CROSSHAIR V FORMULA-Z

ASUS

Motherboard

E7710
Revised Edition
September 2012

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Contents

Safety information

Electrical safety

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

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

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

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

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

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

Operation safety

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

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

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

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

- Place the product on a stable surface.

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

About this guide

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

How this guide is organized

This guide contains the following parts:

- **Chapter 1: Product introduction**

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

- **Chapter 2: Basic Installation**

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

- **Chapter 3: BIOS setup**

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

- **Chapter 4: Software support**

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

- **Chapter 5: RAID support**

  This chapter describes the RAID configurations.

- **Chapter 6: Multiple GPU support**

  This chapter describes how to install and configure multiple AMD® 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 (+).

CROSSHAIR V FORMULA-Z specifications summary

CPU	AMD® Socket AM3+ for AMD® FX series CPU up to 8-core compatible with AMD® Socket AM3 for AMD® Phenom™ II / Athlon II™ / Sempron™ 100 series processors Supports AMD® 140W CPU AMD® Cool 'n' Quiet Technology Supports AM3+ 32nm CPU
Chipset	AMD® 990FX / SB950
System Bus	Up to 5200 MT/s; HyperTransport™ 3.0
Memory	4 x DIMM, Max. 32GB, DDR3 2400(O.C.) / 2133(O.C) / 1866/1600/1333/1066 MHz, ECC, Non-ECC, un-buffered Memory Dual channel memory architecture * **Refer to www.asus.com for Memory QVL (Qualified Vendors List) of AM3+ / AM3 CPU for details.** ** **Due to OS limitation, when installing a 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 PCI Express 2.0 x16 slots (Dual at x16 or x16/x8/x8 mode) 1 x PCI Express 2.0 x16 slot [red] (supports x4 mode) 2 x PCI Express 2.0 x1 slots
Multi-GPU support	Supports NVIDIA® Quad-GPU SLI™ Technology Supports AMD® Quad-GPU CrossFireX™ Technology Supports NVIDIA® 3-WAY SLI™ Technology Supports AMD® 3-WAY CrossFireX™ Technology
LAN	1 x Intel® Gigabit LAN controller
Storage	**AMD® SB950 Chipset** 　- 6 x SATA 6.0 Gb/s ports [red] with RAID 0, 1, 5 and 10 support **ASMedia® SATA 6Gb/s controllers** 　- 2 x SATA 6Gb/s ports [red] 　- 2 x eSATA 6Gb/s ports [red]
Audio	**SupremeFX III, built-in 8-Channel High Definition Audio CODEC** 　- Supports jack-detection, multi-streaming and front panel jack-retasking 　- SupremeFX Shielding™ Technology 　- 1500 uF Audio power capacitor 　- Gold-plated jacks **Audio Features:** 　- Blu-ray audio layer content protection 　- Optical S/PDIF out ports at rear panel 　- DTS UltraPC II 　- DTS Connect

(continued on the next page)

CROSSHAIR V FORMULA-Z specifications summary

USB	**3 x ASMedia® USB 3.0 controllers**
	  - 2 x USB 3.0 ports at mid-board for front panel support
	  - 4 x USB 3.0 ports at rear panel [blue]
	
	AMD® SB950 Chipset
	  - 12 x USB 2.0 ports (4 ports at mid-board, 8 ports at rear panel)

ROG Exclusive Features	ROG Connect
	  - RC Diagram
	  - RC Remote
	  - RC Poster
	  - GPU TweakIt
	ROG Extreme Engine Digi+ II
	  - 8+2 phase CPU power
	  - 2 phase DRAM power
	UEFI BIOS features
	  - ROG BIOS Print
	  - GPU.DIMM Post
	GameFirst II
	iROG
	Extreme Tweaker
	Loadline Calibration
	Overclocking Protection
	  - COP EX (Component Overheat Protection -EX)
	  - ASUS C.P.R. (CPU Parameter Recall)

Special features	**ASUS TPU**
	  - CPU Level Up
	
	ASUS Exclusive Features:
	  - MemOK!
	  - AI Charger+
	
	ASUS Quiet Thermal Solution:
	  - ASUS Fan Xpert
	
	ASUS EZ DIY:
	  - ASUS Q-Shield
	  - ASUS O.C. Profile
	  - ASUS EZ Flash 2
	  - ASUS MyLogo3
	
	ASUS Q-Design
	  - ASUS Q-LED (CPU, DRAM, VGA, Boot Device LED)
	  - ASUS Q-Connector

CROSSHAIR V FORMULA-Z specifications summary

Rear panel I/O ports	1 x PS/2 keyboard/mouse combo port
	1 x Optical S/PDIF Output port
	2 x eSATA 6Gb/s ports [red]
	1 x ROG Connect button
	1 x LAN (RJ-45) port
	4 x USB 3.0/2.0 ports [blue]
	8 x USB 2.0/1.1 ports (white port for ROG Connect)
	6 x 8-channel audio jacks
	1 x Clear CMOS button
Internal I/O connectors	1 x USB 3.0/2.0 connector (supports additional 2 19-pin USB 3.0/2.0 ports)
	2 x USB 2.0/1.1 connectors (support additional 4 USB 2.0/1.1 ports)
	8 x SATA 6Gb/s connectors
	2 x CPU fan connectors (4-pin)
	3 x Optional fan connectors (4-pin)
	3 x Chassis fan connectors (4-pin)
	1 x S/PDIF Out header
	1 x DirectKey button
	1 x DRCT header
	1 x TPM header
	1 x Fast Boot switch
	1 x 24-pin EATX power connector
	1 x 8-pin EATX 12V power connector
	1 x 4-pin EATX 12V power connector
	1 x EZ Plug connector (4-pin Molex power connector)
	1 x Power-on button
	1 x Reset button
	1 x GO button
	8 x ProbeIt measurement points
	3 x Thermal sensor connectors
	Front panel audio connector
	System panel (Q-Connector)
BIOS features	64 Mb Flash ROM, UEFI BIOS, PnP, DMI 2.0, WfM 2.0, SM BIOS 2.5, ACPI 2.0a, Multi-language BIOS
Manageability	WOL by PME, WOR by PME, PXE

(continued on the next page)

CROSSHAIR V FORMULA-Z specifications summary

Support DVD contents	Drivers
	GameFirst II
	Kaspersky® Anti-virus
	DAEMON Tools Pro Standaard
	ROG CPU-Z
	ASUS WebStorage
	ASUS Utilities (AI Suite II/TurboV EVO/ASUS Update)
Form factor	ATX form factor: 12 in. x 9.6 in. (30.5 cm x 24.4 cm)

Specifications are subject to change without notice.

Package contents
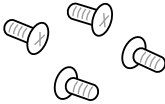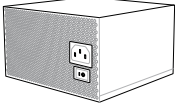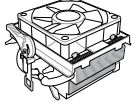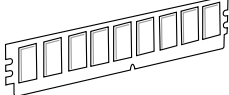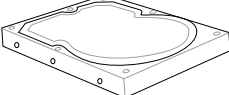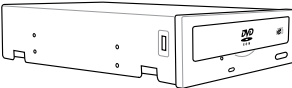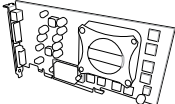
Check your motherboard package for the following items.

Motherboard	ROG CROSSHAIR V FORMULA-Z
Cables	1 x ROG Connect cable
	3 x 2-in-1 SATA 6.0 Gb/s signal cables
	1 x SLI bridge
	1 x 3-WAY SLI bridge
	1 x CrossFire cable
Accessories	I/O Shield
	1 x 12-in-1 ROG cable label
	1 x 2-in-1 ASUS Q-Connector kit
Application DVD	ROG motherboard support DVD
Documentation	User guide

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

Installation tools and components

1 bag of screws	**Philips (cross) screwdriver**
PC chassis	**Power supply unit**
AMD AM3+ CPU	**AMD AM3+ compatible CPU Fan**
DDR3 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.

Product introduction

1

1.1 Special features

1.1.1 Product highlights

Republic of Gamers

The Republic of Gamers offers you the best of the best. We offer the best hardware engineering, the fastest performance, the most innovative 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 Republic of Gamers and make your presence felt.

AMD® FX™-Series/Phenom™ II/Athlon™ II/Sempron™ 100 Series Processors (socket AM3+/AM3)

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

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® AM3+ and multi-core CPUs to provide excellent system performance and overclocking capabilities.

Dual-Channel DDR3 2400(O.C.) / 2133(O.C.) / 2000(O.C.) / 1800(O.C.) / 1600 / 1333 / 1066 MHz Support

The motherboard supports the dual-channel DDR3 memory that features data transfer rates of DDR3 2400(O.C.) / 2133(O.C.) / 2000(O.C.) / 1800(O.C.) / 1600/ 1333 / 1066 MHz to boost the system's performance, and to meet the higher bandwidth requirements of 3D graphics, multimedia, and Internet applications.

SLI™/CrossFire On-Demand

This motherboard features a unique PCIe 2.0 bridge chip to support multi-GPU SLI™/ CrossFireX™ graphics cards for an unrivaled gaming performance. With the AMD® 990FX platform to optimize the PCIe allocation of multiple GPUs, it supports up to 3-WAY GPU SLI™ or 3-WAY GPU CrossFireX™ configuration.

1.1.2   ROG unique gaming features

GameFirst II

ASUS GameFirst II, with cFos Traffic Shaping technology, provides a powerful and user-friendly network control to easily frag in online multiplayer games. Featuring the EZ Mode for beginners' setup and Advanced Mode for professionals' tweaking, your frags comes first.

SupremeFX III

SupremeFX™ III is an onboard 8-channel audio solution equipped with 1500uF capacitors, providing you a crisp, warm sound for a better gaming audio experience. Its ROG-exclusive SupremeFX Shielding™ technology has a metallic EMI cover and a special PCB layout design that isolates analog audio signals from digital sources, and a gold-plated jack that provides rich notes with minimal audio distortion.

1.1.3   ROG Intelligent Performance & Overclocking features

ROG Connect

ROG Connect allows you to monitor the status of your desktop PC and tweak its parameters in real-time via a notebook. 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.

Extreme Engine Digi+ II

The Extreme Engine Digi+ II has a digital VRM design that allows you to achieve ultimate performance with adjustable CPU and memory power management frequencies.

iROG

The iROG is a special IC that fully maximizes ROG's unique functions, providing you with full control of your motherboard at any stage. It greatly increases your overclocking enjoyment, and offers you with advanced system control and management features purely at a hardware level.

USB BIOS FlashBack

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

CPU Level Up

With ROG's CPU Level Up, overclocking has never been so easy, or cost-free. Simply select the processor that you want to overclock to, and the motherboard will do the rest.

GPU.DIMM Post

GPU.DIMM Post enables you to catch potential problems even before you enter the OS, saving you valuable time in detecting component failure under extreme conditions. With GPU.DIMM Post, quickly and easily check your graphic cards, memory modules' statuses in the BIOS, and overclocking settings.

BIOS Print

ROG offers a whole new UEFI BIOS feature to handle the demands of an overclocking experience. The motherboard features ROG BIOS Print that allows you to easily share your BIOS settings to others with the press of a button.

ProbeIt

This motherboard consists of eight ProbeIt measurement points that helps you detect your system's current voltage. With the use of a multimeter device, these points can help measure your system's CPU, CPU/NB, VDDA, DRAM, NB, HT, and SB voltages.

MemOK!

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

Extreme Tweaker

Extreme Tweaker is the one stop shop to fine-tune your system to optimal performance. With Extreme Tweaker, you can adjust the system settings such as frequency, over-voltage, memory timing, and more.

COP EX

COP EX allows you to increase the chipset voltages without worrying about overheating. You can monitor the CPU and save it from overheating, allowing your system to achieve its ulitmate performance.

Loadline Calibration

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

1.1.4   ROG-rich bundled software

Kaspersky® Anti-Virus

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.

DAEMON Tools Pro Standard

DAEMON Tools Pro offers essential functionality to backup CD, DVD and Blu-ray discs. It converts optical media into virtual discs and emulates devices to work with the virtual copies. DAEMON Tools Pro organizes data, music, video, and photo collections on a PC, notebook, or netbook.

ROG CPU-Z

ROG CPU-Z, authorized by Intel's CPU Identification (CPUID), is a customized ROG utility that allows you to gather information about your system's main components. It gives you the current information and status of your CPU, motherboard, memory, and other main components. Get that ROG look of reporting your system's current information with ROG CPU-Z.

1.1.5   Other features

Intel® Gigabit LAN

The LAN solution from Intel has been long known to have a better throughput, lower CPU utilization as well as better stability. With the Intel Gigabit LAN solutions onboard, the ultimate network experience can therefore be delivered to its users like never before.

SATA 6.0 Gb/s support

With AMD® SB950 Southbridge natively support for the next-generation Serial ATA (SATA) storage interface, this motherboard delivers up to 6.0 Gb/s data transfer rates. It also provides enhanced scalability, faster data retrieval, double the bandwidth of current bus systems.

DTS Connect

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

DTS UltraPC II

DTS UltraPC II delivers an exceptional 7.1 surround experience through the most popular PC audio setups—your existing stereo speakers or headphones. In addition to virtual surround, it upgrades the original sound to new levels with Audio Restoration, recreating dynamic range of audio files. Symmetry mode improves the balance of perceived loudness across different input sources, and enhances boost audio quality through high hand low frequency equalization. With these technologies, users experience better home theater audio with ease.

ASUS Fan Xpert

ASUS Fan Xpert intelligently allows you to adjust both the CPU and chassis fan speeds based on different ambient temperatures, resulting to a quiet and cool computing environment.

1.2 Motherboard overview

1.2.1 Before you proceed

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

⚠️

- Unplug the power cord from the wall socket before touching any component.

- **Before handling components, use a grounded wrist strap or touch a safely grounded object or a metal object, such as the power supply case, to avoid damaging them due to static electricity.**

- **Hold components by the edges to avoid touching the ICs on them.**

- Whenever you uninstall any component, place it on a grounded antistatic pad or in the bag that came with the component.

- Before you install or remove any component, ensure that the ATX power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, or components.

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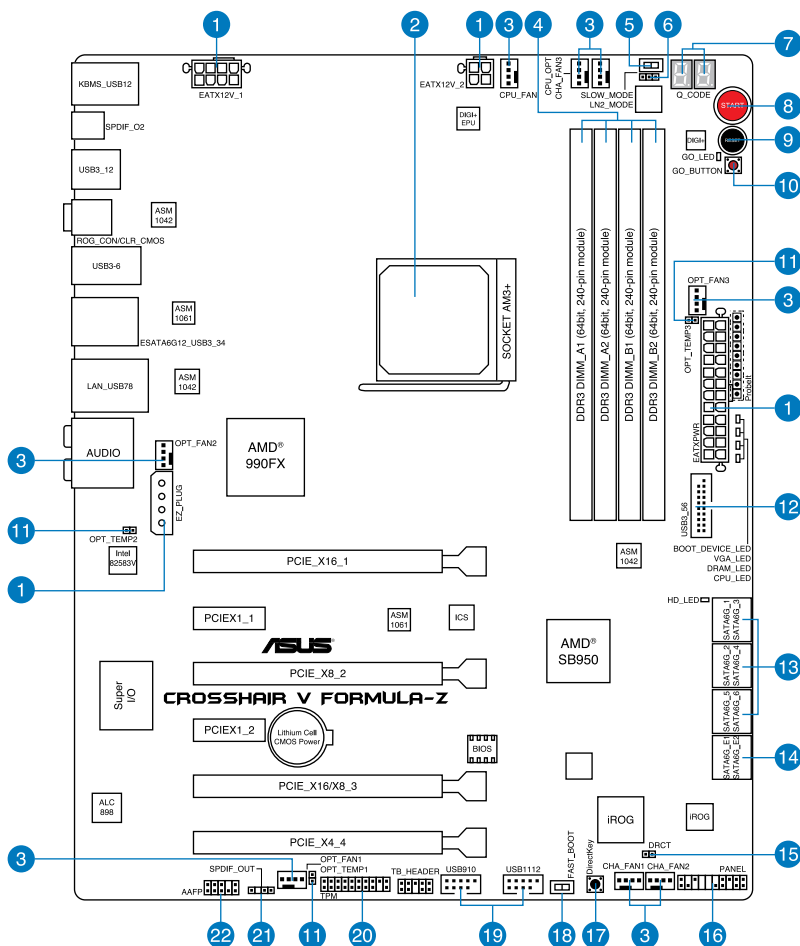
Refer to **1.2.9 Internal connectors** and **2.3.1 Rear I/O connection** for more information about rear panel connectors and internal connectors.

Layout contents

Connectors/Jumpers/Buttons and switches/Slots	Page
1. ATX power connectors (24-pin EATXPWR, 8-pin EATX12V_1, 4-pin EATX12V_2, 4 pin EZ_PLUG)	1-43
2. AM3+/ AM3 CPU Socket	1-8
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)	1-41
4. DDR3 DIMM slots	1-9
5. Slow Mode switch	1-24
6. LN2 Mode Jumper (3 pin LN2)	1-27
7. Q_Code LEDs	1-30
8. START (Power-on) button	1-23
9. Reset button	1-23
10. GO button	1-24
11. Thermal sensor cable connectors (2-pin OPT_TEMP1-3)	1-45
12. USB 3.0 connector (20-1 pin USB3_56)	1-38
13. AMD® Serial ATA 6.0 Gb/s connectors (7-pin SATA6G_1-6 [red])	1-37
14. ASMedia® Serial ATA 6.0 Gb/s connectors (7-pin SATA6G_E12 [red])	1-38
15. Direct Connector (2-pin DRCT)	1-42
16. System panel connector (20-8 pin PANEL)	1-44
17. DirectKey button (DirectKey)	1-25
18. Fast Boot switch (FAST_BOOT)	1-26
19. USB 2.0 connectors (10-1 pin USB910; USB1112)	1-39
20. TPM connector (20-1 pin TPM)	1-40
21. Digital audio connector (4-1 pin SPDIF_OUT)	1-40
22. Front panel audio connector (10-1 pin AAFP)	1-42

Chapter 1

1.2.3 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.
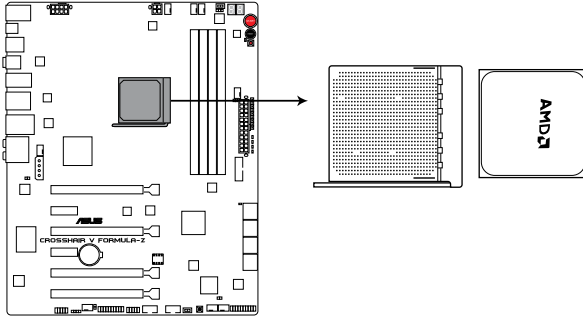
CROSSHAIR V FORMULA-Z CPU AM3+

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!

1.2.4 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.
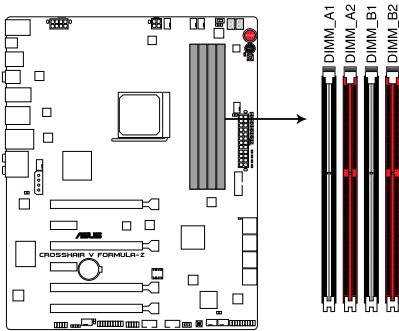
CROSSHAIR V FORMULA-Z 240-pin DDR3 DIMM sockets

Recommended memory configurations

DIMM_A2

DIMM_A2

DIMM_B2

DIMM_A1
DIMM_A2
DIMM_B1
DIMM_B2

Chapter 1
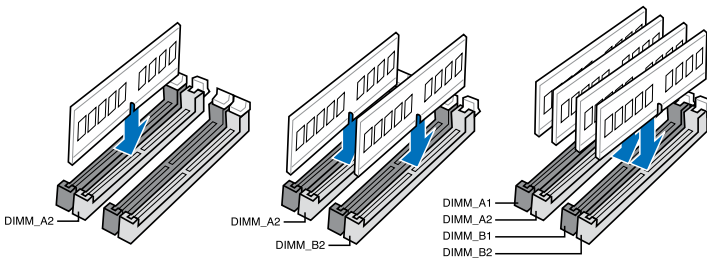
Memory configurations

You may install 1GB, 2GB, 4GB, and **8GB unbuffered and non-ECC DDR3 DIMMs into the** DIMM sockets.

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

- • **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.

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

- • **Due to the memory address limitation on 32-bit Windows OS, when you install 4GB** or more memory on the motherboard, the actual usable memory for the OS can be about 3GB or less. For effective use of memory, we recommend that you do any of the following:

  - a) **Use a maximum of 3GB system memory if you are using a 32-bit Windows OS.**

  - b) **Install a 64-bit Windows OS when you want to install 4GB or more on the** motherboard.

  - c) For more details, refer to the Microsoft® support site at http://support.microsoft. com/kb/929605/en-us.

- • This motherboard does not support DIMMs made up of 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-Z Motherboard Qualified Vendors Lists (QVL)

DDR3 2400 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)	
								2	4
G.SKILL	F3-19200CL10Q-32GBZHD	32GB (4x8GB)	DS	-	-	10-12-12-31	1.65	•	
G.SKILL	F3-19200CL11Q-16GBZHD	16GB (4x4GB)	DS	-	-	11-11-11-31	1.65	•	
G.SKILL	F3-19200CL9D-4GBPIS	4G (2x2G)	DS	-	-	9-11-9-28	1.65	•	
G.SKILL	F3-19200CL9Q-16GBZMD	16GB (4x4GB)	DS	-	-	9-11-11-31	1.65	•	
GEIL	GOC316GB2400C10QC	16GB (4x4GB)	DS	-	-	10-11-11-30	1.65	•	
Kingston	KHX24C11K4/16X	16GB (4x4GB)	DS	-	-	11-13-13-30	1.65	•	
Patriot	PXD38G2400C11K	8GB (2x4GB)	DS	-	-	11-11-11-30	1.65	•	
Team	TXD34096M2400HC9N-L	4GB	DS	SAMSUNG	K4B2G0846D	9-9-9-24	1.65	•	

DDR3 2200 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)	
								2	4
G.SKILL	F3-17600CL7D-4GBFLS	4G (2x 2G)	DS	-	-	7-10-10-28	1.65	•	•
GEIL	GET34GB2200C9DC	4GB (2x 2GB)	DS	-	-	9-10-9-28	1.65	•	

DDR3 2133 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)	
								2	4
A-DATA	AX3U2133C2G9B	2GB	SS	-	-	9-11-9-27	1.55~1.75	•	
Apacer	78.BAGE4.AFD0C	8GB (2x4GB)	DS	-	-	9-9-9-24	-	•	
CORSAIR	CMT4GX3M2A2133C9	4GB (2x2GB)	DS	-	-	9-10-9-24	1.65	•	•
CORSAIR	CMT4GX3M2B2133C9 (Ver7.1)	4GB (2x2GB)	DS	-	-	9-9-9-24	1.5	•	•
CORSAIR	CMT4GX3M2B2133C9	4GB (2x2GB)	DS	-	-	9-10-9-27	1.5	•	•
G.SKILL	F3-17000CL11Q2-64GBZLD	64GB (8x8GB)	DS	-	-	11-11-11-30	1.5	•	•
G.SKILL	F3-17000CL9Q-16GBZH	16GB (4x4GB)	DS	-	-	9-11-10-28	1.65	•	•
G.SKILL	F3-17066CL9D-8GBPID	8GB (2x4GB)	DS	-	-	9-9-9-24	1.65	•	
G.SKILL	F3-17066CL9Q-16GBTDD	16GB (4x4GB)	DS	-	-	9-9-9-24	1.65	•	

(continued on the next page)

DDR3 2133 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)	
								2	4
KINGSTON	KHX2133C11D3K4/16GX	16GB (4x4GB)	DS	-	-	11-12-11-30	1.65	•	•
KINGSTON	KHX2133C11D3T1K2/16GX	16GB (2x8GB)	DS	-	-	9-9-9-24	1.6	•	•
OCZ	OCZ3XTEP2133C9LV4GK	2GB	DS	-	-	7-7-7-20	1.65	•	
Patriot	PVV34G2133C9K	4GB (2x2GB)	DS	-	-	9-11-9-27	1.66	•	•
Patriot	PXD38G2133C11K	8GB (2x4GB)	DS	-	-	9-9-9-24	1.65	•	•
Team	TXD34096M2133HC9N-L	4GB	DS	SAMSUNG	K4B2G0846D	9-9-9-24	1.65	•	•

