MX46LS-V
MX46LS-533V
Online Manual

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AOpen

Overview

Hardware Installation

Drivers & Utilities

AWARD BIOS Setup

Glossary

Troubleshooting & Technical Support

What's in this manual

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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 4.0 for online viewing, it is included in Bonus CD 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.

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Overview

Thank you for choosing AOpen MX46LS-V / MX46LS-533V motherboard. MX46LS-V / MX46LS-533V is Intel® Socket 478 motherboard (M/B) based on the micro-ATX form factor featuring the **SIS 650GX chipset** (MX46LS-V) and the **SIS 651 chipset**. As high performance chipset built in the M/B, MX46LS-V supports Intel® Socket 478 Pentium® 4 (Willamette / Northwood) and 400MHz Front Side Bus (FSB) clock. MX46LS-533V supports Intel® Socket 478 Pentium® 4 (Willamette / Northwood) and 400MHz/533MHz Front Side Bus (FSB) clock. In the AGP performance, it has one AGP slot and supports **AGP** 4X mode and pipelined spilt-transaction long burst transfer up to 1056MB/sec. According to different customer's requirements, MX46LS-V / MX46LS-533V supports PC100/PC133 SDRAM up to 1GB maximum. The onboard IDE controller supports **Ultra DMA** 33/66/100/133 mode. More than that, on the strength of integrated SiS LAN controller with Realtek PHY on board, which is a highly integrated Platform LAN Connect device, it provides 10/100M bps Ethernet for office and home use. Six **USB 2.0** ports are supported with a fancy speed of up to 480Mbps. Besides, MX46LS-V / MX46LS-533V has an **AC97 CODEC** chipset onboard providing high performance and magic surround stereo sound to let people enjoy working with

it. Now, let's enjoy all features from AOpen MX46LS-V / MX46LS-533V motherboard.
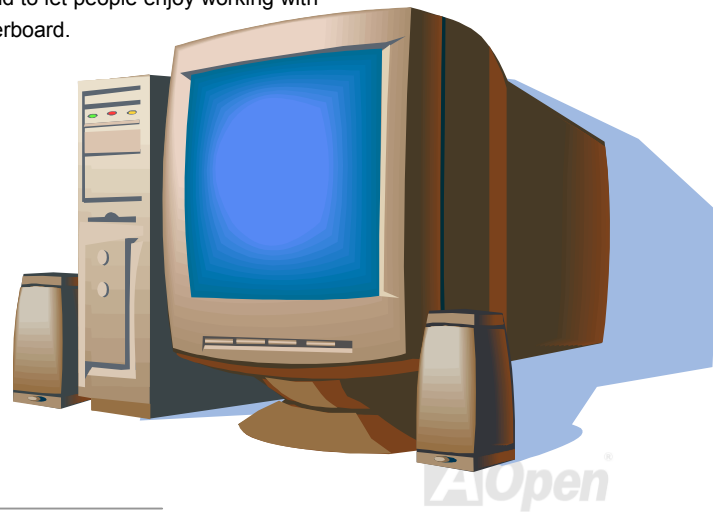
Feature Highlight

CPU

MX46LS-V supports Intel® Socket 478 Pentium® 4 (Willamette / Northwood) 1.4GHz~2.8GHz+ with 400MHz Front Side Bus (FSB) designed for Socket 478 technology and MX46LV-533V with 400MHz/533MHz Front Side Bus (FSB).

Chipset

MX46LS-V

This motherboard is equipped with SIS 650GX chipset. SiS 650GX chipset consists of host interface Controller and integrated high performance SDRAM Host system controller, which provides superior performance among CPU, SDRAM, and AGP buses. In coordination with SiS 650GX, the SIS 962L chipset is integrated fast Ethernet/Home networking controller, Audio/Modem Controller with AC'97 interface and advanced power management, which can strongly enhance the system performance.

MX46LS-533V

This motherboard is equipped with SIS 651 chipset. SIS 651 IGUI Host Memory Controller integrates a high performance host interface for Intel Pentium 4 processor, a high performance 2D/3D Graphic Engine, a high performance memory controller and an AGP 4X interface. SiS651 Host Interface features the AGTL & AGTL+ compliant bus driver technology with integrated on-die termination to support Intel Pentium 4 series processors with FSB 100MHz and over clocking up to 133MHz. SiS651 also can support external AGP slot with AGP 1X/2X/4X capability and Fast Write Transactions.

The South Bridge SIS 962L MuTIOL Media I/O integrates one Universal Serial Bus 2.0 Host Controllers, the Audio Controller with AC97 Interface, three Universal Serial Bus 1.1 Host Controllers and the IDE Master/Slave controllers. The PCI to LPC bridge, I/O Advanced

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Programmable Interrupt Controller, legacy system I/O and legacy power management functionalities are integrated as well. The SIS 961B chipset integrated fast Ethernet/Home networking controller, Audio/Modem Controller with AC'97 interface and advanced power management, which can strongly enhance the system performance.

Expansion Slots

Including three 32-bit/33MHz PCI, one AGP 1X/2X/4X 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 1056MB/s. MX46LS-V / MX46LS-533V motherboard includes one AGP expansion slot for a bus mastering AGP graphic card. For AD and SBA signaling, MX46LS-V / MX46LS-533V motherboard can support 4X mode. Of three PCI slots provided, all of them are master PCI slots with arbitration and decoding for all integrated functions and LPC bus.

Memory

MX46LS-V / MX46LS-533V provides two 168-pin SDRAM SIMM sockets that support up to 1GB of PC100/PC133 compliant SDRAM (Synchronous Dynamic Random Access Memory).

Watch Dog Timer

Includes AOpen "Watch Dog Timer" function that can auto-reset system in 4.8 seconds when you fail to system overclocking.

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 100~248MHz by 1MHz stepping adjustment, and helps your system get maximum performance.

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LAN Port

On the strength of integrated SiS LAN controller with Realtek PHY on board, which is a highly integrated Platform LAN Connect device, it provides 10/100 Mbps Ethernet for office and home use.

Ultra DMA 33/66/100/133 Bus Mater IDE

Comes with an on-board PCI Bus Master IDE controller with two connectors that support four IDE devices in two channels, supports Ultra DMA 33/66/100/133, PIO Modes 3 and 4 and Bus Master IDE DMA Mode 6, and supports Enhanced IDE devices.

On-board AC'97 Sound

MX46LS-V / MX46LS-533V uses RealTek AC97 sound chip. This on-board audio includes a complete audio recording and playback system.

3 USB2.0 Channels (6 Ports)

Provides 3 USB2.0 channels (6 ports) for USB interface devices, such as mouse, keyboard, modem, scanner, etc.

S/PDIF Connectors

S/PDIF (Sony/Philips Digital Interface) is the newest audio transfer file format, which provides impressive quality through optical fiber and allows you to enjoy digital audio instead of analog audio.

Power Management/Plug and Play

Supports the power management function that confirms to the power-saving standards of the U.S. Environmental Protection Agency (EPA) Energy Star program. It also offers Plug-and-Play, which helps save users from configuration problems, thus making the system much user-friendlier.

Hardware Monitoring Management

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

Enhanced ACPI

Fully implement the ACPI standard for Windows® 98/ME/2000 series compatibility, and supports Soft-Off, STR (Suspend to RAM, S3), STD (Suspend to Disk, S4) features.

Super Multi-I/O

Provides two high-speed UART compatible serial ports and one parallel port with EPP and ECP capabilities. UART can also be directed from COM1 to the Infrared Module for the wireless connections.

