



**MK86-N**  
**MK86-L**  
**MK86-1394**  
**Online Manual**



DOC. NO.: MK86L-OL-E0310A






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## **Before You Start**



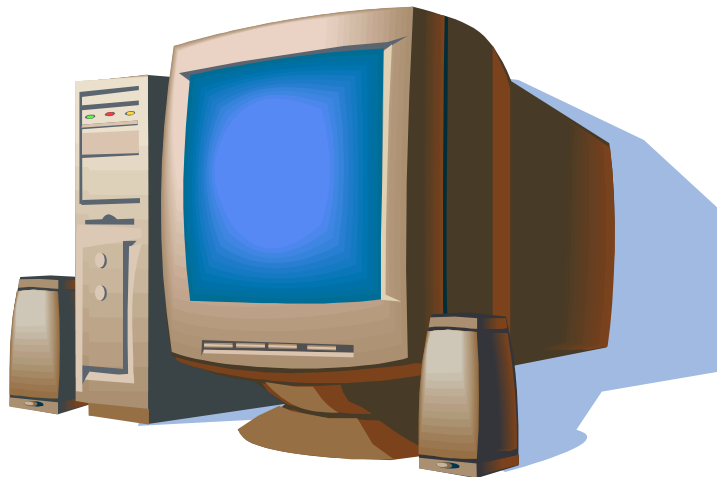
This Online Manual will introduce to the user how this product is installed. All useful information will be described in later chapters. Please keep this manual carefully for future upgrades or system configuration changes. This Online Manual is saved in [PDF format](#), we recommend using Adobe Acrobat Reader 5.0 for online viewing, it is included in Bonus CD disc or you can get free download from [Adobe web site](#).

Although this Online Manual is optimized for screen viewing, it is still capable for hardcopy printing, you can print it by A4 paper size and set 2 pages per A4 sheet on your printer. To do so, choose **File > Page Setup** and follow the instruction of your printer driver.

Thanks for the help of saving our earth.

## Overview

Thank you for choosing AOpen MK86-N / MK86-L / MK86-1394. The MK86-N / MK86-L / MK86-1394 is AMD® Socket 754 motherboard (M/B) based on the micro ATX form factor featuring the [VIA K8T800 chipset](#). As high performance chipset built in the M/B, the MK86-N / MK86-L / MK86-1394 comes with AMD® Socket 754 Athlon 64 processor and 200MHz QDR CPU front side bus. In the AGP performance, it has one AGP slot and supports AGP 8X/4X mode and pipelined spilt-transaction long burst transfer up to 2.1GB/sec. With memory controller built in the Athlon 64 processor, [DDR400\(PC3200\)](#), [DDR333\(PC2700\)](#) and [DDR266\(PC2100\)](#) DDR RAM can be applied to the MK86-N / MK86-L / MK86-1394 and DDR400 maximum memory size can be up to 2GB. The on-board IDE controller supports Ultra DMA 66/100/133 mode and the transfer rate up to 133MB/s. MK86-N / MK86-L / MK86-1394 also has two Serial ATA connectors and they aim to provide you an even faster transfer rate of 150 Mbytes/second. Beside, MK86-N / MK86-L / MK86-1394 has an [AC97 CODEC](#) Realtek ALC655 chipset onboard and supports 5.1 channels, providing high performance and magic surround stereo sound to let people enjoy working with it. More than that, this motherboard supports [USB 2.0](#) function with a fancy speed of up to 480Mbps and [IEEE1394](#) (for MK86-1394) provided data transfer rate up to 400Mbps. Now, enjoy all features from AOpen MK86-N / MK86-L / MK86-1394.



## **MK86-N / MK86-L / MK86-1394 Comparison Table**

Following we list different functions in those three models. “V” represents those functions that the model equips with and “X” represents functions that model doesn’t have. Please always refer to this page to see the functions of your model.

	<b>MK86-N</b>	<b>MK86-L</b>	<b>MK86-1394</b>
<b>IEEE 1394 Function</b>	X	X	V
<b>IEEE 1394 Connector</b>	X	X	V
<b>10/100Mbps LAN</b>	V	V	V
<b>Gigabits LAN</b>	X	V	X

## **Feature Highlight**

### **CPU**

Supports AMD® Socket 754 Athlon 64 CPU with 800MHz Hyper Transport Bus.

### **Chipset**

The K8T800 North Bridge is a high performance and energy efficient solution for the implementation of desktop PC systems with Hyper Transport CPU host interface based on AMD Athlon 64 processors. The K8T800 chipset provides support for AMD Athlon 64 processors via the Hyper Transport Bus and South Bridge VT8237 chipset via the V-Link Host Controller. The V-Link Host Controller in the North Bridge connects it to the South Bridge and provides superior performance between the CPU / DRAM subsystem, V-Link bus and AGP 8X graphics controller bus with pipelined, burst and concurrent operation. The South Bridge VT8237 integrates PCI controller, networking MAC, IDE controller, two-channel Serial ATA (with RAID function) controller and four ports USB 2.0 controller.

### **Ultra DMA 66/100/133 Bus Master IDE**

Comes with an on-board PCI Bus Master IDE controller with two connectors that supports four IDE devices in two channels, supports Ultra DMA 66/100/133, PIO Modes 3 and 4 and Bus Master IDE DMA Mode 4, and supports Enhanced IDE devices.

## LAN Port

For MK86-L, on the strength of BCM5705 controller on board, which is a highly integrated Platform LAN Connect device, it provides 10/100/1000Mbps Ethernet for office and home use. For MK86-N and MK86-1394, with BCM4401 network controller on boards, it provides 10/100Mbps Ethernet for office and home use.

## Serial ATA

This motherboard comes with an integrated SATA controller in VIA VT8237, aiming to provide you an even faster transfer rate of 150 Mbytes/second. The SATA connectors (port 1 and port 2) provided by VIA VT8237 support RAID 0, RAID 1, RAID 0+1 and JBOD mode.

## Expansion Slots

Including three 32-bit/33MHz PCI and one AGP 8X slots. The [PCI](#) local bus throughput can be up to 132MB/s. The [Accelerated Graphics Port \(AGP\)](#) specification provides a new level of video display sophistication and speed. The AGP video cards support data transfer rate up to 2.1GB/s. As MK86-N / MK86-L / MK86-1394 includes one AGP expansion slot for a bus mastering AGP graphic card for AD and SBA signaling, MK86-N / MK86-L / MK86-1394 can support 133MHz 4X/8X mode. MK86-N / MK86-L / MK86-1394 also support three master PCI slots for arbitration and decoding functions.

## Watch Dog ABS

Includes AOpen "Watch Dog ABS" function that can auto-reset system in few seconds when you fail the system overclocking.

## Memory

With memory controller built in the AMD Athlon 64 processors, which is a brand new design in AMD Athlon 64 CPUs, MK86-N / MK86-L / MK86-1394 can support [Double-Data-Rate \(DDR\) RAM](#). The DDR RAM interface allows zero wait state bursting between the RAM and the data buffers at 400/333/266/200 MHz. The four banks of DDR RAM can be composed of an arbitrary mixture of 64, 128, 256, 512, 1024MB DDR RAM and support DDR400/DDR333/266 maximum up to 2GB.

## On-board AC97 Sound

MK86-N / MK86-L / MK86-1394 uses the [AC97 CODEC](#) RealTek ALC655 chip, which supports high quality of 5.1 Channel audio effects. This on-board audio includes a complete audio recording and playback system.

## IEEE 1394 (for MK86-1394)

This motherboard comes with great function of IEEE1394 which has transfer data rate up to 400Mbps.

## Eight USB 2.0 Connectors

Provides four [USB](#) ports for USB interface devices, such as mouse, keyboard, modem, scanner, etc. The new USB 2.0, with fancy speed up to 480Mbps, is 40 times faster than the traditional ones. Except for the speed increase, USB 2.0 supports old USB 1.0/1.1 software and peripherals, offering impressive and even better compatibility to customers.

## 1MHz Stepping CPU Frequency Adjustment

Provides “1MHz Stepping CPU Frequency Adjustment” function in the BIOS. This magic function allows you to adjust CPU [FSB](#) frequency from 200~232MHz by 1MHz stepping, and lets your system get maximum performance.

## Power Management/Plug and Play

MK86-N / MK86-L / MK86-1394 support power management function that conforms to the power-saving standards of the U.S. Environmental Protection Agency (EPA) Energy Star program. It also offers [Plug-and-Play](#), which helps saving users from configuration problems, thus making the system much more user-friendly.

## Hardware Monitoring Management

Supports CPU or system fans status, temperature, voltage monitoring and alert through on-board hardware monitor module and AOpen Hardware Monitoring Utility.

## Enhanced ACPI

Fully implement the [ACPI](#) standard for Windows® 95/98/ME/NT/2000/XP series compatibility, and supports Soft-Off, STR (Suspend to RAM, S3), STD (Suspend to Disk, S4), WOM (Wake On Modem), WOL (Wake On LAN) features.

## Super Multi-I/O

MK86-N / MK86-L / MK86-1394 provide two high-speed UART compatible serial ports and one parallel port with EPP and ECP capabilities. UART2 can also be directed from COM2 to the Infrared Module for the wireless connections.

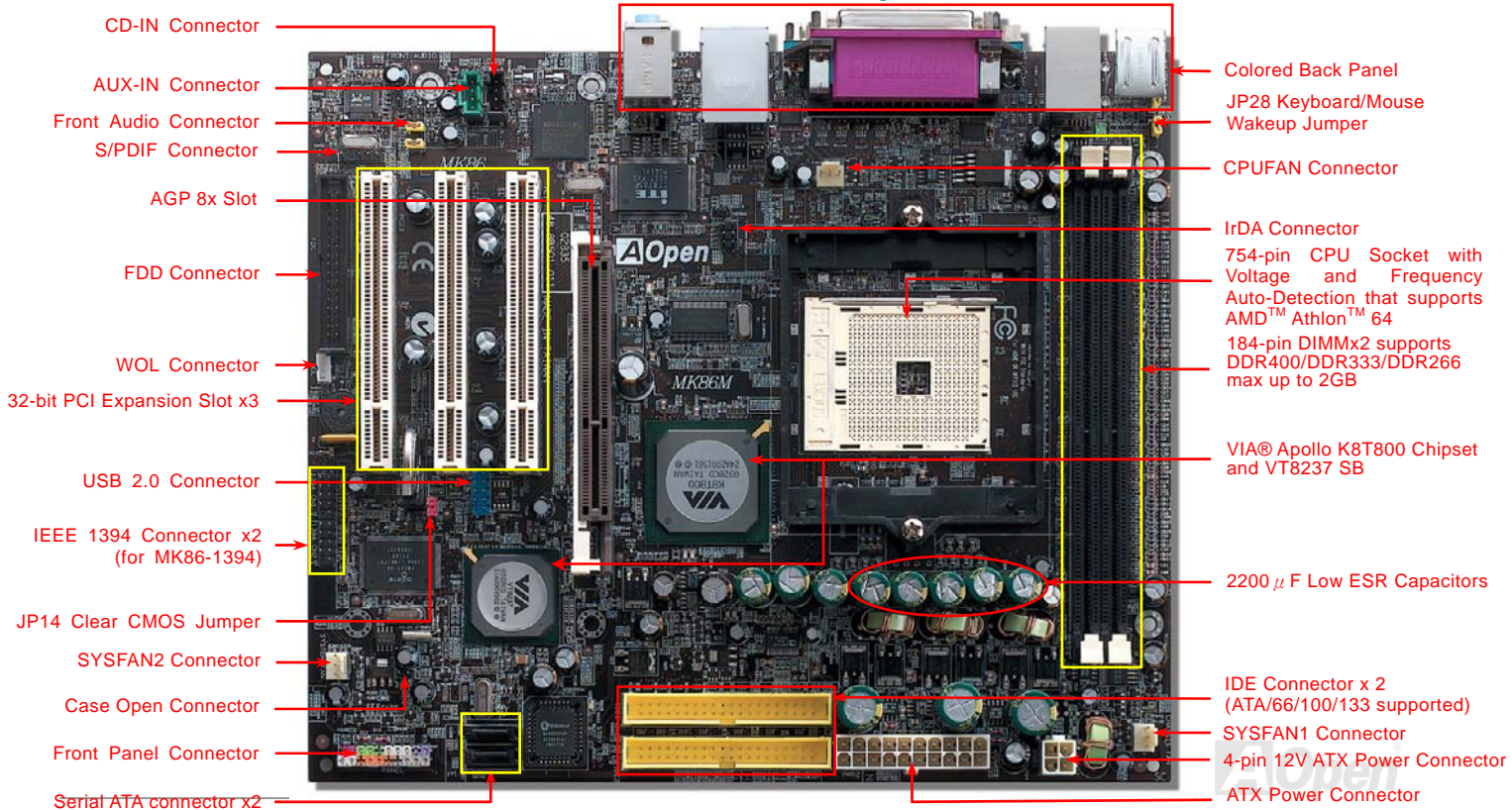
## **Quick Installation Procedure**

This page gives you a quick procedure on how to install your system. Follow each step accordingly.

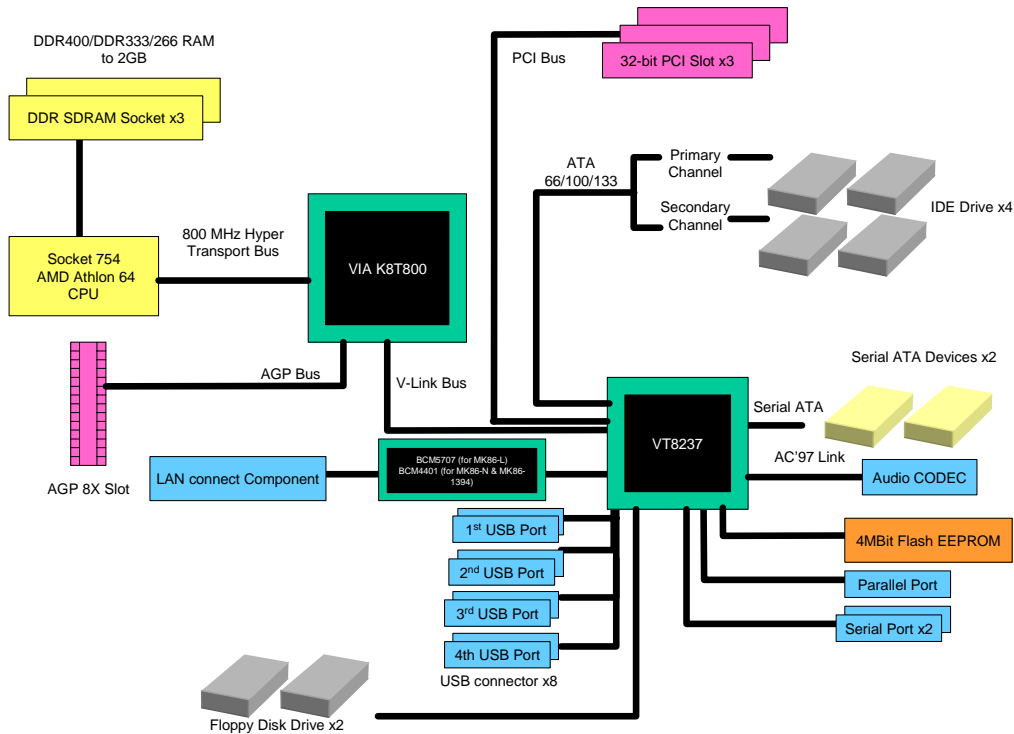
1. Installing [CPU](#) and [Fan](#)
2. [Installing System Memory \(DIMM\)](#)
3. [Connecting Front Panel Cable](#)
4. [Connecting IDE and Floppy Cable](#)
5. [Connecting ATX Power Cable](#)
6. [Connecting Back Panel Cable](#)
7. [Power-on and Load BIOS Setup Default](#)
8. [Setting CPU Frequency](#)
9. Reboot
10. Installing Operating System (such as Windows XP)
11. [Installing Driver and Utility](#)



## Motherboard Map



## Block Diagram



# Hardware Installation

This chapter describes jumpers, connectors and hardware devices of this motherboard.



**Note:** *Electrostatic discharge (ESD) can damage your processor, disk drives, expansion boards, and other components. Always observe the following precautions before you install a system component.*

1. *Do not remove a component from its protective packaging until you are ready to install it.*
2. *Wear a wrist ground strap and attach it to a metal part of the system unit before handling a component. If a wrist strap is not available, maintain contact with the system unit throughout any procedures requiring ESD protection.*

## About “Manufacturer Upgrade Optional” and “User Upgrade Optional”...

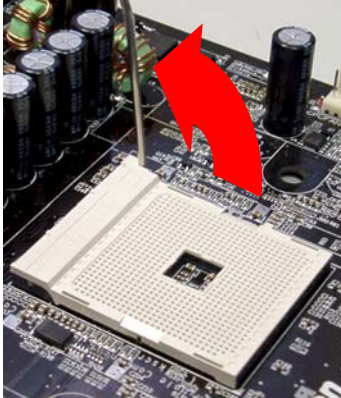
When you read this online manual and start to assemble your computer system, you may find some of functions are called “Manufacturer Upgrade Optional”, and some are called “User Upgrade Optional”. Though all AOpen motherboards include many amazing and powerful features, in some situations, these powerful features are not used to every user. Hence, we changed some key features as “Manufacturer Upgrade Optional” for you to choose. Some optional functions that can be upgraded by users, we call them “User Upgrade Optional”. As for those optional functions that can't be upgraded by ourselves, we call them “Manufacturer Upgrade Optional”. If needed, you can contact our local distributors or resellers for purchasing “User Upgrade Optional” components, and again you can visit AOpen official web site: <http://english.aopen.com.tw/> for more detail information.



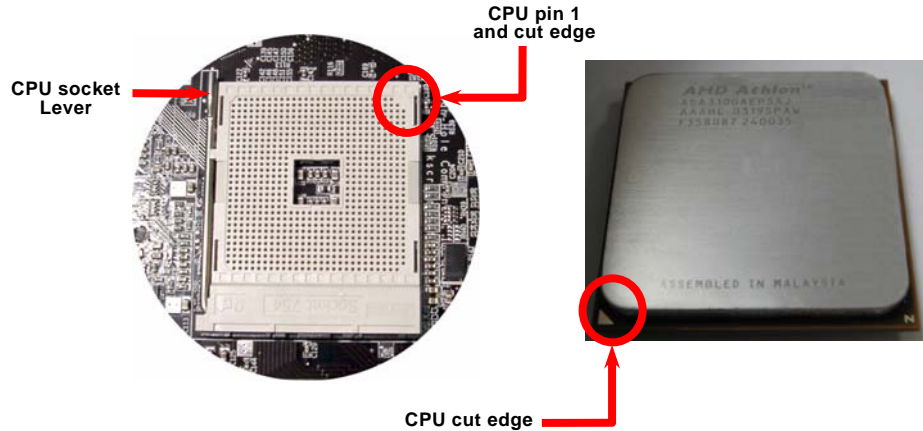
## CPU Installation

This motherboard supports AMD® Athlon 64 Socket 754 CPU. Be careful of CPU orientation when you plug it into CPU socket (with **CPU Overheat Protection** function implemented, the system will be automatically power off when the temperature of CPU reached 97 degree).

1. Pull up the CPU socket lever and up to 90-degree angle.



2. Locate Pin 1 in the socket and look for a black dot or cut edge on the CPU upper interface. Match Pin 1 and cut edge, then insert the CPU into the socket.



Note: This picture is for example only; it may not exactly be the same motherboard.

3. Press down the CPU socket lever and finish CPU installation.



**CPU cut edge**

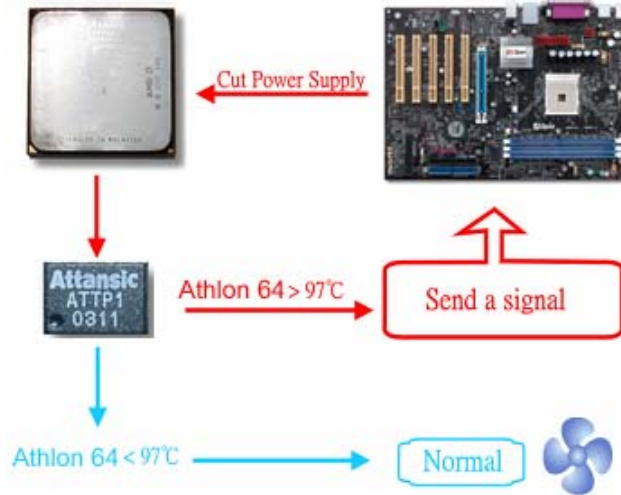
**Note:** If you do not match the CPU socket Pin 1 and CPU cut edge well, it may damage the CPU.

Note: This picture is for example only; it may not exactly be the same motherboard.

## AOpen Overheat Protection (O.H.P.) Technology



With AMD platform substantially keeps increasing the speed of its CPU, it inevitably led to the annoying problem of high CPU operation temperature at the same time. In order to prevent accidental failure of CPU fan, which could cause the burning down of the Athlon 64 CPU, we, AOpen, have meticulously developed a new technology, named, O.H.P. (Overheat Protection) Technology to protect them. Thanks to the intelligent monitoring design of AOpen O.H.P. technology, user can now finally set their mind at ease even when fan failed to work without fearing the possible damage of CPU.



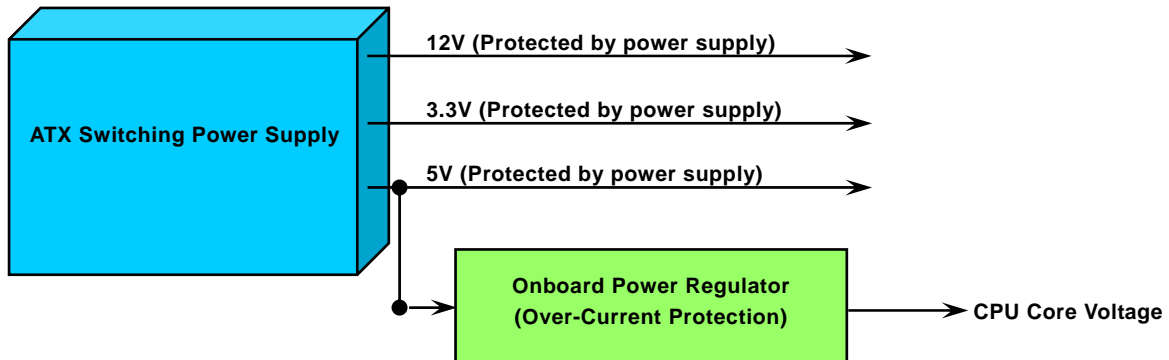
Under the circumstances that CPU fan is running properly, Athlon 64 temperature should be way below the highest temperature limit of 97°C. However, if CPU fan accidentally becomes malfunction or improperly installed, the CPU temperature would rocket abruptly, and you may find your system hang up or crying over the smoking CPU if you haven't installed AOpen O.H.P. previously. With AOpen O.H.P. technology applied, the specific thermal detection pins on Athlon 64 CPU would sense voltage difference when processor is overheated with fan failed, and the overheat

protection system would immediately send out a signal to abort your system by cutting CPU electricity before any damage is done. Unlike other manufacturers who use BIOS or software to control the power supply of CPU, AOpen O.H.P. Technology is purely hardware-controlled the minute after system boot-up, and occupies no system resource. We are pleasant to phase in this practical function on all AOpen AMD series motherboards to protect customer's valuable hardware and personal data.