DDR3 2000 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)	
								2	4
A-DATA	AX3U2000GB2G9B	2GB	DS	-	-	9-11-9-27	1.55~1.75	•	•
A-DATA	AX3U2000GC4G9B	4GB	DS	-	-	9-11-9-27	1.55~1.75	•	•
AEXEA	AXA3ES2G2000LG28V	2GB	DS	-	-	-	1.65	•	•
AEXEA	AXA3ES4GK2000LG28V	4GB (2x2GB)	DS	-	-	-	1.65	•	•
Apacer	78.AAGD5.9KD	6GB (3x2GB)	DS	-	-	9-9-9-27	-		•
Asint	SLA302G08-ML2HB	4GB	DS	Hynix	H5TQ2G83BFRH9C	9-9-9-27	-	•	•
CORSAIR	CMT6GX3M3A2000C8	6GB (3x2GB)	DS	-	-	8-9-8-24	1.65	•	•
CORSAIR	CMZ4GX3M2A2000C10 (Ver 5.12)	4GB (2x2GB)	SS	-	-	10-10-10-27	1.5	•	
G.SKILL	F3-16000CL9D-4GBTD	4GB (2x2GB)	DS	-	-	9-9-9-24	1.65	•	
GEIL	GUP34GB2000C9DC	4GB (2x2GB)	DS	-	-	9-9-9-28	1.65	•	•
Patriot	PV736G2000ELK	6GB (3x2GB)	DS	-	-	7-7-7-20	1.65	•	•
Patriot	PVT36G2000LLK	6GB (3x2GB)	DS	-	-	8-8-8-24	1.65	•	•
Silicon Power	SP002GBLYU200S02	2GB	DS	-	-	-	-	•	•
Team	TXD32048M2000C9	2GB	DS	Team	T3D1288RT-20	9-9-9-24	1.5	•	•
Team	TXD32048M2000C9-L	2GB	DS	Team	T3D1288LT-20	9-9-9-24	1.5	•	•
Team	TXD32048M2000C9-L	2GB	DS	Team	T3D1288RT-20	9-9-9-24	1.6	•	

(continued on the next page)

DDR3 1866 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)	
								2	4
A-DATA	AX3U1866GC2G9B	2GB	SS	-	-	9-11-9-27	1.55~1.75	•	•
A-DATA	AX3U1866GC4G9B	4GB	DS	-	-	9-11-9-27	1.55~1.75	•	•
CORSAIR	CMD16GX3M4A1866C9 (Ver4.13)	16GB (4x4GB)	DS	-	-	9-10-9-27	1.5	•	•
CORSAIR	CMD8GX3M2A1866C9 (Ver4.13)	8GB (2x4GB)	DS	-	-	-	1.5	•	•
CORSAIR	CMT32GX3M4X1866C9 (Ver3.23)	32GB (4x8GB)	DS	-	-	9-10-9-27	1.5	•	
CORSAIR	CMZ16GX3M4X1866C9R (Ver8.16)	16GB (4x4GB)	DS	-	-	9-10-9-27	1.5	•	•
CORSAIR	CMZ32GX3M4X1866C10 (Ver3.23)	32GB (4x8GB)	DS	-	-	10-11-10-27	1.5	•	•
CORSAIR	CMZ8GX3M2A1866C9	8GB (2x4GB)	DS	-	-	9-10-9-27	1.5	•	•
Crucial	BLE4G3D1869DE1XT0.16FMD	4GB	DS	-	-	9-9-9-27	1.5	•	•
G.SKILL	F3-14900CL10Q2-64GBZLD	64GB (8x8GB)	DS	-	-	10-11-10-30	1.5	•	•
G.SKILL	F3-14900CL9D-8GBSR	8GB (2x4GB)	DS	-	-	9-10-9-28	1.5	•	•
G.SKILL	F3-14900CL9Q-16GBXL	16GB (4x4GB)	DS	-	-	9-10-9-28	1.5	•	•
G.SKILL	F3-14900CL9Q-16GBZL	16GB (4x4GB)	DS	-	-	9-10-9-28	1.5	•	•
G.SKILL	F3-14900CL9Q-8GBFLD	8GB (2x4GB)	DS	-	-	9-9-9-24	1.6	•	•
Kingston	KHX1866C9D3K2/8GX	8GB (2x4GB)	DS	-	-	-	1.65	•	•
Patriot	PXD34G1866ELK	4GB (2x2GB)	SS	-	-	9-9-9-24	1.65	•	•
Patriot	PXD38G1866ELK	8GB (2x4GB)	DS	-	-	9-11-9-27	1.65	•	•
Patriot	PXD38G1866ELK	8GB (2x4GB)	DS	-	-	9-11-9-27	1.65	•	•
Team	TXD34096M1866HC9K-L	4GB	DS	Hynix	H5TC2G83BFRH9A	9-11-9-27	1.65	•	•

DDR3 1800 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)	
								2	4
G.SKILL	F3-14400CL9D-4GBRL	4GB (2x2GB)	DS	-	-	9-9-9-24	1.6	•	•

(continued on the next page)

Chapter 1

DDR3 1600 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional) 2	4
A-DATA	AM2U16BC2P1	2GB	SS	A-DATA	3CCD-1509A	-	-	•	•
A-DATA	AM2U16BC4P2	4GB	DS	A-DATA	3CCD-1509A	-	-	•	•
A-DATA	AX3U1600GC4G9	4GB	DS	-	-	-	1.55~1.75	•	•
A-DATA	AX3U1600PC4G8	4GB	DS	-	-	8-8-8-24	1.55~1.75	•	•
A-DATA	AX3U1600XC4G79	4GB	DS	-	-	7-9-7-21	1.65	•	•
AMD	AE32G1609U1-U	2GB	SS	AMD	23EY4587MB6H	-	1.5	•	•
AMD	AP38G1608U2K	8GB (2x4GB)	DS	-	-	9-9-9-28	1.65	•	•
Apacer	78.B1GE3.9L10C	4GB	DS	Apacer	AM5D5908DEQSCK	-	1.65	•	•
Apacer	AHU04GFA60C9Q1D	4GB	DS	-	-	9-9-9-27	1.65	•	•
Asint	SLA302G08-EGG1C	4GB	DS	Asint	302G08-GG1C	9-9-9-27	-	•	•
Asint	SLA302G08-EGJ1C	4GB	DS	Asint	302G08-GJ1C	9-9-9-27	-	•	•
Asint	SLA302G08-EGN1C	4GB	DS	ASint	302G08-GN1C	-	-	•	•
Asint	SLB304G08-EGN1B	8GB	DS	ASint	304G08-GN1B	-	-	•	•
Asint	SLZ302G08-EGN1C	2GB	SS	ASint	302G08-GN1C	-	-	•	•
Asint	SLZ3128M8-EGJ1D	2GB	DS	Asint	3128M8-GJ1D	-	-	•	•
ATP	AQ12M64B8BKK0S	4GB	DS	SAMSUNG	K4B2G08460	-	NO	•	•
CORSAIR	CMG4GX3M2A1600C6	4GB (2x2GB)	DS	-	-	6-6-6-18	1.65	•	•
CORSAIR	CML16GX3M4X1600C8 (Ver 2.12)	16GB (4x4GB)	DS	-	-	Heat-Sink Package	1.5	•	•
CORSAIR	CMP6GX3M3A1600C8	6GB (3x2GB)	DS	-	-	8-8-8-24	1.65	•	•
CORSAIR	CMP6GX3M3A1600C8	6GB (3x2GB)	DS	-	-	8-8-8-24	1.65	•	•
CORSAIR	CMX6GX3M3A1600C9	6GB (3x2GB)	DS	-	-	9-9-9-24	1.65	•	•
CORSAIR	CMX6GX3M3C1600C7	6GB (3x2GB)	DS	-	-	7-8-7-20	1.65	•	•
CORSAIR	CMZ16GX3M4A1600C9	16GB (4x4GB)	DS	-	-	9-9-9-24	1.5	•	•
CORSAIR	CMZ32GX3M4X1600C10 (Ver2.2)	32GB (4x8GB)	DS	-	-	10-10-10-27	1.5	•	•
CORSAIR	CMZ8GX3M2A1600C8	8GB (2x4GB)	DS	-	-	8-8-8-24	1.5	•	•
CORSAIR	CMZ8GX3M2A1600C9	8GB (2x4GB)	DS	-	-	9-9-9-24	1.5	•	•
CORSAIR	CMZ8GX3M4X1600C9 (Ver 2.12)	8GB (4x2GB)	SS	-	-	9-9-9-24	1.5	•	•
CORSAIR	HX3X12G1600C9	12GB (6x2GB)	DS	-	-	9-9-9-24	1.6	•	•

(continued on the next page)

DDR3 1600 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)	
								2	4
Crucial	BL12864BN1608.8FF	2GB (2x1GB)	SS	-	-	8-8-8-24	1.65	•	•
Crucial	BL25664BN1608.16FF	4GB (2x2GB)	DS	-	-	8-8-8-24	1.65	•	•
Crucial	BLT4G3D1608DT1TX0.16FM	4GB	DS	-	-	8-8-8-24	1.5	•	•
EK Memory	EKM324L28BP8-I16	4GB (2x2GB)	DS	-	-	9	-	•	•
EK Memory	EKM324L28BP8-I16	4GB (2x2GB)	DS	-	-	9	-	•	•
Elixir	M2X2G64CB88G7N-DG	2GB	SS	Elixir	N2CB2G80GN-DG	9-9-9-28	-	•	•
Elixir	M2X4G64CB8HG5N-DG	4GB	DS	Elixir	N2CB2G80GN-DG	9-9-9-28	-	•	•
Elixir	M2X8G64CB8HB5N-DG	8GB	DS	Elixir	N2CB4G80BN-DG	9-9-9-28	1.5	•	•
G.SKILL	F3-12800CL7D-8GBRH	8GB (2x4GB)	DS	-	-	7-8-7-24	1.6	•	•
G.SKILL	F3-12800CL7Q-16GBXH	16GB (4x4GB)	DS	-	-	7-8-7-24	1.6	•	•
G.SKILL	F3-12800CL8D-8GBECO	8GB (2x4GB)	DS	-	-	8-8-8-24	1.35	•	
G.SKILL	F3-12800CL9D-4GBNQ	4GB (2x2GB)	DS	-	-	9-9-9-24	1.5	•	•
G.SKILL	F3-12800CL9D-8GBRL	8GB (2x4GB)	DS	-	-	9-9-9-24	1.5	•	•
G.SKILL	F3-12800CL9D-8GBSR2	8GB (2x4GB)	DS	-	-	9-9-9-24	1.25	•	•
G.SKILL	F3-12800CL9Q-16GBXL	16GB (4x4GB)	DS	-	-	9-9-9-24	1.5	•	•
G.Skill	F3-12800CL9Q-16GBZL	16GB (4x4GB)	DS	-	-	9-9-9-24	1.5	•	•
GEIL	GET316GB1600C9QC	16GB (4x4GB)	DS	-	-	9-9-9-28	1.6	•	•
GEIL	GUP34GB1600C7DC	4GB (2x2GB)	DS	-	-	7-7-7-24	1.6	•	•
GEIL	GVP38GB1600C8QC	8GB (4x2GB)	DS	-	-	8-8-8-28	1.6	•	•
GoodRam	GR1600D364L9/2G	2GB	DS	GoodRam	GF1008KC-JN	-	-	•	•
Hynix	HMT351U6CFR8C-PB	4GB	DS	Hynix	H5TQ2G83CFR	-	-	•	•
Hynix	HMT41GU6MFR8C-PB	8GB	DS	Hynix	H5TQ4G83MFR	-	-	•	•
KINGMAX	FLGE85F-C8KL9A	2GB	SS	KINGMAX	N/A	9-9-9-28	-	•	•
KINGMAX	FLGF65F-C8KL9A	4GB	DS	KINGMAX	N/A	9-9-9-28	-	•	•

(continued on the next page)

Chapter 1

DDR3 1600 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)	
								2	4
KINGSTON	KHX1600C9D3K2/4GX	4GB (2x2GB)	DS	-	-	-	1.65	•	•
KINGSTON	KHX1600C9D3K3/12GX	12GB (3x4GB)	DS	-	-	9	1.65	•	
KINGSTON	KHX1600C9D3K3/12GX	12GB (3x4GB)	DS	-	-	-	1.65	•	•
KINGSTON	KHX1600C9D3K3/6GX	6GB (3x2GB)	DS	-	-	9	1.65	•	
KINGSTON	KHX1600C9D3K3/6GX	6GB (3x2GB)	DS	-	-	9	1.65	•	•
KINGSTON	KHX1600C9D3K3/6GX	6GB (3x2GB)	DS	-	-	9	1.65	•	•
Kingston	KHX1600C9D3K4/16GX	16GB (4x4GB)	DS	-	-	9-9-9-24	1.65	•	•
KINGSTON	KHX1600C9D3K6/24GX	24GB (6x4GB)	DS	-	-	9	1.65	•	•
Kingston	KHX1600C9D3K8/32GX	32GB (8x4GB)	DS	-	-	9-9-9-27	1.65	•	•
KINGSTON	KHX1600C9D3LK2/4GX	4GB (2x2GB)	DS	-	-	-	1.35	•	•
Kingston	KHX1600C9D3LK2/8GX	8GB (2x4GB)	DS	-	-	9-9-9-24	1.35	•	•
KINGSTON	KHX1600C9D3P1K2/8G	8GB (2x4GB)	DS	-	-	9	1.5	•	•
KINGSTON	KHX1600C9D3T1BK3/12GX	12GB (3x4GB)	DS	-	-	9	1.65	•	
KINGSTON	KHX1600C9D3T1K3/6GX	6GB (3x2GB)	DS	-	-	9	1.65	•	
KINGSTON	KHX1600C9D3X2K2/4GX	4GB (2x2GB)	DS	-	-	9	1.65	•	•
Kingston	KVR16N11/4	4G	DS	Hynix	H5TQ2G83CFRPBC	-	1.5	•	•
KINGTIGER	KTG2G1600PG3	2GB	DS	-	-	-	-	•	•
MICRON	MT16KTF51264AZ-1G6M1	4GB	DS	MICRON	D9PFJ	11-11-11-28	-		•
MICRON	MT16KTF51264AZ-1G6M1	4GB	DS	MICRON	D9PFJ	-	-	•	•
MICRON	MT8KTF25664AZ-1G6M1	2GB	SS	MICRON	D9PFJ	-	-	•	•
Mushkin	996805	4GB (2x2GB)	DS	-	-	6-8-6-24	1.65	•	•
Mushkin	998805	6GB (3x2GB)	DS	-	-	6-8-6-24	1.65	•	•

Chapter 1

DDR3 1600 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional) 2	4
OCZ	OCZ3BE1600C8LV4GK	4GB (2x2GB)	DS	-	-	8-8-8	1.65	•	
OCZ	OCZ3OB1600LV4GK	4GB (2x2GB)	DS	-	-	9-9-9	1.65	•	•
Patriot	PGD316G1600ELK	16GB (2x8GB)	DS	-	-	-	1.65	•	•
Patriot	PGD38G1600ELK	8GB (2x4GB)	DS	-	-	9-9-9-24	1.65	•	•
Patriot	PGS34G1600LLKA	4GB (2x2GB)	DS	-	-	7-7-7-20	1.7	•	•
Patriot	PGS34G1600LLKA2	4GB (2x2GB)	DS	-	-	8-8-8-24	1.7	•	•
Patriot	PVV38G1600LLK	8GB (2x4GB)	DS	-	-	8-9-8-24	1.65	•	•
Patriot	PX538G1600LLK	8GB (2x4GB)	DS	-	-	8-9-8-24	1.65	•	
Patriot	PX7312G1600LLK	12GB (3x4GB)	DS	-	-	8-9-8-24	1.65	•	•
SanMax	SMD-4G68HP-16KZ	4GB	DS	Hynix	H5TQ2G83BFRPBC	-	1.5	•	•
SanMax	SMD-4G68NG-16KK	4GB	DS	ELPIDA	J2108BDBG-GN-F	-	-	•	•
Silicon Power	SP002GBLTU160V02	2GB	SS	S-POWER	20YT5NG	9-11-11-28	1.5	•	•
Silicon Power	SP004GBLTU160V02	4GB	DS	S-POWER	20YT5NG	9-9-9-24	1.5	•	•
Team	TED34096M1600HC11	4GB	DS	Team	T3D2568ET-16	-	-	•	•
Team	TXD31024M1600C8-D	1GB	SS	Team	T3D1288RT-16	8-8-8-24	1.65	•	•
Team	TXD32048M1600C7-L	2GB	DS	Team	T3D1288LT-16	7-7-7-24	1.65	•	
Team	TXD32048M1600C8-D	2GB	DS	Team	T3D1288RT-16	8-8-8-24	1.65	•	•
Team	TXD32048M1600HC8-D	2GB	DS	Team	T3D1288RT-16	8-8-8-24	1.65	•	•
Team	TXD34096M1600HC9-D	4GB	DS	Hynix	H5TC2G83BFRH9A	9-9-9-24	1.5	•	•

(continued on the next page)

Chapter 1

DDR3 1333 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional) 2	4
ACTICA	ACT1GHU64B8F1333S	1GB	SS	SAMSUNG	K4B1G0846F	-	-	•	
ACTICA	ACT1GHU72C8G1333S	1GB	SS	SAMSUNG	K4B1G0846F(ECC)	-	-	•	
ACTICA	ACT2GHU64B8G1333M	2GB	DS	Micron	D9KPT	-	-	•	
A-DATA	AD63I1B0823EV	2GB	SS	A-DATA	3CCA-1509A	-	-	•	•
A-DATA	AD63I1C1624EV	4GB	DS	A-DATA	3CCA-1509A	-	-	•	•
A-DATA	AM2U139C2P1	2GB	SS	A-DATA	3CCD-1509A	-	-	•	•
A-DATA	AM2U139C4P2	4GB	DS	A-DATA	3CCD-1509A	-	-	•	•
A-DATA	AXDU1333GC2G9	2GB	SS	-	-	9-9-9-24	1.25~1.35	•	•
A-DATA	SU3U1333W8G9	8GB	DS	ELPIDA	J4208BASE-DJ-F	-	-	•	•
Apacer	78.A1GC6.9L1	2GB	DS	Apacer	AM5D5808FEQSBG	9	-	•	•
Apacer	78.B1GDE.9L10C	4GB	DS	Apacer	AM5D5908CEHSBG	9	-	•	•
CORSAIR	CMX8GX3M2A1333C9	8GB (2x4GB)	DS	-	-	9-9-9-24	1.5	•	•
CORSAIR	TW3X4G1333C9A	4GB (2x2GB)	DS	-	-	9-9-9-24	1.5	•	
Elixir	M2F2G64CB88G7N-CG	2GB	SS	Elixir	N2CB2G80GN-CG	-	-	•	•
Elixir	M2F4G64CB8HD5N-CG	4GB	DS	Elixir	M2CB2G80DN-CG	-	-	•	•
ELPIDA	EBJ41UF8BCF0-DJ-F	4GB	DS	ELPIDA	J2108BCSE-DJ-F	-	-	•	•
G.SKILL	F3-10600CL9D-4GBNT	4GB (2x2GB)	DS	G.SKILL	D3 128M8CE9 2GB	9-9-9-24	1.5	•	•
G.SKILL	F3-10666CL7D-8GBRH	8GB (2x4GB)	DS	-	-	7-7-7-21	1.5	•	•
G.SKILL	F3-10666CL8D-4GBHK	4GB (2x2GB)	DS	-	-	8-8-8-21	1.5	•	•
G.SKILL	F3-10666CL9D-8GBRL	8GB (2x4GB)	DS	-	-	9-9-9-24	1.5	•	•
G.SKILL	F3-10666CL9D-8GBRL	8GB (2x4GB)	DS	-	-	9-9-9-24	1.5	•	•
G.SKILL	F3-10666CL9D-8GBXL	8GB (x2x4GB)	DS	-	-	9-9-9-24	1.5	•	•
GEIL	GB34GB1333C7DC	4GB (2x2GB)	DS	GEIL	GL1L128M88BA15FW	7-7-7-24	1.5	•	•
GEIL	GET316GB1333C9QC	16GB (4x4GB)	DS	-	-	9-9-9-24	1.5	•	•
GEIL	GG34GB1333C9DC	4GB (2x2GB)	DS	GEIL	GL1L128M88BA115FW	9-9-9-24	1.3	•	•
GEIL	GG34GB1333C9DC	4GB (2x2GB)	DS	GEIL	GL1L128M88BA15B	9-9-9-24	1.3	•	•
GEIL	GVP34GB1333C9DC	4GB (2x2GB)	DS	-	-	9-9-9-24	1.5	•	•
GEIL	GVP38GB1333C7QC	8GB (4x2GB)	DS	-	-	7-7-7-24	1.5	•	•
GEIL	GVP38GB1333C9DC	8GB (2x4GB)	DS	-	-	9-9-9-24	1.5	•	•

(continued on the next page)

DDR3 1333 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional) 2	4
Hynix	HMT125U6TFR8A-H9	2GB	DS	Hynix	H5TC1G83TFR	-	-	•	•
Hynix	HMT325U6BFR8C-H9	2GB	SS	Hynix	H5TQ2G83BFR	-	-		•
KINGMAX	FLFD45F-B8KL9	1GB	SS	KINGMAX	KFB8FNLXF-BNF-15A	-	-	•	•
KINGMAX	FLFE85F-B8KL9	2GB	DS	KINGMAX	KFB8FNLXL-BNF-15A	-	-	•	•
KINGMAX	FLFE85F-C8KL9	2GB	SS	KINGMAX	KFC8FNLBF-GXX-12A	-	-	•	•
KINGMAX	FLFE85F-C8KL9	2GB	SS	KINGMAX	KFC8FNLXF-DXX-15A	-	-	•	•
KINGMAX	FLFE85F-C8KM9	2GB	SS	Kingmax	KFC8FNMXF-BXX-15A	-	-	•	•
KINGMAX	FLFF65F-C8KL9	4GB	DS	KINGMAX	KFC8FNLBF-GXX-12A	-	-	•	•
KINGMAX	FLFF65F-C8KL9	4GB	DS	KINGMAX	KFC8FNLXF-DXX-15A	-	-	•	•
KINGMAX	FLFF65F-C8KM9	4GB	DS	Kingmax	KFC8FNMXF-BXX-15A	-	-	•	•
KINGSTON	KVR1333D3E9S/4G	4GB	DS	Elpida	J2108ECSE-DJ-F	9	1.5	•	•
KINGSTON	KVR1333D3N9/2G	2GB	DS	Kingston	D1288JPNDPLD9U	9	1.5	•	•
KINGSTON	KVR1333D3N9/2G	2GB	DS	Elpida	J1108BDBG-DJ-F	-	1.5	•	•
KINGSTON	KVR1333D3N9H/8G	8GB	DS	ELPIDA	J4208EASE-DJ-F	9-9-9-24	1.5	•	•
KINGSTON	KVR1333D3N9K2/4G	4GB (2x2GB)	DS	KINGSTON	D1288JEMFPGD9U	-	1.5	•	•
KINGSTON	KVR1333D3S8N9/2G	2GB	SS	Micron	IFD77 D9LGK	-	1.5	•	•
MICRON	MT16JTF1G64AZ-1G4D1	8GB	DS	MICRON	D9PCP	-	-	•	•
MICRON	MT8JTF25664AZ-1G4M1	2GB	SS	MICRON	D9PFJ	-	-	•	•
OCZ	OCZ3G1333LV4GK	4GB (2x2GB)	DS	-	-	9-9-9	1.65	•	
OCZ	OCZ3G1333LV8GK	8GB (2x4GB)	DS	-	-	9-9-9	1.65	•	•
OCZ	OCZ3G1333LV8GK	8GB (2x4GB)	DS	-	-	9-9-9	1.65	•	
OCZ	OCZ3RPR1333C9LV8GK	8GB (2x4GB)	DS	-	-	9-9-9	1.65	•	
SAMSUNG	M378B1G73AH0-CH9	8GB	DS	SAMSUNG	K4B4G0846A-HCH9	-	-	•	•
SAMSUNG	M378B5273CH0-CH9	4GB	DS	SAMSUNG	K4B2G0846C	-	-	•	•
SAMSUNG	M378B5273DH0-CH9	4GB	DS	SAMSUNG	K4B2G08460	-	-	•	•
SAMSUNG	M378B5673FH0-CH9	2GB	DS	SAMSUNG	K4B1G0846F	-	-	•	•
SAMSUNG	M378B5773DH0-CH9	2GB	SS	SAMSUNG	K4B2G08460	-	-	•	•

Chapter 1

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

(1)   Supports one (1) module inserted into any slot as Single-channel memory configuration. We suggest that you install the module into A2 slot.

(2)   Supports two (2) modules inserted into either the red slots or the black slots as one pair of Dual-channel memory configuration. We suggest that you install the modules into slots A2 and B2 for better compatibility.

(4)   Supports four (4) modules inserted into both the red and black slots as two pairs of Dual-channel memory configuration.

•   ASUS exclusively provides hyper DIMM support function.

