

**SABERTOOTH
990FX**



Motherboard

E6674

Second Edition
May 2011

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Notices

Federal Communications Commission Statement

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

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

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

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



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

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.

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.

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

Where to find more information

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

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

Conventions used in this guide

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



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



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



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



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

Typography

Bold text

Indicates a menu or an item to select.

Italics

Used to emphasize a word or a phrase.

<Key>

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

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

<Key1> + <Key2> + <Key3>

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

Example: **<Ctrl> + <Alt> + **

SABERTOOTH 990FX specifications summary

CPU	<p>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 32nm CPU AMD® Cool 'n' Quiet™ Technology AMD® 140W CPU Support</p>
Chipset	AMD® 990FX/SB950
System Bus	Up to 5.2 GT/s HyperTransport™ 3.0
Memory	<p>*4 x DIMM, Max. 32GB, DDR3 1866/1600/1333/1066 MHz, ECC, Non-ECC and un-buffered memory Dual channel memory architecture *Refer to www.asus.com or user manual for the Memory QVL (Qualified Vendors Lists) of AM3+ / AM3 CPU **Due to OS limitation, when installing total memory of 4GB capacity or more, Windows® 32-bit operation system may only recognize less than 3GB. Hence, a total installed memory of less than 3GB is recommended. ***Due to CPU spec, AMD 100 Series CPUs support up to DDR3 1066MHz. With ASUS design, this motherboard can support up to DDR3 1333MHz.</p>
Expansion Slots	<p>3 x PCI Express 2.0 x16 slots (single @ x16, dual @ x16 / x16, triple @ x16 / x8 / x8 mode)* 1 x PCI Express 2.0 x16 slot (Black @ x4) 1 x PCI Express 2.0 x1 slot 1 x PCI slot *In dual VGA card mode, ensure to install the VGA cards to PClex16_1 and PClex16_3 for better performance. Refer to "2.5 Expansion slots" for details.</p>
Multi-GPU Technology	Support NVIDIA® Quad-GPU SLI™ and ATI® Quad-GPU CrossFireX™ Technology
Storage	<p>AMD® SB950 Chipset:</p> <ul style="list-style-type: none"> - 6 x SATA 6Gb/s ports with RAID 0, 1, 5, 10 support <p>2 x JMicron® JMB362 SATA controllers:</p> <ul style="list-style-type: none"> - 2 x SATA 3Gb/s ports - 1 x Power eSATA 3Gb/s port (green) - 1 x eSATA 3Gb/s port (red)
LAN	Realtek® 8111E Gigabit LAN controller
High Definition Audio	<p>Realtek® ALC892 8-channel High Definition Audio CODEC</p> <ul style="list-style-type: none"> - Absolute Pitch 192KHz/24bit True BD Lossless Sound - BD Audio Layer Content Protection - Supports Jack-Detection, Multi-streaming, Front Panel Jack-Retasking - Optical S/PDIF out port at back I/O
IEEE 1394	VIA® VT6308P controller supports 2 x IEEE 1394a ports (1 port at mid-board; 1 port at back panel)

*Refer to Chapter 2 for slot configurations.

(continued on the next page)

SABERTOOTH 990FX specifications summary

USB	2 x ASMedia® USB 3.0 controllers <ul style="list-style-type: none">- 2 x USB 3.0 ports at mid-board for front panel support- 2 x USB 3.0 ports at back panel (blue) AMD® SB950 chipset <ul style="list-style-type: none">- 14 x USB 2.0 ports (4 ports at mid-board, 10 ports at back panel)
Exclusive TUF Features	Ultimate COOL! Thermal Solution <ul style="list-style-type: none">- TUF CeraM!X Heatsink Coating Tech.- TUF Thermal Radar "TUF ENGINE!" Power Design <ul style="list-style-type: none">- 8+2 Digital phase Power Design- TUF Components (Alloy choke, Cap. & MOSFET; certified by military-standard)- ASUS DIGI+VRM Utility- E. S. P. : Efficient Switching Power Design "Safe & Stable!" Guardian Angel <ul style="list-style-type: none">- ESD Guards- MemOK!- Anti Surge
Other Special Features	Front Panel USB 3.0 Support ASUS UEFI BIOS EZ Mode featuring friendly graphics user interface AI Suite II ASUS Q-Connector ASUS Q-Shield ASUS Q-LED (CPU, DRAM, VGA, Boot Device LED) ASUS Q-Slot ASUS Q-DIMM ASUS O.C. Profile ASUS EZ Flash 2 ASUS MyLogo 2 Multi-language BIOS
BIOS Features	32 Mb Flash ROM, UEFI BIOS, PnP, DMI2.0, WfM2.0, SM BIOS 2.5, ACPI 2.0a, Multi-language BIOS, ASUS EZ Flash 2

(continued on the next page)

SABERTOOTH 990FX specifications summary

Manageability	WfM 2.0, DMI 2.0, WOL by PME, WOR by PME, PXE
Back Panel I/O Ports	1 x PS/2 Keyboard/Mouse combo port 1 x Optical S/PDIF Output port 1 x Power eSATA 3Gb/s port (green) 1 x eSATA 3Gb/s port (red) 1 x IEEE1394a port 1 x LAN (RJ45) port 2 x USB 3.0/2.0 ports (blue) 10 x USB 2.0/1.1 ports 8-channel Audio I/O ports
Internal I/O Connectors	1 x USB 3.0/2.0 connector supports additional 2 USB 3.0/2.0 ports (19-pin; moss green) 2 x USB 2.0/1.1 connectors support additional 4 USB 2.0/1.1 ports 6 x SATA 6Gb/s connectors (brown) 2 x SATA 3Gb/s connectors (black) 1 x CPU Fan connector (4-pin) 4 x Chassis Fan connectors (3 x 4-pin; 1 x 3-pin) 1 x CPU Opt fan connector (4-pin) 1 x IEEE1394a connector Front panel audio connector 1 x COM connector 1 x S/PDIF Out header 24-pin EATX Power connector 8-pin EATX 12V Power connector System Panel (Q-Connector) 1 x MemOK! button 1 x Clear CMOS jumper
Software	Drivers Anti-virus software (OEM version) ASUS Update ASUS Utilities
Form Factor	ATX Form Factor, 12"x 9.6" (30.5cm x 24.4cm)

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

1.1 Welcome!

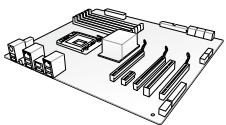
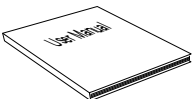
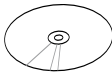
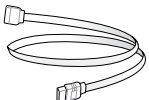

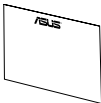
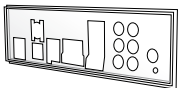
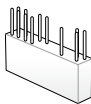

Thank you for buying an ASUS® SABERTOOTH 990FX motherboard!

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

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

1.2 Package contents

Check your motherboard package for the following items.

		
ASUS SABERTOOTH 990FX motherboard	User guide	Support DVD
		
4 x Serial ATA 6.0 Gb/s cables	1 x ASUS SLI™ bridge connector	1 x TUF Certification card
		
1 x ASUS Q-Shield	1 x 2-in-1 ASUS Q-Connector kit	1 x TUF Five-year warranty manual



- If any of the above items is damaged or missing, contact your retailer.
- The illustrated items above are for reference only. Actual product specifications may vary with different models.

1.3 Special features

1.3.1 Product highlights

The Ultimate Force



TUF /tʌf/, stands for The Ultimate Force.

The TUF series delivers a “tough” image. With the unique design & high quality components (military-standard), TUF series is born for pursuing the preeminent stability, all-round compatibility, and extreme durability

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

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

AMD 990FX Chipset

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

Quad-GPU SLI and Quad-GPU CrossFireX™ support!

Flexible Multi-GPU Solutions, Your Weapon of Choice!

SABERTOOTH 990FX brings multi-GPU configurations through both SLI™ and CrossFireX. This motherboard features the powerful AMD® 990FX chipset, optimizing PCIe allocation in multiple GPU setups. Expect a brand new gaming sensation like you've never experienced before!

PCIe 2.0

Double Speed; Double Bandwidth

This motherboard supports the latest PCIe 2.0 devices for double speed and bandwidth which enhances system performance.

Front Panel USB 3.0 Support

Convenient USB 3.0 Front Panel Compatibility

ASUS provides standardized USB 3.0 front panel support, compatible with any chassis. Enjoy faster throughput of USB 3.0 without relegating cables or devices to the hard-to-reach rear I/O.

Complete USB 3.0 Solution

Double USB access, double convenience

ASUS facilitates strategic USB 3.0 accessibility for both the front and rear panel - 4 USB 3.0 ports in total. Experience the latest plug & play connectivity at speeds up to 10 times faster than USB 2.0. The SABERTOOTH 990FX affords greater convenience to high speed connectivity.

1.3.2 “Ultimate COOL!” Thermal Solution

TUF CeraM!X - Heatsink Coating Tech.

Larger area for heat dissipation with the revolutionary ceramics-coating technology

Innovative ceramics actively conducts heat away from the system. It replaces traditional anti-oxidant to dissipate heat better with its microscopic irregular surface and enlarged area. Better cooling leads to overall improvement in system stability.



Do Not uninstall the heatsink module by yourself. Doing so may bend the tubing and affect the heat dissipation performance.

TUF Thermal Radar

Real Time Temp Detection and Heat Removal

The TUF Thermal Radar monitors temps in critical parts of the motherboard in real time, automatically adjusting fan speeds to make sure the system maintains high stability without overheating. It consists of multiple sensors for various components on the motherboard, giving users the ability to monitor each one individually. The Thermal Radar automatically calculates ideal fan speeds based on different parameters selected by users for each component, keeping everything cooler and longer lasting.

1.3.3 “TUF ENGINE!” Power Design

DIGI+ VRM

Herald the Arrival of a New Digital Power Design Era

The new ASUS DIGI+ VRM design upgrades motherboard power delivery to a digital standard. The 8+2 digital architecture provides the highest power efficiency, generating less heat to enhance longer component lifespan and ensure minimal powerloss. With ASUS DIGI+ VRM, users can easily adjust power phase performance, enabling new PWM voltage and frequency modulation controls. Digital 8+2 power phase design also expands the modulation spectrum for improved stability and lower VRM switching noise by dynamically detecting system load, empowering users with superior flexibility and perfect precision to ensure optimized performance, extreme system stability, and greater power efficiency.

E.S.P. Efficient Switching Power Design

Optimal power efficiency for key components

Exclusively for this motherboard, the switching power design is provided not only for the CPU and memory, but also for other key components such as graphics cards, LAN and USB 3.0. E.S.P. dramatically improves system efficiency and reduces heat generation.

TUF Components (Alloy Choke, Cap. & MOSFET; Certified by Military-standard)

Certified for Tough Duty

Get rugged performance even in the most challenging conditions with robust TUF chokes, solid capacitors, and MOSFETs--certified through third-party, military-grade testing. TUF Chokes, also known as the "Alloy Choke", is made of a compound of various types of metal instead of standard iron, enabling the support of up to a massive 40A of rated current, 25% higher than conventional components. Furthermore, the single-piece packaging also eliminates the emission of vibration noise, delivering superb characteristics as well as durability under extreme conditions.

ESD Guards

Unique protection of motherboard components from unexpected electrostatic discharges (ESD)

Electrostatic discharge (ESD) can happen suddenly and its damaging effects are often underestimated. Exclusive ASUS anti-static chip, a protective circuit design, and the I/O shield provides four times better protection to extend component lifespan.

Any Memory is A-OK!

MemOK! quickly ensures memory boot compatibility. This remarkable memory rescue tool requires a mere push of a button to patch memory issues. MemOK! determines fail-safe settings and dramatically improves system boot success. Get your system up and running in no time!

1.3.4 ASUS DIY

UEFI BIOS (EZ Mode)

Flexible & Easy BIOS Interface

ASUS brand new UEFI BIOS offers a user-friendly interface that goes beyond traditional keyboard-only BIOS, to enable more flexible and convenient mouse controls. Users can easily navigate the new UEFI BIOS with the same smoothness as their operating system. The exclusive EZ Mode displays frequently-accessed setup info, while the Advanced Mode is for experienced performance enthusiasts that demand far more intricate system settings.

AI Suite II

One-stop Access to Innovative ASUS Features

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

ASUS Q-Design

DIY quickly, DIY easily!

ASUS Q-Design enhances your DIY experience. All of Q-LED, Q-Slot, and Q-DIMM design speed up and simplify the DIY process!

Q-Shield

Easy and Comfortable Installations

The specially designed ASUS Q-Shield does without the usual ""fingers"" - making it convenient and easy to install. With better electric conductivity, it ideally protects your motherboard against static electricity and shields it against Electronic Magnetic Interference (EMI).

ASUS Q-Connector

Make connection quick and accurate!

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

EZ Flash2

Simply update BIOS from a USB flash disk before entering the OS

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

O.C. Profile

Conveniently store or load multiple BIOS settings

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

8 Channel Audio Codec

The onboard 8-channel HD audio (High Definition Audio, previously codenamed Azalia) CODEC enables high-quality Absolute Pitch 192khz/24bit audio output, true BD lossless sound, jack-sensing feature, retasking functions and multi-streaming technology.

MyLogo2

Personalize your system with customizable boot logo

The ASUS MyLogo 2 is the new feature present in the motherboard that allows you to personalize and add style to your system with customizable and animated boot logos.

Power eSATA on the Go

The motherboard supports hard drives based on the Serial ATA (SATA) 3Gb/s storage specification, delivering enhanced scalability and doubling the bus bandwidth for high-speed data retrieval and saves. The Power eSATA solution combines the eSATA connector and power source together, allowing users to use external SATA devices without the need of additional power source*. The external SATA port located at the back I/O provides smart setup and hot-plug functions. Easily backup photos, videos and other entertainment contents on external devices. *Power eSATA requires a specially designed signal cable to provide 5V power for the external SATA device. The cable is purchased separately.

IEEE 1394a interface

IEEE 1394a interface provides high speed digital interface for audio/video appliances such as digital television, digital video camcorders, storage peripherals & other PC portable devices.

ErP Ready

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

2.1 Before you proceed

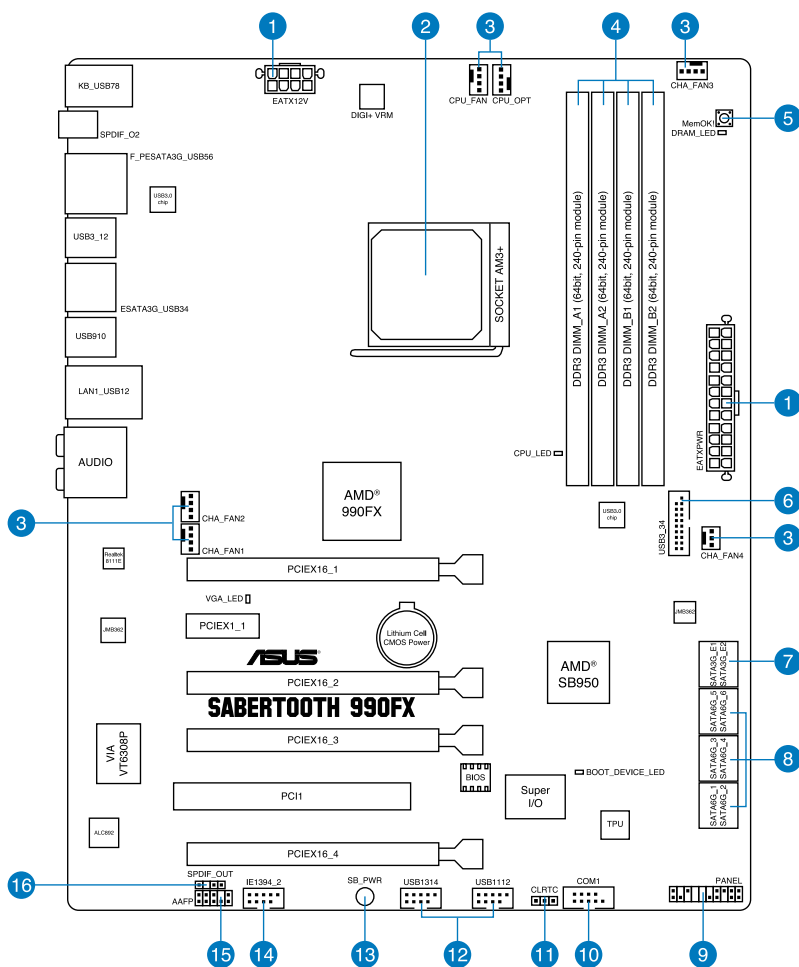
Take note of the following precautions before you install motherboard components or change any motherboard settings.



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

2.2 Motherboard overview

2.2.1 Motherboard layout



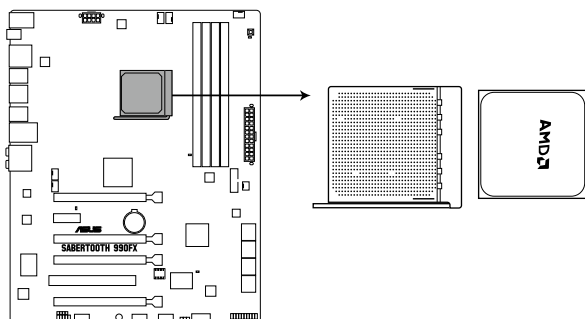
Refer to **2.2.8 Internal connectors** and **2.3.10 Rear panel connection** for more information about rear panel connectors and internal connectors.

Layout contents

Connectors/Jumpers/Slots		Page
1.	ATX power connectors (24-pin EATXPWR, 8-pin EATX12V)	2-21
2.	AM3+ CPU socket	2-4
3.	CPU and chassis fan connectors (4-pin CPU_FAN, CPU_OPT FAN, CHA_FAN1~3, 3-pin CHA_FAN4)	2-20
4.	DDR3 DIMM slots	2-5
5.	MemOK! switch	2-14
6.	USB 3.0 connector (20-1 pin USB3_34)	2-18
7.	JMicron® Serial ATA 3.0 Gb/s connectors (7-pin SATA3G_E1/E2 [black])	2-17
8.	AMD® Serial ATA 6.0 Gb/s connectors (7-pin SATA6G_1-6 [brown])	2-16
9.	System panel connector (20-8 pin PANEL)	2-23
10.	Serial port connector (10-1 pin COM1)	2-17
11.	Clear RTC RAM (3-pin CLRTC)	2-13
12.	USB 2.0 connectors (10-1 pin USB1112, USB1314)	2-18
13.	Standby power LED (SB_PWR)	2-15
14.	IEEE 1394a port connector (10-1 pin IE1394_2)	2-19
15.	Front panel audio connector (10-1 pin AAFP)	2-21
16.	Digital audio connector (4-1 pin SPDIF_OUT)	2-19

2.2.2 Central Processing Unit (CPU)

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



SABERTOOTH 990FX CPU AM3+



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



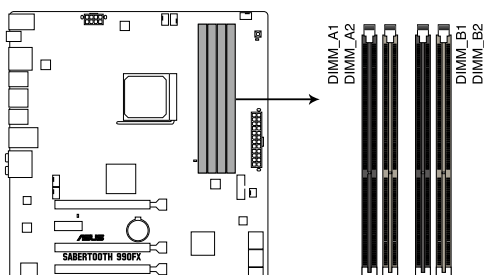
The AM3+ socket has a different pinout design, ensure that you use a CPU designed for the AM3+/AM3 socket. The CPU fits in only one correct orientation. DO NOT force the CPU into the socket to prevent bending the connectors on the socket and damaging the CPU!

2.2.3 System memory

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

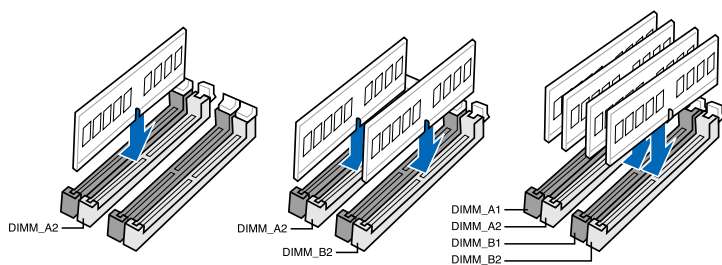


A DDR3 module is notched differently from a DDR or DDR2 module. DO NOT install a DDR or DDR2 memory module to the DDR3 slot.



SABERTOOTH 990FX 240-pin DDR3 DIMM socket

Recommended memory configurations



Memory configurations

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



- You may install varying memory sizes in Channel A and Channel B. The system maps the total size of the lower-sized channel for the dual-channel configuration. Any excess memory from the higher-sized channel is then mapped for single-channel operation.
- Due to CPU behavior, DDR3 1800 MHz memory module will run at DDR3 1600 MHz frequency as default.
- Always install DIMMs with the same CAS latency. For optimum compatibility, we recommend that you obtain memory modules from the same vendor.
- Due to the memory address limitation on 32-bit Windows OS, when you install 4GB or more memory on the motherboard, the actual usable memory for the OS can be about 3GB or less. For effective use of memory, we recommend that you do any of the following:
 - Use a maximum of 3GB system memory if you are using a 32-bit Windows OS.
 - Install a 64-bit Windows OS when you want to install 4GB or more on the motherboard.For more details, refer to the Microsoft® support site at <http://support.microsoft.com/kb/929605/en-us>.
- This motherboard does not support DIMMs made up of 512Mb (64MB) chips or less (Memory chip capacity counts in Megabit, 8 Megabit/Mb = 1 Megabyte/MB).



- The default memory operation frequency is dependent on its Serial Presence Detect (SPD), which is the standard way of accessing information from a memory module. Under the default state, some memory modules for overclocking may operate at a lower frequency than the vendor-marked value. To operate at the vendor-marked or at a higher frequency, refer to section **3.4 Ai Tweaker menu** for manual memory frequency adjustment.
- For system stability, use a more efficient memory cooling system to support a full memory load (4 DIMMs) or overclocking condition.