## CPU Over-current Protection

Over Current Protection has been popularly implemented on ATX 3.3V/5V/12V switching power supply for a while. However, new generation CPU is able to use regulator of different voltages to transfer 12V to CPU voltage (for example, to 2.0V). This motherboard is with switching regulator onboard that supports CPU over-current protection, and it applies to 3.3V/5V/12V power supply for providing full line over-current protection.



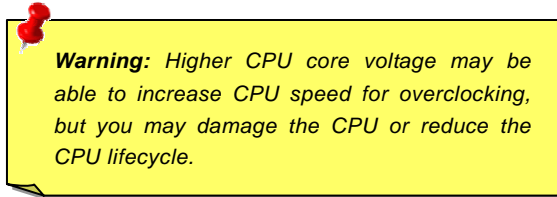
**Note:** Although we have implemented protection circuit try to prevent any human operating mistake, there is still certain risk that CPU, memory, HDD, add-on cards installed on this motherboard may be damaged because of component failure, human operating error or unknown nature reason. **AOpen cannot guaranty the protection circuit will always work perfectly.**



## Full-range Adjustable CPU Core Voltage

This function is dedicated to overclockers. The CPU core voltage of this motherboard is adjustable 0.8V to 1.55V by 0.025V stepping. But this motherboard can also automatically detect CPU VID signal and generates proper CPU core voltage.

### BIOS Setup > Frequency/Voltage Control > CPU Voltage Setting



## Setting CPU Frequency

This motherboard is CPU jumper-less design, you can set CPU frequency through the BIOS setup, and no jumpers or switches are needed.

### BIOS Setup > Frequency/Voltage Control > CPU Speed Setting

CPU Ratio	From 8x to 50x step 1x (auto-detection)
CPU Clock (By manual Adjustment)	200~232MHz by 1MHz stepping adjustment technology

**Warning:** VIA® Apollo K8T800 chipset supports 200MHz system clock and 66MHz AGP clock, higher clock setting may cause serious system damage.

**Warning:** If you have adjusted CPU ratio on your current CPU, and planned to replace a new CPU, please use <Home> key or Clear CMOS to restore the default setting when changing a new CPU.



**Tip:** If your system hangs or fails to boot because of overclocking, simply use <Home> key to restore the default setting or you can wait the AOpen "Watch Dog ABS" reset the system after five seconds and system will auto-detect hardware again.

## Supported CPU Frequency

Core Frequency = CPU Bus Clock \* CPU Ratio

PCI Clock = CPU Bus Clock / Clock Ratio

AGP Clock = PCI Clock x 2

CPU	CPU Frequency	Core System Clock	Ratio
Athlon 64 3000+	1.6GHz	200MHz	8x
Athlon 64 3200+	2.0GHz	200MHz	10x
Athlon 64 3400+	2.2GHz	200MHz	11x

**Note:** With CPU speed changing rapidly, there might be fastest CPU on the market by the time you received this installation guide. This table is kindly for your references only.

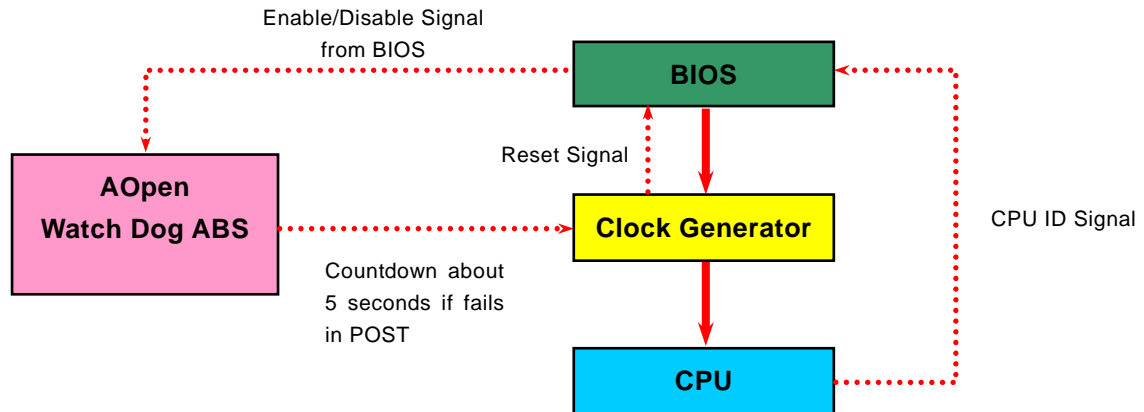


**Note:** This motherboard support CPU auto-detection function. Therefore you don't need to setup the CPU frequency manually.

## AOpen “Watch Dog ABS”

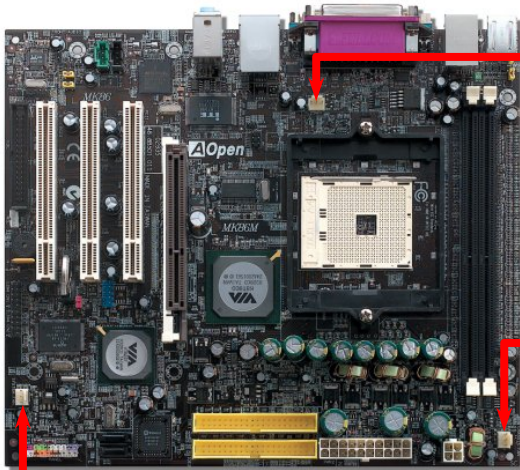


With this motherboard, AOpen provides a very special, useful feature for overclockers. When you power-on the system, the BIOS will check last system [POST](#) status. If it succeeded, the BIOS will enable “Watch Dog ABS” function immediately, and set the CPU [FSB](#) frequency by user’s setting that stored in the BIOS. If system failed in BIOS POST, the “Watch Dog ABS” will reset the system to reboot in five seconds. Then, BIOS will detect the CPU’s default frequency and POST again. With this special feature, you can easily overclock your system to get higher system performance without removing the cover of system housing, and be able to set the jumper to clear CMOS data when your system hanged.

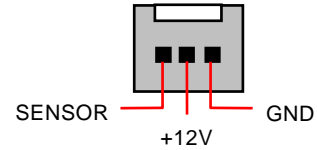


## CPU and Housing Fan Connector (with H/W Monitoring)

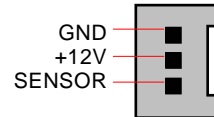
Plug in the CPU fan cable to the 3-pin **CPUFAN** connector. If you have chassis fan, you can also plug it on **SYSFAN1** or **SYSFAN2** connector.



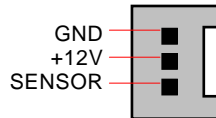
CPUFAN Connector



SYSFAN1 Connector



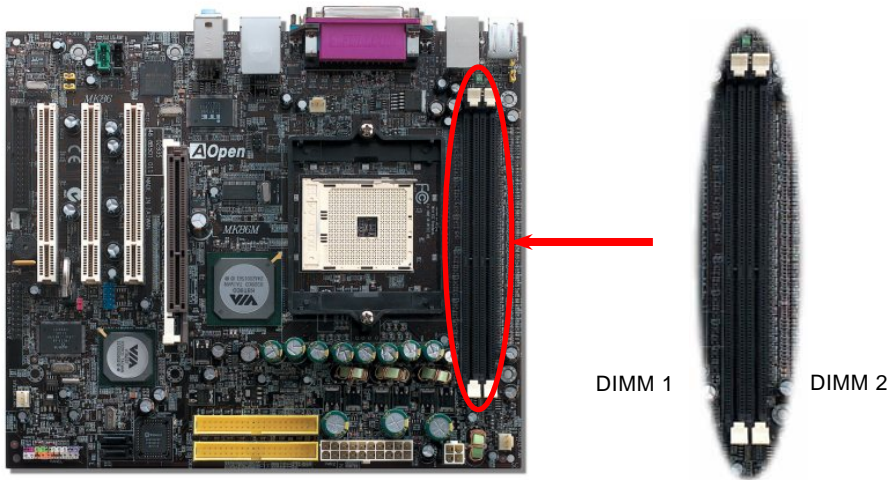
SYSFAN2 Connector



**Note:** Some CPU fans do not have sensor pin, so that they cannot support fan monitoring.

## DIMM Sockets

This motherboard has two 184-pin DDR DIMM sockets that allow you to install DDR266/333/400 memory up to 2GB. Non-ECC DDR RAM is supported; otherwise it will cause serious damage on memory sockets or RAM module.



**Warning:** This motherboard supports DDR RAM. Please do not install the SDRAM on the DDR RAM sockets; otherwise it will cause serious damage on memory sockets or SDRAM module.

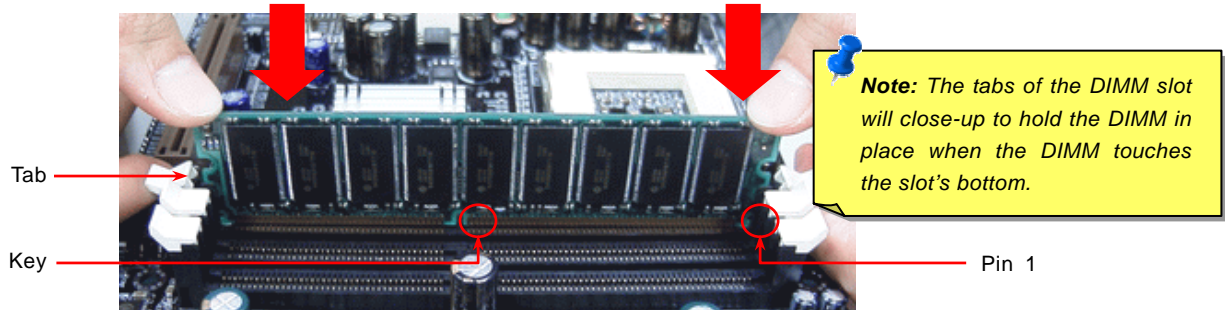
## How to Install Memory Modules

Please follow the procedure as shown below to finish memory installation.

1. Make sure the DIMM module's pin face down and match the socket's size as depicted below.



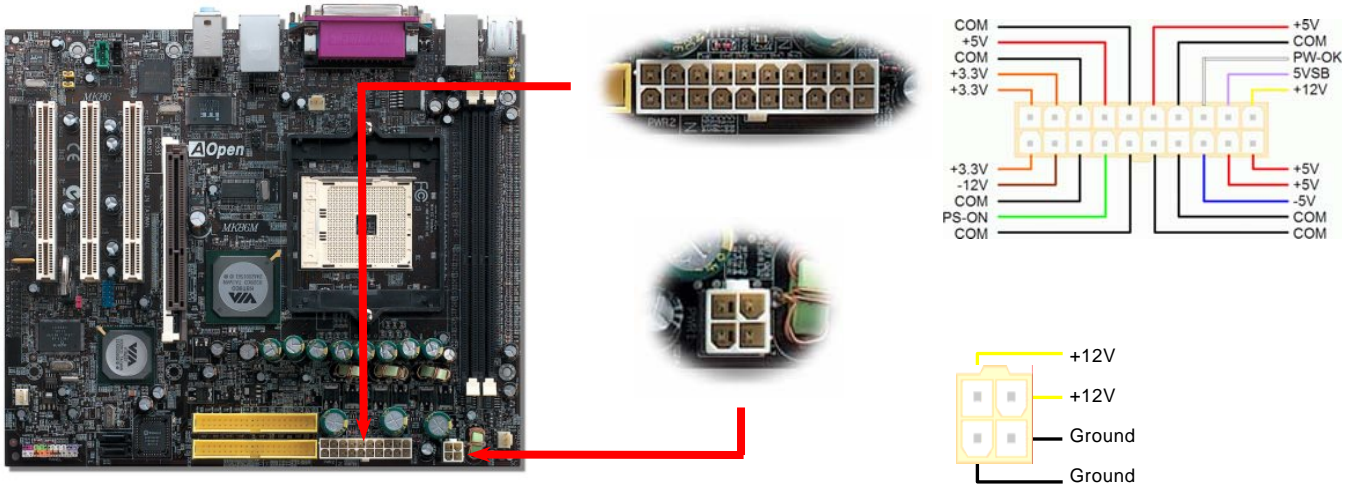
2. Insert the module straight down to the DIMM slot with both hands and press down firmly until the DIMM module is securely in place.



3. Repeat step 2 to finish additional DIMM modules installation.

## ATX Power Connector

This motherboard comes with a 20-pin and 4-pin ATX power connector. Make sure you plug in the right direction.



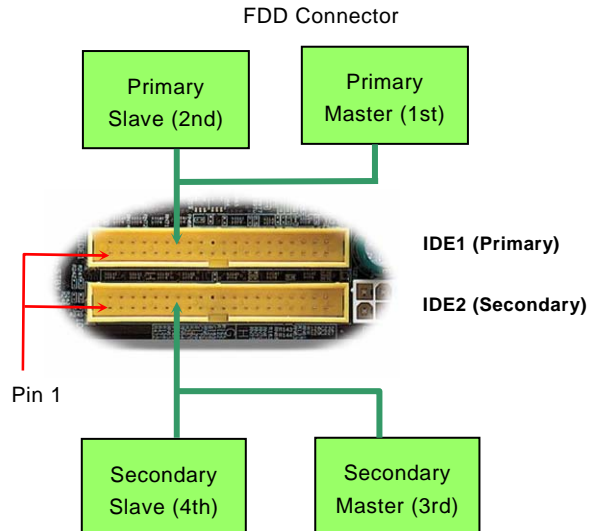
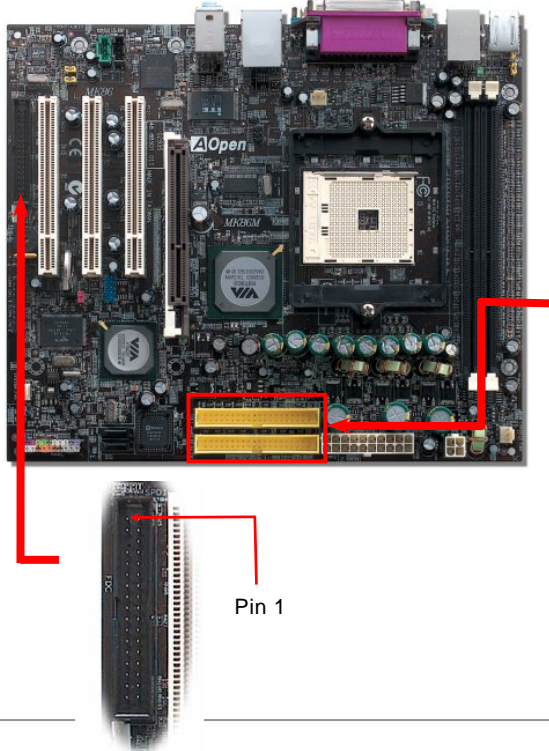
## AC Power Auto Recovery

A traditional ATX system should remain at power off stage when AC power resumes from power failure. This design is inconvenient for a network server or workstation, without an UPS, that needs to keep power-on. This motherboard implements an AC Power Auto Recovery function to solve this problem.



## IDE and Floppy Connector

Connect 34-pin floppy cable and 40-pin IDE cable to floppy connector FDC connector. Be careful of the pin1 orientation. Wrong orientation may cause system damage.



IDE1 is also known as the primary channel, IDE2 is known as the secondary channel. Each channel supports two IDE devices that make a total of four devices. In order to work together, the two devices on each channel must be set differently to **Master** and **Slave** mode. Either one can be the hard disk or the CDROM. The setting as master or slave mode depends on the jumper on your IDE device, so please refer to your hard disk and CDROM manual accordingly.



**Warning:** *The specification of the IDE cable is a maximum of 46cm (18 inches); make sure your cable does not exceed this length.*



**Tip:**

1. *For better signal quality, it is recommended to set the far end side device to master mode and follow the suggested sequence to install your new device. Please refer to above diagram*
2. *To achieve the best performance of Ultra DMA 66/100/133 hard disks, a special **80-wires IDE cable** for Ultra DMA 66/100/133 is required.*

## ATA/133 Supported

This motherboard supports [ATA66](#), [ATA100](#) or [ATA133](#) IDE devices. Following table lists the transfer rate of IDE PIO and DMA modes. The IDE bus is 16-bit, which means every transfer is two bytes. As the hard drive industry introduces faster and higher capacity hard drives, the current Ultra ATA/100 interface causes a data bottleneck between the drive and the host computer. To avoid this problem, hard disk manufacturers have introduced the new Ultra ATA-133 interface technology. Compared to traditional ATA/100, ATA/133 has up to 33 percent increase in interface speed with transfer rate of 133MB/s. ATA/133 performance is ideal for new operating systems, such as Window XP, that demand more storage space and faster data transfer rates from more responsive computing experiences.

To make good use of this new technology and enjoy its best performance, we recommend you to pair your system with a hard disk equipped with ATA/133 technology so that your system's need for speeding on this motherboard can be satisfied.

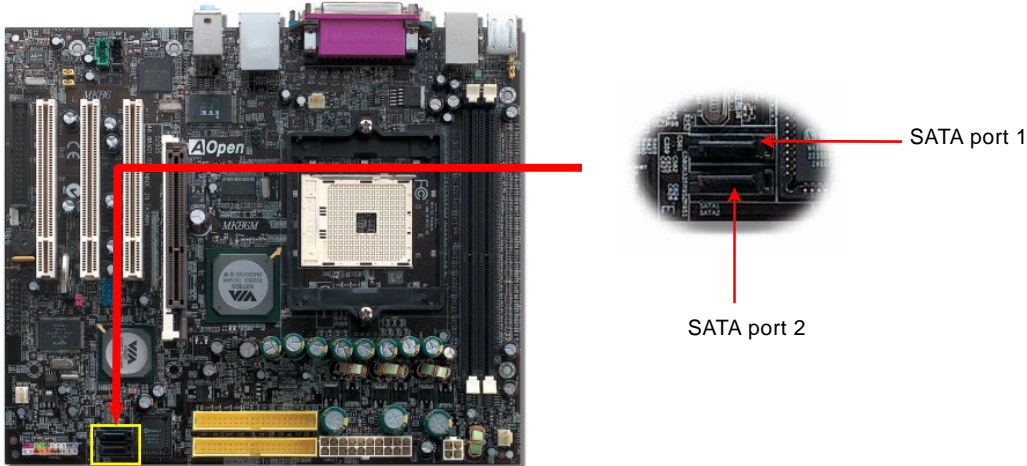
Mode	Clock Period	Clock Count	Cycle Time	Data Transfer Rate
PIO mode 0	30ns	20	600ns	$(1/600\text{ns}) \times 2\text{byte} = 3.3\text{MB/s}$
PIO mode 1	30ns	13	383ns	$(1/383\text{ns}) \times 2\text{byte} = 5.2\text{MB/s}$
PIO mode 2	30ns	8	240ns	$(1/240\text{ns}) \times 2\text{byte} = 8.3\text{MB/s}$
PIO mode 3	30ns	6	180ns	$(1/180\text{ns}) \times 2\text{byte} = 11.1\text{MB/s}$
PIO mode 4	30ns	4	120ns	$(1/120\text{ns}) \times 2\text{byte} = 16.6\text{MB/s}$
DMA mode 0	30ns	16	480ns	$(1/480\text{ns}) \times 2\text{byte} = 4.16\text{MB/s}$
DMA mode 1	30ns	5	150ns	$(1/150\text{ns}) \times 2\text{byte} = 13.3\text{MB/s}$
DMA mode 2	30ns	4	120ns	$(1/120\text{ns}) \times 2\text{byte} = 16.6\text{MB/s}$
ATA33	30ns	4	120ns	$(1/120\text{ns}) \times 2\text{byte} \times 2 = 33\text{MB/s}$
ATA66	30ns	2	60ns	$(1/60\text{ns}) \times 2\text{byte} \times 2 = 66\text{MB/s}$
ATA100	20ns	2	40ns	$(1/40\text{ns}) \times 2\text{byte} \times 2 = 100\text{MB/s}$
ATA133	15ns	2	30ns	$(1/30\text{ns}) \times 2\text{byte} \times 2 = 133\text{MB/s}$

## Serial ATA Supported (With RAID Function)



The traditional parallel ATA specification has defined the standard storage interface for PCs with its original speed of just 3 Mbytes/second since the protocol was introduced in the 1980s. And the latest generation of the interface, Ultra ATA-133, has been developed further with a burst data transfer rate of 133 Mbytes/second. However, while ATA has enjoyed an illustrious track record, the specification is now showing its age and imposes some serious design issues on today's developers, including a 5-volt signaling requirement, high pin count, and serious cabling headaches.

The Serial ATA specification is designed to overcome these design limitations while enabling the storage interface to scale with the growing media rate demands of PC platforms. Serial ATA is to replace parallel ATA with the compatibility with existing operating systems and drivers, adding performance headroom for years to come. It reduces voltage and pins count requirements and can be implemented with thin and easy to route cables.

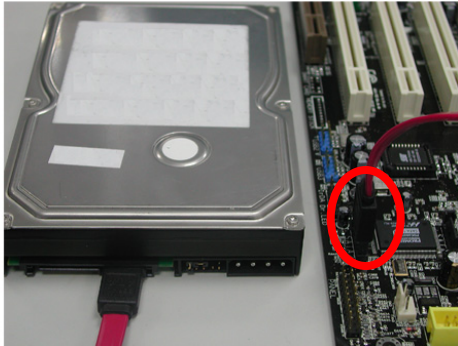


## Connecting Serial ATA Disk

To connect a Serial ATA disk, you have to have a 7-pin Serial ATA cable. Connect two ends of the Serial ATA cable to the Serial ATA header on the motherboard and the disk. Like every other traditional disk, you also have to connect a power cable. Please note that it is a jumper free implement; you don't need to set jumpers to define a master or slave disk. When connecting two Serial ATA disks, the system will automatically take the one connected to "Serial ATA 1" header as a master disk.