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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 98)
11. Installing Driver and Utility

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Motherboard Map

Realtek Ethernet PHY

CD-IN Connector

S/PDIF Connector

AC'97 CODEC

Front Audio Connector

MODEM-IN Connector

CNR Slot

32-bit PCI Expansion Slot x3

WOL Connector

3rd USB2.0 channels

SYSFAN2 Connector

JP14 CMOS Clear Jumper

IrDA Connector

Case Open Connector

Front Panel Connector

ATA 100/133 IDE1 Connector

PC99 Colored Back Panel

SYSFAN3 Connector

4-pin 12V. ATX Power Connector

COM2 Connector

Low ESR Capacitors

AGP 4x Expansion Slot

478-pin CPU socket (Willamette/
Northwood) with Voltage and
Frequency Auto-detection that
supports Intel® Pentium® 4
1.4~2.8GHz+ CPU

SIS 650GX/962L Chipset (MX46LS-V)
SIS 651/962L Chipset (MX46LS-533V)

CPUFAN1 connector

168-pin SIMMx2 supports
PC100/133 SDRAM maximum
up to 1GB

ATX Power Connector

Flash ROM BIOS

FDD Connector

ITE IT8705

ATA 100/133 IDE2 Connector

Block Diagram

PC100/PC133 SDRAM
Up to 1GB

32-bit PCI Slot x3

SIMM Socket x2

Socket 478
Intel Pentium 4
CPU(Willamette
/Northwood)

MX46LS-V: 400MHz
System Bus

MX46LS-533V: 400/533MHz
System Bus

MX46LS-V: SIS
650GX
MX46LS-533V:
SIS 651

PCI Bus

ATA
66/100/133

Primary
Channel

IDE Drive x4

Secondary
Channel

AGP 4X Slot

SIS 962L

RealTek
AC97
CODEC

LAN connect Component

Realtek
LAN PHY

1st USB Channel

USB2.0
port x6

2nd USB Channel

ITE
IT8705F

2Mbit Flash EEPROM

3rd USB Channel

Parallel Port

Floppy Disk Drive x2

Serial Port x2

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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 procedure requiring ESD protection.*

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About "User Upgrade Optional" and "Manufacture Upgrade Optional"…

When you read this online manual and start to assemble your computer system, you may notice that some of the functions are marked as "User Upgrade Optional" or "Manufacture Upgrade Optional". Although all of AOpen's motherboards have included many amazing and powerful features, sometimes not every user is familiar with these powerful features. As a result of this we define features that can be upgraded by users as "User Upgrade Optional". You can upgrade these functions by purchasing additional devices. As for functions that cannot be upgraded by users, we define them as "Manufacture Upgrade Optional". If need be, you can contact our local distributors or resellers to purchase "Manufacture Upgrade Optional" components, and again you are also welcome to visit our official website at HTTP://english.aopen.com.tw for detail information.

CPU Installation

This motherboard supports Intel® Pentium 4 Socket 478 series CPU (Willamette / Northwood). Be careful of CPU orientation when you plug it into CPU socket.

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

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

CPU socket Lever

CPU pin 1 and cut edge
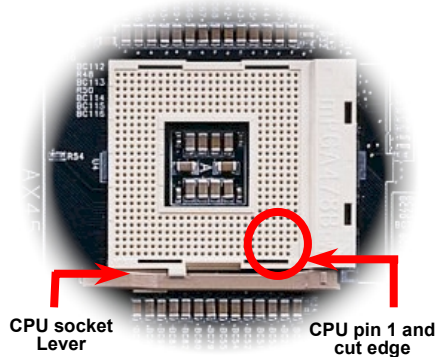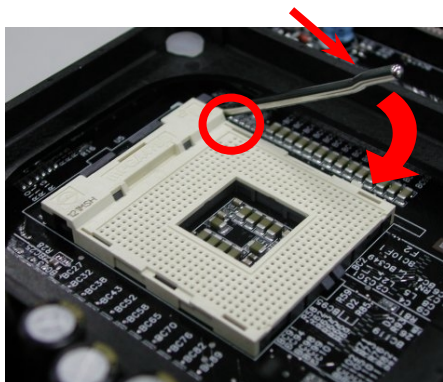
CPU cut edge

Note: Those pictures are for example only; they may not look the same with the motherboard you purchased.

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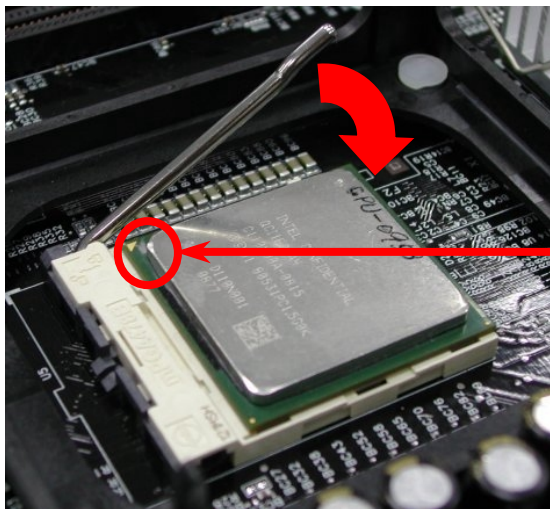
CPU cut edge

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

Note: This socket supports
Micro-FC-PGA2 package CPU, which is
the latest CPU package developed by
Intel. Other forms of CPU package are
impossible to be fitted in.

Note: This picture is for example only; it may not look the same with the motherboard you purchased.

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CPU Fan Installation

This motherboard comes with a retention module attached on the CPU socket when shipped, we strongly recommend you to install AOpen special designed CPU Fan as shown below on the retention module for better heat dissipation. Please install the CPU Fan correctly as the following pictures shown.

1. Gently put the CPU Fan down on the retention module with clips aligning correctly to the four corners.
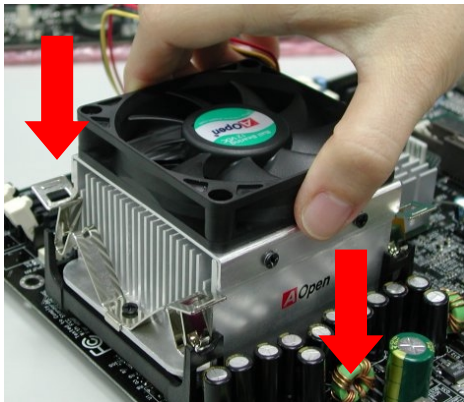
2. Pressing down the four clips with force one by one on the retention module.

Clip

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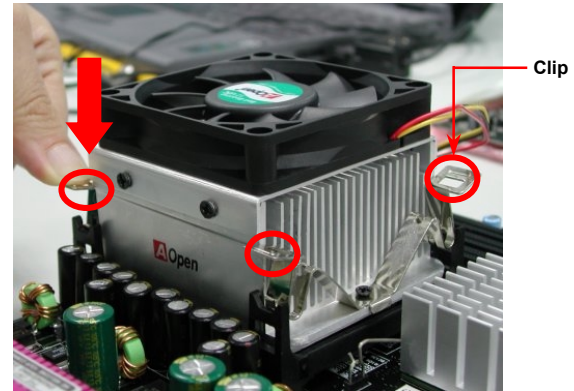
Enlarged Aluminum Heatsink

Cool down CPU and Chipset are important for system reliability. Enlarged aluminum heat sink provides better heat consumption especially when you are trying to over-clock the CPU.
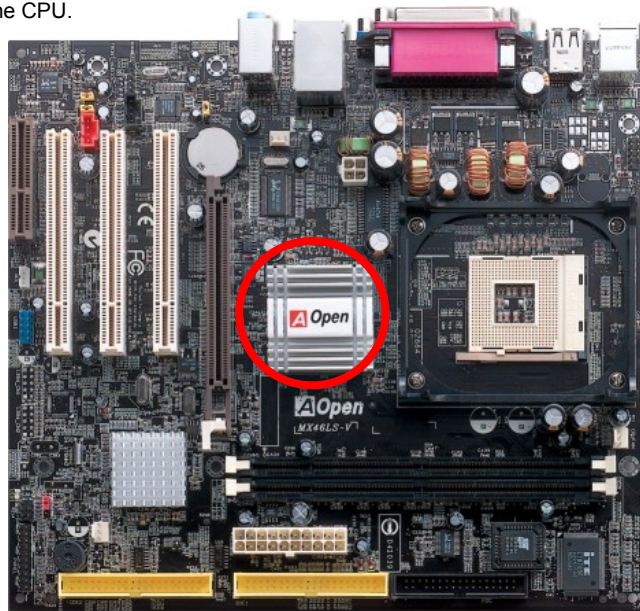
Full-range Adjustable CPU Core Voltage

This function is dedicated to overclockers and supports Adjustable CPU Core Voltage from 1.10V to 1.85V. However, this motherboard can also automatically detect CPU VID signal and generates proper CPU core voltage.

Setting CPU Frequency

BIOS Setup > Frequency/Voltage Control > CPU Clock Setting

This motherboard is CPU jumper-less design, you can set CPU frequency through the BIOS setup, and no jumpers or switches are needed. The default setting is "table select mode". You can adjust the FSB from "CPU Host/SDRAM/PCI Clock" for overclocking.