SABERTOOTH 990FX Motherboard Qualified Vendors Lists (QVL) AM3 DDR3 1066 MHz capability

Vendors	Part No.	Size	SS/ DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)		
								1 DIMM	2 DIMM	4 DIMM
Crucial	CT12864BA1067.8FF	1GB	SS	MICRON	D9KPT	7	-	*	*	*
Crucial	CT12864BA1067.8SFD	1GB	SS	MICRON	D9JNL	7	-	*	*	*
Crucial	CT12872BA1067.9FF	1GB	SS	MICRON	D9KPT(ECC)	7	-	*	*	*
Crucial	CT25664BA1067.16FF	2GB	DS	MICRON	D9KPT	7	-	*	*	*
Crucial	CT25664BA1067.16SFD	2GB	DS	MICRON	D9JNL	7	-	*	*	*
Crucial	CT25672BA1067.18FF	2GB	DS	MICRON	D9KPT(ECC)	7	-	*	*	*
ELPIDA	EBJ10UE8BAW0-AE-E	1GB	SS	ELPIDA	J1108BABG-DJ-E	7	-	*	*	*
ELPIDA	EBJ10UE8EDF0-AE-F	1GB	SS	ELPIDA	J1108EDSE-DJ-F	-	-	*	*	*
ELPIDA	EBJ21UE8BAW0-AE-E	2GB	DS	ELPIDA	J1108BABG-DJ-E	7	-	*	*	*
ELPIDA	EBJ21UE8EDF0-AE-F	2GB	DS	ELPIDA	J1108EDSE-DJ-F	-	-	*	*	*
GEIL	GG34GB1066C8DC	4GB (2x 2GB)	DS	GEIL	GL1L128M88BA115FW	8-8-8-20	1.3	*	*	*
Hynix	HMT112U6AFP8C-G7N0	1GB	SS	HYNIX	H5TQ1G83AFP8G7C	7	-	*	*	*
Hynix	HYMT112U64ZNF8-G7	1GB	SS	HYNIX	HY5TQ1G831ZNFP-G7	7	-	*	*	*
Hynix	HMT125U6AFP8C-G7N0	2GB	DS	HYNIX	H5TQ1G83AFP8G7C	7	-	*	*	*
Hynix	HYMT125U64ZNF8-G7	2GB	DS	HYNIX	HY5TQ1G831ZNFP-G7	7	-	*	*	*
Kingston	KVR1066D3N7/1G	1GB	SS	Kingston	D1288JPNPLD9U	7	1.5	*	*	*
Kingston	KVR1066D3N7/2G	2GB	DS	Elpida	J1108BDSE-DJ-F	7	1.5	*	*	*
KINGSTON	KVR1066D3N7K2/4G	4GB (2x 2GB)	DS	KINGSTON	D1288JELDNGD9U	-	1.5	*	*	*
MICRON	MT8JTF12864AZ-1G1F1	1GB	SS	MICRON	8ZF22 D9KPV	7	-	*	*	*
MICRON	MT8JTF12864AZ-1G1F1	1GB	SS	MICRON	D9KPT	7	-	*	*	*
MICRON	MT9JSF12872AZ-1G1F1	1GB	SS	MICRON	D9KPT(ECC)	7	-	*	*	*
MICRON	MT16JTF25664AZ-1G1F1	2GB	DS	MICRON	8ZF22 D9KPV	7	-	*	*	*
MICRON	MT16JTF25664AZ-1G1F1	2GB	DS	MICRON	D9KPT	7	-	*	*	*
MICRON	MT18JSF25672AZ-1G1F1	2GB	DS	MICRON	D9KPT(ECC)	7	-	*	*	*
SAMSUNG	M378B5273BH1-CF8	4GB	DS	SAMSUNG	K4B2G0846B-HCF8	8	1.5	*	*	*
Elixir	M2Y2G64CB8HC5N-BE	2GB	DS	Elixir	N2CB1G80CN-BE	-	-	*	*	*
Elixir	M2Y2G64CB8HC9N-BE	2GB	DS	-	-	-	-	*	*	*

SABERTOOTH 990FX Motherboard Qualified Vendors Lists (QVL) AM3 DDR3 1333 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)			
								1	DIMM 2	DIMM 4	DIMM
A-DATA	SU3U1333W8G9-B	8GB	DS	Elpida	J4208BASE-DJ-F	9	-	*	*	*	*
Apacer	78.01GC6.9L0	1GB	SS	Apacer	AM5D5808DEJ5BG	9	-	*	*	*	*
Apacer	78.A1GC6.9L1	2GB	DS	Apacer	AM5D5808FEQ5BG	9	-	*	*	*	*
CORSAIR	TW3X4G1333C9A	4GB (2x 2GB)	DS	-	-	9-9-9-24	1.5	*	*	*	*
CORSAIR	CMX8GX3M2A1333C9(XMP)	8GB (2x 4GB)	DS	-	-	9-9-9-24	1.5	*	*	*	*
CORSAIR	CMX8GX3M4A1333C9	8GB (4 x 2GB)	DS	-	-	9-9-9-24	1.5	*	*	*	*
Crucial	CT12864BA1339.8FF	1GB	SS	MICRON	D9KPT	9	-	*	*	*	*
Crucial	BL25664BN1337.16FF(XMP)	2GB	DS	-	-	7-7-7-24	1.65	*	*	*	*
Crucial	CT25664BA1339.16FF	2GB	DS	MICRON	D9KPT	9	-	*	*	*	*
Crucial	CT25672BA1339.18FF	2GB	DS	MICRON	D9KPT(ECC)	9	-	*	*	*	*
ELPIDA	EBJ10UE8BDF0-DJ-F	1GB	SS	ELPIDA	J1108BDSE-DJ-F	-	-	*	*	*	*
ELPIDA	EBJ10UE8DF0-DJ-F	1GB	SS	ELPIDA	J1108EDSE-DJ-F	-	-	*	*	*	*
ELPIDA	EBJ20UF8BCF0-DJ-F	2GB	SS	Elpida	J2108BCSE-DJ-F	-	-	*	*	*	*
ELPIDA	EBJ21UE8BDF0-DJ-F	2GB	DS	ELPIDA	J1108BDSE-DJ-F	-	-	*	*	*	*
G.SKILL	F3-10600CL9D-4GBNT	4GB (2x 2GB)	DS	G.SKILL	D3 128M8CE9 2GB	9-9-9-24	1.5	*	*	*	*
G.SKILL	F3-10666CL8D-4GBHK(XMP)	4GB (2x 2GB)	DS	-	-	8-8-8-21	1.5	*	*	*	*
G.SKILL	F3-10666CL7D-4GBRH(XMP)	4GB (2 x 2GB)	DS	-	-	7-7-7-21	1.5	*	*	*	*
G.SKILL	F3-10666CL8D-4GBECO(XMP)	4GB (2 x 2GB)	DS	-	-	8-8-8-24	1.35	*	*	*	*
G.SKILL	F3-10666CL9D-8GBRL	8GB (2x 4GB)	DS	-	-	9-9-9-24	1.5	*	*	*	*
G.SKILL	F3-10666CL9D-8GBRL	8GB (2x 4GB)	DS	-	-	9-9-9-24	1.5	*	*	*	*
GEIL	GET316GB1333C9QC	16GB (4x 4GB)	DS	-	-	9-9-9-24	1.5	*	*	*	*
GEIL	GG34GB1333C9DC	4GB (2x 2GB)	DS	GEIL	GL1L128M88BA115FW	9-9-9-24	1.3	*	*	*	*
GEIL	GB34GB1333C7DC	4GB (2 x 2GB)	DS	GEIL	GL1L128M88BA15FW	7-7-7-24	1.5	*	*	*	*
GEIL	GG34GB1333C9DC	4GB (2 x 2GB)	DS	GEIL	GL1L128M88BA12N	9-9-9-24	1.3	*	*	*	*
GEIL	GV34GB1333C7DC	4GB (2 x 2GB)	DS	-	-	7-7-7-24	1.5	*	*	*	*
GEIL	GVP38GB1333C7QC	8GB (4x 2GB)	DS	-	-	7-7-7-24	1.5	*	*	*	*
Hynix	HMT112U6TFR8A-H9	1GB	SS	Hynix	H5TC1G83TFR	-	-	*	*	*	*
Hynix	HMT325U6BFR8C-H9	2GB	SS	Hynix	H5TQ2G83BFR	-	-	*	*	*	*
Hynix	HMT125U6BFR8C-H9	2GB	DS	Hynix	H5TQ1G83BFRH9C	9	-	*	*	*	*
Hynix	HMT125U6TFR8A-H9	2GB	DS	Hynix	H5TC1G83TFR	-	-	*	*	*	*
Hynix	HMT351U6BFR8C-H9	4GB	DS	Hynix	H5TQ2G83BFR	-	-	*	*	*	*
KINGMAX	FLFE85F-C8KM9	2GB	SS	Kingmax	KFC8FNMXF-BXX-15A	-	-	*	*	*	*
KINGMAX	FLFE85F-B8KL9	2GB	DS	KINGMAX	KFB8FNXL-BNF-15A	-	-	*	*	*	*
KINGMAX	FLFF65F-C8KM9	4GB	DS	Kingmax	KFC8FNMXF-BXX-15A	-	-	*	*	*	*
Kingston	KVR1333D3N9/1G	1GB	SS	Elpida	J1108BDSE-DJ-F	9	1.5	*	*	*	*
Kingston	KVR1333D3N9/2G	2GB	DS	Kingston	D1288JPNDPLD9U	9	1.5	*	*	*	*
Kingston	KHX1333C9D3UK2/4GX(XMP)	4GB (2x 2GB)	DS	-	-	9	1.25	*	*	*	*
KINGSTON	KVR1333D3N9K2/4G	4GB (2x 2GB)	DS	KINGSTON	D1288JEMFGPD9U	-	1.5	*	*	*	*
MICRON	MT8JTF25664AZ-1G4D1	2GB	SS	Micron	D9LGK	-	-	*	*	*	*
MICRON	MT8JTF25664AZ-1G4D1	2GB	SS	Micron	D9LGK	-	-	*	*	*	*
MICRON	MT16JTF51264AZ-1G4D1	4GB	DS	Micron	D9LGK	-	-	*	*	*	*
OCZ	OCZ3P1333LV3GK	3GB (3 x 1GB)	SS	-	-	7-7-7	1.65	*	*	*	*
OCZ	OCZ3G1333LV4GK	4GB (2x 2GB)	DS	-	-	9-9-9	1.65	*	*	*	*

SABERTOOTH 990FX Motherboard Qualified Vendors Lists (QVL)
AM3 DDR3 1333 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)		
								1 DIMM	2 DIMM	4 DIMM
OCZ	OC23RPR1333C9LV8GK	8GB (2x 4GB)	DS	-	-	9-9-9	1.65	*	*	*
PSC	PC310600U-9-10-A0	1GB	SS	PSC	A3P1GF3FGF	-	-	*	*	*
PSC	AL8F8G73D-DG1	2GB	DS	PSC	A3P1GF3DGF	-	-	*	*	*
PSC	PC310600U-9-10-B0	2GB	DS	PSC	A3P1GF3FGF	-	-	*	*	*
SAMSUNG	M378B2873EH1-CH9	1GB	SS	SAMSUNG	K4B1G0846E	-	-	*	*	*
SAMSUNG	M378B2873FHS-CH9	1GB	SS	SAMSUNG	K4B1G0846F	-	-	*	*	*
SAMSUNG	M378B5773DH0-CH9	2GB	SS	Samsung	K4B2G08460	-	-	*	*	*
SAMSUNG	M378B5673FH0-CH9	2GB	DS	SAMSUNG	K4B1G0846F	-	-	*	*	*
SAMSUNG	M378B5273BH1-CH9	4GB	DS	SAMSUNG	K4B2G0846B-HCH9	9	-	*	*	*
SAMSUNG	M378B5273CH0-CH9	4GB	DS	SAMSUNG	K4B2G0846C	K4B2G0846C	-	*	*	*
SAMSUNG	M378B5273DH0-CH9	4GB	DS	Samsung	K4B2G08460	-	-	*	*	*
SAMSUNG	M378B1G73AHO-CH9	8GB	DS	SAMSUNG	K4B4G0846A-HCH9	-	-	*	*	*
Transcend	TS256MLK64V3N (566577)	2GB	SS	Hynix	H5TQ2G83BFR	9	-	*	*	*
Transcend	TS256MLK64V3N (574206)	2GB	SS	Micron	D9LGK	9	-	*	*	*
Transcend	TS512MLK64V3N (389889)	4GB	DS	Hynix	H5TQ2G83BFR	9	-	*	*	*
Transcend	TS512MLK64V3N (574831)	4GB	DS	Micron	D9LGK	9	-	*	*	*
ACTICA	ACT1GHU64B8F1333S	1GB	SS	Samsung	K4B1G0846F	-	-	*	*	*
ACTICA	ACT1GHU72C8G1333S	1GB	SS	Samsung	K4B1G0846F(ECC)	-	-	*	*	*
ACTICA	ACT2GHU64B8G1333M	2GB	DS	Micron	D9KPT	-	-	*	*	*
ACTICA	ACT2GHU64B8G1333S	2GB	DS	Samsung	K4B1G0846F	-	-	*	*	*
ACTICA	ACT2GHU72D8G1333M	2GB	DS	Micron	D9KPT(ECC)	-	-	*	*	*
ACTICA	ACT2GHU72D8G1333S	2GB	DS	Samsung	K4B1G0846F(ECC)	-	-	*	*	*
ACTICA	ACT4GHU64B8H1333H	4GB	DS	Hynix	H5TQ2G83AFR	-	-	*	*	*
ACTICA	ACT4GHU72D8H1333H	4GB	DS	Hynix	H5TQ2G83AFR(ECC)	-	-	*	*	*
BUFFALO	D3U1333-1G	1GB	SS	Elpida	J1108BFBG-DJ-F	-	-	*	*	*
BUFFALO	FSH1333D3G-T3G(XMP)	3GB (3 x 1GB)	SS	-	-	7-7-7-20	-	*	*	*
BUFFALO	D3U1333-2G	2GB	DS	Elpida	J1108BFBG-DJ-F	-	-	*	*	*
BUFFALO	D3U1333-4G	4GB	DS	NANYA	NT5CB256M8BN-CG	-	-	*	*	*
EK Memory	EKM324L28BP8-I13	4GB (2 x 2GB)	DS	-	-	9	-	*	*	*
Elixir	M2F2G64CB88B7N-CG	2GB	SS	Elixir	N2CB2G808N-CG	-	-	*	*	*
Elixir	M2F4G64CB8HB5N-CG	4GB	DS	Elixir	N2CB2G808N-CG	-	-	*	*	*
GoodRam	GR1333D364L9/2G	2GB	DS	Qimonda	IDSH1G-03A1F1C-13H	-	-	*	*	*
KINGTIGER	F10DA2T1680	2GB	DS	KINGTIGER	KTG1333PS1208NST-C9	-	-	*	*	*
KINGTIGER	KTG2G1333PG3	2GB	DS	-	-	-	-	*	*	*
Patriot	PSD32G13332	2GB	DS	Prtriot	PM128M8D3BU-15	9	-	*	*	*
Patriot	PGS34G1333LLKA	4GB (2 x 2GB)	DS	-	-	7-7-7-20	1.7	*	*	*
Patriot	PVS34G1333ELK	4GB (2 x 2GB)	DS	-	-	9-9-9-24	1.5	*	*	*
Patriot	PVS34G1333LLK	4GB (2 x 2GB)	DS	-	-	7-7-7-20	1.7	*	*	*
Silicon Power	SP001GBLTE133S01	1GB	SS	NANYA	NT5CB128M8AN-CG	-	-	*	*	*
Silicon Power	SP001GBLTU1333S01	1GB	SS	NANYA	NT5CB128M8AN-CG	-	-	*	*	*
Silicon Power	SP002GBLTE133S01	2GB	DS	NANYA	NT5CB128M8AN-CG	-	-	*	*	*
Silicon Power	SP002GBLTU1333S02	2GB	DS	S-POWER	I0YT3E0	9	-	*	*	*
Team	TXD31024M1333C7(XMP)	1GB	SS	Team	T3D1288LT-13	7-7-7-21	1.75	*	*	*
Team	TXD31048M1333C7-D(XMP)	1GB	SS	Team	T3D1288LT-13	7-7-7-21	1.75	*	*	*
Team	TXD32048M1333C7-D(XMP)	2GB	DS	Team	T3D1288LT-13	7-7-7-21	1.5-1.6	*	*	*
Team	TXD32048M1333C7-D(XMP)	2GB	DS	Team	T3D1288LT-13	7-7-7-21	1.5-1.6	*	*	*

SABERTOOTH 990FX Motherboard Qualified Vendors Lists (QVL) AM3 DDR3 1600 MHz capability

Vendors	Part No.	Size	SS/ DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)		
								1 DIMM	2 DIMM	4 DIMM
CORSAIR	HX3X12G1600C9(XMP)	12GB (6x 2GB)	DS	-	-	9-9-9-24	1.6	*	*	*
CORSAIR	CMZ16GX3M4A1600C9(XMP)	16GB (4x 4GB)	DS	-	-	9-9-9-24	1.5	*	*	*
CORSAIR	CMG4GX3M2A1600C6	4GB (2x 2GB)	DS	-	-	6-6-6-18	1.65	*	*	*
CORSAIR	CMD4GX3M2B1600C8	4GB (2x 2GB)	DS	-	-	8-8-8-24	1.65	*	*	*
CORSAIR	CMG4GX3M2A1600C6	4GB (2x 2GB)	DS	-	-	6-6-6-18	1.65	*	*	*
CORSAIR	CMX4GX3M2A1600C8(XMP)	4GB (2x 2GB)	DS	-	-	8-8-8-24	1.65	*	*	*
CORSAIR	CMD4GX3M2A1600C8(XMP)	4GB (2x 2GB)	DS	-	-	8-8-8-24	1.65	*	*	*
CORSAIR	CMG4GX3M2A1600C7(XMP)	4GB (2x 2GB)	DS	-	-	7-7-7-20	1.65	*	*	*
CORSAIR	CMX4GX3M2A1600C9(XMP)	4GB (2x 2GB)	DS	-	-	9-9-9-24	1.65	*	*	*
CORSAIR	CMP6GX3M3A1600C8(XMP)	6GB (3x 2GB)	DS	-	-	8-8-8-24	1.65	*	*	*
CORSAIR	CMP6GX3M3A1600C8(XMP)	6GB (3x 2GB)	DS	-	-	8-8-8-24	1.65	*	*	*
CORSAIR	CMX6GX3M3C1600C7(XMP)	6GB (3x 2GB)	DS	-	-	7-8-7-20	1.65	*	*	*
CORSAIR	TR3X6G1600C8D(XMP)	6GB (3x 2GB)	DS	-	-	8-8-8-24	1.65	*	*	*
CORSAIR	CMP8GX3M2A1600C9(XMP)	8GB (2x 4GB)	DS	-	-	9-9-9-24	1.65	*	*	*
CORSAIR	CMZ8GX3M2A1600C8(XMP)	8GB (2x 4GB)	DS	-	-	8-8-8-24	1.5	*	*	*
CORSAIR	CMZ8GX3M2A1600C9(XMP)	8GB (2x 4GB)	DS	-	-	9-9-9-24	1.5	*	*	*
CORSAIR	CMX8GX3M4A1600C9(XMP)	8GB (4x 2GB)	DS	-	-	9-9-9-24	1.65	*	*	*
Crucial	BL12864BN1608.8FF(XMP)	2GB (2x 1GB)	SS	-	-	8-8-8-24	1.65	*	*	*
Crucial	BL25664BN1608.16FF(XMP)	2GB	DS	-	-	8-8-8-24	1.65	*	*	*
G.SKILL	F3-12800CL9D-4GBNQ(XMP)	4GB (2x 2GB)	DS	-	-	9-9-9-24	1.5	*	*	*
G.SKILL	F3-12800CL7D-4GBECO(XMP)	4GB (2x 2GB)	DS	-	-	7-8-7-24	-	*	*	*
G.SKILL	F3-12800CL7D-4GBRH(XMP)	4GB (2x 2GB)	DS	-	-	7-7-7-24	1.65	*	*	*
G.SKILL	F3-12800CL8D-4GBRM(XMP)	4GB (2x 2GB)	DS	-	-	8-8-8-24	1.6	*	*	*
G.SKILL	F3-12800CL9D-4GBECO(XMP)	4GB (2x 2GB)	DS	-	-	9-9-9-24	1.35	*	*	*
G.SKILL	F3-12800CL8T-6GBPI(XMP)	6GB (3x 2GB)	DS	-	-	8-8-8-21	1.6-1.65	*	*	*
G.SKILL	F3-12800CL7D-8GBRH(XMP)	8GB (2x 4GB)	DS	-	-	7-8-7-24	1.6	*	*	*
G.SKILL	F3-12800CL9D-8GBRL(XMP)	8GB (2x 4GB)	DS	-	-	9-9-9-24	1.5	*	*	*
G.SKILL	F3-12800CL8D-8GBECO(XMP)	8GB (2x 4GB)	DS	-	-	8-8-8-24	1.35	*	*	*
GEIL	GET316GB1600C9QC(XMP)	16GB (4x 4GB)	DS	-	-	9-9-9-28	1.6	*	*	*
GEIL	GE34GB1600C9DC(XMP)	4GB (2x 2GB)	DS	-	-	9-9-9-28	1.6	*	*	*
GEIL	GUP34GB1600C7DC(XMP)	4GB (2x 2GB)	DS	-	-	7-7-7-24	1.6	*	*	*
GEIL	GVP38GB1600C8QC(XMP)	8GB (4x 2GB)	DS	-	-	8-8-8-28	1.6	*	*	*
KINGMAX	FLGD45F-B8MF7(XMP)	1GB	SS	-	-	-	-	*	*	*
KINGSTON	KHX1600C9D3K3/12GX(XMP)	12GB (3x 4GB)	DS	N/A	-	-	1.65	*	*	*
KINGSTON	KHX1600C7D3K2/4GX(XMP)	4GB (2x 2GB)	DS	-	-	-	1.65	*	*	*

SABERTOOTH 990FX Motherboard Qualified Vendors Lists (QVL)

AM3 DDR3 1600 MHz capability

Vendors	Part No.	Size	SS/DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)		
								1 DIMM	2 DIMM	4 DIMM
KINGSTON	KHX1600C9D3K2/4GX(XMP)	4GB (2x 2GB)	DS	-	-	-	1.65	*	*	*
KINGSTON	KHX1600C9D3K2/4GX(XMP)	4GB (2x 2GB)	DS	-	-	-	1.65	*	*	*
Kingston	KHX1600C9D3LK2/4GX(XMP)	4GB (2x 2GB)	DS	-	-	-	1.65	*	*	*
KINGSTON	KHX1600C9D3X2K2/4GX(XMP)	4GB (2x 2GB)	DS	-	-	9	1.65	*	*	*
KINGSTON	KHX1600C9D3K3/6GX(XMP)	6GB (3x 2GB)	DS	-	-	9	1.65	*	*	*
KINGSTON	KHX1600C9D3T1K3/6GX(XMP)	6GB (3x 2GB)	DS	-	-	-	1.65	*	*	
OCZ	OCZ3G16004GK	4GB (2x 2GB)	DS	-	-	8-8-8	1.7	*	*	
OCZ	OCZ3BE1600C8LV4GK	4GB (2x 2GB)	DS	-	-	8-8-8	1.65	*		
OCZ	OCZ3BE1600C8LV4GK	4GB (2x 2GB)	DS	-	-	8-8-8	1.65	*	*	*
OCZ	OCZ3OB1600LV4GK	4GB (2x 2GB)	DS	-	-	9-9-9	1.65	*	*	*
OCZ	OCZ3X1600LV4GK(XMP)	4GB (2x 2GB)	DS	-	-	8-8-8	1.65	*	*	*
OCZ	OCZ3G1600LV6GK	6GB(3 x 2GB)	DS	-	-	8-8-8	1.65	*	*	
OCZ	OCZ3X1600LV6GK(XMP)	6GB(3 x 2GB)	DS	-	-	8-8-8	1.65	*	*	*
OCZ	OCZ3X1600LV6GK(XMP)	6GB(3 x 2GB)	DS	-	-	8-8-8	1.65	*	*	*
Super Talent	WP160UX4G8(XMP)	4GB(2 x 2GB)	DS	-	-	8	-	*	*	
Super Talent	WP160UX4G9(XMP)	4GB(2 x 2GB)	DS	-	-	9	-	*	*	*
Super Talent	WB160UX6G8(XMP)	6GB(3 x 2GB)	DS	-	-	-	-	*	*	*
Super Talent	WB160UX6G8(XMP)	6GB(3 x 2GB)	DS	-	-	8	-	*	*	*
AEXEA	AXA3PS2G1600S18V(XMP)	2GB	DS	-	-	-	1.65	*	*	*
AEXEA	AXA3PS4GK1600S18V(XMP)	4GB (2x 2GB)	DS	-	-	-	1.65	*	*	*
Asint	SLZ3128M8-EGJ1D(XMP)	2GB	DS	Asint	3128M8-GJ1D	-	-	*	*	*
EK Memory	EKM324L28BP8-116(XMP)	4GB(2x 2GB)	DS	-	-	9	-	*	*	*
EK Memory	EKM324L28BP8-116(XMP)	4GB(2 x 2GB)	DS	-	-	9	-	*	*	*
Elixir	M2P2G64CB8HC9N-DG(XMP)	2GB	DS	-	-	-	-	*	*	*
GoodRam	GR1600D364L9/2G	2GB	DS	GoodRam	GF1008KC-JN	-	-	*	*	*
KINGTIGER	KTG2G1600PG3(XMP)	2GB	DS	-	-	-	-	*	*	*
Mushkin	996805(XMP)	4GB (2x 2GB)	DS	-	-	6-8-6-24	1.65	*	*	*
Mushkin	996805(XMP)	6GB (3x 2GB)	DS	-	-	6-8-6-24	1.65	*	*	*
Patriot	PX7312G1600LLK(XMP)	12GB (3x 4GB)	DS	-	-	8-9-8-24	1.65	*	*	*
Patriot	PGS34G1600LLKA2	4GB (2x 2GB)	DS	-	-	8-8-8-24	1.7	*	*	*
Patriot	PGS34G1600LLKA	4GB(2x 2GB)	DS	-	-	7-7-7-20	1.7	*	*	*
PATRIOT	PGS34G1600LLKA	4GB(2 x 2GB)	DS	-	-	7-7-7-20	1.7	*	*	*
Patriot	PVT36G1600LLK(XMP)	6GB(3 x 2GB)	DS	-	-	8-8-8-24	1.65	*	*	*
Patriot	PX538G1600LLK(XMP)	8GB (2x 4GB)	DS	-	-	8-9-8-24	1.65	*	*	*
Team	TXD31024M1600C8-D(XMP)	1GB	SS	Team	T3D1288RT-16	8-8-8-24	1.65	*	*	*
Team	TXD32048M1600C7-L(XMP)	2GB	DS	Team	T3D1288LT-16	7-7-7-24	1.65	*	*	
Team	TXD32048M1600HC8-D(XMP)	2GB	DS	Team	T3D1288RT-16	8-8-8-24	1.65	*	*	*