Serial ATA Cable **Comparison between Parallel ATA and Serial ATA**



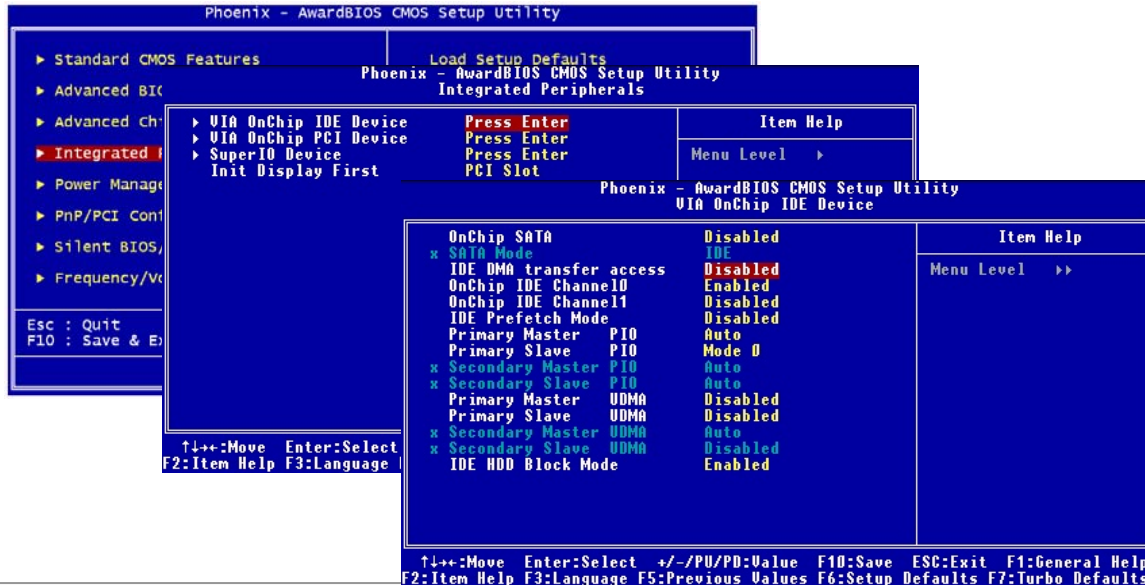
	Parallel ATA	Serial ATA
<b>Bandwidth</b>	100/133 MB/Secs	150/300/600 MB/Secs
<b>Volts</b>	5V	250mV
<b>Pins</b>	40	7
<b>Length Limitation</b>	18 inch (45.72cm)	1 meter (100cm)
<b>Cable</b>	Wide	Thin
<b>Ventilation</b>	Bad	Good
<b>Peer-to-Peer</b>	No	Yes

Note: This picture is for example only; it may not be exactly the same motherboard.

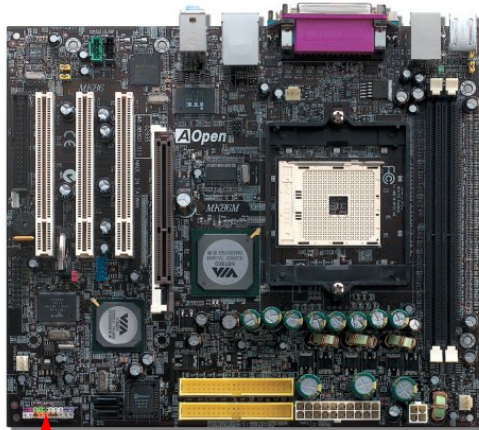
## Adjusting Your Hard Disk

Except its original 2 sets of parallel IDE, this motherboard does come with the support for the latest Serial ATA hard disk. If you are unable to find your newly installed Serial ATA hard disks on your operating system after you have had installed them on, the problem mainly lies in the BIOS setting. You may simply adjust BIOS settings to have them work properly.

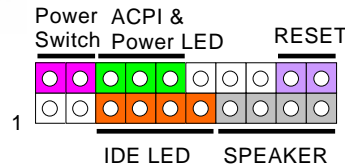
After having properly installed your hard disks, you may directly get into the BIOS setting screen for adjustment. You may simply press “Integrated Peripherals → On-Chip IDE Device → VIA-OnChip IDE Device→OnChip SATA” to either enable or disable SATA interface.



## Front Panel Connector



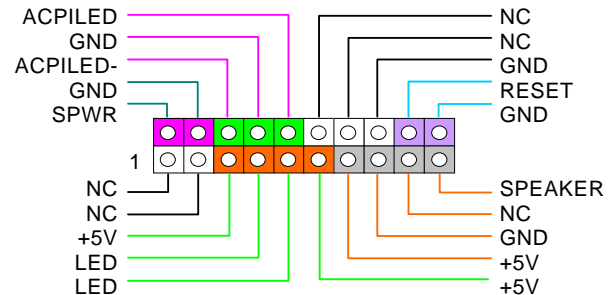
Pin 1



Attach the power LED, speaker, power and reset switch connectors to the corresponding pins. If you enable "Suspend Mode" item in BIOS Setup, the ACPI & Power LED will keep flashing while the system is in suspend mode.

Locate the power switch cable from your ATX housing. It is 2-pin female connector from the housing front panel. Plug this connector to the soft-power switch connector marked **SPWR**.

Suspend Type	ACPI LED
Power on Suspend (S1)	Blinking between green and red
Suspend to RAM (S3) or Suspend to Disk (S4)	Blinking between green and red

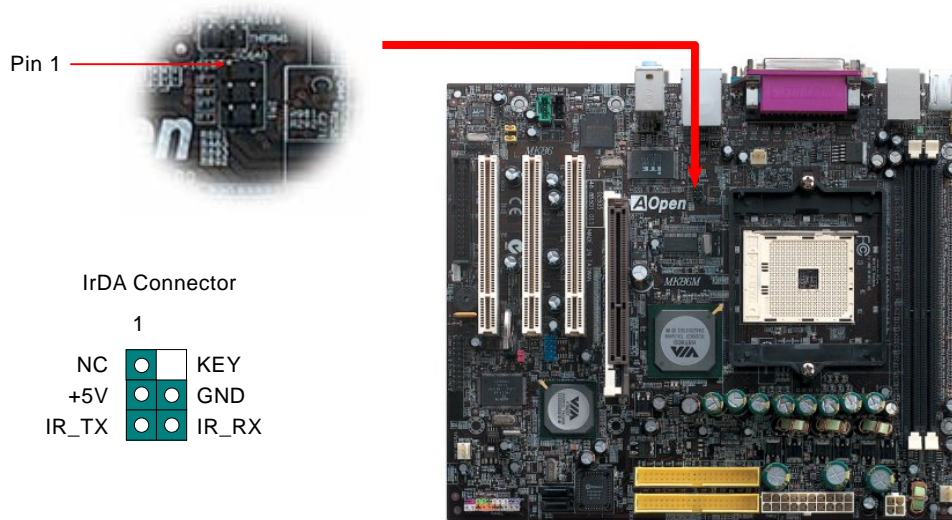




## IrDA Connector

The IrDA connector can be configured to support wireless infrared module, with this module and application software such as Laplink or Windows 95 Direct Cable Connection, the user can transfer files to or from laptops, notebooks, PDA devices and printers. This connector supports HPSIR (115.2Kbps, 2 meters) and ASK-IR (56Kbps).

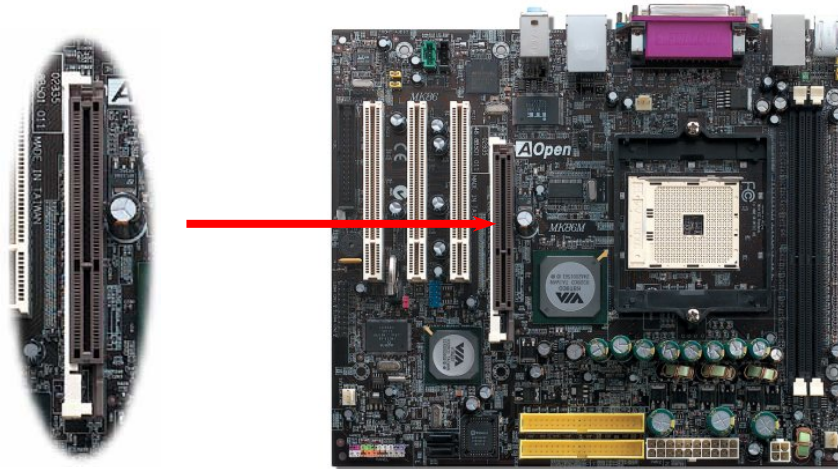
Install the infrared module onto the **IrDA** connector and enable the infrared function from BIOS Setup, UART2 Mode, make sure to have the correct orientation when you plug in the IrDA connector.





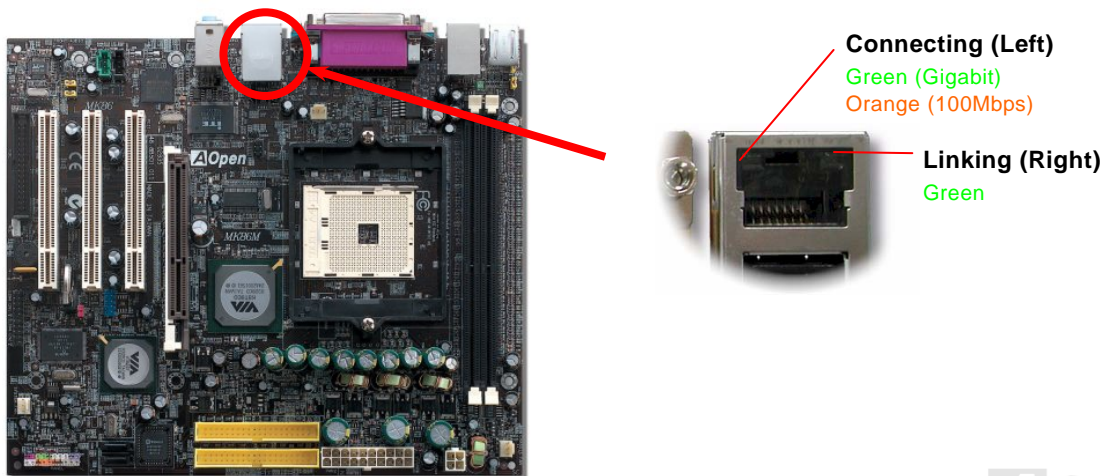
## AGP (Accelerated Graphic Port) 8X Expansion Slot

The MK86-N / MK86-L / MK86-1394 provide an [AGP](#) 8X slot. The AGP 8X is a bus interface targeted for high-performance 3D graphic. AGP supports only memory read/write operation and single-master single-slave one-to-one only. AGP uses both rising and falling edge of the 66MHz clock, for 4X AGP, the data transfer rate is  $66\text{MHz} \times 4\text{bytes} \times 4 = 1056\text{MB/s}$ . AGP is now moving to AGP 8X mode, which is  $66\text{MHz} \times 4\text{bytes} \times 8 = 2.1\text{GB/s}$ . This AGP expansion slot is for 1.5V-1.6V AGP card only.



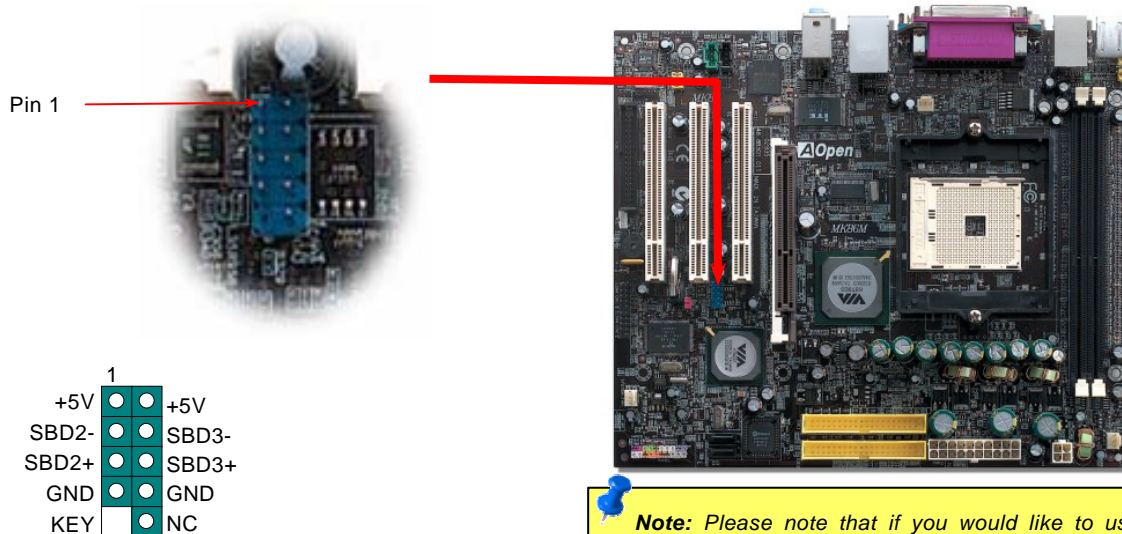
## 10/100/1000 Mbps LAN onboard

The South Bridge VT8237 includes a fast Ethernet controller on chip. For MK86-L, on the strength of Broadcom BCM5705 LAN controller on board, it provides 10/100/1000M bps Ethernet for office and home use. For MK86-N and MK86-1394, the Broadcom BCM4401 LAN controller provides 10/100M bps Ethernet. The Ethernet RJ45 connector is located on top of USB connectors. The right-hand side LED indicates the link mode, it blinks in green whenever linking to network. The left-hand side LED indicates the Connecting mode, and it lights in orange when 100Mbps LAN is connected (never lights while 10Mbps is connected), but lights in green when Gigabits LAN is connected. To enable or disable this function, you may simply adjust it through BIOS.



## Support eight USB 2.0 connectors

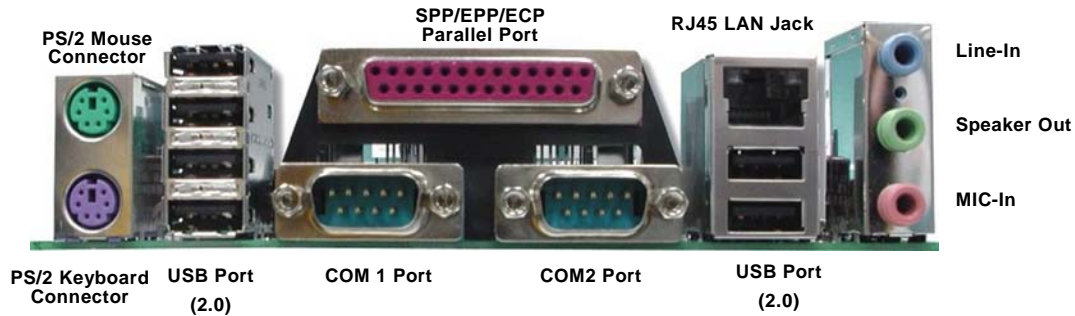
This motherboard provides eight USB ports to connect USB devices, such as mouse, keyboard, modem, printer, etc. There are six connectors on the PC99 back panel. You can use proper cables to connect the other USB connectors to the USB modules or front panel of chassis. Please note that USB 2.0, with fancy speed up to 480Mbps, is 40 times faster than the traditional ones. Except for the speed increase, USB 2.0 supports old USB 1.0/1.1 software and peripherals, offering impressive and even better compatibility to customers.



**Note:** Please note that if you would like to use USB devices (Example: keyboard, mouse etc.) under DOS environment, you must install driver that comes with the devices to make it work.

## Color Coded Back Panel

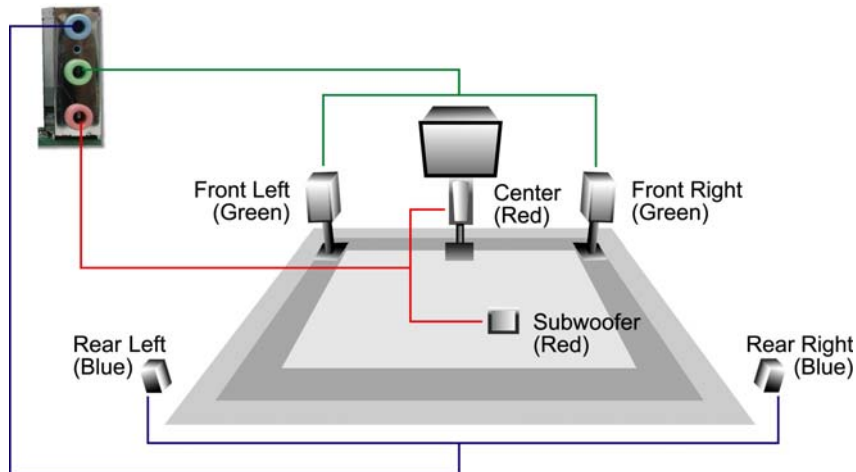
The onboard I/O devices are PS/2 Keyboard, PS/2 Mouse, serial ports COM1 and COM2, RJ45 LAN Jack, Printer, USB, AC97 sound. The view angle of drawing shown here is the back panel of the housing.



- PS/2 Keyboard:** For standard keyboard, which uses a PS/2 plug.
- PS/2 Mouse:** For PC-Mouse, which uses a PS/2 plug.
- USB Port:** Available for connecting USB devices.
- Parallel Port:** To connect with SPP/ECP/EPP printer.
- COM1/COM2 Port:** To connect with pointing devices, modem or others serial devices.
- RJ-45 LAN connector:** To connect Ethernet for home or office use.
- Speaker Out:** To External Speaker, Earphone or Amplifier.
- Line-In:** Comes from the signal sources, such as CD/Tape player.
- MIC-In:** From Microphone.

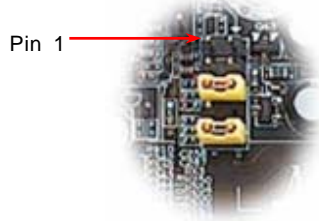
## Super 5.1 Channel Audio Effect

This motherboard comes with an ALC655 CODEC, which supports high quality of 5.1 Channel audio effects, bringing you a brand new audio experience. On the strength of the innovative design of ALC655, you're able to use standard line-jacks for surround audio output without connecting any external module. To apply this function, you have to install the audio driver in the Bonus Pack CD as well as an audio application supporting 5.1 Channel. Picture bellow represents the standard location of all speakers in 5.1 Channel sound tracks. Please connect the plug of your front speakers to the green "Speaker out" port, rear speakers' plug to the blue "Line in" port and both of the center and subwoofer speakers to the red "MIC in" port.



## Front Audio Connector

If the housing has been designed with an audio port on the front panel, you'll be able to connect onboard audio to front panel through this connector. By the way, please remove 5-6 and 9-10 jumper caps from the Front Audio Connector before connecting the cable. Please do not remove these 5-6 and 9-10 yellow jumper caps if there's no audio port on the front panel.



Pin 1

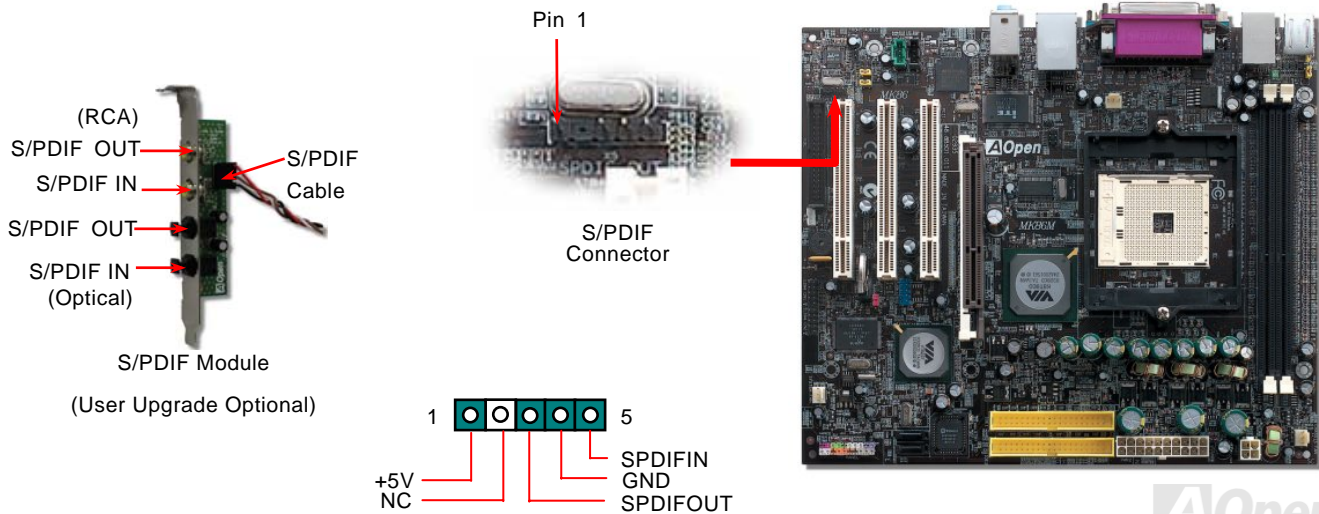


	1		
AUD_MIC	●	●	AUD_GND
AUD_MIC_BIAS	●	●	AUD_VCC
AUD_FPOUT_R	●	●	AUD_RET_R
NC	●	□	KEY
AUD_FPOUT_L	●	●	AUD_RET_L



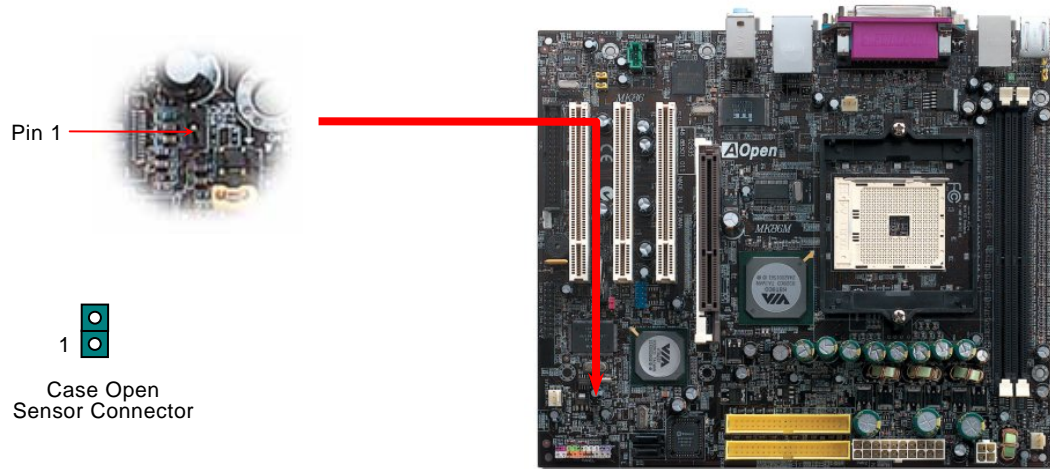
## S/PDIF (Sony/Philips Digital Interface) Connector

S/PDIF (Sony/Philips Digital Interface) is a newest audio transfer file format, which provides impressive audio quality through optical fiber and allows you to enjoy digital audio instead of analog audio. Through a specific audio cable, you can connect the S/PDIF connector to other end of the S/PDIF audio module, which bears S/PDIF digital output. Normally there are two S/PDIF outputs as shown, one for RCA connector, the most common one used for consumer audio products, and the other for optical connector with better audio quality. Same as outputs, you can also connect RCA or optical audio products to input connectors on the module and have the voice or music come out from your computer. However, you must have a S/PDIF supported speaker/amplifier/decoder with S/PDIF digital input/output to connect to the S/PDIF digital input/output to make the most out of this function.



## Case Open Connector

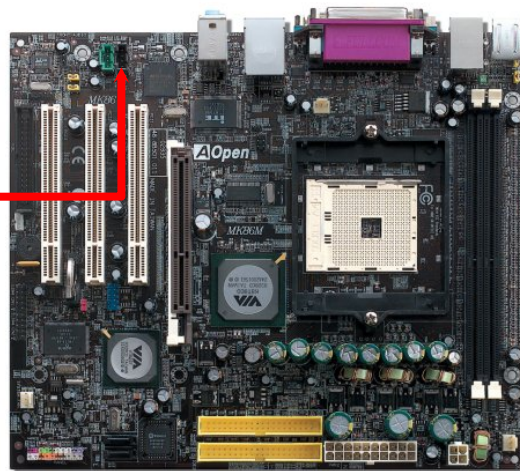
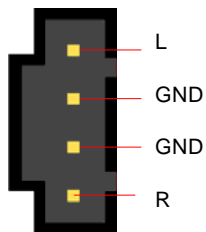
The “CASE OPEN” header provides chassis intrusion-monitoring function. To make this function work, you have to enable it in the system BIOS, connect this header to a sensor somewhere on the chassis. So, whenever the sensor is being triggered by light or opening of the chassis, the system will send out beep sound to inform you. Please be informed that this useful function only applies to advanced chassis, you may purchase an extra sensor, attach it on your chassis, and make a good use of this function.





