled]

System might become unstable due to different CPU margins.

CPU Core Activation [Auto]

Allows you to manually turn off the second or the third core.
Configuration options: [Auto] [Manual]

3.5.6 Onboard Devices Configuration

ASM1061 Storage Controller [ACHI Mode]

Allows you to select the ASM1061 storage controller operating mode.

[Disabled] Disables the controller.

[IDE] Set to [IDE] when you want to use the Serial ATA hard disk drives as Parallel ATA physical storage devices.

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

ASM1061 Storage OPROM [Enabled]

This item appears only when you set the previous item to [Enabled] and allows you to enable or disable the OptionRom of the ASM1061 storage controller. Configuration options: [Enabled] [Disabled]

Asmedia USB 3.0 Controller [Enabled]

[Enabled] Enables the Asmedia USB 3.0 Controller.

[Disabled] Disables the controller.

Asmedia USB 3.0 Battery Charging Support [Disabled]

[Enabled] Enables the Asmedia USB 3.0 Battery Charging Support fuction.

[Disabled] Disables the fuction.

Intel 82583 LAN [Enabled]

[Enabled] Enables the Intel 82583 LAN controller.

[Disabled] Disables the controller.

Launch PXE OPROM [Disabled]

This item appears only when you set the previous item to [Enabled] and allows you to enable or disable boot option for Legacy Network Devices.
Configuration options: [Enabled] [Disabled]

SB HD Azalia Configuration

HD Audio Azalia Device [Enabled]

[Enabled] Enables the HD Audio Device.

[Disabled] Disables the controller.

Azalia Front Panel [HD]

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.

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

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

SPDIF Out Type [SPDIF]

[SPDIF] Sets to [SPDIF] for SPDIF audio output.

[HDMI] Sets to [HDMI] for HDMI audio output.

3.5.7 APM

ErP Ready [Disabled]

[Disabled] Disables the Energy Using Products (EuP) Ready function.

[Enabled] Allows BIOS to switch off some power at S5 state to get system ready for the EuP requirement. When set to [Enabled], power for WOL, WO_USB, audio and onboard LEDs will be switched off at S5 state.

Restore AC Power Loss [Power Off]

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

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

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

Power On By PS/2 Device [Disabled]

[Disabled] Disables the Power On by a PS/2 device.

[Enabled] Enables the Power On by a PS/2 device. This feature requires an ATX power supply that provides at least 1A on the +5VSB lead.

Power On By PME [Disabled]

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

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

Power On By RTC [Disabled]

[Disabled] Disables RTC to generate a wake event.

[Enabled] When set to [Enabled], the items RTC Alarm Date (Days) and Hour/Minute/Second will become user-configurable with set values.

3.5.8 iROG Configuration

iROG Timer Keeper [Last State]

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

3.5.9 ROG Connect

ROG Connect [Enabled]

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

RC Poster Mode [String]

RC Poster describes what occurs during the POST.
Configuration options: [String] [Code]

3.5.10 LED Control

The LED Control menu items allow you to change the advanced settings for the onboard LEDs.

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

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].

ROG Logo [Enabled]

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

Voltiminder LED [Enabled]

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

CPU LED Selection [CPU]

Allows you to switch the onboard CPU LED display between CPU voltage [CPU], CPU/NB voltage [CPU/NB], and CPU VDDA [CPU VDDA]. Configuration options: [CPU] [CPU/NB] [CPU VDDA]

NB LED Selection [NB]

Allows you to switch the onboard NB LED display between NB voltage [NB], NB 1.8V [NB 1.8V], and VDDPCIE voltage [VDDPCIE].
Configuration options: [NB] [NB 1.8V] [VDDPCIE]

SB LED Selection [SB]

Allows you to switch the onboard SB LED display between SB voltage [NB] and HT voltage [HT]. Configuration options: [SB] [HT]

DDR LED Selection [DDR]

Allows you to switch the onboard DDR LED display between DDR voltage [DDR] and VDDR voltage [VDDR]. Configuration options: [DDR] [VDDR]

3.6 Monitor menu

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

Voltage Monitor

Vcore Voltage; 3.3V Voltage; 5V Voltage; 12V Voltage; VDDA2.5V Voltage; CPU/NB Voltage; DRAM Voltage; HT Voltage; NB Voltage; SB Voltage [xxxV]

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

Temperature Monitor

CPU Temperature; MB Temperature; NB Temperature; SB Temperature; OPT1/2/3 Temperature[xxxºC/xxxºF]

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

NB Overheat Protection [90ºC]

The system automatically shuts down when the NB is heated over the set temperature to protect it from damage.

Configuration options: [Disabled] [70ºC] [80ºC] [90ºC] [100ºC]

SB Overheat Protection [90ºC]
The system automatically shuts down when the SB is heated over the set temperature to protect it from damage.
Configuration options: [Disabled] [70ºC] [80ºC] [90ºC] [100ºC]

OPT TEMP1/2/3 Overheat Protection [90ºC]
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] [70ºC] [80ºC] [90ºC] [100ºC]

Fan Speed Monitor

CPU FAN; CPU Opt FAN; Chassis FAN1/2/3 Speed; Opt 1/2/3 FAN Speed [xxxxRPM] or [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

CPU Q-Fan Control [Disabled]

Allows you to enable or disable the CPU fan controller.

[Disabled] Disables the CPU Q-fan controller.
[Enabled] Enables the CPU Q-fan controller.

The following items appear when you enable the CPU Fan Control feature.

Select Fan Type [PWM Fan]
Configuration options: [PWM Fan] [DC Fan]

CPU Fan Profile [Standard]
Allows you to set the appropriate performance level of the CPU fan.

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

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

[Turbo] Set to [Turbo] to achieve maximum CPU fan speed.

[Manual] Sets to [Manual] to display more items for you to manually adjust the CPU upper/lower temperature, and CPU fan upper/lower duty cycle.

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

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

CPU Lower Temperature [20]
Displays the lower limit of the CPU temperature.

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

CPU Fan Min. Duty Cycle(%) [20]
Use the <+> and <-> keys to adjust the minimum CPU fan duty cycle. The values range from 20% to 100%. When the CPU temperature is under 40ºC, the CPU fan will operate at the minimum duty cycle.