SABERTOOTH 990FX Motherboard Qualified Vendors Lists (QVL) AM3 DDR3 1800 MHz capability

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

SABERTOOTH 990FX Motherboard Qualified Vendors Lists (QVL) AM3 DDR3 1866 MHz capability

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

SABERTOOTH 990FX Motherboard Qualified Vendors Lists (QVL) AM3 DDR3 2000 MHz capability

Vendors	Part No.	Size	SS/ DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)		
								1 DIMM	2 DIMM	4 DIMM
A-DATA	AX3U2000GB2G9B(XMP)	2GB	DS	-	-	9-11-9-27	1.55~1.75	*		
A-DATA	AX3U2000GC4G9B(XMP)	4GB	DS	-	-	9-11-9-27	1.55~1.75	*		
Apacer	78.AAGD5.9KD(XMP)	8GB (3 x 2GB)	DS	-	-	9-9-9-27	-	*	*	
CORSAIR	CMT6GX3M3A2000C8(XMP)	6GB (3x 2GB)	DS	-	-	8-9-8-24	1.65	*		
G.SKILL	F3-16000CL9D-4GBRH(XMP)	4GB (2 x 2GB)	DS	-	-	9-9-9-24	1.65	*	*	
G.SKILL	F3-16000CL9D-4GBTD(XMP)	4GB (2 x 2GB)	DS	-	-	9-9-9-24	1.65	*	*	
G.SKILL	F3-16000CL9T-6GBPS(XMP)	6GB (3 x 2GB)	DS	-	-	9-9-9-24	1.65	*		
G.SKILL	F3-16000CL7Q-8GBFLS(XMP)	8GB (4 x 2GB)	DS	-	-	7-9-7-24	1.65	*		
GEIL	GE38GB2000C9QC(XMP)	8GB (4 x 2GB)	DS	-	-	9-9-9-28	1.65	*		
KINGSTON	KHX2000C9AD3T1K3/ 3GX(XMP)	3GB (3x 1GB)	SS	-	-	-	1.65	*		
KINGSTON	KHX2000C9AD3T1K2/ 4GX(XMP)	4GB (2x 2GB)	DS	-	-	9	1.65	*		
KINGSTON	KHX2000C9AD3T1K3/ 6GX(XMP)	6GB (3x 2GB)	DS	-	-	9	1.65	*		
KINGSTON	KHX2000C9AD3T1K3/ 6GX(XMP)	6GB (3x 2GB)	DS	-	-	-	1.65	*		
Transcend	TX2000KLN-8GK (388375)(XMP)	4GB	DS	-	-		1.6	*	*	
AEXEA	AXA3ES4GK2000LG28V(XMP)	4GB (2x 2GB)	DS	-	-	-	1.65	*	*	
Patriot	PX7312G2000ELK(XMP)	12GB (3x 4GB)	DS	-	-	9-11-9-27	1.65	*		
Patriot	PVT36G2000LLK(XMP)	6GB (3 x 2GB)	DS	-	-	8-8-8-24	1.65	*		
Silicon Power	SP002GBLYU200S02(XMP)	2GB	DS	-	-	-	-	*		
Team	TXD32048M2000C9(XMP)	2GB	DS	Team	T3D1288RT-20	9-9-9-24	1.5	*	*	
Team	TXD32048M2000C9-L(XMP)	2GB	DS	Team	T3D1288RT-20	9-9-9-24	1.6	*		

SABERTOOTH 990FX Motherboard Qualified Vendors Lists (QVL) AM3+ DDR3 2000 MHz capability

Vendors	Part No.	Size	SS/ DS	Chip Brand	Chip NO.	Timing	Voltage	DIMM socket support (Optional)		
								1 DIMM	2 DIMM	4 DIMM
A-DATA	AX3U2000GB2G9B(XMP)	2GB	DS	-	-	9-11-9-27	1.55~1.75	*	*	*
A-DATA	AX3U2000GC4G9B(XMP)	4GB	DS	-	-	9-11-9-27	1.55~1.75	*	*	*
Apacer	78.AAGD5.9KD(XMP)	6GB(3 x 2GB)	DS	-	-	9-9-9-27	-	*	*	*
G.SKILL	F3-16000CL9D-4GBTD(XMP)	4GB(2 x 2GB)	DS	-	-	9-9-9-24	1.65	*	*	*
G.SKILL	F3-16000CL9T-6GBPS(XMP)	6GB(3 x 2GB)	DS	-	-	9-9-9-24	1.65	*	*	*
G.SKILL	F3-16000CL9T-6GBTD(XMP)	6GB(3 x 2GB)	DS	-	-	9-9-9-24	1.6	*	*	*
GEIL	GUP34GB2000C9DC(XMP)	4GB (2x 2GB)	DS	-	-	9-9-9-28	1.65	*	*	*
GEIL	GE38GB2000C9QC(XMP)	8GB(4 x 2GB)	DS	-	-	9-9-9-28	1.65	*	*	*
KINGSTON	KHX2000C9AD3T1K3/ 3GX(XMP)	3GB (3x 1GB)	SS	-	-	-	1.65	*	*	*
KINGSTON	KHX2000C9AD3T1K2/ 4GX(XMP)	4GB (2x 2GB)	DS	-	-	9	1.65	*	*	*
KINGSTON	KHX2000C9AD3W1K2/ 4GX(XMP)	4GB (2x 2GB)	DS	-	-	9	1.65	*	*	*
KINGSTON	KHX2000C9D3T1K2/ 4GX(XMP)	4GB (2x 2GB)	DS	-	-	-	1.65	*	*	*
KINGSTON	KHX2000C9AD3T1K3/ 6GX(XMP)	6GB (3x 2GB)	DS	-	-	9	1.65	*	*	*
KINGSTON	KHX2000C9AD3T1K3/ 6GX(XMP)	6GB (3x 2GB)	DS	-	-	-	1.65	*	*	*
Gingie	9CAASS37AZZ01D1	2GB	DS	-	-	9-9-9-24	-	*	*	*
Patriot	PVT36G2000LLK(XMP)	6GB(3 x 2GB)	DS	-	-	8-8-8-24	1.65	*	*	*



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

DIMM support:

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

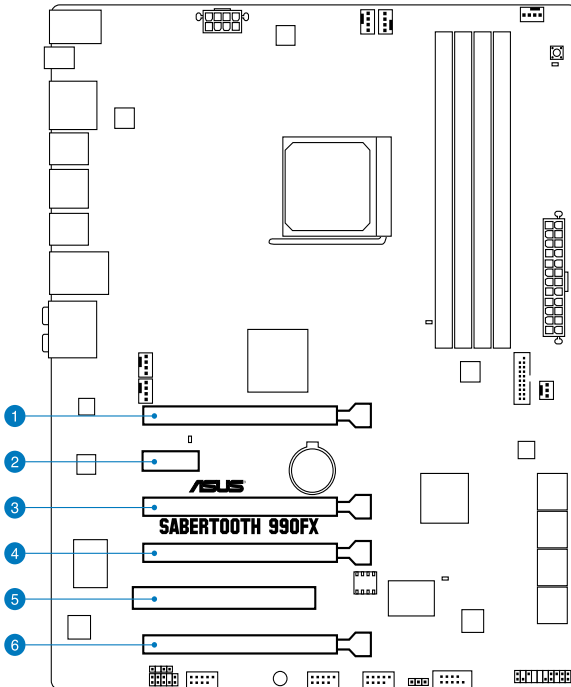


- When installing total memory of 4GB capacity or more, Windows 32-bit operation system may only recognize less than 3GB. Hence, a total installed memory of less than 3GB is recommended.
- The default DIMM frequency depends on its Serial Presence Detect (SPD), which is the standard way of accessing information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

2.2.4 Expansion slots



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



Slot No.	Slot Description
1	PCIe 2.0 x16_1 slot (single at x16, dual at x16/x16, triple at x16/x8/x8 mode)
2	PCIe 2.0 x1_1 slot
3	PCIe 2.0 x16_2 slot
4	PCIe 2.0 x16_3 slot
5	PCI slot 1
6	PCIe 2.0 x16_4 slot

VGA configuration	PCI Express operating mode			
	PCIe 2.0 x16_1	PCIe 2.0x16_2	PCIe 2.0x16_3	PCIe 2.0x16_4
Single VGA/PCIe card	x16 (Recommend for single VGA)	N/A	N/A	N/A
Dual VGA/PCIe card	x16	N/A	x16	N/A
3-way SLI	x16	N/A	x8	x8



- In single VGA card mode, use the PCIe 2.0 x16_1 slot (beige) for a PCI Express x16 graphics card to get better performance.
- In CrossFireX™ or SLI™ mode, use the PCIe 2.0 x16_1 and PCIe 2.0 x16_3 slots for PCI Express x16 graphics cards to get better performance.
- In 3-way SLI mode, use the PCIe 2.0 x16_1/PCIe 2.0 x16_3/PCIe 2.0 x16_4 slots for PCI Express x16 graphic cards to get better performance.
- We recommend that you provide sufficient power when running CrossFireX™ or SLI™ mode.
- Connect a chassis fan to the motherboard connector labeled CHA_FAN1/2 when using multiple graphics cards for better thermal environment.

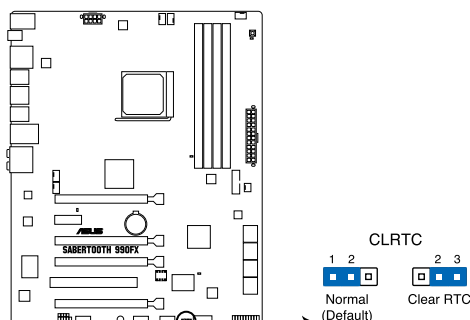
IRQ assignments for this motherboard

	A	B	C	D	E	F	G	H
VIA6308 (1394)	–	–	–	–	–	–	shared	–
Realtek 8111E (LAN)	–	shared	–	–	–	–	–	–
JMicron ATA Controller 0	–	–	–	–	shared	–	–	–
JMicron ATA Controller 1	–	–	–	–	–	–	shared	–
ASM USB 3.0	–	–	–	shared	–	–	–	–
Onchip SATA Controller	–	–	–	shared	–	–	–	–
Onchip USB1	–	–	shared	–	–	–	–	–
Onchip USB2	–	–	shared	–	–	–	–	–
Onchip Azalix	shared	–	–	–	–	–	–	–
PCI Slot1	–	–	–	–	shared	–	–	–
PCIEX16_1	shared	–	–	–	–	–	–	–
PCIEX16_2	–	–	–	–	shared	–	–	–
PCIEX16_3	–	–	–	shared	–	–	–	–
PCIEX16_4	shared	–	–	–	–	–	–	–
PCIEX1_1	shared	–	–	–	–	–	–	–

2.2.5 Jumper

Clear RTC RAM (3-pin CLRTC)

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



SABERTOOTH 990FX Clear RTC RAM

To erase the RTC RAM

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



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



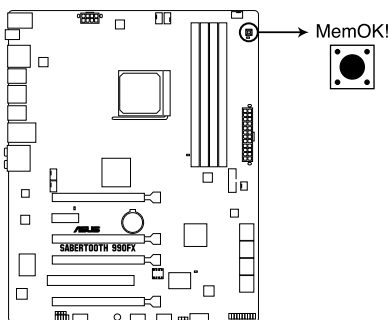
- If the steps above do not help, remove the onboard battery and move the jumper again to clear the CMOS RTC RAM data. After the CMOS clearance, reinstall the battery.
- You do not need to clear the RTC when the system hangs due to overclocking. For system failure due to overclocking, use the C.P.R.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

2.2.6 Onboard switch

The onboard switch allows 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.

MemOK! switch

Installing DIMMs that are incompatible with the motherboard may cause system boot failure, and the DRAM_LED near the MemOK! switch lights continuously. Press and hold the MemOK! switch until the DRAM_LED starts blinking to begin automatic memory compatibility tuning for successful boot.



SABERTOOTH 990FX MemOK! switch

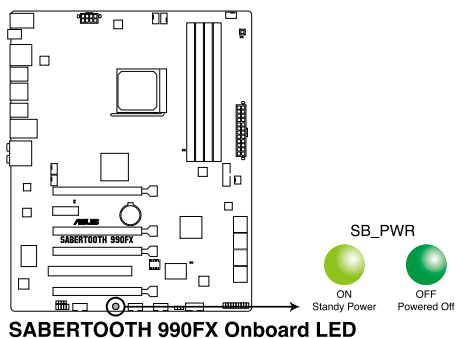


- Refer to section **2.2.7 Onboard LEDs** for the exact location of the DRAM_LED.
- The DRAM_LED also lights when the DIMM is not properly installed. Turn off the system and reinstall the DIMM before using the MemOK! function.
- The MemOK! switch does not function under Windows™ OS environment.
- During the tuning process, the system loads and tests failsafe memory settings. It takes about 30 seconds for the system to test one set of failsafe settings. If the test fails, the system reboots and test the next set of failsafe settings. The blinking speed of the DRAM_LED increases, indicating different test processes.
- Due to memory tuning requirement, the system automatically reboots when each timing set is tested. If the installed DIMMs still fail to boot after the whole tuning process, the DRAM_LED lights continuously. Replace the DIMMs with ones recommended in the Memory QVL (Qualified Vendors Lists) in this user manual or on the ASUS website at www.asus.com.
- If you turn off the computer and replace DIMMs during the tuning process, the system continues memory tuning after turning on the computer. To stop memory tuning, turn off the computer and unplug the power cord for about 5–10 seconds.
- If your system fail to boot due to BIOS overclocking, press the MemOK! switch to boot and load BIOS default settings. A message will appear during POST reminding you that the BIOS has been restored to its default settings.
- We recommend that you download and update to the latest BIOS version from the ASUS website at www.asus.com after using the MemOK! function.

2.2.7 Onboard LEDs

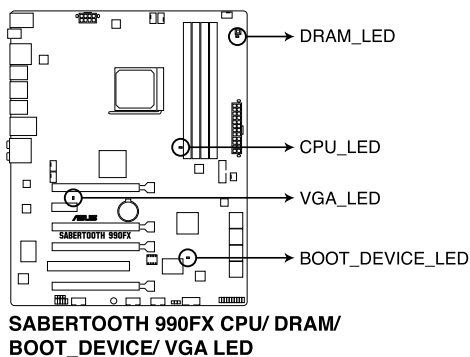
1. Standby Power LED

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



2. POST State LEDs

The POST State LEDs of CPU, DRAM, VGA card, and HDD indicate key components status during POST (Power-on Self Test). If an error is found, the LED next to the error device will continue lighting until the problem is solved. This user-friendly design provides an intuitional way to locate the root problem within a second.

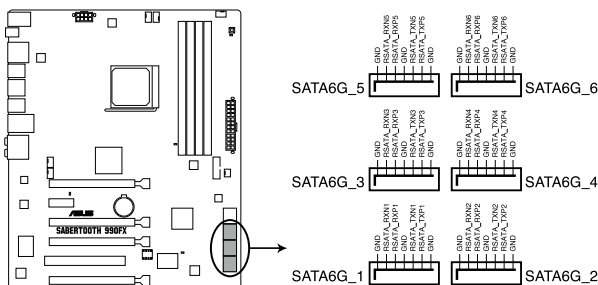


2.2.8 Internal connectors

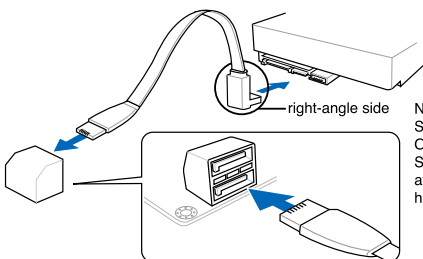
1. AMD® Serial ATA 6.0 Gb/s connectors (7-pin SATA6G_1-6 [brown])

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

If you installed Serial ATA hard disk drives, you can create a RAID 0, 1, 5, and 10 configuration through the onboard AMD® SB950 chipset.



SABERTOOTH 990FX SATA 6 0 Gb/s connectors



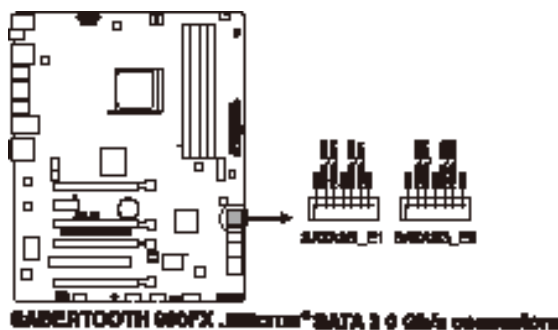
NOTE: Connect the right-angle side of SATA signal cable to SATA device.
Or you may connect the right-angle side of SATA cable to the onboard SATA port to avoid mechanical conflict with huge graphics cards.



- These connectors are set to [AHCI Mode] by default. 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 **4.4 RAID configurations** or the manual bundled in the motherboard support DVD.
- When using hot-plug and 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 Service Pack 3 or later versions.

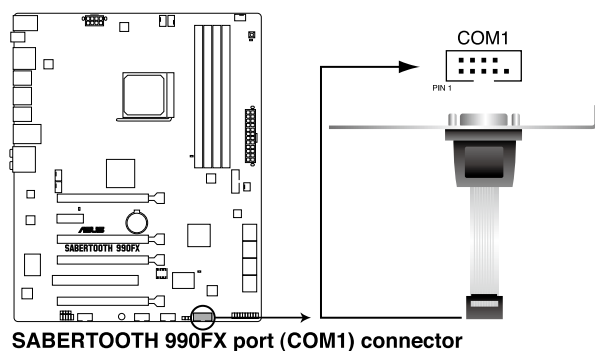
2. JMicron® JMB362 Serial ATA 3.0 Gb/s connectors (7-pin SATA3G_E1/E2 [black])

These connectors connect to Serial ATA 3.0 Gb/s hard disk drives and optical disc drives via Serial ATA 3.0 Gb/s signal cables.



3. Serial port connector (10-1 pin COM1)

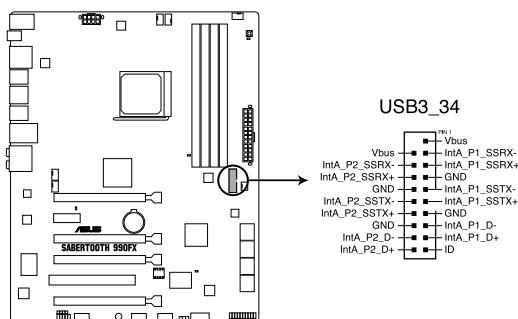
This connector is for a serial (COM) port. Connect the serial port module cable to this connector, then install the module to a slot opening at the back of the system chassis.



The COM module is purchased separately.

4. USB 3.0 connector (20-pin USB3_34)

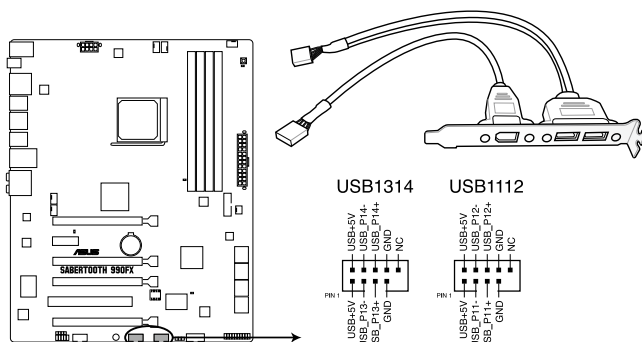
This connector is for the additional USB 3.0 ports, and complies with the USB 3.0 specification that supports up to 480 MBps connection speed. If the USB 3.0 front panel cable is available from your system chassis, with this USB 3.0 connector, you can have a front panel USB 3.0 solution.



SABERTOOTH 990FX USB3.0 connector

5. USB 2.0 connectors (10-pin USB1112; USB1314)

These connectors are for USB 2.0 ports. Connect the USB module cable to any of these connectors, then install the module to a slot opening at the back of the system chassis. These USB connectors comply with USB 2.0 specification that supports up to 48 MBps connection speed.



SABERTOOTH 990FX USB2.0 connectors



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



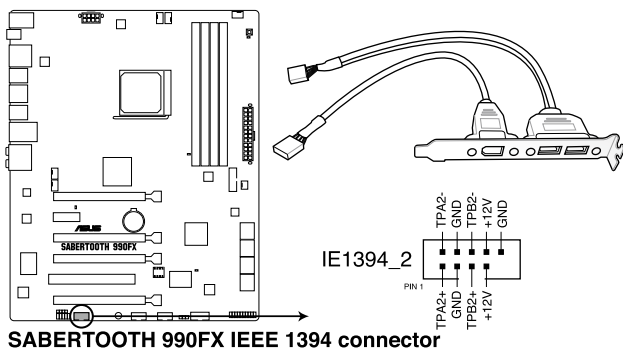
You can connect the front panel USB cable to the ASUS Q-Connector (USB, blue) first, and then install the Q-Connector (USB) to the USB connector onboard if your chassis supports front panel USB ports.



The USB module cable is purchased separately.

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

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



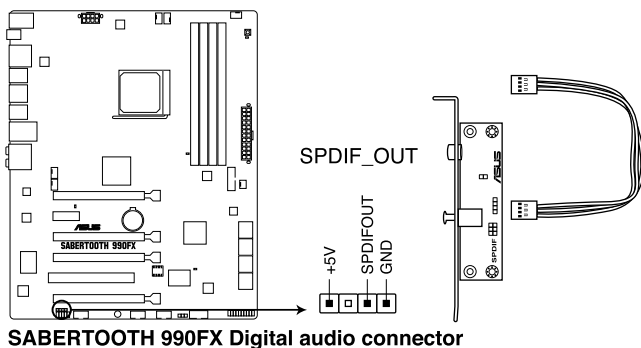
Never connect a USB cable to the IEEE 1394a connector. Doing so will damage the motherboard!



The IEEE 1394a module is purchased separately.

