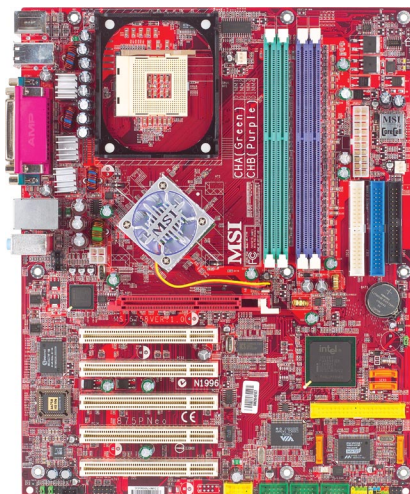




875P Neo  
**MS-6758 (v1.X) ATX Mainboard**

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**Version 1.1**  
**G52-M6758X4-K01**

Manual Rev: 1.1  
Release Date: April 2003



## **FCC-B Radio Frequency Interference Statement**

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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 when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

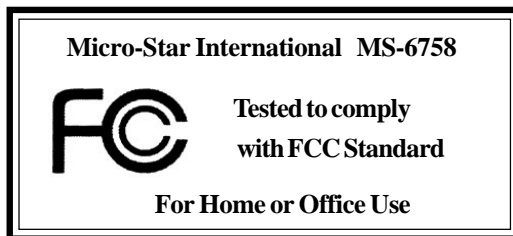
### **Notice 1**

The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### **Notice 2**

Shielded interface cables and A.C. power cord, if any, must be used in order to comply with the emission limits.

**VOIR LA NOTICE D'INSTALLATION AVANT DE RACCORDER AU RESEAU.**



## Copyright Notice

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## Revision History

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| <b>Revision</b> | <b>Revision History</b>   | <b>Date</b> |
|-----------------|---|-------------|
| V1.0            | First release with chipsets<br>Intel® 875P & Intel® ICH5          | March 2003  |
| V1.1            | Update the Core Center photo<br>Delete the S-Bracket description, | April 2003  |

## Safety Instructions

---

1. Always read the safety instructions carefully.
2. Keep this User's Manual for future reference.
3. Keep this equipment away from humidity.
4. Lay this equipment on a reliable flat surface before setting it up.
5. The openings on the enclosure are for air convection hence protects the equipment from overheating. **Do not cover the openings.**
6. Make sure the voltage of the power source and adjust properly 110/220V before connecting the equipment to the power inlet.
7. Place the power cord such a way that people can not step on it. Do not place anything over the power cord.
8. Always Unplug the Power Cord before inserting any add-on card or module.
9. All cautions and warnings on the equipment should be noted.
10. Never pour any liquid into the opening that could damage or cause electrical shock.
11. If any of the following situations arises, get the equipment checked by a service personnel:
  - The power cord or plug is damaged.
  - Liquid has penetrated into the equipment.
  - The equipment has been exposed to moisture.
  - The equipment has not work well or you can not get it work according to User's Manual.
  - The equipment has dropped and damaged.
  - The equipment has obvious sign of breakage.
12. **Do not leave this equipment in an environment unconditioned, storage temperature above 60<sup>o</sup> C (140<sup>o</sup>F), it may damage the equipment.**



**CAUTION:** Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.

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# *Getting Started*

Thank you for choosing the 875P Neo (MS-6758) v1.X ATX mainboard. The MS-6758 is based on **Intel® Canterwood & ICH5** chipsets for optimal system efficiency. Designed to fit the advanced **Intel® Pentium® 4** processors in 478 pin package, the 875P Neo delivers a high performance and professional desktop platform solution.



## **Mainboard Specifications**

### **CPU**

- Supports Intel® P4 Northwood/Prescott (Socket 478) processors.
- FSB 533~800MHz, depending on the North Bridge integrated.
- Supports up to 3.6GHz or higher speed.

### **Chipset**

- Intel® Canterwood chipset
  - Supports FSB 800/533MHz.
  - Supports AGP 8X interface.
  - Supports ECC memory.
  - Supports Single/Dual Channel DDR 400/333/266 memory up to 4GB.
- Intel® ICH5/ICH5R chipset
  - Hi-Speed USB (USB2.0) controller, 480Mb/sec, 8 ports.
  - 2 Serial ATA/150 ports.
  - 2 channel Ultra ATA 100 bus Master IDE controller.
  - PCI Master v2.3.
  - I/O APIC.
  - Supports both ACPI and legacy APM power management.
  - Serial ATA/150 RAID 0 (Optional).

### **MainMemory**

- Supports four unbuffered DIMM of 2.5 Volt DDR SDRAM.
- Supports up to 4GB memory size.
- Supports Dual channel DDR400/333/266 MHz and up.

### **Slots**

- One AGP slot supports 8x/4x at 0.8V (AGP 3.0) or 4x at 1.5V (3.3V is not supported).
- Five 32-bit v2.3 Master PCI bus slots (support 3.3v/5v PCI bus interface).

### **On-BoardIDE**

- Dual Ultra DMA 66/100 IDE controllers integrated in ICH5/ICH5R.
  - Supports PIO, Bus Master operation modes.
  - Can connect up to four Ultra ATA drives.
- Serial ATA/150 controller integrated in ICH5/ICH5R.
  - Up to 150MB/sec transfer speeds.
  - Can connect up to two Serial ATA drives.
  - Supports SATA RAID 0 (Optional).

**Promise 20378 On-Board (Optional)**

- ▶ Supports Ultra ATA, Serial ATA, Ultra ATA RAID 0 or 1 , Serial ATA RAID 0 or 1, Ultra/Serial ATA RAID 0+1 supported.
- ▶ Connect up to 2 Serial ATA devices and 2 Ultra ATA 133 devices.

**On-Board Peripherals**

- ▶ On-Board Peripherals include:
  - 1 floppy port supports 2 FDDs with 360K, 720K, 1.2M, 1.44M and 2.88Mbytes
  - 2 serial port COMA& COMB
  - 1 parallel port supports SPP/EPP/ECP mode
  - 8 USB 2.0 ports (Rear \* 6/ Front \* 2 or Rear \* 4/ Front \* 4)
  - 1 Line-In/Line-Out/Mic-In port
  - 1 RJ45 LAN jack (Optional)
  - 3 IEEE 1394 pinheaders (Optional)

**Audio**

- ▶ 6 channels software audio codec ADI S/W 5.1channel Audio 1980/1985.
  - Compliance with AC97 v2.2 Spec (for 1980) / PC99 v2.3 Spec (for 1985).
  - Meet PC2001 audio performance requirement.
  - Can support SPDIF Out via S-Bracket only.

**LAN (Optional)**

- ▶ Intel® 82547EI (CSA interface) /Intel® 82562EZ Dual layout.
  - Integrated Fast Ethernet MAC and PHY in one chip.
  - Supports 10Mb/s, 100Mb/s and 1000Mb/s (1000Mb/s only for Intel® 82547EI).
  - Compliance with PCI 2.2.
  - Supports ACPI Power Management.

**BIOS**

- ▶ The mainboard BIOS provides “Plug & Play” BIOS which detects the peripheral devices and expansion cards of the board automatically.
- ▶ The mainboard provides a Desktop Management Interface (DMI) function which records your mainboard specifications.

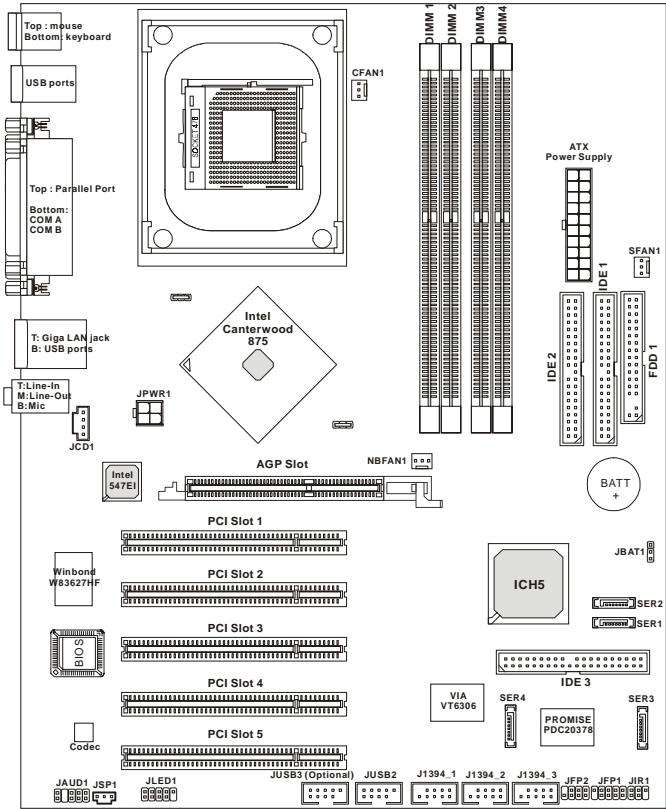
**Dimension**

- ▶ ATX Form Factor: 30.5 cm (L) x 24.4 cm (W).

**Mounting**

- ▶ 9 mounting holes.

# Mainboard Layout



**875P Neo (MS-6758) v1.X ATX Mainboard**

## MSI Special Features

### Super Pack (Optional)

MSI provides a useful CD which includes 6 powerful and popular utilities for your office professional working and for your home leisure entertainments.



1. Adobe Photoshop Album: The fast and easy way to organize and share your lifetime of photos.
2. Media Dialer: A high quality voice service for PC users to make international calls without the elevated cost of traditional IDD providers.
3. FarStone Virtual Drive: A revolutionary software that emulates a physical CD drive.
4. InterVideo WinDVD: The World's Most Popular Software DVD Player.
5. InterVideoWinRip: A state-of-the-art software application that provides you with a complete audio playback and environment.
6. FarStone RestoreIt!: Instantly recover from system crash, virus attack, and addidental data deletion.

## Core Center

The Core Center is a new utility you can find in the CD-ROM disk. The utility is just like your PC doctor that can detect, view and adjust the PC hardware and system status during real time operation. In the left side it shows the current system status including the Vcore, 3.3V, +5V and 12V. In the right side it shows the current PC hardware status such as the CPU & system temperatures and all fans speeds.



When you click the red triangles in the left and right sides, two sub-menus will open for users to overclock, overspec or to adjust the thresholds of system to send out the warning messages. If you click the *Core Center* button in the top, a screen pops up for you to choose the “Auto mode” or “User mode” of CPU fan.



**Left-side: Current system status**

In the left sub-menu, you can configure the settings of FSB, Vcore, Memory Voltage and AGP Voltage by clicking the radio button in front of each item and make it available (the radio button will be lighted as yellow when selected), use the “+” and “-” buttons to adjust, then click **OK** to apply the changes. Then you can click **Save** to save the desired FSB you just configured.

Also you may click **Auto** to start testing the maximal CPU overclocking value, The CPU FSB will automatically increase the testing value until the PC reboots. Or you may click **Default** to restore the default values.

**Right-side: PC hardware status during real time operation**

In the right sub-menu, here you can configure the PC hardware status such as CPU & system temperatures and fan speeds. You may use the scroll bars to adjust each item, then click click “**OK**” to apply the changes. The values you set for the temperatures are the maximum thresholds for the system for warnings, and the valus for fan speeds are the minimum thresholds.

**Top-side: User mode/Auto mode**

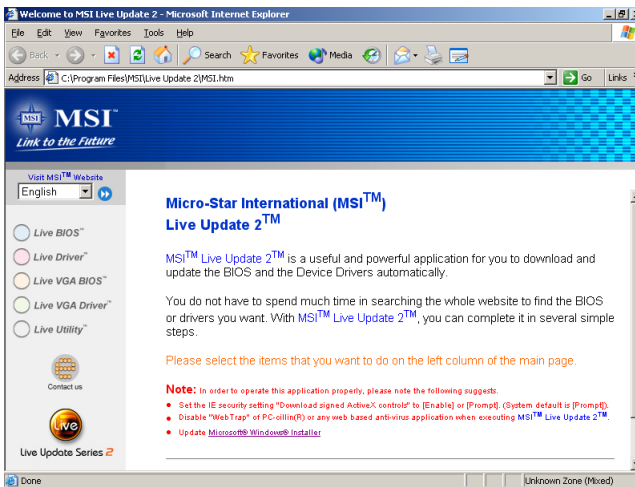
Here you may adjust the CPU fan speed. If you choose **User mode**, you may adjust the CPU fan speed in 8 different modes, from **Stop** to **Full speed**.

## Live BIOS™/Live Driver™

The Live BIOS™/Live Driver™ is a tool used to detect and update your BIOS/drivers online so that you don't need to search for the correct BIOS/driver version throughout the Web site. To use the function, you need to install the "MSI Live Update 2" application. After installation, the "MSI Live Update 2" icon (as shown on the right) will appear on the screen.



Double click the "MSI Live Update 2" icon, and the following screen will appear:



Five buttons are placed on the leftmost pane of the screen. Click the desired button to start the update process.


- **Live BIOS** – Updates the BIOS online.
- **Live Driver** – Updates the drivers online.
- **Live VGA BIOS** – Updates the VGA BIOS online.
- **Live VGA Driver** – Updates the VGA driver online.
- **Live Utility** – Updates the utilities online.

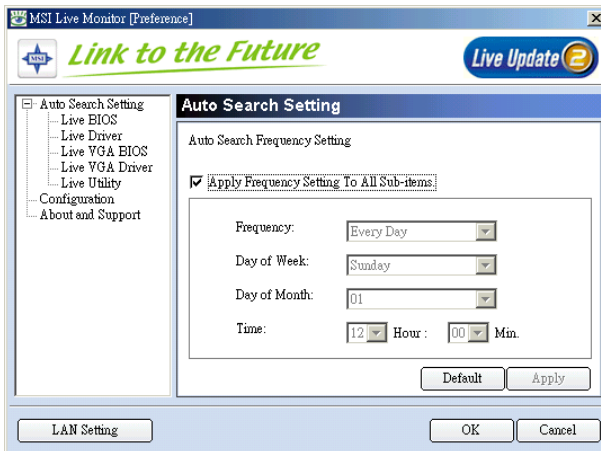
If the product you purchased does not support any of the functions listed above, a "sorry" message is displayed. For more information on the update instructions, insert the companion CD and refer to the "Live Update Guide" under the "Manual" Tab.

## Live Monitor™

The Live Monitor™ is a tool used to schedule the search for the latest BIOS/drivers version on the MSI Web site. To use the function, you need to install the “MSI Live Update 2” application. After installation, the “MSI Live Monitor” icon (as shown on the right) will appear on the screen. Double click this icon to run the application.



Double click the “MSI Live Monitor” icon  at the lower-right corner of the taskbar, and the following dialog box will appear. You can specify how often the system will automatically search for the BIOS/drivers version, or change the LAN settings right from the dialog box.



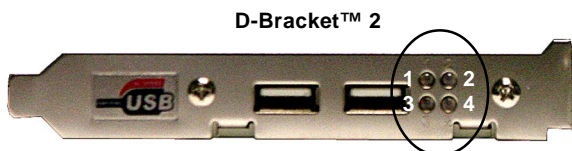
You can right-click the MSI Live Monitor icon  to perform the functions listed below:

- **Auto Search** – Searches for the BIOS/drivers version you need immediately.
- **View Last Result** – Allows you to view the last search result if there is any.
- **Preference** – Configures the Search function, including the Search schedule.
- **Exit** – Exits the Live Monitor™ application.
- **FAQ** – Provides a link to a database which contains various possible questions about MSI's products for users to inquire.













## D-Bracket™ 2 (Optional)

D-Bracket™ 2 is a USB bracket integrating four Diagnostic LEDs, which use graphic signal display to help users understand their system. The LEDs provide up to 16 combinations of signals to debug the system. The 4 LEDs can detect all problems that fail the system, such as VGA, RAM or other failures. This special feature is very useful for overclocking users. These users can use the feature to detect if there are any problems or failures. D-Bracket™ 2 supports both USB 1.1 & 2.0 spec.