CPU Fan Speed Low Limit [600 RPM]
Allows you to set the low speed limit of the CPU fan and the system sends warning message when the fan speed drops below the set value.
Configuration options: [Ignored] [100 RPM] [200 RPM] [300 RPM] [400 RPM] [500 RPM]
[600 RPM]

Chassis Q-Fan Control [Disabled]

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

[Enabled] Enables the Chassis Q-Fan control feature.

Chassis Fan Profile [Standard]
This item appears only when you enable the Chassis Q-Fan Control feature and allows you to set the appropriate performance level of the chassis fan.

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

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

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

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

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

Chassis Upper Temperature [70]
Use the <+> and <-> keys to adjust the upper limit of the CPU temperature. The values range from 40ºC to 90ºC.

Chassis Lower Temperature [40]
Displays the lower limit of the chassis temperature.

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

Chassis Fan Min. Duty Cycle(%) [60]

Use the <+> and <-> keys to adjust the minimum chassis fan duty cycle. The values range from 60% to 100%. When the chassis temperature is under 40ºC, the chassis fan will operate at the minimum duty cycle.

Chassis Fan Speed Low Limit [600 RPM]

This item appears only when you enable the Chassis Q-Fan Control feature and allows you to disable or set the chassis fan warning speed.
Configuration options: [Ignore] [100 RPM] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

OPTFAN 1/2/3 Control [Disabled]

Allows you to select the optional fan control mode. When this item is set to [Duty Mode], you can configure the **OPT Fan1/2/3 Duty** item. If you set this item to [User Mode], you are allowed to configure the **OPT Fan1/2/3 Low Speed Temp** and **OPT Fan1/2/3 Full Speed Temp** item.
Configuration options: [Disabled] [Duty Mode] [User Mode]

OPTFAN 1/2/3 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 OPTFAN1/2/3 Control item is set to [User Mode].
Configuration options: [25˚C] [30˚C] [35˚C] [40˚C]

OPTFAN 1/2/3 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 OPTFAN1/2/3 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.

Bootup NumLock State [On]

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

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

Full Screen Logo [Enabled]

[Enabled] Enables the full screen logo display feature.

[Disabled] Disables the full screen logo display feature.

Set this item to [Enabled] to use the ASUS MyLogo 3™ feature.

Option ROM Messages [Force BIOS]

[Force BIOS] The third-party ROM messages will be forced to display during the boot sequence.

[Keep Current] The third-party ROM messages will be displayed only if the third-party manufacturer had set the add-on device to do so.

Interrupt 19 Capture [Disabled]

[Enabled]: Allows option ROMs to trap Int 19.

[Disabled]: Stops option ROMs to trap Int 19.

Setup Mode [Advanced Mode]

[Advanced Mode] Sets Advanced Mode as the default screen for entering the BIOS setup program.

[EZ Mode] Sets EZ Mode as the default screen for entering the BIOS setup program.

Wait for 'F1' If Error [Enabled]

When set to [Enabled], the system waits for the <F1> key to be pressed when error occurs.

Boot Option Priorities

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

- To select the boot device during system startup, press <F8> when ASUS Logo appears.
- To access Windows OS in Safe Mode, do any of the following:
  - Press <F5> when ASUS Logo appears.
  - Press <F8> after POST.

Boot Override

These items displays the available devices. The number of device items that appears on the screen depends on the number of devices installed in the system. Click an item to start booting from the selected device.

3.8 Tools menu

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

3.8.1 ASUS EZ Flash 2 Utility

Allows you to run ASUS EZ Flash 2 Utility. When you press <Enter> to start the application.

For more details, refer to section 3.10.2 ASUS EZ Flash 2 Utility.

3.8.2 ASUS SPD Information

Allows you to get DRAM SPD information.

3.8.3 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.

3.8.4 GO Button File

This menu allows you to set the GO Button files, and load the desired GO Button file.

Scroll down to display the following items:

CPU Bus/PEG Frequency; PCIE Frequency; CPU Ratio; CPU Voltage; CPU/NB Voltage; CPU VDDA Voltage; DRAM Voltage; NB Voltage; NB HT Voltage; NB 1.8V Voltage; SB Voltage; VDD PCIE; VDDR

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

Load Default

Allows you to load default settings.

Save Above Settings

Allows you to save the adjusted values for specific items as a GO Button file.

3.9 Exit menu

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

Load Optimized Defaults

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

Save Changes & Reset

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

Discard Changes & Exit

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

ASUS EZ Mode

This option allows you to enter the EZ Mode screen.

Launch EFI Shell from filesystem device

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

3.10 Updating BIOS

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

Visit the ASUS website (www.asus.com) to download the latest BIOS file for this motherboard.

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

1. **ASUS Update:** Updates the BIOS in Windows® environment.
2. **ASUS EZ Flash 2:** Updates the BIOS using a USB flash drive.
3. **ASUS BIOS Updater:** Updates and backups the BIOS in DOS environment using the motherboard support DVD and a USB flash disk drive.

Refer to the corresponding sections for details on these utilities.

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

3.10.1 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:

- Update the BIOS directly from the Internet
- Download the latest BIOS file from the Internet
- Update the BIOS from an updated BIOS file
- Save the current BIOS file
- 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).

Launching ASUS Update

After installing AI Suite II from the motherboard support DVD, launch ASUS Update by clicking **Update > ASUS Update** on the AI Suite II main menu bar.

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. From the ASUS Update screen, select **Update BIOS from Internet**, and then click **Next**.

2. Select the ASUS FTP site nearest you to avoid network traffic.

   If you want to enable the BIOS downgradable function and auto BIOS backup function, check the checkboxs before the two items on the screen.

3. Select the BIOS version that you want to download. Click **Next**.

4. You can decide whether to change the BIOS boot logo, which is the image appearing on screen during the Power-On Self-Tests (POST). Click **Yes** if you want to change the boot logo or **No** to continue.