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

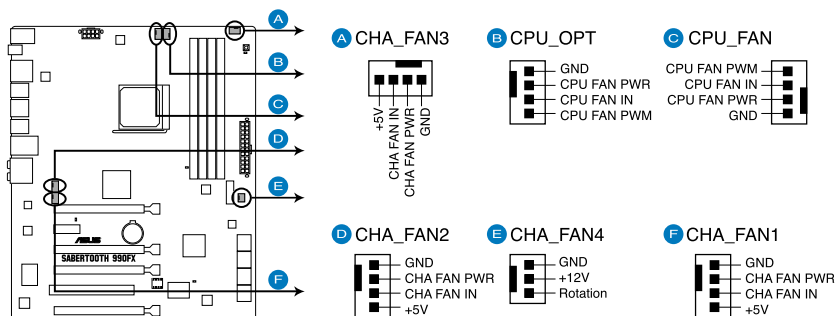
This connector is for an additional Sony/Philips Digital Interface (S/PDIF) port(s). Connect the S/PDIF Out module cable to this connector, then install the module to a slot opening at the back of the system chassis.



The S/PDIF module is purchased separately.

8. CPU and chassis fan connectors (4-pin CPU_FAN; CPU_OPT FAN; CHA_FAN1-3; 3-pin CHA_FAN4)

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.



SABERTOOTH 990FX Fan connectors



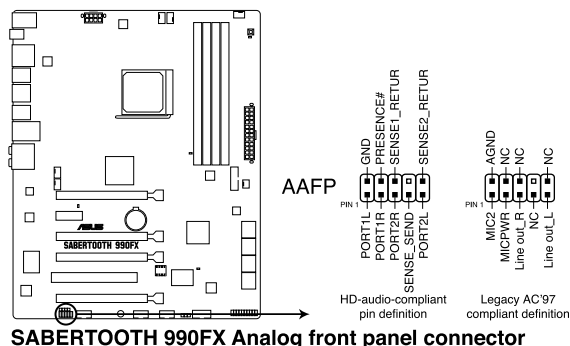
Do not forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan connectors!



- 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 or CHA_FAN2 for better thermal environment.

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

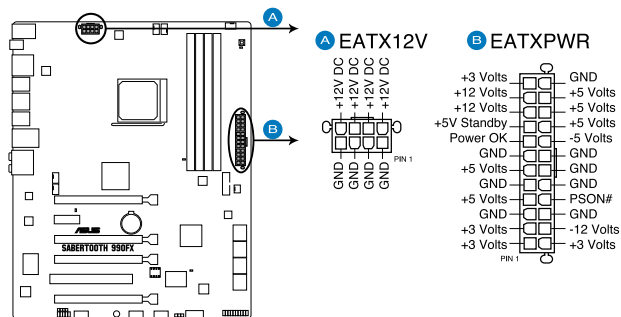
This connector is for a chassis-mounted front panel audio I/O module that supports either HD Audio or legacy AC'97 audio standard. Connect one end of the front panel audio I/O module cable to this connector.



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

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

These connectors are for ATX power supply plugs. The power supply plugs are designed to fit these connectors in only one orientation. Find the proper orientation and push down firmly until the connectors completely fit.

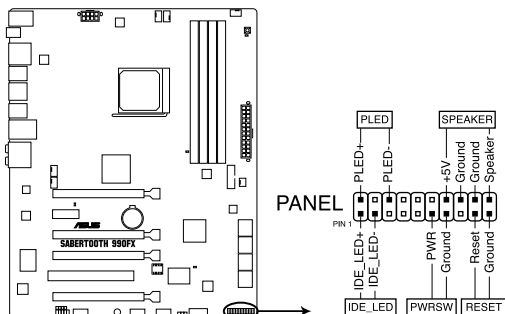




-
- For a fully configured system, we recommend that you use a power supply unit (PSU) that complies with ATX 12 V Specification 2.0 (or later version) and provides a minimum power of 350 W.
 - Do not forget to connect the 4-pin/8-pin EATX12 V power plug; otherwise, the system will not boot.
 - Use of a PSU with a higher power output is recommended when configuring a system with more power-consuming devices. The system may become unstable or may not boot up if the power is inadequate.
 - If you 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.



SABERTOOTH 990FX 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)**

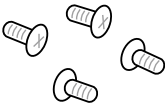


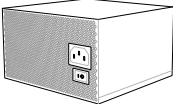

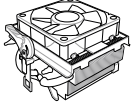
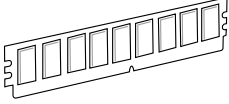
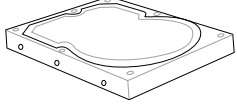
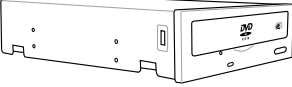
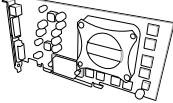
This connector is for the system power button. Pressing the power button turns the system on or puts the system in sleep or soft-off mode depending on the BIOS settings. Pressing the power switch for more than four seconds while the system is ON turns the system OFF.

- **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.

2.3 Building your computer system

2.3.1 Additional tools and components to build a PC system

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



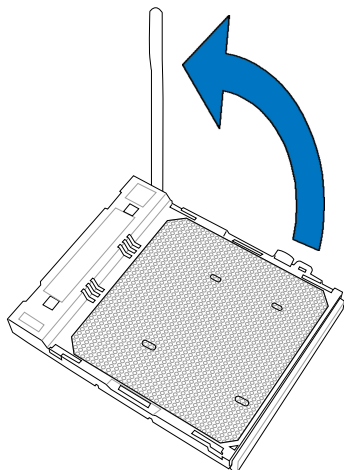
The tools and components in the table above are not included in the motherboard package.

2.3.2 CPU installation

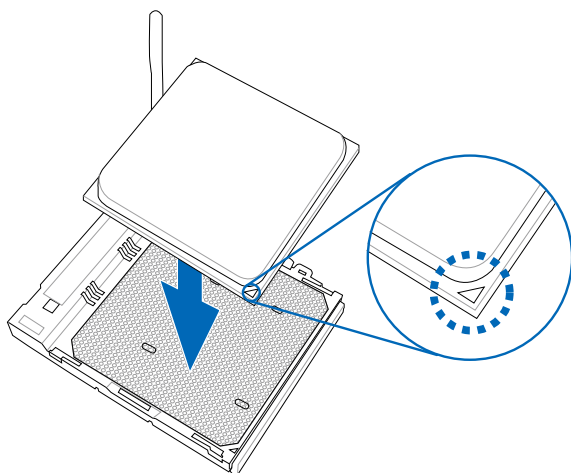


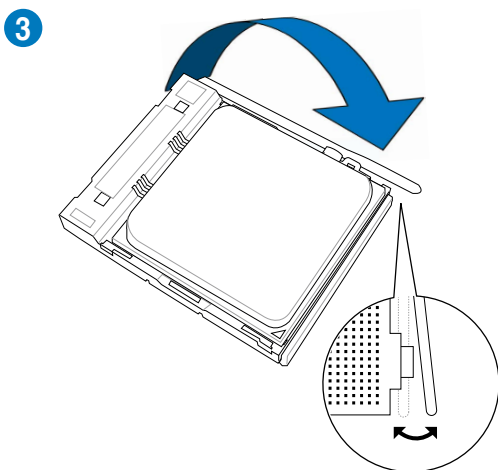
The AMD AM3+ socket is compatible with AMD AM3+ and AM3 processors. Ensure you use a CPU designed for the AM3+ socket. The CPU fits in only one correct orientation. DO NOT force the CPU into the socket to prevent bending the connectors on the socket and damaging the CPU!

1

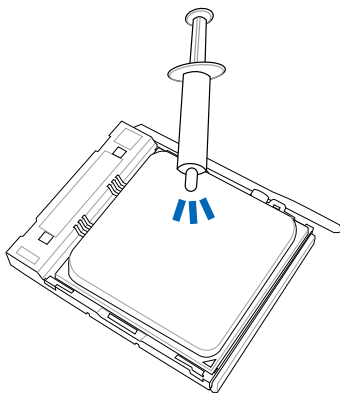


2





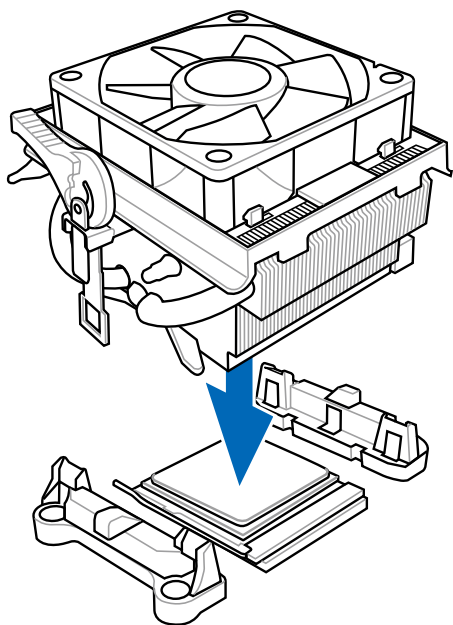
2.3.3 CPU heatsink and fan assembly installation



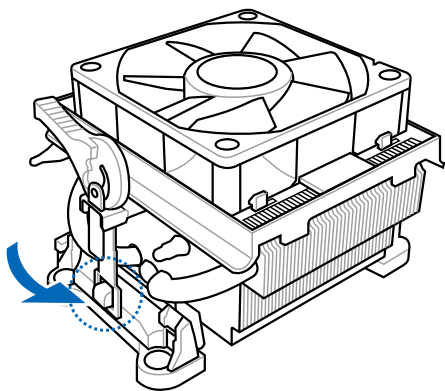
Apply the Thermal Interface Material to the CPU heatsink and CPU before you install the heatsink and fan if necessary.

To install the CPU heatsink and fan assembly

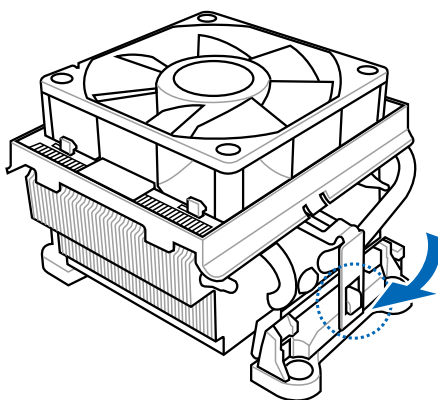
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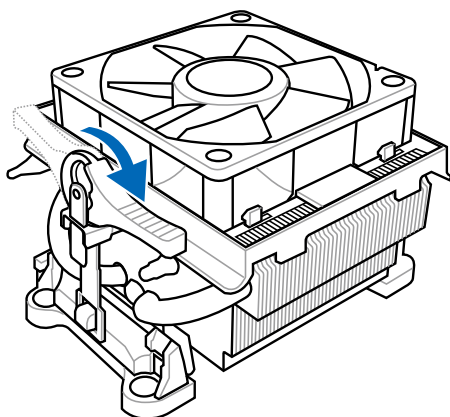
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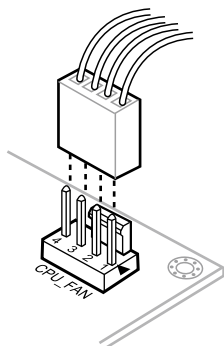
3



4



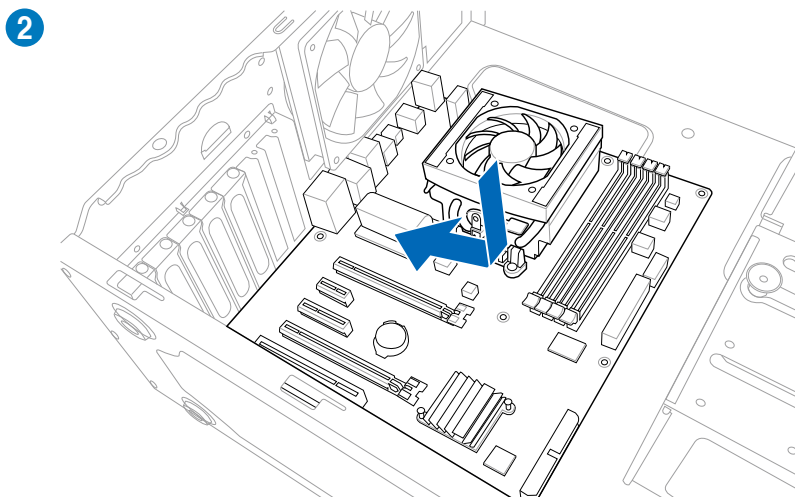
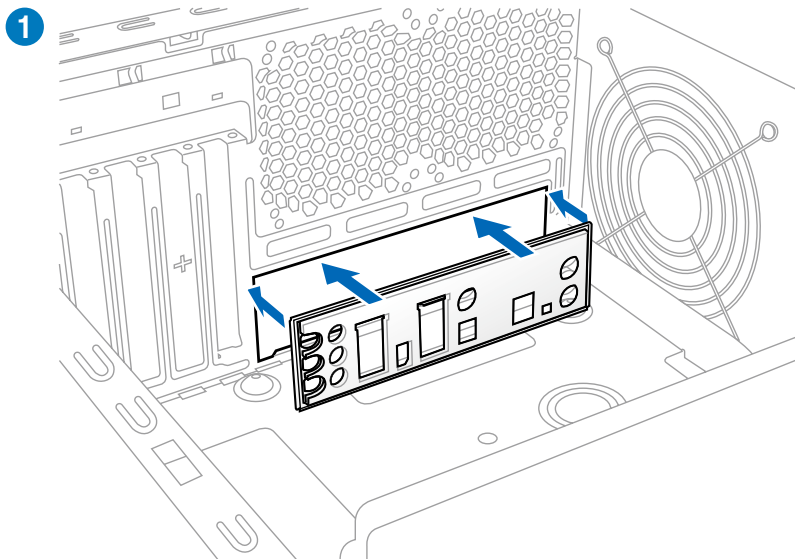
5



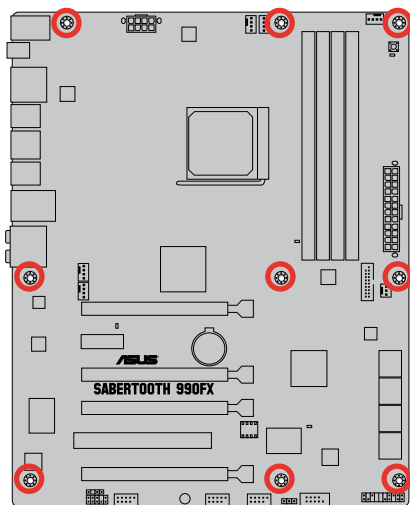
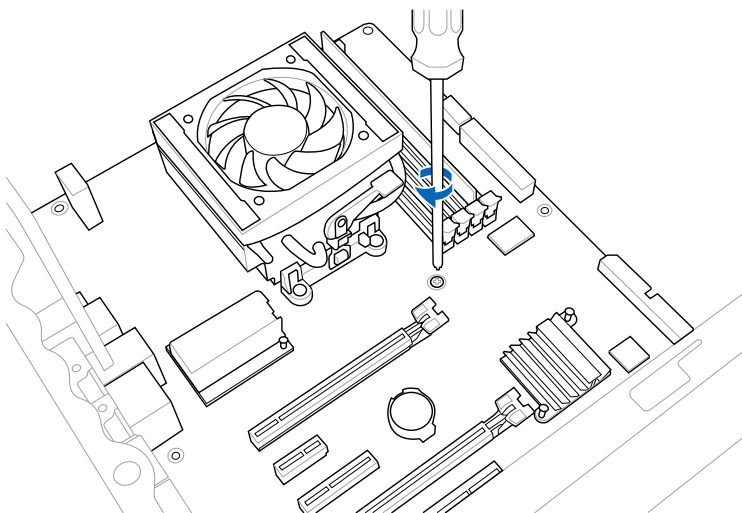
2.3.5 Motherboard installation



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



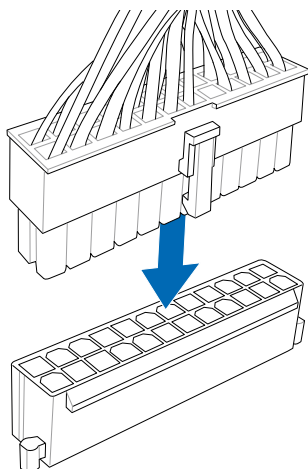
3



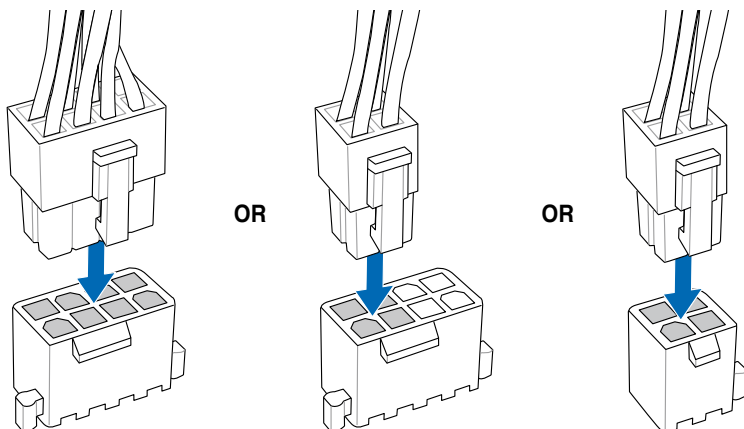
DO NOT overtighten the screws! Doing so can damage the motherboard.

2.3.6 ATX Power connection

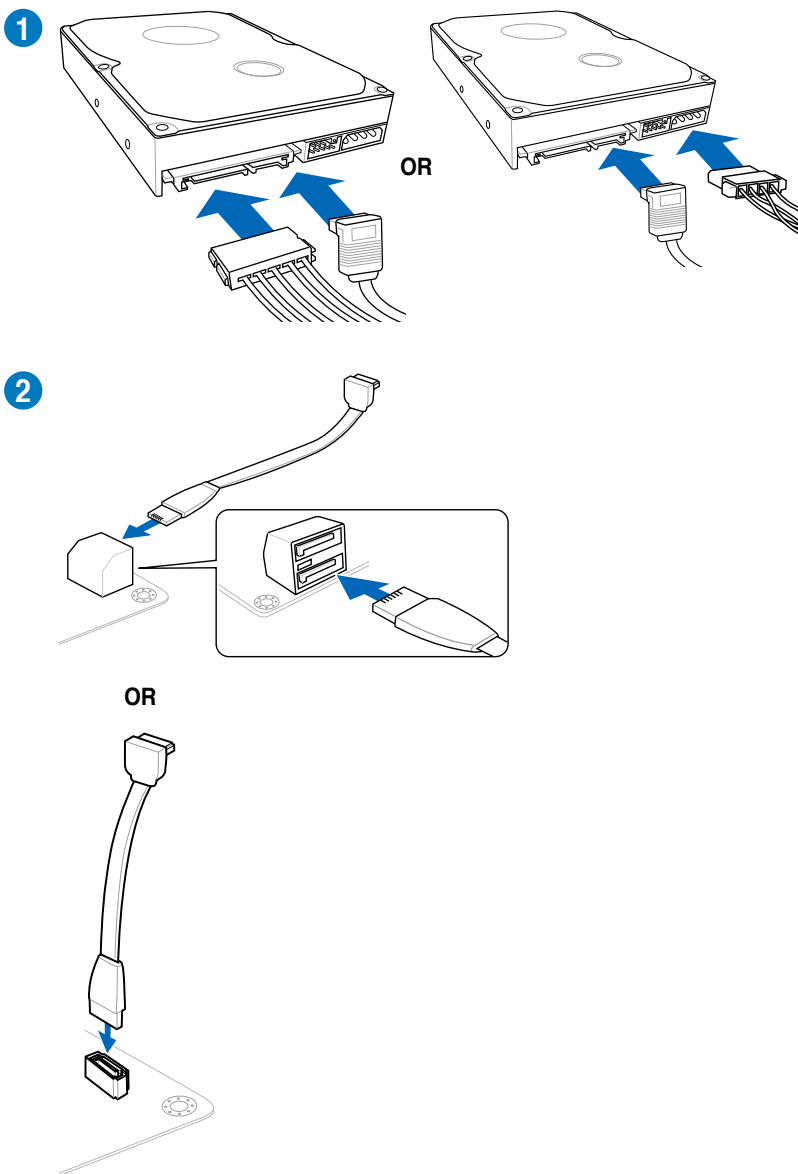
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2

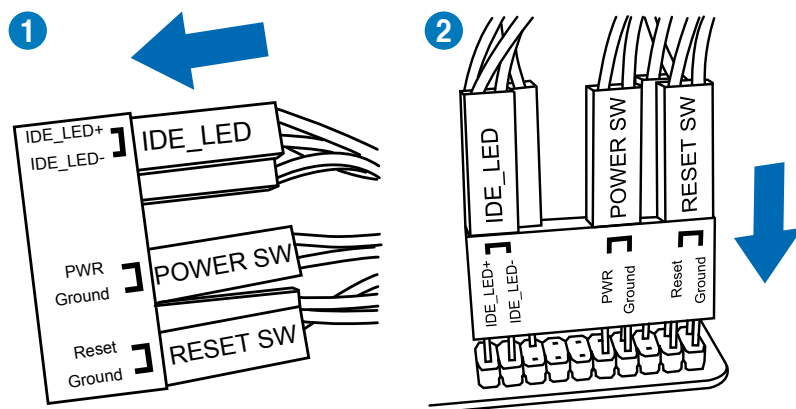


2.3.7 SATA device connection

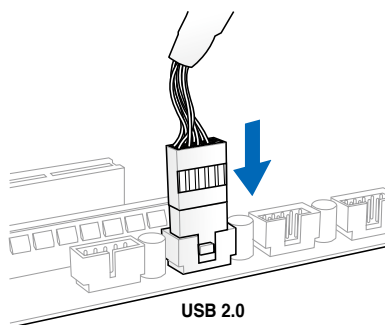


2.3.8 Front I/O Connector

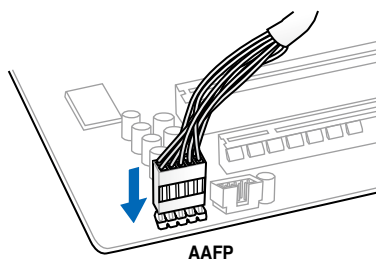
To install ASUS Q-Connector



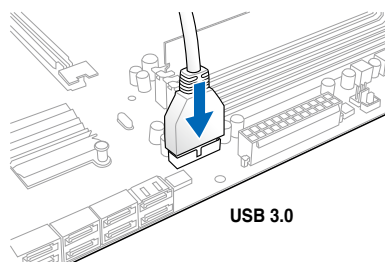
To install USB 2.0 Connector



To install front panel audio connector

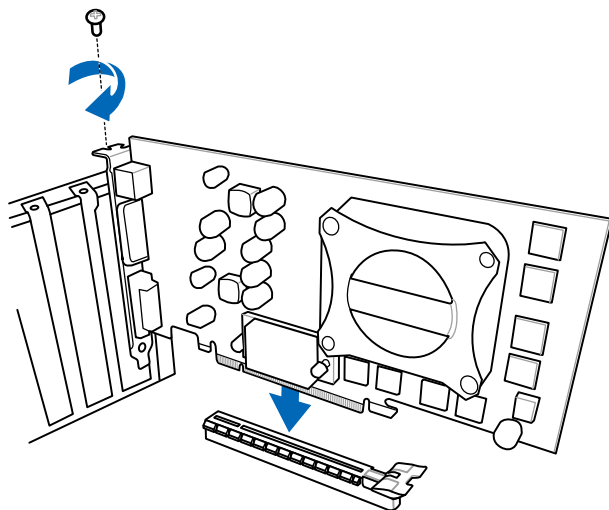


To install USB 3.0 Connector

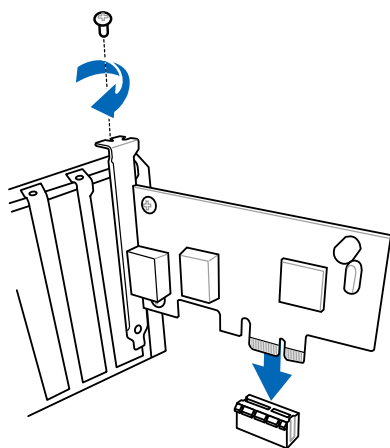


2.3.9 Expansion Card installation

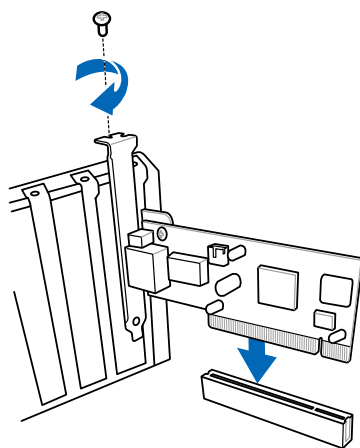
To install PCIe x16 cards



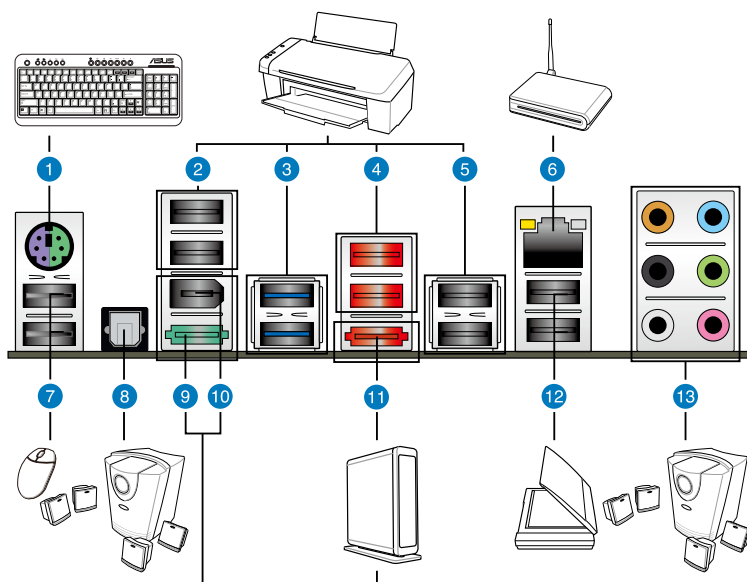
To install PCIe x1 cards



To install PCI cards



2.3.10 Rear panel connection



Rear panel connectors

1. PS/2 keyboard/mouse combo port	8. Optical S/PDIF Out port
2. USB 2.0 ports 5 and 6	9. Power External SATA port
3. USB 3.0 ports 1 and 2	10. IEEE 1394a port
4. USB 2.0 ports 3 and 4	11. External SATA port
5. USB 2.0 ports 9 and 10	12. USB 2.0 ports 1 and 2
6. LAN1 (RJ-45) port*	13. Audio I/O ports**
7. USB 2.0 ports 7 and 8	

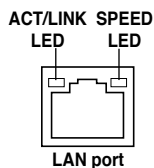
* and **: Refer to the tables on the next page for LAN port LED and audio port definitions.