● Red    ○ Green

| D-Bracket™ 2  | Description  |
|---|--|
| <div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;"> <span style="font-size: 10px;">1</span> ● <span style="font-size: 10px;">2</span><br/> <span style="font-size: 10px;">3</span> ● <span style="font-size: 10px;">4</span> </div> </div> | System Power ON<br>- The D-LED will hang here if the processor is damaged or not installed properly.                                   |
| <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <span style="font-size: 10px;">○</span> ●<br/> <span style="font-size: 10px;">●</span> ●                 </div>   | Early Chipset Initialization   |
| <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <span style="font-size: 10px;">●</span> ○<br/> <span style="font-size: 10px;">●</span> ●                 </div>   | Memory Detection Test<br>- Testing onboard memory size. The D-LED will hang if the memory module is damaged or not installed properly. |
| <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <span style="font-size: 10px;">○</span> ○<br/> <span style="font-size: 10px;">●</span> ●                 </div>   | Decompressing BIOS image to RAM for fast booting.  |
| <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <span style="font-size: 10px;">●</span> ●<br/> <span style="font-size: 10px;">○</span> ●                 </div>   | Initializing Keyboard Controller.  |
| <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <span style="font-size: 10px;">○</span> ●<br/> <span style="font-size: 10px;">○</span> ●                 </div>   | Testing VGA BIOS<br>- This will start writing VGA sign-on message to the screen.   |

| D-Bracket™ 2  | Description  |
|---|--|
|    | <p>Processor Initialization</p> <p>- This will show information regarding the processor (like brand name, system bus, etc...)</p>                                |
|    | <p>Testing RTC (Real Time Clock)</p>   |
|    | <p>Initializing Video Interface</p> <p>- This will start detecting CPU clock, checking type of video onboard. Then, detect and initialize the video adapter.</p> |
|    | <p>BIOS Sign On</p> <p>- This will start showing information about logo, processor brand name, etc....</p>   |
|    | <p>Testing Base and Extended Memory</p> <p>- Testing base memory from 240K to 640K and extended memory above 1MB using various patterns.</p>                     |
|    | <p>Assign Resources to all ISA.</p>  |
|  | <p>Initializing Hard Drive Controller</p> <p>- This will initialize IDE drive and controller.</p>  |
|  | <p>Initializing Floppy Drive Controller</p> <p>- This will initializing Floppy Drive and controller.</p>   |
|  | <p>Boot Attempt</p> <p>- This will set low stack and boot via INT 19h.</p>   |
|  | <p>Operating System Booting</p>  |

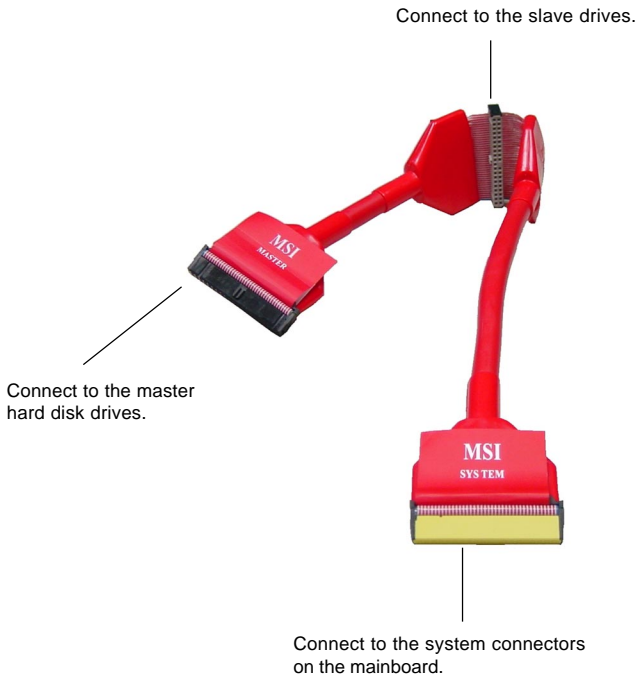
## **CPU Thermal Protection**

Aimed to prevent the CPU from overheating, MSI has developed a CPU Thermal Protection mechanism for Intel® CPU platform. This CPU Thermal Protection mechanism works on a thermal signal sensor. If the mechanism senses an abnormal temperature rise, it will automatically shut down the system and the CPU temperature will then drop down and resume normal. With this unique feature, users can better protect their CPU. Please note that this feature is for Intel® Pentium CPU only.

## Round Cable (Optional)

Round cable is an enhanced cable for PCI IDE and Ultra DMA controller. It has the following benefits:

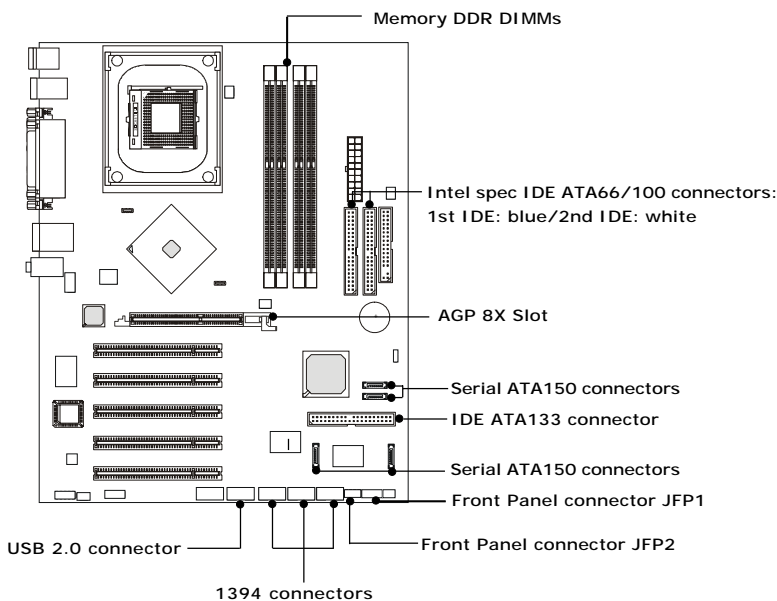
- Data transfer rate started by 133MB/s
- Backward compatibility (ATA33/66/100/133)
- Higher performance than traditional Flat cable (data rate)
- Improved data robustness
- Better airflow due to thinner ATA/133 cable



## Color Management

MSI has a unified color management rule for some connectors on the mainboards, which helps you to install the memory modules, expansion cards and other peripherals devices more easily and conveniently.

- Dual Memory DDR DIMMs: Channel A in purple, Channel B in light green
- Intel spec IDE ATA66/100 connector: 1st IDE in blue, 2nd IDE in white
- IDE ATA133 connector: yellow
- Serial ATA150 connector: orange
- AGP 8X slot: red
- 1394 connector: dark green
- USB 2.0 connector: yellow
- Front panel connector JFP1 : HDD LED in red, Reset Switch in blue, Power Switch in black, Power LED in light green.
- Front panel connector JFP2: Power LED in light green.



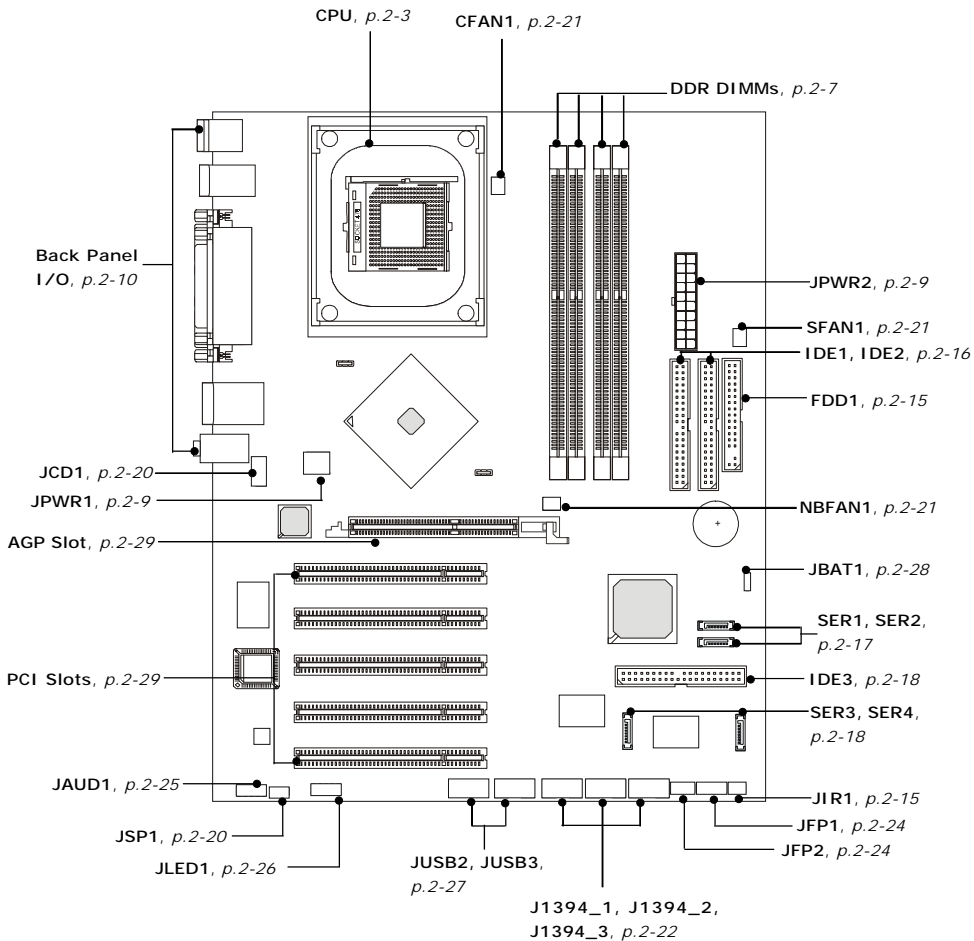
# 2

## *Hardware Setup*

This chapter tells you how to install the CPU, memory modules, and expansion cards, as well as how to setup the jumpers on the mainboard. Also, it provides the instructions on connecting the peripheral devices, such as the mouse, keyboard, etc.

While doing the installation, be careful in holding the components and follow the installation procedures.

# Quick Components Guide



## Central Processing Unit: CPU

The mainboard supports Intel® Pentium® 4 Northwood/Prescott processor in the 478 pin package. The mainboard uses a CPU socket called PGA478 for easy CPU installation. When you are installing the CPU, **make sure the CPU has a heat sink and a cooling fan attached on the top to prevent overheating.** If you do not find the heat sink and cooling fan, contact your dealer to purchase and install them before turning on the computer.

### CPU Core Speed Derivation Procedure

|             |                |   |                             |
|-------------|----------------|---|-----------------------------|
| <b>If</b>   | CPU Clock      | = | 100MHz                      |
|             | Core/Bus ratio | = | 16                          |
| <b>then</b> | CPU core speed | = | Host Clock x Core/Bus ratio |
|             |                | = | 100MHz x 16                 |
|             |                | = | 1.6 GHz                     |



#### MSI Reminds You...

##### **Overheating**

*Overheating will seriously damage the CPU and system, always make sure the cooling fan can work properly to protect the CPU from overheating.*

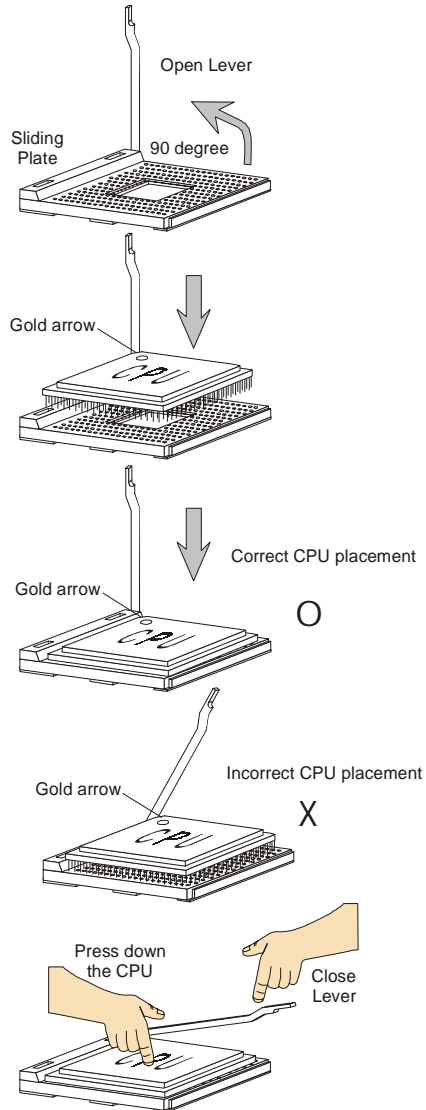
##### **Overclocking**

*This motherboard is designed to support overclocking. However, please make sure your components are able to tolerate such abnormal setting, while doing overclocking. Any attempt to operate beyond product specifications is not recommended. **We do not guarantee the damages or risks caused by inadequate operation or beyond product specifications.***



## CPU Installation Procedures for Socket 478

1. Please turn off the power and unplug the power cord before installing the CPU.
2. Pull the lever sideways away from the socket. Make sure to raise the lever up to a 90-degree angle.
3. Look for the gold arrow. The gold arrow should point towards the lever pivot. The CPU can only fit in the correct orientation.
4. If the CPU is correctly installed, the pins should be completely embedded into the socket and can not be seen. Please note that any violation of the correct installation procedures may cause permanent damages to your mainboard.
5. Press the CPU down firmly into the socket and close the lever. As the CPU is likely to move while the lever is being closed, always close the lever with your fingers pressing tightly on top of the CPU to make sure the CPU is properly and completely embedded into the socket.

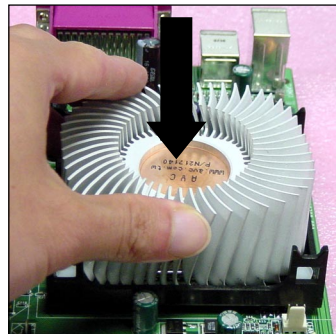
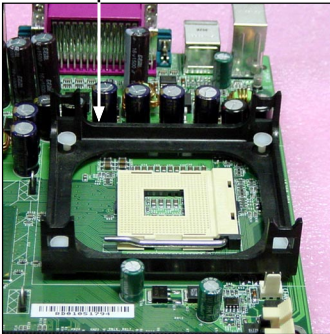


## Installing the CPU Fan

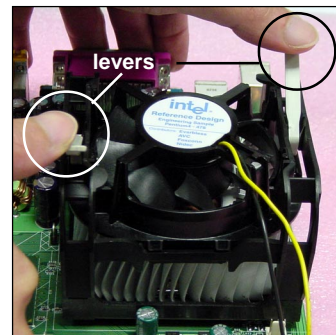
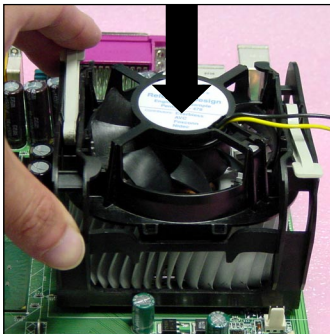
As processor technology pushes to faster speeds and higher performance, thermal management becomes increasingly important. To dissipate heat, you need to attach the CPU cooling fan and heatsink on top of the CPU. Follow the instructions below to install the Heatsink/Fan:

1. Locate the CPU and its retention mechanism on the motherboard.
2. Position the heatsink onto the retention mechanism.

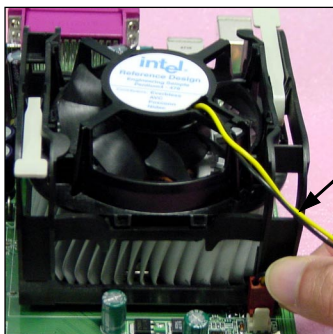
retention mechanism



3. Mount the fan on top of the heatsink. Press down the fan until its four clips get wedged in the holes of the retention mechanism.
4. Press the two levers down to fasten the fan. Each lever can be pressed down in only ONE direction.



5. Connect the fan power cable from the mounted fan to the 3-pin fan power connector on the board.



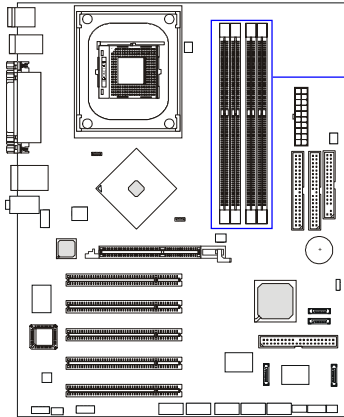
fan power cable



## **NOTES**

## Memory

The mainboard provides 4 slots for 184-pin, 2.5V DDR DIMM with 8 memory banks. You can install DDR266/DDR333/DDR400 SDRAM modules on the DDR DIMM slots (DIMM 1~4). To operate properly, at least one DIMM module must be installed.



**DDR DIMM Slots**  
 (DDR 1~4, from left to right)  
 Channel A: DIMM1 & DIMM2  
 Channel B: DIMM3 & DIMM4

### Introduction to DDR SDRAM

DDR (Double Data Rate) SDRAM is similar to conventional SDRAM, but doubles the rate by transferring data twice per cycle. It uses 2.5 volts as opposed to 3.3 volts used in SDR SDRAM, and requires 184-pin DIMM modules rather than 168-pin DIMM modules used by SDR SDRAM. Please note that the DDR SDRAM does support ECC (error correcting code) and registered DIMM.

### DDR Population Rules

Install at least one DIMM module on the slots. Each DIMM slot supports up to a maximum size of 1GB. Users can install either single- or double-sided modules to meet their own needs. Please note that **each DIMM can work respectively for single-channel DDR, but there are some rules while using dual-channel DDR** (Please refer to the suggested DDR population table on p. 2-8). Users may install memory modules of different type and density on different-

channelDDR DIMMs. However, the *same type and density memory modules* are necessary while using dual-channel DDR, or instability may happen.

Please refer to the following table for detailed dual-channel DDR. Other combination not listed below will function as single-channel DDR.

| DIMM1 (Ch A) | DIMM2 (Ch A) | DIMM3 (Ch B) | DIMM4 (Ch B) | System Density |
|--------------|--------------|--------------|--------------|----------------|
| 128MB~1GB    |              | 128MB~1GB    |              | 256MB~2GB      |
|              | 128MB~1GB    |              | 128MB~1GB    | 256MB~2GB      |
| 128MB~1GB    | 128MB~1GB    | 128MB~1GB    | 128MB~1GB    | 512MB~4GB      |

### Installing DDR Modules

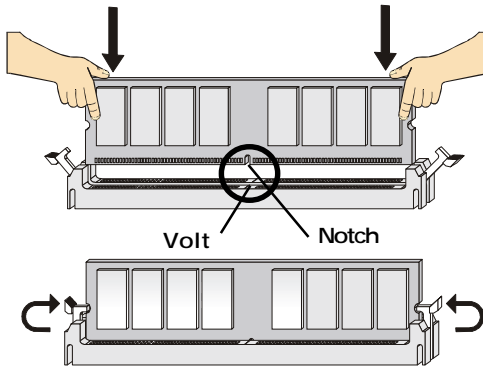
1. The DDR DIMM has only one notch on the center of module. The module will only fit in the right orientation.
2. Insert the DIMM memory module vertically into the DIMM slot. Then push it in until the golden finger on the memory module is deeply inserted in the socket.



#### MSI Reminds You...

*You can barely see the golden finger if the module is properly inserted in the socket.*

3. The plastic clip at each side of the DIMM slot will automatically close.



## Power Supply

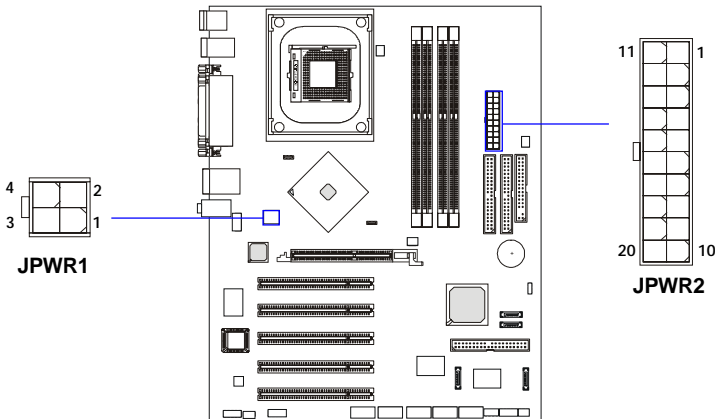
The mainboard supports ATX power supply for the power system. Before inserting the power supply connector, always make sure that all components are installed properly to ensure that no damage will be caused.