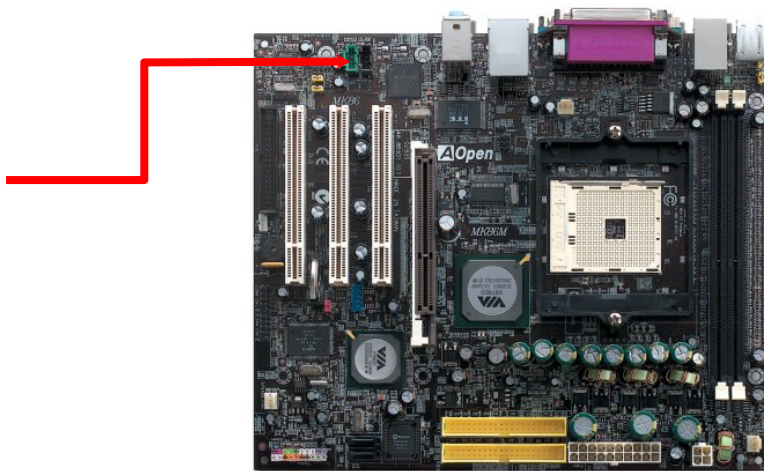
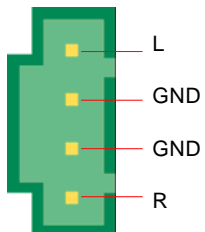
## CD Audio Connector

This connector is used to connect CD Audio cable from CD-ROM or DVD drive to onboard sound.



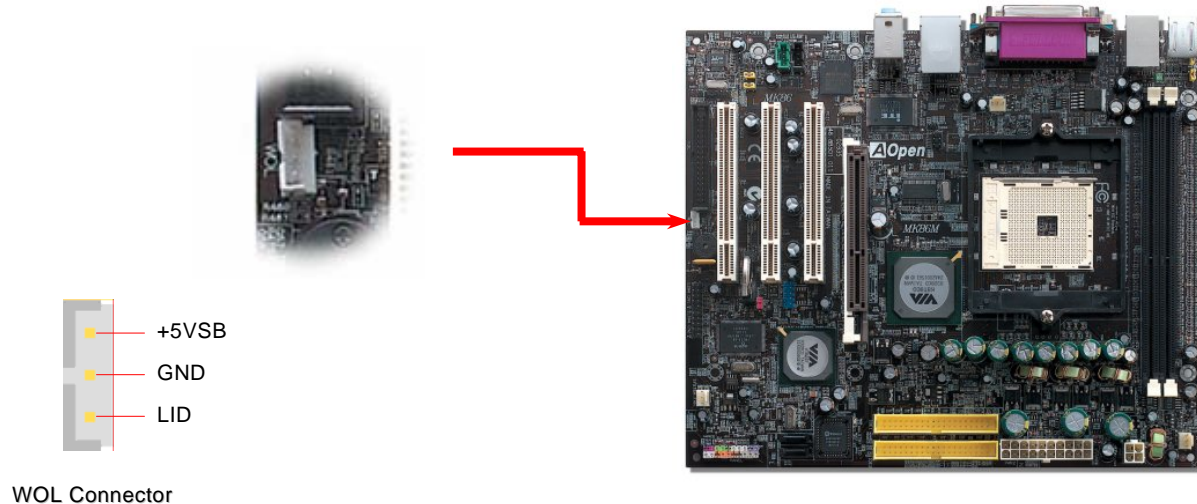
## AUX-IN Connector

This connector is used to connect MPEG Audio cable from MPEG card to onboard sound.



## WOL (Wake on LAN)

This feature is very similar as [Wake On Modem](#), but it goes through local area network. To use Wake On LAN function, you must have a network card with a chipset supporting this feature, and connect a cable from LAN card to motherboard WOL connector. The system identification information (probably IP address) is stored on network card and because there is a lot of traffic on the Ethernet, you need to install network management software, such as ADM, for the checking of how to wake up the system. Note that, at least 600mA ATX standby current is required to support the LAN card for this function.

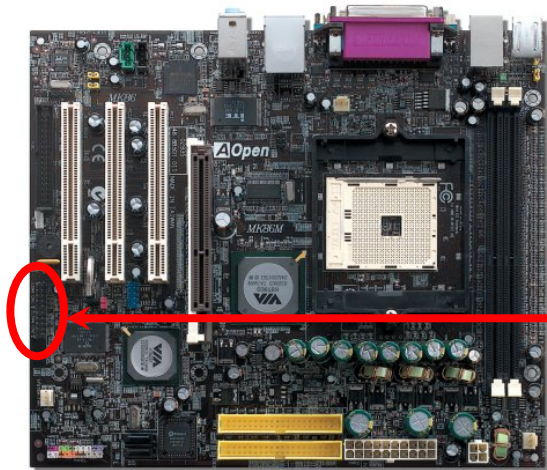


## IEEE 1394 Connector (for MK86-1394)



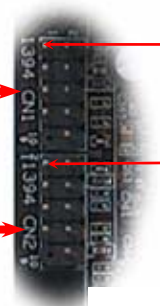
**IEEE1394**

This motherboard comes with IEEE 1394 connector onboard. The IEEE 1394 provides data transfer rate up to 400Mb/s, and USB just has 12Mb/s. Hence, the IEEE 1394 interface can connect with the devices that need high data transferring performance such as digital camera, scanner or others IEEE 1394 devices. Please use the proper cable to connect with devices.



IEEE 1394  
Port 1

IEEE 1394  
Port 2



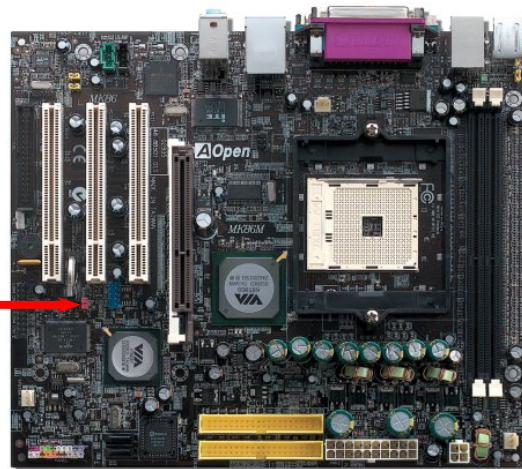
Pin 1

	1	2	
TPA+	●	●	TPA-
GND	●	●	GND
TPB+	●	●	TPB-
+12V(Fused)	●	●	+12V(Fused)
	●	●	SHIED GND
	9	10	

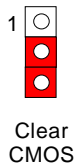
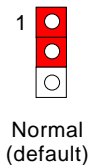
## JP14 Clear CMOS Data Jumper

You can clear CMOS to restore system default setting. To clear the CMOS, follow the procedures below.

1. Turn off the system and unplug the AC power.
2. Remove ATX power cable from connector PWR2.
3. Locate JP14 and short pins 2-3 for a few seconds.
4. Return JP14 to its normal setting by shorting pin 1 & pin 2.
5. Connect ATX power cable back to connector PWR2.



Pin 1

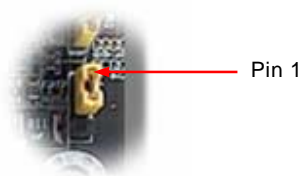


### Tip: When should I Clear CMOS?

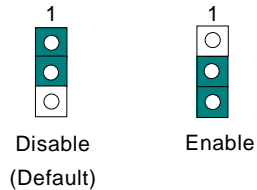
1. Boot fail because of overclocking...
2. Forget password...
3. Troubleshooting...

## JP28 KB/Mouse Wake-up Jumper

This motherboard provides keyboard / mouse wake-up function. You can use JP28 to enable or disable this function, which could resume your system from suspend mode with keyboard or mouse installed. The factory default setting is set to “Disable” (1-2), and you may enable this function by setting the jumper to pin2-3.



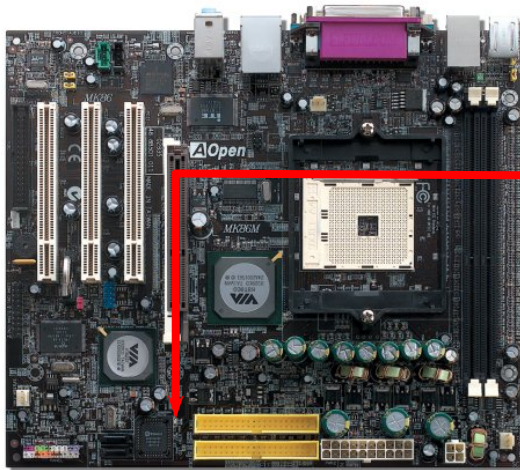
JP28 KB/Mouse Wake-up Jumper





## STBY LED

STBY LED is AOpen's considerate design that aims at providing you friendly system information. The STBY LED will light up when power is provided to the motherboard. This is a convenient indication for you to check the system power status in many circumstances such as power on/off, stand-by mode and RAM power status during Suspend to RAM mode.



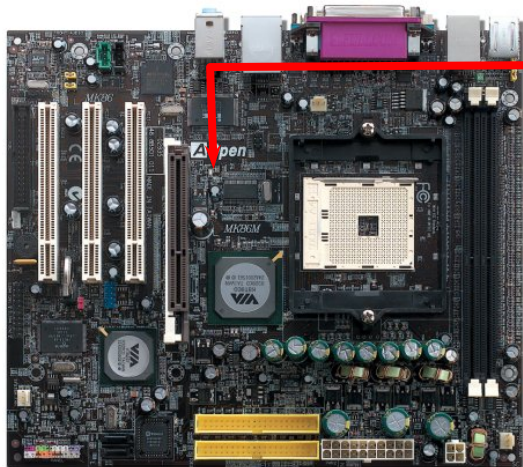
System  
Power LED



**Warning:** Do not install or remove the DIMM module or others devices when the STBY LED lights on.

## AGP Protection Technology and AGP LED

With the outstanding R&D ability of AOpen and its specially developed circuit, this model implements a blend new technology to protect your motherboard from being damaged by over-voltaging of AGP card. When AGP Protection Technology is implemented, this motherboard will automatically detect the voltage of AGP card and prevent your chipsets from being burnt out. Please note that if you install a AGP card with 3.3V, which is not supported, the AGP LED on the motherboard will light up to warn you the possible damage of the exceeding voltage. You may contact your AGP card vendor for further support.



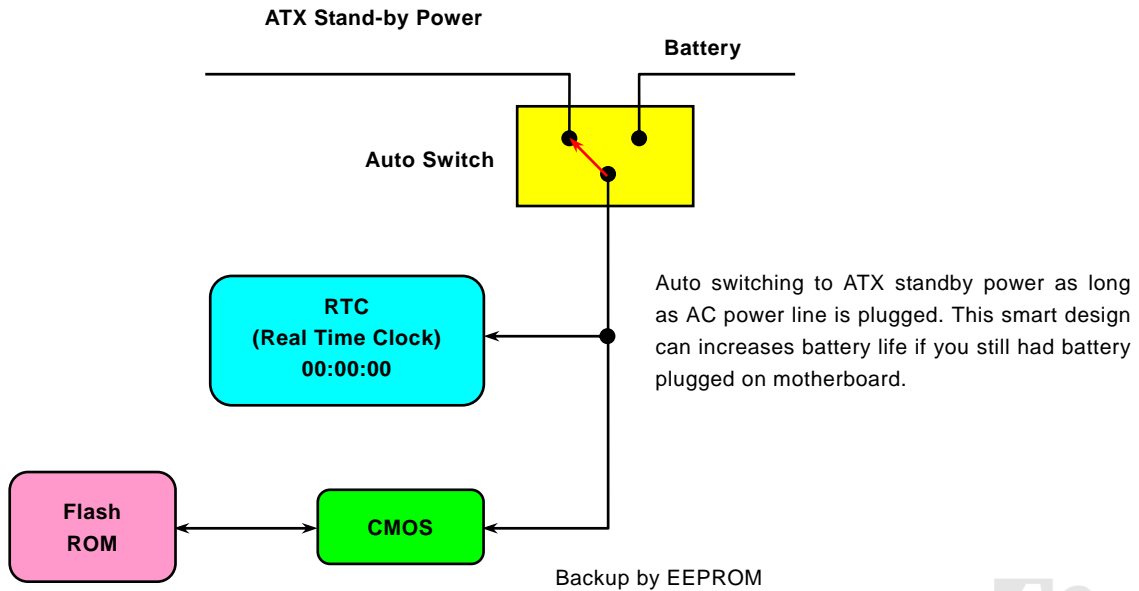
AGP LED

**Warning:** It is strongly recommended not to install a 3.3V AGP card, which is not supported. When you do so, the AGP LED on the motherboard will light up to warn you the possible damage.



## Battery-less and Long Life Design

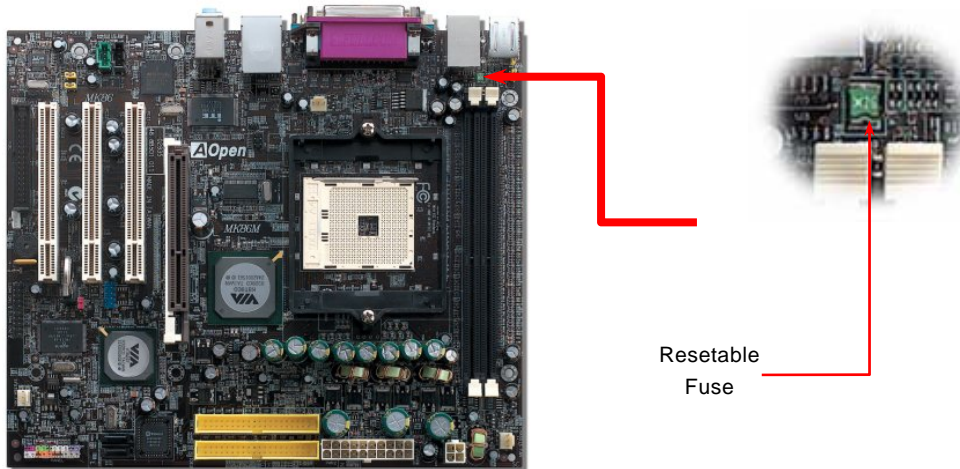
This Motherboard implements [Flash ROM](#) and a special circuit that allows you to save your current CPU and CMOS Setup configurations without using the battery. The RTC (real time clock) can also keep running as long as the power cord is plugged. If you lose your CMOS data by accident, you can just reload the CMOS configurations from Flash ROM and the system will recover as usual.



## Resettable Fuse

Traditional motherboard has fuse for Keyboard and USB port to prevent over-current or shortage. These fuses are soldered onboard that user cannot replace it when it is damaged (did the job to protect motherboard), and the motherboard remains malfunction.

With expensive Resettable Fuse, the motherboard can resume back to normal function after fuse had done its protection job.

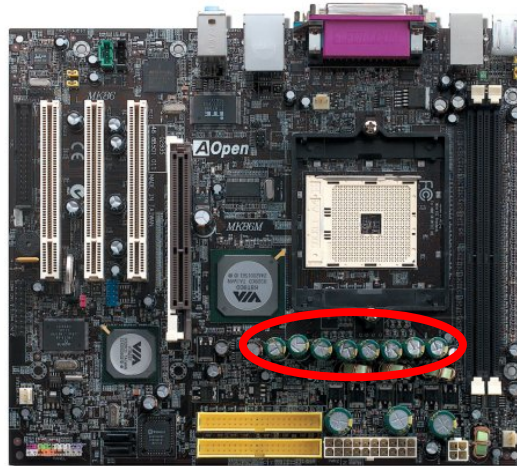


Resettable  
Fuse

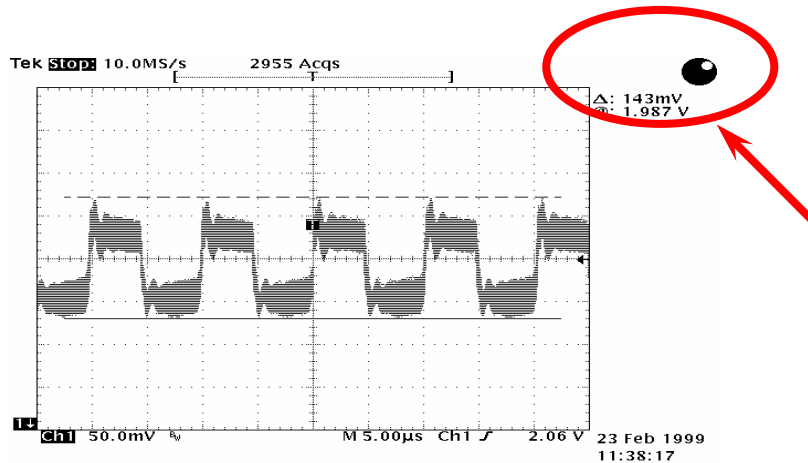
## 2200 $\mu$ F Low ESR Capacitor

The quality of low ESR capacitor (Low Equivalent Series Resistance) during high frequency operation is very important for the stability of CPU power. The idea of where to put these capacitors is another know-how that requires experience and detail calculation.

Not only that, this motherboard implements 2200  $\mu$ F capacitor, which is much larger than normal capacitor (1000 or 1500  $\mu$ F) and it provides better stability for CPU power.



The power circuit of the CPU core voltage must be checked to ensure system stability for high speed CPUs (such as the new Pentium III, or when overclocking). A typical CPU core voltage is 2.0V, so a good design should control voltage between 1.860V and 2.140V. That is, the transient must be below 280mV. Below is a timing diagram captured by a Digital Storage Scope, it shows the voltage transient is only 143mv even when maximum 60 current is applied.



Note: This diagram for example only; it may not exactly be the same motherboard.

# RAID Introduction



## What's RAID?

Two major challenges facing the storage industry today are keeping pace with the increasing performance demands of computer systems by improving disk I/O throughput and providing data accessibility in the face of hard disk failures.

The idea of RAID (Redundant Array of Independent Disks) was first introduced by David A. Patterson, Garth Gibson and Randy H. Katz at the University California at Berkeley in 1988. RAID is a purpose of storing the same data in different places on multiple hard disks and improves storage subsystem performance. The advantage of RAID is to provide better throughput performance and/or data fault tolerance. Better performance is accomplished by sharing the workload in parallel among multiple physical hard drives. Fault-tolerance is achieved through data redundant operation where if one (or more) drive fails or has a sector failure, a mirrored copy of the data can be found on another drive(s).

A RAID appears to the operating system to be a single logical hard disk. The RAID controller manages how the data is stored and accessed across the physical and logical arrays. The RAID controller help users to ensure that the operating system only sees the logical drives and users do not need to worry about managing the complicated schema.

For optimal performance results, select identical hard drives to install in disk arrays. The drives' matched performance allows the array to function better as a single drive.

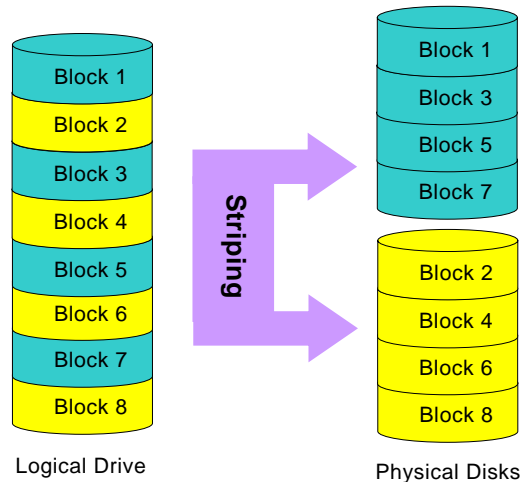


**Warning:** *The Serial ATA RAID function can be supported under **Windows XP** and **Windows .Net** environments.*

## What are the RAID levels?

### Striping / Span (RAID 0)

RAID level 0, which is the fastest drive array you can have, is a performance-oriented disk mapping method. The data in this array gets written across a stripe or different disks for a faster transfer. This technique has striping but no redundancy of data. It offers the best performance but no fault-tolerance. Reads and writes sector of data interleaved between multiple drives. When any disk member fails, it affects the entire array. Performance is better than a single drive since the workload is balanced between the array members. This array type is for high performance systems. Identical drives are recommended for performance as well as data storage efficiency. The disk array data capacity is equal to the number of members times the smallest member capacity. For example, one 40GB and one 60GB drives will form an 80GB (40GBx2) disk array.

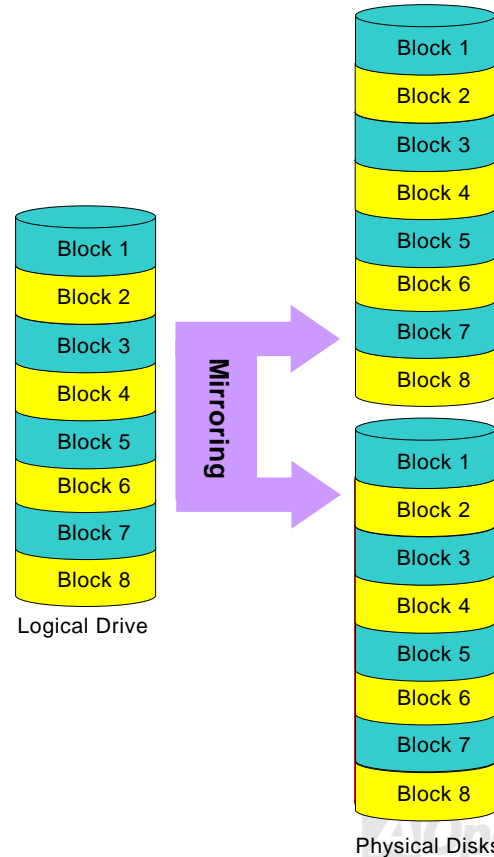


## Mirroring (RAID 1)

RAID level 1 uses at least two duplicate hard drives and store the exact same blocks of information between them. This is the slowest form of fault tolerance because the data has to be replicated onto two disks at the same time. However, this is the simplest way to provide high reliability.

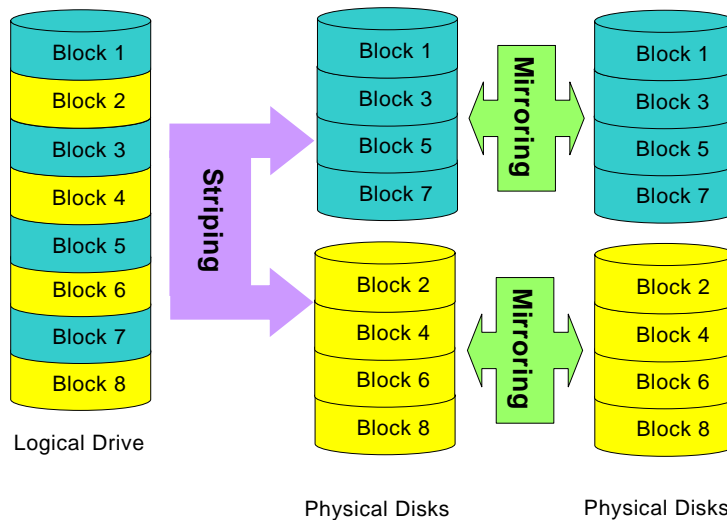
If one of the mirrored drives suffers a mechanical failure or does not respond, the remaining drive will continue to serve and provide correct data. If one drive has a physical sector error, the mirrored drive will continue to function.