- DO NOT insert a different connector to the external SATA port.
- DO NOT connect a keyboard/mouse to any USB 3.0 port when installing Windows® operating system.
- 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.
- If you want to use the hot-plug function of the external SATA ports, you have to set the **JMB Storage Controller** item in the BIOS setting to [Enabled] and install the **JMicron JMB36X Controller Driver** from the motherboard support DVD. Refer to section 3.5.6 **Onboard Devices Configuration** for details.

* 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



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

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

2.3.11 Audio I/O connections

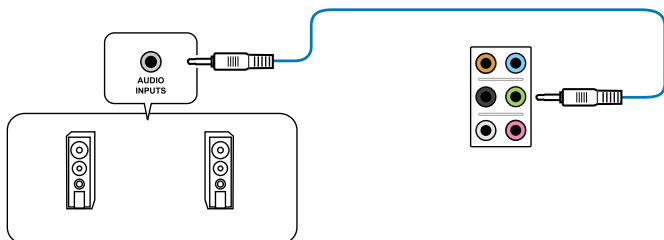
Audio I/O ports



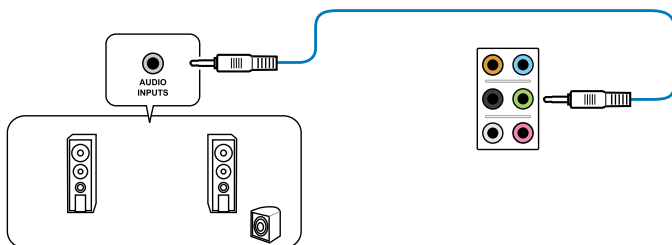
Connect to Headphone and Mic



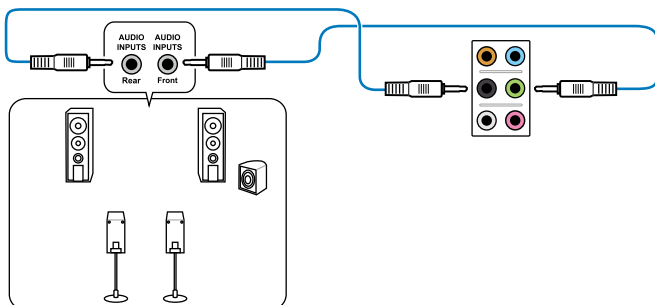
Connect to Stereo Speakers



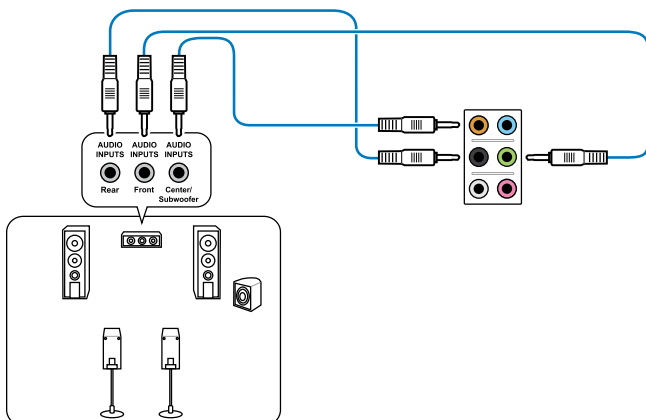
Connect to 2.1 channel Speakers



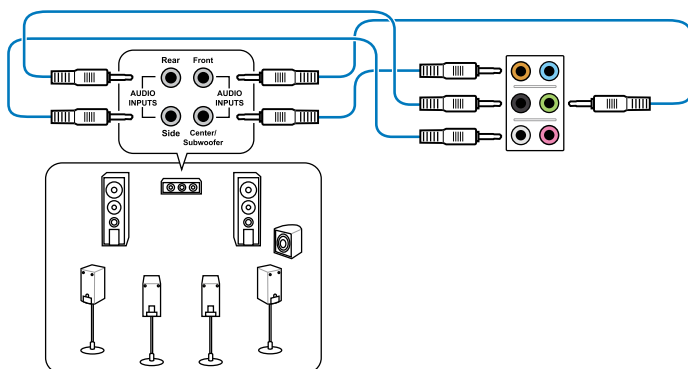
Connect to 4.1 channel Speakers



Connect to 5.1 channel Speakers



Connect to 7.1 channel Speakers



2.4 Starting up for the first time

1. After making all the connections, replace the system case cover.
2. Be sure that all switches are off.
3. Connect the power cord to the power connector at the back of the system chassis.
4. Connect the power cord to a power outlet that is equipped with a surge protector.
5. Turn on the devices in the following order:
 - a. Monitor
 - b. External SCSI devices (starting with the last device on the chain)
 - c. System power
6. After applying power, the system power LED on the system front panel case lights up. For systems with ATX power supplies, the system LED lights up when you press the ATX power button. If your monitor complies with 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 or POST. While the tests are running, the BIOS beeps (refer to the BIOS beep codes table below) or additional messages appear on the screen. If you do not see anything within 30 seconds from the time you turned on the power, the system may have failed a power-on test. Check the jumper settings and connections or call your retailer for assistance.

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

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

2.5 Turning off the computer

While the system is ON, pressing the power switch for less than four seconds puts the system on sleep mode or soft-off mode, depending on the BIOS setting. Pressing the power switch for more than four seconds lets the system enter the soft-off mode regardless of the BIOS setting.

Chapter 3

3.1 Knowing BIOS



The new ASUS UEFI BIOS is an Extensible Firmware Interface that complies with UEFI architecture, offering a user-friendly interface that goes beyond traditional keyboard-only BIOS controls to enable more flexible and convenient mouse input. Users can easily navigate the new UEFI BIOS with the same smoothness as their 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 optimum performance. We recommend that you not change the default BIOS settings except in the following circumstances:

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



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

3.2 BIOS setup program

A BIOS setup program is provided for BIOS item modification. When you start up the computer, the system provides you with the opportunity to run this program. Press during the Power-On Self-Test (POST) to enter the Setup utility. Otherwise, POST continues with its test routines.

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



- The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.
- Ensure that a USB mouse is connected to your motherboard if you want to use the mouse to control the BIOS setup program.
- If the system becomes unstable after changing any BIOS setting, load the default settings to ensure system compatibility and stability. Select the **Load Optimized Defaults** item under the **Exit** menu. See section 3.9 **Exit Menu** for details.
- If the system fails to boot after changing any BIOS setting, try to clear the CMOS and reset the motherboard to the default value. See section 2.2.5 **Jumper** for information on how to erase the RTC RAM.
- The BIOS setup program does not support the bluetooth devices.

The BIOS setup program is designed to make it as easy to use as possible. Being a menu-driven program, it lets you scroll through the various submenus and select from the available options using a keyboard or a USB mouse.

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

3.2.1 EZ Mode

By default, the EZ Mode screen appears when you enter the BIOS setup program. The EZ Mode provides you an overview of the basic system information, and allows you to select the display language, system performance mode and boot device priority. To access the Advanced Mode, click **Exit/Advanced Mode**, then select **Advanced Mode**.



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

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

Selects the display language of the BIOS setup program

Clicks to display all fan speeds if available

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

ASUS UEFI BIOS Utility - EZ Mode

SABERTOOTH P67
BIOS Version : 0121
CPU Type : AMD Phenom(tm) II X4 965 Processor
Total Memory : 1024 MB

Build Date : 04/11/2011
Speed : 3448 MHz

Monday 4/11/2011

Temperature Voltage Fan Speed

CPU +138.2°F/+60.0°C
MB +93.2°F/+34.0°C

CPU 1.356V 5V 5.078V
3.3V 3.288V 12V 11.891V

CPU FAN 4245RPM CPU OPT FAN N/A
CHASSIS FAN N/A CHASSIS FAN2 N/A

System Performance

Quiet Performance Energy Saving

Normal

Boot Priority

Use the mouse to drag or keyboard to navigate to decide the boot priority.

Boot Menu(F8) Default(F5)

Selects the boot device priority

Power Saving mode

Normal mode

Selects the boot device priority

Loads optimized default

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

ASUS Optimal mode



- 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 EZ Mode, click **Exit**, then select **ASUS EZ Mode**.



Menu bar

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

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

Menu items

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

The other items (Ai 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.

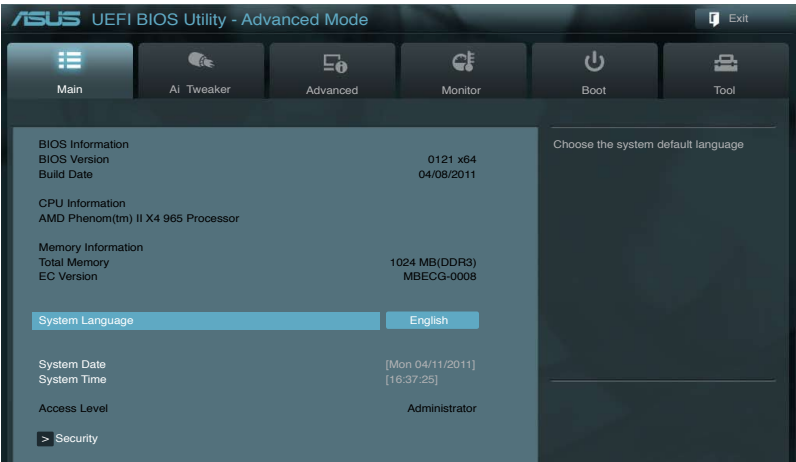
Configuration fields

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

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

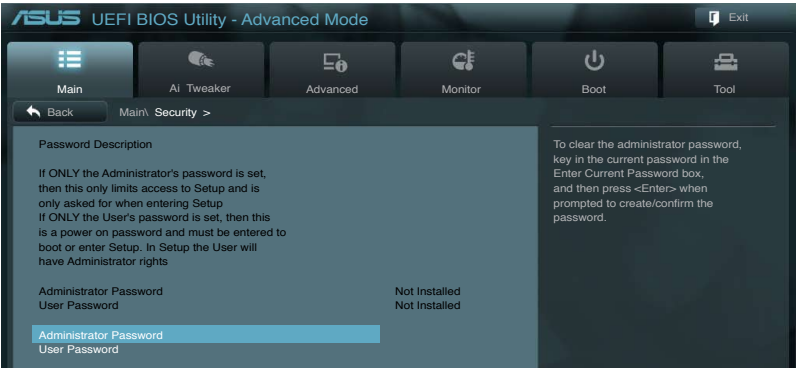
3.3 Main menu

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 2.2.5 **Jumper** for information on how to erase the RTC RAM.
- The **Administrator** or **User Password** items on top of the screen show the default **Not Installed**. After you set a password, these items show **Installed**.

Administrator Password

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

To set an administrator password:

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

To change an administrator password:

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

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

User Password

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

To set a user password:

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

To change a user password:

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

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

3.4 Ai Tweaker menu

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



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



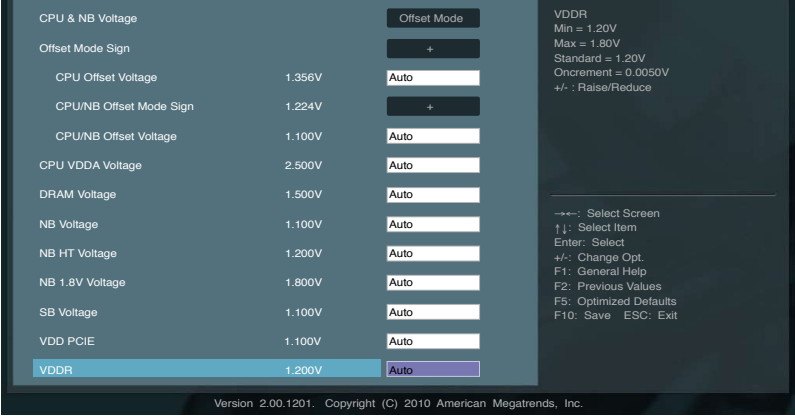
The configuration options for this section vary depending on the CPU and DIMM model you installed on the motherboard.



Scroll down to display the following items:



Scroll down to display the following items:



Ai Overclock Tuner [Auto]

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

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

OC Tuner [CANCEL]

OC Tuner automatically overclocks the frequency and voltage of CPU and DRAM for enhancing the system performance. Press <Enter> and select Ok to start overclocking automatically.

CPU Ratio [Auto]

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



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

CPU Bus/PEG Frequency [Auto]

Allows you to set the CPU and VGA 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 600.

Memory Frequency [Auto]

Allows you to set the memory operating frequency. The configuration options: [DDR3-800MHz] [DDR3-1066MHz] [DDR3-1333MHz] [DDR3-1600MHz] [DDR3-1866MHz]*



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



* [DDR3-1866MHz] item is for AM3+ CPU only.

CPU/NB Frequency [Auto]

Allows you to set the ratio between NB clock and the CPU Bus frequency.

Configuration options: [Auto] [846MHz] [1080MHz] [1296MHz] [1512MHz] [1728MHz] [1944MHz] [2160MHz] [2376MHz] [2592MHz] [2808MHz] [3024MHz] [3240MHz] [3456MHz]

HT Link Speed [Auto]

Allows you to set the HyperTransport link speed.

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

CPU Spread Spectrum [Auto]

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

PCIe Spread Spectrum [Auto]

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

EPU Power Saving Mode [Disabled]

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



The following item appears only when you set the **EPU Power Saving Mode** items to [Enabled].

EPU Setting

Configuration options: [Auto] [Light Power Saving Mode] [Medium Power Saving Mode] [Max Power Saving Mode]

DRAM Timing Control

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



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

DRAM Driving Control

DCT0 Information:

CKE drive strength [1.5x]

Configuration options: [Auto] [1x] [1.25x] [1.5x] [2x]

CS/ODT drive strength [1.5x]

Configuration options: [Auto] [1x] [1.25x] [1.5x] [2x]

ADDR/CMD drive strength [1.5x]

Configuration options: [Auto] [1x] [1.25x] [1.5x] [2x]

MEMCLK drive strength [1.5x]

Configuration options: [Auto] [0.75x] [1x] [1.25x] [1.5x]

Data drive strength [1x]

Configuration options: [Auto] [0.75x] [1x] [1.25x] [1.5x]

DQS drive strength [1x]

Configuration options: [Auto] [0.75x] [1x] [1.25x] [1.5x]

Processor ODT [60 ohms +/- 20%]

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

DCT1 Information:

CKE drive strength [1x]

Configuration options: [Auto] [1x] [1.25x] [1.5x] [2x]

CS/ODT drive strength [1x]

Configuration options: [Auto] [1x] [1.25x] [1.5x] [2x]

ADDR/CMD drive strength [1x]

Configuration options: [Auto] [1x] [1.25x] [1.5x] [2x]

MEMCLK drive strength [0.75x]

Configuration options: [Auto] [0.75x] [1x] [1.25x] [1.5x]

Data drive strength [0.75x]

Configuration options: [Auto] [0.75x] [1x] [1.25x] [1.5x]

DQS drive strength [0.75x]

Configuration options: [Auto] [0.75x] [1x] [1.25x] [1.5x]

Processor ODT [240 ohms +/- 20%]

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

DIGI+ VRM

CPU Load-line Calibration [Auto]

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

Configuration options: [Auto] [Regular] [Medium] [High] [Ultra High] [Extreme]



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

CPU/NB Load Line Calibration [Auto]

Allows you to select the CPU/NB Load-Line mode.

Configuration options: [Auto] [Regular] [High] [Extreme]

CPU Current Capability [100%]

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: [100%] [110%] [120%] [130%] [140%]



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



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

CPU/NB Current Capability [100%]

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: [100%] [110%] [120%] [130%]

CPU Power Phase Control [Standard]

Phase number is the number of working 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 Voltage Frequency [Auto]

Allows you to select the CPU Voltage Frequency.

Configuration options: [Auto] [Manual]

VRM Spread Spectrum [Disabled]

This item appears only when you set the CPU Voltage Frequency item to [Auto] and allows you to enable the spread spectrum to enhance system stability.

VRM Fixed Frequency Mode [300]

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

CPU Power Duty Control [T.Probe Thermal]

[T.Probe Thermal] Maintains the VRM thermal balance.

[C.Probe Current] Maintains the VRM current balance.

CPU & NB Voltage [Offset Mode]

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

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

CPU Manual Voltage [Auto]

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

CPU/NB Manual Voltage [Auto]

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



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

Offset Mode Sign [+]

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

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

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

CPU Offset Voltage [Auto]

This item appears only when you set the CPU Voltage item to [Offset Mode] and allows you to set the Offset voltage. The values range from 0.006250V to 0.793750V with a 0.006250V interval.

CPU/NB Offset Mode Sign [+]

CPU/NB Offset Voltage [Autp]

allows you to set the Offset voltage. The values range from 0.006250V to 0.793750V with a 0.006250V interval.

CPU VDDA Voltage [Auto]

Allows you to set the CPU VDDA voltage. The values range from 2.20000V to 2.90000V with a 0.00625V interval. The text color in the configuration field indicates voltage condition.

DRAM Voltage [Auto]

Allows you to set the DRAM voltage. The values range from 1.20V to 2.50V with a 0.00625V interval.



According to AMD® CPU spec, DIMMs with voltage requirement over 1.65V may damage the CPU permanently. We recommend you install the DIMMs with the voltage requirement below 1.65V.

NB Voltage [Auto]

Allows you to set the North Bridge voltage. The values range from 0.80000V to 1.40000V with a 0.00625V interval.

NB HT Voltage [Auto]

Allows you to set the NB HT voltage. The values range from 0.80000V to 1.40000V with a 0.00625V interval.

NB 1.8V Voltage [Auto]

Allows you to set the NB 1.8V voltage. The values range from 1.80000V to 2.80000V with a 0.005V interval.

SB Voltage [Auto]

Allows you to set the SB voltage. The values range from 1.10V to 1.8V with a 0.005V interval.

VDD PCIE [Auto]

Allows you to set the VDD PCIE voltage. The values range from 1.10V to 2.20V with a 0.005V interval. The text color in the configuration field indicates voltage condition.

VDDR [Auto]

Allows you to set the VDDR voltage. The values range from 1.20V to 1.80V with a 0.0050V interval.

3.5 Advanced menu

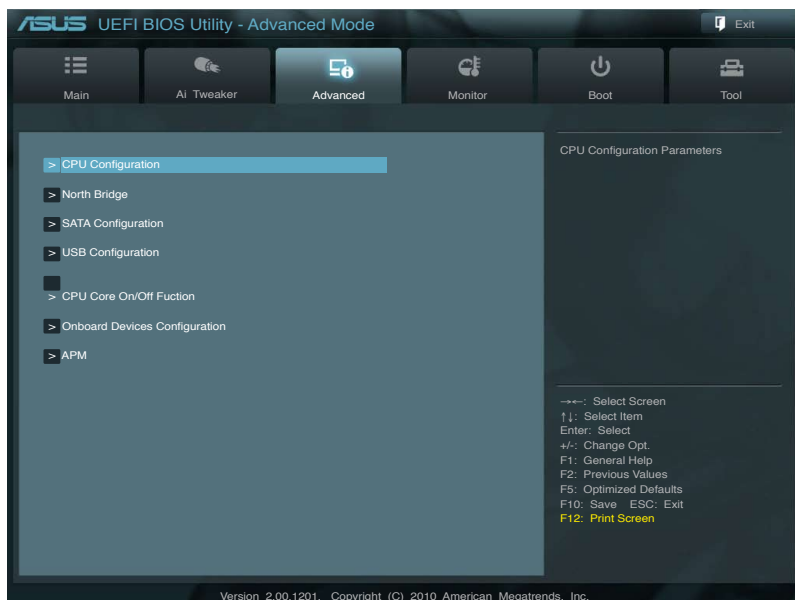
The Advanced menu items allow you to change the settings for the CPU and other system devices.