### ATX 20-Pin Power Connector: JPWR2

This connector allows you to connect to an ATX power supply. To connect to the ATX power supply, make sure the plug of the power supply is inserted in the proper orientation and the pins are aligned. Then push down the power supply firmly into the connector.

### ATX 12V Power Connector: JPWR1

This 12V power connector is used to provide power to the CPU.



JPWR2 Pin Definition

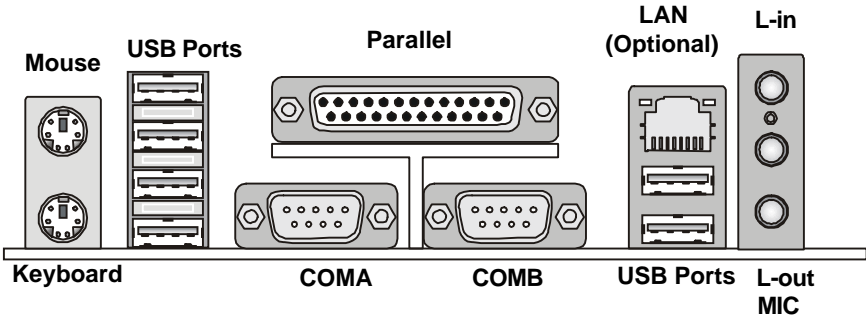
| PIN | SIGNAL | PIN | SIGNAL |
|-----|--------|-----|--------|
| 1   | 3.3V   | 11  | 3.3V   |
| 2   | 3.3V   | 12  | -12V   |
| 3   | GND    | 13  | GND    |
| 4   | 5V     | 14  | PS_ON  |
| 5   | GND    | 15  | GND    |
| 6   | 5V     | 16  | GND    |
| 7   | GND    | 17  | GND    |
| 8   | PW_OK  | 18  | -5V    |
| 9   | 5V_SB  | 19  | 5V     |
| 10  | 12V    | 20  | 5V     |

JPWR1 Pin Definition

| PIN | SIGNAL |
|-----|--------|
| 1   | GND    |
| 2   | GND    |
| 3   | 12V    |
| 4   | 12V    |

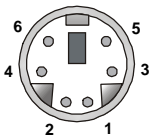
## Back Panel

The back panel provides the following connectors:



### Mouse Connector

The mainboard provides a standard PS/2<sup>®</sup> mouse mini DIN connector for attaching a PS/2<sup>®</sup> mouse. You can plug a PS/2<sup>®</sup> mouse directly into this connector. The connector location and pin assignments are as follows:



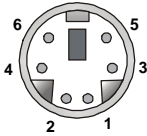
**PS/2 Mouse (6-pin Female)**

**Pin Definition**

| PIN | SIGNAL      | DESCRIPTION   |
|-----|-------------|---------------|
| 1   | Mouse DATA  | Mouse DATA    |
| 2   | NC          | No connection |
| 3   | GND         | Ground        |
| 4   | VCC         | +5V           |
| 5   | Mouse Clock | Mouse clock   |
| 6   | NC          | No connection |

## Keyboard Connector

The mainboard provides a standard PS/2<sup>®</sup> keyboard mini DIN connector for attaching a PS/2<sup>®</sup> keyboard. You can plug a PS/2<sup>®</sup> keyboard directly into this connector.



PS/2 Keyboard (6-pin Female)

Pin Definition

| PIN | SIGNAL         | DESCRIPTION    |
|-----|----------------|----------------|
| 1   | Keyboard DATA  | Keyboard DATA  |
| 2   | NC             | No connection  |
| 3   | GND            | Ground         |
| 4   | VCC            | +5V            |
| 5   | Keyboard Clock | Keyboard clock |
| 6   | NC             | No connection  |

## USB Connectors

The mainboard provides a UHCI (Universal Host Controller Interface) Universal Serial Bus root for attaching USB devices such as keyboard, mouse or other USB-compatible devices. You can plug the USB device directly into the connector.



USB Port Description

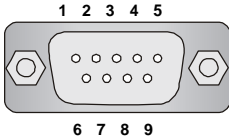
| PIN | SIGNAL  | DESCRIPTION             |
|-----|---------|-------------------------|
| 1   | VCC     | +5V                     |
| 2   | -Data 0 | Negative Data Channel 0 |
| 3   | +Data0  | Positive Data Channel 0 |
| 4   | GND     | Ground                  |
| 5   | VCC     | +5V                     |
| 6   | -Data 1 | Negative Data Channel 1 |
| 7   | +Data 1 | Positive Data Channel 1 |
| 8   | GND     | Ground                  |

USB Ports



## Serial Port Connectors: COM A

The mainboard offers one 9-pin male DIN connectors as serial port COM A. The port is a 16550A high speed communication port that sends/receives 16 bytes FIFOs. You can attach a serial mouse or other serial devices directly to the connectors.



**9-Pin Male DIN Connector**

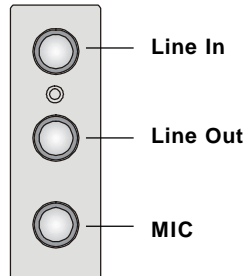
**Pin Definition**

| PIN | SIGNAL | DESCRIPTION                 |
|-----|--------|-----------------------------|
| 1   | DCD    | Data Carry Detect           |
| 2   | SIN    | Serial In or Receive Data   |
| 3   | SOUT   | Serial Out or Transmit Data |
| 4   | DTR    | Data Terminal Ready)        |
| 5   | GND    | Ground                      |
| 6   | DSR    | Data Set Ready              |
| 7   | RTS    | Request To Send             |
| 8   | CTS    | Clear To Send               |
| 9   | RI     | Ring Indicate               |

## Audio Port Connectors

**Line Out** is a connector for Speakers or Headphones. **Line In** is used for external CD player, Tape player, or other audio devices. **Mic** is a connector for microphones.

**1/8" Stereo Audio Connectors**

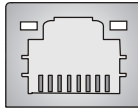


### **MSI Reminds You...**

*For advanced audio application, ADI SoundMax is provided to offer support for **6-channel audio operation** and can turn rear audio connectors from 2-channel to 4-/6-channel audio. For more information on **6-channel audio operation**, please refer to Appendix. Using 4- or 6-Channel Audio Function.*

## LAN (RJ-45) Jacks: 10/100 LAN (with Intel 82562EZ) or Giga-bit LAN (with Intel 82547EI) (Optional)

The mainboard provides a standard RJ-45 jacks for connection to Local Area Network (LAN). 10/100 LAN enables data to be transferred at 100 or 10Mbps, while Giga-bit LAN at 1000, 100 or 10Mbps. You can connect a network cable to either LAN jack.



**RJ-45 LAN Jack**

**10/100 LAN Pin Definition**

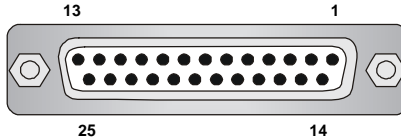
| PIN | SIGNAL | DESCRIPTION                |
|-----|--------|----------------------------|
| 1   | TDP    | Transmit Differential Pair |
| 2   | TDN    | Transmit Differential Pair |
| 3   | RDP    | Receive Differential Pair  |
| 4   | NC     | Not Used                   |
| 5   | NC     | Not Used                   |
| 6   | RDN    | Receive Differential Pair  |
| 7   | NC     | Not Used                   |
| 8   | NC     | Not Used                   |

**Giga-bit LAN Pin Definition**

| PIN | SIGNAL | DESCRIPTION          |
|-----|--------|----------------------|
| 1   | D0P    | Differential Pair 0+ |
| 2   | D0N    | Differential Pair 0- |
| 3   | D1P    | Differential Pair 1+ |
| 4   | D2P    | Differential Pair 2+ |
| 5   | D2N    | Differential Pair 2- |
| 6   | D1N    | Differential Pair 1- |
| 7   | D3P    | Differential Pair 3+ |
| 8   | D3N    | Differential Pair 3- |

## Parallel Port Connector: LPT1

The mainboard provides a 25-pin female centronic connector as LPT. A parallel port is a standard printer port that supports Enhanced Parallel Port (EPP) and Extended Capabilities Parallel Port (ECP) mode.



**Pin Definition**

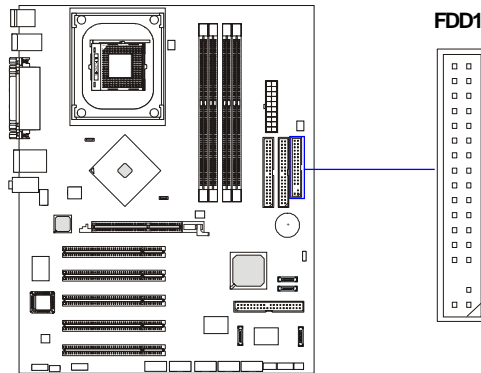
| <b>PIN</b> | <b>SIGNAL</b> | <b>DESCRIPTION</b> |
|------------|---------------|--------------------|
| 1          | STROBE        | Strobe             |
| 2          | DATA0         | Data0              |
| 3          | DATA1         | Data1              |
| 4          | DATA2         | Data2              |
| 5          | DATA3         | Data3              |
| 6          | DATA4         | Data4              |
| 7          | DATA5         | Data5              |
| 8          | DATA6         | Data6              |
| 9          | DATA7         | Data7              |
| 10         | ACK#          | Acknowledge        |
| 11         | BUSY          | Busy               |
| 12         | PE            | Paper End          |
| 13         | SELECT        | Select             |
| 14         | AUTO FEED#    | Automatic Feed     |
| 15         | ERR#          | Error              |
| 16         | INIT#         | Initialize Printer |
| 17         | SLIN#         | Select In          |
| 18         | GND           | Ground             |
| 19         | GND           | Ground             |
| 20         | GND           | Ground             |
| 21         | GND           | Ground             |
| 22         | GND           | Ground             |
| 23         | GND           | Ground             |
| 24         | GND           | Ground             |
| 25         | GND           | Ground             |

## Connectors

The mainboard provides connectors to connect to FDD, IDE HDD, case, modem, LAN, USB Ports, IR module and CPU/System/Power Supply FAN.

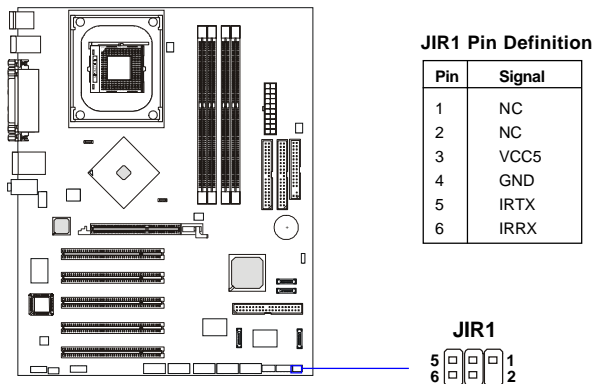
### Floppy Disk Drive Connector: FDD1

The mainboard provides a standard floppy disk drive connector that supports 360K, 720K, 1.2M, 1.44M and 2.88M floppy disk types.



### IrDA Infrared Module Header: JIR1

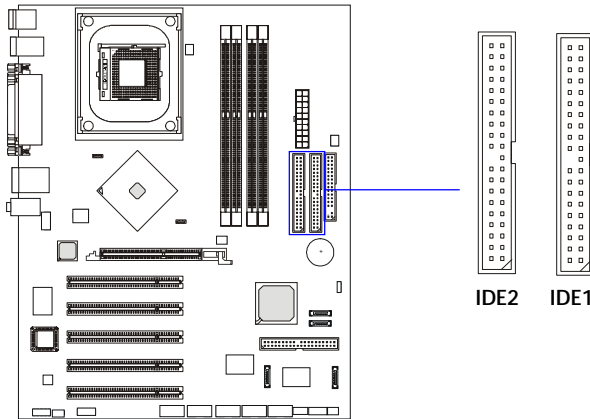
The connector allows you to connect to IrDA Infrared module. You must configure the setting through the BIOS setup to use the IR function. JIR1 is compliant with Intel® Front Panel I/O Connectivity Design Guide.



## **ATA100 Hard Disk Connectors: IDE1 & IDE2**

The mainboard has a 32-bit Enhanced PCI IDE and Ultra DMA 66/100 controller that provides PIO mode 0~4, Bus Master, and Ultra DMA 66/100 function. You can connect up to four hard disk drives, CD-ROM, 120MB Floppy (reserved for future BIOS) and other devices.

The Ultra ATA100 interface boosts data transfer rates between the computer and the hard drive up to 100 megabytes (MB) per second. The new interface is one-third faster than earlier record-breaking Ultra ATA/100 technology and is backwards compatible with the existing Ultra ATA interface.



### **IDE1 (Primary IDE Connector)**

The first hard drive should always be connected to IDE1. IDE1 can connect a Master and a Slave drive. You must configure second hard drive to Slave mode by setting the jumper accordingly.

### **IDE2 (Secondary IDE Connector)**

IDE2 can also connect a Master and a Slave drive.



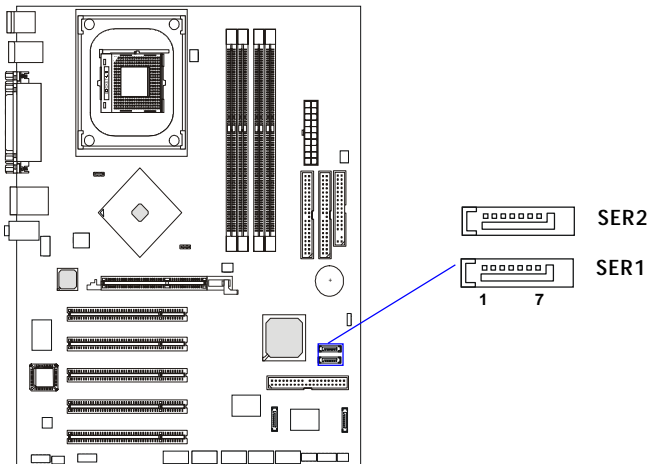
### **MSI Reminds You...**

*If you install two hard disks on cable, you must configure the second drive to Slave mode by setting its jumper. Refer to the hard disk documentation supplied by hard disk vendors for jumper setting instructions.*

## Serial ATA/Serial ATA RAID Connectors controlled by ICH5R: SER1, SER2 (Optional)

The Southbridge of this mainboard is ICH5R which supports two serial connectors SER1 & SER2.

SER1 & SER2 are dual high-speed Serial ATA interface ports. Each supports 1<sup>st</sup> generation serial ATA data rates of 150 MB/s. Both connectors are fully compliant with Serial ATA 1.0 specifications. Each Serial ATA connector can connect to 1 hard disk device. Please refer to *Serial ATA/Serial ATA Raid* manual for detail software installation procedure.

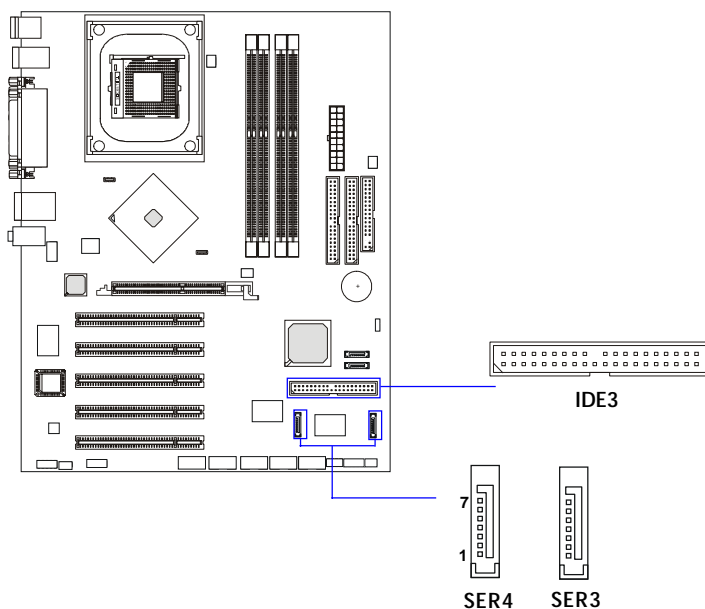


## **Serial ATA/Serial ATA RAID Connectors controlled by Promise 20378: IDE3, SER3 & SER4 (Optional)**

The brand new Promise 20378 chipset supports one IDE connector IDE3 and two serial connectors SER3 & SER4.

IDE3 is a 32-bit Enhanced PCI IDE and Ultra DMA 66/100/133 controller that provides PIO mode 0~6, Bus Master, and Ultra DMA 66/100/133 function. You can connect up to 2 hard disk drives---one IDE master and one IDE slave.

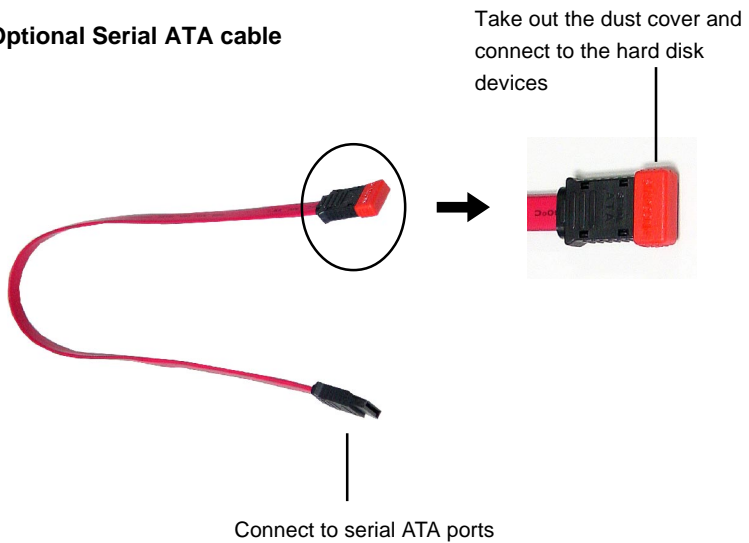
And SER3 & SER4 are dual high-speed Serial ATA interface ports. Each supports 1<sup>st</sup> generation serial ATA data rates of 150 MB/s. Both connectors are fully compliant with Serial ATA 1.0 specifications. Each Serial ATA connector can connect to 1 hard disk device. Please refer to *Serial ATA/Serial ATA Raid* manual for detail software installation procedure.