Due to redundancy, the drive capacity of the array is half the total drive capacity. For example, two 40GB drives that have a combined capacity of 80GB would have 40GB of usable storage. With drives of different capacities, there may be unused capacity on the larger drive. RAID 1 increases cost as it takes twice as much hard drives to build our arrays.



## Striping with Mirroring (RAID 0+1)

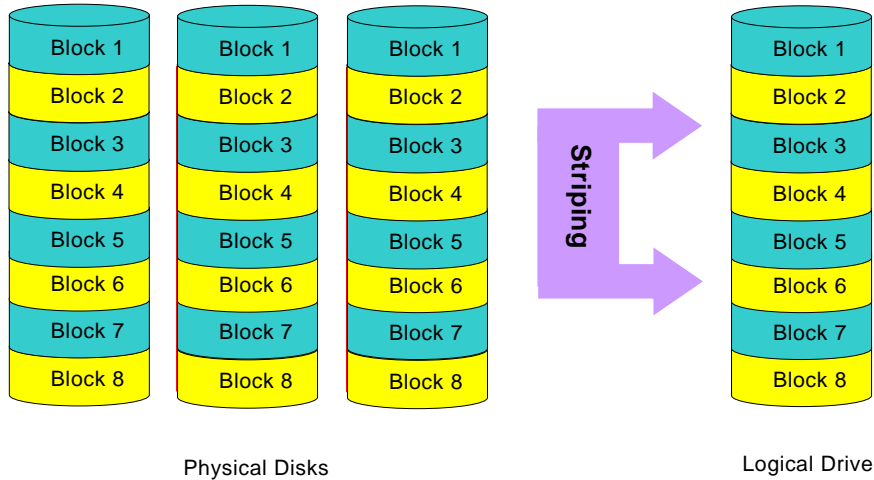
As the name would suggest, RAID 0+1 is striping and mirroring combined. This RAID combines the best of both RAID 0 and RAID 1. It takes a Disk stripe using two disks, and mirrors it to another set of disks for fault tolerance. Data is striped across several disks, each disk stripe has partner with exactly the same data on it. You get the benefits of fast data access as in RAID 0, with the fault tolerance of RAID 1. This configuration provides optimal speed and reliability. You need double the number of disks as a RAID 0, half for each side of the mirror. At least 4 hard disks are needed while performing RAID 0+1. There are other RAID configurations in addition to those described here, but these are the types most commonly used in the industry.





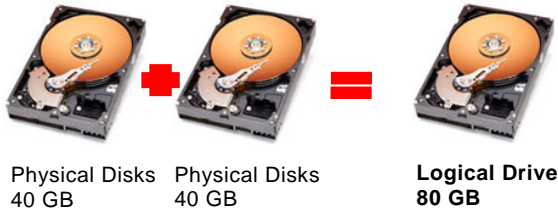
### JBOD (Just a Bunch of Disks)

JBOD combines multiple drives into one larger logical one, which is recognized by the operating system as a single drive. Although it doesn't provide data integrity advantages as RAID levels 0 and 1 have, it can be very helpful for users dealing with extremely large file sizes such as animation or digital editing files.

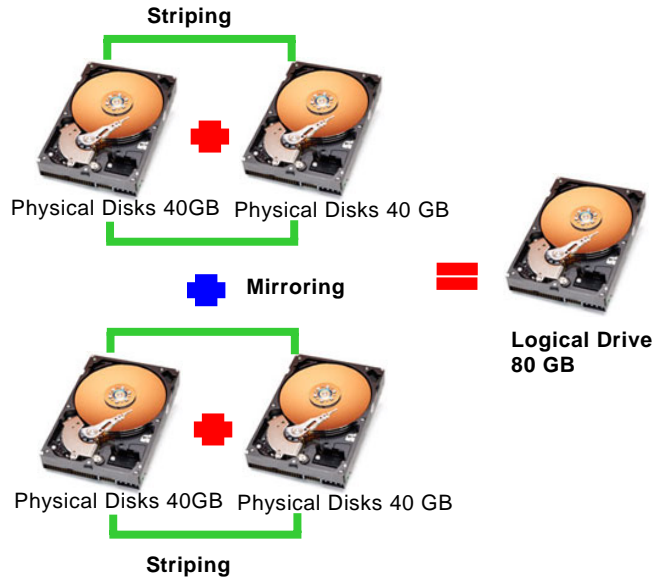


## HDD Capacity of RAID Levels

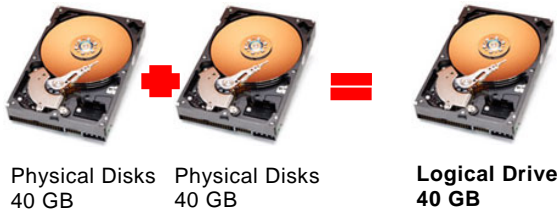
### Striping / Span (RAID 0)



### Striping with Mirroring (RAID 0 +1)



### Mirroring (RAID 1)



# PHOENIX-AWARD BIOS

System parameters can be modified by going into [BIOS](#) Setup menu, this menu allows you to configure the system parameters and save the configuration into the 128 bytes CMOS area, (normally in the RTC chip or in the main chipset).

The Phoenix-Award BIOS™ that installed in the [Flash ROM](#) of the motherboard is a custom version of an industry standard BIOS. The BIOS provides critical low-level support for standard devices such as hard disk drives, serial and parallel ports.

AOpen's R&D engineering team had optimized most BIOS setting of this motherboard. But, the default setting of BIOS still can't fine-tune the chipset controlling entire system. Hence, the rest of this chapter is intended to guide you through the process of configuring your system using setup.

Currently there are two kinds of beep sound when system fails to boot at POST. The first type of beep sound consists of a single long beep and two short beeps, indicating a video error has failed BIOS from initializing video screen for displaying any additional information. The 2<sup>nd</sup> type of beep sound is a single long beep that beeping repeatedly, signaling a DRAM error has occurred. You may look over the indicated error according to different beep significances.

To enter to BIOS setup menu, press <Del> when [POST \(Power-On Self Test\)](#) screen is shown on your monitor.



**Note:** *Because the BIOS code is the most often changed part of the motherboard design, the BIOS information contained in this manual may be different with actual BIOS that come with your motherboard.*

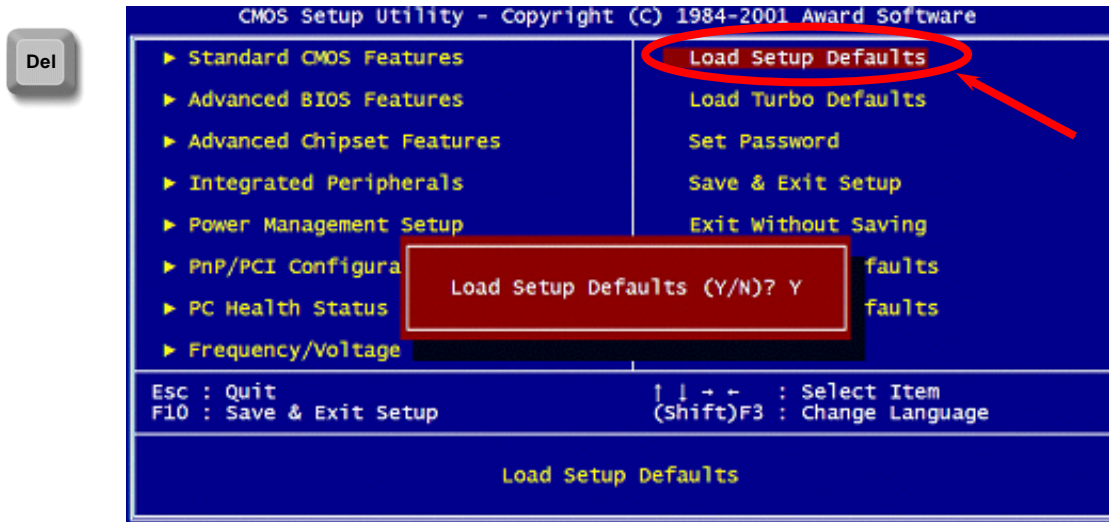
## How To Use Phoenix-Award™ BIOS Setup Program

Generally, you can use the arrow keys to highlight items that you want to choose, then press <Enter> key to select, and use the <Page Up> and <Page Down> key to change setting value. You also can press <F1> key for help and press <Esc> key to quit Phoenix-Award™ BIOS setup program. The following table provides details about how to use keyboard in the Phoenix-Award™ BIOS setup program. By the way, all products of AOpen also provides a special function in the BIOS setup, you can press <F3> key selecting preferred menu language to display.

Key	Description
Page Up or +	Changing setting to next value or increase the value.
Page Down or -	Changing setting to previous value or decrease value.
Enter	Select the item.
Esc	1. In main menu: Quit and don't save any change. 2. In sub menu: Exit current menu to main menu.
Up Arrow	Highlight previous item.
Down Arrow	Highlight next item.
Left Arrow	Move the light bar to left side of menu.
Right Arrow	Move the light bar to right side of menu.
F6	Load Setup Default setting value from CMOS.
F7	Load turbo setting value from CMOS.
F10	Save changed setting and exit setup program.

## How To Enter BIOS Setup

After you finish the setting of jumpers and connect correct cables. Power on and enter the BIOS Setup, press <Del> during [POST \(Power-On Self Test\)](#). Choose "Load Setup Defaults" for recommended optimal performance.



Del

**Warning:** Please avoid of using "Load Turbo Defaults", unless you are sure your system components (CPU, SDRAM, HDD, etc.) are good enough for turbo setting.

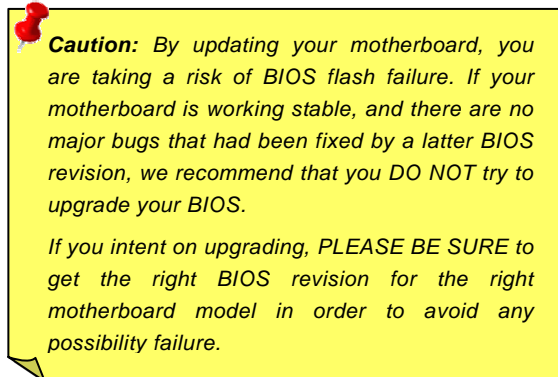
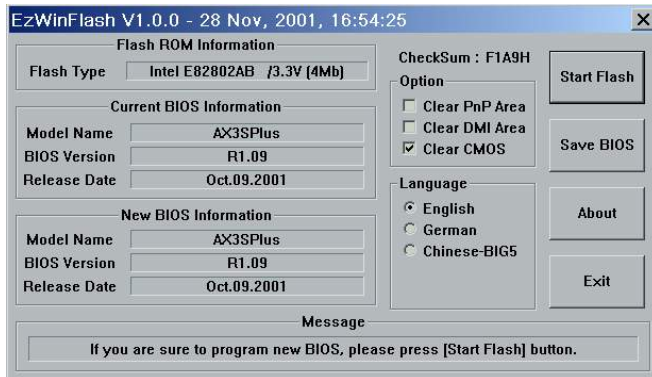


## BIOS Upgrade under Windows environment



With outstanding R&D ability of AOpen, we now bring you a whole new BIOS Flash wizard ---- EzWinFlash. With an eye to users convenience, EzWinFlash combines the BIOS binary code and flash module together, so the only thing you have to do is just clicking on the utility you downloaded from web and let it helps you complete the flash process automatically. EzWinFlash detects your motherboard and checks the BIOS version cleverly to prevent your system from any possible failure. Moreover, EzWinFlash has been taken into consideration to go with any windows platform you might be using, no matter if you're using Windows 95/98, 98SE/ME, NT4.0/2000, or even the latest Windows XP.

In the meanwhile, in order to provide a much more user-friendly operating environment, AOpen EzWinFlash is natively designed to have multi-language function to provide easier way for users' usage in changing BIOS setting.



Note: The model name on this BIOS picture is for reference only. It may not be the exact model name.

You may accomplish BIOS upgrade procedure with EzWinFlash by the following steps, and it's STRONGLY RECOMMENDED to close all the applications before you start the upgrading.

1. Download the new version of BIOS package zip file from AOpen official web site. (ex: <http://english.aopen.com.tw/>)
2. Unzip the download BIOS package (ex: WMK86L102.ZIP) with WinZip (<http://www.winzip.com>) in Windows environment.
3. Save the unzipped files into a folder, for example, WMK86L102.EXE & WMK86L102.BIN.
4. Double click on the WMK86L102.EXE, EzWinFlash will detect the model name and BIOS version of your motherboard. If you had got the wrong BIOS, you will not be allowed to proceed with the flash steps.
5. You may select preferred language in the main menu, then click [Start Flash] to start the BIOS upgrade procedure.
6. EzWinFlash will complete all the process automatically, and a dialogue box will pop up to ask you to restart Windows. You may click [YES] to reboot Windows.
7. Press <Del> at POST to enter BIOS setup, choose "Load Setup Defaults", then "Save & Exit Setup". Done!

**It is strongly recommended NOT to turn off the power or run any application during FLASH PROCESS.**



**Warning:** The new BIOS upgrade will permanently replace your original BIOS's settings when flashing. You may need to reconfigure your BIOS setting so that your system can go back to work as normal.

## Open JukeBox Player



Here we are pleased to provide you a brand-new powerful interface—Open JukeBox. Without any cost you can have your PC turn into a fashionable CD player! This latest Open JukeBox motherboard aims at helping you directly operate your CD player on the PC without any hassle of entering Windows operation system.





## How Your Open JukeBox Works

The operation of Open JukeBox Player is the same as other CD players. By pressing specific keys on the keyboard you will find playing Open JukeBox Player couldn't be easier than the traditional CD Players. Below is the function description of respective buttons.

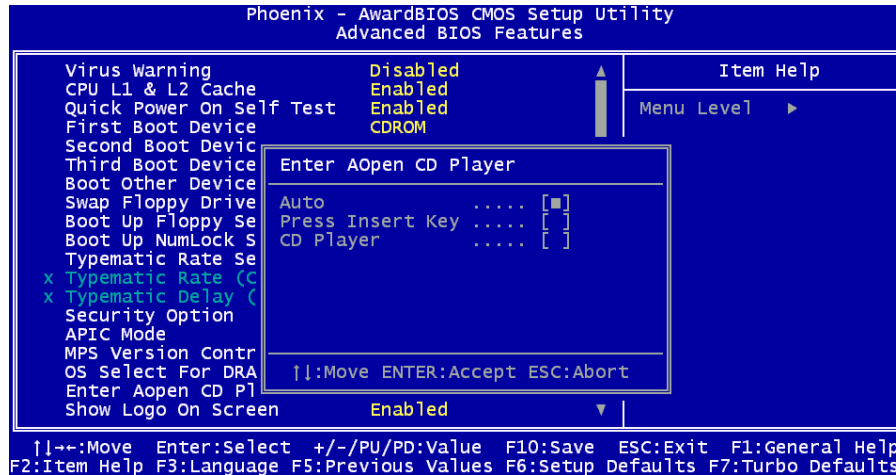


- Power:** Pressing **O**, to directly power off your computer with no hassle of entering Windows Operation System.
- Boot:** Pressing **B**, to intelligently boot to Windows Operation System for you.
- Play:** Pressing **A**, to start playing CD music.
- Stop:** Pressing **S**, to stop the music playing.
- Pause:** Pressing **P**, to pause the music playing temporarily.
- Eject:** Pressing **E**, to eject CD tray for you to change CD disc.
- Repeat:** Like other CD Players, pressing **R**, to shift the repeat mode.
- Volume +/-:** Pressing **+** or **-** to adjust the volume of playing music.
- Rewind/Forward** **← / →**: Pressing **arrow keys**, to rewind or forward the music.

**Note:** Though some of the latest version of Windows support "Digital Audio" through IDE bus. However, in order to use Open Jukebox player, which is driven under BIOS, it is a **MUST** to insert audio cable to CD-IN connector on the motherboard.

## Your Open JukeBox Settings in BIOS

There are three Open JukeBox settings in BIOS as follows.



**Auto:** The default setting is “Auto” with which the Open JukeBox will automatically check the CD player every time you power on. The Open JukeBox will automatically be launched when it detects a music CD in your CD player.

**Press Insert Key:** Choosing this setting will allow a reminder message popped up on the screen during BIOS POST. It reminds you of pressing “Ins” key on your keyboard to start Open JukeBox Player; otherwise the system will launch the Windows Operation System.

**CD Player:** Choosing this setting allows the system to launch Open JukeBox Player every time you power on. However, by pressing **B** on your keyboard the Windows Operation System will be launched.

## Your Open JukeBox EzSkin



Except these powerful functions above, Open JukeBox Player is also equipped with another fancy feature for you to change its “skin”. You can download as many skins as you want from AOpen Website, and changing them whenever you want by using this useful utility – **EzSkin** – which may also be downloaded from our website.

Even more, you may design your own skins with innovative idea and sharing them to users around the world by uploading to our website. For further technical information, we welcome you to visit our website at <http://english.aopen.com.tw/tech/download/skin>



## Vivid BIOS technology




Have you been fed up with the conservative and immutable POST screen? Let's rule out the tradition idea that POST screen are stiff and frigid, and let AOpen show you the newly developed VividBIOS to experience the lively vivid colorful POST screen!

Unlike earlier graphic POST screen which could occupy the whole screen and mask text information during POST, AOpen VividBIOS deals with graphics and texts separately, and makes them running simultaneously during POST. With this innovative design, VividBios now brings you a beautiful and sleek 256 colors screen without missing any important information shown on POST screen.

In addition, the limited space of BIOS ROM is another big issue. When all of the traditional BIOS can only show space-consuming and uncompressed Bitmap, AOpen has considerably tuned the BIOS to next generation, to recognize the smaller-sized GIF format and even dynamic-showing GIF animation.



Vivid BIOS shares the same fundamental technology with Open JukeBox CD Player, you may use the same EzSkin utility to

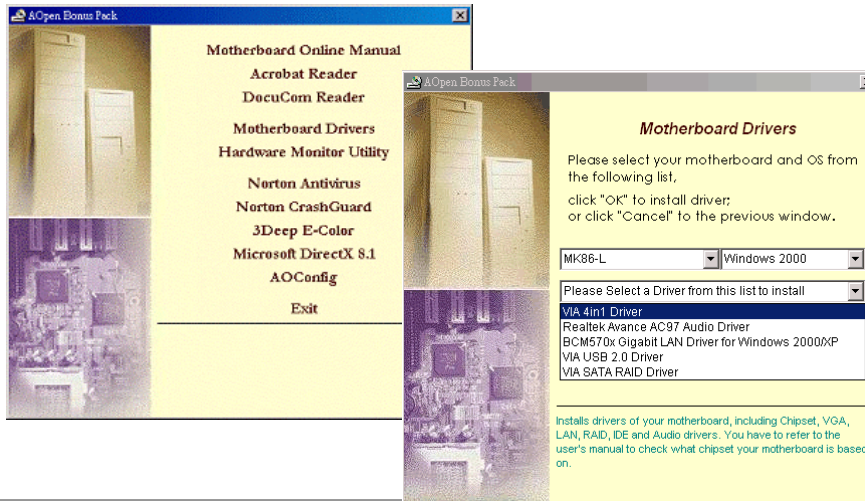
change your Vivid BIOS screen or to download your favorite Open JukeBox skin. If you see this little logo  shown beside your model name on the BIOS download page, <http://english.aopen.com.tw/tech/download/skin>, it is assured that your motherboard supports this innovative feature!

# Driver and Utility

There are motherboard drivers and utilities included in AOpen Bonus CD. You don't need to install all of them in order to boot your system. But after you finish the hardware installation, you have to install your operation system first (such as Windows XP) before you can install any drivers or utilities. Please refer to your operation system's installation guide.

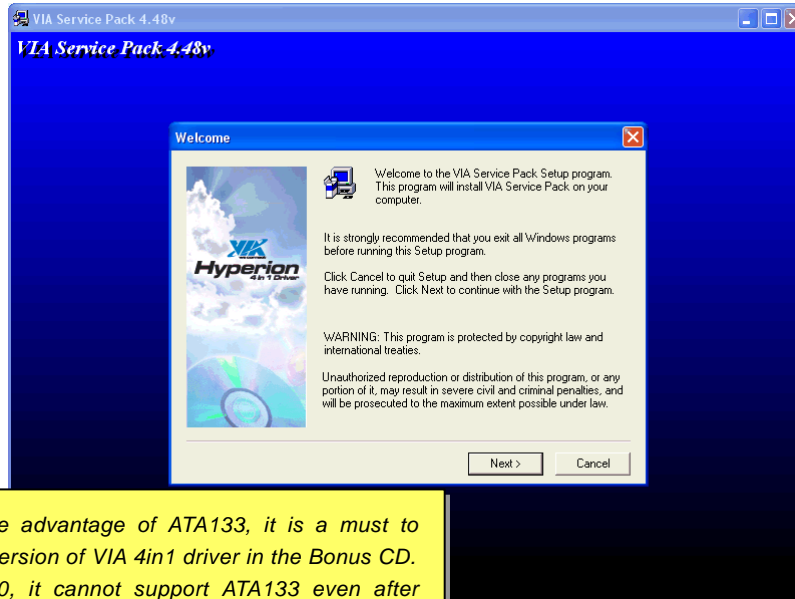
## Auto-run Menu from Bonus CD

You can use the auto-run menu of Bonus CD. Choose the utility and driver and select model name.



## Installing VIA 4 in 1 Driver

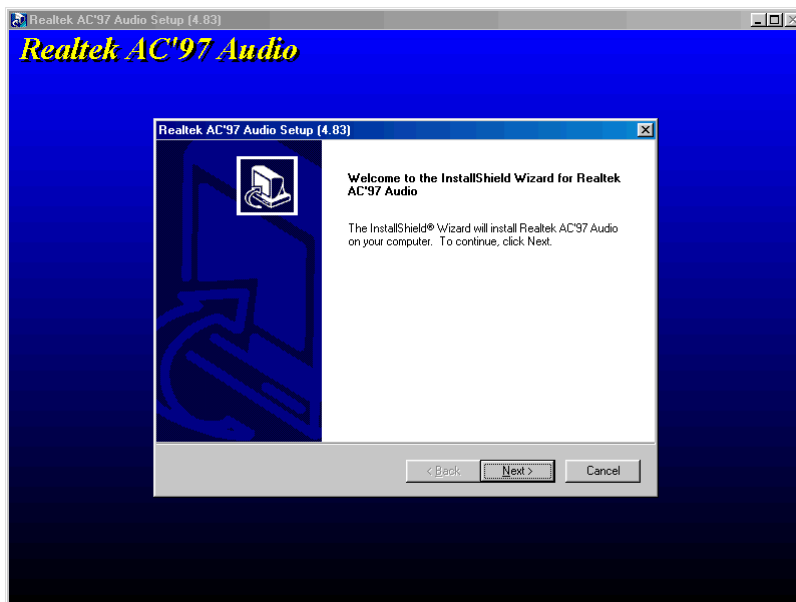
You can install the VIA 4 in 1 driver (IDE Bus master (For Windows NT use), VIA ATAPI Vendor Support Driver, VIA AGP, IRQ Routing Driver (For Windows 98 use), VIA Registry (INF) Driver) from the Bonus Pack CD auto-run menu.