*Core Frequency = CPU FSB Clock * CPU Ratio*

PCI Clock = CPU FSB Clock / Clock Ratio

AGP Clock = PCI Clock x 2

CPU Ratio	8x, 10x… 21x, 22x, 23x, 24x
CPU FSB (By BIOS table)	100 MHz

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Northwood CPU	CPU Core Frequency	FSB Clock	System Bus	Ratio
Pentium 4 1.6G	1600MHz	100MHz	400MHz	16x
Pentium 4 1.6G	1600MHz	133MHz	533MHz	12x
Pentium 4 1.7G	1700MHz	133MHz	533MHz	13x
Pentium 4 1.8G	1800MHz	100MHz	400MHz	18x
Pentium 4 2.0G	2000MHz	100MHz	400MHz	20x
Pentium 4 2.2G	2200MHz	100MHz	400MHz	22x
Pentium 4 2.26G	2260MHz	133MHz	533MHz	17x
Pentium 4 2.4G	2400MHz	100MHz	400MHz	24x
Pentium 4 2.4G	2400MHz	133MHz	533MHz	18x
Pentium 4 2.53G	2530MHz	133MHz	533MHz	19x
Pentium 4 2.66G	2660MHz	133MHz	533MHz	20x
Pentium 4 2.8G	2800MHz	133MHz	533MHz	21x

Willamette CPU	CPU Core Frequency	FSB Clock	System Bus	Ratio
Pentium 4 1.5G	1500MHz	100MHz	400MHz	15x
Pentium 4 1.6G	1600MHz	100MHz	400MHz	16x
Pentium 4 1.7G	1700MHz	100MHz	400MHz	17x
Pentium 4 1.8G	1800MHz	100MHz	400MHz	18x
Pentium 4 1.9G	1900MHz	100MHz	400MHz	19x
Pentium 4 2.0G	2000MHz	100MHz	400MHz	20x

Celeron CPU	CPU Core Frequency	FSB Clock	System Bus	Ratio
Celeron 1.7G	1700MHz	100MHz	400MHz	17x
Celeron 1.8G	1800MHz	100MHz	400MHz	18x

*Warning: SIS 650GX / SIS 651 chipsets support maximum 400MHz (100MHz*4) system bus and 66MHz AGP clock; higher clock setting may cause serious system damage.*

Note: Since the latest processor, Northwood, would detect the clock ratio automatically, you may not be able to adjust the clock ratio in BIOS manually.

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CPU and System Fan Connectors   (with H/W Monitoring)

Plug in the CPU fan cable to the 3-pin **CPUFAN1** connector. If you have chassis fan, you can also plug it on **SYSFAN2** or **SYSFAN3** connector.

SYSFAN3 Connector

GND
+12V
NC

CPUFAN1 Connector

GND
+12V
SENSOR
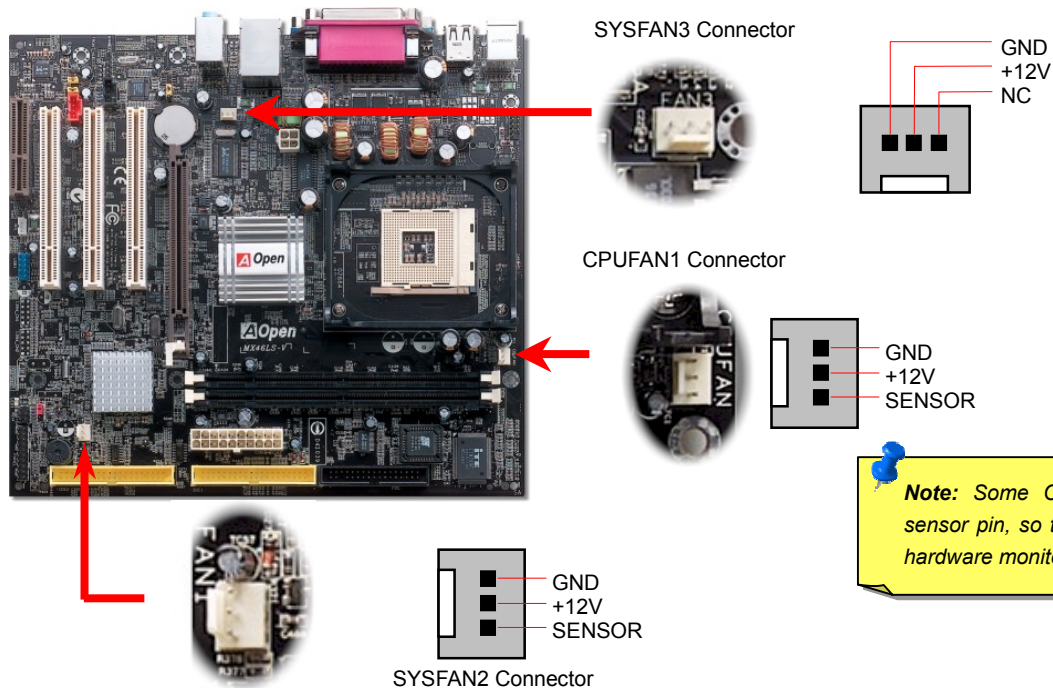
Note: Some CPU fans do not have sensor pin, so that they cannot support hardware monitoring function.

GND
+12V
SENSOR

SYSFAN2 Connector

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DIMM Sockets

This model has two 168-pin <u>DIMM</u> sockets that allow you to install PC100/PC133 memory up to 1GB.

DIMM1
DIMM2
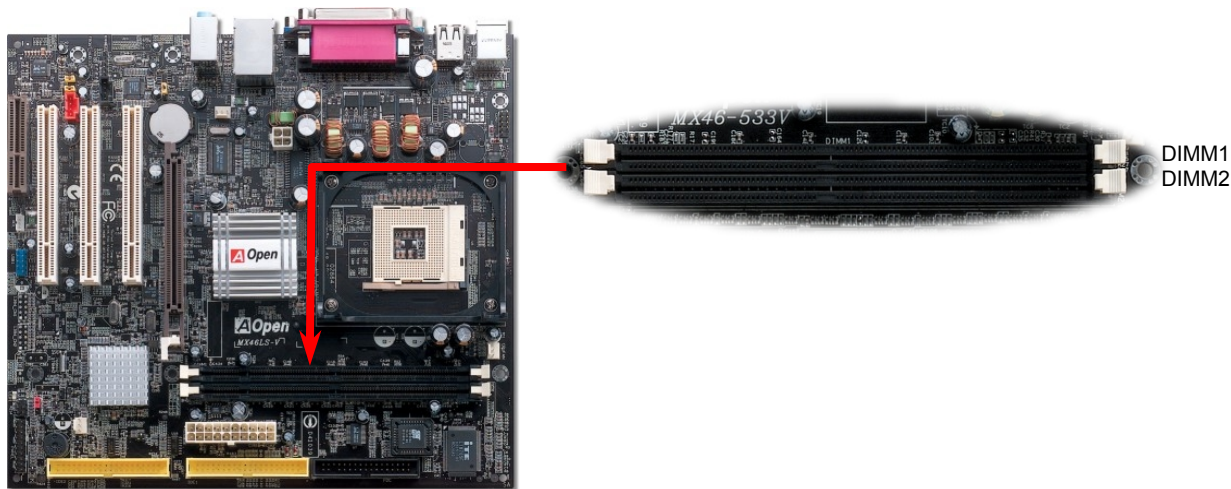
How to Install Memory Modules

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

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

         20 pins   60 pins   88 pins
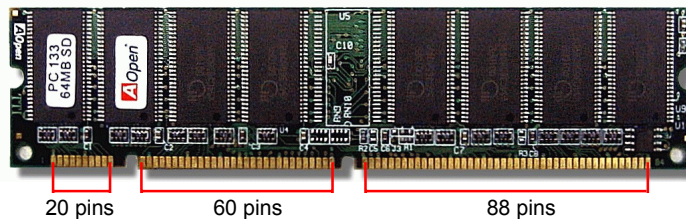
2. Insert the module straight down to the SIMM slot with both hands and press down firmly until the SIMM module is securely in place.

Tab

> **Note:** The tabs of the SIMM slot will close-up to hold the SIMM in place when the SIMM touches the slot's bottom.
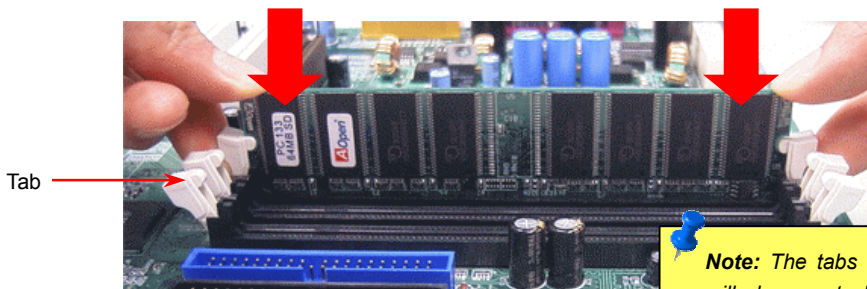
3. Repeat step 2 to finish additional SIMM modules installation.