**SER1~ SER4 Pin Definition**

| PIN | SIGNAL | PIN | SIGNAL |
|-----|--------|-----|--------|
| 1   | GND    | 2   | TXP    |
| 3   | TXN    | 4   | GND    |
| 5   | RXN    | 6   | RXP    |
| 7   | GND    |     |        |

**Optional Serial ATA cable**



**MSI Reminds You...**

*Please do not fold the serial ATA cable in a 90-degree angle, which will cause the loss of data during the transmission.*

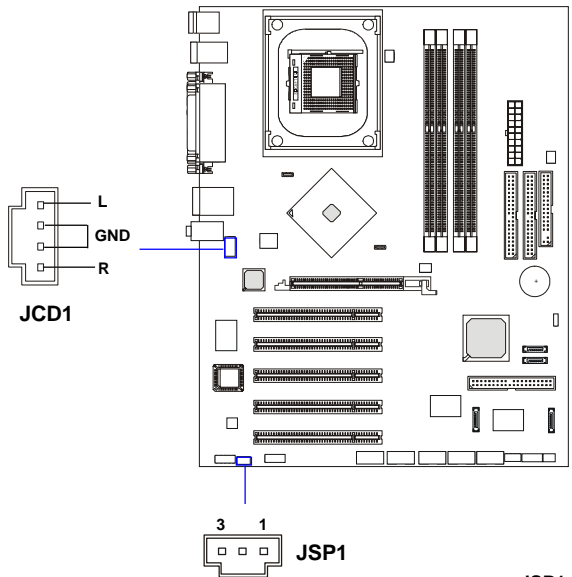


### CD-In Connector: JCD1

The connector is for CD-ROM audio connector.

### SPDIF Connector: JSP1

The connector is used to connect SPDIF (Sony & Philips Digital Interconnect Format) interface for digital audio transmission.



**JSP1 Pin Definition**

| PIN | SIGNAL |
|-----|--------|
| 1   | VCC    |
| 2   | SPDIF  |
| 3   | NC     |

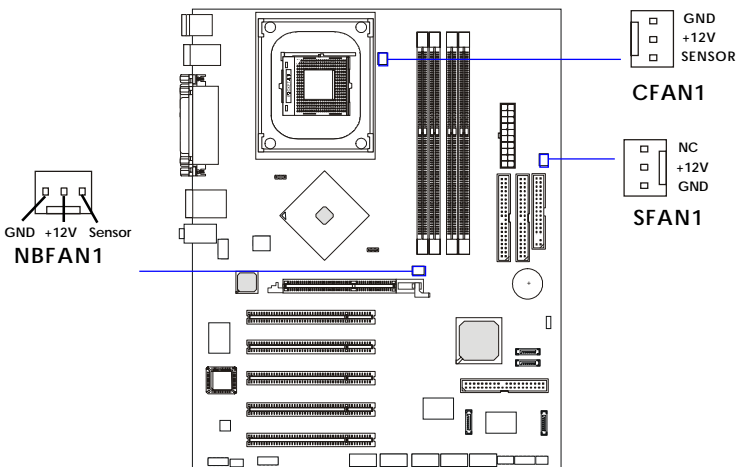
Connected to JSP1



**SPDIF Bracket**

## Fan Power Connectors: CFAN1/SFAN1/NBFAN1

The CFAN1 (processor fan), SFAN1 (system fan) and NBFAN1 (NorthBridge Chipset fan) support system cooling fan with +12V. It supports three-pin head connector. When connecting the wire to the connectors, always take note that the red wire is the positive and should be connected to the +12V, the black wire is Ground and should be connected to GND. If the mainboard has a System Hardware Monitor chipset on-board, you must use a specially designed fan with speed sensor to take advantage of the CPU fan control.

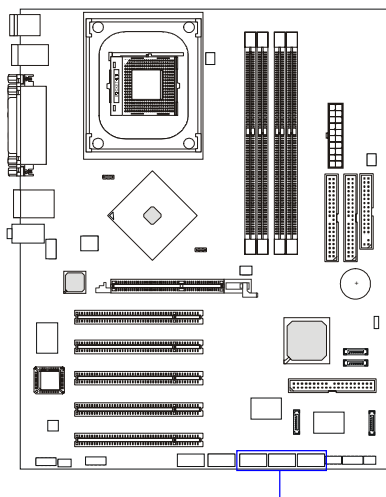


### MSI Reminds You...

1. Always consult the vendors for proper CPU cooling fan.
2. CFAN1 supports the fan control. You can install the PC Alert utility that will automatically control the CPU fan speed according to the actual CPU temperature.

## IEEE 1394 Connectors: J1394\_1, J1394\_2, J1394\_3 (Optional)

The mainboard provides three 1394 pin headers that allow you to connect optional IEEE 1394 ports.

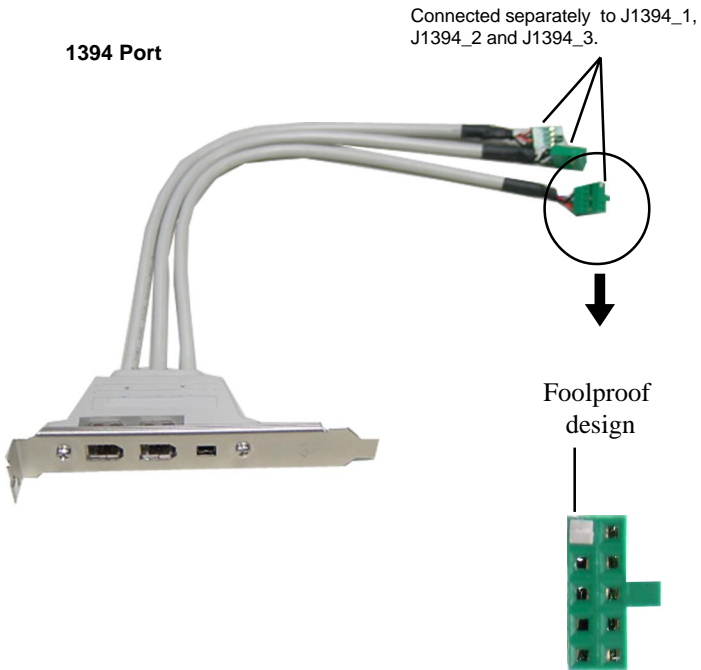


**J1394\_1, J1394\_2, J1394\_3**  
(from left to right)

**J1394 Pin Definition**

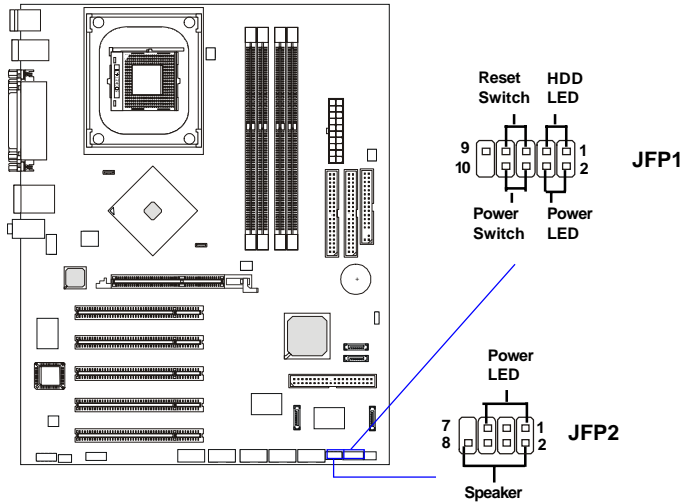
| PIN | SIGNAL       | PIN | SIGNAL      |
|-----|--------------|-----|-------------|
| 1   | TPA+         | 2   | TPA-        |
| 3   | Ground       | 4   | Ground      |
| 5   | TPB+         | 6   | TPB-        |
| 7   | Cable power  | 8   | Cable power |
| 9   | Key (no pin) | 10  | Ground      |

## How to attach the IEEE 1394 Port:



## Front Panel Connectors: JFP1 & JFP2

The mainboard provides two front panel connectors for electrical connection to the front panel switches and LEDs. JFP1 is compliant with Intel® Front Panel I/O Connectivity Design Guide.



**JFP1 Pin Definition**

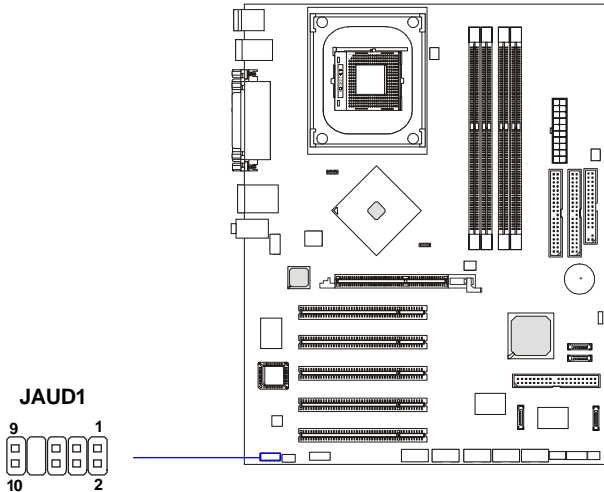
| PIN | SIGNAL     | DESCRIPTION                                 |
|-----|------------|---|
| 1   | HD_LED_P   | Hard disk LED pull-up                       |
| 2   | FP PWR/SLP | MSG LED pull-up                             |
| 3   | HD_LED_N   | Hard disk active LED                        |
| 4   | FP PWR/SLP | MSG LED pull-up                             |
| 5   | RST_SW_N   | Reset Switch low reference pull-down to GND |
| 6   | PWR_SW_P   | Power Switch high reference pull-up         |
| 7   | RST_SW_P   | Reset Switch high reference pull-up         |
| 8   | PWR_SW_N   | Power Switch low reference pull-down to GND |
| 9   | RSVD_DNU   | Reserved. Do not use.                       |

**JFP2 Pin Definition**

| PIN | SIGNAL | PIN | SIGNAL |
|-----|--------|-----|--------|
| 1   | GND    | 2   | SPK-   |
| 3   | SLED   | 4   | BUZ+   |
| 5   | PLED   | 6   | BUZ-   |
| 7   | NC     | 8   | SPK+   |

## Front Panel Audio Connector: JAUD1

The JAUD1 front panel audio connector allows you to connect to the front panel audio and is compliant with Intel® Front Panel I/O Connectivity Design Guide.



JAUD1 Pin Definition

| PIN | SIGNAL       | DESCRIPTION  |
|-----|--------------|--|
| 1   | AUD_MIC      | Front panel microphone input signal                    |
| 2   | AUD_GND      | Ground used by analog audio circuits                   |
| 3   | AUD_MIC_BIAS | Microphone power                                       |
| 4   | AUD_VCC      | Filtered +5V used by analog audio circuits             |
| 5   | AUD_FPOUT_R  | Right channel audio signal to front panel              |
| 6   | AUD_RET_R    | Right channel audio signal return from front panel     |
| 7   | HP_ON        | Reserved for future use to control headphone amplifier |
| 8   | KEY          | No pin   |
| 9   | AUD_FPOUT_L  | Left channel audio signal to front panel               |
| 10  | AUD_RET_L    | Left channel audio signal return from front panel      |



### MSI Reminds You...

*If you don't want to connect to the front audio header, pins 5 & 6, 9 & 10 have to be jumpered in order to have signal output directed to the rear audio ports. Otherwise, the Line-Out connector on the back panel will not function.*

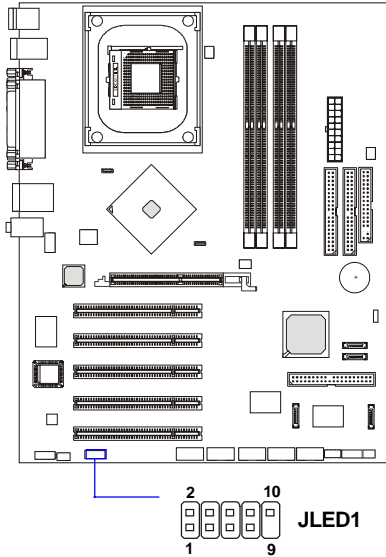


### D-Bracket™ 2 Connector: JLED1 (Optional)

The mainboard comes with a JLED1 connector for you to connect to D-Bracket™ 2. D-Bracket™ 2 is a USB Bracket that supports both USB1.1 & 2.0 spec. It integrates four LEDs and allows users to identify system problem through 16 various combinations of LED signals. For definitions of 16 signal combinations, please refer to *D-Bracket™ 2* in *Chapter 1*.

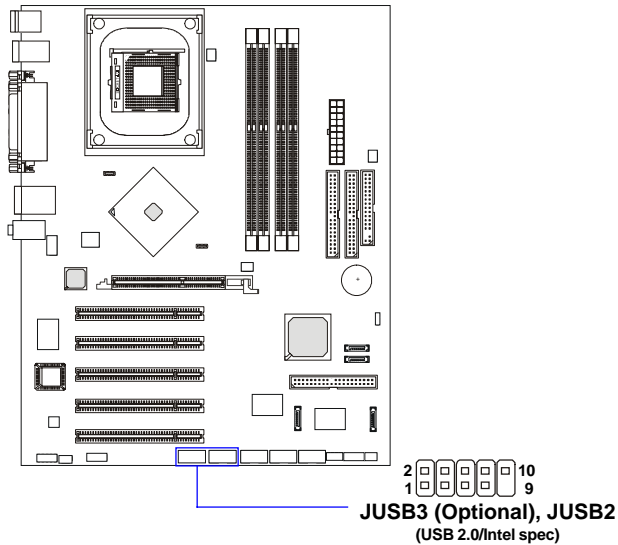
**JLED1 Pin Definition**

| Pin | Signal                      |
|-----|-----------------------------|
| 1   | DBG1 (high for green color) |
| 2   | DBR1 (high for red color)   |
| 3   | DBG2 (high for green color) |
| 4   | DBR2 (high for red color)   |
| 5   | DBG3 (high for green color) |
| 6   | DBR3 (high for red color)   |
| 7   | DBG4 (high for green color) |
| 8   | DBR4 (high for red color)   |
| 9   | Key (no pin)                |
| 10  | NC                          |



## Front USB Connectors: JUSB2, JUSB3 (Optional)

The mainboard provides one USB 2.0 pin header *JUSB2* and one optional USB 2.0 pin header *JUSB3* that are compliant with Intel® I/O Connectivity Design Guide. USB 2.0 technology increases data transfer rate up to a maximum throughput of 480Mbps, which is 40 times faster than USB 1.1, and is ideal for connecting high-speed USB interface peripherals such as **USB HDD, digital cameras, MP3 players, printers, modems and the like.**



**JUSB2 & JUSB3 Pin Definition**

| PIN | SIGNAL       | PIN | SIGNAL |
|-----|--------------|-----|--------|
| 1   | VCC          | 2   | VCC    |
| 3   | USB0-        | 4   | USB1-  |
| 5   | USB0+        | 6   | USB1+  |
| 7   | GND          | 8   | GND    |
| 9   | Key (no pin) | 10  | USBOC  |

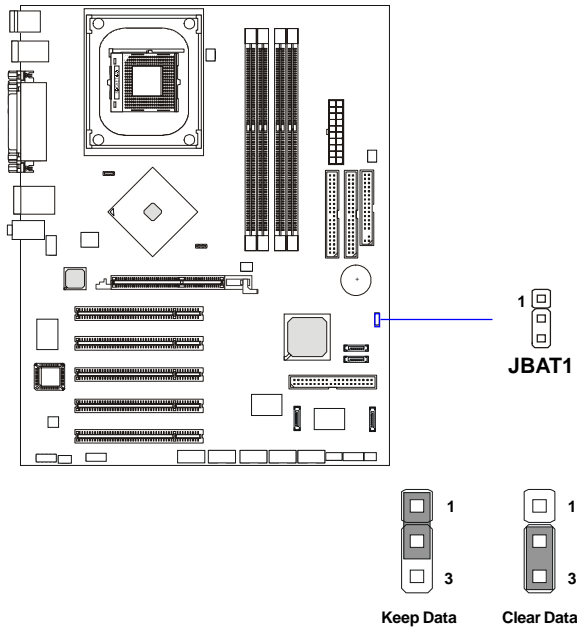


## Jumpers

The motherboard provides the following jumpers for you to set the computer's function. This section will explain how to change your motherboard's function through the use of jumpers.

### Clear CMOS Jumper: JBAT1

There is a CMOS RAM on board that has a power supply from external battery to keep the data of system configuration. With the CMOS RAM, the system can automatically boot OS every time it is turned on. If you want to clear the system configuration, use the JBAT1 (Clear CMOS Jumper ) to clear data. Follow the instructions below to clear the data:

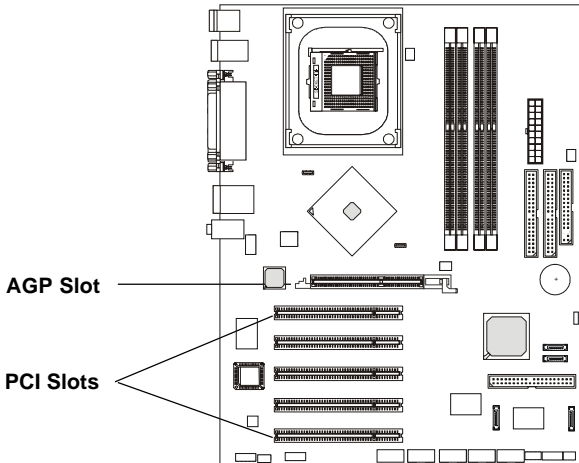


#### MSI Reminds You...

*You can clear CMOS by shorting 2-3 pin while the system is off. Then return to 1-2 pin position. Avoid clearing the CMOS while the system is on; it will damage the mainboard.*

## Slots

The motherboard provides one AGP slot and five 32-bit PCI bus slots.