**Warning:** To take advantage of ATA133, it is a must to install the latest version of VIA 4in1 driver in the Bonus CD. For Windows2000, it cannot support ATA133 even after installing the latest version of VIA 4-in-1 driver until the new release of Service-Pack 3 from Microsoft.

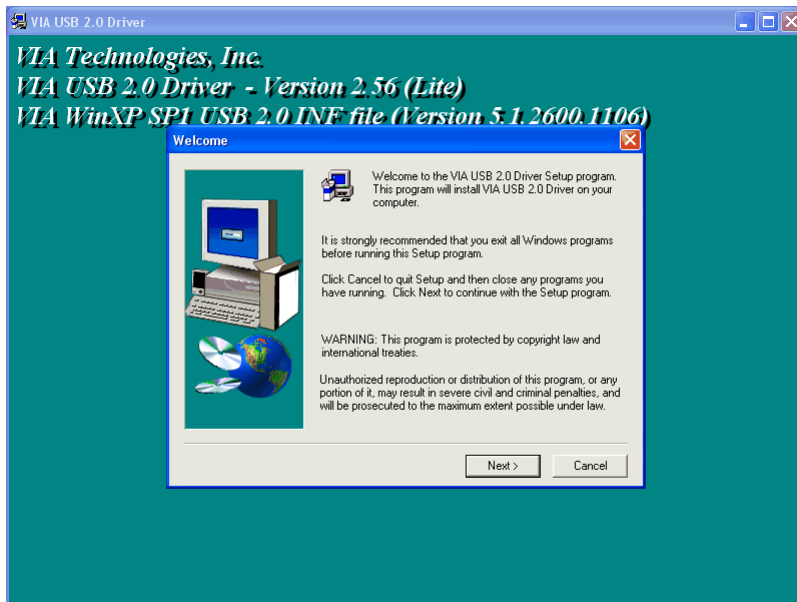
## Installing Audio Driver

This motherboard comes with RealTek ALC655 [AC97 CODEC](#) and the sound controller is in VIA South Bridge chipset. You can find the audio driver from the Bonus Pack CD auto-run menu.



## Installing USB2.0 Driver

This motherboard comes with USB2.0 function. You can install USB2.0 Driver under Windows 98SE, Windows ME, Windows 2000 and Windows XP from the Bonus Pack CD auto-run menu.



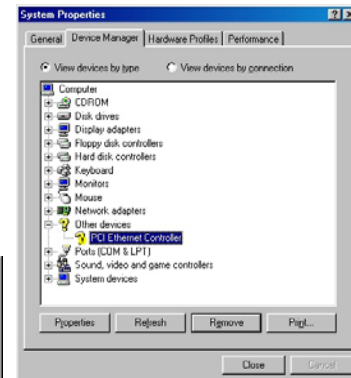
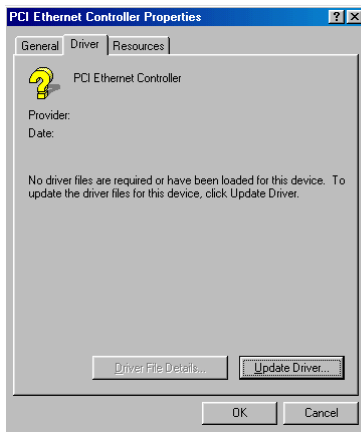


## Installing LAN Driver (for MK86-L)

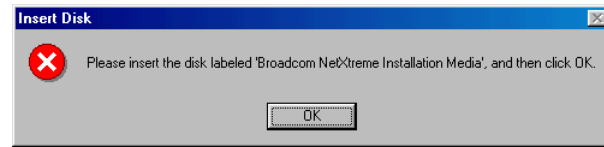
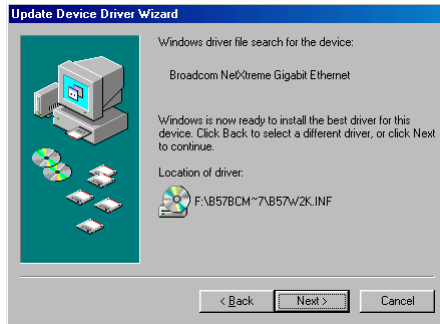
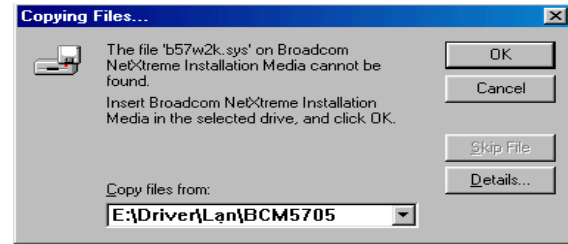
This motherboard comes with BCM5705 controller on board, which is a highly-integrated Platform LAN connect device providing 10/100/1000 Mbps Ethernet for office and home use.

### Windows 98 / ME installation guide

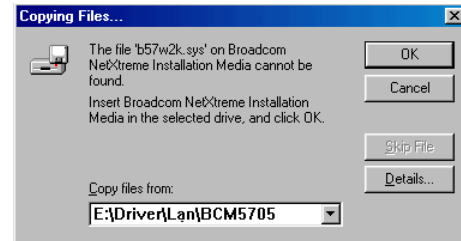
1. Open the Device Manager and check if there is a "PCI Ethernet Controller" in "Other devices".
2. Insert the supplied "Bonus CD". Click "PCI Ethernet Controller" -> "Driver" -> "Update Driver" and Select "Install the software automatically (Recommended)" And then Click "Next".



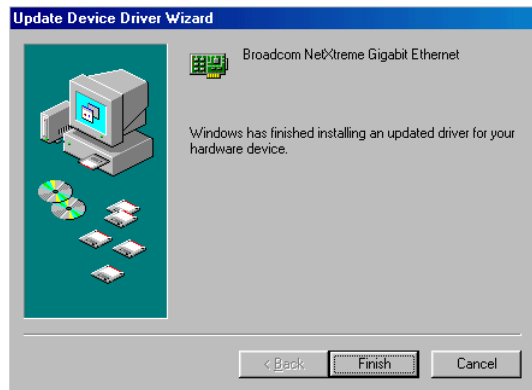
- When prompted, insert the media to be searched into your CD-ROM drive, type the path to the driver, and select OK.  
Example: e:\Driver\Lan\BCM5705\Win98MENT (Where "e:\Driver\Lan\BCM5705\Win98MENT" is the designation of the driver on your system).
- In the Driver Files Search Results window, verify the correct path to the driver software is shown, and then click Next. The OS will request you to insert the Bonus CD into CD-ROM Drive



- Type the path of the BroadCom Ethernet driver and select "OK".  
Example: e:\Driver\Lan\BCM5705\Win98MENT (Where "e:\Driver\Lan\BCM5705\Win98MENT" is the designation of the "b57w2k.sys" on your Bonus CD.)

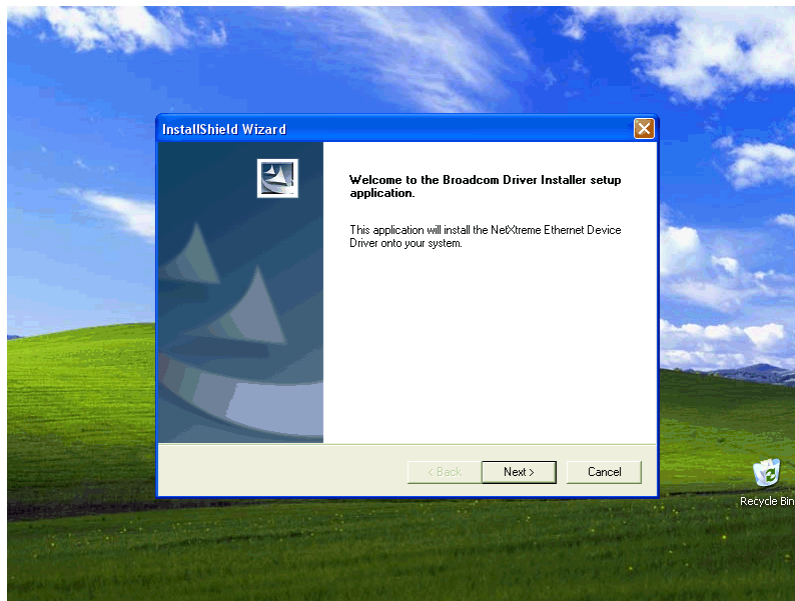


6. BroadCom Ethernet driver installation is finished.



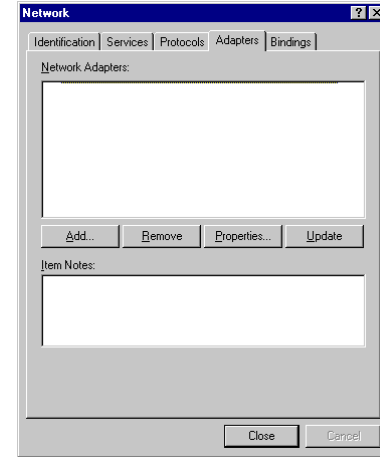
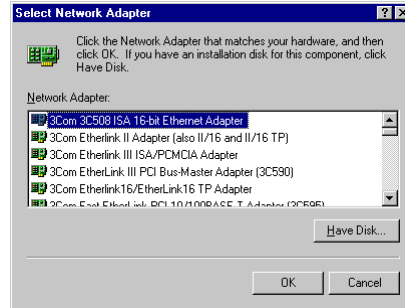
**Windows 2000 / XP installation guide**

For Windows 2000 / XP users, you can install the LAN driver form the Bonus Pack CD auto-run menu.

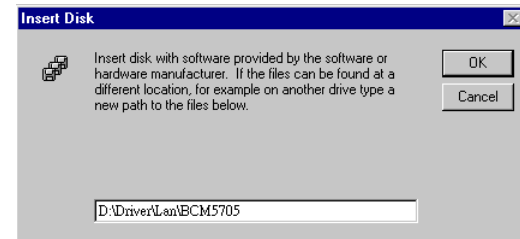


## Windows NT installation guide

1. Please make sure your Windows NT system is upgraded with Service Pack 4 or later.
2. Start your Windows NT system and log in. You must have System Administrator privileges to install the driver software.
3. Open the Control Panel. In the Control Panel, double-click the Network icon. When Network window opens, select **Adapters** tab.
4. Click "Add" to install a new adapter. All previously installed drivers will be listed under Network Adapters.

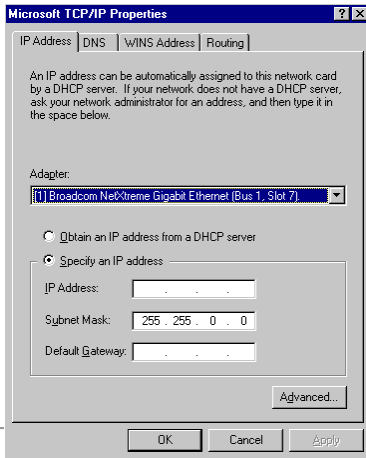
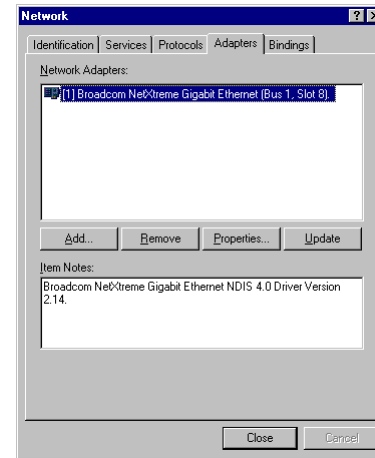
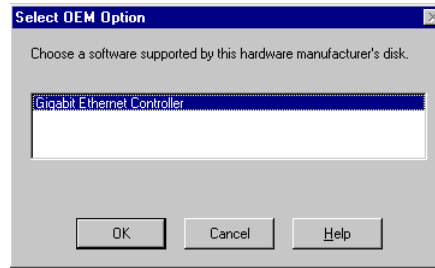


5. When the Select Network Adapter window opens, click "**Have Disk**". When prompted, insert the driver installation media, or choose a location to install the driver from. Type the path to the driver, and click "**OK**". For example, to install the adapter driver software for Windows NT, type **D:\Driver\Lan\BCM5705\Win98MENT** in the Insert Disk location box



(where "d:\Driver\Lan\BCM5705\Win98MENT" is the designation of the Lan driver on Bonus CD).

- With "Gigabit Ethernet Controller" highlighted in the Select OEM Option window, click "OK". When the adapter files are installed, the Network window will display newly installed adapter.



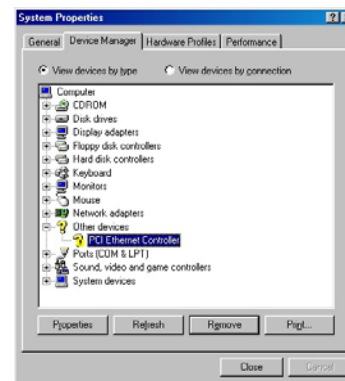
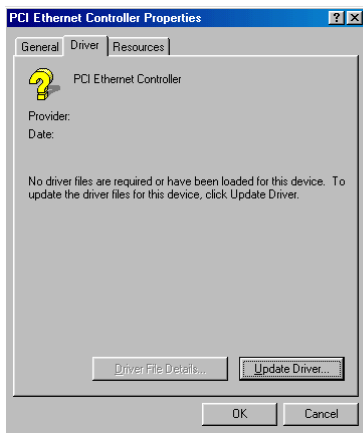
- Click "Close", then the Microsoft TCP/IP Properties window appears. Configure the TCP/IP protocol and click "OK". When prompted to restart your computer, click "Yes".

## Installing LAN Driver (for MK86-N and MK86-1394)

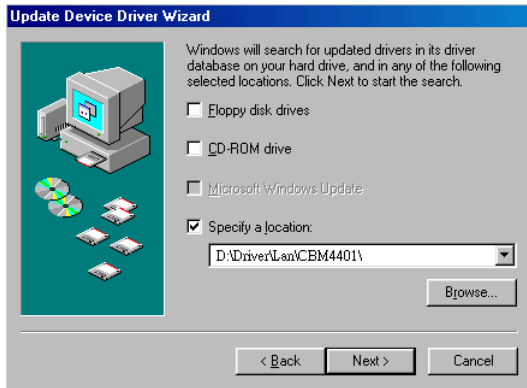
This motherboard comes with BCM4401 controller on board, which is a highly integrated Platform LAN connecting device providing 10/100 Mbps Ethernet for office and home use.

### Windows 98 / ME installation guide

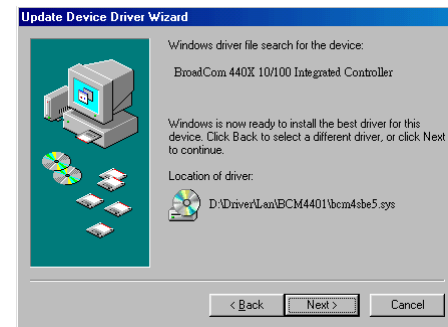
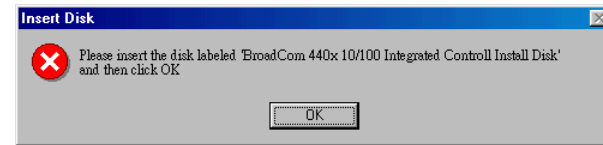
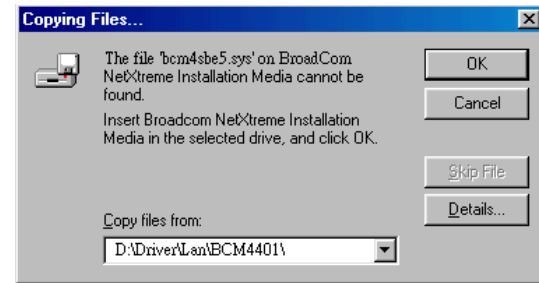
1. Open the Device Manager and check if there is a "PCI Ethernet Controller" in "Other devices".
2. Insert the supplied "Bonus CD". Click "PCI Ethernet Controller" -> "Driver" -> "Update Driver" and Select "Install the software automatically (Recommended)" And then Click "Next".



- When prompted, insert the media to be searched into your CD-ROM drive, type the path to the driver, and select OK. Example: e:\Driver\Lan\BCM4401\Win98MENT (Where "e:\Driver\Lan\BCM4401\Win98MENT" is the designation of the driver on your system).
- In the Driver Files Search Results window, verify the correct path to the driver software is shown, and then click Next. The OS will request you to insert the Bonus CD into CD-ROM Drive

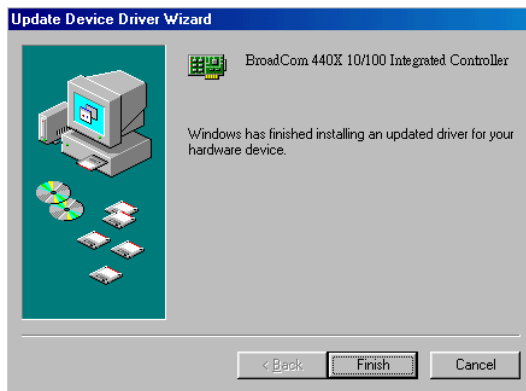


- Type the path of the BroadCom Ethernet driver and select "OK". Example: e:\Driver\Lan\BCM4401\Win98MENT (Where "e:\Driver\Lan\BCM4401\Win98MENT" is the designation of the "bcm4sbe5.sys" on your Bonus CD.)



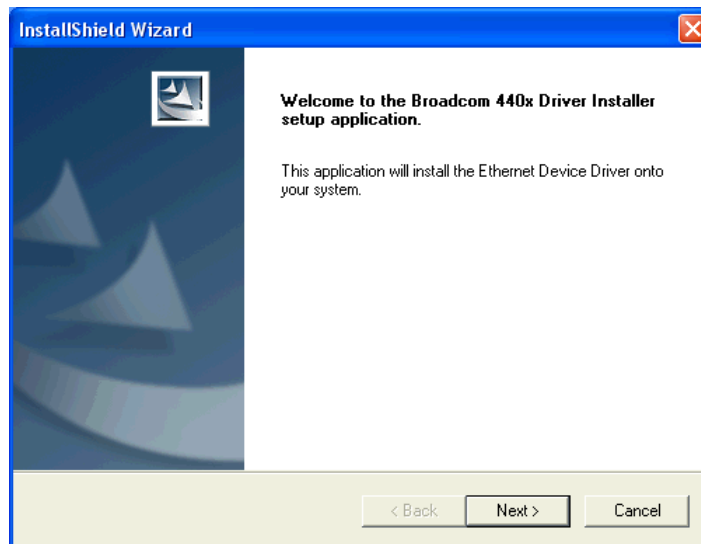


6. BroadCom Ethernet driver installation is finished.



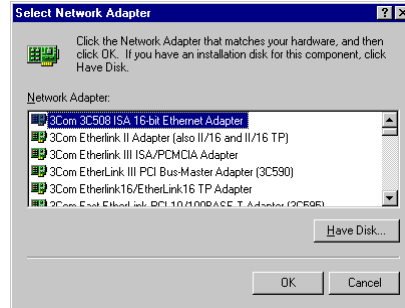
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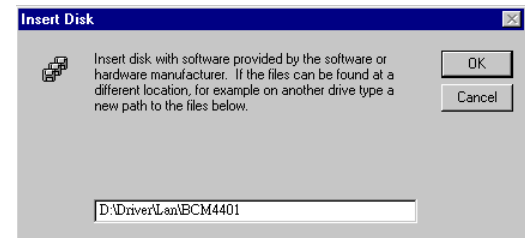
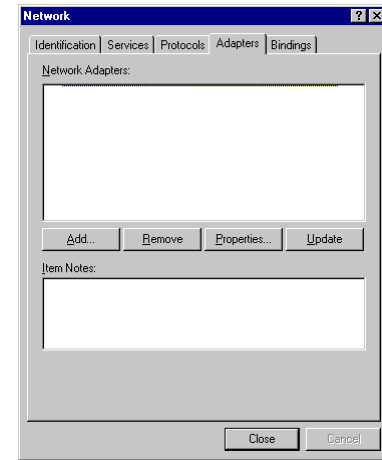
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4. Click "Add" to install a new adapter. All previously installed drivers will be listed under Network Adapters.

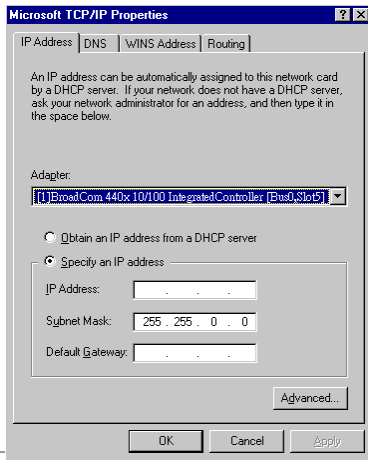
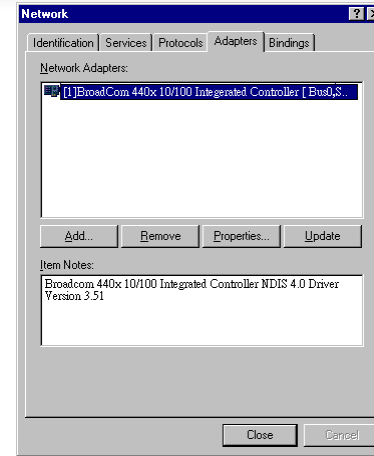
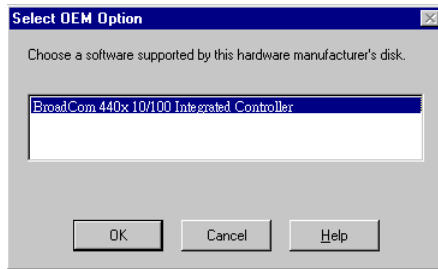


5. When the Select Network Adapter window opens, click "**Have Disk**". When prompted, insert the driver installation media, or choose a location to install the driver from. Type the path to the driver, and click "**OK**".

For example, to install the adapter driver software for Windows NT, type **D:\Driver\Lan\BCM4401\Win98MENT** in the Insert Disk location box (where "d:\Driver\Lan\BCM4401\Win98MENT" is the designation of the Lan driver on Bonus CD).