5. Click Browse to locate your desired picture file.

6. Adjust the picture resolution if needed and click **Next** to continue.

7. Follow the onscreen instructions to complete the update process.

Updating the BIOS through a BIOS file

To update the BIOS through a BIOS file:

1. From the ASUS Update screen, select **Update BIOS from file**, and then click **Next**.

2. Locate the BIOS file from the Open window, click **Open**, and click **Next**.

3. You can decide whether to change the BIOS boot logo. Click **Yes** if you want to change the boot logo or **No** to continue.
4. Follow the onscreen instructions to complete the update process.

- The screenshots in this section are for reference only. The actual BIOS information vary by models.
- Refer to the software manual in the support DVD or visit the ASUS website at www.asus.com for detailed software configuration.

3.10.2 ASUS EZ Flash 2 Utility

The ASUS EZ Flash 2 Utility feature allows you to update the BIOS without having to use a bootable floppy disk or an OS-based utility.

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 Utility:

1. Insert the USB flash disk that contains the latest BIOS file to the USB port.
2. Enter the Advanced Mode of the BIOS setup program. Go to the **Tool** menu to select **ASUS EZ Flash 2 Utility** and press <Enter> to enable it.

3. Press <Tab> to switch to the **Drive** field.
4. Press the Up/Down arrow keys to find the USB flash disk that contains the latest BIOS, and then press <Enter>.
5. Press <Tab> to switch to the **Folder Info** field.
6. Press the Up/Down arrow keys to find the BIOS file, and then press <Enter> to perform the BIOS update process. Reboot the system when the update process is done.

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

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

3.10.3 ASUS BIOS Updater

The ASUS BIOS Updater allows you to update BIOS in DOS environment. This utility also allows you to copy the current BIOS file that you can use as a backup when the BIOS fails or gets corrupted during the updating process.

The succeeding utility screens are for reference only. The actual utility screen displays may not be same as shown.

Before updating BIOS

1. Prepare the motherboard support DVD and a USB flash drive in FAT32/16 format and single partition.
2. Download the latest BIOS file and BIOS Updater from the ASUS website at http://support.asus.com and save them on the USB flash drive.

- NTFS is not supported under DOS environment. Do not save the BIOS file and BIOS Updater to a hard disk drive or USB flash drive in NTFS format.
- Do not save the BIOS file to a floppy disk due to low disk capacity.

3. Turn off the computer and disconnect all SATA hard disk drives (optional).

Booting the system in DOS environment

1. Insert the USB flash drive with the latest BIOS file and BIOS Updater to the USB port.
2. Boot your computer. When the ASUS Logo appears, press <F8> to show the **BIOS Boot Device Select Menu**. Insert the support DVD into the optical drive and select the optical drive as the boot device.

3. When the **Make Disk** menu appears, select the **FreeDOS command prompt** item by pressing the item number.
4. At the FreeDOS prompt, type **d:** and press <Enter> to switch the disk from Drive C (optical drive) to Drive D (USB flash drive).

```
Welcome to FreeDOS (http://www.freedos.org)!
C:\>d:
D:\>
```

Backing up the current BIOS

To backup the current BIOS file using the BIOS Updater

Ensure that the USB flash drive is not write-protected and has enough free space to save the file.

1. At the FreeDOS prompt, type **`bupdater /o[filename]`** and press <Enter>.

```
D:\>bupdater /oOLDBIOS1.rom
```

Filename **Extension**

The [filename] is any user-assigned filename with no more than eight alphanumeric characters for the filename and three alphanumeric characters for the extension.

2. The BIOS Updater backup screen appears indicating the BIOS backup process. When BIOS backup is done, press any key to return to the DOS prompt.

Updating the BIOS file

To update the BIOS file using BIOS Updater

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

```
D:\>bupdater /pc /g
```

2. The BIOS Updater screen appears as below.

3. Press <Tab> to switch between screen fields and use the <Up/Down/Home/End> keys to select the BIOS file and press <Enter>. BIOS Updater checks the selected BIOS file and prompts you to confirm BIOS update.

4. Select **Yes** and press <Enter>. When BIOS update is done, press <ESC> to exit BIOS Updater. Restart your computer.

DO NOT shut down or reset the system while updating the BIOS to prevent system boot failure!

- For BIOS Updater version 1.04 or later, the utility automatically exits to the DOS prompt after updating BIOS.
- Ensure to load the BIOS default settings to ensure system compatibility and stability. Select the **Load Optimized Defaults** item under the **Exit** BIOS menu. See Chaper 3 of your motherboard user manual for details.
- Ensure to connect all SATA hard disk drives after updating the BIOS file if you have disconnected them.

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

4 Software support

Chapter summary

4

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4.1 Installing an operating system

This motherboard supports Windows® XP/64-bit XP/Vista/7 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 3 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 at 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.

AMD Chipset Driver

Installs the AMD® chipset driver.

Realtek Audio Driver

Installs the Realtek® audio driver and application.

ASUS ROG THUNDERBOLT Audio Driver

Installs the ASUS ROG TunderBolt audio driver and application.

ASUS ROG THUNDERBOLT LAN Driver

Installs the ASUS ROG TunderBolt LAN driver and application.

Browser Configuration Utility

Installs the browser configuration utility.

USB 3.0 Driver

Installs the USB 3.0 driver.

Asmedia SATA Controller Driver

Installs the Asmedia SATA Controller driver.

The ASUS ROG THUNDERBOLT Audio/LAN Drivers appear only when ROG ThunderBolt has been installed in the system.

4.2.3 Utilities menu

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

ASUS AI Suite II

Installs the ASUS AI Suite II.

ASUS ROG Connect

Installs the ASUS ROG Connect utility.

ASUS ROG Connect Plus

Installs the ASUS ROG Connect Plus utility.

ASUS ROG GameFirst

Installs the ASUS ROG GameFirst utility.

AMD OverDrive Utility (AOD)

Installs the AMD® OverDrive utility.

Sound Blaster X-Fi MB 2

Installs the Sound Blaster X-Fi MB 2 utility.

Adobe Reader 9

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.

4.2.4 Make disk menu

The Make disk menu contains items to create the AMD AHCI/RAID 32/64bit driver disk.