### AGP (Accelerated Graphics Port) Slot

The AGP/AGP Pro slot allows you to insert the AGP graphics card. AGP is an interface specification designed for the throughput demands of 3D graphics. It introduces a 66MHz, 32-bit channel for the graphics controller to directly access main memory. The slot supports 8x/4x/2x/1x AGP card.

### PCI (Peripheral Component Interconnect) Slots

The PCI slots allow you to insert the expansion cards to meet your needs. When adding or removing expansion cards, make sure that you unplug the power supply first. Meanwhile, read the documentation for the expansion card to make any necessary hardware or software settings for the expansion card, such as jumpers, switches or BIOS configuration.

## PCI Interrupt Request Routing

The IRQ, acronym of interrupt request line and pronounced I-R-Q, are hardware lines over which devices can send interrupt signals to the microprocessor. The PCI IRQ pins are typically connected to the PCI bus INT A# ~ INT D# pins as follows:

|            | Order 1 | Order 2 | Order 3 | Order 4 |
|------------|---------|---------|---------|---------|
| PCI Slot 1 | INT A#  | INT B#  | INT C#  | INT D#  |
| PCI Slot 2 | INT B#  | INT C#  | INT D#  | INT A#  |
| PCI Slot 3 | INT C#  | INT D#  | INT A#  | INT B#  |
| PCI Slot 4 | INT D#  | INT A#  | INT B#  | INT C#  |
| PCI Slot 5 | INT B#  | INT C#  | INT D#  | INT A#  |

# 3

## ***BIOS Setup***

This chapter provides information on the BIOS Setup program and allows you to configure the system for optimum use.

You may need to run the Setup program when:

- ◆ An error message appears on the screen during the system booting up, and requests you to run SETUP.
- ◆ You want to change the default settings for customized features.

## Entering Setup

Power on the computer and the system will start POST (Power On Self Test) process. When the message below appears on the screen, press <DEL> key to enter Setup.

DEL:Setup    F11:Boot Menu    F12:Network boot    TAB:Logo

If the message disappears before you respond and you still wish to enter Setup, restart the system by turning it OFF and On or pressing the RESET button. You may also restart the system by simultaneously pressing <Ctrl>, <Alt>, and <Delete> keys.

## Selecting the First Boot Device

You are allowed to select the 1st boot device without entering the BIOS setup utility by pressing <F11>. When the same message as listed above appears on the screen, press <F11> to trigger the boot menu.

The POST messages might pass by too quickly for you to respond in time. If so, restart the system and press <F11> after around 2 or 3 seconds to activate the boot menu similar to the following.

| Select First Boot Device |               |                          |
|--------------------------|---------------|--------------------------|
| Floppy                   | :             | 1st Floppy               |
| IDE-0                    | :             | IBM-DTLA-307038          |
| CDROM                    | :             | ATAPI CD-ROM DRIVE 40X M |
| [Up/Dn] Select           | [RETURN] Boot | [ESC] cancel             |

The boot menu will list all the bootable devices. Select the one you want to boot from by using arrow keys and then pressing <Enter>. The system will boot from the selected device. The selection will not make changes to the settings in the BIOS setup utility, so next time when you power on the system, it will still use the original first boot device to boot up.

## Control Keys

|         |   |
|---------|---|
| <↑>     | Move to the previous item   |
| <↓>     | Move to the next item   |
| <←>     | Move to the item in the left hand                                 |
| <→>     | Move to the item in the right hand                                |
| <Enter> | Select the item   |
| <Esc>   | Jumps to the Exit menu or returns to the main menu from a submenu |
| <+/PU>  | Increase the numeric value or make changes                        |
| <-/PD>  | Decrease the numeric value or make changes                        |
| <F6>    | Load Setup Original values  |
| <F7>    | Load BIOS Setup defaults  |
| <F8>    | BIOS Languages switch   |
| <F9>    | Load High Performance defaults                                    |
| <F10>   | Save all the CMOS changes and exit                                |

## Getting Help

After entering the Setup utility, the first screen you see is the Main Menu.

### Main Menu

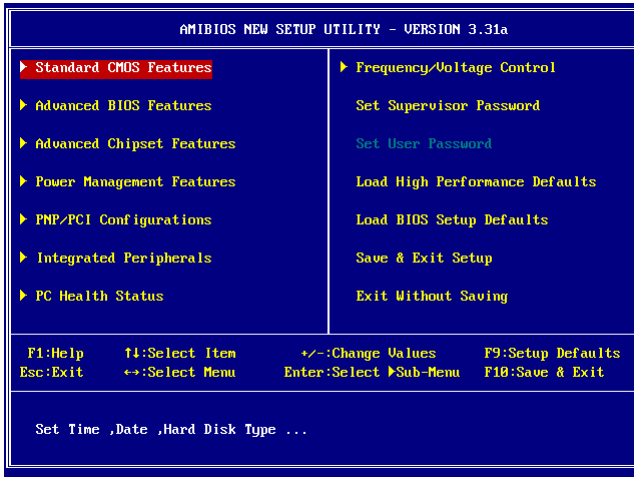
The main menu displays the setup categories the BIOS supplies. You can use the arrow keys (↑↓) to select the item. The on-line description for the selected setup category is displayed at the bottom of the screen.

### Default Settings

The BIOS setup program contains two kinds of default settings: the BIOS Setup and High Performance defaults. BIOS Setup defaults provide stable performance settings for all devices and the system, while High Performance defaults provide the best system performance but may affect the system stability.

## The Main Menu

Once you enter AMIBIOS NEW SETUP UTILITY, the Main Menu will appear on the screen. The Main Menu displays twelve configurable functions and two exit choices. Use arrow keys to move among the items and press <Enter> to enter the sub-menu.



### Standard CMOS Features

Use this menu for basic system configurations, such as time, date etc.

### Advanced BIOS Features

Use this menu to setup the items of AMI® special enhanced features.

### Advanced Chipset Features

Use this menu to change the values in the chipset registers and optimize your system's performance.

### Power Management Features

Use this menu to specify your settings for power management.

### PNP/PCI Configurations

This entry appears if your system supports PnP/PCI.

**Integrated Peripherals**

Use this menu to specify your settings for integrated peripherals.

**PC Health Status**

This entry shows your PC health status.

**Frequency/Voltage Control**

Use this menu to specify your settings for frequency/voltage control.

**Set Supervisor Password**

Use this menu to set Supervisor Password.

**Set User Password**

Use this menu to set User Password.

**Load High Performance Defaults**

Use this menu to load the BIOS values for the best system performance, but the system stability may be affected.

**Load BIOS Setup Defaults**

Use this menu to load factory default settings into the BIOS for stable system performance operations.

**Save & Exit Setup**

Save changes to CMOS and exit setup.

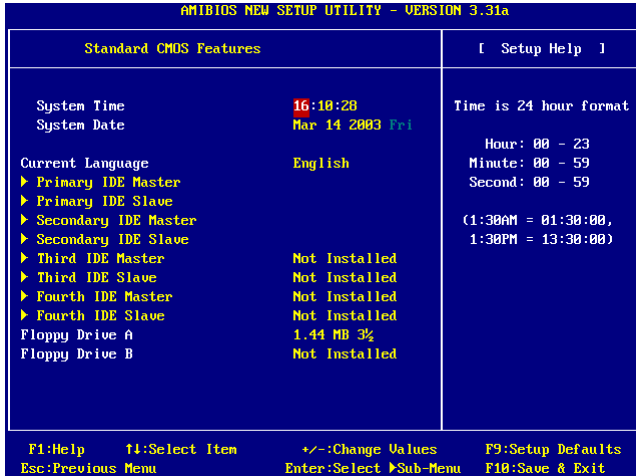
**Exit Without Saving**

Abandon all changes and exit setup.



## Standard CMOS Features

The items inside STANDARD CMOS SETUP menu are divided into 9 categories. Each category includes none, one or more setup items. Use the arrow keys to highlight the item you want to modify and use the <PgUp> or <PgDn> keys to switch to the value you prefer.



### System Time

This allows you to set the system time that you want (usually the current time). The time format is <hour> <minute> <second>.

### System Date

This allows you to set the system to the date that you want (usually the current date). The format is <day><month> <date> <year>.

- day** Day of the week, from Sun to Sat, determined by BIOS. Read-only.
- month** The month from Jan. through Dec.
- date** The date from 1 to 31 can be keyed by numeric function keys.
- year** The year can be adjusted by users.

**Current Language**

This allows you to switch the language of BIOS. Setting options: *English, China (Simplified Chinese), Chinese (Traditional Chinese), Japanese, Korea, French, German.*



**Primary/Secondary/Third/Fourth IDE Master/Slave**

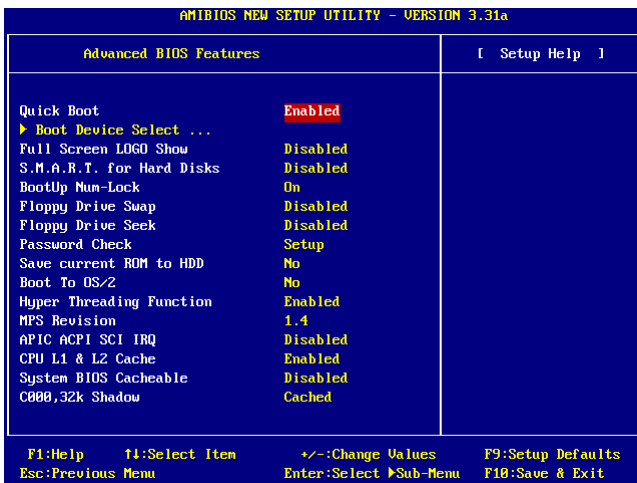
Press PgUp/<+> or PgDn/<-> to select the hard disk drive type. The specification of hard disk drive will show up on the right hand according to your selection.

|                           |  |
|---------------------------|--|
| Type                      | Select how to define the HDD parameters  |
| Cylinders                 | Enter cylinder number  |
| Heads                     | Enter head number  |
| Write Precompensation     | Enter write precomp cylinder   |
| Sectors                   | Enter sector number  |
| Maximum Capacity          | Read the maximal HDD capacity  |
| LBA Mode                  | Select <i>Auto</i> for a hard disk > 512 MB under Windows and DOS, or <i>Disabled</i> under Netware and UNIX |
| Block Mode                | Select <i>Auto</i> to enhance the hard disk performance  |
| Fast Programmed I/O Modes | Select <i>Auto</i> to enhance hard disk performance by optimizing the hard disk timing                       |
| 32 Bit Transfer Mode      | Enable 32 bit to maximize the IDE hard disk data transfer rate   |

**Floppy Drive A:/B:**

This item allows you to set the type of floppy drives installed. Available options: *Not Installed, 1.2 MB 5¼, 720 KB 3½, 1.44 MB 3½* and *2.88 MB 3½.*

## Advanced BIOS Features

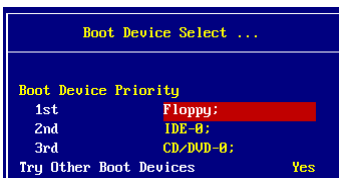


### Quick Boot

Setting the item to *Enabled* allows the system to boot within 5 seconds since it will skip some check items. Available options: *Enabled*, *Disabled*.

### Boot Device Select

Press <Enter> to enter the sub-menu screen.



### Boot Device Priority: 1st/2nd/3rd

The items allow you to set the sequence of boot devices where AMIBIOS attempts to load the operating system. The settings are:

- IDE-0*      The system will boot from the first HDD.
- IDE-1*      The system will boot from the second HDD.
- IDE-2*      The system will boot from the third HDD.
- IDE-3*      The system will boot from the fourth HDD.
- Floppy*     The system will boot from floppy drive.
- ARMD-FDD* The system will boot from any ARMD device, such as

- LS-120 or ZIP drive, that functions as a floppy drive.
- ARMD-HDD** The system will boot from ARMD device, such as MO or ZIP drive, that functions as hard disk drive.
- CD/DVD-0** The system will boot from the first CD-ROM.
- CD/DVD-1** The system will boot from the secon CD-ROM.
- CD/DVD-2** The system will boot from the third CD-ROM.
- CD/DVD-3** The system will boot from the 4th CD-ROM.
- Legacy SCSI** The system will boot from the SCSI.
- Legacy NETWORK** The system will boot from the Network drive.
- BBS-0** The system will boot from the first BBS (BIOS Boot Specification) compliant device.
- BBS-1** The system will boot from the second BBS (BIOS Boot Specification) compliant device.
- BBS-2** The system will boot from the third BBS (BIOS Boot Specification) compliant device.
- BBS-3** The system will boot from the fourth BBS (BIOS Boot Specification) compliant device.
- BBS-4** The system will boot from the 5th BBS (BIOS Boot Specification) compliant device.
- BBS-5** The system will boot from the 6th BBS (BIOS Boot Specification) compliant device.
- BBS-6** The system will boot from the 7th BBS (BIOS Boot Specification) compliant device.
- BBS-7** The system will boot from the 8th BBS (BIOS Boot Specification) compliant device.
- BBS-8** The system will boot from the 9th BBS (BIOS Boot Specification) compliant device.
- BBS-9** The system will boot from the 10 BBS (BIOS Boot Specification) compliant device.
- USB FDD** The system will boot from USB-interfaced floppy drive.
- USB CDROM** The system will boot from the USB-interfaced CD-ROM.
- USB HDD** The system will boot from the USB-interfaced HDD.
- USB RMD-FDD** The system will boot from any USB-interfaced ARMD device, such as LS-120 or ZIP drive, that functions as a floppy drive.
- USB RMD-HDD** The system will boot from USB-interfaced ARMD

device, such as MO or ZIP drive, that functions as hard disk drive.

*Disabled*      Disable this sequence.



**MSI Reminds You...**

1. Available settings for “1st/2nd/3rd Boot Device” vary depending on the bootable devices you have installed. For example, if you did not install a floppy drive, the setting “Floppy” does not show up.
2. If you want to boot from any of the USB-interfaced devices, please set **USB Legacy Support** to **All Device**.

**Try Other Boot Device**

Setting the option to *Yes* allows the system to try to boot from other devices if the system fails to boot from the 1st/2nd/3rd boot device.

**Full Screen LOGO Show**

This item enables you to show the company logo on the bootup screen. Settings are:

- Enabled*      Shows a still image (logo) on the full screen at boot.  
*Disabled*      Shows the POST messages at boot.

**S.M.A.R.T. for Hard Disks**

This allows you to activate the S.M.A.R.T. (Self-Monitoring Analysis & Reporting Technology) capability for the hard disks. S.M.A.R.T is a utility that monitors your disk status to predict hard disk failure. This gives you an opportunity to move data from a hard disk that is going to fail to a safe place before the hard disk becomes offline. Settings: *Enabled, Disabled*.

**BootUpNum-Lock**

This item is to set the Num Lock status when the system is powered on. Setting to *On* will turn on the Num Lock key when the system is powered on. Setting to *Off* will allow end users to use the arrow keys on the numeric keypad. Setting options: *On, Off*.

**Floppy Drive Swap**

Setting to *Enabled* will swap floppy drives A: and B:.

**Floppy Drive Seek**

This setting causes the BIOS to search for floppy disk drives at boot time. When enabled, the BIOS will activate the floppy disk drives during the boot

process: the drive activity light will come on and the head will move back and forth once. First A: will be done and then B: if it exists. Setting options: *Disabled, Enabled*.

### Password Check

This specifies the type of AMIBIOS password protection that is implemented. Setting options are described below.

| Option | Description  |
|--------|--|
| Setup  | The password prompt appears only when end users try to run Setup.  |
| Always | A password prompt appears every time when the computer is powered on or when end users try to run Setup. |

### Save Current ROM to HDD

This allows you to save the BIOS to your hard disk drive. Setting options: *No, Yes*.

### Hyper Threading Function

This field is used to enable or disable the Hyper Threading function. Setting to Enabled will increase the system performance. Settings: *Enabled, Disabled*.



#### MSI Reminds You...

*Enabling the functionality of Hyper-Threading Technology for your computer system requires ALL of the following platform Components:*

- \*CPU: An Intel® Pentium® 4 Processor with HT Technology;*
- \*Chipset: An Intel® Chipset that supports HT Technology;*
- \*BIOS: A BIOS that supports HT Technology and has it enabled;*
- and*
- \*OS: An operating system that supports HT Technology.*

*For more information on Hyper-threading Technology, go to:  
[www.intel.com/info/hyperthreading](http://www.intel.com/info/hyperthreading)*

### Boot To OS/2

This allows you to run the OS/2® operating system with DRAM larger than 64MB. When you choose *No*, you cannot run the OS/2® operating system with DRAM larger than 64MB. But it is possible if you choose *Yes*.

**MPS Revision**

This field allows you to select which MPS (Multi-Processor Specification) version to be used for the operating system. You need to select the MPS version supported by your operating system. Settings: *1.4* and *1.1*.

**APIC ACPI SCI IRQ**

This field is used to enable or disable the APIC (Advanced Programmable Interrupt Controller). Due to compliance to PC2001 design guide, the system is able to run in APIC mode. Enabling APIC mode will expand available IRQs resources for the system. Settings: *Enabled* and *Disabled*.

**CPU L1 & L2 Cache**

Cache memory is additional memory that is much faster than conventional DRAM (system memory). When the CPU requests data, the system transfers the requested data from the main DRAM into cache memory, for even faster access by the CPU. The setting controls the internal cache (also known as L1 or level 1 cache). Setting to *WriteBack* will speed up the system performance.