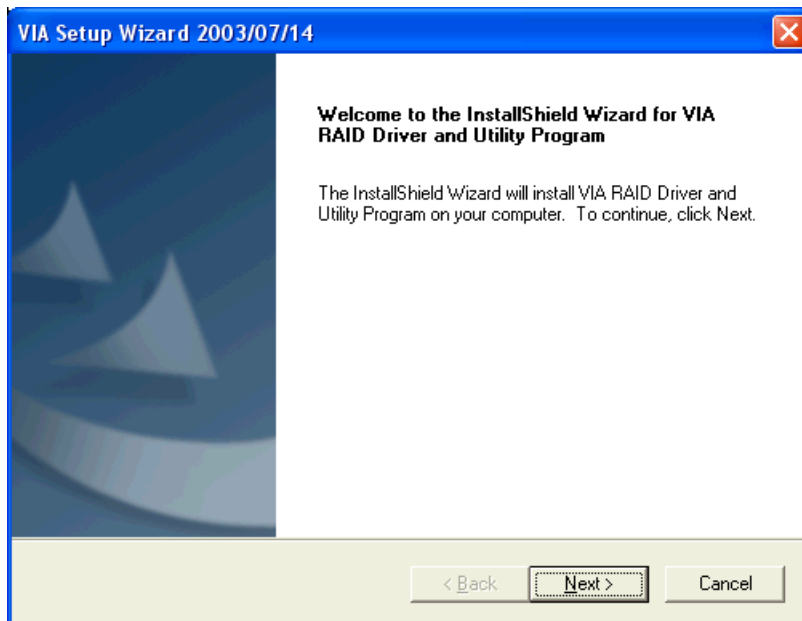
6. With "Gigabit Ethernet Controller" highlighted in the Select OEM Option window, click "OK". When the adapter files are installed, the Network window will display newly installed adapter.



7. Click "Close", then the Microsoft TCP/IP Properties window appears. Configure the TCP/IP protocol and click "OK". When prompted to restart your computer, click "Yes".

## Installing VIA Serial ATA RAID Driver

This Motherboard has two SATA ports, which is provided by the south bridge VIA VT8237. The two ports support RAID 0 and RAID 1. You can install the SATA RAID driver from the Bonus Pack CD auto-run menu.



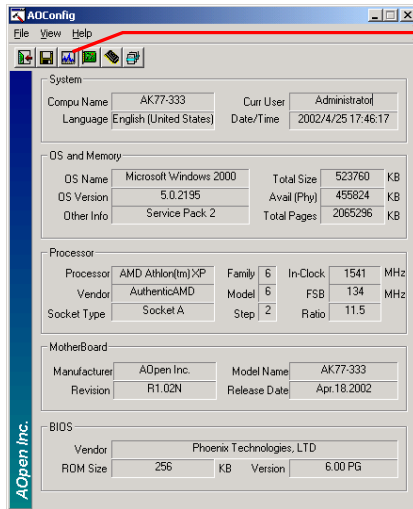


## AOConfig Utility



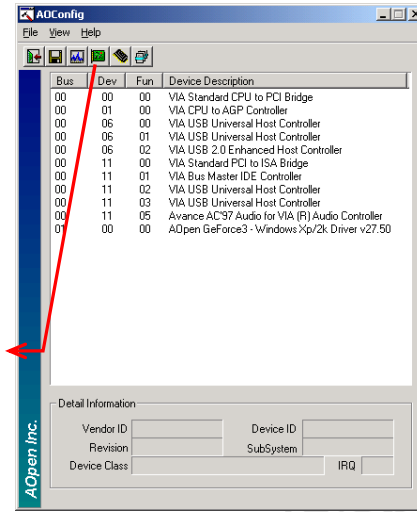
AOpen always dedicated to provide users a much friendlier computer environment. We now bring you a comprehensive system detective utility. AOconfig is a Windows based utility with user-friendly interface that allows users to obtain information of the operation system and hardware such as motherboard, CPU, memory, PCI devices and IDE devices. The powerful utility also displays the version of BIOS and firmware for your convenience of maintenance.

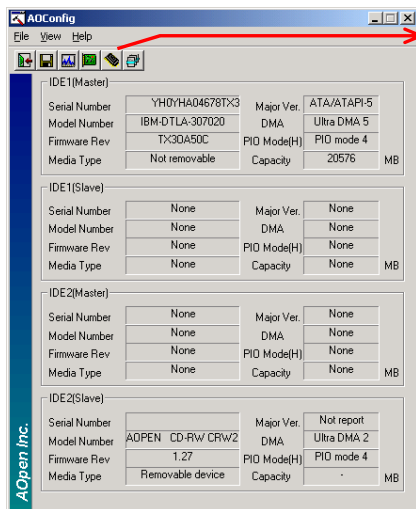
Moreover, AOconfig allows users to save information in \*.BMP or \*.TXT format which users may collect the system information in detail and send them to AOpen directly for technical support or further diagnosis of system problem.



1. The system page shows the detail information of the motherboard, the operating system, the processor, and BIOS version.

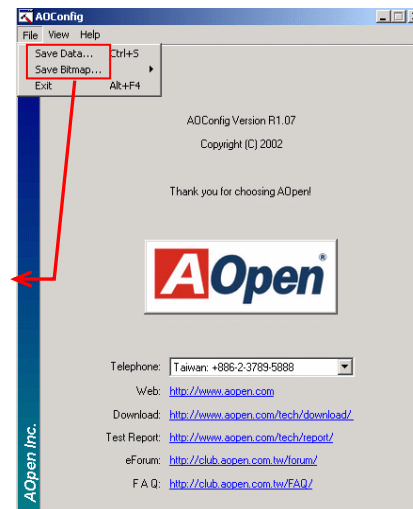
2. The PCI device page shows the configurations of all PCI devices installed on your motherboard.





3. This page presents the IDE devices information, such as the serial number, the manufacturer, the firmware version, and capacity.

4. From this page, users may obtain the technical support information of AOpen. Moreover, detailed information could be saved in .bmp or .txt format.



**NOTE:** AOconfig can be used in Windows 98SE/ME, NT4.0/2000, or even the latest Windows XP. Please be informed that AOconfig can only be operated in a system equipped with an AOpen motherboard. Meanwhile, all applications must be closed before starting AOconfig.

## The noise is gone!! ---- SilentTek



As the clock of CPU keeps rocketing higher and higher, it inevitably brings higher heat and system temperature in a relative way. The way we deal with this heat problem, however, is to spare no effort to add one fan after another to protect our pampered system, expecting these fans could cool down our machine as much as it could.

But at the same time, we believe that same amount of users are affected terribly while working with their PC by the irritating noises of these fans. As a matter of fact, we do not have to get our fans running at such a high speed in most cases; on the contrary, we discovered that having your fans running at appropriate time and speed could not only reduce the noise, but also

consume the least power the system needed, so as to prevent over-wasting of energy resource.

Today, AOpen Motherboard is honored to bring you a new overall solution, SilentTek, to have your system quiet. To collocate with hardware circuit, BIOS and the utility under Windows, SilentTek combined "Hardware-Status Monitoring", "Overheat Warning" and "Fan Speed Control" with user-friendly interfaces to provide you a perfect balance between noises, system performance and stability.

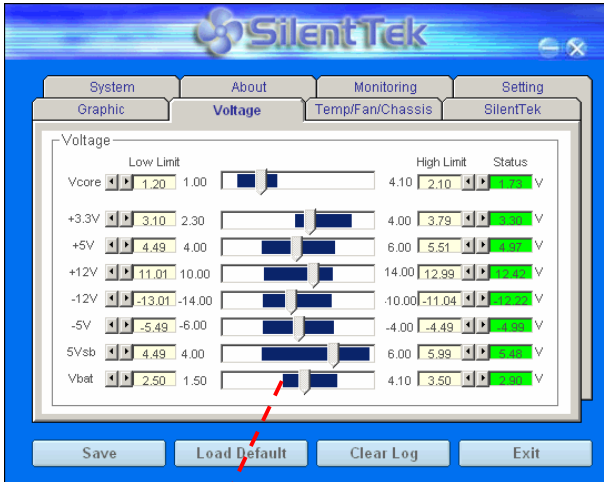
Phoenix - AwardBIOS CMOS Setup Utility  
Silent PC/PC Health Status

CPU Warning Temp.	60° C/140° F		Item Help
CPUFan1 Boot Speed	70% 3150 RPM		Menu Level ▶
SYSFan2 Boot Speed	70% 3500 RPM		
CPUFan1 OS Speed	100% 4500 RPM		
SYSFan2 OS Speed	100% 5000 RPM		
Fan Mode	Smart Control		This is fan control mode during POST and Open Jukebox, after exiting the Jukebox, the fan will be set to Fan OS Speed.
x CPUFan1 Fixed Speed	100% 4500 RPM		[Full Speed]
x SYSFan2 Fixed Speed	100% 5000 RPM		Run in full speed.
CPU Set Temp.	40° C		[Smart Control]
SYS Set Temp.	30° C		According to the safety temperature you set below, fan speed will be controlled as slow as possible.
CPU Kernel Temp.	69° C/156° F		
CPU Temp.	47° C/116° F		
SYS Temp.	31° C/107° F		
CPUFAN1 Speed	4500 RPM		
SYSFAN2 Speed	5000 RPM		
SYSFAN3 Speed	5532 RPM		
Vcore(V)	1.48 V		

↑↓←→:Move Enter:Select +/-/PU/PD:Value F10:Save ESC:Exit F1:General Help  
F2:Item Help F5:Previous Values F6:Setup Defaults F7:Turbo Defaults

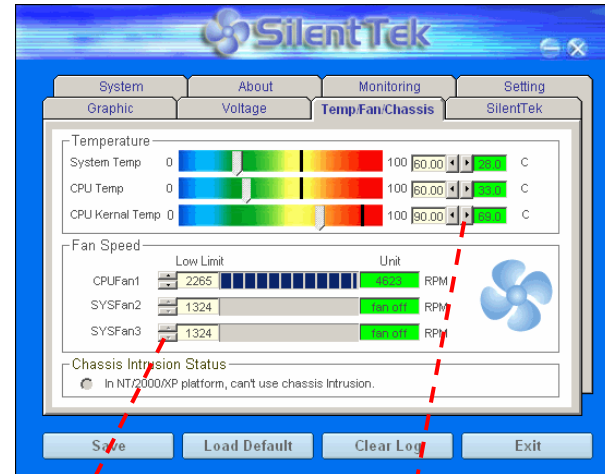


The first image you have here is the Voltage Status page. You can find current status of all voltages and set your expected margins of warning level.



You may check your system voltage from the indicating bar here.

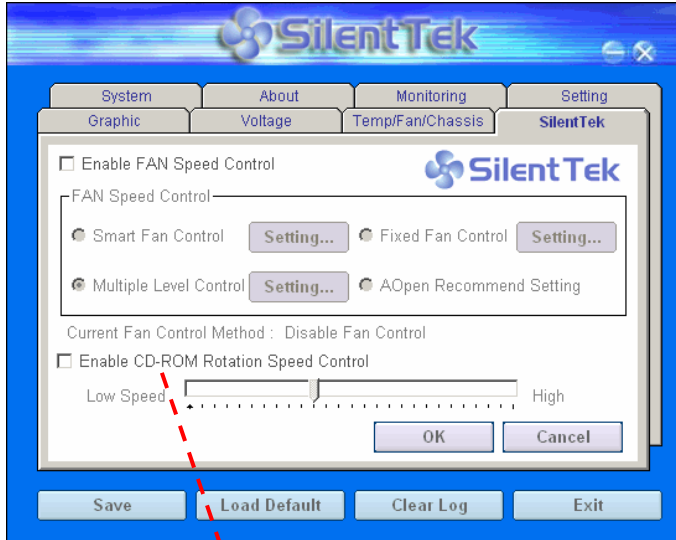
In "Temp/Fan/Case" page, you may get aware of the current temperature of CPU and the heat inside chassis, plus checking if fans are running properly.



Of course, you may set your defaulted lowest margin for your fans and the SilentTek would also pop up a message box and alarm you when the fan is rotating slower than this specified speed.

You may set the highest margin of your CPU and system temperature as default, and SilentTek would pop up a message box and alert you with alarm when the temperature goes beyond the specified margin.

The following page is surely the most important part of this utility. You may control the rotation speed of specific fans that you have got the options inside in this page.



**CD-ROM Rotation Speed Control:** by enabling the CD-ROM Rotation Speed Control, you can adjust the rotation speed of your CD-ROM. When you set the speed to high level, the CD-ROM will work at its fastest speed and it will run at basic required speed while you set the value to low speed.

1. **Smart FAN Control:** This is the default setting of SilentTek and can be used for any branded computer housing. With a special algorithm developed by AOpen, the fan speed is automatically adjusted by the factors of CPU and ambient temperature. Ease-of-use and trouble free at your service.
2. **Fixed FAN Control:** Under this setting, a desired fan speed is set fixed when operating.
3. **Multiple Level Control:** This is the most versatile setting that allows you to set fan speed in relation to temperature. You may find that this setting fits you best.
4. **AOpen Recommend Setting:** This setting is designed specifically for AOpen housing. A series of lab tests were conducted under the real world scenario to determine optimum fan speed to reduce noise level within CPU working condition and temperature. Most of the time, the fan would remain still when CPU is not fully utilized.

**Note:** Due to hundreds different brands of fan on the market, inaccuracy may happen in some cases when you had your rotation speed adjusted. It is still under the criterion and please rest assured that it won't cause any problem to your system.



## EzClock



Have you ever thought how great it would be if you can adjust the frequency setting on your motherboard under Windows environment and be a real master of your system? Everybody knows that the ratio and frequency setting are key factors to influence the system

performance, however, it's absolutely not an easy task for an amateur to adjust the setting value. On most traditional motherboards, you have to get into BIOS screen for the frequency and reboot the system again and again. But from now on, you don't have to surfer the boring stuffs anymore.

With brand-new and user-friendly EzClock that AOpen specially designs for his users, you can adjust those important values as you please and think of suitable. This tailor-made EzClock allows you to set the voltage and frequency of CPU, VGA, PCI and memory under Windows environment as well as in BIOS setting page; even better, those settings will be displayed realtime. Having this handy EzClock, you can monitor the system when you're fine-tuning the performance of your system. It provides you detailed and necessary information. Now let's take a look how it works on utility, BIOS and POST.



AOpen

## How You Adjust the Settings in EzClock Utility

In EzClock utility, you can adjust CPU Front Side Bus (FSB), the voltage and frequency of VGA, AGP, PCI and DRAM. Besides, the CPU related information such as CPU voltage, temperature and CPUFAN rotation speed will also be displayed on this utility.

### CPU Color Bars:

The color bar will light on and show different colors as values change. On default values, it will show green.



On the left circle area shows Ratio, FSB and frequency information about CPU. When the values are set to factory default, the light on the top and bottom of the circle will show green and it will vary as you change these CPU settings.

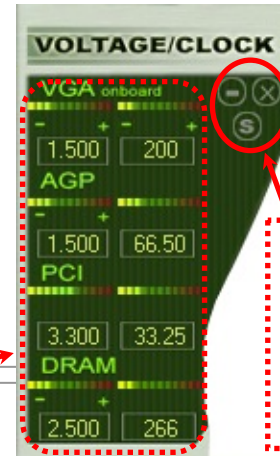
### CPU Ratio, FSB and frequency displaying area:

You can adjust CPU FSB here by entering preferred value.

On the right part of the panel is the section that you adjust the settings of VGA, AGP, PCI and memory. To adjust the voltage and clock frequency of those installments, you can press “-” or “+” on corresponding items. The color parts represent the situation of values. The higher value you set, the light on the color bar goes to right and turns red. After finishing those value settings, you can press “S” button on the upper right hand corner to save changes to CMOS.

### VGA, AGP, PCI and DRAM Voltage / Clock Area:

Pressing “-” and “+” buttons, you can adjust the voltage and clock frequency values of onboard VGA, AGP, PCI and DRAM.



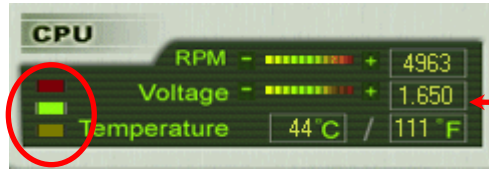
### Control buttons:

“-” button allows you to minimize the utility and “X” button to close the utility. Pressing “S” button you can save the changes to CMOS.

On the bottom rectangular panel represents CPU fan speed, CPU voltage and CPU temperature. The three color bars on the right hand side will light on according to operation temperature. Please refer to the picture shown above.

**CPU Color Bars:**

The color bars will light on according to CPU operation temperature.

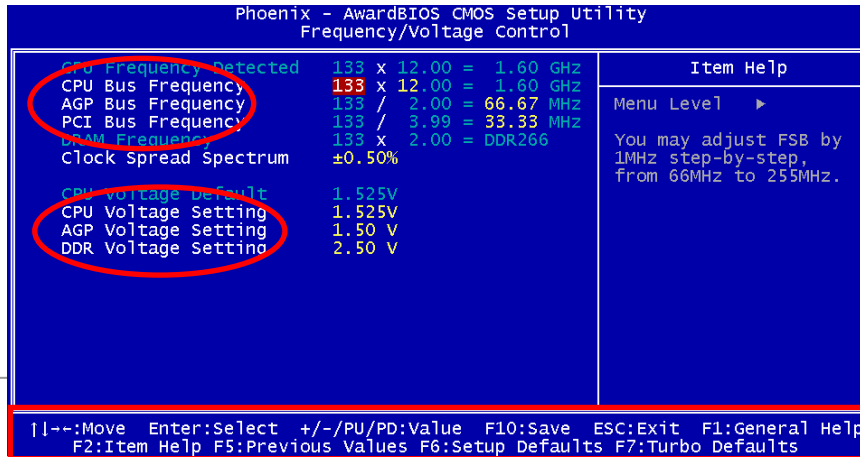


**CPU Fan, Voltage and Temperature:**

representing CPU fan speed, CPU voltage and CPU temperature in Celsius and Fahrenheit degrees.

**How You Adjust the Settings in BIOS**

Apart from EzClock utility, the voltage and frequency values of CPU, PCI and memory can also be adjusted on BIOS page. By pressing "+", "-", "PgUp" or "PgDn" keys, you can adjust the frequency values of CPU Bus, PCI Bus and DRAM.



Also, the same keys help you adjust the voltage of CPU and DDR settings. Some values may change while you adjust the settings. You can press "F10" to save the changes you've made.

Function Keys  
Description



## How Your Boot Screen Looks Like

After you finish setting BIOS, these setting values will be displayed on the boot screen like the shown picture here.

Every time you boot your system, both default and current settings will pop up on the screen. Your personal settings that had been adjusted earlier will be highlighted; thus, you can have clear idea how your system functions and monitor your system more easily.

Current values  
of your system

**NOTE:** Due to BIOS versions are updated in an extremely fast speed, it's strongly recommended to download the latest version of EzClock from our website for best compatibility.

```

Phoenix-Award BIOS v6.00PG, An Energy Star Ally
Copyright (C) 2002, Phoenix Technologies, LTD

Jan.13.2003 AOpen Inc.

Main Processor : Intel Pentium(R) 4 1.60GHz(133x12.0)
Memory Testing : 262144K OK
CPU Brand Name : Intel(R) Pentium(R) 4 CPU 2.93GHz

```

	Default	Current	Default	Current
CPU	1.525V	1.525V	133MHz	333MHz
DRAM	2.50 V	2.50 V	266MHz	266MHz
AGP	1.50 V	1.50 V	66.67MHz	66.67MHz
PCI	3.30 V	3.30 V	33.33MHz	33.33MHz

```

Primary Master : IDE0209UR07-0 ER20A40
Primary Slave : None
Secondary Master : CD-ROM 52X/AKH A64
Secondary Slave : None

Primary IDE channel no 80 conductor cable installed

AOpen vivid BIOS

Press DEL to enter SETUP, INS to enter Open JukeBox
01/13/2003-i7205-w83627-6A69AB9C-00

```

Default settings of  
this motherboard

The highlighted setting value  
you manually adjust

# Glossary

## **AC97 CODEC**

Basically, AC97 CODEC is the standard structure of PCI sound card. As we know, computer is digital-based, but music is based on analog-based. Therefore, there must be a process to turn digital into analog during the last stage processing of sound in computer. Hence, the component on sound card that play this important task is what we called CODEC.

Audio CODEC 97 (briefly called AC97) is the specification regulated by Intel, and it's about the structure of audio conversion. The special place about CODEC is that it is separated from sound card (CODEC is an independent chipset). Therefore, PCI sound card could possess with 90db and do other application process as well. We called CODEC that meets this structure AC97 CODEC.

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

ACPI is the power management specification of PC97 (1997). It intends to save more power by taking full control of power management to operating system and bypass [BIOS](#). The chipset or super I/O chip needs to provide standard register interface to operating system (such as Windows 98). This is a bit similar as the [PnP](#) register interface. ACPI defines ATX momentary soft power switch to control the power state transition.

## **ACR (Advanced Communication Riser)**

Building on the PC motherboard riser architecture, ACR slot is backward compatible with AMR but beyond the limitation of it. The ACR specification is designed to support modem, audio, Local Area Network (LAN) and Digital Subscriber Line (DSL).

**AGP (Accelerated Graphic Port)**

The main function of AGP simply put is to tell monitor what screen information had to be shown, a visual transmission device actually. With the rapid developing of AGP card, we can see that it had been developed from single colorful AGP card to 2D and 3D graphic. AGP supports only memory read/write operation and single-master single-slave one-to-one only. Though AGP and PCI share the same algorithm of 32-bit, its frequencies are 66MHz and 33MHz respectively. AGP interface had been developed from 2X to 8x.

**1X AGP**, data transfer rate is  $66\text{MHz} \times 4\text{byte} \times 1 = 264\text{MB/s}$

**2X AGP**, data transfer rate is  $66\text{MHz} \times 4\text{byte} \times 2 = 528\text{MB/s}$

**4X AGP**, data transfer rate is  $66\text{MHz} \times 4\text{byte} \times 4 = 1056\text{MB/s}$ .

**8X AGP**, data transfer rate is  $66\text{MHz} \times 4\text{byte} \times 8 = 2112\text{MB/s}$ .

**AMR (Audio/Modem Riser)**

The CODEC circuit of AC97 sound/modem solution can be put on motherboard or put on a riser card (AMR card) that connects to motherboard through AMR connector.

**ATA (AT Attachment)**

Before talking about ATA (AT Attachment), we must understand **DMA** (Direct Memory Access), which allows devices to skip the CPU devices and access memory directly. DMA specification could not only eliminate the workload of CPU, but also accelerate the transmission of data. DMA begins with a data transfer rate of 16.6MB/Sec, but afterward developed to new data rate of 33.3MB/Sec, which is twice the data rate and we called it **Ultra DMA**. **ATA** details power and data signals between the drive



and integrated drive controller and the computer's motherboard. Two drives (master and slave) are supported. The ATA specification allows the drive to connect directly to the ISA bus on the computer. ATA transfer rate then had been developed to 133MHz/Sec and would come out with fastest rate later (please refer to [Serial ATA](#)).

**DMA**, data transfer rate is 16.6MHz/s.

**Ultra DMA**, data transfer rate is  $16.6\text{MHz} \times 2 = 33\text{MB/s}$ .

**ATA/66**, data transfer rate is  $16.6\text{MHz} \times 4 = 66\text{MB/s}$ .

**ATA/100**, data transfer rate is  $16.6\text{MHz} \times 6 = 100\text{MB/s}$ .

**ATA/133**, data transfer rate is  $16.6\text{MHz} \times 8 = 133\text{MB/s}$ .

(ATA/133 uses both rising edge and falling edge as ATA/66 but clock cycle time is reduced to 30ns.)