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



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

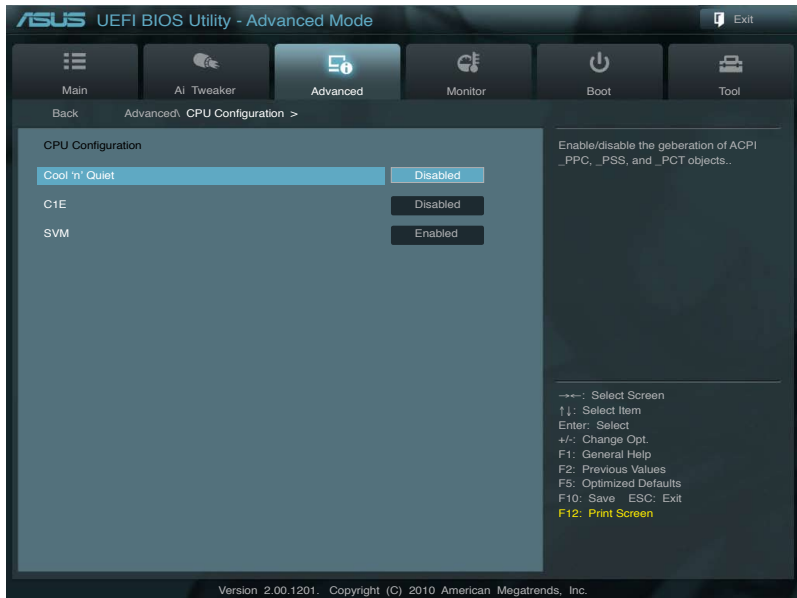


3.5.1 CPU Configuration

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



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



Cool'n'Quiet [Disabled]

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

[Disabled] Disables this function.

C1E [Disabled]

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

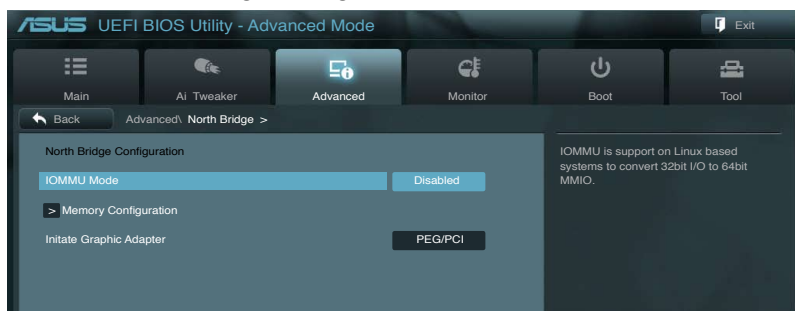
[Disabled] Disables this function.

SVM [Enabled]

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

[Disabled] Disables this function.

3.5.2 North Bridge Configuration



IOMMU [Disabled]

Configuration options: [Disabled] [64MB]

Memory Configuration

Bank Interleaving [Auto]

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

Channel Interleaving [Auto]

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

ECC Mode [Enabled]

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

Power Down Enable [Disabled]

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

Memory Hole Remapping [Enabled]

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

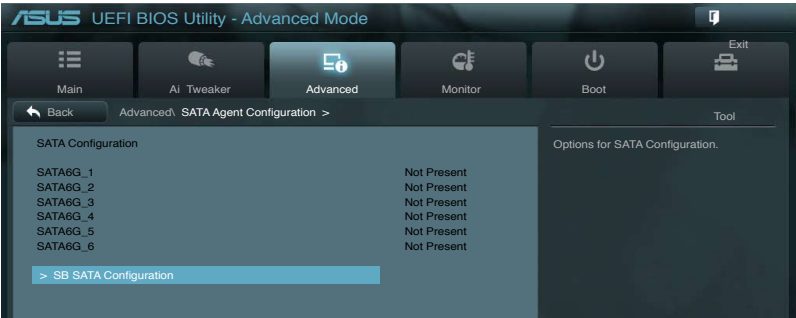
DCT Unganged Mode [Enabled]

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

Initiate Graphic Adapter [PEG/PCI]

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

3.5.3 SATA Configuration



SB SATA Configuration

Onchip SATA Channel [Enabled]

Configuration options: [Disabled] [Disabled]

SATA Port1-Port4 [AHCI]

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

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

SATA Port5-Port6 [AHCI]

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

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



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

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

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

Configuration options: [Disabled] [Enabled]

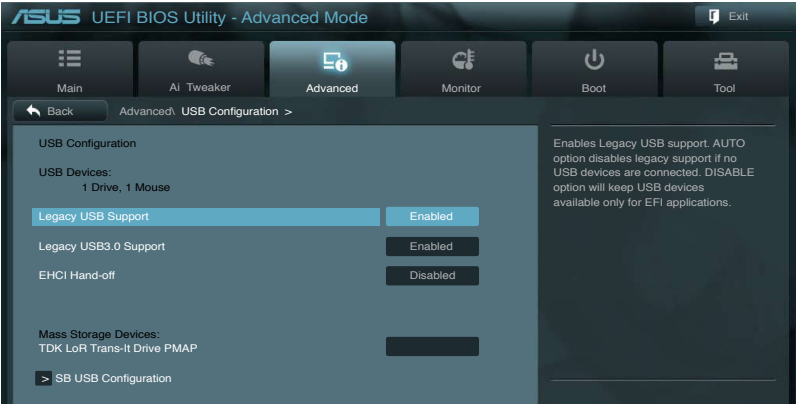
SATA Hot Plug on PORT1-6 [Disabled]

Allows you to set SATA Hot Plug on PORT1-6 to external SATA port.

Configuration options: [Disabled] [Enabled]

3.5.4 USB Configuration

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



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

Legacy USB Support [Enabled]

- [Disabled] The USB devices can be used only for the BIOS setup program.
- [Enabled] Enables the support for USB devices on legacy operating systems (OS).
- [Auto] Allows the system to detect the presence of USB devices at startup. If detected, the USB controller legacy mode is enabled. If no USB device is detected, the legacy USB support is disabled.

Legacy USB3.0 Support [Enabled]

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

EHCI Hand-off [Disabled]

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

SB USB Configuration

OHCI HC (Bus 0 Dev 18 Fn 0) [Enabled]

Allows you to enable or disable OHCI USB1.1 controller (Bus 0 Dev 18 Fn 0).
Configuration options: [Disabled] [Enabled]

OHCI HC (Bus 0 Dev 19 Fn 0) [Enabled]

Allows you to enable or disable OHCI USB1.1 controller (Bus 0 Dev 19 Fn 0).
Configuration options: [Disabled] [Enabled]

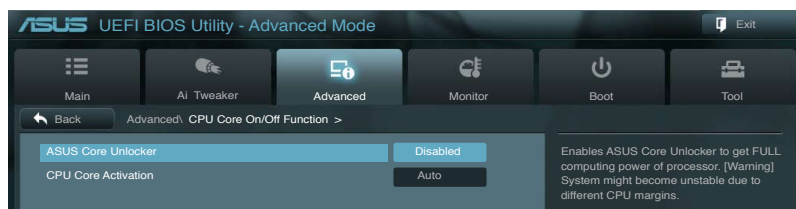
OHCI HC (Bus 0 Dev 22 Fn 0) [Enabled]

Allows you to enable or disable OHCI USB1.1 controller (Bus 0 Dev 22 Fn 0).
Configuration options: [Disabled] [Enabled]

OHCI HC (Bus 0 Dev 20 Fn 5) [Enabled]

Allows you to enable or disable OHCI USB1.1 controller (Bus 0 Dev 22 Fn 0).
Configuration options: [Disabled] [Enabled]

3.5.5 CPU Core On/Off Fuction



ASUS Core Unlocker [Disabled]

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

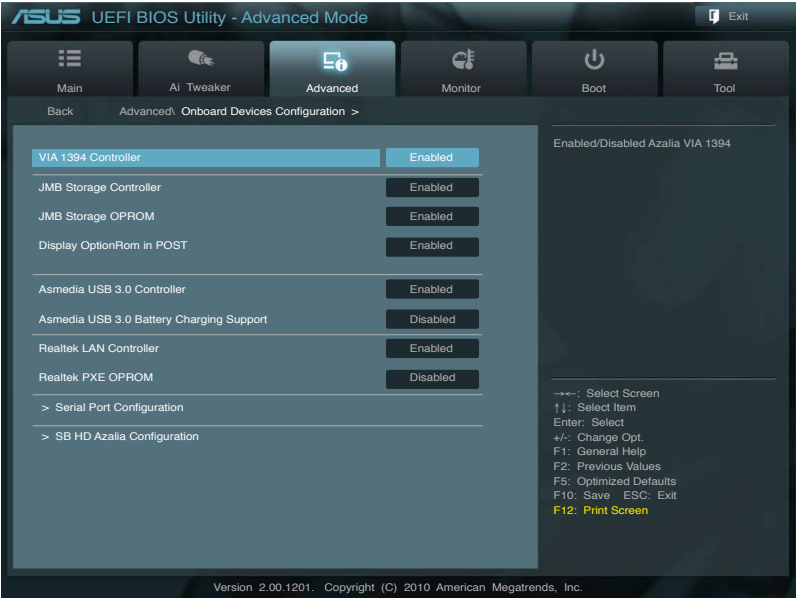


System might become unstable due to different CPU margins.

CPU Core Activation [Auto]

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

3.5.6 Onboard Devices Configuration



VIA 1394 Controller [Enabled]

[Enabled] Enables the onboard IEEE 1394a controller.

[Disabled] Disables the controller.

JMB Storage Controller [Enabled]

Allows you to enable or disable the JMB storage controller.

Configuration options: [Disabled] [Enabled]



If you want to use the full function of the JMB storage controller (ex. AHCI), we recommend that you set this item to [Enabled] and install the JMicron JMB36X Controller Driver from the motherboard support DVD.

JMB Storage OPROM [Enabled]

This item appears only when you set the previous item to [Enabled] and allows you to enable or disable the OptionRom of the JMB storage controller.

Configuration options: [Enabled] [Disabled]

Display OptionRom in POST [Enabled]

This item appears only when you set the JMB Storage OPROM item to [Enabled] and allows you to display or hide the OptionRom of the JMB storage controller during POST.

Configuration options: [Enabled] [Disabled]

Asmedia USB 3.0 Controller [Enabled]

- [Enabled] Enables the USB 3.0 controller.
[Disabled] Disables the controller.

Asmedia USB 3.0 Battery Charging Support [Disabled]

- [Enabled] Enables the USB 3.0 battery charging support.
[Disabled] Disables the fuction.

Realtek LAN Controller [Enabled]

- [Enabled] Enables the Realtek LAN controller.
[Disabled] Disables the controller.

Realtek PXE OPROM [Disabled]

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

Serial Port Configuration

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



This item functions only if there is a serial port (COM1) connector on the motherboard.

Serial Port [Enabled]

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

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

Allows you to select the Serial Port base address.
Configuration options: [IO=3F8h; IRQ=4] [IO=2F8h; IRQ=3] [IO=3E8h; IRQ=4]
[IO=2E8h; IRQ=3]

SB HD Azalia Configuration

HD Audio Azalia Device [Enabled]

- [Enabled] Enables the HD Audio Device.
[Disabled] Disables the controller.

Azalia Front Panel [HD]

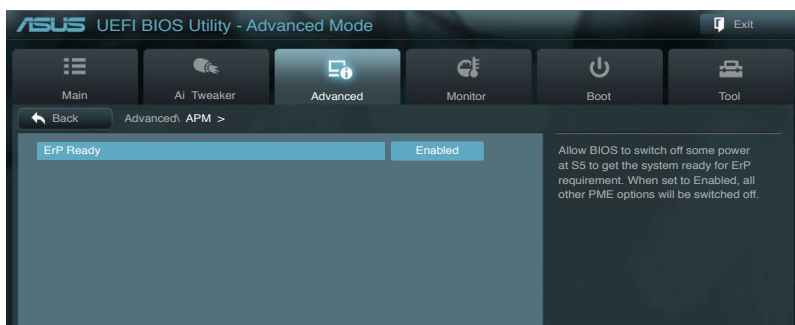
Allows you to set the front panel audio connector (AAFP) mode to legacy AC'97 or high-definition audio depending on the audio standard that the front panel audio module supports.

- [AC97] Sets the front panel audio connector (AAFP) mode to legacy AC'97
[HD] Sets the front panel audio connector (AAFP) mode to high definition audio.

SPDIF Out Type [SPDIF]

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

3.5.7 APM



ErP Ready [Enabled]

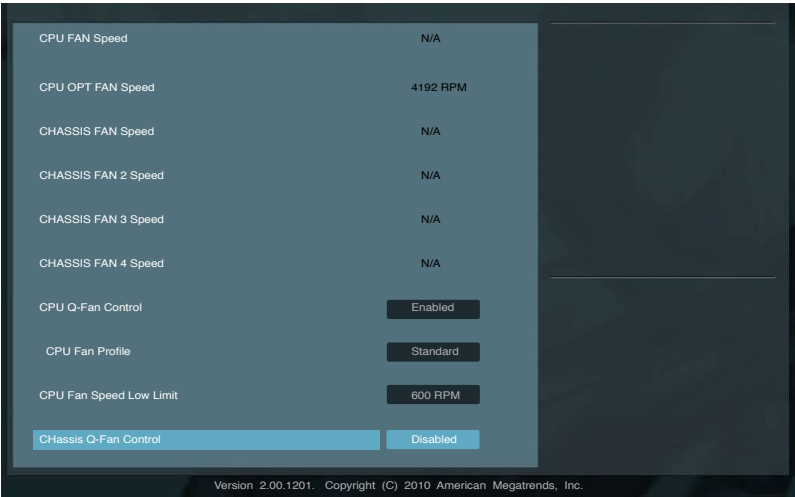
Allows BIOS to switch off some power at S5 to get the system ready for ErP requirement. When set to [Enabled], all other PME options will be switched off. Configuration options: [Disabled] [Enabled]

3.6 Monitor menu

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



Scroll down to display the following items:



CPU Temperature / MB Temperature [xxx°C/xxx°F]

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

CPU Fan Speed [xxxx RPM] or [Ignore] / [N/A]

Chassis Fan 1/2/3/4 Speed [xxxx RPM] or [Ignore] / [N/A]

CPU OPT Fan Speed [xxxx RPM] or [Ignore] / [N/A]

The onboard hardware monitor automatically detects and displays the CPU, chassis, power, and assistant fan speed in rotations per minute (RPM). If the fan is not connected to the motherboard, the field shows **N/A**. Select **Ignore** if you do not wish to display the detected speed.

CPU Q-Fan Control [Enabled]

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

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

CPU Fan Profile [Standard]

This item appears only when you enable the **CPU Q-Fan Control** feature and allows you to set the appropriate performance level of the CPU fan.

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

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

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

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



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 20°C to 75°C.

CPU Lower Temperature [20]

Use the <+> and <-> keys to adjust the lower limit of the CPU temperature. The values range from 20°C to 75°C.

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 0% to 100%. When the CPU temperature is under 40°C, the CPU fan will operate at the minimum duty cycle.

CPU Fan Speed Low Limit [600 RPM]

This item appears only when you enable the CPU Q-Fan Control feature and allows you to disable or set the CPU fan warning speed.

Configuration options: [Ignore] [100RPM] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

Chassis Q-Fan Control [Disabled]

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

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

Chassis Fan 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] [100RPM] [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 40°C to 90°C.

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 Lower Temperature [40]

Displays the lower limit of the chassis temperature.

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

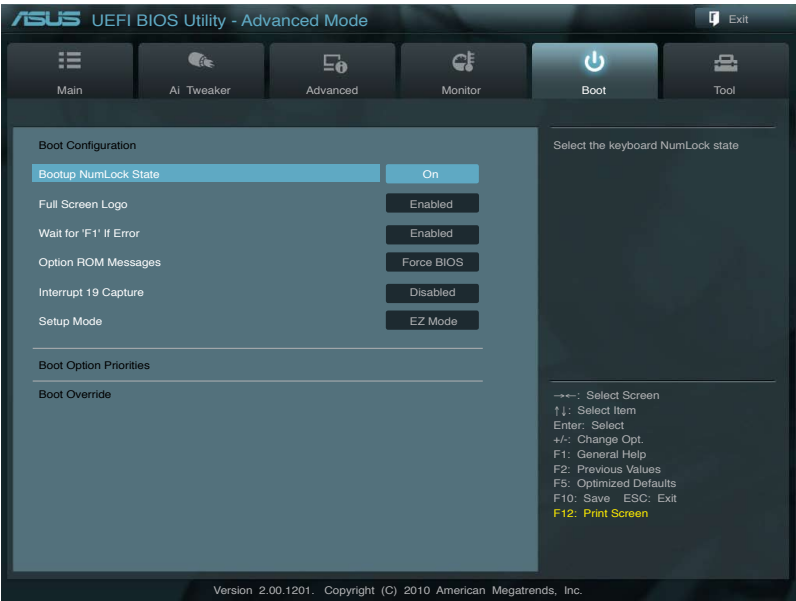
Use the <+> and <-> keys to adjust the minimum chassis fan duty cycle. The values range from 60% to 100%. When the chassis temperature is under 40°C, the chassis fan will operate at the minimum duty cycle.

VCORE Voltage, 3.3V Voltage, 5V Voltage, 12V Voltage, VDDA2.5V Voltage

The onboard hardware monitor automatically detects the voltage output through the onboard voltage regulators. Select Ignore if you do not want to detect this item.

3.7 Boot menu

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



Bootup NumLock State [On]

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

Full Screen Logo [Enabled]

- [Enabled] Enables the full screen logo display feature.
- [Disabled] Disables the full screen logo display feature.



Set this item to [Enabled] to use the ASUS MyLogo 2™ feature.

Wait for 'F1' If Error [Enabled]

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

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.

Setup Mode [EZ 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.

Boot Option Priorities

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



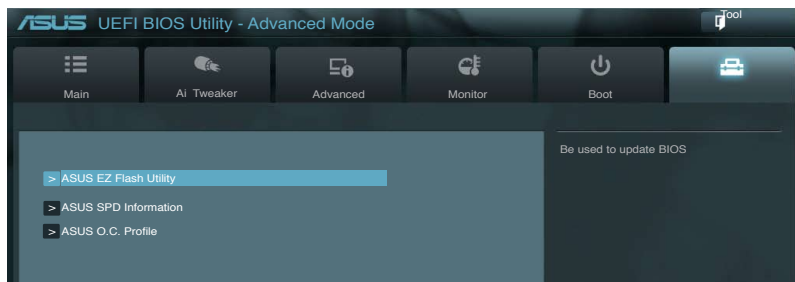
- To select the boot device during system startup, press <F8> when ASUS Logo appears.
- To access Windows OS in Safe Mode, do any of the following:
 - Press <F8> after POST.

Boot Override

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

3.8 Tools menu

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



ASUS EZ Flash 2

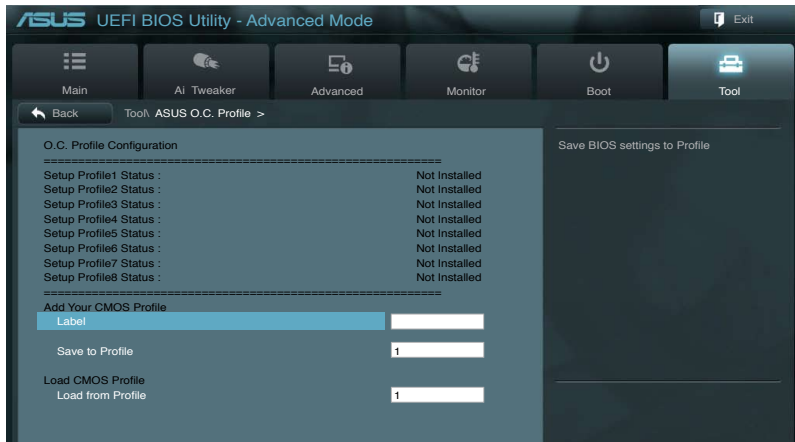
Allows you to run ASUS EZ Flash 2. When you press <Enter>, a confirmation message appears. Use the left/right arrow key to select between [Yes] or [No], then press <Enter> to confirm your choice.



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

ASUS O.C. Profile

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



The Setup Profile Status items show Not Installed if no profile is created.

Label

Allows you to input the label of setup profile.

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

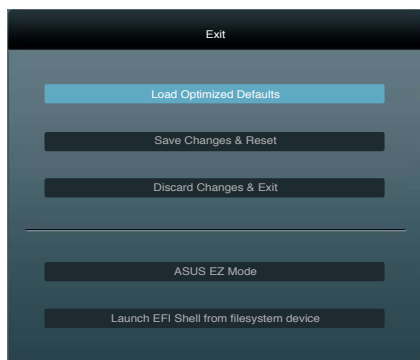
Allows you to load the previous BIOS settings saved in the BIOS Flash. Key in the profile number that saved your BIOS settings, press <Enter>, and then select Yes.



- 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.

3.9 Exit menu

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



Load Optimized Defaults

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

Save Changes & Reset

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

Discard Changes & Exit

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

ASUS EZ Mode

This option allows you to enter the EZ Mode screen.

Launch EFI Shell from filesystem device

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

3.10 Updating BIOS

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



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

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

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

Refer to the corresponding sections for details on these utilities.



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

3.10.1 ASUS Update utility

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

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

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



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

Launching ASUS Update

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



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

Updating the BIOS through the Internet

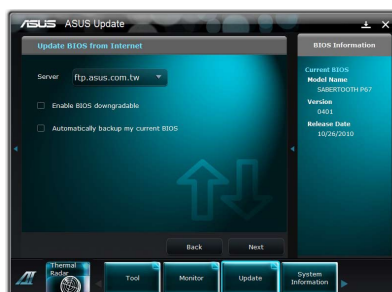
To update the BIOS through the Internet:

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



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

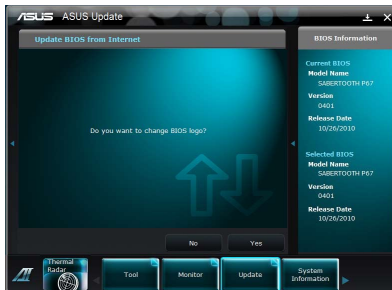
If you want to enable the BIOS downgradable function and auto BIOS backup function, check the checkboxes before the two items on the screen.



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



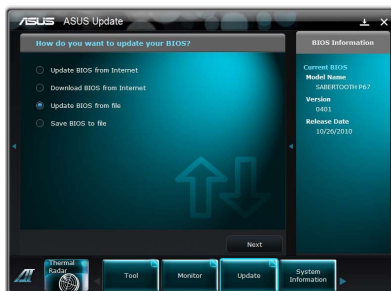
4. You can decide whether to change the BIOS boot logo, which is the image appearing on screen during the Power-On Self-Tests (POST). Click **Yes** if you want to change the boot logo or **No** to continue.
5. Follow the onscreen instructions to complete the update process.



Updating the BIOS through a BIOS file

To update the BIOS through a BIOS file:

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



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



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



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

3.10.2 ASUS EZ Flash 2 utility

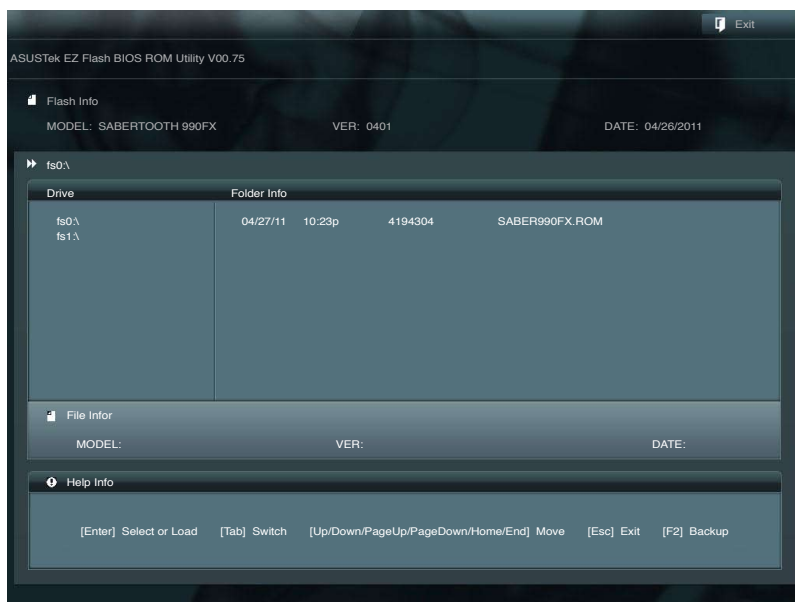
The ASUS EZ Flash 2 feature allows you to update the BIOS without having to use a bootable floppy disk or an OS-based utility.