•   **Hyper DIMM support is subject to the physical characteristics of individual CPUs. Load** the D.O.C.P. settings in the BIOS for the hyper DIMM support.

•   **Visit the ASUS website for the latest QVL.**

Chapter 1

1.2.5 Expansion slots

⚠️ Unplug the power cord before adding or removing expansion cards. Failure to do so may cause you physical injury and damage motherboard components.
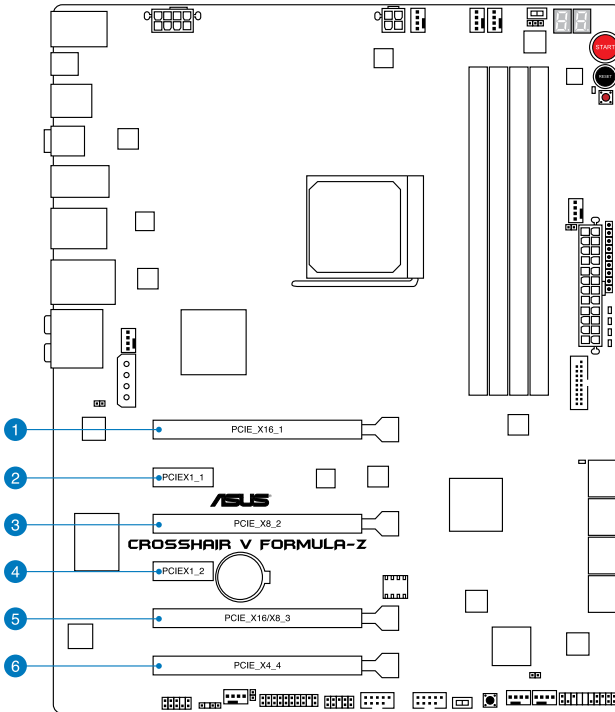
Slot No.	Slot Description
1	PCIe 2.0 x16 slot
2	PCIe 2.0 x1 slot
3	PCIe 2.0 x8 slot
4	PCIe 2.0 x1 slot
5	PCIe 2.0 x16/x8 slot
6	PCIe 2.0 x4 slot

VGA configuration	PCI 2.0 operating mode		
	Single VGA	SLI/CrossFireX™	3-WAY SLI/CrossFireX™
PCIe_x16_1	x16	x16	x16
PCIe_x8_2	–	–	x8
PCIe_x16/x8_3	–	x16	x8

- We recommend that you provide sufficient power when running CrossFireX™ or SLI™ mode.
- Connect a chassis fan to the motherboard connector labeled CHA_FAN1-3 when using multiple graphics cards for better thermal environment.

When the system is running with three VGA cards, ensure to connect the EZ PLUG for extra PCIe power supply.

**IRQ assignments for this motherboard**

	A	B	C	D	E	F	G	H
Intel 82583V	–	–	–	–	–	–	shared	–
ASM1061_1	–	–	–	–	shared	–	–	–
ASM1061_2	–	–	–	–	–	–	–	shared
ASM1042 USB3.0_1	–	–	–	shared	–	–	–	–
ASM1042 USB3.0_2	–	–	shared	–	–	–	–	–
ASM1042 USB3.0_2	shared	–	–	–	–	–	–	–
Onchip SATA Controller	–	–	–	shared	–	–	–	–
Onchip USB1	–	shared	–	–	–	–	–	–
Onchip USB2	–	–	–	–	–	shared	–	–
Onchip USB3	–	–	–	–	–	–	–	shared
Onchip Azalia	shared	–	–	–	–	–	–	–
PCIE_X16_1	shared	–	–	–	–	–	–	–
PCIE_X8_2	–	–	–	–	shared	–	–	–
PCIE_X16/X8_3	shared	–	–	–	–	–	–	–
PCIE_X4_4	shared	–	–	–	–	–	–	–
PCIEX1_1	–	–	–	–	shared	–	–	–
PCIEX1_2	–	–	–	–	–	shared	–	–

Chapter 1

1.2.6 Onboard buttons and switches

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

1. **Power-on button**

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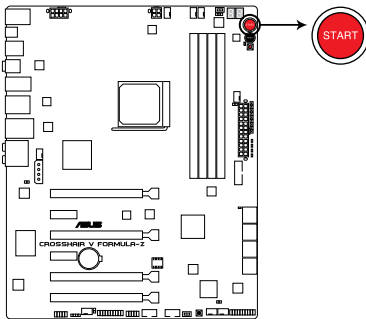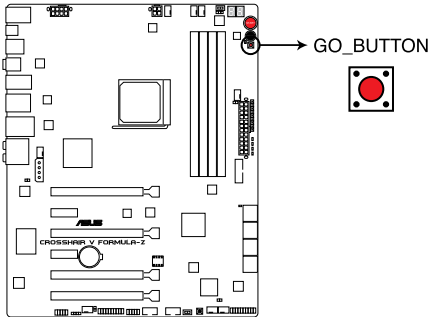

CROSSHAIR V FORMULA-Z Power on button

2. **Reset button**

   Press the reset button to reboot the system.
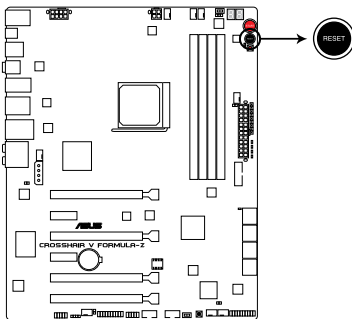
CROSSHAIR V FORMULA-Z Reset button

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.

GO_BUTTON

CROSSHAIR V FORMULA-Z GO button

4. **Slow Mode switch**

   Slow Mode switch allows your system to provide better overclocking margins when using the LN2 cooling system. When enabled, the Slow Mode switch prevents the system from crashing, slows down the CPU, and the system's tuner will make the adjustments.

SLOW_MODE

ON

OFF

OFF

Disable
(Default)
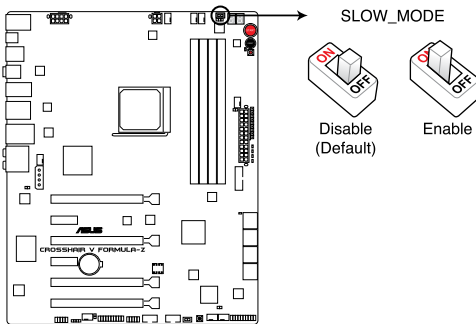
Enable

CROSSHAIR V FORMULA-Z Slow Mode switch

Ensure to set the LN2 Mode jumper to [Enable] before using the Slow Mode Switch.

5. **DirectKey button (DirectKey)**

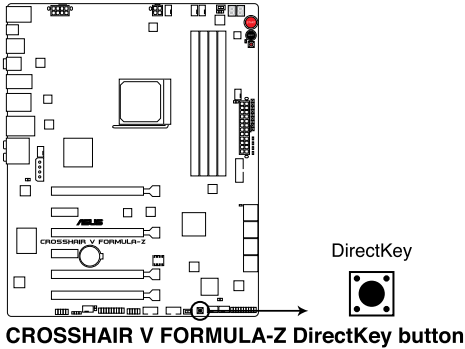This feature allows your system to go to the BIOS Setup program with the press of a button. With DirectKey, you can enter the BIOS anytime without having to press the <Del> key during POST. It also allows you to turn on or turn off your system and conveniently enter the BIOS during boot-up.

DirectKey

CROSSHAIR V FORMULA-Z DirectKey button

Ensure to save your data before using the DirectKey button.

• When the system is on and you press the DirectKey button, your system will shut down. Press the DirectKey button again or the Power-on button to reboot and enter the BIOS directly.

• Turn off your system using the power-on button to allow your system to go through POST (without entering the BIOS) when you reboot your system.

• Refer to section **3.7 Boot Menu** for details about setting the DirectKey default function.

6.   **Fast Boot switch (FAST_BOOT)**

This feature allows you to accelerate your system's boot speed with the use of a switch, allowing the system to skip POST and enter the OS at its fastest time.

CROSSHAIR V FORMULA-Z FAST_BOOT switch
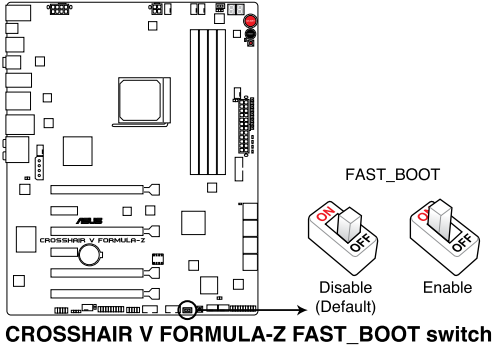
- When you enable the Fast Boot in OS mode, your system will only initiate the Fast Boot function after you restart your system.

- When you set the Fast Boot state (enable/disable state) in BIOS Setup or ASUS Boot Setting utility, the Fast Boot state that you set via the Fast Boot switch will be replaced.

- Refer to section **3.7 Boot menu** for details about setting the Fast Boot function.

1.2.7   Jumpers

1.   **LN2 Mode Jumper (3-pin LN2)**

When enabled, the LN2 Mode jumper allows your system to eliminate the cold bugs in the processor during POST. It allows the processor to run at an extremely low temperature and helps the system boot fast.

LN2_MODE

1 2   2 3

Disable   Enable
(Default)

CROSSHAIR V FORMULA-Z LN2_MODE
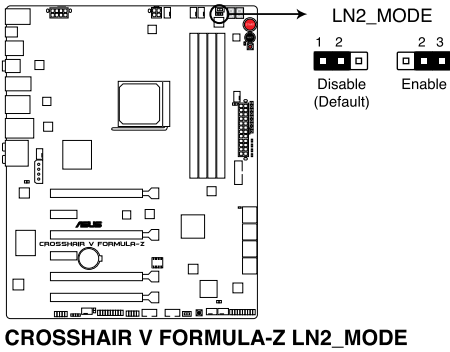
1.2.8 Onboard LEDs

1. 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.

→ HD_LED
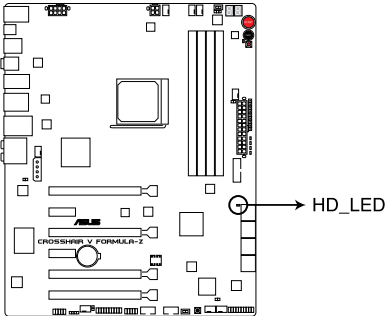
CROSSHAIR V FORMULA-Z Hard Disk LED

2. 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.
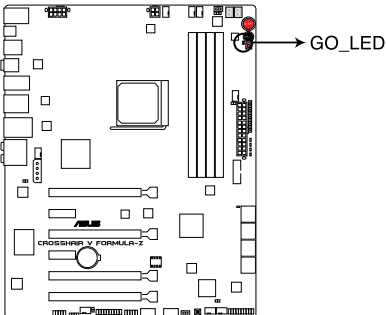
→ GO_LED

CROSSHAIR V FORMULA-Z GO_LED

Chapter 1

3. **Q LED**

Q LEDs check key components (CPU, DRAM, VGA card, and booting devices) in sequence during the 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 intuitive way to locate the root problem within seconds.

BOOT_DEVICE_LED

VGA_LED

DRAM_LED

CPU_LED
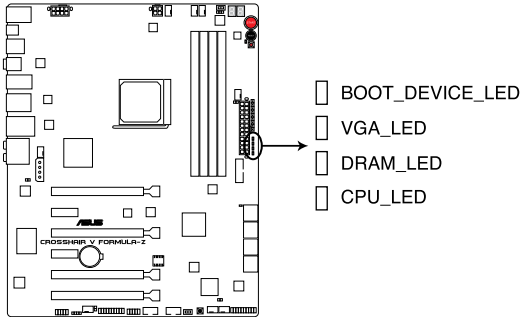
CROSSHAIR V FORMULA-Z CPU/ DRAM/ VGA/ BOOT_DEVICE LED

4. **Power LED**

The motherboard comes with a power-on button 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 button.

START
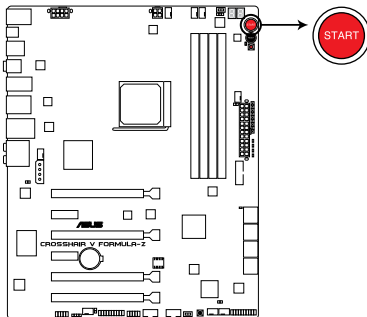
CROSSHAIR V FORMULA-Z Power LED

Chapter 1

5.   **Q-Code LEDs**

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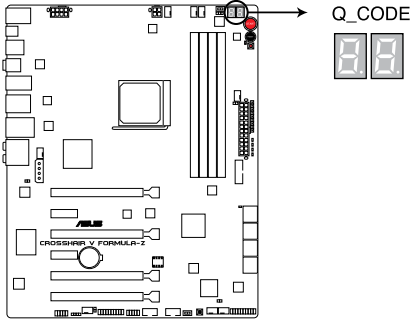
CROSSHAIR V FORMULA-Z Q_Code LED

Q-Code table

Code	Description
00	Not used
01	Power on. Reset type detection (soft/hard).
02	AP initialization before microcode loading
03	System Agent initialization before microcode loading
04	PCH initialization before microcode loading
06	Microcode loading
07	AP initialization after microcode loading
08	System Agent initialization after microcode loading
09	PCH initialization after microcode loading
0B	Cache initialization
0C – 0D	Reserved for future AMI SEC error codes
0E	Microcode not found
0F	Microcode not loaded
10	PEI Core is started
11 – 14	Pre-memory CPU initialization is started
15 – 18	Pre-memory System Agent initialization is started
19 – 1C	Pre-memory PCH initialization is started
2B – 2F	Memory initialization
30	Reserved for ASL (see ASL Status Codes section below)
31	Memory Installed
32 – 36	CPU post-memory initialization
37 – 3A	Post-Memory System Agent initialization is started
3B – 3E	Post-Memory PCH initialization is started
4F	DXE IPL is started

Chapter 1

Q-Code table

Code	Description
50 – 53	Memory initialization error. Invalid memory type or incompatible memory speed
54	Unspecified memory initialization error
55	Memory not installed
56	Invalid CPU type or Speed
57	CPU mismatch
58	CPU self test failed or possible CPU cache error
59	CPU micro-code is not found or micro-code update is failed
00	Not used
01	Power on. Reset type detection (soft/hard).
02	AP initialization before microcode loading
03	System Agent initialization before microcode loading
04	PCH initialization before microcode loading
06	Microcode loading
07	AP initialization after microcode loading
08	System Agent initialization after microcode loading
09	PCH initialization after microcode loading
0B	Cache initialization
0C – 0D	Reserved for future AMI SEC error codes
0E	Microcode not found
0F	Microcode not loaded
10	PEI Core is started
11 – 14	Pre-memory CPU initialization is started
15 – 18	Pre-memory System Agent initialization is started
19 – 1C	Pre-memory PCH initialization is started
2B – 2F	Memory initialization
30	Reserved for ASL (see ASL Status Codes section below)
31	Memory Installed
32 – 36	CPU post-memory initialization
37 – 3A	Post-Memory System Agent initialization is started

Q-Code table

Code	Description
3B – 3E	Post-Memory PCH initialization is started
4F	DXE IPL is started
50 – 53	Memory initialization error. Invalid memory type or incompatible memory speed
54	Unspecified memory initialization error
55	Memory not installed
56	Invalid CPU type or Speed
57	CPU mismatch
58	CPU self test failed or possible CPU cache error
59	CPU micro-code is not found or micro-code update is failed
5A	Internal CPU error
5B	Reset PPI is not available
5C – 5F	Reserved for future AMI error codes
E0	S3 Resume is stared (S3 Resume PPI is called by the DXE IPL)
E1	S3 Boot Script execution
E2	Video repost
E3	OS S3 wake vector call
E4 – E7	Reserved for future AMI progress codes
E8	S3 Resume Failed
E9	S3 Resume PPI not Found
EA	S3 Resume Boot Script Error
EB	S3 OS Wake Error
EC – EF	Reserved for future AMI error codes
F0	Recovery condition triggered by firmware (Auto recovery)
F1	Recovery condition triggered by user (Forced recovery)
F2	Recovery process started
F3	Recovery firmware image is found
F4	Recovery firmware image is loaded
F5 – F7	Reserved for future AMI progress codes
F8	Recovery PPI is not available

Chapter 1

Q-Code table

Code	Description
F9	Recovery capsule is not found
FA	Invalid recovery capsule
FB – FF	Reserved for future AMI error codes
60	DXE Core is started
61	NVRAM initialization
62	Installation of the PCH Runtime Services
63 – 67	CPU DXE initialization is started
68	PCI host bridge initialization
69	System Agent DXE initialization is started
6A	System Agent DXE SMM initialization is started
6B – 6F	System Agent DXE initialization (System Agent module specific)
70	PCH DXE initialization is started
71	PCH DXE SMM initialization is started
72	PCH devices initialization
73 – 77	PCH DXE Initialization (PCH module specific)
78	ACPI module initialization
79	CSM initialization
7A – 7F	Reserved for future AMI DXE codes
90	Boot Device Selection (BDS) phase is started
91	Driver connecting is started
92	PCI Bus initialization is started
93	PCI Bus Hot Plug Controller Initialization
94	PCI Bus Enumeration
95	PCI Bus Request Resources
96	PCI Bus Assign Resources
97	Console Output devices connect
98	Console input devices connect
99	Super IO Initialization
9A	USB initialization is started
9B	USB Reset

(continued on the next page)

Chapter 1

Q-Code table

Code	Description
9C	USB Detect
9D	USB Enable
9E – 9F	Reserved for future AMI codes
A0	IDE initialization is started
A1	IDE Reset
A2	IDE Detect
A3	IDE Enable
A4	SCSI initialization is started
A5	SCSI Reset
A6	SCSI Detect
A7	SCSI Enable
A8	Setup Verifying Password
A9	Start of Setup
AA	Reserved for ASL (see ASL Status Codes section below)
AB	Setup Input Wait
AC	Reserved for ASL (see ASL Status Codes section below)
AD	Ready To Boot event
AE	Legacy Boot event
AF	Exit Boot Services event
B0	Runtime Set Virtual Address MAP Begin
B1	Runtime Set Virtual Address MAP End
B2	Legacy Option ROM Initialization
B3	System Reset
B4	USB hot plug
B5	PCI bus hot plug
B6	Clean-up of NVRAM
B7	Configuration Reset (reset of NVRAM settings)
B8– BF	Reserved for future AMI codes
D0	CPU initialization error
D1	System Agent initialization error

Chapter 1

Q-Code table

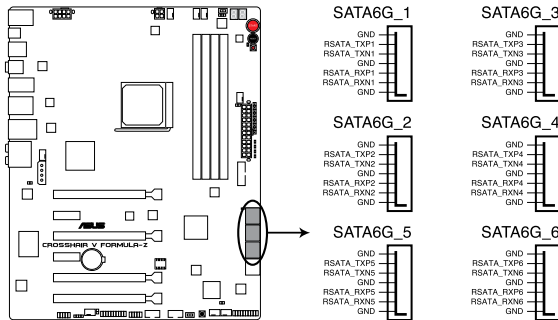| Code	Description
D2	PCH initialization error
D3	Some of the Architectural Protocols are not available
D4	PCI resource allocation error. Out of Resources
D5	No Space for Legacy Option ROM
D6	No Console Output Devices are found
D7	No Console Input Devices are found
D8	Invalid password
D9	Error loading Boot Option (LoadImage returned error)
DA	Boot Option is failed (StartImage returned error)
DB	Flash update is failed
DC	Reset protocol is not available

ACPI/ASL Checkpoints

Code	Description
0x01	System is entering S1 sleep state
0x02	System is entering S2 sleep state
0x03	System is entering S3 sleep state
0x04	System is entering S4 sleep state
0x05	System is entering S5 sleep state
0x10	System is waking up from the S1 sleep state
0x20	System is waking up from the S2 sleep state
0x30	System is waking up from the S3 sleep state
0x40	System is waking up from the S4 sleep state
0xAC	System has transitioned into ACPI mode. Interrupt controller is in PIC mode.
0xAA	System has transitioned into ACPI mode. Interrupt controller is in APIC mode.

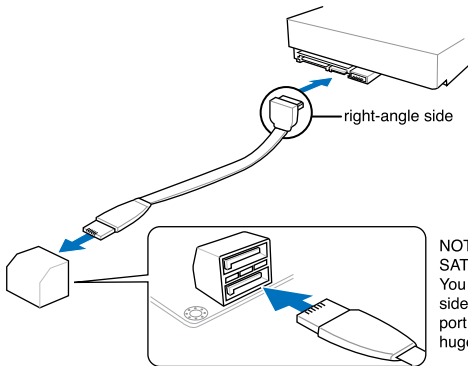**Chapter 1**

1.2.9　Internal connectors

1.　AMD® Serial ATA 6.0 Gb/s connectors (7-pin SATA6G_1-6 [red])

These connectors are for the Serial ATA 6.0 Gb/s 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, RAID 1, RAID 5, or RAID 10 configuration through the onboard AMD® SB950 controller.

SATA6G_1

GND
RSATA_TXP1
RSATA_TXN1
GND
RSATA_RXP1
RSATA_RXN1
GND

SATA6G_3

GND
RSATA_TXP3
RSATA_TXN3
GND
RSATA_RXP3
RSATA_RXN3
GND

SATA6G_2

GND
RSATA_TXP2
RSATA_TXN2
GND
RSATA_RXP2
RSATA_RXN2
GND

SATA6G_4

GND
RSATA_TXP4
RSATA_TXN4
GND
RSATA_RXP4
RSATA_RXN4
GND

SATA6G_5

GND
RSATA_TXP5
RSATA_TXN5
GND
RSATA_RXP5
RSATA_RXN5
GND

SATA6G_6

GND
RSATA_TXP6
RSATA_TXN6
GND
RSATA_RXP6
RSATA_RXN6
GND

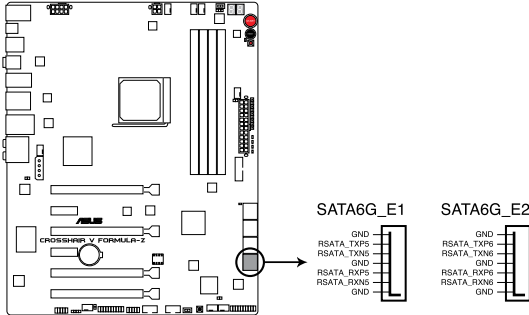**CROSSHAIR V FORMULA-Z AMD® SATA 6.0 Gb/s connectors**

right-angle side

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

- ・　These connectors are set to **[AHCI Mode]** by default. If you intend to create a Serial ATA RAID set using these connectors, set the SATA Mode item in the BIOS to [RAID Mode]. Refer to section **3.5.4 SATA Configuration** for details.

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

- ・　When creating a RAID set, set the SATA_5-6 connectors to **[AHCI Mode]** or **[IDE Mode]** to ensure that the system recognizes your ODD device.

- ・　When using NCQ, set the SATA Mode in the BIOS to [AHCI Mode]. Refer to section **3.5.4 SATA Configuration** for details.

- ・　You must install Windows® XP Service Pack 3 or later versions before using Serial ATA hard disk drives. The Serial ATA RAID feature is available only if you are using Windows® XP SP3 or later versions.

2. ASMedia® Serial ATA 6.0 Gb/s connectors (7-pin SATA6G_E12 [red])

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

SATA6G_E1
GND
RSATA_TXP5
RSATA_TXN5
GND
RSATA_RXP5
RSATA_RXN5
GND

SATA6G_E2
GND
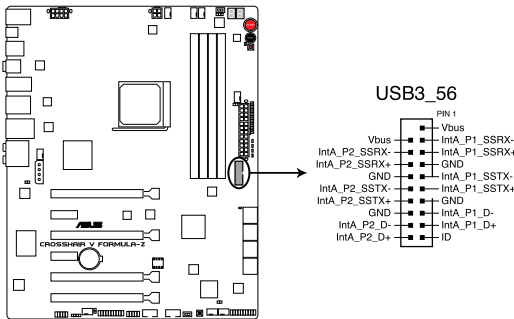RSATA_TXP6
RSATA_TXN6
GND
RSATA_RXP6
RSATA_RXN6
GND

CROSSHAIR V FORMULA-Z ASMedia SATA 6.0 Gb/s connectors

You must install Windows® XP Service Pack 3 or later versions before using Serial ATA hard disk drives.

3. USB 3.0 connector (20-1 pin USB3_56)

This connector is for the additional USB 3.0 ports, and complies with the USB 3.0 specificaton that supports up to 5.0 Gbps connection speed. If the USB 3.0 front panel cable is available from your system chassis, with this USB 3.0 connector, you can have a front panel USB 3.0 solution.