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

BIOS, is a set of assembly routine/program that reside in [EPROM](#) or Flash ROM. BIOS controls Input/output devices and other hardware devices of motherboard. In general, to provide hardware independent portability, operation system and drivers is required to access BIOS without directly access hardware devices.

### **Bluetooth**

Bluetooth is a wireless transferring technology that enables short-range wireless connections between desktop and laptop computers, personal digital assistants (PDAs), cellular phones, printers, scanners, digital cameras and even home appliances. The principle of Bluetooth (a chipset) is to transfer information and voices at the frequency of ISM Band. Every Bluetooth technology devices do come with a standard address for you to connect one-to-one or one-to-seven (to form a Pico-net), with transferring range up to 10 meters (100 meters to follow), using low power radio. Bluetooth do not only possess

high transfer rate of 1MB/s, it also could be encrypted with pin code. With hopping rate of 1600 hops per second, it's difficult to be intercepted and are less interrupted by electromagnetic wave.

### **CNR (Communication and Networking Riser)**

The CNR specification provides the PC industry the opportunity to deliver a flexible and cost reduced method of implementing LAN, home networking, DSL, USB, wireless, audio and modem subsystems widely used in today's "connected PCs". The CNR specification is an open industry specification and is supported by OEMs, IHV card manufacturers, silicon supplier and Microsoft.

### **DDR (Double Data Rate) RAM**

DDR RAM utilizes the existing [SDRAM](#) (For ex, PC-100, PC-133) infrastructure and technology while doubling the nominal bandwidth available to systems in an easy to design and simple to adopt way. Based on FSB frequency, DDR RAM on the market are DDR200, DDR266 and DDR333 with more coming around soon.

**DDR200**, transfer bandwidth up to  $200 \times 64 / 8 = 1600 \text{MB/s}$  (PC1600)

**DDR266**, transfer bandwidth up to  $266 \times 64 / 8 = 2100 \text{MB/s}$  (PC2100)

**DDR333**, transfer bandwidth up to  $333 \times 64 / 8 = 2700 \text{MB/s}$  (PC2700)

**DDR400**, transfer bandwidth up to  $400 \times 64 / 8 = 3200 \text{MB/s}$  (PC3200)

### **ECC (Error Checking and Correction)**

The ECC mode needs 8 ECC bits for 64-bit data. Each time memory is accessed; ECC bits are updated and checked by a special algorithm. The ECC algorithm has the ability to detect double-bit error and automatically correct single-bit error while

parity mode can only detect single-bit error.

**EEPROM (Electronic Erasable Programmable ROM)**

Also known as E<sup>2</sup>PROM. Both EEPROM and [Flash ROM](#) can be re-programmed by electronic signals, but the interface technology is different. Size of EEPROM is much smaller than flash ROM.

**EPROM (Erasable Programmable ROM)**

Traditional motherboard stores BIOS code in EPROM. EPROM can only be erased by ultra-violet (UV) light. If BIOS has to be upgraded, you need to remove EPROM from motherboard, clear by UV light, re-program, and then insert back.

**EV6 Bus**

EV6 Bus is the technology of Alpha processor from Digital Equipment Corporation. EV6 bus uses both rising and falling clock edge to transfer data, similar as DDR RAM or ATA/66 IDE bus.

EV6 Bus Speed = CPU external bus clock x 2.

**200 MHz EV6 bus**, 200MHz = 100 MHz external bus clock x 2

**FCC DoC (Declaration of Conformity)**

The DoC is component certification standard of FCC EMI regulations. This standard allows DIY component (such as motherboard) to apply DoC label separately without a shielding of housing.

***FC-PGA (Flip Chip-Pin Grid Array)***

FC means Flip Chip, FC-PGA is a package of Intel for Pentium III for 0.18 $\mu$ m process CPU, which can be plugged into SKT370 socket.

***FC-PGA2 (Flip Chip-Pin Grid Array)***

After FC-PGA, FC-PGA2 is the package for 0.13 $\mu$ m process CPU developed by Intel, which can be plugged into SKT423/478 socket as well.

***Flash ROM***

Flash ROM can be re-programmed by electronic signals. It is easier for BIOS to upgrade by a flash utility, but it is also easier to be infected by virus. Because of increase of new functions, BIOS size is increased from 64KB to 512KB (4M bit).

***Hyper Threading***

Hyper-Threading technology is an innovative design from Intel that enables multi-threaded software applications to process threads in parallel within each processor resulting in increased utilization of processor execution resources. As a result, an average improvement of ~40% in CPU resource utilization yields higher processing throughput.

***IEEE 1394***

IEEE 1394, which also called Firewire, is a serial data transfer protocol and interconnection system. The main feature of the Firewire that assures its adoption for the digital video and audio (A/V) consumer application is its low cost. Fire wire interface is

capable of supporting various high-end digital A/V applications, such as consumer A/V device control and signal routing, Digital Video (DV) editing, home networking, and more than 32 channels of digital mixing. Gone are those days of expensive video capture cards. Firewire allows for video capture from both newer DV camcorders with Firewire ports and older analog equipment using A/V to Firewire converters.

The advantages of the IEEE1394:

**High data transfer rate** – Start from 400 Mbps, (with 800/1600/3200 Mbps coming soon), which is about 30 times faster than USB 1.1.

**Supports up to 63 devices** (16 - daisy chained) with cable length up to about 4.5 m (14 feet).

**Hot-pluggable** (like USB). No need to turn of your device to connect or disconnect, and you don't need to reboot your PC. Also, it is a plug-and-play bus.

**IEEE1394 is very easy to connect** (Like USB1.1/2/0).

### **Parity Bit**

The parity mode uses 1 parity bit for each byte, normally it is even parity mode, that is, each time the memory data is updated, parity bit will be adjusted to have even count "1" for each byte. When next time, if memory is read with odd number of "1", the parity error is occurred and this is called single bit error detection.

### **PCI (Peripheral Component Interface) Bus**

Developed by Intel, Peripheral Component Interconnect (PCI) is a local bus standard. A bus is a channel used to transfer data to (input) and from (output) a computer and to or from a peripheral device. Most PCs have a PCI bus usually implemented at 32-bits providing a 33 MHz clock speed with a throughput rate of 133 MBps.



**PDF Format**

With PDF file, it is easy to do universal document exchange. Virtually any document may be converted in Portable Document Format (PDF). Contents in PDF documents are exactly the same as the original file, including fonts and graphics, and they can be distributed by e-mail or stored on the World Wide Web, an intranet, a file system, or a CD-ROM for other users to view on any platforms. You may download Acrobat Reader in order to read PDF file from its website ([www.adobe.com](http://www.adobe.com)).

**PnP (Plug and Play)**

Oversimplified, Plug-and-Play automatically tells the software (device drivers) where to find various pieces of hardware (devices) such as modems, network cards, sound cards, etc. Plug-and-Play's task is to match up physical devices with the software (device drivers) that operates them and to establish channels of communication between each physical device and its driver.

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

The BIOS self-test procedure after power-on, sometimes, it is the first or the second screen shown on your monitor during system boot.

**PSB (Processor System Bus) Clock**

PSB Clock means the external bus clock of CPU.

CPU internal clock = CPU PSB Clock x CPU Clock Ratio

**RDRAM (Rambus Dynamic Random Access Memory)**

A DRAM technology developed by Rambus Corporation\*, to achieve high speed of memory through the use of multiple channels in parallel by 16-bits. Basically, RDRAM uses new structure of Multibank, which is quite different from FPM, EDO, SDRAM. Using different memory module as well, RDRAM uses "RIMM" with transfer rate of 600/700/800MHz, providing bandwidth as high to 1.6GB.

**RIMM (Rambus Inline Memory Module)**

184-pin memory module that supports [RDRAM](#) memory technology. A RIMM memory module may contain up to maximum of 16 RDRAM devices.

**SDRAM (Synchronous DRAM)**

SDRAM is one of the DRAM technologies that allow DRAM to use the same clock as the CPU host bus (EDO and FPM are asynchronous and do not have clock signal). It is similar as PDSRAM to use burst mode transfer. SDRAM comes in 64-bit 168-pin DIMM and operates at 3.3V, and have been gradually replaced by DDR RAM.

**SATA (Serial ATA)**

The Serial ATA specification is designed to overcome speed limitations while enabling the storage interface to scale with the growing media rate demands of PC platforms. Serial ATA is to replace parallel [ATA](#) with the compatibility with existing operating systems and drivers, adding performance headroom for years to come. It is developed with data transfer rate of 150 Mbytes/second, and 300M/bs, 600M/bs to come. It reduces voltage and pins count requirements and can be implemented with thin and easy to route cables.

**SMBus (System Management Bus)**

SMBus is also called I<sup>2</sup>C bus. It is a two-wire bus developed for component communication (especially for semiconductor IC). For example, set clock of clock generator for jumper-less motherboard. The data transfer rate of SMBus is only 100Kbit/s, it allows one host to communicate with CPU and many masters and slaves to send/receive message.

**SPD (Serial Presence Detect)**

SPD is a small ROM or [EEPROM](#) device resided on the DIMM or [RIMM](#). SPD stores memory module information such as DRAM timing and chip parameters. SPD can be used by [BIOS](#) to decide best timing for this DIMM or RIMM.

**USB 2.0 (Universal Serial Bus)**

A Universal Serial Bus (USB) is an external bus (an interconnection) standard that supports data transfer rates of 12 Mbps. A single USB port can be used to connect up to 127 peripheral devices, such as mouse, modems and keyboards. Introduced in 1996, USB has completely replaced serial and parallel ports. It also supports plug-and-play installations and hot plugging. Plug-and-play is the ability to add and remove devices to a computer while the computer is running and have the operating system automatically recognize the change. USB 2.0, which supports data transfer rates of 480 Mbps, has been widely used in motherboard these days.

**VCM (Virtual Channel Memory)**

NEC's Virtual Channel Memory (VCM) is a new DRAM core architecture that dramatically improves the memory system's ability to service multimedia requirements. VCM increases memory bus efficiency and performance of any DRAM technology by





providing a set of fast static registers between the memory core and I/O pins. Using VCM technology results in reduced data access latency and reduced power consumption.

**Wireless LAN – 802.11b**

802.11 is a specification developed by IEEE and Wireless LAN technology, which is an interface between a wireless client and a base station or between two wireless clients.

802.11 family includes the following specifications and with more coming:

**802.11** = 1 or 2 Mbps transmission in the 2.4 GHz band, using either frequency hopping spread spectrum (FHSS) or direct sequence spread spectrum (DSSS).

**802.11a** = 54 Mbps in the 5GHz band, using orthogonal frequency division multiplexing)

**802.11b** (11 Mbps transmission in the 2.4 GHz band, using direct sequence spread spectrum (DSSS)).

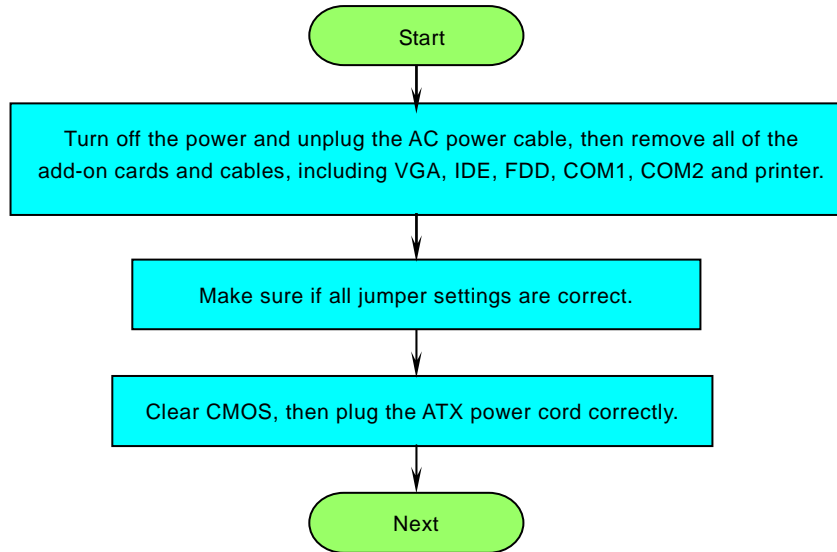
**ZIP file**

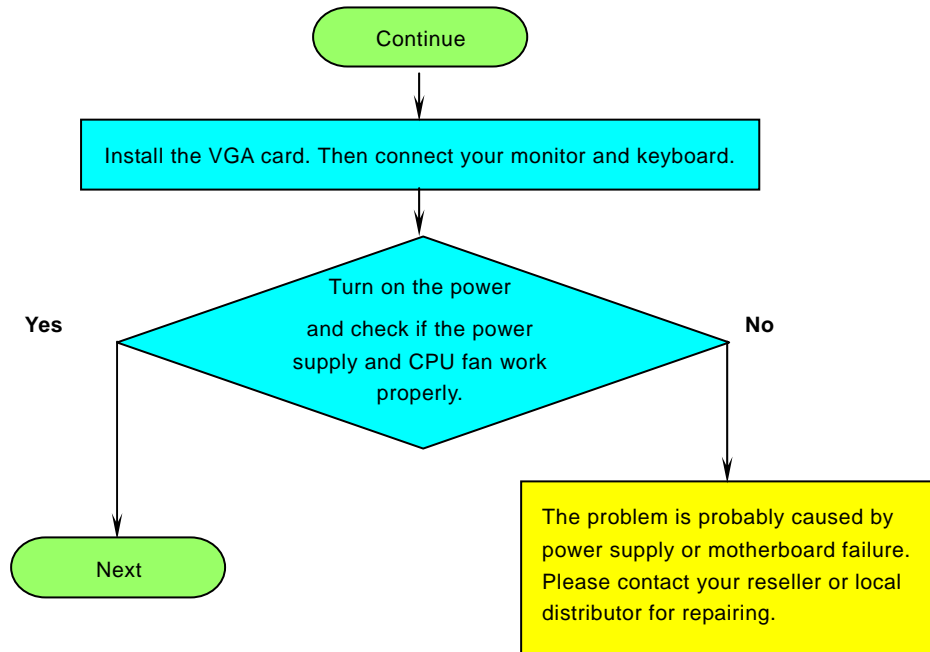
A compressed file format to reduce file size. To unzip file, run shareware PKUNZIP (<http://www.pkware.com/>) for DOS and other operating system or WINZIP (<http://www.winzip.com/>) for windows environment.

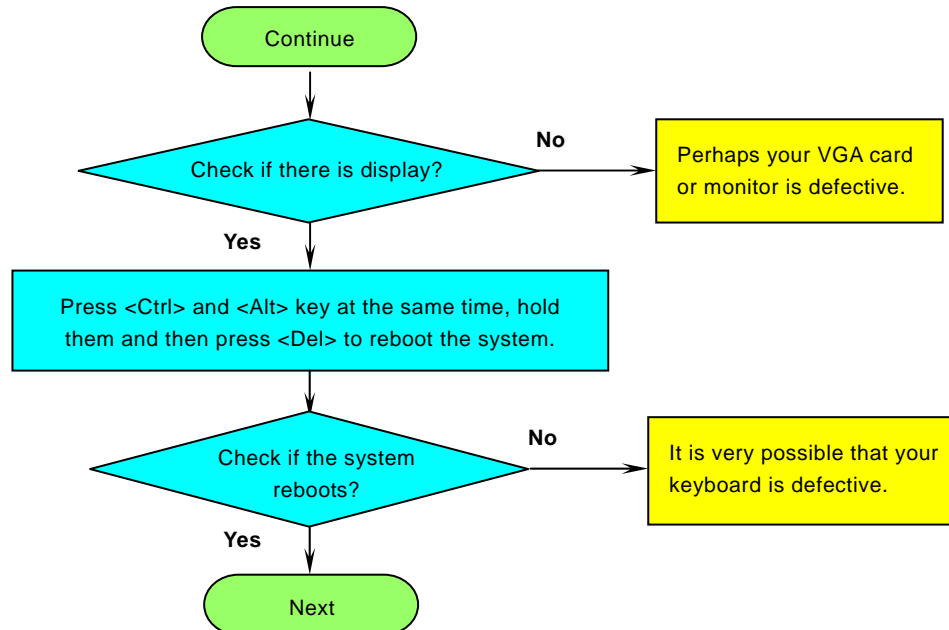


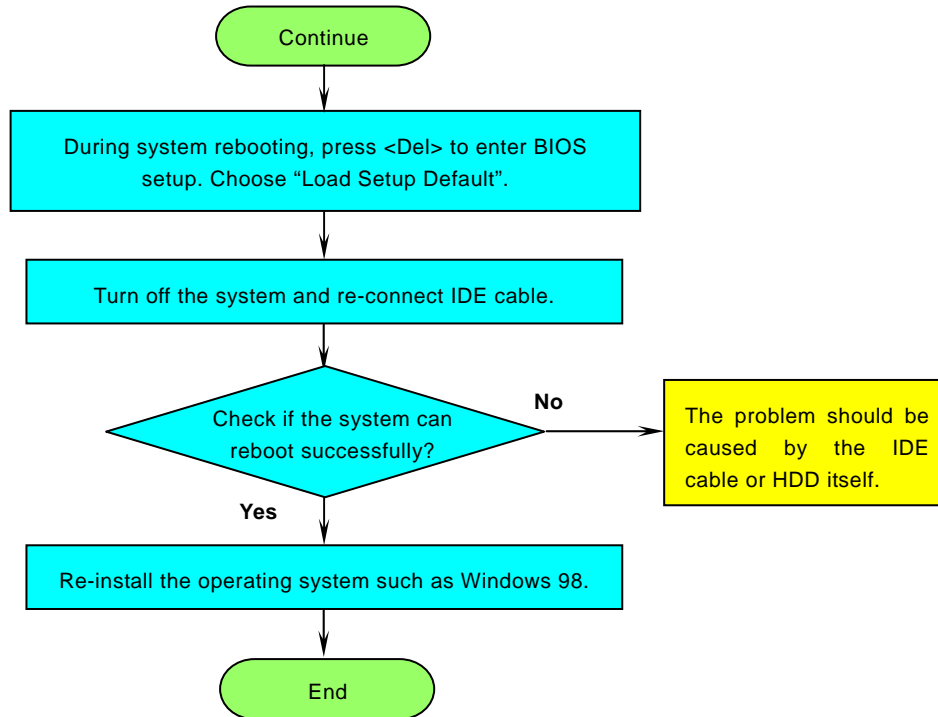
# Troubleshooting

If you encounter any trouble to boot your system, follow the procedures accordingly to resolve the problem.











# Technical Support

Dear Customer,

Thanks for choosing AOpen products. To provide the best and fastest service to our customer is our first priority. However, we receive numerous emails and phone-calls worldwide everyday, it is very hard for us to serve everyone on time. We recommend you follow the procedures below and seek help before contact us. With your help, we can then continue to provide the best quality service to more customers.

Thanks very much for your understanding!

AOpen Technical Supporting Team

**1**

**Online Manual:** To download manual, please log on and then select your preferred language. Under "Type" directory, choose "Manuals" to go to our manual database. You can also find the manual and EIG in AOpen Bonus Pack.

<http://download.aopen.com.tw/downloads>

**2**

**Test Report:** We recommend you to choose board/card/device from the compatibility test reports for assembling your PC. It may prevent incompatibility problems.

<http://english.aopen.com.tw/tech/report/default.htm>

**3**

**FAQ:** Here we list problems that users often encounter and FAQ (Frequently Asked Questions). You may select your preferred language after log on and find a solution to your problem.

<http://club.aopen.com.tw/faq/>

**4**

**Download Software:** After log on and having language selected, you may get the latest updated BIOS/utility and drivers you need under "Type" directory. In most case, newer versions of drivers and BIOS have solved earlier bugs or compatibility problems.

<http://download.aopen.com.tw/downloads>

**5**

**eForum:** AOpen eForum is provided to discuss our products with other users, in which your problem probably had been discussed before or will be answered. After log on, you may select your preferred language under “Multi-language”.

<http://club.aopen.com.tw/forum/>

**6**

**Contact Distributors/Resellers:** We sell our products through resellers and integrators. They should know your system configuration very well and should be able to solve your problem efficiently and provide important reference for you.

**7**

**Contact Us:** Please prepare detail system configuration and error symptom before contacting us. The **part number**, **serial number** and **BIOS version** are also very helpful.

### Part Number and Serial Number

The Part Number and Serial number are printed on bar code label. You can find this bar code label on the outside packing, or on component side of PCB. For example:



Part No.

Serial No.



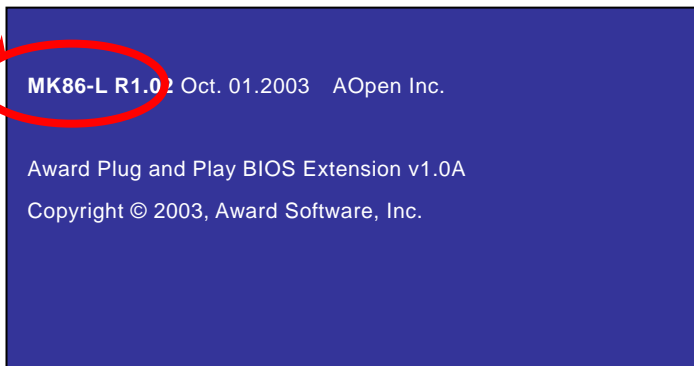
Part No.

Serial No.

**P/N: 91.88110.201** is part number, **S/N: 91949378KN73** is serial number.

### **Model name and BIOS version**

Model name and BIOS version can be found on upper left corner of first boot screen ([POST](#) screen). For example:



**MK86-L** is model name of motherboard, **R1.02** is BIOS version.





# Product Registration

Club AOpen

Welcome to AOpen Inc.



Thank you for choosing AOpen product. AOpen encourages you to spend few minutes in completing the following product registration. To register your product will ensure the high quality of services from AOpen. After the registration, you will:

- Have opportunities to play online slot machine and win a prize from AOpen by accumulating your bonuses for later prize exchange.
- Be upgraded to gold membership of Club AOpen program.
- Receive email notification about product safety alerts. Its purpose is to alert consumers quickly and conveniently when products contain technical issues.
- Receive email notification about latest product's announcements.
- Be able to personalize your AOpen web pages.
- Receive e-mail notification about latest BIOS/Driver/Software release information.
- Have opportunities to participate special product promotional programs.
- Enjoy higher service priority to receive technical assistance provided by AOpen specialists worldwide.
- Be able to join the discussions of web-based news groups.

AOpen makes sure that the information you provide is encrypted, so that it cannot be read or intercepted by other people or companies. Further, AOpen will not disclose any of information you submitted under any conditions. Please consult our [online privacy policy](#) for further information on our company policy.

**Note:** *If registering products purchased from different dealers/retails and/or purchased on different dates, please submit a separate form for each product.*

AOpen



## How to Contact Us



Please do not hesitate contact us if you have any problem about our products. Any opinion will be appreciated.

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Web Site: [www.aopen.com](http://www.aopen.com)

E-mail: Send us email by going through the contact form below.

English <http://english.aopen.com.tw/tech/default.htm>

Japanese <http://www.aopen.co.jp/tech/default.htm>

Chinese <http://www.aopen.com.tw/tech/default.htm>

German <http://www.aopencom.de/tech/default.htm>

Simplified Chinese <http://www.aopen.com.cn/tech/default.htm>