AMD AHCI/RAID Driver Disk

Allows you to create an Intel® AHCI/RAID driver disk.

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.

4.2.8 Other information

The icons on the top right corner of the screen give additional information on the motherboard and the contents of the support DVD. Click an icon to display the specified information.

Motherboard Info

Displays the general specifications of the motherboard.

Browse this DVD

Displays the support DVD contents in graphical format.

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 AI Suite II

ASUS AI Suite II allows you to launch several ASUS utilities easily.

Installing AI Suite II

To install AI Suite 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.
2. Click the Utilities tab, then click **AI Suite II**.
3. Follow the screen instructions to complete installation.

Launching AI Suite II

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

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

After launching the application, the AI Suite II icon appears in the Windows® notification area. Click the icon to close or restore the application.

Using AI Suite II

Click each button to select and launch a desired utility, to monitor or update the system, to display the system information and to customize your settings.

The screenshots of AI Suite II in this user manual are for regerence only. The actual screenshots vary with models.

4.3.2 Tool

TurboV EVO

ASUS TurboV EVO introduces Manual Mode that allows you to manually adjust the CPU frequency and related voltages as well as Auto Tuning function that offers automatic and easy overlocking and system level up. After installing AI Suite II from the motherboard support DVD, launch TurboV EVO by clicking **Tool > TurboV EVO** on the AI Suite II main menu bar.

Refer to the software manual in the support DVD or visit the ASUS website at www.asus.com for detailed software configuration.

Manual Mode

Manual Mode allows you to overclock the BCLK frequency, CPU voltage, IMC voltage, and DRAM Bus 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 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 advanced overclock ability, adjust first the BIOS items, and then proceed more detailed adjustments in More Settings.

Using Advanced Mode

Click **More Settings**, and then click the **Advanced Mode** tab to adjust the advanced voltage settings.

CPU Ratio

Allows you to manually adjust the CPU ratio.

1. Click **More Settings**, and then click the **CPU Ratio** tab.
2. Drag the adjustment bar upwards or downwards to the desired value.
3. You will requested to restart the system. Click **Yes** to make the change take effect.

- Set the CPU Ratio Setting item in BIOS to [Auto] before using the CPU Ratio function in TurboV. Refer to Chapter 3 of your motherboard user manual for details.
- The CPU Ratio bars show the status of the CPU cores, which vary with your CPU model.

Auto Tuning

ASUS TurboV EVO includes two auto tuning modes, providing the most flexible auto-tuning options.

- The overclocking result varies with the CPU model and the system configuration.
- To prevent overheating from damaging the motherboard, a better thermal environment is strongly recommended.

- Fast Tuning: fast CPU overclocking
- Extreme Tuning: extreme overclocking for CPU and memory

Using Fast Tuning

1. Click the **Auto Tuning** tab and then click **Fast**.
2. Read through the warning messages and click **OK** to start auto-overclocking.

3. TurboV automatically overclocks the CPU, saves BIOS settings and restarts the system. After re-entering Windows, a message appears indicating auto tuning success. Click **OK** to exit.

Using Extreme Tuning

1. Click the Auto Tuning tab and then click **Extreme**.
2. Read through the warning messages and click **OK** to start auto-overclocking.

3. TurboV automatically overclocks the CPU and memory and restarts the system. After re-entering Windows, a message appears indicating the current overclocking result. To keep the result, click **Stop**.

4. If you did not click Stop in the previous step, TurboV automatically starts further system overclocking and stability test. An animation appears indicating the overclocking process. Click **Stop** if you want to cancel the Overclocking process.

5. TurboV automatically adjusts and saves BIOS settings and restarts the system. After re-entering Windows, a message appears indicating auto tuning success. Click **OK** to exit.

4.3.3 DIGI+ VRM

ASUS DIGI+ VRM allows you to adjust VRM voltage and frequency modulation to enhance reliability and stability. It also provides the highest power efficiency, generating less heat to longer component lifespan and minimize power loss.

After installing AI Suite II from the motherboard support DVD, launch DIGI+ VRM by clicking **Tool > DIGI+ VRM** on the AI Suite II main menu bar.

Introduction on DIGI+ VRM Configuration Items

CPU Load-line Calibration

Load-line is defined by AMD® VRM spec and affects CPU voltage. The CPU working voltage will decrease proportionally to CPU loading. Higher load-line calibration could get higher voltage and good overclocking performance but increase the CPU and VRM thermal.

- Regular: 0%
- Medium: 25%
- High: 50%
- Ultra High: 75%
- Extreme: 100%

- The actual performance boost may vary depending on your CPU specification.
- Do not remove the thermal module. The thermal conditions should be monitored.

CPU Current Capability

CPU Current Capability provides wider total power range for overclocking. A higher value setting gets higher VRM power consumption delivery.

A higher value brings a wider total power range and extends the overclocking frequency range simultaneously.

Suggestion: choose higher value when overclocking or under high CPU loading for extra power support.

CPU Voltage Frequency

Switching frequency will affect the VRM transient response and component thermal. Higher frequency gets quicker transient response.

Enable Spread Spectrum to enhance system stability.

- VRM Fixed Frequency Range: 300–550kHz
- Manual Frequency Step: 10kHz

Do not remove the thermal module when switching to Manual mode. The thermal conditions should be monitored.

CPU/NB Load-line Calibration

Load-line is defined by Intel VRM spec and affects CPU/NB voltage. The CPU/NB working voltage will decrease proportionally to CPU/NB loading. Higher load-line calibration could get higher voltage and good overclocking performance but increase the CPU/NB and VRM thermal.

- Regular: 0%
- High: 50%
- Extreme: 100%

- The actual performance boost may vary depending on your CPU specification.
- Do not remove the thermal module. The thermal conditions should be monitored.

CPU/NB Current Capability

CPU/NB Current Capability provides wider total power range for overclocking. A higher value setting gets higher VRM power consumption delivery.

A higher value brings a wider total power range and extends the overclocking frequency range simultaneously.

Suggestion: choose higher value when overclocking or under high CPU loading for extra power support.