USB3_56

PIN 1
Vbus — Vbus
IntA_P2_SSRX- — IntA_P1_SSRX-
IntA_P2_SSRX+ — IntA_P1_SSRX+
GND — GND
IntA_P2_SSTX- — IntA_P1_SSTX-
IntA_P2_SSTX+ — IntA_P1_SSTX+
GND — GND
IntA_P2_D- — IntA_P1_D-
IntA_P2_D+ — IntA_P1_D+
ID

CROSSHAIR V FORMULA-Z USB3.0 connector

4. USB 2.0 connectors (10-1 pin USB910; USB1112)

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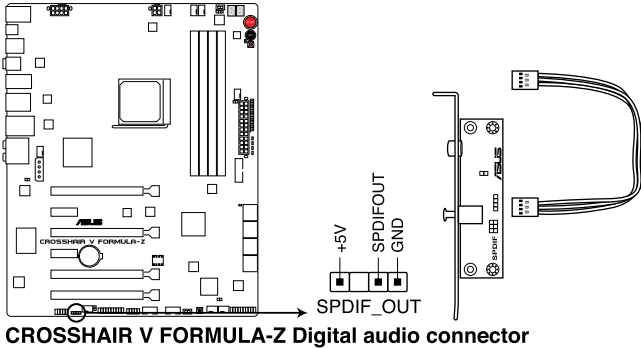

CROSSHAIR V FORMULA-Z USB2.0 connectors
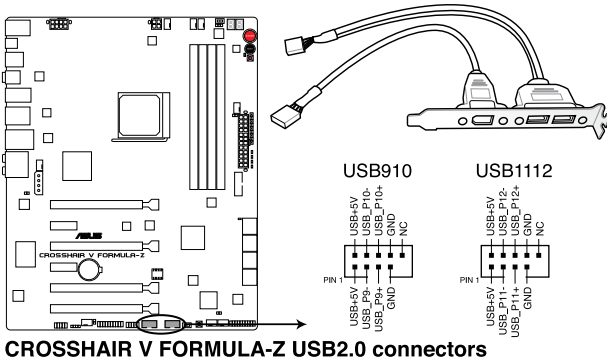
Never connect a 1394 cable to the USB connectors. Doing so will damage the motherboard!

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

5. **Digital audio connector (4-1 pin SPDIF_OUT)**

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

CROSSHAIR V FORMULA-Z Digital audio connector

The S/PDIF module is purchased separately.

6. **TPM connector (20-1 pin TPM)**

This connector supports a Trusted Platform Module (TPM) system, which can securely store keys, digital certificates, passwords, and data. A TPM system also helps enhance network security, protects digital identities, and ensures platform integrity. This connector can also serve for G.P. Diagnosis card installation.
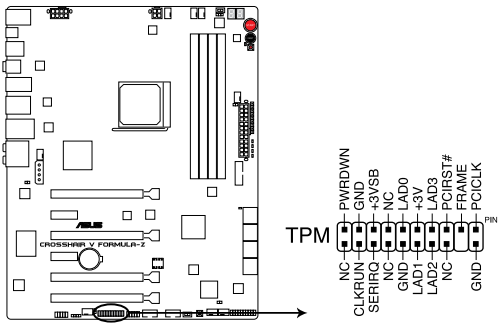
CROSSHAIR V FORMULA-Z TPM connector

7. CPU, chassis, and optional fan connectors

(4-pin CPU_FAN; 4-pin CPU_OPT; 4-pin CHA_FAN1-3; 4-pin OPT_FAN1-3)

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.
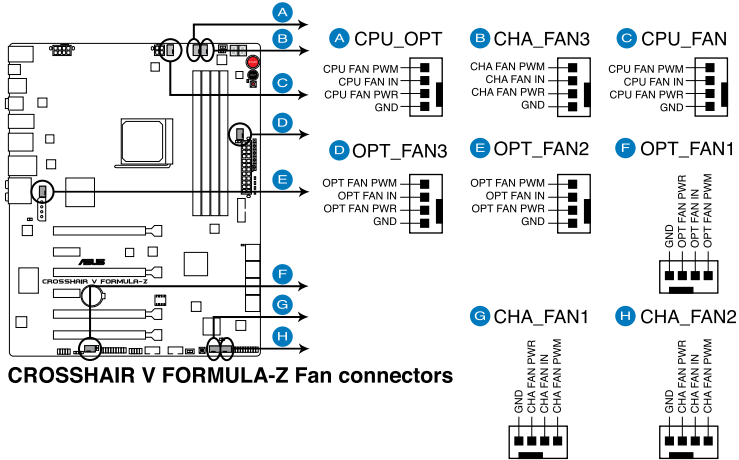

CROSSHAIR V FORMULA-Z Fan connectors

A CPU_OPT

CPU FAN PWM
CPU FAN IN
CPU FAN PWR
GND

B CHA_FAN3

CHA FAN PWM
CHA FAN IN
CHA FAN PWR
GND

C CPU_FAN

CPU FAN PWM
CPU FAN IN
CPU FAN PWR
GND

D OPT_FAN3

OPT FAN PWM
OPT FAN IN
OPT FAN PWR
GND

E OPT_FAN2

OPT FAN PWM
OPT FAN IN
OPT FAN PWR
GND

F OPT_FAN1

GND
OPT FAN IN
OPT FAN IN
OPT FAN PWM

G CHA_FAN1

GND
CHA FAN PWR
CHA FAN IN
CHA FAN PWM

H CHA_FAN2

GND
CHA FAN PWR
CHA FAN IN
CHA FAN PWM

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

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

• If you install two VGA cards, we recommend that you plug the rear chassis fan cable to the motherboard connector labeled CHA_FAN1, CHA_FAN2, CHA_FAN3 for better thermal environment.

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.

AAFP

PIN 1

GND
PRESENCE#
SENSE1_RETUR
SENSE2_RETUR

PORT1L
PORT1R
PORT2R
SENSE_SEND
PORT2L

HD-audio-compliant
pin definition

PIN 1

AGND
NC
NC

MIC2
MICPWR
Line out_R
NC
Line out_L

Legacy AC'97
compliant definition
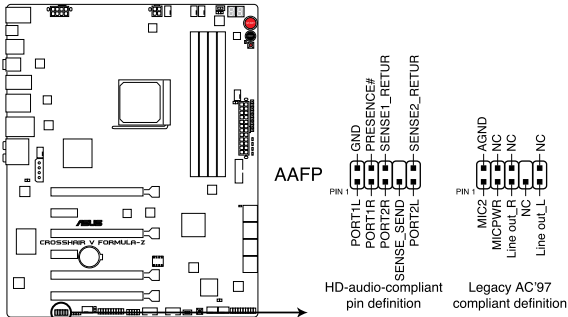
CROSSHAIR V FORMULA-Z Analog front panel connector

- We recommend that you connect a high-definition front panel audio module to this connector to avail of the motherboard's high-definition audio capability.

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

9. Direct Connector (2-pin DRCT)

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

DRCT

DRCT
GND

PIN 1
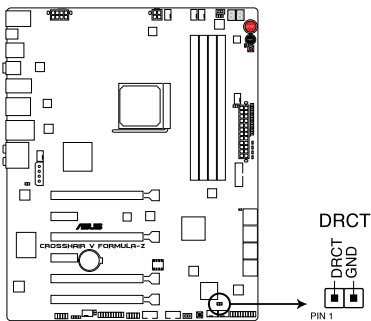
CROSSHAIR V FORMULA-Z DRCT connector

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

10. ATX power connectors

**(24-pin EATXPWR; 8-pin EATX12V_1; 4-pin EATX12V_2; 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-Z ATX power connectors
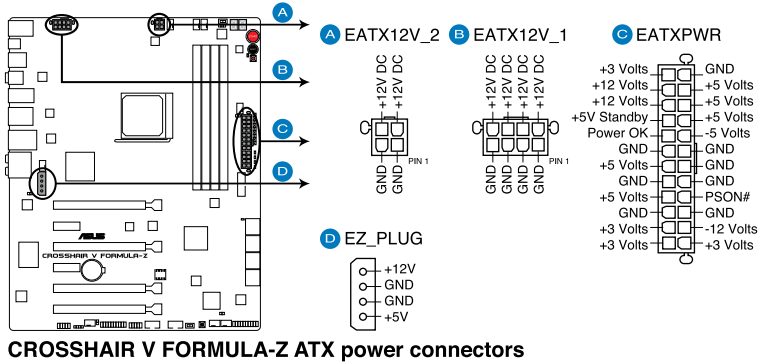
• For a fully configured system, we recommend that you use a power supply unit (PSU) that complies with ATX 12 V Specification 2.0 (or later version) and provides a minimum power of 350 W.

• Do not forget to connect the 4-pin/8-pin EATX12 V power plug. Otherwise, the system will not boot.

• Connect the 4-pin EZ_PLUG power plugs to ensure sufficient power supply when you install multiple graphics cards.

• We recommend that you use a PSU with a higher power output when configuring a system with more power-consuming devices. The system may become unstable or may not boot up if the power is inadequate.

• If you want to use two or more high-end PCI Express x16 cards, use a PSU with 1000W power or above to ensure the system stability.

• 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.

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

This connector supports several chassis-mounted functions.
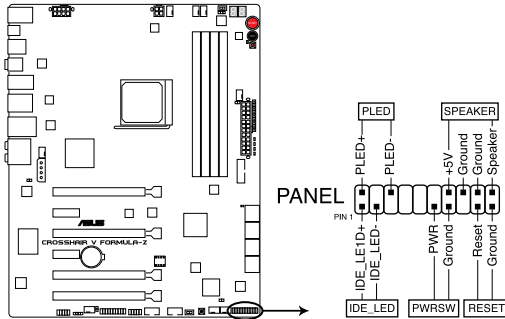
CROSSHAIR V FORMULA-Z System panel connector

- **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.

Chapter 1

12.   **Thermal sensor cable connectors (2-pin OPT_TEMP1-3)**

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 the temperature. The optional fan 1/2/3 can work with the temperature sensors for a better cooling effect.
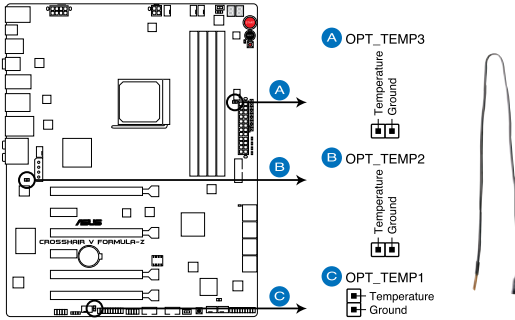
CROSSHAIR V FORMULA-Z Thermal sensor cable connectors

You must enable the **OPT FAN 1/2/3 overheat protection** in BIOS if you connect the thermal sensor cables to these connectors.

The thermal sensor cables are purchased separately.

Chapter 1

1.2.10 ProbeIt

The ROG ProbeIt allows you to detect your system's current voltage and OC settings. Use a multimeter to measure the ProbeIt points even during overclocking.

See the illustration below to locate the respective ProbeIt points.

GND
CPU
CPU/NB
VDDA
DRAM
NB
HT
SB
GND
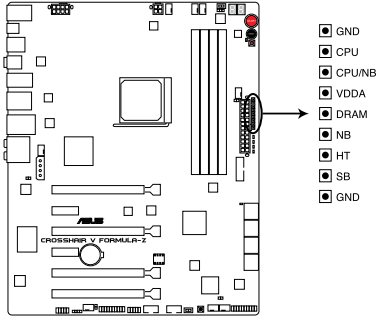
CROSSHAIR V FORMULA-Z ProbeIt

Using ProbeIt

You may connect the multitester to the motherboard as shown on Figure 1.
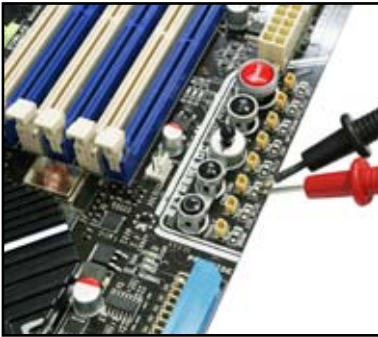
Figure 1

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

Basic Installation

2

2.1 Building your PC system

2.1.1 Motherboard installation

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

1.   Install the ASUS I/O Shield to the chassis rear I/O panel.
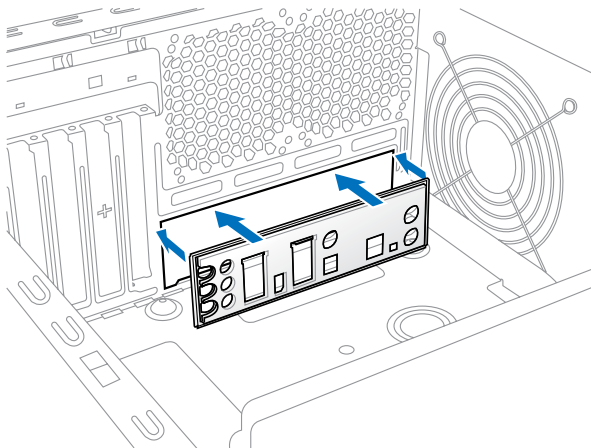
2.	Place the motherboard into the chassis, ensuring that its rear I/O ports are aligned to the chassis' rear I/O panel.
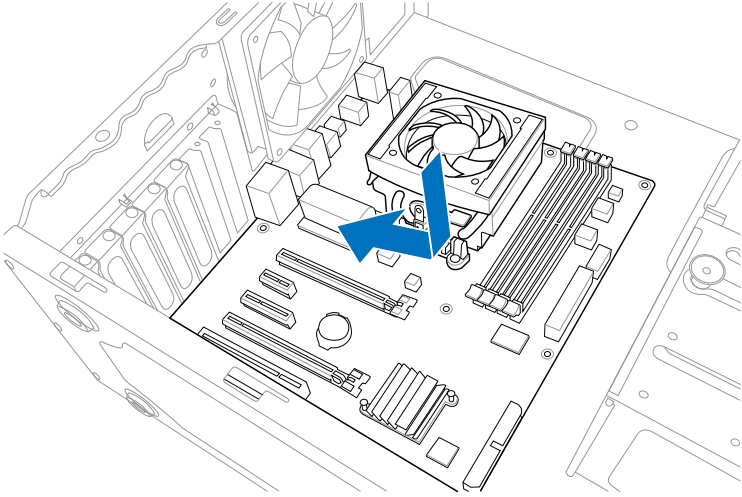
3. Place nine screws into the holes indicated by circles to secure the motherboard to the chassis.
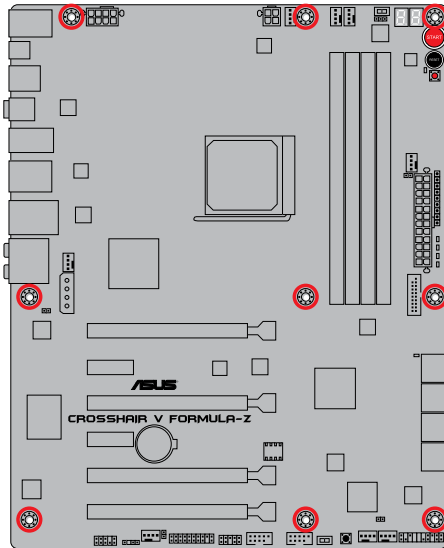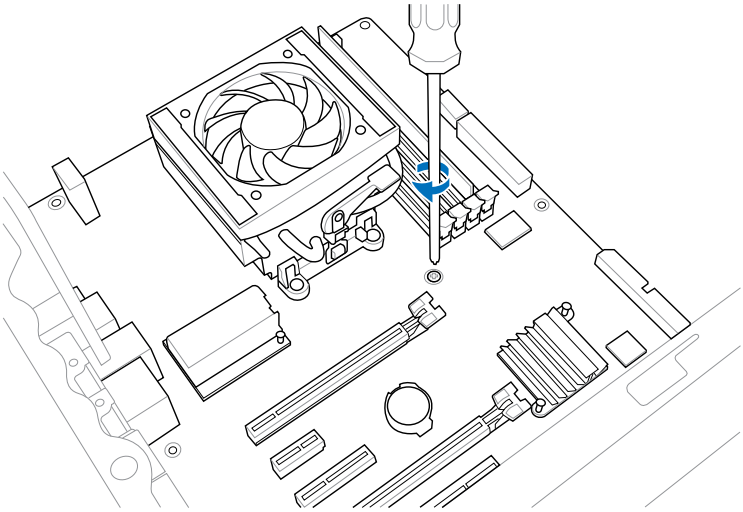
DO NOT overtighten the screws! Doing so can damage the motherboard.

2.1.2   CPU installation

The AMD AM3+ socket is compatible with AMD AM3+ and AM3 processors. 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!
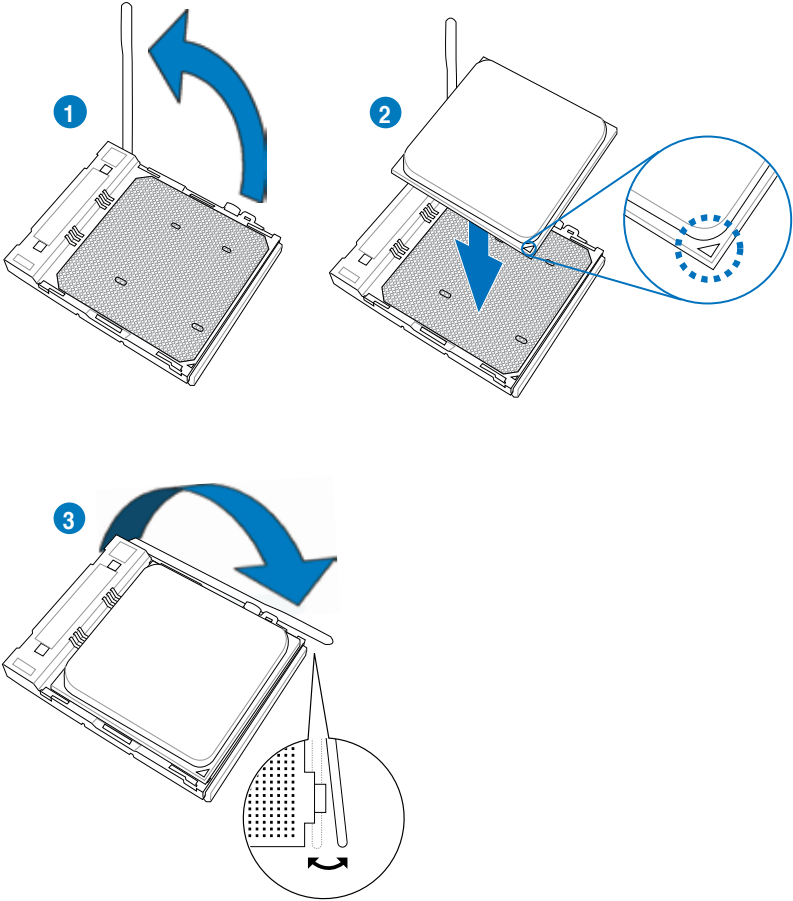
2.1.3 CPU heatsink and fan assembly installation
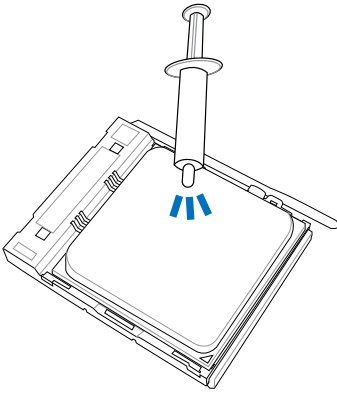
Apply the Thermal Interface Material to the CPU heatsink and CPU before you install the heatsink and fan if necessary.

To install the CPU heatsink and fan assembly

Chapter 2
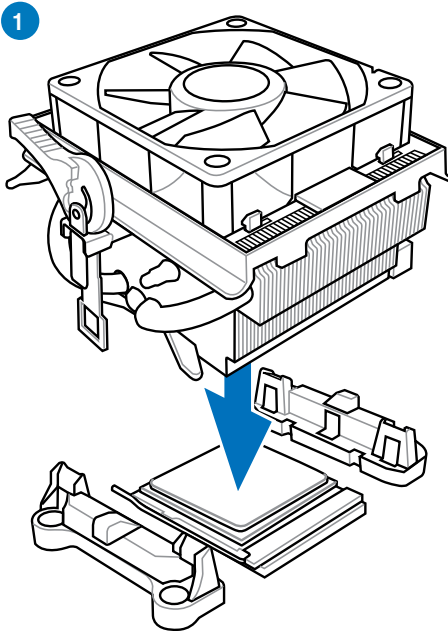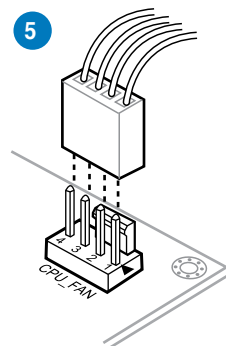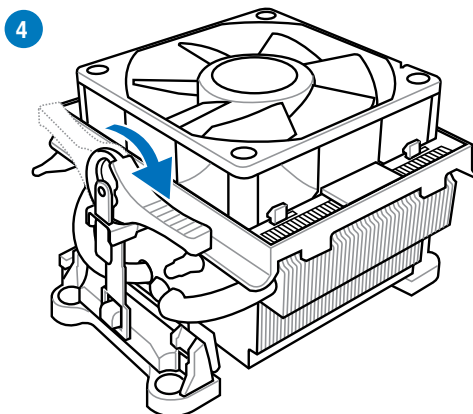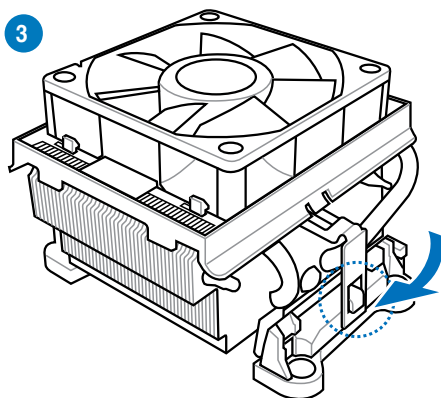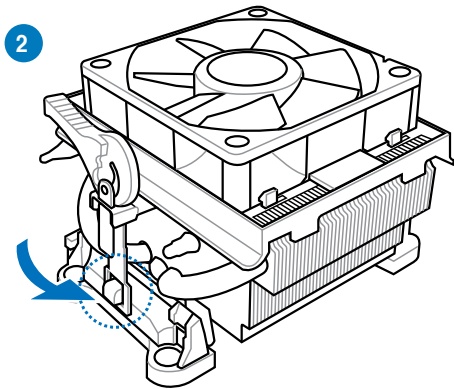
2.1.4   DIMM installation
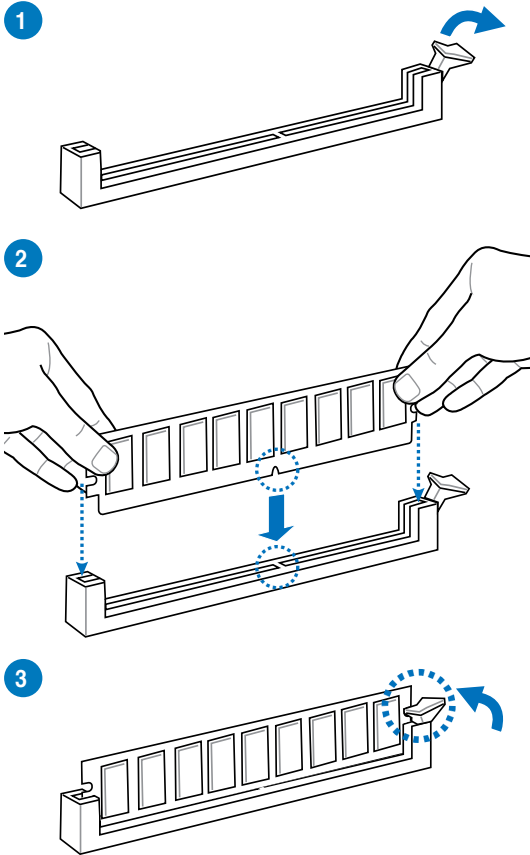
To remove a DIMM
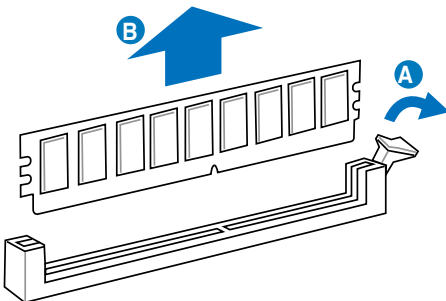
2.1.5   ATX Power connection