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

To update the BIOS using EZ Flash 2:

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 BIOS Updater

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



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

Before updating BIOS

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

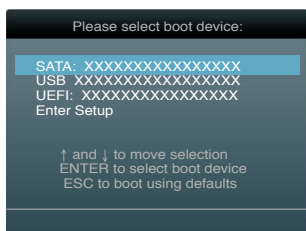


- NTFS is not supported under DOS environment. Do not save the BIOS file and BIOS Updater to a hard disk drive or USB flash drive in NTFS format.
- Do not save the BIOS file to a floppy disk due to low disk capacity.

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

Booting the system in DOS environment

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



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

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

To backup the current BIOS file using the BIOS Updater

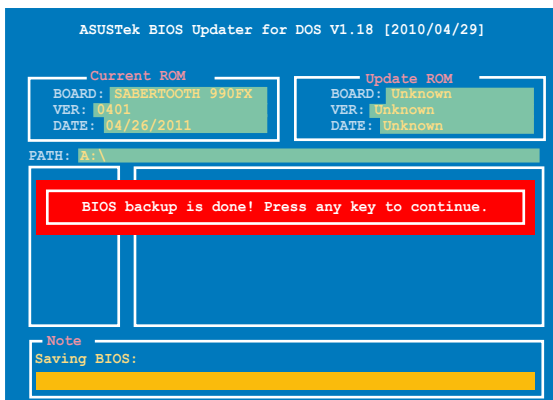


Ensure that the USB flash drive is not write-protected and has enough free space to save the file.

- D:\>bupdater /o**OLDBIOS1**.rom
- Filename Extension

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

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



Updating the BIOS file

To update the BIOS file using BIOS Updater

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

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

2. The BIOS Updater screen appears as below.

ASUSTek BIOS Updater for DOS V1.18 [2010/04/29]

Current ROM	Update ROM
BOARD: SABERTOOTH 990FX	BOARD: Unknown
VER: 0401	VER: Unknown
DATE: 04/26/2010	DATE: Unknown

PATH: A:\

A:	
	SABER990FX.ROM 4194304 2010-10-26 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 Chapter 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 4

4.1 Installing an operating system

This motherboard supports Windows® XP/ 64-bit XP/ Vista / **64-bit Vista / 7** / 64-bit 7 operating systems (OS). Always install the latest OS version and corresponding updates to maximize the features of your hardware.



- Motherboard settings and hardware options vary. Use the setup procedures presented in this chapter for reference only. Refer to your OS documentation for detailed information.
- Ensure that you install the Windows® XP Service Pack 2 or later versions before installing the drivers for better compatibility and system stability.

4.2 Support DVD information

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



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

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

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.

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.

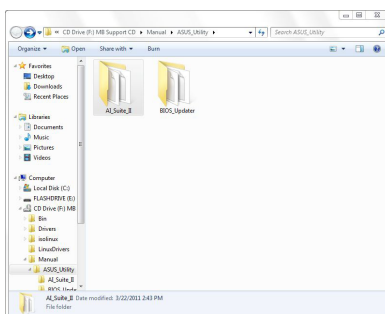


The software manual files are in Portable Document Format (PDF). Install the Adobe® Acrobat® Reader from the Utilities menu before opening the files.

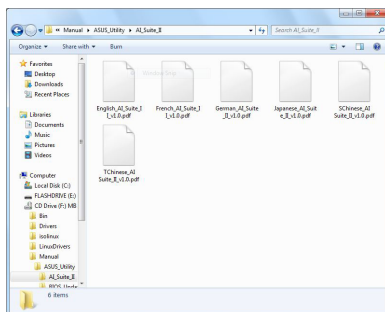
1. Click the **Manual** tab. Click **ASUS Motherboard Utility Guide** from the manual list on the left.



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

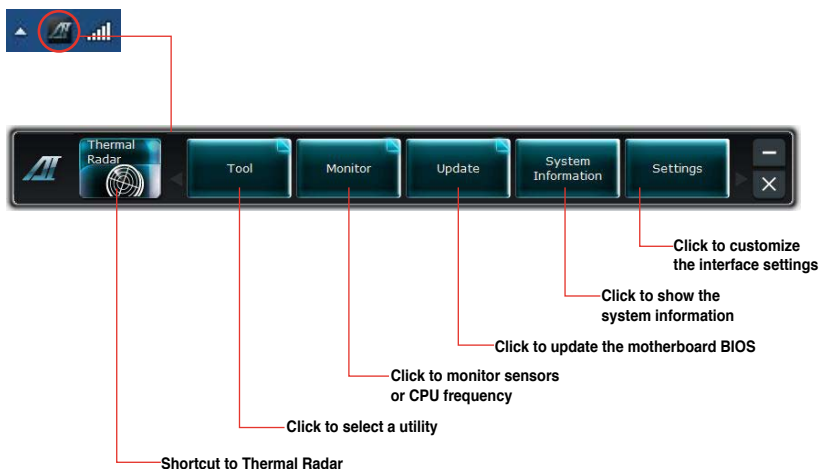
To install AI Suite II on your computer

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

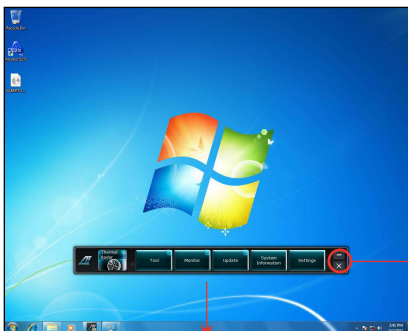
Click each button to select and launch a utility, to monitor the system, to update the motherboard BIOS, to display the system information, and to customize the settings of AI Suite II.



- 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.

Other feature buttons

- Click  to minimize the main menu bar as a tab on the side of the Windows desktop. Click the tab again to restore the main menu bar.



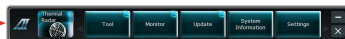
Click to minimize the main menu bar as a tab




Tab


Desktop

- When on a function screen, click  on the upper-right corner of the screen to switch back to the main menu bar.






- When on a function screen, you may hide the middle pane (main operation area) by clicking  on the left side of the middle pane.



You may hide the right pane (system information area) by clicking  on the right side of the middle pane.



- Click  to close the main menu bar and keep the AI Suite II icon in the Windows notification area (). AI Suite II is still running.
- To exit AI Suite II, right click the AI Suite II icon  in the Windows notification area, then, left-click and select Exit.

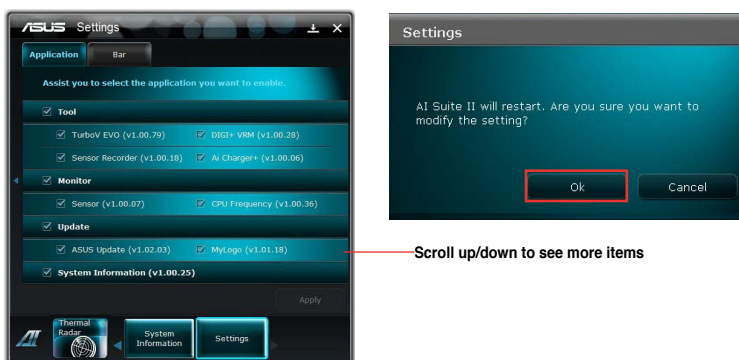
Customizing the interface

From the main menu bar, click Settings to customize the main menu bar settings and the interface's skin.

Application

Allows you to select the application that you want to enable.

1. Tick the item that you want to display on the main menu bar, and then click **Apply**.
2. Click **Ok** to restart AI Suite II and apply the setting.



3. The new setting has been applied to the main menu bar.

Before



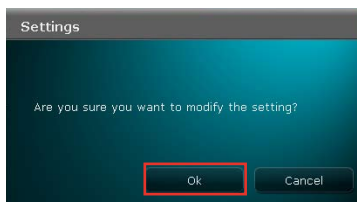
After



Bar

Allows you to modify the bar setting.

1. Tick **Auto hide** and select the countdown time that the Auto hide function takes effect.
2. Click **Apply** to apply the setting.



The Auto hide function only takes effect in Bar mode.

4.3.2 ASUS Thermal Radar

The Thermal Radar monitors temps in critical parts of the motherboard in real time, automatically adjusting fan speeds to make sure the system maintains high stability without overheating. It consists of multiple sensors for various components on the motherboard, giving user the ability to monitor each one individually. The Thermal Radar automatically calculates ideal fan speeds based on different parameters selected by users for each component, keeping everything cooler and longer lasting.

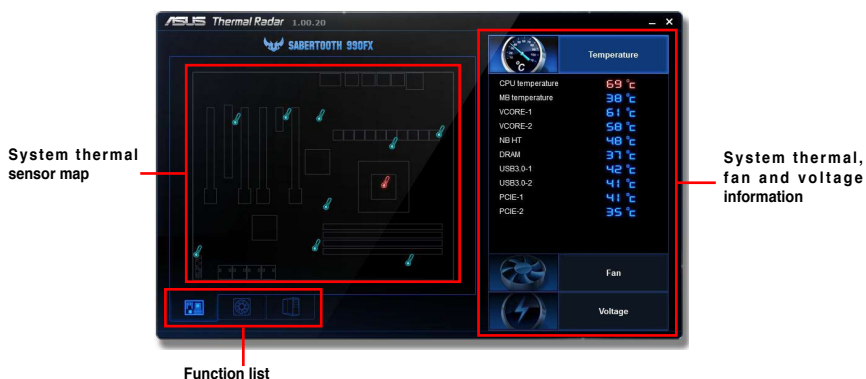
Launching Thermal Radar

After installing AI Suite II from the motherboard support DVD, launch Thermal Radar by clicking the Thermal Radar icon on the on the AI Suite II main menu bar.



The software screen captures in this manual are for reference only, but the operation steps remain the same.

Using the Thermal Radar main screen





- Click any thermal sensor on the sensor map to read the detail information of the selected sensor.
- On the right part of the Thermal Radar main screen, click Temperature, Fan or Voltage to see the real-time system thermal, fan and voltage information.

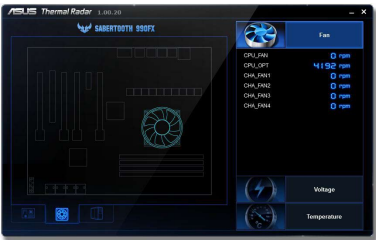
Configuring system fan settings

The TUF Thermal Radar provides easy-to-use fan profiles for adjusting the CPU fan, assistant fan, and the chassis fan speeds according to different ambient temperatures caused by different climate conditions in different geographic regions and your PC's system loading. Thermal Radar also provides fully-customizable fan speed control, offering the most flexible controls of fan speed to achieve a quiet and cool environment.

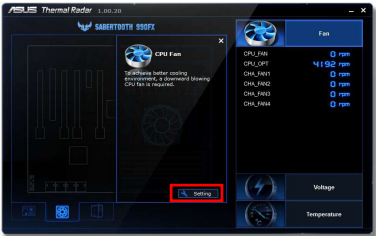
Loading default fan profiles

To load the system default fan profiles

- 1. Click  or  from the function list on the bottom of the Thermal Radar main screen.
- 2. Click a fan to configure. For example, click **CPU Fan**.



- 3. Read the introduction and notice of the selected fan. Click **Setting**.



- 4. Select a fan profile in the Profile Name drop-down list and click **Apply**. You can also configure other system fans by clicking the CHA and ASST icon below.

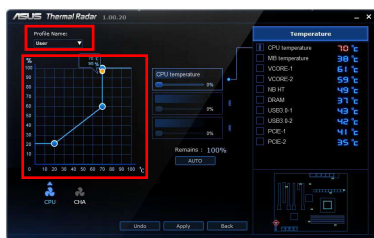


Configuring user-customizable fan settings

You can customize the fan speed to meet different computing and environment needs.

To fast customize the fan speed

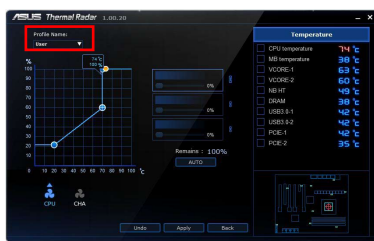
1. Select **User** in the Profile Name drop-down list.
2. Drag the control points on the fan speed curve to set the fan speed percentage.
3. Click **Apply**.



You can also assign the specific system component(s) to monitor and have Thermal Radar to dynamically adjust the fan speeds in real-time when the temperature of the monitored system component reaches to certain degree.

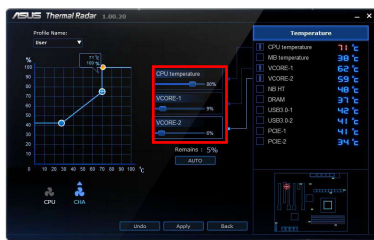
To customize the fan speed with advanced options

1. Select **User** in the Profile Name drop-down list.
2. Drag the paper clip icon to the system component(s) listed on the right of the Thermal Radar window. You can assign maximum three components to monitor.

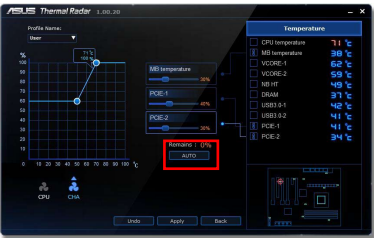


3. Adjust the slider(s) under each component you selected for a combination of 100% and click **Apply**.

For example, you assign 60% to motherboard, 20% to VCCIO, and 20% to VCCSA and click **Apply**, Thermal Radar automatically sets the required fan speed by calculating the overall temperature of the monitored components.



4. If you are not sure how to choose the proper components to monitor and the percentage to adjust, click **Auto** and have Thermal Radar do the recommended settings for you. Click **Apply** for the setting to take effect.



4.3.3 Tool

TurboV EVO

ASUS TurboV EVO introduces Manual Mode that allows you to manually adjust the CPU frequency and related voltages. After installing AI Suite II from the motherboard support DVD, launch TurboV EVO by clicking Tool > TurboV EVO on the AI Suite II main menu bar.



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

Manual Mode

Manual Mode allows you to overclock the BCLK frequency, CPU voltage, IMC voltage, and DRAM Bus voltage in Windows® environment and takes effect in real-time without exiting and rebooting the OS.



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



For system stability, all changes made in TurboV will not be saved to BIOS settings and will not be kept on the next system boot. Use the Save Profile function to save your customized overclocking settings and manually load the profile after Windows starts.

The screenshot shows the ASUS TurboV EVO interface. On the left, a sidebar contains 'Manual Mode' (selected), 'Load profile', and 'Target values'. The main area is divided into 'Current values' (showing CPU Bus/PEG Freq at 200 MHz, CPU Voltage at 1.425000V, CPU/MB Voltage at 1.100000V, and DRAM Voltage at 1.500000V) and 'More Settings' (showing VDD POE Voltage, VDDR Voltage, VDDA Voltage, NB HT Voltage, SB Voltage, and NB 1.8V Voltage). At the bottom, there are buttons for 'OS Default Settings', 'Undo', and 'Apply'. On the right, a 'CPU' panel shows 'CPU Frequency' at 3410 MHz and 'CPU Usage' at 1% and 3%. Labels with red lines point to various elements: 'Manual Mode' points to the sidebar; 'Load profile' points to the 'Load profile' button; 'Target values' points to the 'Target values' button; 'Current values' points to the 'Current values' section; 'Click to show / hide more settings' points to the 'More Settings' button; 'Click to restore all start-up settings' points to the 'OS Default Settings' button; 'Save the current settings as a new profile' points to the 'Save Profile' button; 'Voltage Adjustment bars' points to the voltage sliders; 'Undoes all changes without applying' points to the 'Undo' button; and 'Applies all changes immediately' points to the 'Apply' button.



For advanced overclock ability, adjust first the BIOS items, and then proceed more detailed adjustments in More Settings.

Using Advanced Mode

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



CPU Ratio

Allows you to manually adjust the CPU ratio.

The first time you use CPU Ratio, go to **AI Tweaker > CPU Power Management** in BIOS and set the Turbo Ratio item to **[Maximum Turbo Ratio setting in OS]**, or activate CPU Ratio by clicking the CPU Ratio tab to adjust the values manually.

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

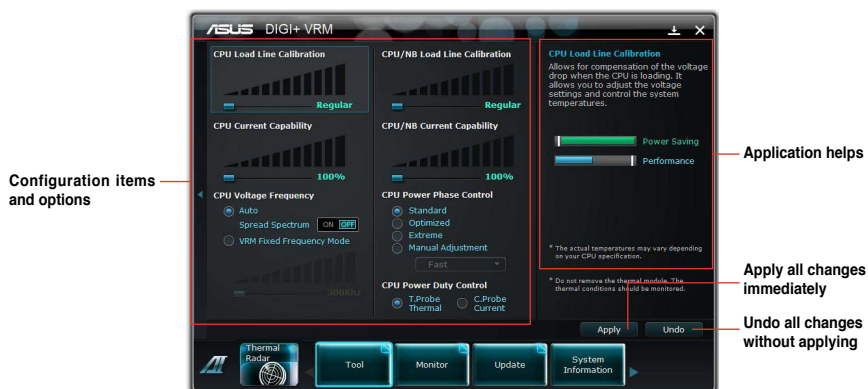


- Set the CPU Ratio Setting item in BIOS to **[Auto]** before using the CPU Ratio function in TurboV. Refer to Chapter 3 of your motherboard user manual for details.
- The CPU Ratio bars show the status of the CPU cores, which vary with your CPU model.

DIGI+ VRM

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

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



Introduction on DIGI+ VRM Configuration Items

CPU Load-line Calibration

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

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



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

CPU Current Capability

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

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



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

CPU Voltage Frequency

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

Enable Spread Spectrum to enhance system stability.

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



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

CPU/NB Load-line Calibration

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

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



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

CPU/NB Current Capability

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

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



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

CPU Power Phase Control

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

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



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

CPU Power Duty Control

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

- T.Probe Thermal: Thermal balance
- C.Probe Current: Current balance



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

Sensor Recorder

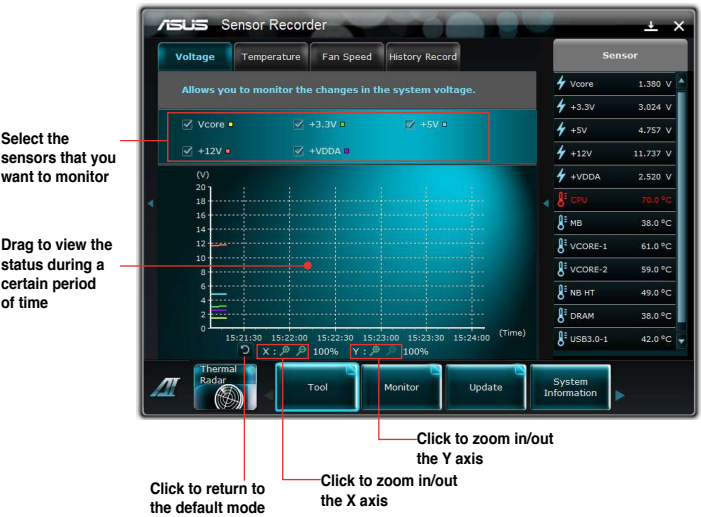
Sensor Recorder allows you to monitor the changes in the system voltage, temperature, and fan speed, as well as recording the changes.

Launching Sensor Recorder

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

Configuring Sensor Recorder

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



Voltage

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



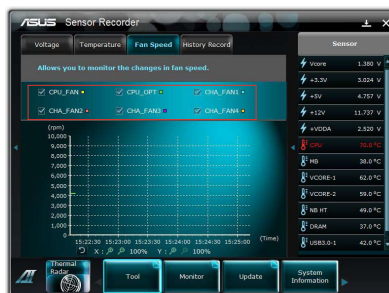
Temperature

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



Fan Speed

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



History Record


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



To use the recording function

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

To edit the recorded history

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

Ai Charger+

Battery Charging Version 1.1 (BC 1.1), a USB Implementers Forum (USB-IF) certified USB charging function, is designed to make USB charging faster than the standard USB devices. If your USB device supports the BC 1.1 function*, when you connect your USB device to your system, the system automatically detects your USB device and starts a fast USB charging. The charging speed may get 3 times faster than that of the standard USB devices**.

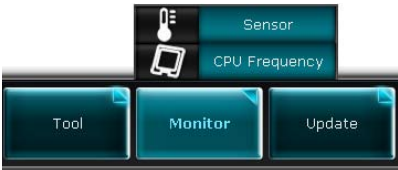


- * Check your USB device manufacturer if it fully supports the BC 1.1 function.
- ** The actual charging speed may vary with your USB device's conditions.
- Ensure to remove and reconnect your USB device after enabling or disabling Ai Charger+ to ensure normal charging function.



4.3.4 Monitor

The Monitor section includes the Sensor and CPU Frequency panels.



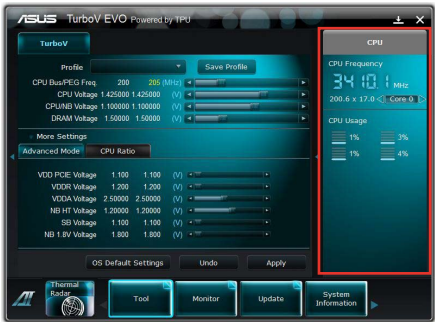
Sensor

The Sensor panel displays the current value of a system sensor such as fan rotation, CPU temperature, and voltages. Click **Monitor > Sensor** on the AI Suite II main menu bar to launch the Sensor panel.

CPU Frequency

The CPU Frequency panel displays the current CPU frequency and CPU usage. Click **Monitor > CPU Frequency** on the AI Suite II main menu bar to open the CPU Frequency panel.

Resident in the right pane (system information area)



Sensor panel



CPU Frequency panel



4.3.5 Update

The Update section allows you to update the motherboard BIOS and the BIOS boot logo with the ASUS designed update utilities.



ASUS Update

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

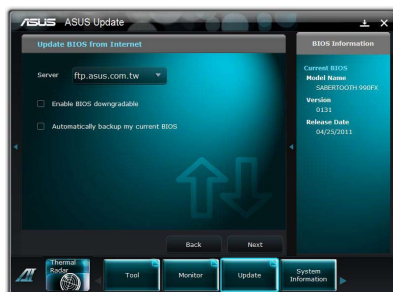
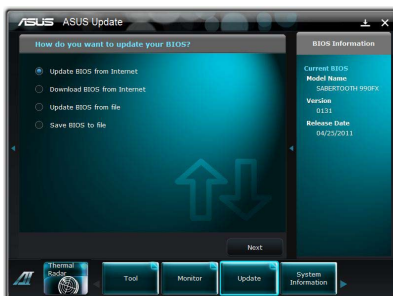
- Update the BIOS directly from the Internet
- Download the latest BIOS file from the Internet
- Update the BIOS from an updated BIOS file
- Save the current BIOS file
- View the BIOS version information



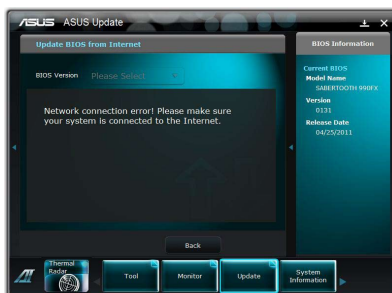
ASUS Update requires an Internet connection either through a network or an Internet Service Provider (ISP).