CPU Power Phase Control

The CPU Power Phase Control

Phase number is the number of working VRM phase. Increase phase number under heavy system loading to get more transient and better thermal performance. Reduce phase number under light system loading to increase VRM efficiency.

- **Standard**: Phase control based on CPU command.
- **Optimized**: ASUS optimized phase tuning profile
- **Extreme**: Full phase mode
- **Manual Adjustment**: Phase number adjusted by current (A) step

- Select Ultra Fast for a faster response. The reaction time will be longer when Regular is selected.
- Do not remove the thermal module when switching to Extreme and Manual mode. The thermal conditions should be monitored.

CPU Power Duty Control

The CPU Power Duty Control adjusts the current of every VRM phase and the thermal of every phase component. Select the [T.Probe] option to maintain VRM thermal balance or the [Extreme] option to maintain VRM current balance.

- **T.Probe**: Thermal balance
- **Extreme**: Current balance

Do not remove the thermal module. The thermal conditions should be monitored.

4.3.4 EPU

EPU is an energy-efficient tool that satisfies different computing needs. This utility provides several modes that you can select to save system 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, GPU frequency, vCore Voltage, and Fan Control.

Launching EPU

After installing AI Suite II from the motherboard support DVD, launch EPU by clicking **Tool > EPU** on the AI Suite II main menu bar.

*• Select From EPU Installation to show the CO2 that has been reduced since you installed EPU.

*• Select From the Last Reset to show the total CO2 that has been reduced since you click the Clear button Clear.

• Refer to the software manual in the support DVD or visit the ASUS website at www.asus.com for detailed software configuration.

4.3.5 FAN Xpert

FAN Xpert allows you to adjust both the CPU and chassis fan speeds according to different ambient temperatures and your PC's system loading. The various fan profiles offer flexible controls of fan speeds to achieve a quiet and cool system environment.

Launching FAN Xpert

After installing AI Suite II from the motherboard support DVD, launch FAN Xpert by clicking **Tool > Fan Xpert** on the AI Suite II main window.

Using FAN Xpert

Click **Fan Name** to select a fan to test the speed or click **Setting** to select a preset mode for your selected fan.

Setting

- **Disable**: disables the Fan Xpert function.
- **Standard**: adjusts fan speed in a moderate pattern.
- **Silent**: minimizes fan speed for quiet fan operation.
- **Turbo**: maximizes the fan speed for the best cooling effect.
- **User**: Allows you to configure the CPU fan profile under certain limitations.

4.3.6 Probe II

Probe II is a utility that monitors the computer's vital components, and detects and alerts you of any problem with these components. Probe II senses fan rotations, CPU temperature, and system voltages, among others. Because 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.

Launching Probe II

After installing AI Suite II from the motherboard support DVD, launch PC Probe II by clicking **Tool > Probe II** on the AI Suite II main window.

Monitoring hardware

The hardware monitor panels display the current value of a system sensor such as fan rotation, CPU temperature, and voltages. Click the tab on the top to switch display content. Click the box before each sensor to enable the alert function.

Adjusting the sensor threshold value

You can adjust the sensor threshold value in the monitor panel by moving the sliders.

Setting preference

Click **Preference** on the top to customize **Probe II**, including detection cycle, and temperature display unit.

Checking Alert Log

Click **Alert Log** on the top to check the log. Click **Clear** to reset the log if needed.

4.3.7 Sensor Recorder

Sensor Recorder allows you to monitor the changes in the system voltage, temperature, and fan speed, as well as recording the changes.

Launching Sensor Recorder

After installing AI Suite II from the motherboard support DVD, click **Tool > Sensor Recorder** on the AI Suite II main menu bar to launch PC Probe II.

Configuring Sensor Recorder

Click the **Voltage/Temperature/Fan Speed** tabs and select the sensors that you want to monitor. The History Record tab allows you to record the changes in the sensors that you enable.

Voltage

The Voltage tab displays the status of the system voltages. Select the items that you want to monitor.

Temperature

The Temperature tab displays the status of the CPU and motherboard temperatures. Select the items that you want to monitor.

Fan Speed

The Fan Speed tab displays the status of the rotations (per minute) of the CPU, chassis, and power fans. Select the items that you want to monitor.

History Record

The History Record tab allows you to record the changes in the system.

To use the recording function

1. Select the sensor type, and then select the sensors whose changes you want to record.
2. Select the record interval and duration.
3. Click **Start recording**. To stop, click **Recording** while the recording is in progress.

To edit the recorded history

- Select a date to view a certain recorded history.
- If you want to delete a recorded history, click ☒ beside the date of the selected recorded history to clear it.

4.3.8 ROG Connect

ROG Connect allows you to monitor and adjust the local PC through your remote PC.

Setting up USB connection between your local and remote PC

- Install ROG Connect on the remote PC from the provided Support DVD before using ROG Connect.
- ROG Connect must work with ROG Connect Plus to avail full function. Ensure that you install ROG Connect Plus on your local PC from the provided Support DVD before using ROG Connect.

1. Connect the provided ROG Connect cable to the local PC and the remote PC.
2. Press the ROG Connect Button.

3. Double-click the RC TweakIt shortcut on the remote PC to activate the function

Using RC TweakIt

Use the sliders and buttons to monitor or adjust your local PC.

Click Function to display more options.

RC Poster

RC Poster shows the status of the local system during the POST. You can switch the display mode between String and Code.

RC Remote

RC Remote allows you to operate your local system through the ROG Connect cable.

RC Diagram

RC Diagram allows you to monitor and record your local system status.

GPU TweakIt

GPU TweakIt allows you to control and monitor the installed GPU on the local system. Use the sliders to adjust the values and click Apply to save your customized settings.

4.3.9 ROG ThunderBolt LAN

Bigfoot Killer Network Manager

1. Double-click Bigfoot Killer Network Manager on the desktop.
2. Ensure that you have connected to the internet and click Start to perform the bandwidth test.

Network

Click the Network tab on the left to configure your network settings.

ROG ThunderBolt is only available on selected model.

Advanced

Click the Advanced tab on the left to configure Killer Network Manager settings. You can select the display information, set up the application control, and other configurations.