OR   **OR**
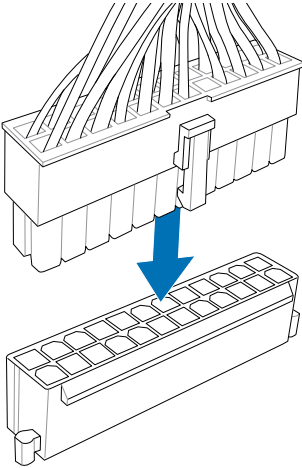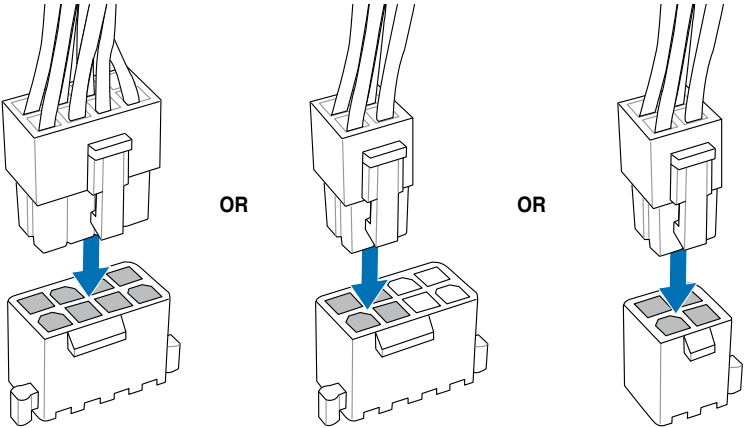
2.1.6   SATA device connection

OR
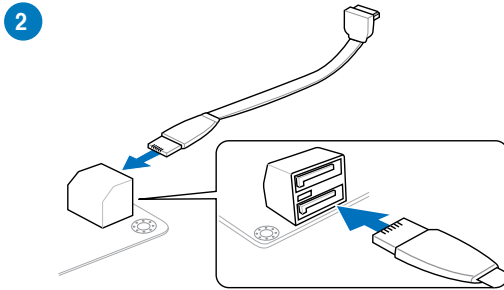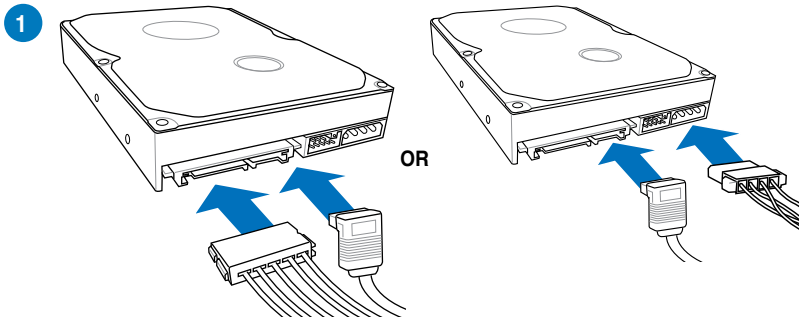
2.1.7 Front I/O Connector

To install ASUS Q-Connector
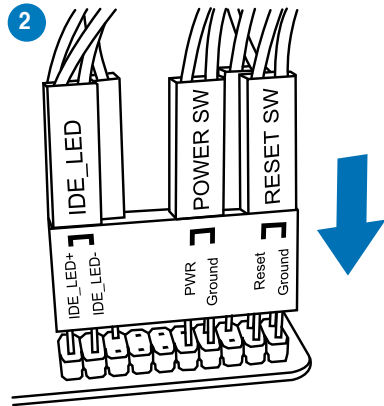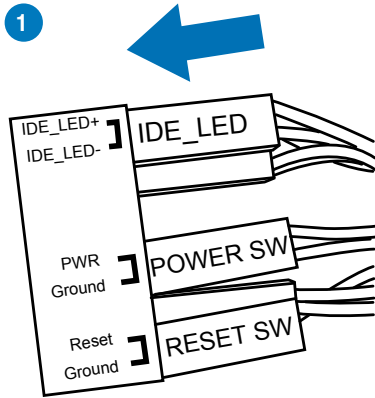
To install USB 2.0 connector

USB 2.0
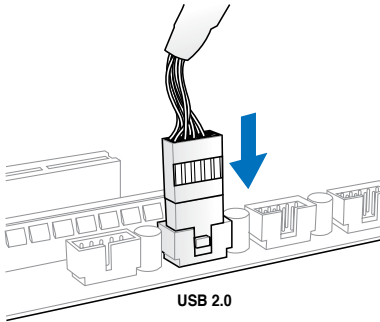
To install front panel audio connector

AAFP
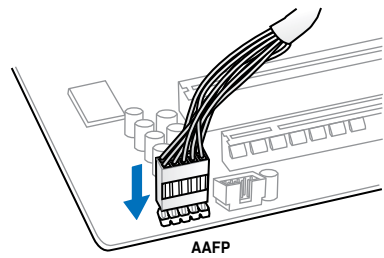
To install USB 3.0 connector

USB 3.0
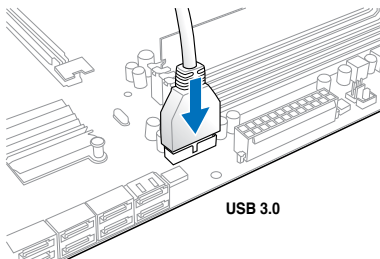
2.1.8 Expansion Card installation

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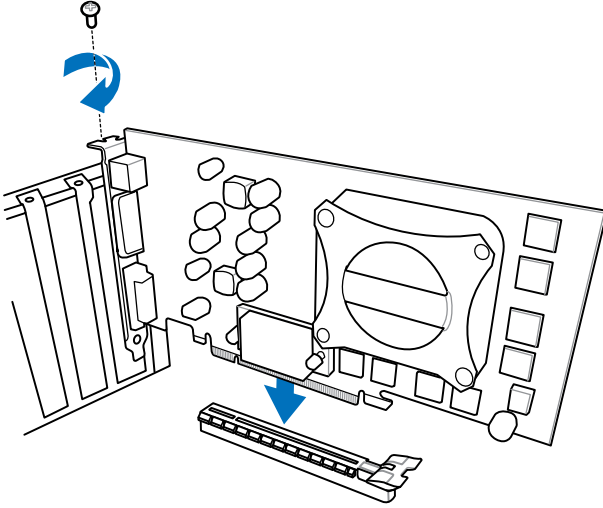
To install PCIe x1 cards
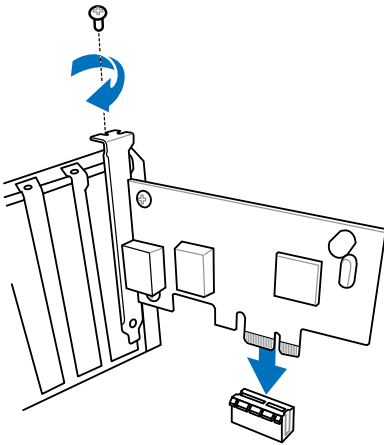
2.2 BIOS update utility

USB BIOS Flashback

USB BIOS Flashback allows you to easily update the BIOS without entering the existing BIOS or operating system. Simply insert a USB storage device to the USB port, press the USB BIOS Flashback button for three seconds, and the BIOS is updated automatically.

To use USB BIOS Flashback:

1. Download the latest BIOS file from the ASUS website

2. Extract and rename the BIOS image file to **C5FZ.CAP**.

3. Copy **C5FZ.CAP** to the root directory of the USB flash disk drive.

4. Turn off the system and insert the USB storage device to the ROG Connect port.

5. Press the ROG Connect button and release when a flashing light appears, which indicates that the BIOS Flashback function is enabled.

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

ROG Connect button   USB BIOS Flashback port
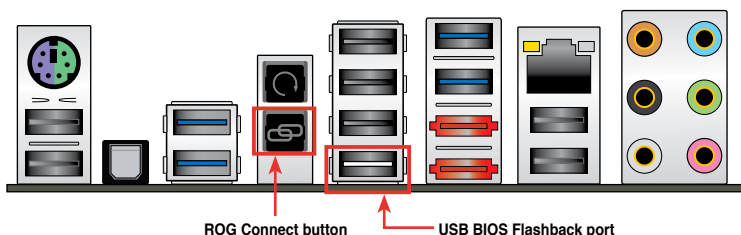
For more BIOS update utilities in BIOS setup, refer to the section **3.10 Updating BIOS** in Chapter 3.

• DO NOT unplug portable disk, power system, or press the CLR_CMOS button while BIOS update is ongoing, otherwise update will be interrupted. In case of interruption, please follow the steps again.

• Updating BIOS may have risks. If the BIOS program is damaged during the process and results to the system's failure to boot up, please contact your local ASUS Service Center.

Chapter 2

2.3 Motherboard rear and audio connections

2.3.1 Rear I/O connection
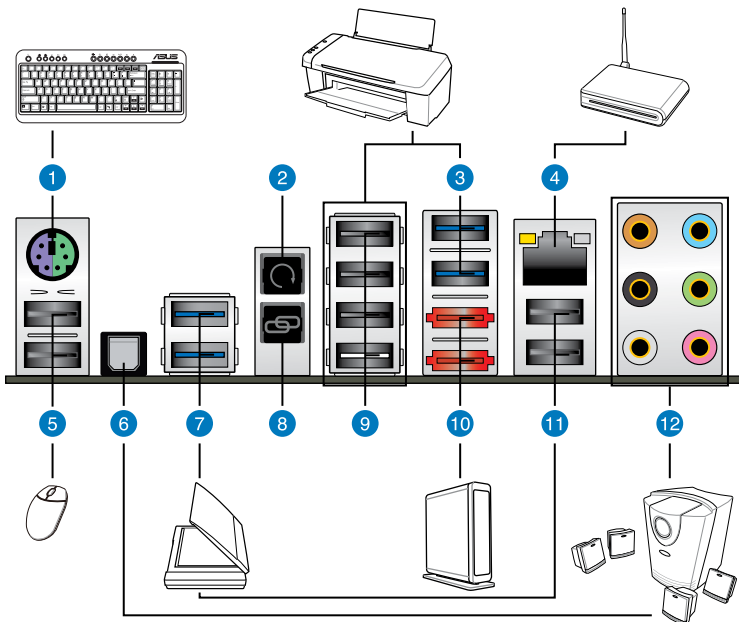
Rear panel connectors	
1. PS/2 keyboard/mouse combo port	7. **USB 3.0 ports 1 and 2**
2. Clear CMOS switch	8. **ROG Connect button**
3. **USB 3.0 ports 3 and 4**	9. **USB 2.0 ports 3, 4, 5 and 6 (1 port can be used for ROG Connect)**
4. **LAN (RJ-45) port***	10. **External SATA 6.0 Gb/s ports 1 and 2**
5. **USB 2.0 ports 1 and 2**	11. **USB 2.0 ports 7 and 8**
6. **Optical S/PDIF Out port**	12. Audio I/O ports*

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

Chapter 2

- • Press the Clear CMOS switch to clear BIOS setup information only when the system hangs due to overclocking.

- • DO NOT insert a different connector to the external SATA port.

- • Due to USB 3.0 controller limitation, USB 3.0 devices can only be used under Windows® OS environment and after the USB 3.0 driver installation.

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

- • We strongly recommend that you connect USB 3.0 devices to USB 3.0 ports for faster and better performance for your USB 3.0 devices.

* LAN ports LED indications

Activity Link LED		Speed LED	
Status	Description	Status	Description
OFF	No link	OFF	10 Mbps connection
ORANGE	Linked	ORANGE	100 Mbps connection
BLINKING	Data activity	GREEN	1 Gbps connection

ACT/LINK LED   SPEED LED

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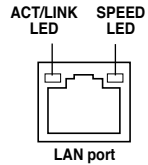
** Audio 2, 4, 6, or 8-channel configuration

Port	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

2.3.2 Audio I/O connections

Audio I/O ports

orange
black
gray

light blue
lime
pink
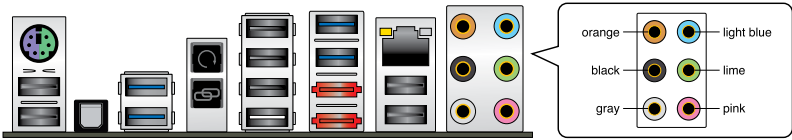
Connect to Headphone and Mic

Connect to Stereo Speakers

AUDIO INPUTS
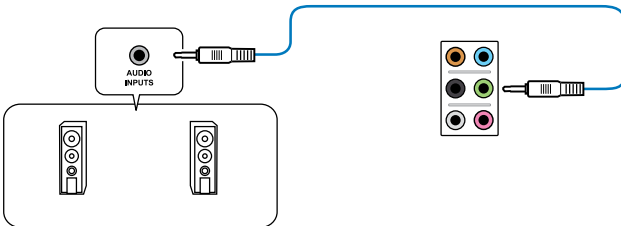
Connect to 2.1 channel Speakers
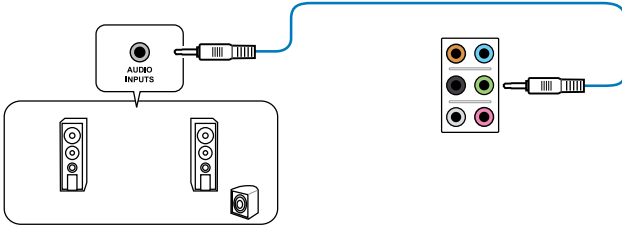
Connect to 4.1 channel Speakers
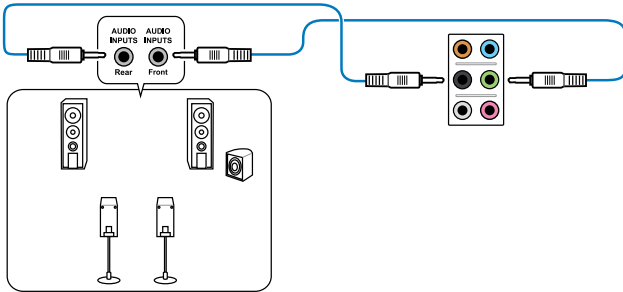
Connect to 5.1 channel Speakers
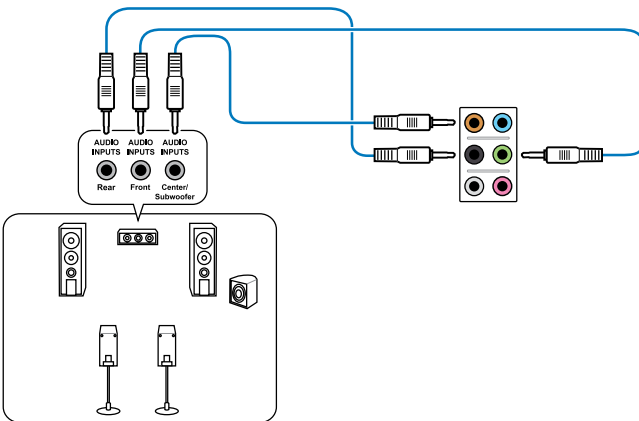
Connect to 7.1 channel Speakers
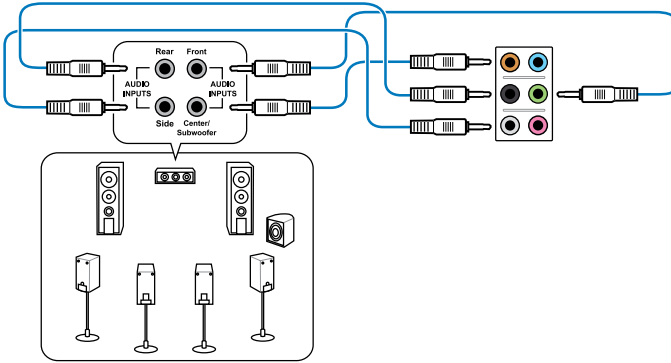
When the DTS UltraPC II and DTS Connect functions are enabled, ensure to connect the rear speaker to the gray port.

2.4   Starting up for the first time

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

2.   Ensure that all switches are off.

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

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

5.   Turn on the devices in the following order:

     a.   Monitor

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

     c.   System power

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

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

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

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

2.5   Turning off the computer

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

BIOS setup

3

3.1   Knowing BIOS

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

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

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

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

> When downloading or updating the BIOS file, rename it as **C5FZ.CAP** for this motherboard.

3.2 BIOS setup program

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

Entering BIOS at startup

To enter BIOS Setup at startup:

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

Entering BIOS Setup after POST

To enter BIOS Setup after POST:

•   Press <Ctrl>+<Alt>+<Delete> simultaneously.

•   Press the reset button on the system chassis.

•   Press the power button to turn the system off then back on. Do this option only if you failed to enter BIOS Setup using the first two options.

•   The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.

•   Ensure that a USB mouse is connected to your motherboard if you want to use the mouse to control the BIOS setup program.

•   If the system becomes unstable after changing any BIOS setting, load the default settings to ensure system compatibility and stability. Select the **Load Optimized Defaults** item under the **Exit** menu or press hotkey **<F5>**. See section **3.9 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 **1.2.6 Onboard buttons and switches** for information on how to erase the RTC RAM via the Clear CMOS button.

•   The BIOS setup program does not support the bluetooth devices.

BIOS menu screen

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

3.2.1 EZ Mode

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

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

Selects the display language of the BIOS setup program

Click to display all fan speeds if available

Displays the CPU/motherboard temperature, CPU/5V/3.3V/12V voltage output, CPU/chassis/power fan speed

Exits the BIOS setup program without saving the changes, saves the changes and resets the system, or enters the Advanced Mode

Selects the Advanced Mode functions

Displays the Advanced mode menus

Power Saving mode

Normal mode

Loads optimized default settings

Selects the boot device priority

ASUS Optimal mode

Displays the system properties of the selected mode on the right hand side

> •   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

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 Advanced Mode, click **Exit**, then select **Advanced Mode** or press **F7** hotkey.

Menu items   **Menu bar**   **Configuration fields**   **General help**

Submenu item   **Pop-up window**   **Scroll bar**   **Navigation keys**
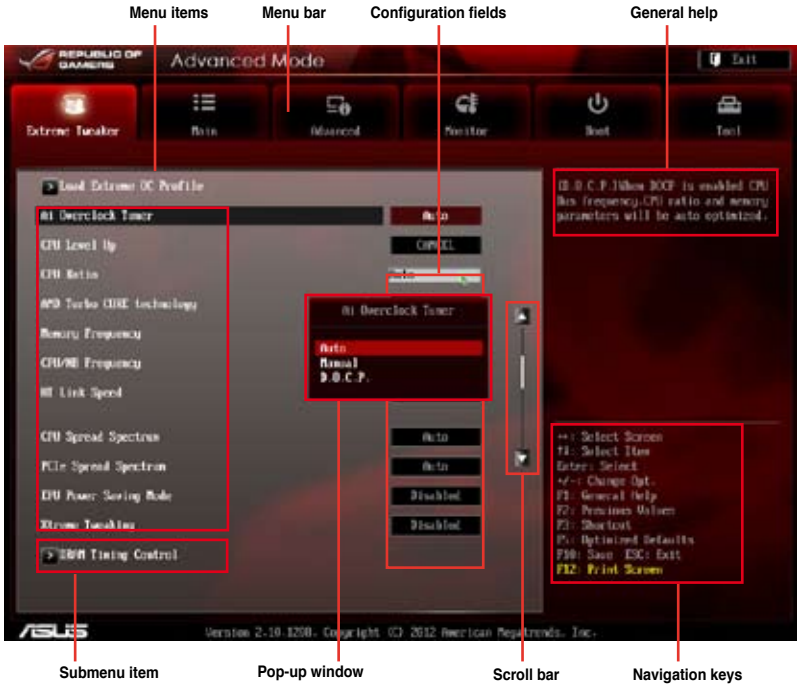
Menu bar

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.

General help

At the top right corner of the menu screen is a brief description of the selected item. Use <F12> key to capture the BIOS screen and save it to the removable storage device.

Configuration fields

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

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

Chapter 3

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 other BIOS items.

Load Extreme OC Profile

Press <Enter> and select Yes to load the Extreme OC profile to suit extreme overclocking.

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.]   CPU Bus, CPU ratio and memory parameters will be auto optimized.

> The following item appears only when you set the **Ai Overclocking Tuner** to [Manual].

CPU Bus Frequency [Auto]

Allows you to set the CPU Bus frequency. Use the <+> and <-> keys to adjust the PCIE frequency. You can also key in the desired value using the numeric keypad. The values range from 100 to 600.

PCIE Frequency [Auto]

Allows you to set the PCI Express frequency. Use the <+> and <-> keys to adjust the PCIE frequency. You can also key in the desired value using the numeric keypad. The values range from 100 to 150.

CPU Level Up [CANCEL]

Allows you to select a CPU level, and the related parameters will be automatically adjusted according to the selected CPU level.

Configuration options: [CANCEL] [CPU LEVEL UP 1] [CPU LEVEL UP 2]

CPU Ratio [Auto]

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

AMD Turbo CORE technology [Auto]

Allows you to enable or disable the AMD Turbo CORE technology.

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

Turbo CORE Ratio [Auto]

This item appears only when you set AMD Turbo CORE technology to [Enabled]. This allows you to increase or decrease the target turbo core speed. Use the <+> and <-> keys to adjust the ratio. The speeds range from 800MHz to 7000MHz with a 100MHz interval.

Memory Frequency [Auto]

Allows you to set the memory operating frequency.

Configuration options: [Auto] [DDR3-800MHz] [DDR3-1066MHz] [DDR3-1333MHz] [DDR3-1600MHz] [DDR3-1866MHz] [DDR3-2133MHz] [DDR3-2400MHz]

⚠️ 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]

Allows you to select the CPU/NB frequency.

Configuration options: [Auto] [800MHz] [1000MHz] [1200MHz] [1400MHz] [1600MHz] [1800MHz] [2000MHz] [2200MHz] [2400MHz] [2600MHz] [2800MHz] [3000MHz] [3200MHz] [3400MHz] [3600MHz] [3800MHz] [4000MHz] [4200MHz] [4400MHz] [4600MHz] [4800MHz] [5000MHz] [5200MHz] [5400MHz] [5600MHz] [5800MHz] [6000MHz] [6200MHz]

Chapter 3

HT Link Speed [Auto]

Allows you to select the HyperTransport link speed.

Configuration options: [Auto] [800MHz] [1000MHz] [1200MHz] [1400MHz] [1600MHz] [1800MHz] [2000MHz] [2200MHz] [2400MHz] [2600MHz]

CPU Spread Spectrum [Auto]

[Auto]	Automatic configuration.
[Disabled]	Enhances CPU bus frequency 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]

> **EPU Setting [Auto]**
>
> This item only appears when you set the EPU Power Saving Mode to [Enabled]. It allows you to set the EPU setting to power saving modes.
> Configuration options: [Auto] [Light Power Saving Mode] [Medium Power Saving Mode] [Max Power Saving Mode]

Xtreme Tweaking [Disabled]

This item may help improve some benchmarks performance.

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.

Load 4GB Settings

Allows you to load optimal settings for 4GB DRAM modules.
Configuration options: [Yes] [No]

Load PSC Chip Settings

Allows you to load optimal settings for PSC chip modules.

Configuration options: [Yes] [No]

Primary Timings

DRAM CAS# Latency [Auto]
Configuration options: [Auto] [5 CLK] – [19 CLK]

DRAM RAS# to CAS# Delay [Auto]
Configuration options: [Auto] [2 CLK] – [19 CLK]

DRAM RAS# PRE Time [Auto]
Configuration options: [Auto] [2 CLK] – [19 CLK]

DRAM RAS# ACT Time [Auto]
Configuration options: [Auto] [8 CLK] – [40 CLK]

DRAM READ to PRE Time [Auto]
Configuration options: [Auto] [4 CLK] – [10 CLK]

DRAM RAS# to RAS# Delay [Auto]
Configuration options: [Auto] [1 CLK] – [9 CLK]

DRAM WRITE to READ Delay [Auto]
Configuration options: [Auto] [4 CLK] – [9 CLK]

DRAM CAS# write Latency [Auto]
Configuration options: [Auto] [5 CLK] – [12 CLK]

DRAM WRITE Recovery Time [Auto]
Configuration options: [Auto] [5 CLK] [6 CLK] [7 CLK] [8 CLK] [10 CLK] [12 CLK]
[14 CLK] [16 CLK]

DRAM REF Cycle Time [Auto]
Configuration options: [Auto] [90ns] [110ns] [160ns] [300ns] [350ns]

DRAM Row Cycle Time [Auto]
Configuration options: [Auto] [10 CLK] – [56 CLK]

DRAM READ to WRITE Delay [Auto]
Configuration options: [Auto] [2 CLK] – [22 CLK]

DRAM WRITE to READ Delay(DD) [Auto]
Configuration options: [Auto] [1 CLK] – [11 CLK]

DRAM WRITE to WRITE Timing [Auto]
Configuration options: [Auto] [2 CLK] – [11 CLK]

DRAM READ to READ Timing [Auto]
Configuration options: [Auto] [2 CLK] – [11 CLK]

DRAM Refresh Rate [Auto]
Configuration options: [Auto] [Every 7.8ms] [Every 3.9ms]

DRAM Command Rate [Auto]
Configuration options: [Auto] [1T] [2T]

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] [1x] [1.25x] [1.5x] [2x]

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%]
[80 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] [1x] [1.25x] [1.5x] [2x]

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%]
[80 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 fields show N/A if there are no devices installed on the slots.