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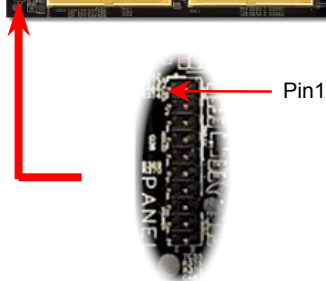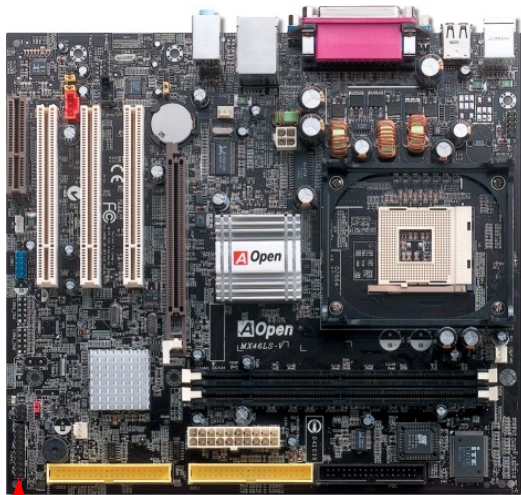
Attach the power LED, Keylock, speaker, power and reset switch connectors to the corresponding pins. If you enable "Suspend Mode" item in BIOS Setup, the ACPI & Power LED will keep flashing while the system is in suspend mode.

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 (S2) or Suspend to RAM (S3)	Flashing for every second
Suspend to Disk (S4)	The LED will be turned off

Pin1

1

SPWR

IDE LED

ACPI & PWR LED

ACPI LED (BLUE)

Speaker

Reset

1

NC	SPWR
NC	GND
+5V	ACPI LED-
IDE LED	GND
IDE LED	ACPILED
+5V	NC
+5V	ACPI_B
GND	GND
NC	RESET
SPEAKER	GND
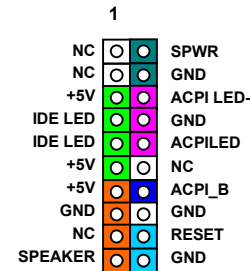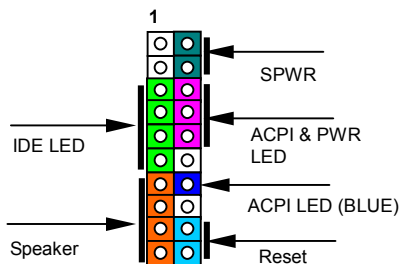
ATX Power Connector

This motherboard comes with a 20-pin and 4-pin ATX power connector. Make sure you plug in the right direction. We strongly recommend you to connect the 4-pin 12V ATX connector before connecting the 20-pin ATX power connector and use standard power supply specially designed for Pentium 4 system.
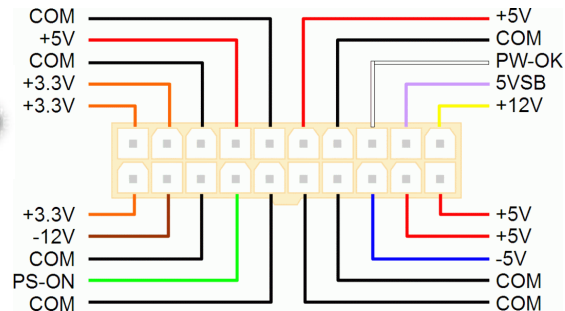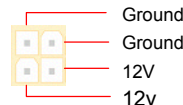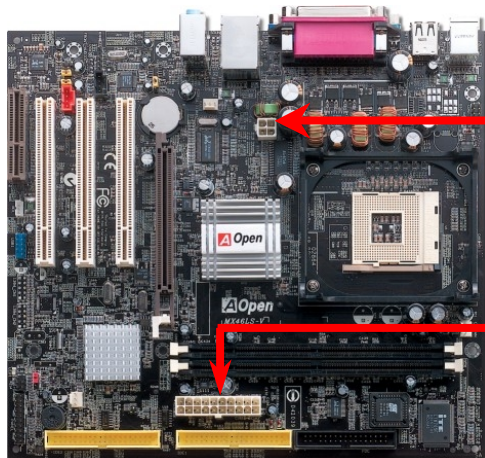
AC Power Auto Recovery

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.

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IDE and Floppy Connector

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

IDE 2 (Secondary)

ATA 66/100/133
IDE Connector

IDE 1 (Primary)

ATA 66/100/133
IDE Connector

FDD Connector
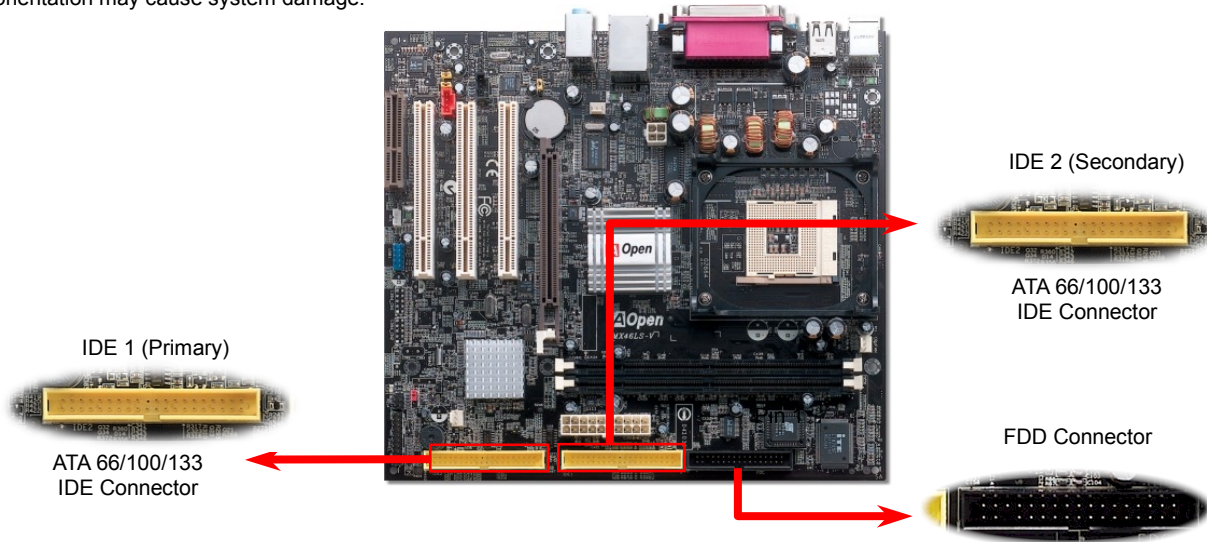
IDE1 is also known as the primary channel and IDE2 as the secondary channel. Each channel supports two IDE devices that make a total of four devices. In order to work together, the two devices on each channel must be set differently to **Master** and **Slave** mode. Either one can be the hard disk or 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.

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 ATA133 hard disks, a special **80-wires IDE cable** for ATA133 is required.*

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

ATA133 Supported   NEW!

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 manufactures 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 speed on this motherboard can be satisfied.