Overviews

Click the Overview tab on the left to see the system information and the current status of the network connection.

PC Monitor

Click the PC Monitor tab on the left to monitor and record the performance of your system. Click View Type to select a desired device for monitoring.

Applications

Click the Applications tab on the left to see the network usage of each applications.

To see the network usage of the applications, you have to enable the application control first. Click the Advanced tab and enable the Application Control.

4.3.10 ThunderBolt Audio

Double-click ROG ThunderBolt Audio on the desktop.

Main Control Panel

- SVN (Smart Volume Normalization): Enable this function to avoid large volume fluctuations.
- DS3D GX: Enable DirectSound3D Game Extensions to support EAX and DirectSound3D extensions for EAX and DS3D games on Windows.

- If you connect your speakers or headphone to the audio jack of the TunderBolt bracket, select Speakers as your default audio output device.

- If you connect your speakers or headphone to the audio jack of the chassis front panel, select Headphone as your default audio output device.

ROG ThunderBolt is only available on selected model.

Game Profiles

Click the Switch to switch the panel from Status Panel to the Game Profiles Panel. Click the plus sign (+) to add your customized profiles or the minus sign (-) to delete unwanted profiles.

Switch to the corresponding game profile according to the game you play.

	FPS Mode (First Person Shooter mode)
	HiFi Mode
	Racing Mode
	RTS Mode (Real-Time Strategy mode)
	Manual (You customized mode)

Audio output

Click the corresponding box to select from Speakers, Headphones, and SPDIF-Out for the output device. Click each button directly to configure the related settings.

Headphone Settings

Click Headphone and select Headphone Settings to do the gain adjustment. Select the gain tuning according to your headphone impedance.

A wrong gain tuning setting may damage your headphone. Select a proper gain according to your headphone specification.

Only audio output from the front panel via the AAFP cable supports the headphone gain tuning function.

Xear Surround Effect

Click Headphone and select Xear Surround Effect to enable the Xear Surround Effect.

Ensure to select a proper Room Size for a better surround effect.

Audio input

Click the corresponding box to select from Mic and Line-In for the input device. Click each button directly to configure the related settings.

4.3.11 Sound Blaster X-Fi MB 2

This application is available only under Windows Vista and Windows 7 operating system.

This installation requires that you have the latest version of the Windows Media Player installed on your system. Ensure to download and install the latest Windows Media Player before installing Sound Blaster X-Fi MB 2.

The onboard 8-channel HD audio (High Definition Audio, previously code-named Azalia) CODEC enables high-quality 192KHz/24-bit audio output, jack-sensing feature, retasking functions and multi-streaming technology that simultaneously sends different audio streams to different destinations.

Activating Sound Blaster X-Fi MB 2

After installing Sound Blaster X-Fi MB 2 successfully, you need to activate this utility online before first use.

1. Double-click Activate on the desktop.

Ensure that you have successfully installed the LAN driver and have connected to the Internet.

2. Click Activate to start activation.

Using Sound Blaster X-Fi MB 2

Speaker and Headphone
You can adjust the speaker-related or the headphone-related configurations.

Environment audio extensions (EAX)
After enabling the EAX effects, you are allowed to select and add your desired environment sounds into the music.

Equalizer

You can manually adjust the audio frequency with the equalizer and customize your presets for later use.

Mixer

You can manually adjust the audio volumes, including Line In, Stereo Mix and Microphone, when recording or during the playback.

THX

THX is a high-fidelity sound technology that allows you to adjust the surround sound effect, sub-woofer volume, etc..

4.4 RAID configurations

The motherboard comes with the AMD® SB950 chipset that allows you to configure Serial ATA hard disk drives as RAID sets. The motherboard supports the following RAID configurations: RAID 0, RAID 1, RAID 5 and RAID 10.

- You must install Windows® XP Service Pack 2 or later versions before using Serial ATA hard disk drives. The Serial ATA RAID feature is available only if you are using Windows® XP SP2 or later versions.
- Due to Windows® XP / Vista limitation, a RAID array with the total capacity over 2TB cannot be set as a boot disk. A RAID array over 2TB can only be set as a data disk only.
- If you want to install a Windows® operating system to a hard disk drive included in a RAID set, you have to create a RAID driver disk and load the RAID driver during OS installation. Refer to section **4.5 Creating a RAID driver disk** for details.

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.

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 volume(s) using SATA HDDs. To do this:

1. Enter the BIOS Setup during POST.
2. Go to the **Advanced** menu > **SATA Configuration**, and then press <Enter>.
3. Set the **SATA Port1-Port4** 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.

When setting the **SATA Port1-Port4** item to [RAID], all four SATA ports run at RAID mode. However, you can set the SATA ports 5 and 6 to [IDE] mode. See section **3.5.4 SATA Configuration** for details.

4.4.4 AMD® Option ROM Utility

To enter the AMD® Option ROM utility:

1. Boot up your computer.
2. During POST, press <Ctrl> + <F> to display the utility main menu.

The Main Menu allows you to select an operation to perform. The Main Menu options include:

- **View Drive Assignments:** shows the status of the hard disk drives.
- **LD View / LD Define Menu:** displays the existing RAID set information / creates a
  RAID 0, RAID 1, RAID 5 or RAID 10 configuration.
- **Delete LD Menu:** deletes a selected RAID set and partition.
- **Controller Configuration:** shows the system resources configuration.

Press <1>, <2>, <3>, or <4> to enter the option you need; press <ESC> to exit the utility.

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

To create a RAID volume using more than four hard disk drives, ensure that the SATA connectors 5/6 are set to [RAID] mode.

Creating a RAID volume

To create a RAID volume:

1. In the Main Menu, press <2> to enter the **LD View / LD Define Menu** function.
2. Press <Ctrl> + <C>, and the following screen appears.

3. Move to the **RAID Mode** item and press <Space> to select a RAID mode to create.
4. Move to the **Assignment** item by using the down arrow key and set **Y** to select the hard disk drives you want to include in the RAID set.
5. Press <Ctrl> + <Y> to save the setting.
6. The utility prompts the following message. Press <Ctrl> + <Y> to input the LD name.