DIGI+ Power Control

CPU Load-Line Calibration [Auto]

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 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 Currrent Capability [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%]

> DO NOT remove the thermal module while changing the DIGI+ Power Control 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 Power Phase Control [Standard]

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.

CPU Power Switching Frequency [Auto]

Switching frequency will affects the VRM transient response and component thermal. Higher frequency gets quicker transient response.
Configuration options: [Auto] [Manual]

> ***VRM Fixed Frequency Mode***
> This item appears only when you set the CPU Power Switching Frequency to [Manual]. It allows you to set a fixed frequency range for the VRM. The values range from 300KHz to 550KHz with a 10KHz interval.

CPU Power Duty Control [T.Probe]

This item adjusts the current and thermal of every VRM phase component.

[T.Probe]   Maintains the VRM thermal balance.

[Extreme]   Maintains the VRM current balance.

CPU Power Response Control [Auto]

Allows you to control the CPU Power Response.
Configuration options: [Auto] [Regular] [Medium] [Fast] [Ultra Fast]

CPU Power Thermal Control [130]

Allows you to control the CPU Power thermal value.
Configuration options: [130] ~ [151]

VRM Spread Spectrum [Disabled]

This item appears only when you set the CPU Power Switching Frequency to [Auto]. It allows you to enable the spread spectrum to enhance system stability.
Configuration options: [Disabled] [Enabled]

CPU/NB Load-Line Calibration [Auto]

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

CPU/NB Currrent Capability [Auto]

This item provides wider total DRAM controller 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/NB Power Response Control [Auto]

Allows you to control the CPU/NB Power Response.
Configuration options: [Auto] [Regular] [Medium] [Fast] [Ultra Fast]

DRAM Current Capability [100%]

Allows you to set the DRAM current capability.
Configuration options: [100%] [110%] [120%] [130%]

DRAM Power Phase Control [Optimized]

Allows you to set the DRAM power phase control.
Configuration options: [Optimized] [Extreme]

DRAM Power Switching Frequency [300KHZ]

Allows you to set the DRAM voltage frequency.
Configuration options: [300KHZ] [350KHZ] [400KHZ] [450KHZ] [500KHZ]

Extreme OV [Disabled]

This item is set to [Disabled] by default to protect the CPU from being overheated. Set this item to [Enabled] to choose a higher voltage to overclock, but doing so might decrease CPU life.

Configuration options: [Disabled] [Enabled]

CPU & NB Voltage [Offset Mode]

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

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

Offset Mode Sign [+]

This item appears only when you set the **CPU & NB Voltage** item to [Offset Mode].

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

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

CPU Offset Voltage [Auto]

This item appears only when you set the CPU & NB Voltage item to [Offset Mode] and allows you to set the Offset voltage. The values range from 0.00625V to 0.70000V with a 0.00625V interval.

CPU/NB Offset Mode Sign [+]

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

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

CPU/NB Offset Voltage [Auto]

This item appears only when you set the CPU & NB Voltage item to [Offset Mode] and allows you to set the CPU/NB Offset voltage. The values range from 0.00625V to 0.70000V with a 0.00625V interval.

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 from 0.675V to 2.3V with a 0.00625V interval.

> 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/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 from 0.5V to 1.9V with a 0.00625V interval.

CPU VDDA Voltage [Auto]

Allows you to set the CPU VDDA voltage. The values range from 2.20000V to 3.187500V with a 0.00625V interval.

DRAM Voltage [Auto]

Allows you to set the DRAM voltage. The values range from 0.86V to 2.135V with a 0.005V interval.

Chapter 3

NB Voltage [Auto]

Allows you to set the Northbridge voltage. The values range from 0.8V to 2V with a 0.00625V interval.

NB HT Voltage [Auto]

Allows you to set the HyperTransport voltage. The values range from 0.8V to 2V with a 0.00625V interval.

NB 1.8V Voltage [Auto]

The values range from 1.802V to 3.00775V with a 0.01325V interval.

SB Voltage [Auto]

Allows you to set the Southbridge voltage. The values range from 1.11300V to 1.80200V with a 0.005V interval.

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 0.395V to 0.630V with a 0.005V interval.

DRAM VREFCA [Auto]

Allows you to set the DRAM VREFCA Voltage. The values range from 0.395V to 0.630V with a 0.005V interval.

DRAM VREFCA on CPU [Auto]

Allows you to set the DRAM VREFCA on CPU Voltage. The values range from 0.395V to 0.630V with a 0.005V interval.

NB Voltage Switching Frequency [Auto]

Allows you to switch NB voltage frequency. Configuration options: [Auto] [1X] [1.4X]

NB 1.8V Switching Frequency [Auto]

Allows you to switch NB 1.8V voltage frequency. Configuration options: [Auto] [1X] [1.4X]

Chapter 3

3.4 Main menu

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

Security

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

- If you have forgotten your BIOS password, erase the CMOS Real Time Clock (RTC) RAM to clear the BIOS password. See section **1.2.6 Onboard buttons and switches** for information on how to erase the RTC RAM via the Clear CMOS button.

- The Administrator or User Password items on top of the screen show the default [Not Installed]. After you set a password, these items show [Installed].

Administrator Password

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

To set an administrator password:

1.   Select the **Administrator Password** item and press <Enter>.

2.   From the **Create New Password** box, key in a password, then press <Enter>.

3.   Confirm the password when prompted.

To change an administrator password:

1.   Select the **Administrator Password** item and press <Enter>.

2.   From the **Enter Current Password** box, key in the current password, then press <Enter>.

3.   From the **Create New Password** box, key in a new password, then press <Enter>.

4.   Confirm the password when prompted.

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

User Password

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

To set a user password:

1.   Select the **User Password** item and press <Enter>.

2.   From the **Create New Password** box, key in a password, then press <Enter>.

3.   Confirm the password when prompted.

Chapter 3

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 in this menu may vary based on the CPU installed.

Enhance Power Down [Auto]

Allows you to enable or disable the Cool 'n' Quiet feature for CPU installed.

Configuration options: [Auto] [Disabled]

Cool'n'Quiet [Enable]

This item appears only when you set Enhance Power Down to [Auto].
Configuration options: [Enabled] [Disabled]

C1E [Enabled]

Enable this feature will let your system utilize the AMD specific ACPI states to save power consumption. Configuration options: [Enabled] [Disabled]

SVM [Enabled]

Enable AMD virtualization in CPU. This secure virtual mode will let you run multiple OS (guest) on the same physical hardware by decoupling OS and physical hardware with the hypervisor layer.

Configuration options: [Enabled] [Disabled]

Core C6 State [Enabled]

Allows you to reduce the CPU's power consumption.

Configuration options: [Enabled] [Disabled]

HPC Mode [Disabled]

Allows you to enable or disable High Performance Computing (HPC) function.

Configuration options: [Enabled] [Disabled]

APM Master Mode [Auto]

Allows you to enable or disable Application Power Management (APM) function.

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

3.5.2 North Bridge Configuration

IOMMU [Disabled]

Set IOMMU to Enabled to show IOMMU Mode.

Configuration options: [Disabled] [Enabled]

> **IOMMU Mode [Disabled]**
>
> This item appears only when you set IOMMU item to [Enabled]. IOMMU is supported on LINUX based systems to convert 32bit I/O to 64bit MMIO.
> Configuration options: [Disabled] [64MB]

Chapter 3

Memory Configuration

Bank Interleaving [Auto]

Configuration options: [Auto] [Disabled]

Channel Interleaving [Auto]

Configuration options: [Auto] [Disabled]

Warm Boot RAM [Enabled]

Allows you to reuse data in RAM after warm boot to speed up boot.
Configuration options: [Disabled] [Enabled]

Memory Clear [Disabled]

Allows you to clear the settings saved in RAM.
Configuration options: [Disabled] [Enabled]

ECC Mode [Enabled]

Enables or disables the DRAM ECC mode that allows the hardware to report and correct memory errors.
[Disabled]   Disables the DRAM ECC mode.

[Enabled]   Set to [Enable] to adjust ECC mode automatically.

Power Down Enable [Disabled]

Enables or disables the DDR power down mode.
Configuration options: [Disabled] [Enabled]

Memory Hole Remapping [Enabled]

Configuration options: [Disabled] [Enabled]

DCT Unganged Mode [Enabled]

Configuration options: [Disabled] [Enabled]

Initiate Graphic Adapter [PEG/PCI]

Allows you to select which graphics controller to use as the primary boot device.

Configuration options: [PCI/PEG] [PEG/PCI]

3.5.3   South Bridge Configuration

HPET [Enabled]

Allows you to set the HPET timer.

Configuration options: [Disabled] [Enabled]

3.5.4 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.

SB SATA Configuration

Options for SATA Configuration.

OnChip SATA Channel [Enabled]

[Enabled]   Enables the onboard channel SATA port.

[Disabled]   Disables the onboard channel SATA port.

The following items appear only when you set the **OnChip SATA Channel** item to [Enabled].

SATA Port1–Port4 [AHCI]

Allows you to set the SATA configuration.

[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]

Setting this item to [IDE] instead of [RAID] or [AHCI] allows the system to recognize the
optical drives connected to the SATA connector 5 or 6 when installing Windows OS.

- When the **SATA Port1–Port 4** and the **SATA Port5–Port6** items are set to **[AHCI]**, the
  information of the SATA connectors 1–6 can be seen only under the OS environment
  or during POST.

- For Windows® XP OS, you have to install the AHCI driver, so that you could use the
  SATA connectors 1–6 in AHCI mode under the OS environment.

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

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

[Enabled]   Enables the S.M.A.R.T feature.

[Disabled]   Disables the S.M.A.R.T feature.

SATA ESP on PORT1 [Disabled]

Configuration options: [Enabled] [Disabled]

SATA ESP on PORT2 [Disabled]

Configuration options: [Enabled] [Disabled]

SATA ESP on PORT3 [Disabled]

Configuration options: [Enabled] [Disabled]

SATA ESP on PORT4 [Disabled]

Configuration options: [Enabled] [Disabled]

SATA ESP on PORT5 [Disabled]

Configuration options: [Enabled] [Disabled]

SATA ESP on PORT6 [Disabled]

Configuration options: [Enabled] [Disabled]

3.5.5 USB Configuration

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

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

Legacy USB Support [Enabled]

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

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

[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]

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

[Disabled]   Disables the function.

SB USB Configuration

USB PORT 1-12 [Enabled]

This item allows you to enable or disable individual USB ports.
Configuration options: [Enabled] [Disabled]

3.5.6   CPU Core On/Off Function

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

CPU Core Activation [Auto]

This item allows you to turn off the CPU cores manually.

Configuration options: [Auto] [Manual]

> The number of cores vary with CPU models.

3.5.7   Onboard Devices Configuration

Scroll down to view the other BIOS items.

ASM1061 Storage Controller (Front) [Enabled]

[Enabled]   Enables the controller.

[Disabled]   Disables the controller.

ASM1061 Storage OPROM [Enabled]

This item appears only when you set the previous item to [Enabled] and allows you to enable or disable the ASM1061 Storage OptionROM.

Configuration options: [Enabled] [Disabled]

ASM1061 Storage Controller (Rear) [Enabled]

[Enabled]   Enables the controller.

[Disabled]   Disables the controller.

ASM1061 Storage OPROM [Enabled]

This item appears only when you set the previous item to [Enabled] and allows you to enable or disable the ASM1061 Storage OptionROM.

Configuration options: [Enabled] [Disabled]

ASMedia USB 3.0 Controller (Rear_12) [Enabled]

[Enabled]   Enables the USB 3.0 controller.

[Disabled]   Disables the controller.

ASMedia USB 3.0 Controller (Front_56) [Enabled]

[Enabled]   Enables the USB 3.0 controller.

[Disabled]   Disables the controller.

ASMedia USB 3.0 Controller (Rear_34) [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.

S3 Video Repost [Disabled]

Allows you to set the S3 Video Repost.

Configuration options: [Disabled] [Enabled]

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

Options for SB HD Azalia.

HD Audio Azalia Device [Enabled]

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

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.

[AC 97]   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.

3.5.8   APM

ErP Ready [Disabled]

[Disabled]   Disables the Energy Related Products (ErP) Ready function.

[Enabled]   Allows BIOS to switch off some power at S5 state to get system ready for the ErP 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]

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

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

Power On By PS/2 Device [Disabled]

[Disabled]   Disables the PS/2 devices from generating a wake event.

[Enabled]   Enables the PS/2 devices to generate a wake event.

Power On By PME Device [Disabled]

[Disabled]   Disables the PME devices from generating 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.

3.5.9 Network Stack

Network stack [Disabled]

This item allows you to enable/disable UEFI network stack function.

Configuration options: [Disabled] [Enabled]

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

Ipv4/Ipv6 PXE Support [Enabled]

Allows you to enable or disable the Ipv4/Ipv6 PXE boot option.
Configuration options: [Disabled] [Enabled]

3.5.10   iROG Configuration

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

3.5.11   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]

3.5.12 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].

SupremeFX III Lighting LED [Enabled]

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

3.6　　Monitor menu

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

Voltage Monitor

CPU Voltage; 3.3V Voltage; 5V Voltage; 12V Voltage; VDDA Voltage; CPU/NB Voltage; DRAM Voltage; HT Voltage; NB Voltage; SB Voltage

The onboard hardware monitor automatically detects the voltage output through the onboard voltage regulators. Press <Enter> and select [Ignore] if you do not wish to display the detected temperatures.

Temperature Monitor

CPU Temperature; MB Temperature [xxxºC/xxxºF]; OPT1-3 Temperature;

The onboard hardware monitor automatically detects and displays the CPU, and motherboard. Press <Enter> and select [Ignore] 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 Speed; CPU OPT Speed; Chassis FAN1/2/3 Speed [xxxxRPM] or [Ignored] / [N/A]; Opt1/2/3 Fan Speed [xxxxRPM] or [Ignored] / [N/A]

The onboard hardware monitor automatically detects and displays the CPU fan, chassis 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. Press <Enter> and select [Ignore] if you do not wish to display the detected temperatures.

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 three items appear when you enable the CPU Fan Control feature.

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]

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. The values range from 20ºC to 75ºC.

CPU Fan Max. Duty Cycle(%) [100]

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

CPU 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.

Chassis Q-Fan Control [Disabled]

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

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

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]

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(%) [100]

Use the <+> and <-> keys to adjust the maximum chassis fan duty cycle. The values range from 60% to 100%. When the chassis temperature reaches the 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.

OPTFAN 1-3 Control [Disabled]

Allows you to disable or set the optional fans' warning speeds.

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

OPTFAN 1-3 Duty [50%]

Allows you to set the optional fans' speed duty percentagea. Configuration options: [40%] [50%] [60%] [70%] [80%] [90%]

User Mode

Allows you to set the optional fan's speed temperature.

OPT1-3 Low Speed Temp [25ºC]

Allows you to set the optional fans' low speed temperature. Configuration options: [25ºC] [30ºC] [35ºC] [40ºC]

OPT1-3 Full Speed Temp [60ºC]

Allows you to set the optional fans' low speed temperature. Configuration options: [60ºC] [70ºC] [80ºC] [90ºC]

3.7 Boot menu

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

Scroll down to display the other BIOS items.

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 2™ feature.

Post Report [3 sec]

This item appears only when you set Full Screen Logo to [Disabled]. This allows you to select a desired post epot waiting time. The values range from 0 to 10 seconds.

Wait For 'F1' If Error [Enabled]

[Disabled]   Disables this function.

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

Fast Boot [Enabled]

[Enabled]   Select to accelerate the boot speed.

[Disabled]   Select to go back to normal boot.

> The following four items appear when you set Fast Boot to [Enabled].

USB Support [Partial Initialization]

[Disabled]	All USB devices will not be available until OS boot up for a fastest POST time.
[Full Initialization]	All USB devices will be available during POST. This process will extend the POST time.
[Partial Initialization]	For a faster POST time, only the USB ports with keyboard and mouse connections will be detected.

PS/2 Keyboard and Mouse Support [Full initialization]

Select any of these settings when PS/2 keyboard and mouse are installed. These settings only apply when Fast Boot is enabled.

[Auto]   For a faster POST time, PS/2 devices will only be available when the system boots up or rebooted when the PS/2 devices have not been reconnected or changed. If you disconnect or change PS/2 devices before restarting the system, PS/2 devices will not be available and BIOS setup program will not be accessible via PS/2 devices.

[Full Initialization] For full system control, PS/2 devices will be available during POST at any circumstances. This process will extend POST time.

[Disabled]   For the fastest POST time, all PS/2 devices will not be available until your computer enters the operating system.

Network Stack Driver Support [Disabled]

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

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

DirectKey Enabled [Go to BIOS...]

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

[Go to BIOS Setup]   Allows the system to power on and go to BIOS Setup directly when you press the DirectKey button.

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.

INT19 Trap Response [Immediate]

[Immediate]   Executes the trap right away.

[Postponed]   Executes the trap during legacy boot.

Next Boot after AC Power Loss [Normal Boot]

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

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

CSM (Compatibility Support Module)

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

Launch CSM [Auto]

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

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

[Disabled]   Disable the CSM to fully support the Windows® Security Update and Security Boot.

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

Boot Devices Control [UEFI and Legacy OpROM]
Allows you to select the type of devices that you want to boot up.
Configuration options: [UEFI and Legacy OpROM] [Legacy OpROM only] [UEFI only]

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

Boot from Storage Devices [Legacy OpROM first]
Allows you to select the type of storage devices that you want to launch.
Configuration options: [Both, Legacy OpROM first] [Both, UEFI first] [Legacy OpROM first] [UEFI driver first] [Ignore]

Boot from PCIe/PCI Expansion Devices [Legacy OpROM first]
Allows you to select the type of PCIe/PCI expansion devices that you want to launch.
Configuration options: [Legacy OpROM first] [UEFI driver first]

Secure Boot parameters

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

OS Type [Windows UEFI mode]

Allows you to select your installed operating system.

[Windows UEFI mode]   Executes the Microsoft® Secure Boot check. Only select this option when booting on Windows® UEFI mode or other Microsoft® Secure Boot compliant OS.

[Other OS]   Get the optimized function when booting on Windows® non-UEFI mode, Windows® Vista/XP, or other Microsoft® Secure Boot non-compliant OS. Microsoft® Secure Boot only supports Windows® UEFI mode.

Secure Boot Mode [Standard]

Allows you to select how the Secure Boot prevents unauthorized firmware, operating systems, or UEFI drivers from running during boot time.

[Standard]   Allows the system to automatically load the Secure Boot keys from the BIOS database.

[Custom]   Allows you to customize the Secure Boot settings and manually load its keys from the BIOS database.

> This item only appears when you set OS Type item to [Windows UEFI mode]

Key Management

This item appears only when you set Secure Boot Mode to [Custom]. It allows you to manage the Secure Boot keys.

Manage the Secure Boot Keys (PK, KEK, db, dbx)

Install Default Secure Boot keys
Allows you to immediately load the default Security Boot keys, Platform key (PK), Key-exchange Key (KEK), Signature database (db), and Revoked Signatures (dbx). When the default Secure boot keys are loaded, the PK state will change from Unloaded mode to loaded mode.

Clear Secure Boot keys
This item appears only when you load the default Secure Boot keys. This item allows you to clear all default Secure Boot keys.

PK Management

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

Load PK from File
Allows you to load the downloaded PK from a USB storage device.

Copy PK to File
Allows you to store the PK to a USB storage device.

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

Configuration options: [Yes] [No]

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

KEK Management

The KEK (Key-exchange Key or Key Enrollment Key) manages the Signature database (db) and Revoked Signature database (dbx).

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

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

Copy KEK to File
Allows you to store the KEK to a USB storage device.

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

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

Configuration options: [Yes] [No]

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

db Management

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

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

Copy db from file
Allows you to store the db to a USB storage device.

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

Delete the db
Allows you to delete the db file from your system.

Configuration options: [Yes] [No]

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

dbx Management

The dbx (Revoked Signature database) lists the forbidden images of db items that are no longer trusted and cannot be loaded.

Load dbx from File
Allows you to load the downloaded dbx from a USB storage device.

Copy dbx from file
Allows you to store the dbx to a USB storage device.

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

Delete the dbx
Allows you to delete the dbx file from your system.

Configuration options: [Yes] [No]

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

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.

Chapter 3

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

> For more details, refer to section **3.10.2 ASUS EZ Flash 2** utility.

3.8.2 ASUS SPD Information

Allows you to view the DRAM SPD information.

3.8.3 ASUS O.C. Profile

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

> The **O.C. Profile Configuration** items show **Not Installed** if no profile is created.

Label

Allows you to input the label of the setup profiles.

Save to Profile

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

Load from Profile

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

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

3.8.4 GO Button File

Allows you to set the GO Button files and load the desired GO Button file.

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; 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.

Load from EEPROM setting

Allows you to load from EEPROM setting.

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 CrashFree BIOS 3: Restores the BIOS using the motherboard support DVD or a USB flash drive when the BIOS file fails or gets corrupted.

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

> 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

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

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

Launching ASUS Update

To launch ASUS Update, click **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 downgrade and auto backup functions, tick **Enable BIOS downgrade** and **Automatically backup my current BIOS**.

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

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 and click **Next**.
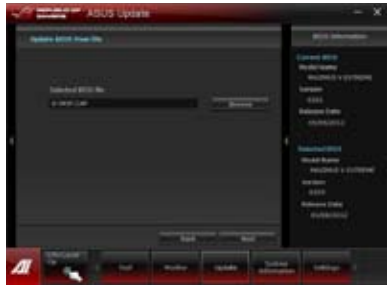
3. You can decide whether to change the BIOS boot logo. Click **Yes** if you want to change the boot logo or **No** to continue.

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

ASUS EZ Flash 2 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:

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 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 CrashFree BIOS 3

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

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

Recovering the BIOS

To recover the BIOS:

1. Turn on the system.

2. Insert the motherboard support DVD to the optical drive, or the USB flash drive containing the BIOS file to the USB port.

3. The utility automatically checks the devices for the BIOS file. When found, the utility reads the BIOS file and enters ASUS EZ Flash 2 automatically.

4. The system requires you to enter BIOS Setup to recover the BIOS setting. To ensure system compatibility and stability, we recommend that you press <F5> to load default BIOS values.

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

3.10.4   ASUS BIOS Updater

The ASUS BIOS Updater allows you to update the 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.

```
Please select boot device:

   SATA:  XXXXXXXXXXXXXXX
   USB  XXXXXXXXXXXXXXX
   UEFI:  XXXXXXXXXXXXXXX
   Enter Setup

   ↑ and ↓ to move selection
   ENTER to select boot device
   ESC to boot using defaults
```
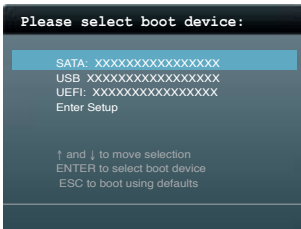
3.	When the Make Disk menu appears, select the FreeDOS command prompt item by pressing the item number.

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:\>
```

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.

```
          ASUSTek BIOS Updater for DOS V2.30 [2012/06/18]
    FLASH TYPE: MX1C 25L1065A
       ─── Current ROM ───              ─── Update ROM ───
   BOARD: CROSSHAIR V FORMULA-Z    BOARD: UNKNOWN
   VER:   0214                     VER:   UNKNOWN
   DATE:  06/18/2012               DATE:  UNKNOWN
   PATH: A:\

   A:           C5F-Z.CAP    2097152 2012-006-18 17:30:48




    ── Note ──
   [Enter] Select or Load     [Tab] Switch    [V] Drive Info
   [Up/Down/Home/End] Move    [B] Backup      [Esc] Exit
```
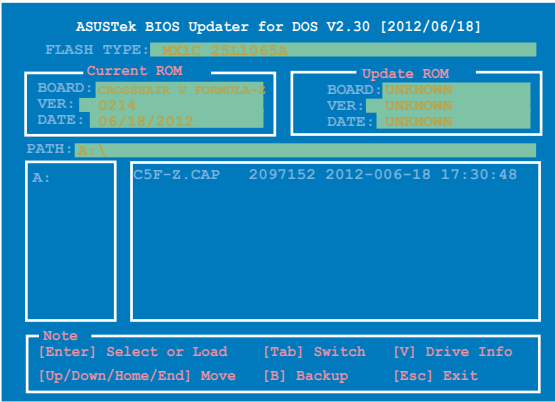
3.	Press <Tab> to switch between screen fields and use the <Up/Down/Home/End> keys to select the BIOS file and press <Enter>. BIOS Updater checks the selected BIOS file and prompts you to confirm BIOS update.