**System BIOS Cacheable**

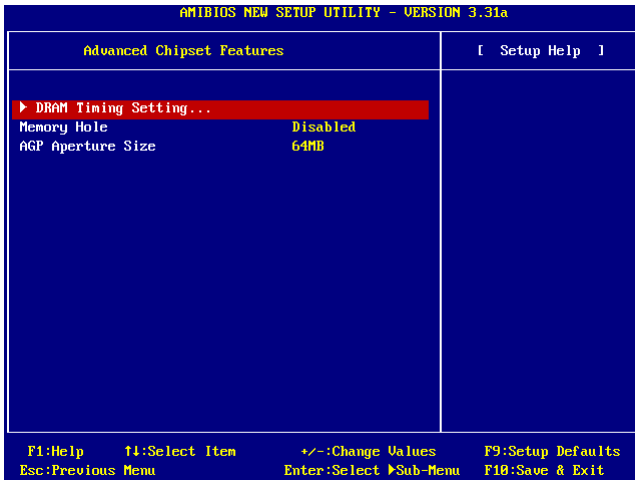
Selecting *Enabled* allows caching of the system BIOS ROM at F0000h-FFFFFh, resulting in better system performance. However, if any program writes to this memory area, a system error may result. Setting options: *Enabled*, *Disabled*.

**C000, 32k Shadow**

This item specifies how the contents of the adapter ROM named in the item are handled. Settings are described below:

| <b>Option</b> | <b>Description</b>   |
|---------------|--|
| Disabled      | The specified ROM is not copied to RAM.  |
| Enabled       | The contents of specified ROM are copied to RAM for faster system performance.   |
| Cached        | The contents of specified ROM are not only copied to RAM, the contents of the ROM area can be written to and read from cache memory. |

## Advanced Chipset Features

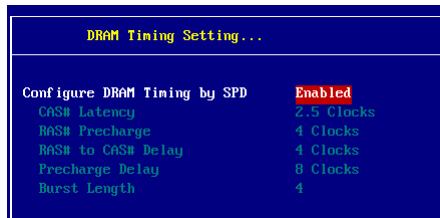


### MSI Reminds You...

*Change these settings only if you are familiar with the chipset.*

### DRAM Timing Setting...

Press <Enter> and to enter the sub-menu screen.



### Configure SDRAM Timing by SPD

Selects whether DRAM timing is controlled by the SPD (Serial Presence Detect) EEPROM on the DRAM module. Setting to *Enabled* enables the following fields automatically to be determined by BIOS based on the configurations on the SPD. Selecting *Disabled* allows users to configure these fields manually.



### **CAS# Latency**

This controls the timing delay (in clock cycles) before SDRAM starts a read command after receiving it. Settings: 2, 2.5 (clocks). 2 (clocks) increases the system performance the most while 2.5 (clocks) provides the most stable performance.

### **RAS# Precharge**

This item controls the number of cycles for Row Address Strobe (RAS) to be allowed to precharge. If insufficient time is allowed for the RAS to accumulate its charge before DRAM refresh, refresh may be incomplete and DRAM may fail to retain data. This item applies only when synchronous DRAM is installed in the system. Available settings: *2 clocks, 3 clocks*.

### **RAS# to CAS# Delay**

When DRAM is refreshed, both rows and columns are addressed separately. This setup item allows you to determine the timing of the transition from RAS (row address strobe) to CAS (column address strobe). The less the clock cycles, the faster the DRAM performance. Setting options: *3 clocks, 2 clocks*.

### **Precharge Delay**

This setting controls the precharge delay, which determines the timing delay for DRAM precharge. Settings: *5 clocks, 6 clocks, 7 clocks*.

### **Burst Length**

This setting allows you to set the size of Burst-Length for DRAM. Bursting feature is a technique that DRAM itself predicts the address of the next memory location to be accessed after the first address is accessed. To use the feature, you need to define the burst length, which is the actual length of burst plus the starting address and allows internal address counter to properly generate the next memory location. The bigger the size, the faster the DRAM performance. Available settings: *4, 8*.

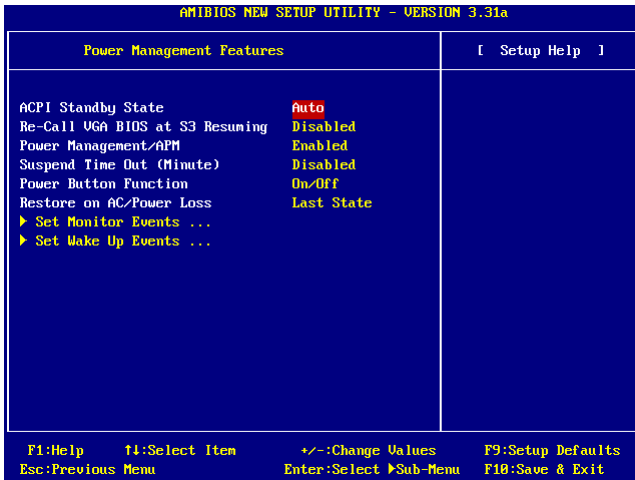
### **Memory Hole**

In order to improve performance, certain space in memory can be reserved for ISA peripherals. This memory must be mapped into the memory space below 16MB. When this area is reserved, it cannot be cached. Settings: *Disabled, 15MB-16MB*.

**AGP Aperture Size (MB)**

This setting controls just how much system RAM can be allocated to AGP for video purposes. The aperture is a portion of the PCI memory address range dedicated to graphics memory address space. Host cycles that hit the aperture range are forwarded to the AGP without any translation. The option allows the selection of an aperture size of *4MB*, *8MB*, *16MB*, *32MB*, *64MB*, *128MB*, and *256 MB*.

## Power Management Features



### MSI Reminds You...

*S3-related functions described in this section are available only when your BIOS supports S3 sleep mode.*

### ACPI Standby State

This item specifies the power saving modes for ACPI function. If your operating system supports ACPI, such as Windows 98SE, Windows ME and Windows 2000, you can choose to enter the Standby mode in S1(POS) or S3(STR) fashion through the setting of this field. Options are:

- |               |  |
|---------------|--|
| <i>S1/POS</i> | The S1 sleep mode is a low power state. In this state, no system context is lost (CPU or chipset) and hardware maintains all system context.   |
| <i>S3/STR</i> | The S3 sleep mode is a lower power state where the information of system configuration and open applications/files is saved to main memory that remains powered while most other hardware components turn off to save energy. The information stored in memory will be used to restore the system when a “wake up” event occurs. |
| <i>Auto</i>   | BIOS determines the best mode automatically.   |

### **Re-Call VGA BIOS at S3 Resuming**

Selecting *Enabled* allows BIOS to call VGA BIOS to initialize the VGA card when system wakes up (resumes) from S3 sleep state. The system resume time is shortened when you disable the function, but system will need an AGP driver to initialize the VGA card. Therefore, if the AGP driver of the card does not support the initialization feature, the display may work abnormally or not function after resuming from S3.

### **Power Management/APM**

Setting to *Enabled* will activate an Advanced Power Management (APM) device to enhance Max Saving mode and stop CPU internal clock. Settings: *Disabled, Enabled*.

### **Suspend Time Out (Minute)**

After the selected period of system inactivity, all devices except the CPU shut off. Settings: *Disabled, 1, 2, 4, 8, 10, 20, 30, 40, 50, 60*.

### **Power Button Function**

This feature sets the function of the power button. Settings are:

- |                |   |
|----------------|---|
| <i>On/Off</i>  | The power button functions as normal power off button.  |
| <i>Suspend</i> | When you press the power button, the computer enters the suspend/sleep mode, but if the button is pressed for more than four seconds, the computer is turned off. |

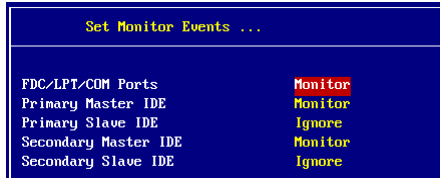
### **Restore on AC/Power Loss**

This setting specifies whether your system will reboot after a power failure or interrupt occurs. Available settings are:

- |                   |  |
|-------------------|--|
| <i>Power Off</i>  | Leaves the computer in the power off state.  |
| <i>Power On</i>   | Leaves the computer in the power on state.   |
| <i>Last State</i> | Restores the system to the previous status before power failure or interrupt occurred. |

### **Set Monitor Events**

Press <Enter> and the following sub-menu appears.

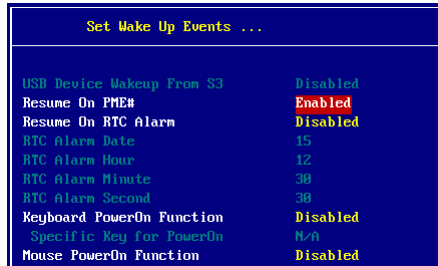


### FDC/LPT/COM Ports, Primary/Secondary Master/Slave IDE

These items specify if the BIOS will monitor the activity of the specified hardware peripherals or components. If set to *Monitor*, any activity detected on the specified hardware peripherals or components will wake up the system or prevent the system from entering the power saving modes. Settings: *Monitor, Ignore*.

### Set WakeUp Events

Press <Enter> and the following sub-menu appears.



### USB Device Wakeup From S3

This item allows the activity of the USB devices (keyboard and mouse) to wake up the system from S3 sleep state. Setting: *Enabled, Disabled*.

### Resume On Ring, Resume On PME#

This field specifies whether the system will be awakened from power saving modes when activity or input signal of the specified hardware peripheral or component is detected. Settings: *Enabled, Disabled*.

### Resume By RTC Alarm

This is used to enable or disable the feature of booting up the system on a scheduled time/date from the soft off (S5) state. Settings: *Enabled, Disabled*.

**RTC Alarm Date/Hour/Minute/Second**

If *Resume By Alarm* is set to *Enabled*, the system will automatically resume (boot up) on a specific date/hour/minute/second specified in these fields.

Available settings for each item are:

|              |                    |
|--------------|--------------------|
| Alarm Date   | 01 ~ 31, Every Day |
| Alarm Hour   | 00 ~ 23            |
| Alarm Minute | 00 ~ 59            |
| Alarm Second | 00 ~ 59            |

**MSI Reminds You...**

*If you have changed this setting, you must let the system boot up until it enters the operating system, before this function will work.*

**Keyboard PowerOn Function**

This controls how the PS/2 keyboard can power on the system. Settings: *Any Key, Specific Key, Disabled*.

**Specific Key for PowerOn**

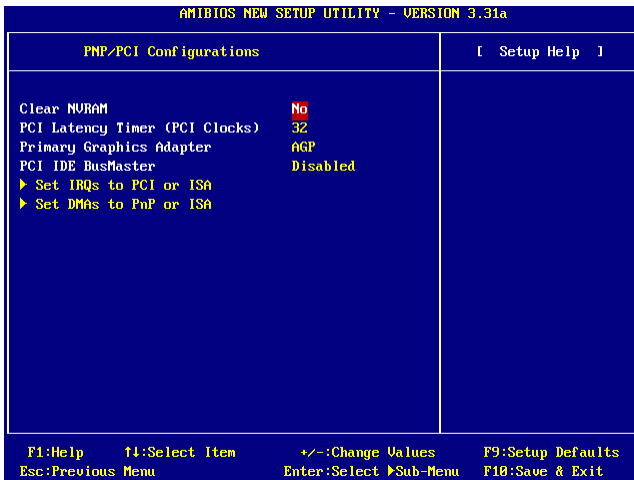
This setting allows users to set a password (max. 5 letters) for the *Keyboard Wakeup* function.

**Mouse PowerOn Function**

This item allows the activity of the mouse to wake up the system sleep state. Settings: *Disabled, (double-click) Left-button, (double-click) Right-button*.

## PNP/PCI Configurations

This section describes configuring the PCI bus system and PnP (Plug & Play) feature. PCI, or **P**eripheral **C**omponent **I**nterconnect, is a system which allows I/O devices to operate at speeds nearing the speed the CPU itself uses when communicating with its special components. This section covers some very technical items and it is strongly recommended that only experienced users should make any changes to the default settings.



### Clear NVRAM

The ESCD (Extended System Configuration Data) NVRAM (Non-volatile Random Access Memory) is where the BIOS stores resource information for both PNP and non-PNP devices in a bit string format. When the item is set to *Yes*, the system will reset ESCD NVRAM right after the system is booted up and then set the setting of the item back to *No* automatically.

### PCI Latency Timer (PCI Clocks)

This item controls how long each PCI device can hold the bus before another takes over. When set to higher values, every PCI device can conduct transactions for a longer time and thus improve the effective PCI bandwidth. For better PCI performance, you should set the item to higher values. Settings range from 32 to 248 at a 32 increment.

### Primary Graphics Adapter

This setting specifies which VGA card is your primary graphics adapter. Setting options are:

|                     |   |
|---------------------|---|
| <i>Internal VGA</i> | The system initializes the onboard VGA device.  |
| <i>AGP/Int-VGA</i>  | The system initializes the installed AGP card first. If an AGP card is not available, it will initialize the onboard VGA device.  |
| <i>AGP/PCI</i>      | The system initializes the installed AGP card first. If an AGP card is not available, it will initialize the PCI VGA card. <i>(This option appears if the mainboard you purchased is without onboard VGA.)</i>    |
| <i>PCI/AGP</i>      | The system initializes the installed PCI VGA card first. If a PCI VGA card is not available, it will initialize the AGP card. <i>(This option appears if the mainboard you purchased is without onboard VGA.)</i> |
| <i>PCI/Int-VGA</i>  | The system initializes the installed PCI VGA card first. If a PCI VGA card is not available, it will initialize the onboard VGA device.   |



#### **MSI Reminds You...**

*Please note the setting options will be different depending on the mainboard you purchased.*

### PCIIDE BusMaster

Set this option to *Enabled* to specify that the IDE controller on the PCI local bus has bus mastering capability. Settings options: *Disabled, Enabled*.

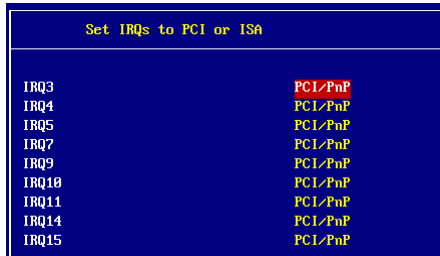
### PCI Slot1/Slot6 IRQ Priority, PCI Slot2/Slot5 IRQ Priority, PCI Slot3 IRQ Priority, PCI Slot4 IRQ Priority

These items specify the IRQ line for each PCI slot. Setting options: *3, 4, 5, 7, 9, 10, 11, Auto*. Selecting *Auto* allows BIOS to automatically determine the IRQ line for each PCI slot.

### Set IRQs to PCI or ISA

Press <Enter> to enter the sub-menu and the following screen appears:





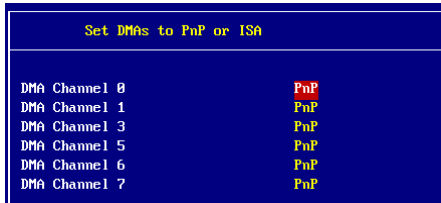
| Set IRQs to PCI or ISA |         |
|------------------------|---------|
| IRQ3                   | PCI/PnP |
| IRQ4                   | PCI/PnP |
| IRQ5                   | PCI/PnP |
| IRQ7                   | PCI/PnP |
| IRQ9                   | PCI/PnP |
| IRQ10                  | PCI/PnP |
| IRQ11                  | PCI/PnP |
| IRQ14                  | PCI/PnP |
| IRQ15                  | PCI/PnP |

**IRQ 3/4/5/7/9/10/11/14/15**

These items specify the bus where the specified IRQ line is used. The settings determine if AMIBIOS should remove an IRQ from the pool of available IRQs passed to devices that are configurable by the system BIOS. The available IRQ pool is determined by reading the ESCD NVRAM. If more IRQs must be removed from the IRQ pool, the end user can use these settings to reserve the IRQ by assigning an *ISA/EISA* setting to it. Onboard I/O is configured by AMIBIOS. All IRQs used by onboard I/O are configured as *PCI/PnP*. If all IRQs are set to *ISA/EISA*, and IRQ 14/15 are allocated to the onboard PCI IDE, IRQ 9 will still be available for PCI and PnP devices. Available settings: *ISA/EISA* and *PCI/PnP*.

**Set DMAs to PnP or ISA**

Press <Enter> to enter the sub-menu and the following screen appears:

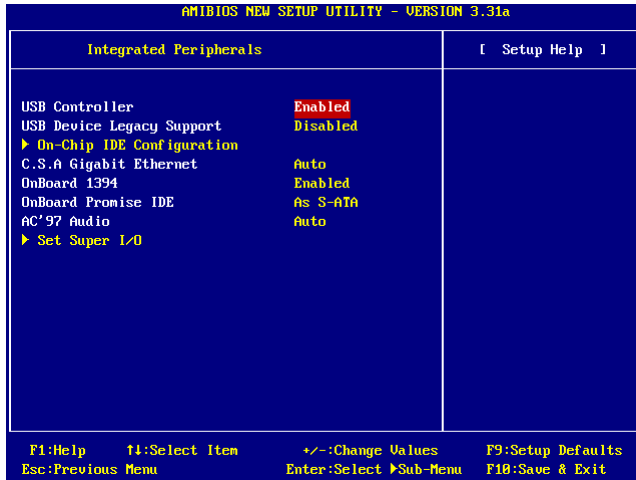


| Set DMAs to PnP or ISA |     |
|------------------------|-----|
| DMA Channel 0          | PnP |
| DMA Channel 1          | PnP |
| DMA Channel 3          | PnP |
| DMA Channel 5          | PnP |
| DMA Channel 6          | PnP |
| DMA Channel 7          | PnP |

**DMA Channel 0/1/3/5/6/7**

These items specify the bus that the system DMA (Direct Memory Access) channel is used. The settings determine if AMIBIOS should remove a DMA from the available DMAs passed to devices that are configurable by the system BIOS. The available DMA pool is determined by reading the ESCD NVRAM. If more DMAs must be removed from the pool, the end user can reserve the DMA by assigning an *ISA/EISA* setting to it.

## Integrated Peripherals



Please note that the options showed on your BIOS might be different depending on the motherboard you buy.