Mode	Clock Period	Clock Count	Cycle Time	Data Transfer Rate
PIO mode 0	30ns	20	600ns	(1/600ns) x 2byte = 3.3MB/s
PIO mode 1	30ns	13	383ns	(1/383ns) x 2byte = 5.2MB/s
PIO mode 2	30ns	8	240ns	(1/240ns) x 2byte = 8.3MB/s
PIO mode 3	30ns	6	180ns	(1/180ns) x 2byte = 11.1MB/s
PIO mode 4	30ns	4	120ns	(1/120ns) x 2byte = 16.6MB/s
DMA mode 0	30ns	16	480ns	(1/480ns) x 2byte = 4.16MB/s
DMA mode 1	30ns	5	150ns	(1/150ns) x 2byte = 13.3MB/s
DMA mode 2	30ns	4	120ns	(1/120ns) x 2byte = 16.6MB/s
ATA 66	30ns	2	60ns	(1/60ns) x 2byte x2 = 66MB/s
ATA 100	20ns	2	40ns	(1/40ns) x 2byte x2 = 100MB/s
ATA 133	15ns	2	30ns	(1/30ns) x 2byte x2= 133MB/s

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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, UART Mode, make sure to have the correct orientation when you plug in the IrDA connector.

```
              1
    NC  [O  ][ ]  KEY
    +5V [O  ][O]  GND
   IR_TX[O  ][O]  IR_RX

       IrDA Connector
```

Pin 1

AOpen
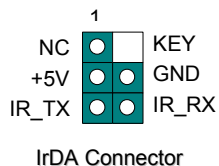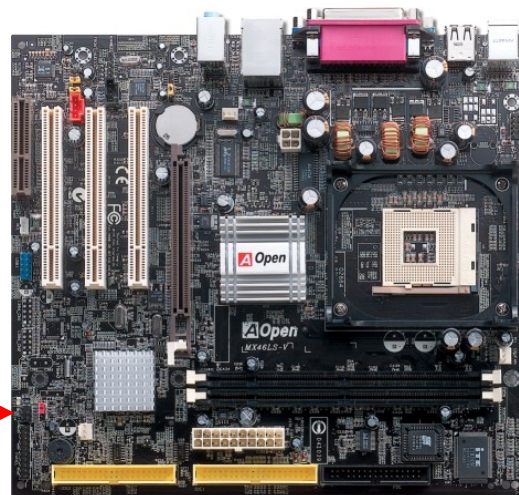
AGP (Accelerated Graphic Port) Expansion Slot

MX46LS-V / MX46LS-533V provides an AGP 4x slot. The AGP 4x 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 2X AGP, the data transfer rate is 66MHz x 4bytes x 2 = 528MB/s. AGP is now moving to AGP 4x mode, 66MHz x 4bytes x 4 = 1056MB/s.
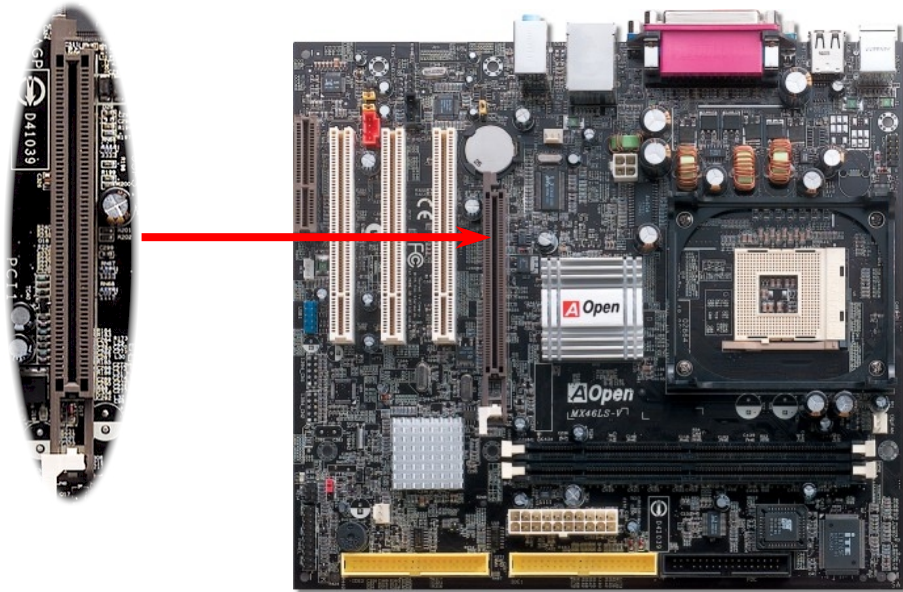
WOL (Wake on LAN)

To use Wake On LAN function, you must have a network card with chipset that supports 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.

LID

GND

+5VSB

WOL connector

AOpen

WOL Connector
(Ethernet Card Side)

WOL Connector
(Motherboard Side)
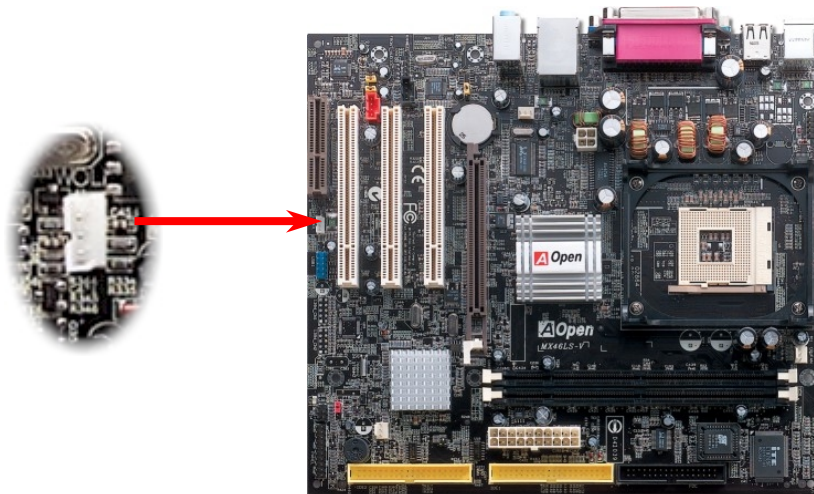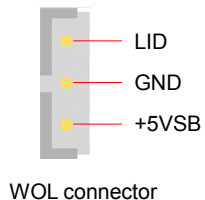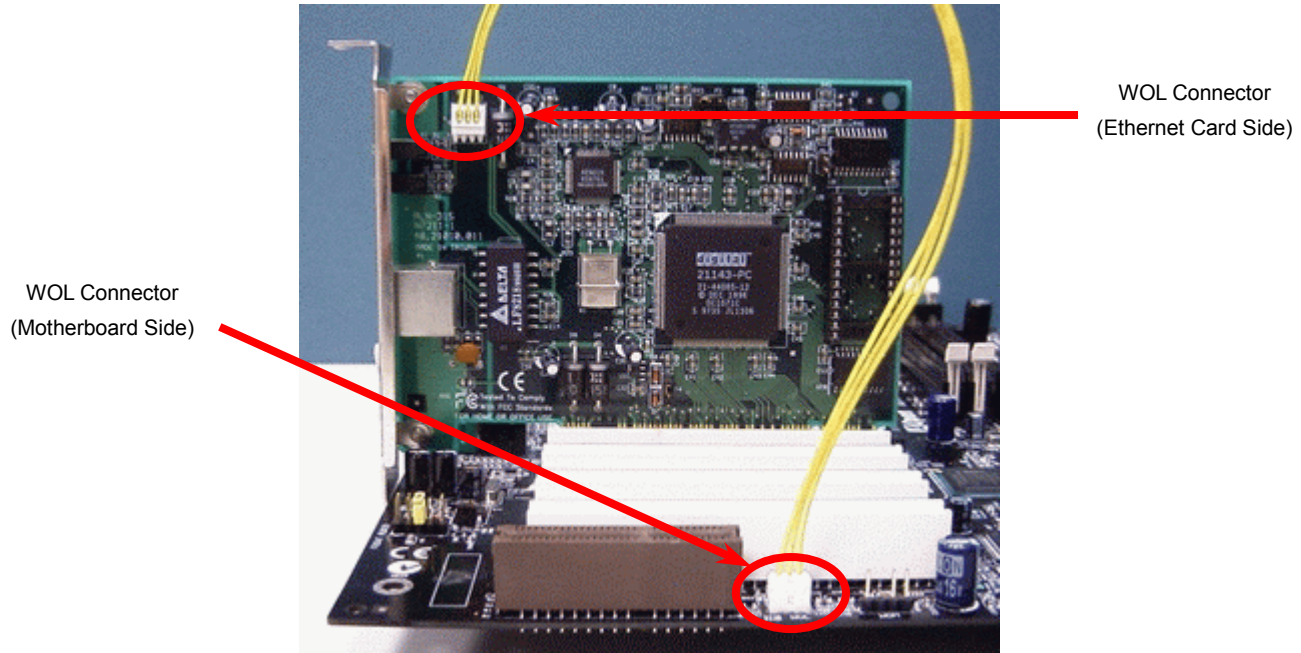
Note: This picture is for example only; it may not exactly look the same with the motherboard you purchased.