```
          Are you sure to update BIOS?
                   Yes      No
```

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.

Chapter 3

4

Software support

4.1   Installing an operating system

🖉
- This motherboard supports Windows® XP/ 64-bit XP/ 7 / 64-bit 7 / 8 / 64-bit 8 operating systems (OS).

- **Motherboard settings and hardware options vary. Use the setup procedures presented** in this chapter for reference only. Refer to your OS documentation for detailed information.

- **Ensure that you install the Windows**® XP Service Pack 3 or later versions before installing the drivers for better compatibility and system stability.

4.2   Support DVD information

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

4.2.1   Running the support DVD

Place the support DVD into the optical drive. The DVD automatically displays the Drivers menu if Autorun is enabled in your computer. Click each menu tab and select the items you want to install.

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

The Make Disk menu contains items to create the RAID/AHCI driver disk.

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

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

Click the Contact tab to display the ASUS contact information.

Click an icon to display 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   Obtaining the software manuals

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

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

1.   Click the **Manual** tab. Click **ASUS Motherboard Utility Guide** from the manual list on the left.

2.   The **Manual** folder of the support DVD appears. Double-click the folder of your selected software.
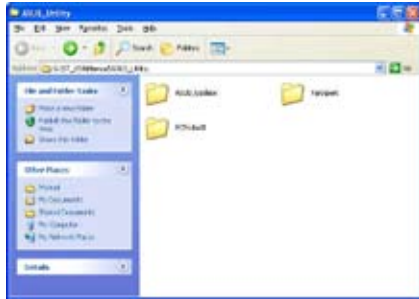
3.   Some software manuals are provided in different languages. Double-click the language to show the software manual.
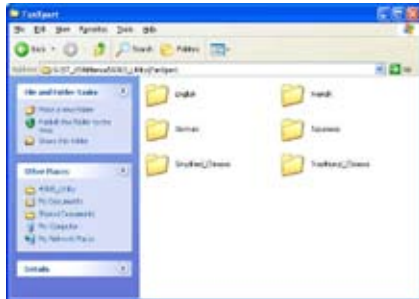
The screenshots in this section are for reference only. The actual software manuals containing in the support DVD vary by models.

4.3 Software information

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

4.3.1 AI Suite II

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

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 enabled the Autorun feature.

2.	Click **Utilities** tab **> AI Suite II**.

3.	Follow the onscreen instructions to complete the installation.

Using AI Suite II

AI Suite II automatically starts when you enter the Windows® operating system (OS). The AI Suite II icon appears in the Windows® notification area. Click the icon to open the AI Suite II main menu bar.

Click each button to select and launch a utility, to monitor the system, to update the motherboard BIOS, to display the system information, and to customize the settings of AI Suite II.

Shortcut to the CPU Level Up under TurboV EVO

Click to monitor sensors or CPU frequency

Click to customize the interface settings

Click to show the system information

Click to update the motherboard BIOS

Click to select a utility

•	The applications in the Tool menu vary with models.

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

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

Chapter 4

4.3.2   TurboV EVO

ASUS TurboV EVO includes **TurboV** that allows you to manually adjust the CPU frequency and related voltages such as **CPU Level Up** that offers automatic and easy overclocking and system level up.

To launch AI Suite II, click **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.

TurboV

TurboV allows you to overclock the CPU Bus/PEG frequency, CPU voltage, CPU/NB voltage and DRAM voltage in Windows® environment and takes effect in real-time without exiting and rebooting the OS.

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

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.

Click to select mode

Load profile

Target values

Current values

Click to show settings

Click to restore all startup settings

Save the current settings as a new profile

Voltage Adjustment bars

Undoes all the changes

Applies all the changes immediately

Chapter 4

Using Advanced Mode

Click on the **Advanced Mode** tab to adjust the advanced voltage settings.

- Advanced mode
- Target values
- Current values
- Click to restore all startup settings
- Voltage Adjustment bars
- Undoes all the changes
- Applies all the changes immediately

CPU Ratio

Allows you to manually adjust the CPU ratio.

1.   Click on the **CPU Ratio** tab.

2.   Drag the adjustment bar upwards or downwards to the desired value.

3.   Click **Apply** to save the changes made.

- CPU Ratio
- Adjustment bar
- Click to restore all startup settings
- Undoes all the changes
- Applies all the changes immediately

> •   Set the **CPU Ratio Setting** item in BIOS to [Auto] before using the CPU Ratio function in TurboV. Refer to the BIOS chapter 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 provides you with these two auto-tuning modes for the most flexible auto-tuning options.

- The overclocking result varies with the CPU model and the system configuration.
- We recommend that you set up a better thermal environment to prevent overheating from damaging the motherboard.

- **Fast Tuning**: fast overclocking for the system
- **Extreme Tuning**: extreme overclocking for the system

Using Fast Tuning

1. Click **Auto Tuning** tab **> Fast**.

2. Read the warning messages and click **Start** to start the auto-overclocking process.

   TurboV automatically overclocks the CPU, saves the BIOS settings, and restarts the system.

3. After the system restarts, a message appears indicating that auto-tuning is successful. Click **OK** to exit.

Using Extreme Tuning

1. Click **Auto Tuning** tab **> Extreme**.

2. Read the warning messages and click **Start** to start the auto-overclocking process.

    TurboV automatically overclocks the CPU and memory, and restarts the system.

3. After the system has restarted, 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. Click **Stop** if you want to cancel the overclocking process.

    TurboV automatically adjusts and saves the BIOS settings and restarts the system.

5. After the system has restarted, a message appears indicating that the auto-tuning process is successful. Click **OK** to exit.

Chapter 4

4.3.3   DIGI+ Power Control

ASUS DIGI+ Power Control 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 prolong the component lifespan and minimize power loss.

To launch DIGI+ Power Control, click **Tool > Power Control** on the AI Suite II main menu bar.

Smart DIGI+ Key

Function no.	Function description
1	**Smart DIGI+ Key** Quickly delivers an optimized VRM frequency, voltage, and current for superior CPU/DRAM overclocking performance with one click.
2	**OC Now!** Adjusts the ratio settings in TurboV.
3	**Default** Sets your CPU/DRAM power to default settings.

Chapter 4

CPU Power

CPU Power offers precise digital power control for CPU and CPU/NB to enhance efficiency, stability, and performance for overclocking scenarios.

Application aids

Applies all the changes immediately

Undoes all the changes

Application aids

Applies all the changes immediately

Undoes all the changes

Function no.	Function description
1	**CPU Load-line Calibration** It allows you to adjust the voltage settings and control the system temperature. Higher load-line calibration could get higher voltage and good overclocking performance but increases the CPU and VRM thermal.
2	**CPU Current Capability** CPU Current Capability provides wider total power range for overclocking. A higher value setting gets higher VRM power consumption delivery.
3	**CPU Voltage Frequency** Switching frequency will affect the VRM transient response and component thermal. Higher frequency gets quicker transient response.

Chapter 4

Function no.	Function description
4	**CPU/NB Load-line Calibration** Set to a higher value for system performance, or to a lower value for better thermal solution.
5	**CPU/NB Current Capability** Setting CPU/NB Current Capability to a higher value increases the overclocking frequency range of the DRAM Controller.
6	**CPU Power Phase Control** 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.
7	**CPU Power Response Control** The VRM controller provides a faster and precise power response rate for CPU. Apply a higher value for an extreme overclocking.
8	**CPU Power Thermal Control** A higher temperature brings a wider CPU power thermal range, and extends the overclocking tolerance to enlarge overclocking potential.
9	**CPU Power Duty Control** CPU Power Duty Control adjusts the current of every VRM phase and the thermal of every phase component.
10	**CPU/NB Power Response Control** The CPU/NB controller provides a faster and precise power response rate for CPU&DRAM. Apply a higher value for an extreme overclocking.

DRAM Power

DRAM Power offers precise digital power control for DRAM to enhance efficiency, stability, and performance for overclocking scenarios.

Application help

Applies all the changes immediately

Undoes all the changes

Function no.	Function description
1	**DRAM Current Capability** A higher value brings a wider total power range and extends the overclocking frequency range simultaneously.
2	**DRAM Voltage Frequency** Allows you to adjust the DRAM switching frequency for system stability or to increase OC Range.
3	**DRAM Power Phase Control** Select **Extreme** for full phase mode to increase system performance or select **Optimized** for ASUS optimized phase tuning profile to increase DRAM power efficiency.

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

Chapter 4

4.3.4   EPU

EPU is an energy-processing utility that provides several power-saving modes. When set to the Auto Mode, the system automatically changes its power-saving mode based on the current system condition.

You can also configure the system settings such as CPU frequency, GPU frequency, vCore Voltage, and Fan Control to customize a power-saving mode.

Launching EPU

To launch EPU, click **Tool > EPU** on the AI Suite II main menu bar.

Multiple system operating modes

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

The items lighting up means power saving engine is activated

Displays the amount of CO2 reduced

*Shifts between the display of Total and Current CO2 reduced

Displays the current CPU power

Advanced settings for each mode

Displays the system properties of each mode

- • 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.
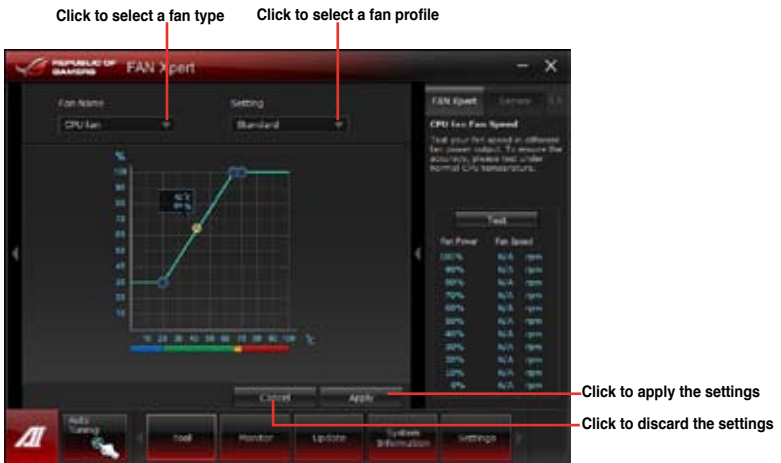
4.3.5   FAN Xpert

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

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 menu bar.

Using FAN Xpert

Click **Fan Name** to select a fan and then click **Setting** to select a preset mode for your selected fan.

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. With this utility, you are assured that your computer is always at a healthy operating condition.

Launching Probe II

To launch Probe II, click **Tool > Probe II** on the AI Suite II main menu bar.

Configuring Probe II

Click the Voltage/Temperature/Fan Speed tabs to activate the sensors or to adjust the sensor threshold values. The Preference tab allows you to customize the time interval of sensor alerts, or change the temperature unit.

Saves your configuration

Loads your saved configuration

Loads the default threshold values for each sensor

Applies your changes

- Click **Monitor** > **Sensor** on the AI Suite II main menu bar and the system status will appear on the right panel.

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

4.3.7 Sensor Recorder

Sensor Recorder monitors the changes in the system voltage, temperature, and fan speed on a timeline. The History Record function allows you to designate specific time spans on record to keep track of the three system statuses for certain purposes.

Launching Sensor Recorder

To launch Sensor Recorder, click **Tool > Sensor Recorder** on the AI Suite II main menu bar.

Using Sensor Recorder

Click on Voltage/ Temperature/ Fan Speed tabs for the status you want to monitor. Colored lines will automatically appear on the diagram to indicate the immediate changes in the system status.

Using History Record

1.   Click the History Record tab and adjust the settings on the left for Record Interval and Record Duration according to need.

2.   Click **Start Recording** to start measuring and recording each sensor.

3.   To stop recording, click **Recording** again.

4.   To track the recorded contents, set Type/ Date/ Select display items to display the history details.

Click on **Monitor > Sensor** on the AI Suite II main menu bar and a highlight of the system statuses will appear on the right panel.

4.3.8 USB 3.0 Boost

ASUS USB 3.0 Boost technology supports UASP (USB Attached SCSI Protocol) and automatically increases a USB 3.0 device's transfer speed up to 170%.

Launching USB 3.0 Boost

To launch USB 3.0 Boost, click **Tool > USB 3.0 Boost** on the AI Suite II main menu bar.

Configuring USB 3.0 Boost

1. Connect a USB 3.0 device to the USB 3.0 port.

   USB 3.0 Boost automatically detects the property of the USB 3.0 device and switches to **Turbo** mode or **UASP** mode (if UASP is supported by the USB 3.0 device).

2. You can manually switch the USB 3.0 mode back to **Normal** mode at any time.

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

- Use the USB 3.0 devices for high performance. The data transfer speed varies with USB devices.

4.3.9   Ai Charger+

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

- • *** Check your manufacturer if your USB device is a Battery Charging Specification 1.1**
    (BC 1.1) compliant or compatible device.
- • ** Actual charging speeds may vary depending on the charging rate and specifications
    of your USB device.
- • To ensure normal charging function, disconnect and reconnect your USB device every
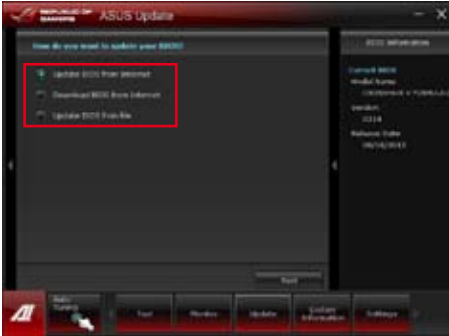   time you enable or disable Ai Charger+.

4.3.10 ASUS Update

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

Launching ASUS Update

To launch ASUS Update, click **Update > ASUS Update** on the AI Suite II main menu bar.

Using ASUS Update

Select any of these options to update the BIOS:

- **Update BIOS from Internet**

    Allows you to download the latest BIOS version from the ASUS website at www.asus.com and follow the onscreen instructions to update the BIOS.

- **Download BIOS from Internet**

    Download the latest BIOS version from the ASUS website at www.asus.com and save it for later use.

- **Update BIOS from file**

    Use the BIOS file that you had downloaded and saved to update the system BIOS.

4.3.11   MyLogo

MyLogo2 allows you to customize the boot logo, which is the image that appears on the screen during the Power On Self Tests (POST).

Launching MyLogo

To launch MyLogo2, click **Update > MyLogo** on the AI Suite II main menu bar.

Using MyLogo

Select the option that you want to use to update your boot logo, click Next and follow the instructions below.

Change the boot logo of a downloaded BIOS file and update (or do not update) this BIOS to the motherboard

1.   From the BIOS file field, click Browse to locate the BIOS file.

2.   From the Picture File field, click Browse the image for your boot logo, then click Next.

3.   Do any of the following:

   •   Click Auto Tune to adjust the image size or the image resolution.

   •   Click Booting Preview to preview the boot image.

4.   Click Next.

5.   Click Flash to update the boot logo.

6.   When prompted, click Yes to reboot the system. You will see the new boot logo the next time you start up the system.

Ensure to enable the Full Screen Logo in BIOS to use this feature.

4.3.12 USB BIOS Flashback Wizard

USB BIOS Flashback allows you to easily update the BIOS without entering the BIOS or operating system. Just connect the USB storage device containing the BIOS file to the USB port, press the BIOS Flashback button, and the BIOS is updated automatically.

Current BIOS information

Sets the schedule for BIOS Update download

Click to check for an update BIOS firmware available for download

Cancels all the changes

Applies all the changes

Scheduling the latest BIOS download

1. In the **Download Setting** field, tick **Schedule (days)** and select the number of days for your download schedule.

2. Click **Apply** to save the BIOS download schedule. Click **Cancel** to cancel the changes made.
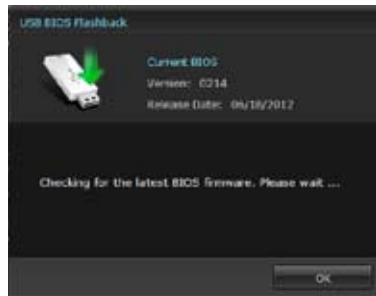
Downloading the updated BIOS

Before you start downloading, ensure that you have installed the USB storage device to your computer's USB port.

1. Click **Check for New BIOS Update** to check for the latest BIOS version.

   Wait for the system to check the latest BIOS firmware.

2. From the **Save to** dropdown list, select
    the USB storage device that you want
    to save the BIOS file to, then click
    Download.

3. When the download process is
    completed, click **OK** to exit.

4.3.13 Audio configurations

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

Follow the installation wizard to install the Realtek® Audio Driver from the support DVD that came with the motherboard package.

If the Realtek® audio software is correctly installed, you will find the Realtek® HD Audio Manager icon on the taskbar. Double-click on the icon to display the Realtek® HD Audio Manager.

Realtek® HD Audio Manager

A.   Realtek HD Audio Manager with DTS Connect and DTS UltraPC II for Windows® 7

Configuration option tabs (vary with the audio devices connected)

Advanced settings

Set default device button

Control settings

Analog and digital connector status

DTS Connect

DTS Connect allows you to select an audio mode for a digital surround sound media entertainment.

Volume bar

Select mode

Reset button

About button

DTS connect only works when you connect 5.1 and 7.1 channel speakers.

DTS UltraPC II

DTS UltraPC II allows you to enhance the audio output for playing movies, music, and games.

Tick to enable the DTS UltraPC feature and customize the settings.

Click to select a category to enhance its audio output

Control settings

Click to reset to its default settings

B.   Realtek HD Audio Manager for Windows® XP

Configuration options

Control settings window

Information button

Exit button

Minimize button

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

• To play Blu-Ray disc, make sure to use an HDCP compliant monitor.

4.3.14 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 and it will light up into a stable glow.

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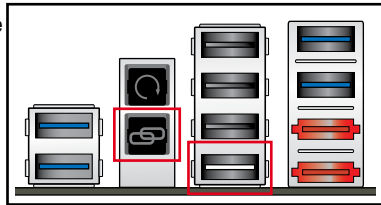
Using RC TweakIt

To use the RC TweakIt

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

2.   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.

4.3.15   GameFirst II

GameFirst II, a traffic shaping solution, improves the Internet latency while maintaining a high transfer rate, and reduces delays during data transfers or playing online games. It allows you to set programs' priorities and increase the bandwidth of your currently running games or programs.

GameFirst II attaches itself to Windows network stack to perform packet inspection, which is useful to online gamers and VOIP users.

To launch GameFirst, click **Start > All Programs > ASUS > ROG GameFirst II**.

Using EZ Mode

Click to open the Advanced Mode

Network adapter information

Click to view the programs under these utilities

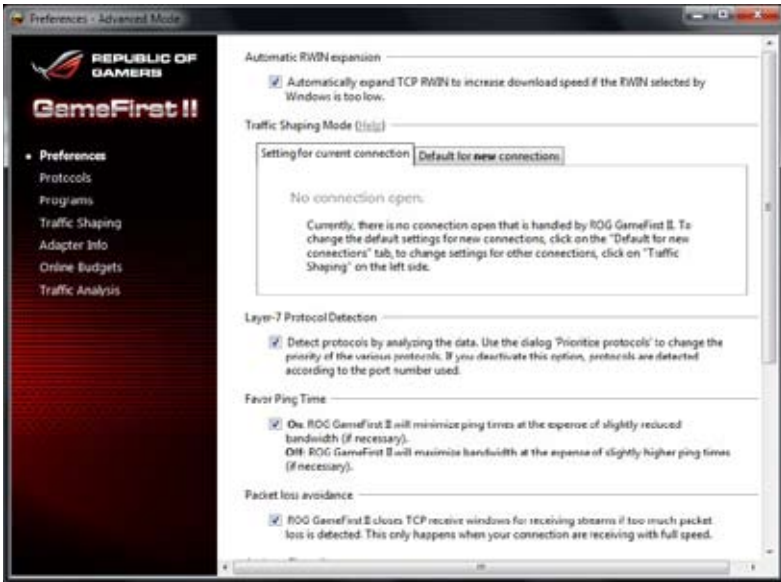Click to delete the program from the list

Adjust the slider to set the priority

Current connection and bandwidth usage status

Chapter 4

> - GameFirst II only works in Windows® operating systems.
> - GameFirst II is powered by cFosSpeed software.
> - cFosSpeed prioritizes the programs listed in GameFirst II.

Using Advanced Mode

Select any of the following settings to configure the priorities of your programs and network devices.

- **Preferences**: Allows you to control the network's traffic to optimize the program's performance, favor ping time, activate firewall, and avoid packet loss.

- **Protocols**: Allows you to set priority to the program's protocol and enter a transmission limit.

- **Programs:** Allows you to set priority to the programs.

- **Traffic Shaping**: Allows you to set priority to the network adapter and its protocol to reduce delay during data transfer, and speeds up the internet access.

- **Adapter Info**: Allows you to view the information of the adapters in your computer.

- **Online Budgets**: Allows you to set an online budget time to your network adapters.

- **Traffic Analysis**: Allows you to assign protocols and programs in one set.

4.3.16   ASUS Boot Setting

ASUS Boot Setting utility allows you to quickly enter the BIOS setup with a click of the DirectBIOS button. It also allows you to select the system bootup process using Normal Boot or Fast Boot.

> To fully support ASUS Boot Setting on your motherboard, download the latest BIOS from ASUS Support site at http://www.asus.com and update the BIOS to your system.

Click to enter BIOS Setup directly.

Click to show Advanced Setup settings

Click to enable or disable Fast Boot

Click to select a bootup setting

Using DirectBIOS button

This button allows you to restart your system and enters directly to BIOS Setup without having to press the <DEL> key during POST.

> Using the DirectBIOS function may result to data loss. We recommend to save your data before clicking this button.

To use DirectBIOS:

1.   From the ASUS Boot Setting screen, click **DirectBIOS**.

2.   On the confirmation message, click **OK** to restart your system and go to the BIOS setup directly.

Using Advanced setup

Advanced setup allows you to set the bootup process of your system.

There are two settings to boot up your system: **Fast Boot** and **Next boot after AC power loss**.

Enabling or disabling Fast Boot

This setting allows you to quickly boot your system.

This setting will take effect after shutting down or restarting your system normally.

To enable or disable Fast Boot:

1.   Click **Advanced Setup** to show the boot setup settings.

2.   In **Fast Boot**, click **Enabled**. If you want to turn off Fast Boot function, click **Disabled**.

3.   On the confirmation message, click **Yes** to apply the setting.

Using Next boot after AC power loss

This setting allows you to boot your system in Fast Boot or Normal Boot under **Next boot after AC power loss**.

To use Fast Boot under AC power loss:

1.   Click **Advanced Setup** to show the boot setup settings.

2.   In **Fast Boot**, click **Enabled**.

3.   In **Next boot after AC power loss**, click **Fast Boot**.

4.   On the confirmation message, click **Yes** to apply this setting.

To use Normal Boot under AC power loss:

1.   Click **Advanced Setup** to show the boot setup settings.

2.   In **Next boot after AC power loss**, click **Normal Boot**.

3 .   On the confirmation message, click **Yes** to apply this setting.

Chapter 4

RAID support

5

5.1 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 3 or later versions before using Serial
  ATA hard disk drives. The Serial ATA RAID feature is available only if you are using
  Windows® XP SP3 or later versions.

- **Due to Windows**® XP 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 **5.2 Creating a RAID driver disk** for details.

5.1.1 RAID definitions

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

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

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

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

5.1.2   Installing Serial ATA hard disks

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

To install the SATA hard disks for a RAID configuration:

1.   Install the SATA hard disks into the drive bays.

2.   Connect the SATA signal cables.

3.   Connect a SATA power cable to the power connector on each drive.

5.1.3   Setting the RAID item in BIOS

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

1.   Enter the BIOS Setup during POST.

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

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

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

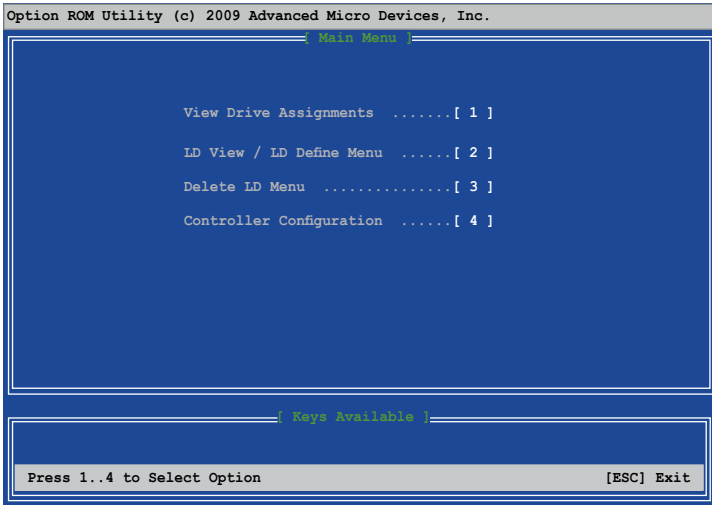> Refer to Chapter 3 for details on entering and navigating through the BIOS Setup

> •   Due to chipset limitation, when SATA ports are 1-4 are set to RAID mode, SATA ports 1-4 run at RAID mode at the same time.
>
> •   When creating a RAID volume using more than four HDDs, ensure that SATA ports 5-6 are set to **[RAID]** mode.
>
> •   When creating a RAID set, set the SATA_5-6 connectors to **[AHCI]** mode or **[IDE]** mode to ensure that the system recognizes your ODD device.

5.1.4 AMD® Option ROM utility

To enter the AMD® Option ROM utility:

1.   Turn on the system.

2.   During POST, press <Ctrl> + <F> to display the utility main menu.