Updating the BIOS

1. From the AI Suite II main menu bar, click **Update > ASUS Update**.
2. You can choose to update the BIOS from the Internet or from a BIOS file. Follow the steps below based on your selected updating option.
To update the BIOS from the Internet
 - a) From the list of options, select Update BIOS from Internet and click **Next**.
 - b) Select the ASUS FTP site nearest you to avoid network traffic. Tick the two items to enable the BIOS downgradable and auto BIOS backup functions.

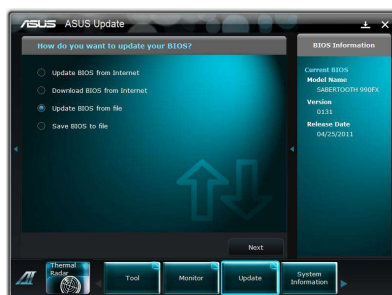


- c) Select the BIOS version that you want to download and click **Next**.



To update the BIOS from a BIOS file

- a) From the list of options, select Update BIOS from file and then click **Next**.



- b) Click Browse to locate the BIOS file and then click **Next**.



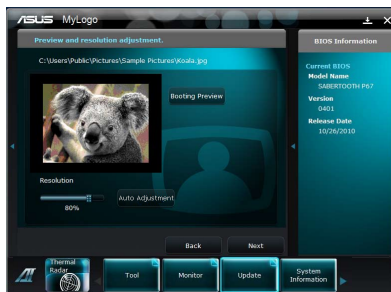
3. Click Yes if you want to change BIOS boot logo, which is the image appearing on the screen during the Power-On Self-Tests (POST). Click **No** to continue.

If you click Yes, follow the steps below:

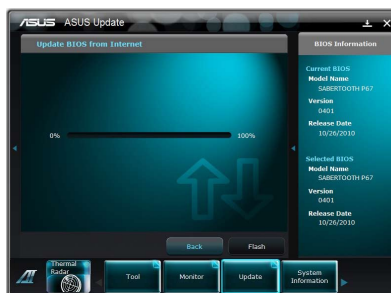
- a) Locate the picture file that you want to use as the boot logo and then click **Next**.
- b) Move the Resolution slider or click **auto tune** for the system to automatically adjust the screen resolution.



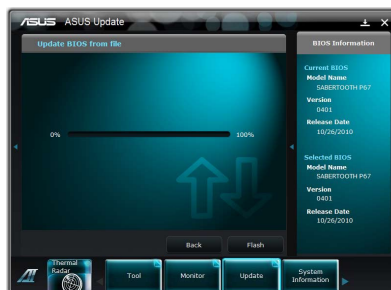
- c) Click the Booting Preview button to preview the way the picture is displayed during POST. Left-click the mouse to return to the setting screen.
- d) Click **Next** when the changes are finished.



- e) Click Flash to start updating the BIOS to your motherboard, and then follow the onscreen instructions to complete the update.



If you click **No**, click Flash to start updating the BIOS to your motherboard, and then follow the onscreen instructions to complete the update.



ASUS MyLogo

ASUS MyLogo allows you to customize the boot logo. The boot logo is the image that appears on screen during the Power-On Self-Tests (POST). ASUS MyLogo allows you to:

- Change the current BIOS boot logo of your motherboard
- Change the boot logo of a downloaded BIOS file and update this BIOS to your motherboard
- Change the boot logo of a downloaded BIOS file without updating this BIOS to your motherboard



Ensure that the BIOS item Full Screen Logo is set to **[Enabled]** to display the boot logo. See the section Boot Settings Configuration of the BIOS Setup chapter in the user manual.

Changing the BIOS boot logo

1. From the AI Suite II main menu bar, click **Update > MyLogo**.
2. Select any of these three options, then click **Next**:
 - Change the BIOS boot logo of my motherboard
 - Change the boot logo of a downloaded BIOS file and update this BIOS to my motherboard
 - Change the boot logo of a downloaded BIOS file (But do not update this BIOS to my motherboard)



Before using the last two options, ensure that you download a BIOS file to your computer using ASUS Update.

3. Locate the picture file that you want to use as the boot logo (and the downloaded BIOS if required) and then click **Next**.



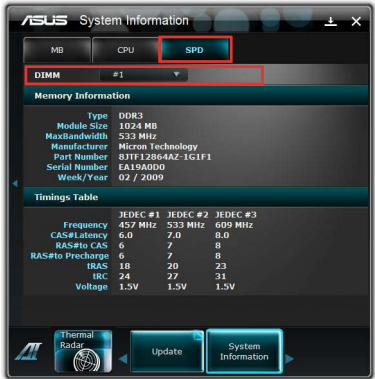
4. Move the Resolution slider or click Auto Adjustment for the system to automatically adjust the screen resolution.
5. Click the Booting Preview button to preview the way the picture is displayed during the POST. Left-click the mouse to return to the setting screen.
6. Click **Next** when the adjustment is finished.
7. Click **Flash** and follow the onscreen instructions to complete the process.



4.3.6 System Information

The System Information section displays the information about the motherboard, CPU, and memory slots.

- Click the **MB** tab to see the details on the motherboard manufacturer, product name, version, and BIOS.
- Click the **CPU** tab to see the details on the processor and the Cache.
- Click the **SPD** tab and then select the memory slot to see the details on the memory module installed on the corresponding slot.



4.3.7 Audio configurations

The Realtek® audio CODEC provides 8-channel audio capability to deliver the ultimate audio experience on your computer. The software provides Jack-Detection 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.

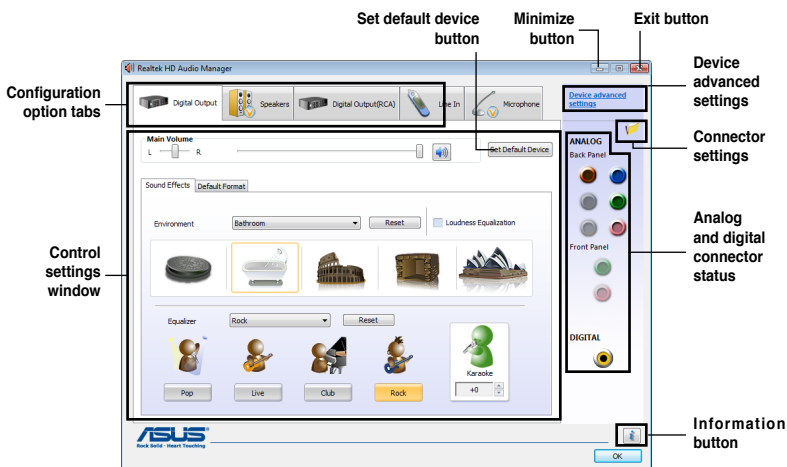
Follow the installation wizard to install the Realtek® Audio Driver from the support DVD that came with the motherboard package.

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 for Windows® Vista™



B. Realtek HD Audio Manager for Windows XP



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

4.4 RAID configurations

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



- 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 Service Pack 3 or later versions.
- Due to Windows® XP / Vista limitation, a RAID array with the total capacity over 2TB cannot be set as a boot disk. A RAID array over 2TB can only be set as a data disk only.
- If you want to install a Windows® operating system to a hard disk drive included in a RAID set, you have to create a RAID driver disk and load the RAID driver during OS installation. Refer to section **4.5 Creating a RAID driver disk** for details.

4.4.1 RAID definitions

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

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

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

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

4.4.2 Installing Serial ATA hard disks

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

To install the SATA hard disks for a RAID configuration:

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

4.4.3 Setting the RAID item in BIOS

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

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

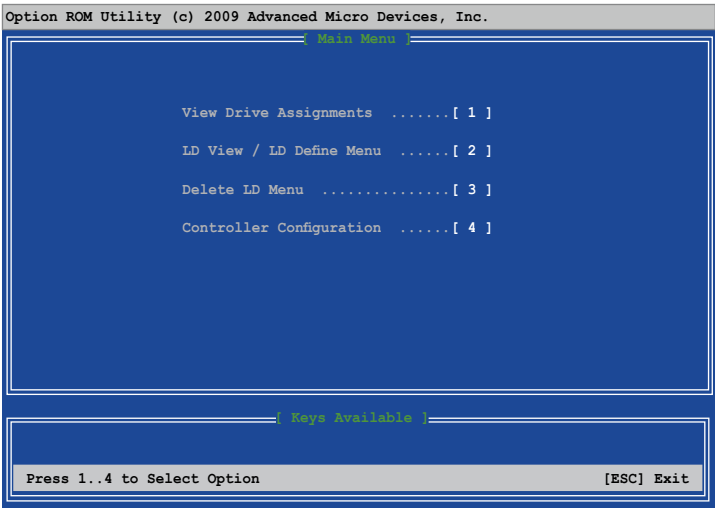


Due to chipset limitation, when set any of SATA ports to RAID mode, all SATA ports run at RAID mode together.

4.4.4 AMD® Option ROM Utility

To enter the AMD® Option ROM utility:

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



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

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

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



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



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

Creating a RAID volume

To create a RAID volume:

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

```
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    XXXXXXXX      XXXXXXXX      XXXXXXXX      Y
02:00    XXXXXXXX      XXXXXXXX      XXXXXXXX      Y
03:00    XXXXXXXX      XXXXXXXX      XXXXXXXX      N
04:00    XXXXXXXX      XXXXXXXX      XXXXXXXX      N

[ Keys Available ]
[?] Up  [V] 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. Enter 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.

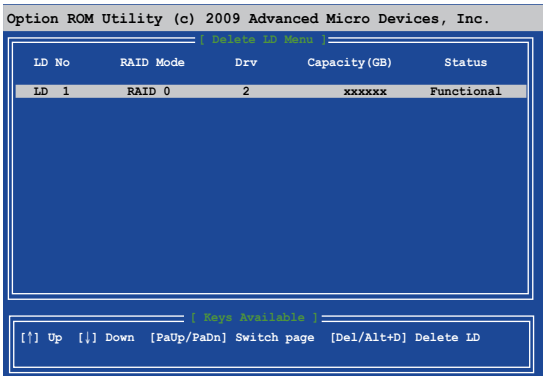
Deleting a RAID configuration



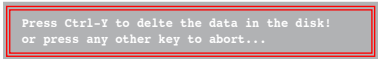
Take caution when deleting a RAID volume. You will lose all data on the hard disk drives when you delete a RAID volume.

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 or <Alt> + <D>.



3. The utility prompts the following messages:

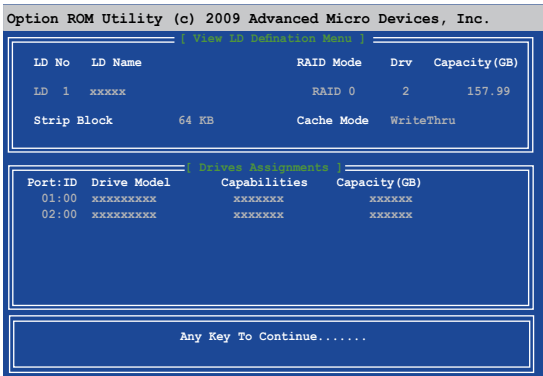


Press <Ctrl> + <Y> to delete the RAID volume.

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.



4.5 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 **4.5.4 Using a USB floppy disk drive**.

4.5.1 Creating a RAID driver disk without entering the OS

To create a RAID driver disk without entering the OS:

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

4.5.2 Creating a RAID driver disk in Windows®

To create a RAID driver disk in Windows®:

1. Start Windows®.
2. Plug the USB floppy disk drive and insert a floppy disk.
3. Place the motherboard support DVD into the optical drive.
4. Go to the **Make Disk** menu, and then click **Intel AHCI/RAID Driver Disk** to create a RAID driver disk.
5. Select USB floppy disk drive as the destination disk.
6. Follow the succeeding screen instructions to complete the process.



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

4.5.3 Installing the RAID driver during Windows® OS installation

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.



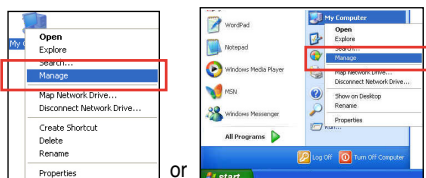
Before loading the RAID driver from a USB flash drive, you have to use another computer to copy the RAID driver from the support DVD to the USB flash drive.

4.5.4 Using a USB floppy disk drive

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

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

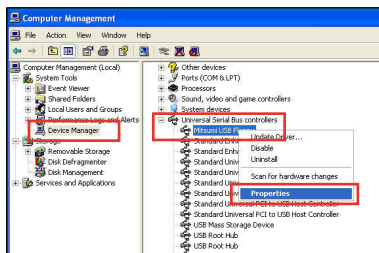
1. Using another computer, plug the USB floppy disk drive, and insert the floppy disk containing the RAID driver.
2. Right-click **My Computer** on the Windows® desktop or **start** menu, and then select **Manage** from the pop-up window.



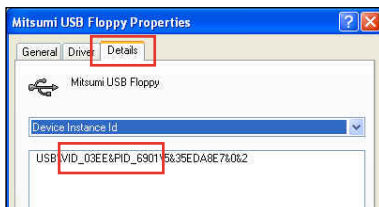
3. Select **Device Manager**. From the **Universal Serial Bus controllers**, right-click **xxxxxx USB Floppy**, and then select **Properties** from the pop-up window.



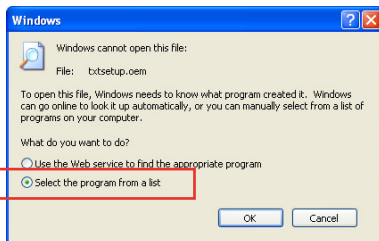
The name of the USB floppy disk drive varies with different vendors.



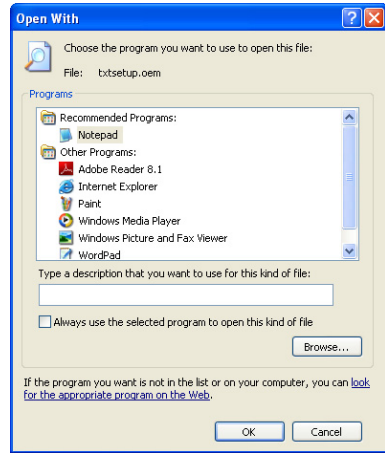
4. Click **Details** tab. The Vendor ID (VID) and Product ID (PID) are displayed.



5. Browse the contents of the RAID driver disk to locate the file **txtsetup.oem**.
6. Double-click the file. A window appears, allowing you to select the program for opening the oem file.



7. Use Notepad to open the file.



8. Find the `[HardwareIds.scsi.iaAHCI_DesktopWorkstationServer]` and `[HardwareIds.scsi.iaStor_DesktopWorkstationServer]` sections in the `txtsetup.oem` file.
9. Type the following line to the bottom of the two sections:
`id = "USB\VID_03EE&PID_6901", "usbstor"`

```
[HardwareIds.scsi.iaAHCI_DesktopWorkstationServer]
id= "PCI\VEN_8086&DEV_1C02&CC_0106", "iaStor"
id= "USB\VID_03EE&PID_6901", "usbstor"

[HardwareIds.scsi.iaStor_DesktopWorkstationServer]
id= "PCI\VEN_8086&DEV_2822&CC_0104", "iaStor"
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.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

5.1 ATI® CrossFireX™ technology

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

5.1.1 Requirements

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



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

5.1.2 Before you begin

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

To uninstall existing graphics card drivers:

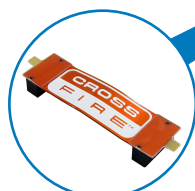
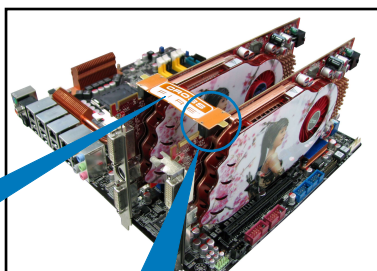
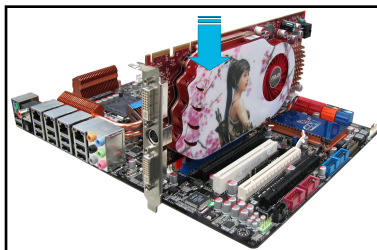
1. Close all current applications.
2. For Windows XP, go to **Control Panel > Add/Remove Programs**.
For Windows Vista, go to **Control Panel > Programs and Features**.
3. Select your current graphics card driver/s.
4. For Windows XP, select **Add/Remove**.
For Windows Vista, select **Uninstall**.
5.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

5.1.3 Installing two CrossFireX™ graphics cards

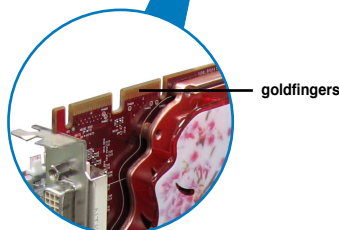


The following pictures are for reference only. The graphics cards and the motherboard layout may vary with models, but the installation steps remain the same.

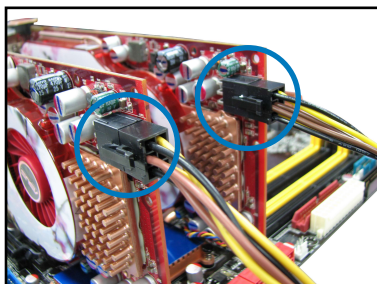
1. Prepare two CrossFireX-ready graphics cards.
2. Insert the two graphics card into the PCIEX16 slots. If your motherboard has more than two PCIEX16 slots, refer to Chapter 2 in this user manual for the locations of the PCIEX16 slots recommended for multi-graphics card installation.
3. Ensure that the cards are properly seated on the slots.
4. Align and firmly insert the CrossFireX bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.



CrossFireX bridge
(bundled with
graphics cards)



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



5.1.4 Installing the device drivers

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



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

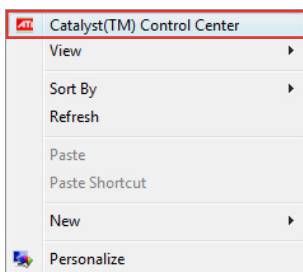
5.1.5 Enabling the ATI® CrossFireX™ technology

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

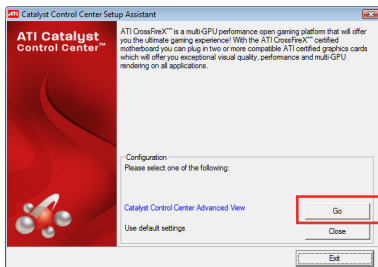
Launching the ATI Catalyst Control Center

To launch the ATI Catalyst Control Center:

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



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



Enabling Dual CrossFireX technology

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



5.2 NVIDIA® SLI™ technology

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

5.2.1 Requirements

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



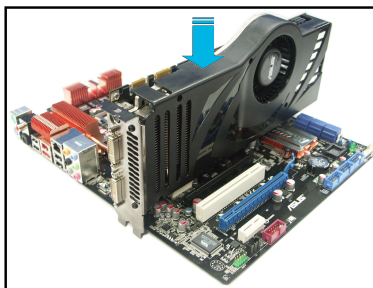
- We recommend that you install additional chassis fans for better thermal environment.
- Visit the NVIDIA zone website (<http://www.nzone.com>) for the latest certified graphics card and supported 3D application list.

5.2.2 Installing two SLI-ready graphics cards

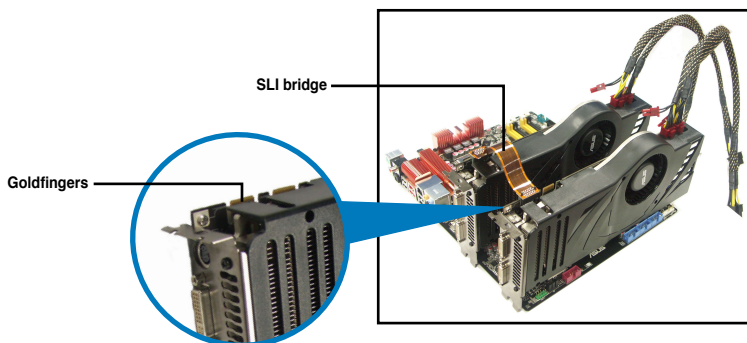


The following pictures are for reference only. The graphics cards and the motherboard layout may vary with models, but the installation steps remain the same.

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



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



5.2.3 Installing the device drivers

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



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

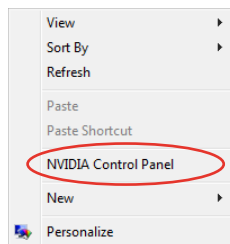
5.2.4 Enabling the NVIDIA® SLI™ technology

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

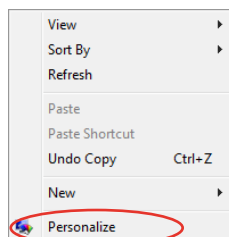
Launching the NVIDIA Control Panel

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

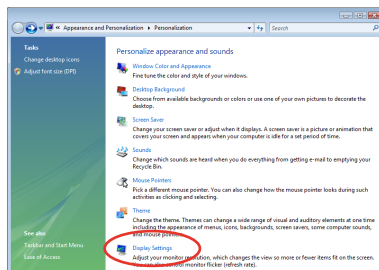
- A. Right click on the empty space of the Windows® desktop and select **NVIDIA Control Panel**.
The NVIDIA Control Panel window appears (See Step B5).



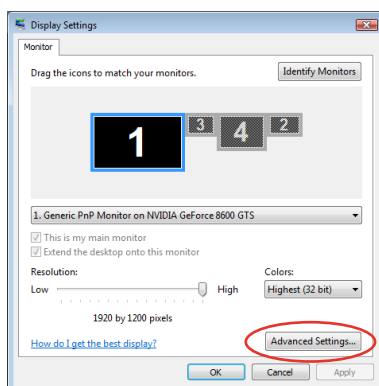
- B1. If you cannot see the NVIDIA Control Panel item in step (A), select **Personalize**.



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



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



[illegible]

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

DECLARATION OF CONFORMITY

Per FCC Part 2 Section 2, 1077(a)



Responsible Party Name: Asus Computer International

Address: 800 Corporate Way, Fremont, CA 94539.

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

hereby declares that the product

Product Name : Motherboard

Model Number : SABERTOOTH 990FX

Conforms to the following specifications:

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

Supplementary Information:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device must 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 : Apr. 30, 2011

Steve Chang

EC Declaration of Conformity



We, the undersigned,

Manufacturer:	ASUSTeK COMPUTER INC.
Address, City:	No. 150, LITE 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 :	SABERTOOTH 990FX

conform with the essential requirements of the following directives:

92/2004/108/EC-EMC Directive	
<input checked="" type="checkbox"/> EN 55022:2006+A1:2007	<input checked="" type="checkbox"/> EN 55024:1988+A1:2001+A2:2003
<input checked="" type="checkbox"/> EN 61000-3-2:2006+A2:2009	<input checked="" type="checkbox"/> EN 61000-3-3:2008
<input checked="" type="checkbox"/> EN 55013:2001+A1:2003+A2:2006	<input checked="" type="checkbox"/> EN 55020:2007

☐ 1999/5/EC-R & TTE Directive

<input type="checkbox"/> EN 300 328 V1.7.1 (2006-05)	<input type="checkbox"/> EN 301 488-1 V1.8.1 (2008-04)
<input type="checkbox"/> EN 300 440-1 V1.4.1 (2008-05)	<input type="checkbox"/> EN 301 488-3 V1.4.1 (2008-08)
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☒ 2006/95/EC-LVD Directive

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☒ 2009/125/EC-ERP Directive

Regulation (EC) No. 1275/2008	Regulation (EC) No. 278/2009
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Regulation (EC) No. 642/2009	
<input type="checkbox"/> EN 62301:2005	

Ver. 10101



CE marking

(EC conformity marking)

Position : CEO
Name : Jerry Shen

Jerry Shen

Signature :

Declaration Date: Apr. 30, 2011
Year to begin affixing CE marking: 2011