### USB Controller

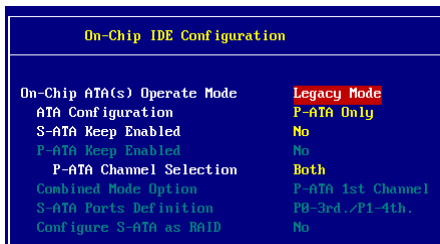
This setting is used to enable/disable the onboard USB controllers.

### USB Device Legacy Support

Set to *All Device* if your need to use any USB 1.1/2.0 device in the operating system that does not support or have any USB 1.1/2.0 driver installed, such as DOS and SCO Unix. Set to *No Mice* only if your want to use any USB device other than the USB mouse. Setting options: *Disabled, No Mice, All Device*.

### On-ChipIDE

Press <Enter> to enter the sub-menu and the following screen appears:



### **On-Chip ATA(s) Operate Mode**

This setting allows you to determine how the RAID controller on the south bridge is going to switch to SATA controller. *Legacy Mode* means you may use the traditional 14 and 15 IRQs, while *Native Mode* means you may use all the available IRQs. Setting options: *Legacy Mode, Native Mode.*

#### **ATA Configuration**

The field lets you to configure the available ATA controller. Setting options: *Disabled, P-ATA Only, S-ATA Only, P-ATA+S-ATA.*

#### **S-ATA Keep Enabled**

This item is available for you to enable/disable the onboard S-ATA. Setting options: *Yes, No.*

#### **P-ATA Keep Enabled**

This item is available for you to enable/disable the onboard P-ATA. Setting options: *Yes, No.*

#### **P-ATA Channel Selection**

This item is available for you to select the parallel ATA channel. Setting options: *Primary, Secondary, Both.*

#### **Combined Mode Option**

This item is available for you to select the combined mode of the ATA controllers. Setting options: *P-ATA 1st Channel, S-ATA 1st Channel.*

#### **S-ATA Ports Definition**

This allows you to set the definition of serial ATA ports.

#### **Configure S-ATA as RAID**

This item is available for you to configure S-ATA as onboard RAID. Setting: *Yes, No.*

### **C.S.A Gigabit Ethernet**

This is used to set the C.S.A. Gigabit Ethernet. Setting: *Auto, Disabled.*

### **Onboard 1394**

This setting is used to enable/disable the onboard IEEE 1394 controller. Setting options: *Disabled, Enabled.*

### Onboard Promise IDE

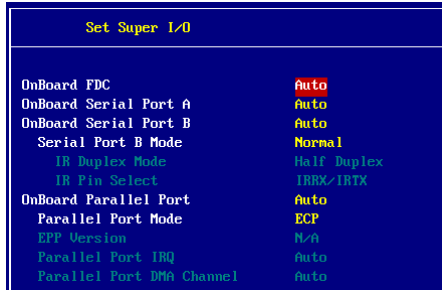
This setting is used to enable/disable the onboard Promise IDE Raid. Setting options: *Disabled, Enabled*.

### AC97 Audio

*Auto* allows the motherboard's BIOS to detect whether you're using any audio device. If so, the onboard audio controller will be enabled. If not, the onboard audio controller will be disabled. If you want to use different controller cards to connect audio connectors, set the field to *Disabled*. Setting options: *Disabled, Auto*.

### Set Super I/O

Press <Enter> to enter the sub-menu and the following screen appears:



### OnBoardFDC

Select Enabled if your system has a floppy disk controller (FDD) installed on the system board and you wish to use it.

| Option   | Description   |
|----------|---|
| Auto     | BIOS will automatically determine whether to enable the onboard Floppy controller or not. |
| Enabled  | Enables the onboard Floppy controller.  |
| Disabled | Disables the onboard Floppy controller.   |

### Onboard Serial Port A/B

These items specify the base I/O port addresses of the onboard Serial Port 1 (COM A)/Serial Port 2 (COM B). Selecting *Auto* allows AMIBIOS to automatically determine the correct base I/O port address. Settings: *Auto, 3F8/COM1, 2F8/COM2, 3E8/COM3, 2E8/COM4* and *Disabled*.

### **Serial Port B Mode**

This item sets the operation mode for Serial Port B. Settings: *Normal*, *1.6uS*, *3/16 Baud* and *ASKIR* (the last three operation modes are settings options for IR function).

#### **IR Duplex Mode**

This setting controls the operating mode of IR transmission/reception. Setting options: *Full Duplex*, *Half Duplex*. Under *Full Duplex* mode, synchronous, bi-directional transmission/reception is allowed. Under *Half Duplex* mode, only asynchronous, bi-directional transmission/reception is allowed.

#### **IR Pin Select**

Set to *IRRX/IRTX* when using an internal IR module connected to the IR connector. Set to *SINB/SOUTB*. when connecting an IR adapter to COM B.

### **Onboard Parallel Port**

This field specifies the base I/O port address of the onboard parallel port. Selecting *Auto* allows AMIBIOS to automatically determine the correct base I/O port address. Settings: *Auto*, *378*, *278*, *3BC* and *Disabled*.

#### **Parallel Port Mode**

This item selects the operation mode for the onboard parallel port: *ECP*, *Normal*, *Bi-Dir* or *EPP*.

#### **EPP Version**

The item selects the EPP version used by the parallel port if the port is set to *EPP* mode. Settings: *1.7* and *1.9*.

#### **Parallel Port IRQ**

When *Onboard Parallel Port* is set to *Auto*, the item shows *Auto* indicating that BIOS determines the IRQ for the parallel port automatically.

#### **Parallel Port DMA Channel**

This feature needs to be configured only when *Parallel Port Mode* is set to the *ECP* mode. When Parallel Port is set to *Auto*, the field will show *Auto* indicating that BIOS automatically determines the DMA channel for the parallel port.

## PC Health Status

This section shows the status of your CPU, fan, overall system status, etc. Monitor function is available only if there is hardware monitoring mechanism onboard.

| PC Health Status   |            | [ Setup Help ] |
|--------------------|------------|----------------|
| Chassis Intrusion  | Disabled   |                |
| CPU Temperature    | 88°C/176°F |                |
| System Temperature | 39°C/102°F |                |
| CPU Fan Speed      |            |                |
| System Fan Speed   |            |                |
| Vcore              |            |                |
| 3.30V              |            |                |
| + 5.00V            |            |                |
| +12.00V            |            |                |
| -12.00V            |            |                |
| - 5.00V            |            |                |
| Battery            |            |                |
| +5V SB             |            |                |

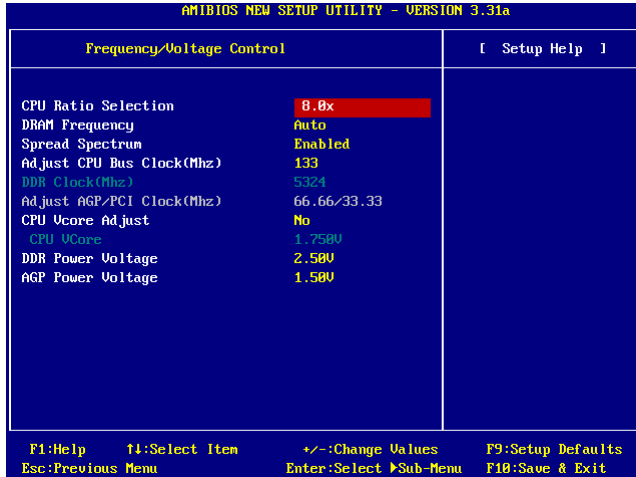
|                   |                 |                   |                   |
|-------------------|-----------------|-------------------|-------------------|
| F1:Help           | F11:Select Item | +/-:Change Values | F9:Setup Defaults |
| Esc:Previous Menu | Enter:Select    | ▶Sub-Menu         | F10:Save & Exit   |

### PWM Frequency, CPU/System Temperature, CPU/NB Fan Speed, Vcore, 3.3V, +5.0V, +12.0V, -12.0V, -5.0V, Battery, +5V SB

These items display the current status of all of the monitored hardware devices/components such as CPU voltages, temperatures and all fans' speeds.

## Frequency/Voltage Control

Use this menu to specify your settings for frequency/voltage control.



### CPU Ratio Selection

This setting controls the multiplier that is used to determine the internal clock speed of the processor relative to the external or motherboard clock speed.

### DRAM Frequency

Use this field to configure the clock frequency of the installed DRAM. Settings are:

PSB 400: 266, Auto.

PSB 533: 266, 333, Auto, 354.

PSB 800: 266, 333, 400, Auto, 500, 532.

### Spread Spectrum

When the motherboard's clock generator pulses, the extreme values (spikes) of the pulses creates EMI (Electromagnetic Interference). The Spread Spectrum function reduces the EMI generated by modulating the pulses so that the spikes of the pulses are reduced to flatter curves. If you do not have any EMI problem, leave the setting at *No* for optimal system stability and performance. But if you are plagued by EMI, setting to *Enabled* for EMI reduction. Remember to disable Spread Spectrum if you are overclocking because even a slight jitter can introduce a temporary boost in clockspeed which may just cause your overclocked processor to lock up.

### Adjust CPU Bus Clock

This item allows you to select the CPU Bus clock frequency (in MHz) and overclock the processor by adjusting the FSB clock to a higher frequency.

### DDR Clock (Mhz)

This item allows you to view the current DDR clock.

### Adjust AGP/PCI Clock (Mhz)

This item allows you to select the AGP/PCI clock frequency (in MHz) by adjusting the AGP/PCI clock to a higher frequency.

### CPU Vcore Adjust

The setting allows you to adjust the CPU Vcore voltage. Available options: *Yes, No*.

#### CPU Vcore

The setting is adjustable if you set the "CPU Vcore Adjust" to "Yes".



#### MSI Reminds You...

*Changing CPU Ratio/Vcore could result in the instability of the system; therefore, it is NOT recommended to change the default setting for long-term usage.*

### DDR Power Voltage

Adjusting the DDR voltage can increase the DDR speed. Any changes made to this setting may cause a stability issue, so ***changing the DDR voltage for long-term purpose is NOT recommended.***

### AGP Power Voltage

AGP voltage is adjustable in the field, allowing you to increase the performance of your AGP display card when overclocking, but the stability may be affected.



## Set Supervisor/User Password

When you select this function, a message as below will appear on the screen:



Type the password, up to six characters in length, and press <Enter>. The password typed now will replace any previously set password from CMOS memory. You will be prompted to confirm the password. Retype the password and press <Enter>. You may also press <Esc> to abort the selection and not enter a password.

To clear a set password, just press <Enter> when you are prompted to enter the password. A message will show up confirming the password will be disabled. Once the password is disabled, the system will boot and you can enter Setup without entering any password.

When a password has been set, you will be prompted to enter it every time you try to enter Setup. This prevents an unauthorized person from changing any part of your system configuration.

Additionally, when a password is enabled, you can also have AMIBIOS to request a password each time the system is booted. This would prevent unauthorized use of your computer. The setting to determine when the password prompt is required is the PASSWORD CHECK option of the ADVANCED BIOS FEATURES menu. If the PASSWORD CHECK option is set to *Always*, the password is required both at boot and at entry to Setup. If set to *Setup*, password prompt only occurs when you try to enter Setup.



### MSI Reminds You...

#### ***About Supervisor Password & User Password:***

*Supervisor password:* Can enter and change the settings of the setup menu.

*User password:* Can only enter but do not have the right to change the settings of the setup menu.

## Load High Performance/BIOS Setup Defaults

The two options on the main menu allow users to restore all of the BIOS settings to High Performance defaults or BIOS Setup defaults. The High Performance Defaults are the values set by the mainboard manufacturer for the best system performance but probably will cause a stability issue. The BIOS Setup Defaults are the default values also set by the mainboard manufacturer for stable performance of the mainboard.

When you select Load High Performance Defaults, a message as below appears:

```
[ Load High Performance Defaults ]
WARNING! This default might have potential reliability risk.
Press [Enter] to Continue
Or [ESC] to Abort
```

Pressing 'Enter' loads the default BIOS values that enable the best system performance but may lead to a stability issue.



### MSI Reminds You...

*The option is for power or overclocking users only. Use of high performance defaults will tighten most timings to increase the system performance. Therefore, a high-end system configuration is a must, which means you need high-quality VGA adapter, RAM and so on. We don't recommend that users should apply the high performance defaults in their regular systems. Otherwise, the system may become unstable or even crash. If the system crashes or hangs after enabling the feature, please CLEAR CMOS DATA to resolve the problem. For more information, refer to "Clear CMOS Jumper:JBAT1" in Chapter 2.*

When you select Load BIOS Setup Defaults, a message as below appears:

```
[ Load BIOS Setup Defaults ]
Press [Enter] to Continue
Or [ESC] to Abort
```

Pressing 'Enter' loads the default values that are factory settings for stable system performance.

## ***Appendix: Using 4- or 6-Channel Audio Function***

The motherboard is equipped with ADI SoundMax, which provides support for 6-channel audio output, including 2 Front, 2 Rear, 1 Center and 1 Subwoofer channel. SoundMax allows the board to attach 4 or 6 speakers for better surround sound effect. The section will tell you how to install and use 4-/6-channel audio function on the board.

## Using 4- or 6-Channel Audio Function

### Installing the Audio Driver

1. Insert the companion CD into the CD-ROM drive. The CD will run automatically and the setup screen will appear.
2. Click **SoundMax Drivers** and follow the on-screen instructions to complete the installation.
3. After completion of the installation, please restart your computer.

### Using 4- or 6-Channel Audio Function

In addition to a default 2-Channel analog audio output function, the audio connectors on the Back Panel also provide 4- or 6-Channel analog audio output function if a proper setting is made in the software utility.

Read the following steps to have the Multi-Channel Audio Function properly set in the software utility, and have your speakers correctly connected to the Back Panel:

#### Configuration in the Software Utility

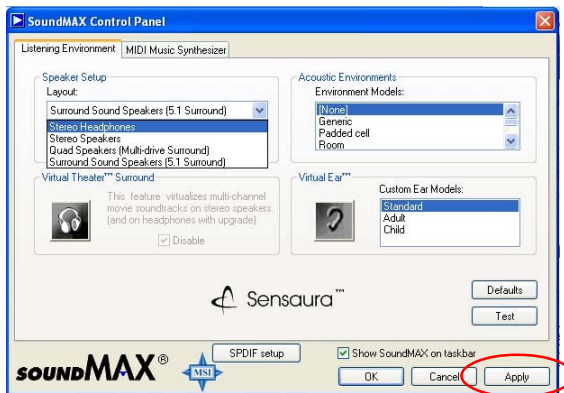
1. Click the white triangle icon from the window tray at the lower-right corner of the screen.
2. Select **SoundMax Control Panel** from the drop-down menu.
3. Then the **SoundMax Control Panel** configuration window will pop up.



## Listening Environment

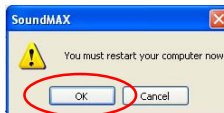
The first tab is Listening Environment and you can configure the outputs you like here.

### ► Speaker Setup




In the Layout drop-down menu, you may configure 2-channel, 4-channel or 5.1-channel outputs as desired. Here *Stereo Speakers* means 2-channel output, *Quad Speaker's (Multi-drive Surround)* means 4-channel output, while *Surround Sound Speakers (5.1 Surround)* means 6-channel output.


After you change your setting, be sure to click **Apply** to save the changes and click **OK** to confirm the changes. Then you will be asked to restart your computer in order to load the settings you just changed. You may click **OK** to restart your PC now or click **Cancel** to do it later.



► **Virtual Theater Surround**

Click on the  You may use this application to virtualize multi-channel. Please note it is not available if you select **Stereo Headphones** in **Speaker Setup/Layout**.

► **Virtual Ear**

Click on the Virtual  Ear icon and you can use Sensaura's Virtual Ear application by downloading the Virtual Ear update from here.

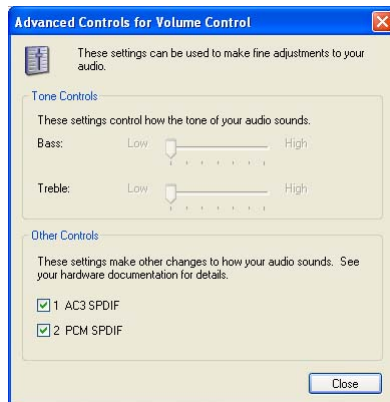


► **Acoustic Environment**

You may use the drop-down list to select the environment models you prefer.

► **SPDIF setup**

Click **SPDIF setup** button and the Advnaced Controls for Volume Control window will pop up. The **AC3 SPDIF** and **PCM SPDIF** options are enabled by default to use SPDIF function.



► **Test**

Click on the **Test** button and you can test the listening environment here. You may also use the drop-down menu to select the desired audio test path.



## MIDI Music Synthesizer

You may set the Synthesizer Default Sound Set you prefer here.



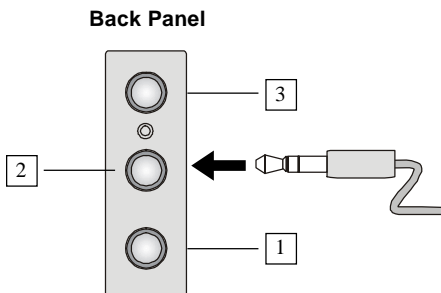
## Connecting the Speakers

When you have set the Multi-Channel Audio Function mode properly in the software utility, connect your speakers to the correct phonejacks in accordance with the setting in software utility.

### ■ 2-Channel Mode for Stereo-Speaker Output

Refer to the following diagram and caption for the function of each phonejack on the back panel when 2-Channel Mode is selected.

- 1 MIC
- 2 Line Out (*Front channels*)
- 3 Line In

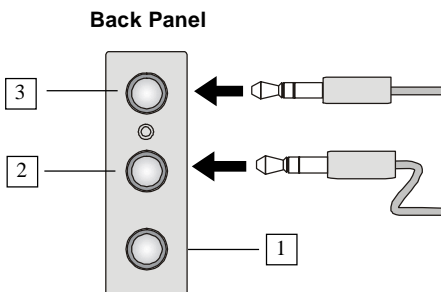


### ■ 4-Channel Mode for 4-Speaker Output

The audio jacks on the back panel always provide 2-Channel analog audio output function, however these audio jacks can be transformed to 4- or 6- channels analog audio jacks by selecting the corresponding multi-channel operation from **No. of Speakers**.