AOpen

Support 10/100 Mbps LAN onboard

On the strength of integrated SiS LAN controller with Realtek PHY on board, which is a highly-integrated Platform LAN Connect device, it provides 10/100M bps Ethernet for office and home use, the Ethernet RJ45 connector is located on top of USB connectors. The green LED indicates the link mode, it lights when linking to network and blinking when transferring data. The orange LED indicates the transfer mode and it lights when data is transferring in 100Mbps mode. To enable or disable this function, you may simply adjust it through BIOS.

Green/10M ACT/LNK

Orange/100M ACT/LNK
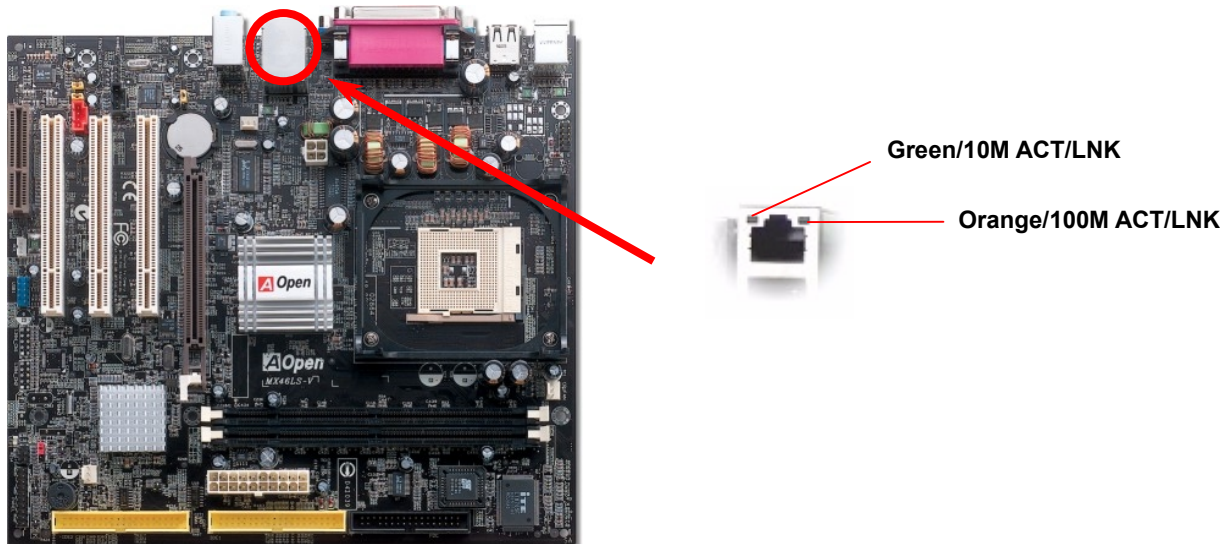
CNR (Communication and Network Riser) Expansion Slot

CNR is a riser card specification to replace the AMR (Audio/Modem Riser) that supports V.90 analog modem, multi-channel audio, and phone-line based networking. Owing to CPU computing power getting stronger, the digital processing job can be implemented in main chipset and share CPU power. The analogy conversion (CODEC) circuit requires a different and separate circuit design, which is put on CNR card. This motherboard implements sound CODEC on board, but reserve CNR slot for the option of modem function. Note that you can still use PCI modem card.
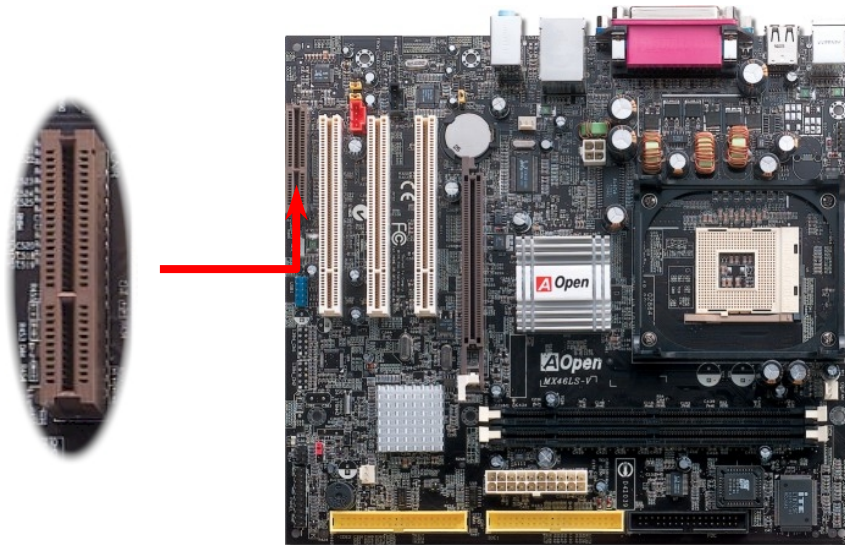
Support Three USB2.0 Channels (Six Ports)

This motherboard provides 6 USB2.0 ports to connect USB devices such as mouse, keyboard, modem, printer, etc. There are four ports on the PC99 back panel. You can use proper cables to connect USB devices from PC99 back panel or connect 3rd USB channel header to the front panel of chassis.

Compared to traditional USB 1.0/1.1 with the speed of 12Mbps, USB 2.0 has a fancy speed up to 480Mbps that is 40 times faster than the traditional one. 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. On this motherboard, all six ports support USB 2.0 function.

1st USB Channel

2nd USB Channel

3rd USB Channel

Pin 1

+5V			+5V
SBD2-			SBD3-
SBD2+			SBD3+
GND			GND
KEY			NC
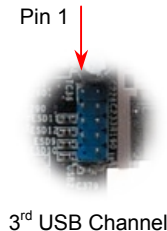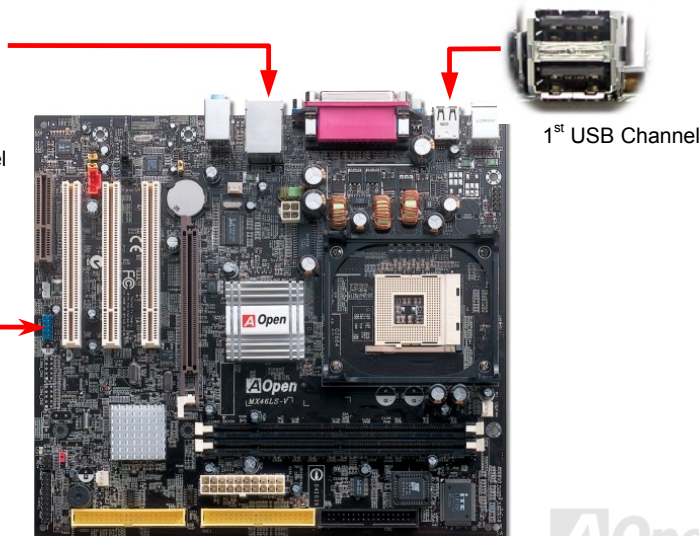
Color Coded Back Panel

The onboard I/O devices are PS/2 Keyboard, PS/2 Mouse, RJ-45 LAN Connector, COM1 and VGA, Printer, USB and AC97 sound. The view angle of drawing shown here is from the back panel of the housing.
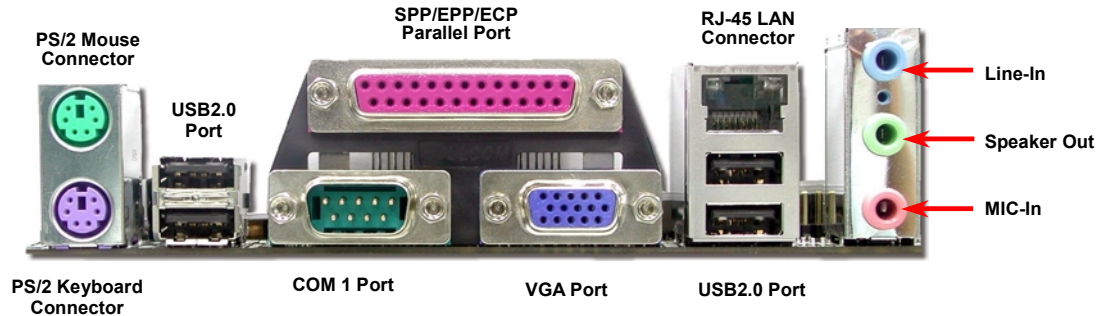
PS/2 Keyboard:	For standard keyboard, which is using a PS/2 plug.	
PS/2 Mouse:	For PC-Mouse, which is using a PS/2 plug.	
USB Port:	Available for connecting USB devices.	
Parallel Port:	To connect with SPP/ECP/EPP printer.	
COM1/COM2 Port:	To connect with pointing devices, modem or others serial devices.	
RJ-45 LAN connector	To connect Ethernet for home or office use.	
VGA Connector:	To connect with PC monitor.	
Speaker Out:	To External Speaker, Earphone or Amplifier.	
Line-In:	Comes from the signal sources, such as CD/Tape player.	
MIC-In:	From Microphone.	