7. Eenter an LD name, and then press any key to continue.

8. Press <Ctrl> + <Y> to erase the MBR, or you may press any key to abort the settings.

9. Press <Ctrl> + <Y> to enter the screen to modify the array capacity, or press any key to use the maximum capacity.

Deleting a RAID configuration

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

To delete a RAID volume:

1. In the Main Menu, press <3> to enter the **Delete LD** function.
2. Select the RAID item you want to delete and press <Del> or <Alt> + <D>.

3. The utility prompts the following messages:

Press <Ctrl> + <Y> to delete the RAID volume.

Dispalying a RAID set information

To display a RAID set information:

1. In the Main Menu, press <2> to enter the “LD View / LD Define Menu” function.
2. Select a RAID item and press <Enter> to display its information.

4.5 Creating a RAID driver disk

A floppy disk with the RAID driver is required when installing Windows® XP operating system on a hard disk drive that is included in a RAID set. For Windows® Vista or later operating systems, use either a USB flash drive with the RAID driver or the support DVD.

- **The motherboard does not provide a floppy drive connector**. You have to use a USB floppy disk drive when creating a SATA RAID driver disk.
- Windows® XP may not recognize the USB floppy disk drive due to Windows® XP limitation. To work around this OS limitation, refer to section **4.5.4 Using a USB floppy disk drive**.

4.5.1 Creating a RAID driver disk without entering the OS

To create a RAID driver disk without entering the OS

1. Boot your computer.
2. Press <Del> 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 <1> to create a RAID driver disk.
7. Insert a formatted floppy disk into the USB floppy disk 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. Plug the USB floppy disk drive and insert a floppy disk.
3. Place the motherboard support DVD into the optical drive.
4. Go to the **Make Disk** menu, and then click **AMD AHCI/RAID 32/64bit xxxx Driver** to create a RAID driver disk.
5. Select USB floppy disk drive as the destination disk.
6. Follow the succeeding screen instructions to complete the process.

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

4.5.3 Installing the RAID driver during Windows® OS installation

If you use a SATA optical drive to run the OS installation disk, we strongly recommend that you install the optical dirve to the SATA connectors 5/6 and set them to [IDE] mode.

To install the RAID driver for 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 USB floppy disk drive.
3. When prompted to select the SCSI adapter to install, select the RAID driver for the corresponding OS version.
4. Follow the succeeding screen instructions to complete the installation.

To install the RAID driver for Windows® Vista or later OS

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

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

4.5.4 Using a USB floppy disk drive

Due to OS limitation, Windows® XP may not recognize the USB floppy disk drive when you install the RAID driver from a floppy disk during the OS installation.

To solve this issue, add the USB floppy disk drive's Vendor ID (VID) and Product ID (PID) to the floppy disk containing the RAID driver. Refer to the steps below:

1. Using another computer, plug the USB floppy disk drive, and insert the floppy disk containing the RAID driver.

2. Right-click **My Computer** on the Windows® desktop or **start** menu, and then select **Manage** from the pop-up window.

3. Select **Device Manager**. From the **Universal Serial Bus controllers**, right-click **xxxxxx USB Floppy**, and then select **Properties** from the pop-up window.

The name of the USB floppy disk drive varies with different vendors.

4. Click **Details** tab. The Vendor ID (VID) and Product ID (PID) are displayed.

5. Browse the contents of the RAID driver disk to locate the file **txtsetup.oem**.

6. Double-click the file. A window appears, allowing you to select the program for opening the oem file.

7. Use Notepad to open the file.

8. Find the **[HardwareIds.SCSI.Napa_i386_ahci8086]** and **[HardwareIds.SCSI.Napa_amd64_ahci]** sections in the **txtsetup.oem** file.
9. Type the following line to the bottom of the two sections: **id = "USB\VID_xxxx&PID_xxxx", "usbstor"**

```
[HardwareIds.SCSI.Napa_i386_ahci8086]
id= "PCI\VEN_1002&DEV_4392&CC_0104","ahcix86"
id= "PCI\VEN_1002&DEV_4391&CC_0106","ahcix86"
id= "PCI\VEN_1002&DEV_4393&CC_0104","ahcix86"
id= "USB\VID_03EE&PID_6901", "usbstor"

[HardwareIds.SCSI.Napa_amd64_ahci]
id= "PCI\VEN_1002&DEV_4392&CC_0104","ahcix64"
id= "PCI\VEN_1002&DEV_4391&CC_0106","ahcix64"
id= "PCI\VEN_1002&DEV_4393&CC_0104","ahcix64"
id= "USB\VID_03EE&PID_6901", "usbstor"
```

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

5 Multiple GPU technology support

Chapter summary

5

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 at www.amd.com.
- Ensure that your power supply unit (PSU) can provide at least the minimum power required by your system. See page 2-25 for details.

- We recommend that you install additional chassis fans for better thermal environment.
- Visit the ATI Game website at 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**.
   For Windows 7, go to **Control Panel > Programs > Uninstall a program**.
3. Select your current graphics card driver/s.
4. For Windows XP, select **Add/Remove**.
   For Windows Vista and 7, 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.

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 **Cayalist Control Center**.

2. The **Catalyst Control Center Setup Assistant** appears when the system detects the existance 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

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

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

1. Prepare two SLI-ready graphics cards.
2. Insert the two graphics card into the PCIEX16 slots. If your motherboard has more than two PCIEX16 slots, refer to Chapter 2 in this user manual for the locations of the PCIEX16 slots recommended for multi-graphics card installation.
3. Ensure that the cards are properly seated on the slots.

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

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).

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**.

B5. The NVIDIA Control Panel window appears.

Enabling SLI settings

From the NVIDIA Control Panel window, select **Set SLI Configuration**. Click **Enable SLI** and set the display for viewing SLI rendered content. When done, click **Apply**.

ASUS contact information

ASUSTeK COMPUTER INC.