Refer to the following diagram and caption for the function of each jack on the back panel when 4-Channel Mode is selected.

- 1 MIC
- 2 Line Out (*Real channels*)
- 3 Line Out (*Front channels*)

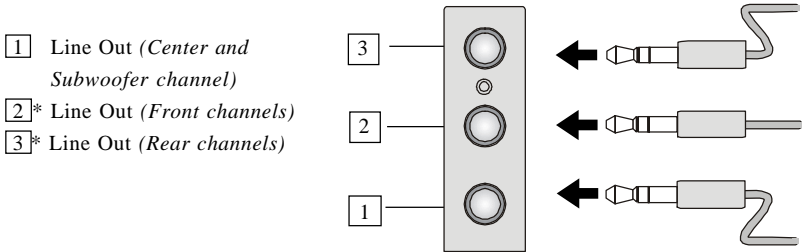


\* Line In function is converted to Line Out function when 4-Channel Mode for 4-Speaker Output is selected.



■ **6-Channel Mode for 6-Speaker Output**

Refer to the following diagram and caption for the function of each jack on the back panel when 6-Channel Mode is selected.



\* Both Line In and MIC function are converted to Line Out function when 4-Channel Mode for 6-Speaker Output is selected.

# *Troubleshooting*

**Q: Where will I find the model number of the mainboard?**

A: There are two places where you can find the model number of the mainboard:

1. Somewhere between the PCI slots you shall find MS-xxxx or the marketing name like "K7T Turbo". You can also find the version number beside it.
2. At the back cover of the user's manual.

**Q: What do you mean by PCB version 1?**

A: PCB is printed circuit board. Saying PCB version 1 is the same as saying motherboard version 1.

**Q: Why does my AMD 133FSB cannot be autodetected by the mainboard?**

A: Due to AMD CPU design, CPU FSB 133 will not be autodetected by the motherboard. So user need to set the FSB manually to 133.

**Q: Why my motherboard BIOS sticker is "Phoenix BIOS" but when I boot up my system I saw that "Award BIOS" is being used?**

A: Phoenix & Award already merged as one company. All MSI motherboard using Award BIOS comes with Phoenix logo sticker.

**Q: How do I know what MSID-LED or D-bracket light mean?**

A: Please follow the special tech issue, [http://www.msi.com.tw/support/techexpress/special\\_tech/smartled.htm](http://www.msi.com.tw/support/techexpress/special_tech/smartled.htm)

**Q: I have got MSI Motherboard and when it says detecting drives, it detects them but says an error saying "Primary IDE Channel no 80 Conductor Cable Installed"**

A: This is not a problem. It merely means that you're using an ATA-66 or ATA-100 HDD, but you're using the conductor 40 ATA-33 cable.

**Q: I have high speed CPU cooling fan like Taisol CGK760092, Vantec CCK-6035D & GlobalWin WBK38. Can I install the fan directly to the motherboard?**

A: We strongly recommend that you do NOT connect those described CPU fan directly to your motherboard, as it draws so much power, that it could damage it. Please use a 3-Pin to 4-Pin Cable that comes together with the fan.

**Q: Can I use more than 512MB memory on Win9x or WinME?**

A: No, you can't. You can only use more than 512MB memory on Win2000 or WinXP. This is a Microsoft OS issue. Please check <http://support.microsoft.com/support/kb/articles/Q108/0/79.ASP>

**Q: I have tried to download the MSI Live Update utility from <http://www.msi.com.tw/support/liveupdate/livedriver.htm> but it keeps on failing?**

A: This can be solved by one of the following suggestions: 1. Dont install zonealarm 2. Disable "WebTrap" of PC-cillion 2000 3. Disable any web based anti-virus Software.

**Q: Can Live Update Series support WinXP?**

A: Live Update Series version 215 can support WinXP. Download it from <http://www.msi.com.tw/support/liveupdate/livedriver.htm>

**Q: After flashing the BIOS, my system for unknown reason dont want to boot, what should I do?**

A: Please refer to the following suggestions: 1. Try the BIOS boot recovery feature as described in <http://www.msi.com.tw/support/bios/boot.htm> 2. Try to clear the CMOS If problem still persists, ask your reseller for new BIOS chip or contact one of MSI office near your place for new BIOS chip <http://www.msi.com.tw/contact/main.htm>

**Q: Should I update my BIOS, once a new BIOS is released?**

A: A new BIOS is usually released due to the following reasons:

1. New function is supported
2. New BIOS source code
3. Bugs are found
4. Customer-specific request

When we release a new BIOS, there's usually a release note attached which lists the reason for the release. Refer to this release note and decide for yourself if upgrading to the new BIOS will be worth it. A word of advice, though, do not upgrade to the new BIOS, unless you really have to.

**Q: How do I update the BIOS?**

A: Please refer to <http://www.msi.com.tw/support/bios/note.htm> for details.

**Q: How do I identify the BIOS version?**

A: Upon boot-up, the 1st line appearing after the memory count is the BIOS version. It is usually in the format:

1. For older model number:

AG76091096 where:

1st digit refers to BIOS maker as A = AMI(R) W = AWARD(R) P = PHOENIX (R).

2nd digit refers to the internal chipset code.

3rd digit refers to the processor class as 5 = 486, 7 = 586, 8 = 686.

4th digit is incremental.

091096 refers to the date this BIOS is released.

2. For newer model number:

W5139MS V1.0091096 where:

1st digit refers to BIOS maker as A = AMI(R) W = AWARD(R) P = PHOENIX (R).

2nd - 5th digit refers to the model number.

6th - 7th digit refers to the customer as MS = all standard customers.

V1.0 refers to the BIOS version.

091096 refers to the date this BIOS is released.

**Q: After flashing the bios and rebooting the system, the screen went blank.**

**A: *For AMI BIOS***

Rename the desired AMI BIOS file to AMIBOOT.ROM and save it on a floppy disk. e.g. Rename A569MS23.ROM to AMIBOOT.ROM

Insert this floppy disk in the floppy drive. Turn On the system and press and hold Ctrl-Home to force update. It will read the AMIBOOT.ROM file and recover the BIOS from the A drive.

When 4 beeps are heard you may remove the floppy disk and restart the computer.

***For Award BIOS***

Make a bootable floppy disk

Copy the Award flash utility & BIOS file to the said floppy disk

Create an autoexec.bat with "awdf1535 biosfilename" in the content e.g.  
awdf1535a619mj21.bin

Boot up system with the said floppy (it will take less than 2 minutes before screen comes out)

Re-flash the BIOS & reboot.

# Glossary

## **ACPI** (*Advanced Configuration & Power Interface*)

This power management specification enables the OS (operating system) to control the amount of power given to each device attached to the computer. Windows 98/98SE, Windows 2000 and Windows ME can fully support ACPI to allow users managing the system power flexibly.

## **AGP** (*Accelerated Graphics Port*)

A new, high-speed graphics interface that based on PCI construction and designed especially for the throughput demands of 3-D graphics. AGP provides a direct channel (32-bit wide bus) between the display controller and main memory for high graphics quality and performance.

## **Bluetooth**

Bluetooth refers to a worldwide standard for the wireless exchange of data between two devices. Bluetooth requires that a low-cost transceiver chip be included in each device. The transceiver transmits and receives in a previously unused frequency band of 2.45 GHz that is available globally (with some variation of bandwidth in different countries). In addition to data, up to three voice channels are available. Each device has a unique 48-bit address from the IEEE 802 standard. Connections can be point-to-point or multipoint. The maximum range is 10 meters. Data can be exchanged at a rate of 1 megabit per second (up to 2 Mbps in the second generation of the technology).

## **BIOS** (*Basic Input/Output System*)

On PCs, an essential software that contains all the control code of input/output interface (such as keyboard, disk drives, etc.). It executes hardware test on booting the system, starts the OS, and provides an interface between the OS and the components. The BIOS is stored in a ROM chip.

## **Bus**

A set of hardware lines within the computer system, through which the data is transferred among different components. In a PC, the term **bus** usually refers to a local bus that connects the internal components to the CPU and main memory.

## **Cache**

A special memory subsystem that is used to speed up the data transfer. It stores the

contents of frequently accessed RAM locations and the addresses where these data items are stored.

### Chipset

A collection of integrated chips designed to perform one or more related functions. For example, a modem chipset contains all the primary circuits for transmitting and receiving data; a PC chipset provides the electronic interfaces between all subsystems.

### Clock Cycle

Clock cycle (or tick) is the smallest unit of time recognized by a device. For personal computers, clock cycles generally refer to the main system clock, which runs at 66 MHz. This means that there are 66 million clock cycles per second. Since modern CPUs run much faster (up to 533 MHz), the CPU can execute several instructions in a single clock tick.

### CMOS (*Complementary Metal-Oxide Semiconductor*)

CMOS is a widely used type of semiconductor, which features high speed and low power consumption. PCs usually contain a small amount of battery-powered CMOS memory to retain the date, time, and system setup parameters.

### DRAM (*Dynamic RAM*)

A most common type of computer memory. It usually uses one transistor and a capacitor to represent a bit. As the development of technology, the memory type and specification used in computer becomes variety, such as SDRAM, DDR SDRAM, and RDRAM. For further instruction, please see the table below:

| Dynamic RAM (DRAM) Memory Technologies |            |            |            |                |       |
|--|------------|------------|------------|----------------|-------|
| Type                                   | First Used | Clock Rate | Bus* Width | Peak Bandwidth | Volts |
| FPM (60,70ns)                          | 1990       | 25MHz      | 64 bits    | 200 MBps       | 5v    |
| EDO (50,60,70ns)                       | 1994       | 40MHz      | 64 bits    | 320 MBps       | 5v    |
| SDRAM (66MHz)                          | 1996       | 66MHz      | 64 bits    | 528 MBps       | 3.3v  |
| SDRAM (100MHz)                         | 1998       | 100MHz     | 64 bits    | 800 MBps       | 3.3v  |
| SDRAM (133MHz)                         | 1999       | 133MHz     | 64 bits    | 1.1 GBps       | 3.3v  |
| RDRAM (Direct Rambus)                  | 1999       | 400MHz     | 16 bits    | 1.6 GBps       | 2.5v  |
| DDR SDRAM (100MHz)                     | 2000       | 100MHz     | 64 bits    | 1.6 GBps       | 3.3v  |
| DDR SDRAM (133MHz)                     | 2000       | 133MHz     | 64 bits    | 2.1 GBps       | 3.3v  |

\* Memory channel width (64 bits started with 75MHz Pentium)

Source: *Computer Desktop Encyclopedia*

**ECC Memory** (*Error Correcting Code Memory*)

A type of memory that contains special circuitry for testing the accuracy of data and correcting the errors on the fly.

**EEPROM**

Acronym for Electrically Erasable Programmable Read-Only Memory. An EEPROM is a special type of PROM that can be erased by exposing it to an electrical charge. Like other types of PROM, EEPROM retains its contents even when the power is turned off. Also like other types of ROM, EEPROM is not as fast as RAM. EEPROM is similar to flash memory (sometimes called flash EEPROM). The principal difference is that EEPROM requires data to be written or erased one byte at a time whereas flash memory allows data to be written or erased in blocks. This makes flash memory faster.

**EIDE**

Short for Enhanced IDE, a newer version of the IDE mass storage device interface standard developed by Western Digital Corporation. It supports data rates of between 4 and 16.6 MBps, about three to four times faster than the old IDE standard. In addition, it can support mass storage devices of up to 8.4 gigabytes, whereas the old standard was limited to 528 MB. Because of its lower cost, enhanced EIDE has replaced SCSI in many areas. There are four EIDE modes defined. The most common is Mode 4, which supports transfer rates of 16.6 MBps. There is also a new mode, called ATA-3 or Ultra ATA, that supports transfer rates of 33 MBps.

**EISA** (*Extended Industry Standard Architecture*)

EISA is a standard bus (computer interconnection) architecture that extends the ISA standard to a 32-bit interface. It was developed in part as an open alternative to the proprietary Micro Channel Architecture (MCA) that IBM introduced in its PS/2 computers. EISA data transfer can reach a peak of 33 megabytes per second.

**ESCD** (*Extended System Configuration Data*)

It is a format for storing information about Plug-and-Play (PnP) devices in the BIOS. Windows and the BIOS access the ESCD area each time you re-boot your computer

**External Cache**

Short for Level 2 cache, cache memory that is external to the microprocessor. In general, L2 cache memory, also called the secondary cache, resides on a separate chip from the microprocessor chip. Although, more and more microprocessors are including L2 caches into their architectures.



**IDE** (*Integrated Drive Electronics*)

A type of disk-drive interface widely used to connect hard disks, CD-ROMs and tape drives to a PC, in which the controller electronics is integrated into the drive itself, eliminating the need for a separate adapter card. The IDE interface is known as the ATA (AT Attachment) specification.

**IEEE 1394**

A new, high speed external bus standard, also known as *FireWire* or *iLink*, which supports data transfer rates of up to 400 Mbps for connecting up to 63 external devices.

**Internal Cache**

Short for Level 1 cache, a memory cache built into the microprocessor. The L1 cache is also called the primary cache.

**IrDA** (*Infrared Data Association*)

A group of device vendors, including computer, component and telecommunications, who have developed a standard for transmitting data via infrared light waves. This enables you to transfer data from one device to another without any cables.

**IRQ** (*Interrupt Request Line*)

IRQs are hardware lines over which devices can send interrupt signals to the microprocessor. When you add a new device to a PC, you sometimes need to set its IRQ number by setting a DIP switch. This specifies which interrupt line the device may use. IRQ conflicts used to be a common problem when adding expansion boards, but the Plug-and-Play specification has removed this headache in most cases.

**ISA** (*Industry Standard Architecture*)

ISA is a standard bus (computer interconnection) architecture that is associated with the IBM AT motherboard. It allows 16 bits at a time to flow between the motherboard circuitry and an expansion slot card and its associated device(s). Also see EISA and MCA.

**LAN** (*Local Area Network*)

A computer network that covers a relatively smaller area, such as in a building or an enterprise. It is made up of servers, workstations, shared resources, a network operating system and a communications link. These individual PCs and devices on a LAN are known as “nodes”, and are connected by cables to access data and devices anywhere on the LAN, so that many users can share expensive devices and data.

**LBA** (*Logical Block Addressing*)

Logical block addressing is a technique that allows a computer to address a hard disk larger than 528 megabytes. A logical block address is a 28-bit value that maps to a specific cylinder-head-sector address on the disk. 28 bits allows sufficient variation to specify addresses on a hard disk up to 8.4 gigabytes in data storage capacity. Logical block addressing is one of the defining features of Enhanced IDE (EIDE), a hard disk interface to the computer bus or data paths.

**LED** (*Light Emitting Diode*)

A semiconductor device that converts electrical energy into light. Since it lights up (usually red) when electricity is passed through it, it is usually used for the activity lights on computer's component, such as disk drivers.

**LPT** (*Line Printer Terminal*)

Logical device name for a line printer; a name reserved by the MS-DOS for up to three parallel printer ports: LPT1, LPT2, and LPT3. It is frequently used by the OS to identify a printer.

**Overclocking**

Overclocking is resetting your computer so that the microprocessor runs faster than the manufacturer-specified speed (for example, setting an Intel 166 MHz (megahertz) microprocessor to run at 200 Mhz).

**PCI** (*Peripheral Component Interconnect*)

A local bus standard developed by Intel that first appeared on PCs in late 1993. PCI provides "plug and play" capability and allows IRQs to be shared. The PCI controller can exchange data with the system's CPU either 32 bits or 64 bits at a time.

**PnP** (*Plug and Play*)

A set of specifications that allows a PC to configure itself automatically to work with peripherals. The user can "plug" in a peripheral device and "play" it without configuring the system manually. To implement this useful feature, both the BIOS that supports PnP and a PnP expansion card are required.

**POST** (*Power On Self Test*)

During booting up your system, the BIOS executes a series of diagnostic tests, include checking the RAM, the keyboard, the disk drives, etc., to see if they are properly connected and operating.

### **PS/2 Port**

A type of port developed by IBM for connecting a mouse or keyboard to a PC. The PS/2 port supports a mini DIN plug containing just 6 pins. Most modern PCs equipped with PS/2 ports so that the special port can be used by another device, such as a modem.

### **RAID**

RAID (Redundant Array of Independent Disks; originally Redundant Array of Inexpensive Disks) is a way of storing the same data in different places (thus, redundantly) on multiple hard disks. By placing data on multiple disks, I/O operations can overlap in a balanced way, improving performance. Since multiple disks increases the mean time between failure (MTBF), storing data redundantly also increases fault-tolerance.

### **SCSI**

Acronym for Small Computer System Interface. Pronounced "scuzzy," SCSI is a parallel interface standard used by Apple Macintosh computers, PCs, and many UNIX systems for attaching peripheral devices to computers. SCSI interfaces provide for faster data transmission rates (up to 80 megabytes per second) than standard serial and parallel ports. In addition, you can attach many devices to a single SCSI port, so that SCSI is really an I/O bus rather than simply an interface.

### **USB** (*Universal Serial Bus*)

A hardware interface for low-speed peripherals such as the keyboard, mouse, joystick, etc. USB provides a maximum bandwidth of 12 Mbit/sec (Mbps) for connecting up to 127 peripheral devices to PC. USB features hot swap capability and multiple data streams, allows external devices to be plugged in and unplugged without turning the system off.

### **Virus**

A program or a piece of code that infects computer files by inserting in those files copies of itself. The virus code is buried within an existing program, and is activated when that program is executed. All the viruses are man-made, and often have damaging side effects.

### **WLAN**

Acronym for wireless local-area network. Also referred to as LAWN. A type of local-area network that uses high-frequency radio waves rather than wires to communicate between nodes.