AOpen

Case Open Connector

The "CASE OPEN" header provides chassis intrusion-monitoring function. To make this function works, you have to enable it in the system BIOS, connect this header to a sensor somewhere on the chassis. So, whenever the sensor is triggered by lights or by the opening of the chassis, the system will beep 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.

Pin 1

1
Sensor
GND

AOpen
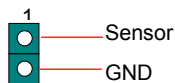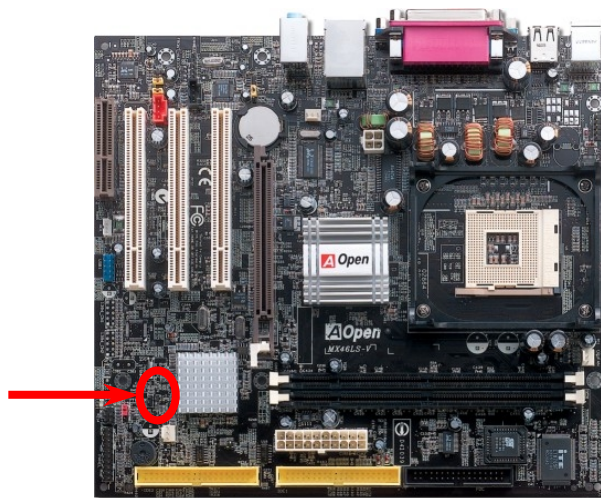
CD Audio Connector

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

R

GND

GND

L

CD-IN

> **Note:** *Though some of the latest versions 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 connect audio cable to CD-IN connector on the motherboard.*
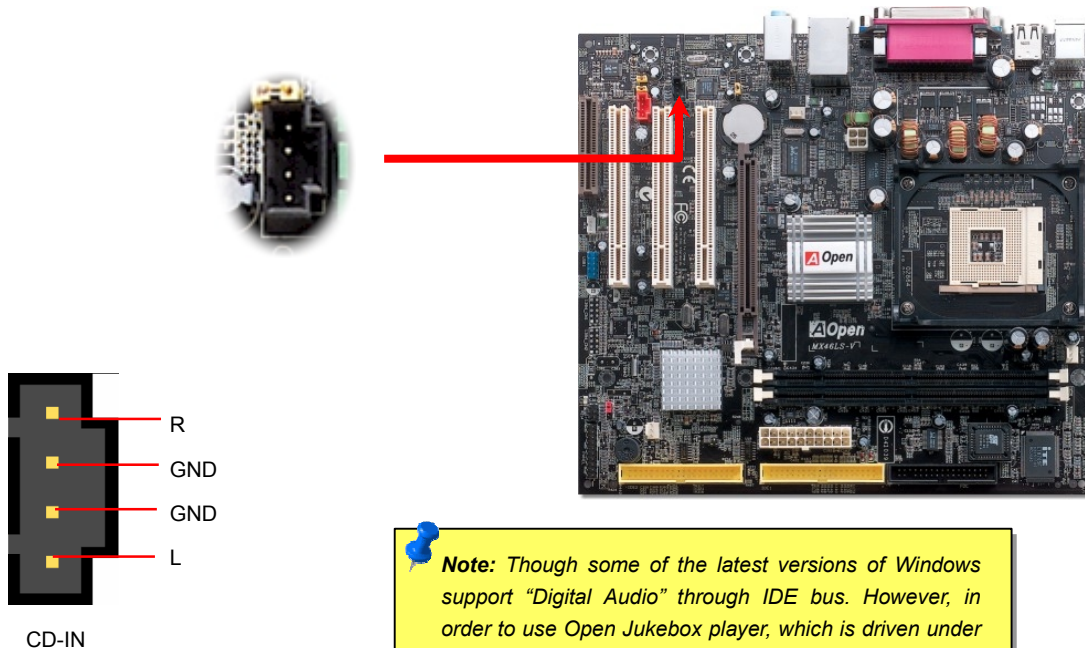
MODEM-IN Connector

The **MODEM-CN** connector is used to connect Mono In/ Mic Out cable from internal modem card to onboard sound circuit.

MIC OUT
GND
GND
MONO IN

MODEM-CN Connector

AOpen
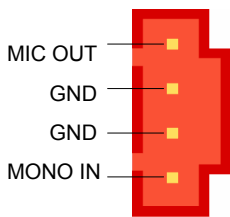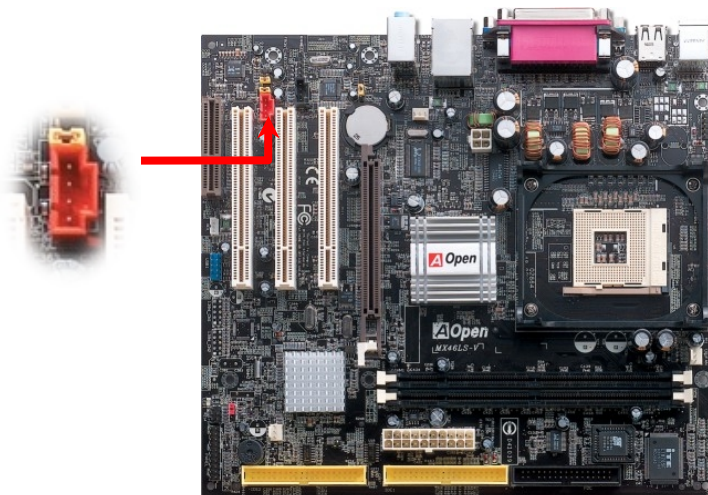
COM2 Connector

This motherboard provides two serial ports. One of them are on back panel connector, the other is on the middle left between PCI slots. With proper cable, you can connect it to the back panel of chassis.

Pin 1 ──────────▶

```
        1   2
DCD#  [ o   o ]  SIN
SOUT  [ o   o ]  DTR#
GND   [ o   o ]  DSR#
RI#   [ o   o ]  CTS#
RTS#  [ o     ]
```

AOpen
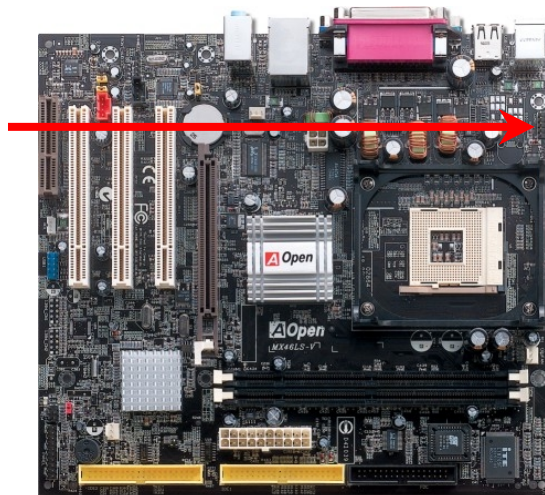
Front Audio Connector

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 the jumper cap from the Front Audio Connector before you connect the cable. Do not remove this yellow jumper cap if your housing doesn't have an audio port on the front panel.

Pin 1

```
                    1
    AUD_MIC   [O O]  AUD_GND
AUD_MIC_BIAS  [O O]  AUD_VCC
 AUD_FPOUT_R  [O O]  AUD_RET_R
         NC   [O  ]  KEY
 AUD_FPOUT_L  [O O]  AUD_RET_L
```
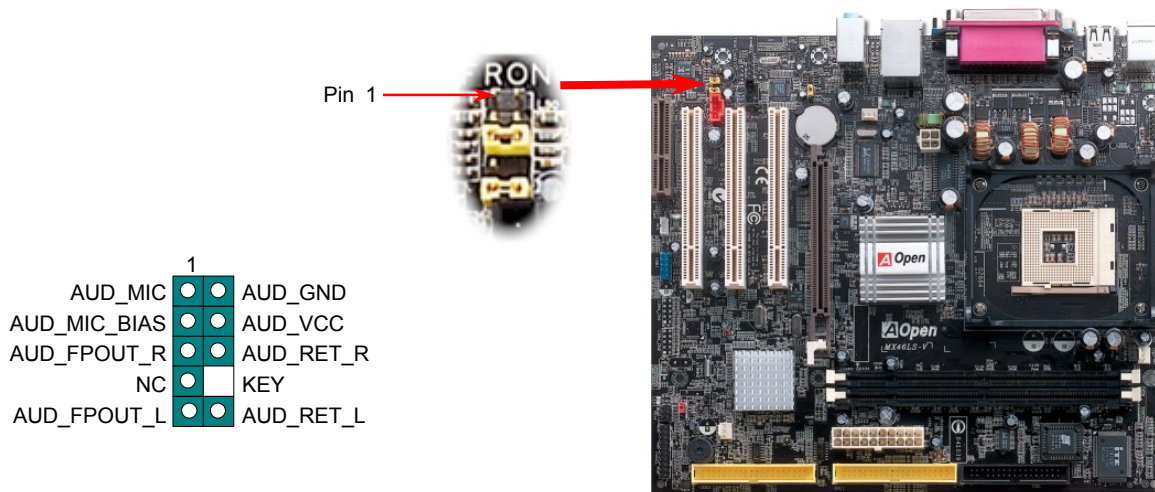
Note: Please remove the jumper cap from the front audio connector before you connect the cable. Do not remove this yellow jumper cap if your housing doesn't have an audio port on the front panel.