```
Option ROM Utility (c) 2009 Advanced Micro Devices, Inc.
                          ─[ Main Menu ]─


            View Drive Assignments  .......[ 1 ]

            LD View / LD Define Menu  ......[ 2 ]

            Delete LD Menu  ..............[ 3 ]

            Controller Configuration  ......[ 4 ]




                     ─[ Keys Available ]─

   Press 1..4 to Select Option                          [ESC] Exit
```

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.

```
Option ROM Utility (c) 2009 Advanced Micro Devices, Inc.
========================[ LD Define Menu ]=========================

   LD No   LD Name                      RAID Mode    Drv

   LD  1   Logical Drive 1              RAID 0          2

   Strip Block           64 KB         Fast Init    ON
   Gigabyte Boundary     ON            Cache Mode   WriteThru

=====================[ Drives Assignments ]=====================
   Port:ID  Drive Model       Capabilities   Capacity(GB)   Assignment
    01:00   xxxxxxxxx           xxxxxxx         xxxxxx           Y
    02:00   xxxxxxxxx           xxxxxxx         xxxxxx           Y
    03:00   xxxxxxxxx           xxxxxxx         xxxxxx           N
    04:00   xxxxxxxxx           xxxxxxx         xxxxxx           N



========================[ Keys Available ]========================
  [↑] Up   [↓] Down   [PaUp/PaDn] Switch page   [Space] Change Option
  [Ctrl-Y] Save   [ESC] Exit
```

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.

```
Please press Ctrl-Y key to input the LD Name
or press any key to exit.
If you do not input any LD name, the default LD
name will be used.
```

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

```
Enter the LD name here:
```

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

```
Fast Initialization Option has been selected
It will erase the MBR data of the disks.
<Press Ctrl-Y Key if you are sure to erase it>
<Press any other key to ignore this option>
```

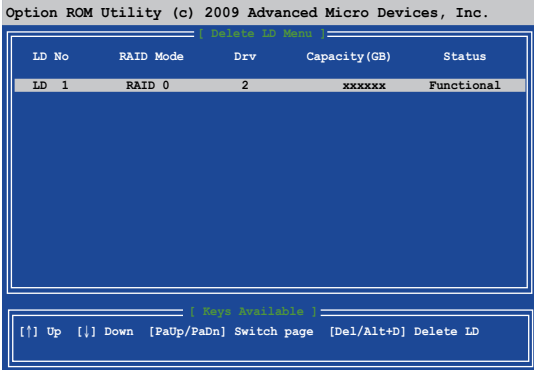9. Press <Ctrl> + <Y> to enter the screen to modify the array capacity, or press any key to use the maximum capacity.

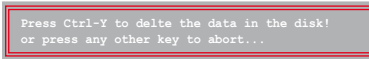## Deleting a RAID configuration

⚠️ 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>.

```
Option ROM Utility (c) 2009 Advanced Micro Devices, Inc.
                        [ Delete LD Menu ]

   LD No        RAID Mode       Drv       Capacity(GB)        Status

   LD  1         RAID 0          2          xxxxxx          Functional








                        [ Keys Available ]
  [↑] Up   [↓] Down   [PaUp/PaDn] Switch page   [Del/Alt+D] Delete LD
```

3. The utility prompts the following messages:

```
  Press Ctrl-Y to delte the data in the disk!
  or press any other key to abort...
```

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

Displaying 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.

```
Option ROM Utility (c) 2009 Advanced Micro Devices, Inc.
                     [ View LD Defination Menu ]

   LD No   LD Name                    RAID Mode    Drv   Capacity(GB)

   LD  1   xxxxx                       RAID 0        2       157.99

   Strip Block          64 KB         Cache Mode   WriteThru


                        [ Drives Assignments ]
   Port:ID  Drive Model       Capabilities    Capacity(GB)
    01:00  xxxxxxxxx           xxxxxxx          xxxxxx
    02:00  xxxxxxxxx           xxxxxxx          xxxxxx




                     Any Key To Continue.......
```

Chapter 5
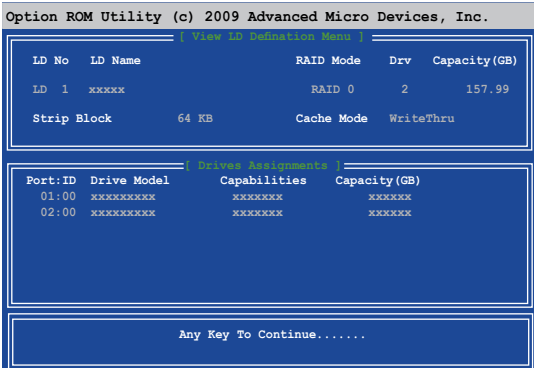
5.2 Creating a RAID driver disk

A floppy disk with the RAID driver is required when installing a Windows® operating system on a hard disk drive that is included in a RAID set.

- • 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 **5.2.4 Using a USB floppy disk drive**.

5.2.1 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.

5.2.2 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.

5.2.3 Installing the RAID driver during Windows® OS installation

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

To install the RAID driver in Windows® XP:

1. During the OS installation, the system prompts you to press the <F6> key to install third-party SCSI or RAID driver.

2. Press <F6>, and then insert the floppy disk with RAID driver into the 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 **Load Driver** to allow you to select the installation media containing the RAID driver.

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

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

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

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

5.2.4 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.

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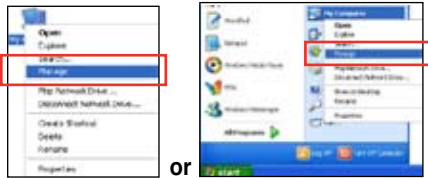
3.   Select **Device Manager**. From the **Universal Serial Bus controllers**, right-click **xxxxxx USB Floppy**, and then select **Properties** from the pop-up window.

> The name of the USB floppy disk drive varies with different vendors.
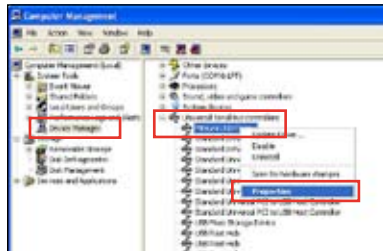
4.   Click **Details** tab. The Vendor ID (VID) and Product ID (PID) are displayed.
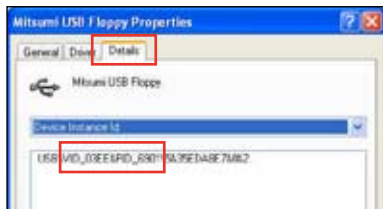
5.   Browse the contents of the RAID driver disk to locate the file **txtsetup.oem**.

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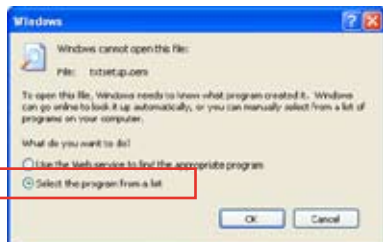
7. Use Notepad to open the file.

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"
```

Add the same line to both sections.

The VID and PID vary with different vendors.

10. Save and exit the file.

Multiple GPU support

6

6.1　AMD® CrossFireX™ technology

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

6.1.1　Requirements

- In Dual CrossFireX mode, you should have two identical CrossFireX-ready graphics cards or one CrossFireX-ready dual-GPU graphics card that are AMD® certified.
- Ensure that your graphics card driver supports the AMD CrossFireX technology. Download the latest driver from the AMD website (www.amd.com).
- Ensure that your power supply unit (PSU) can provide at least the minimum power required by your system. See Chapter 1 for details.

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

6.1.2　Before you begin

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

To uninstall existing graphics card drivers:

1. Close all current applications.

2. For Windows XP, go to **Control Panel** > **Add/Remove Programs**.

   For Windows 7, go to **Control Panel** > **Programs and Features**.

3. Select your current graphics card driver/s.

4. For Windows XP, select **Add/Remove**.

   For Windows 7, select **Uninstall**.

5. Turn off your computer.

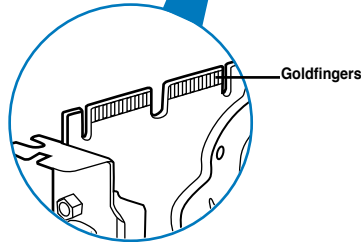## 6.1.3 Installing two CrossFireX™ graphics cards

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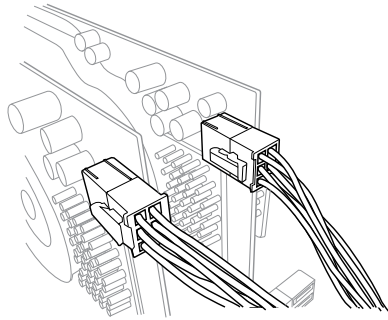
1. Prepare two CrossFireX-ready graphics cards.

2. Insert the two graphics card into the PCIEX16 slots. If your motherboard has more than two PCIEX16 slots, refer to Chapter 1 in this user manual for the locations of the PCIEX16 slots recommended for multi-graphics card installation.

3. Ensure that the cards are properly seated on the slots.

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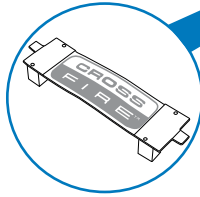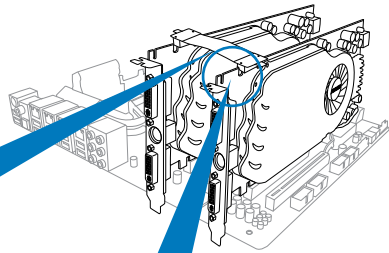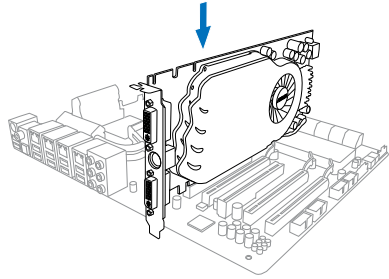
CrossFireX bridge (bundled with graphics cards)

Goldfingers

5. Connect two independent auxiliary power sources from the power supply to the two graphics cards separately.

6. Connect a VGA or a DVI cable to the graphics card.

6.1.4 Installing three CrossFireX™ graphics cards

1. Prepare three CrossFireX-ready graphics cards.

2. Insert the three graphics card into the PCIEX16 slots. If your motherboard has more than three PCIEX16 slots, refer to Chapter 1 in this user manual for the locations of the PCIEX16 slots recommended for multi-graphics card installation.

3. Ensure that the cards are properly seated on the slots.

4. Align and firmly insert the two CrossFireX bridge connectors to the goldfingers on each graphics card. Ensure that the connectors are firmly in place.
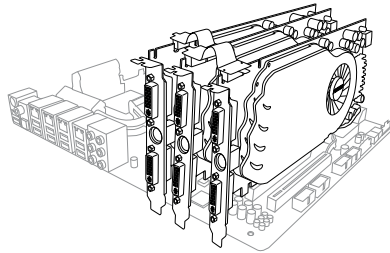
5. Connect three independent auxiliary power sources from the power supply to the three graphics cards separately.

6. Connect a VGA or a DVI cable to the graphics card.
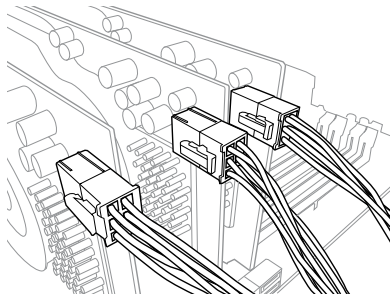
6.1.5 Installing the device drivers

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

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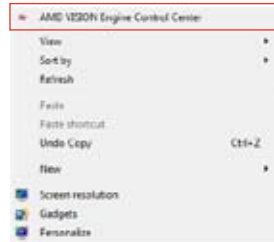
6.1.6 Enabling the AMD® CrossFireX™ technology

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

Launching the AMD VISION Engine Control Center

To launch the AMD VISION Engine Control Center:

1.	Right-click on the Windows® desktop and select **AMD VISION Engine Control Center**.

Enabling Dual CrossFireX technology

1.   In the AMD Vision Engine Control Center window, click **Performance > AMD CrossFireX™**.

2.   Select **Enable CrossFireX™**.

3.   Select a GPU combination from the drop-down list.

4.   Click **Apply** to save and activate the GPU settings made.
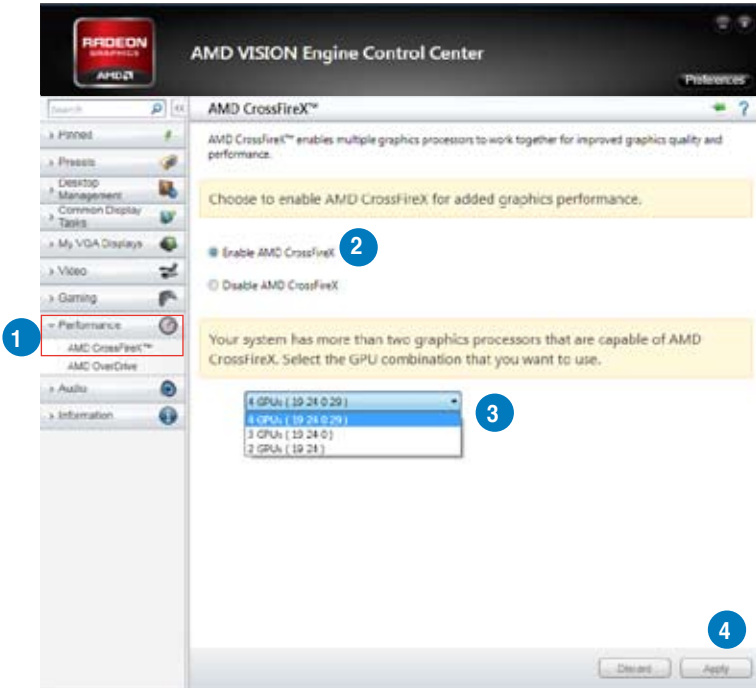
6.2 NVIDIA® SLI™ technology

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

6.2.1 Requirements

- In SLI mode, you should have two identical SLI-ready graphics cards that are NVIDIA® certified.

- Ensure that your graphics card driver supports the NVIDIA SLI technology. Download the latest driver from the NVIDIA website at www.nvidia.com.

- Ensure that your power supply unit (PSU) can provide at least the minimum power required by your system.

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

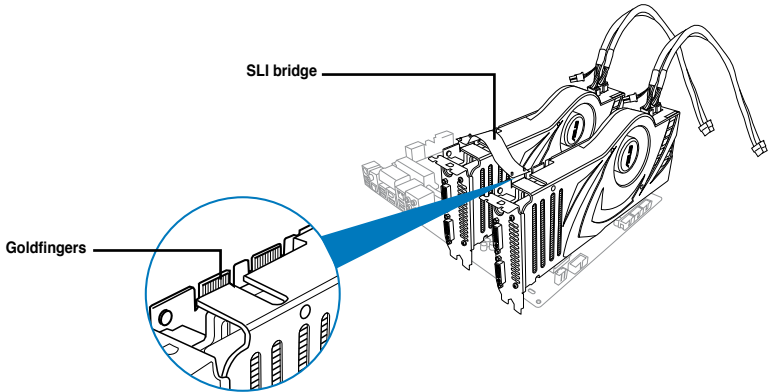## 6.2.2 Installing two SLI-ready graphics cards

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

1. Prepare two SLI-ready graphics cards.

2. Insert the two graphics card into the PCIEX16 slots. If your motherboard has more than two PCIEX16 slots, refer to Chapter 1 in this user manual for the locations of the PCIEX16 slots recommended for multi-graphics card installation.

3. Ensure that the cards are properly seated on the slots.
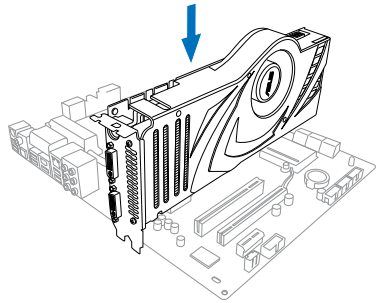
Chapter 6
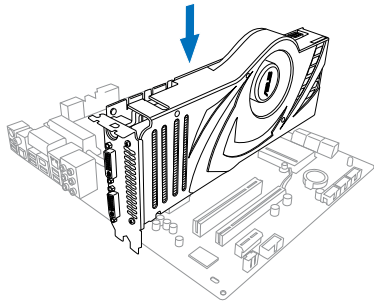
4.   Align and firmly insert the SLI bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.

5.   Connect two independent auxiliary power sources from the power supply to the two graphics cards separately.

6.   Connect a VGA or a DVI cable to the graphics card.

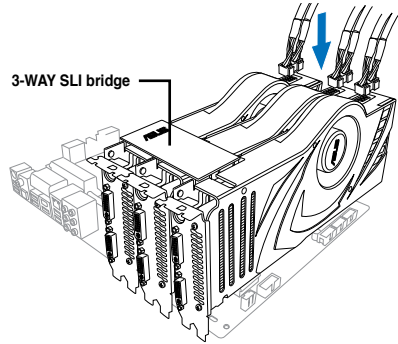**SLI bridge**

Goldfingers

6.2.3   Installing three SLI-ready graphics cards

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

1.   Prepare three SLI-ready graphic a cards.

2.   Insert the three graphics cards into the PCIEX16 slots. If your motherboard has more than two PCIEX16 slots, refer to Chapter 1 in this user manual for locations of the PCIEX16 slots recommended for multi-graphics card installation.

3.   Ensure that the cards are properly seated on the slots.

Chapter 6

4. Align and firmly insert the 3-way SLI bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.

5. Connect three independent auxiliary power sources from the power supply to the three graphics cards.

6. Connect a VGA or a DVI cable to the graphics card.

3-WAY SLI bridge

6.2.4 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 NVIDIA® SLI™ technology. Download the latest driver from the NVIDIA website (www.nvidia.com).

6.2.5   Enabling the NVIDIA® SLI™ technology

After installing your graphics cards and the device drivers, enable the SLI feature in NVIDIA® Control Panel under the Windows® 7 operating system.
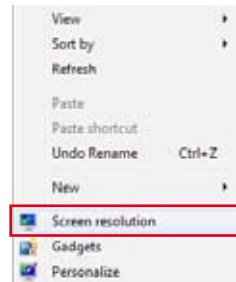
Launching the NVIDIA Control Panel

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

A.   Right click on the empty space of the Windows® desktop and select **NVIDIA Control Panel**.

The NVIDIA Control Panel window appears (See Step B3).
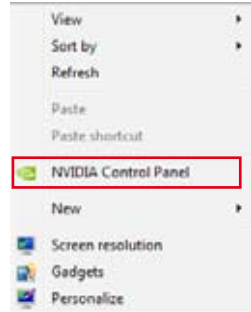
B1.   If you cannot see the NVIDIA Control Panel item in step (A), select **Screen Resolution**.

B2.   From the Screen Resolution window,
       click **Advanced settings**.
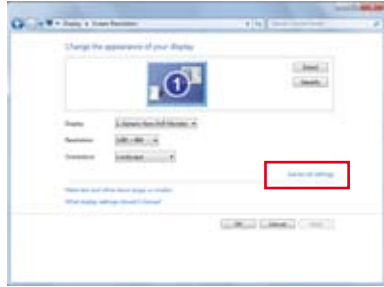
B3.   The NVIDIA Control Panel window
       appears.
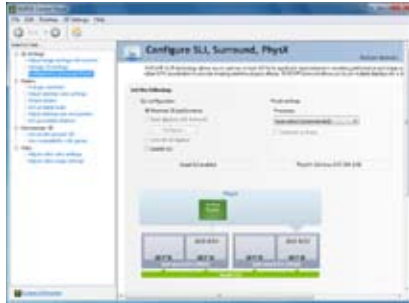
Enabling SLI settings

From the NVIDIA Control Panel window,
select **Configure SLI**, **Surround**, **PhysX**.
In the **Quad-SLI enabled**, click **Maximize
3D Performance SLI** to set the display for
viewing SLI rendered content. When done,
click **Apply**.

Appendices

Notices

Federal Communications Commission Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

*   This device may not cause harmful interference.
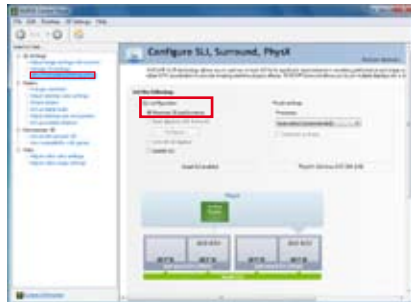*   This device must accept any interference received including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with manufacturer's instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

*   Reorient or relocate the receiving antenna.
*   Increase the separation between the equipment and receiver.
*   Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
*   Consult the dealer or an experienced radio/TV technician for help.

> The use of shielded cables for connection of the monitor to the graphics card is required to assure compliance with FCC regulations. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IC: Canadian Compliance Statement

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

This device complies with Industry Canada license exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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

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

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

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

Canadian Department of Communications Statement

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

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

VCCI: Japan Compliance Statement

VCCI Class B Statement

情報処理装置等電波障害自主規制について
この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は家庭環境で使用されることを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。

取扱説明書に従って正しい取り扱いをして下さい。

KC: Korea Warning Statement

B급 기기 (가정용 방송통신기자재)
이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

*당해 무선설비는 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없습니다.

REACH

Complying with the REACH (Registration, Evaluation, Authorisation, and Restriction of Chemicals) regulatory framework, we published the chemical substances in our products at ASUS REACH website at http://csr.asus.com/english/REACH.htm.

DO NOT throw the motherboard in municipal waste. This product has been designed to enable proper reuse of parts and recycling. This symbol of the crossed out wheeled bin indicates that the product (electrical and electronic equipment) should not be placed in municipal waste. Check local regulations for disposal of electronic products.

DO NOT throw the mercury-containing button cell battery in municipal waste. This symbol of the crossed out wheeled bin indicates that the battery should not be placed in municipal waste.

ASUS Recycling/Takeback Services

ASUS recycling and takeback programs come from our commitment to the highest standards for protecting our environment. We believe in providing solutions for you to be able to responsibly recycle our products, batteries, other components as well as the packaging materials. Please go to http://csr.asus.com/english/Takeback.htm for detailed recycling information in different regions.

Appendices

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.

Appendices

EC Declaration of Conformity

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-Z

conform with the essential requirements of the following directives:

☒2004/108/EC-EMC Directive

☒ EN 55022:2010	☒ EN 55024:2010
☒ EN 61000-3-2:2006+A1:2009+A2:2009	☒ EN 61000-3-3:2008
☐ EN 55013:2001+A1:2009+A2:2006	☐ EN 55020:2007+A11:2011

☐1999/5/EC-R &TTE Directive

☐ EN 300 328 V1.7.1(2006-10)	☐ EN 301 489-1 V1.9.2(2011-09)
☐ EN 300 440-1 V1.6.1(2010-08)	☐ EN 301 489-3 V1.4.1(2002-08)
☐ EN 300 440-2 V1.4.1(2010-08)	☐ 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 V4.2.1(2010-03)	☐ 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 V1.5.1(2010-09)
☐ 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 / A11:2009	☐ EN 60065:2002+A1:2006+A11:2008
☐ EN 60950-1 / A12:2011	☐ EN 60065:2002 / A12:2011

☐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	

☒CE marking

(EC conformity marking)

CE

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

Signature : _____

Declaration Date: Jul. 06, 2012
Year to begin affixing CE marking:2012

Ver. 120601

DECLARATION OF CONFORMITY

Per FCC Part 2 Section 2. 1077(a)

FC

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-Z

Conforms to the following specifications:

☒ FCC Part 15, Subpart B, Unintentional Radiators

Supplementary Information:

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

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

Signature : _____

Date :   **Jul. 06, 2012**

Ver. 120601

Appendices

Appendices