Address	15 Li-Te Road, Peitou, Taipei, Taiwan 11259
Telephone	+886-2-2894-3447
Fax	+886-2-2890-7798
E-mail	info@asus.com.tw
Web site	www.asus.com.tw

Technical Support

Telephone	+86-21-38429911
Online support	support.asus.com

ASUS COMPUTER INTERNATIONAL (America)

Address	800 Corporate Way, Fremont, CA 94539, USA
Telephone	+1-812-282-3777
Fax	+1-510-608-4555
Web site	usa.asus.com

Technical Support

Telephone	+1-812-282-2787
Support fax	+1-812-284-0883
Online support	support.asus.com

ASUS COMPUTER GmbH (Germany and Austria)

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

Technical Support

Telephone	+49-1805-010923*
Support Fax	+49-2102-9599-11
Online support	support.asus.com

*** EUR 0.14/minute from a German fixed landline; EUR 0.42/minute from a mobile phone.**

DECLARATION OF CONFORMITY

Per FCC Part 2 Section 2. 1077(a)

Responsible Party Name: **Asus Computer International**

Address: **800 Corporate Way, Fremont, CA 94539.**

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

hereby declares that the product

Product Name : Motherboard

Model Number : CROSSHAIR V FORMULA

Conforms to the following specifications:

- ☒ FCC Part 15, Subpart B, Unintentional Radiators
- ☐ FCC Part 15, Subpart C, Intentional Radiators
- ☐ FCC Part 15, Subpart E, Intentional Radiators

Supplementary Information:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Representative Person's Name : **Steve Chang / President**

Signature : Steve Chang

Date : **May. 04, 2011**

Ver. 110101

EC Declaration of Conformity

ASUS Inspiring Innovation • Persistent Perfection

We, the undersigned,

Manufacturer:	ASUSTek COMPUTER INC.
Address, City:	No. 150, LI-TE RD., PEITOU, TAIPEI 112, TAIWAN R.O.C.
Country:	TAIWAN
Authorized representative in Europe:	ASUS COMPUTER GmbH
Address, City:	HARKORT STR. 21-23, 40880 RATINGEN
Country:	GERMANY

declare the following apparatus:

Product name :	**Motherboard**
Model name :	**CROSSHAIR V FORMULA**

conform with the essential requirements of the following directives:

☒2004/108/EC-EMC Directive

☒ EN 55022:2006+A1:2007	☒ EN 55024:1998+A1:2001+A2:2003
☒ EN 61000-3-2:2006+A1:2009+A2:2009	☒ EN 61000-3-3:2008
☐ EN 55013:2001+A1:2003+A2:2006	☐ EN 55020:2007

☐1999/5/EC-R &TTE Directive

☐ EN 300 328 V1.7.1(2006-05)	☐ EN 301 489-1 V1.8.1(2008-04)
☐ EN 300 440-1 V1.4.1(2008-05)	☐ EN 301 489-3 V1.4.1(2002-08)
☐ EN 300 440-2 V1.2.1(2008-03)	☐ EN 301 489-4 V1.3.1(2002-08)
☐ EN 301 511 V9.0.2(2003-03)	☐ EN 301 489-7 V1.3.1(2005-11)
☐ EN 301 908-1 V3.2.1(2007-05)	☐ EN 301 489-9 V1.4.1(2007-11)
☐ EN 301 908-2 V3.2.1(2007-05)	☐ EN 301 489-17 V2.1.1(2009-05)
☐ EN 301 893 V1.4.1(2005-03)	☐ EN 301 489-24 V1.4.1(2007-09)
☐ EN 302 544-2 V1.1.1(2009-01)	☐ EN 302 326-2 V1.2.2(2007-06)
☐ EN 50360:2001	☐ EN 302 326-3 V1.3.1(2007-09)
☐ EN 50371:2002	☐ EN 301 357-2 V1.3.1(2006-05)
☐ EN 50385:2002	☐ EN 302 623 V1.1.1(2009-01)

☒2006/95/EC-LVD Directive

☐ EN 60950-1:2006	☐ EN 60065:2002+A1:2006+A11:2008
☒ EN 60950-1:2006+A11:2009	

☐2009/125/EC-ErP Directive

Regulation (EC) No. 1275/2008	Regulation (EC) No. 278/2009
☐ EN 62301:2005	☐ EN 62301:2005
Regulation (EC) No. 642/2009	
☐ EN 62301:2005	Ver. 110101

☒CE marking

CE (EC conformity marking)

Position : **CEO**

Name : **Jerry Shen**

Declaration Date: May. 04, 2011

Year to begin affixing CE marking:2011

Signature : _____

DECLARATION OF CONFORMITY

Per FCC Part 2 Section 2. 1077(a)

Responsible Party Name: **Asus Computer International**

Address: **800 Corporate Way, Fremont, CA 94539.**

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

hereby declares that the product

Product Name : Network/Sound Card

Model Number : THUNDERBOLT

Conforms to the following specifications:

- ☒ FCC Part 15, Subpart B, Unintentional Radiators
- ☐ FCC Part 15, Subpart C, Intentional Radiators
- ☐ FCC Part 15, Subpart E, Intentional Radiators

Supplementary Information:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Representative Person's Name : **Steve Chang / President**

Signature : Steve Chang

Date : **Jan. 28, 2011**

Ver. 110101

EC Declaration of Conformity

ASUS
Inspiring Innovation • Persistent Perfection

We, the undersigned,

Manufacturer:	ASUSTek COMPUTER INC.
Address, City:	No. 150, LI-TE RD., PEITOU, TAIPEI 112, TAIWAN R.O.C.
Country:	TAIWAN
Authorized representative in Europe:	ASUS COMPUTER GmbH
Address, City:	HARKORT STR. 21-23, 40880 RATINGEN
Country:	GERMANY

declare the following apparatus:

Product name :	**Network/Sound Card**
Model name :	**THUNDERBOLT**

conform with the essential requirements of the following directives:

☒2004/108/EC-EMC Directive

☒ EN 55022:2006+A1:2007	☒ EN 55024:1998+A1:2001+A2:2003
☒ EN 61000-3-2:2006	☒ EN 61000-3-3:2008
☐ EN 55013:2001+A1:2003+A2:2006	☐ EN 55020:2007

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Position : **CEO**

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