AOpen

S/PDIF (Sony/Philips Digital Interface) Connector

S/PDIF (Sony/Philips Digital Interface) is a latest audio transfer file format that provides impressive quality through optical fiber and allows you to enjoy digital audio instead of analog. 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 a even better audio quality. Through a specific audio cable, you can connect the S/PDIF connector to a S/PDIF audio module bearing S/PDIF digital output. However, you must have a S/PDIF supported speaker with S/PDIF digital input to make the most of this function.

1   +5V
     NC
     SPDIFOUT
     GND
5   SPDIFIN

Pin 1 →
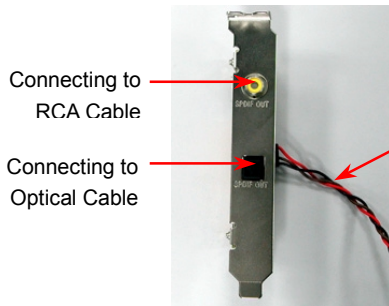
S/PDIF
Connector

Connecting to
RCA Cable

Connecting to
Optical Cable

Audio cable

S/PDIF Module
(Optional)
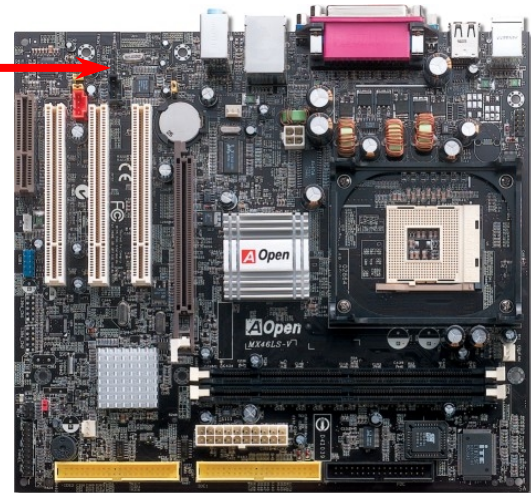
JP14 Clear CMOS Data

You can clear CMOS to restore system default setting. To clear CMOS, follow the procedure 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
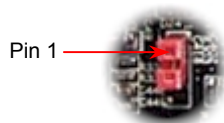
1 Normal
(default)

1 Clear CMOS

Tip: When should I Clear CMOS?

1. Boot fail because of overclocking…

2. Forget password…

3. Troubleshooting…

AOpen

JP28 USB Keyboard/Mouse Wake-up Enable/Disable 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. JP28 controls both 1st and 2nd USB channel and PS2 port. The factory default setting is set to "Disable"(1-2), and you may enable this function by setting the jumper to 2-3.

2nd USB Channel

1st USB Channel

JP28

KB/Mouse Wake-up

Pin 1

Disable

(Default)
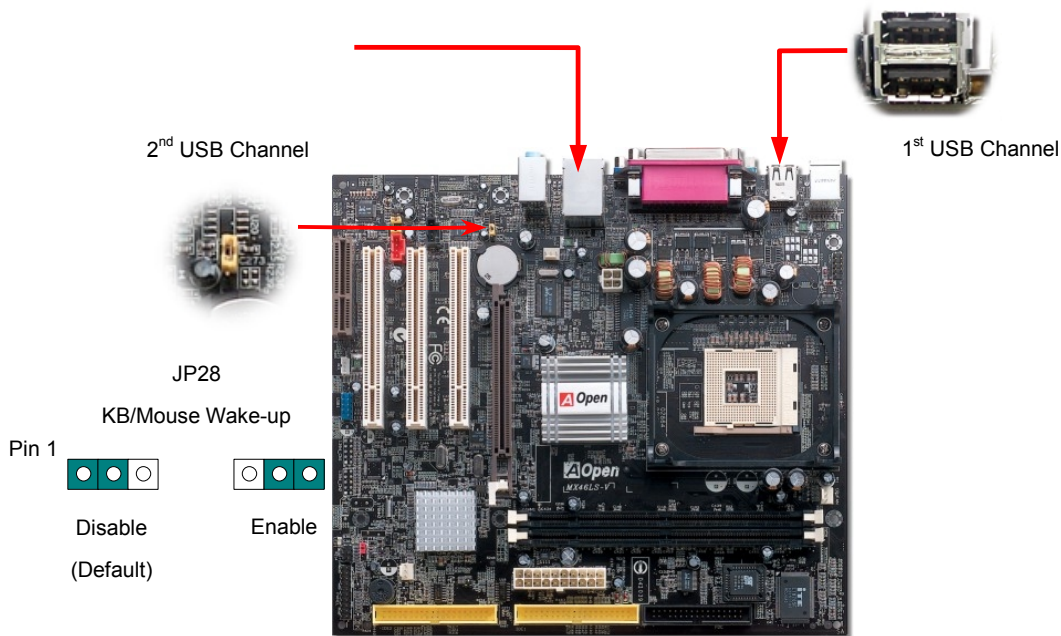
Enable

AOpen

AOpen "Watch Dog Timer"

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 Timer" 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 Timer" 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, and without removing the cover of system housing to set the jumper to clear CMOS data when your system hanged.

Enable/Disable Signal from BIOS

```
            BIOS
```

Reset Signal

```
AOpen
Watch Dog Timer        Clock Generator        CPU ID Signal
```

Countdown about 5 seconds if fails in POST

```
            CPU
```

AOpen
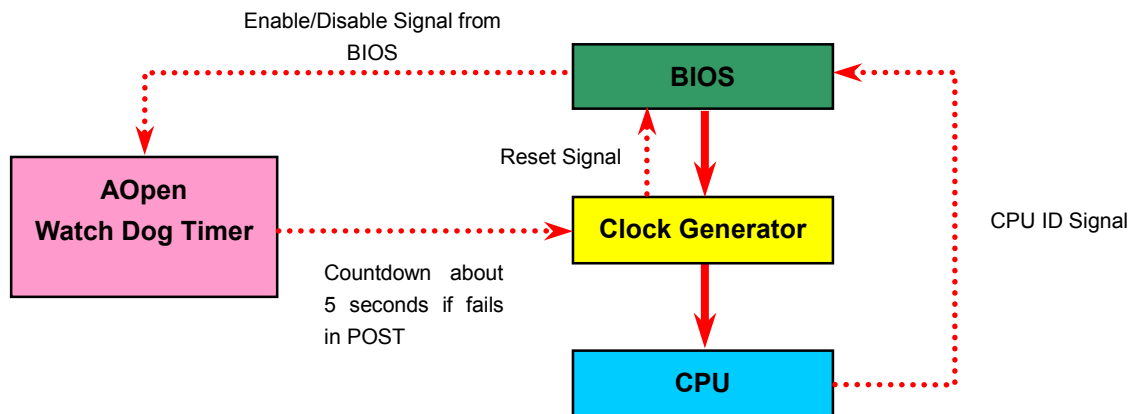
Battery-less and Long Life Design

This Motherboard implements a [Flash ROM](#) and a special circuit that provide you no batter power consumption of current CPU and CMOS Setup configurations. 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.

ATX Stand-by Power   **Battery**

Auto Switch

RTC
(Real Time Clock)
00:00:00

Auto switching to ATX standby power as long as AC power line is plugged. This smart design increases battery life if you still plug battery on motherboard.

Flash ROM   **CMOS**

Backup by EEPROM

AOpen
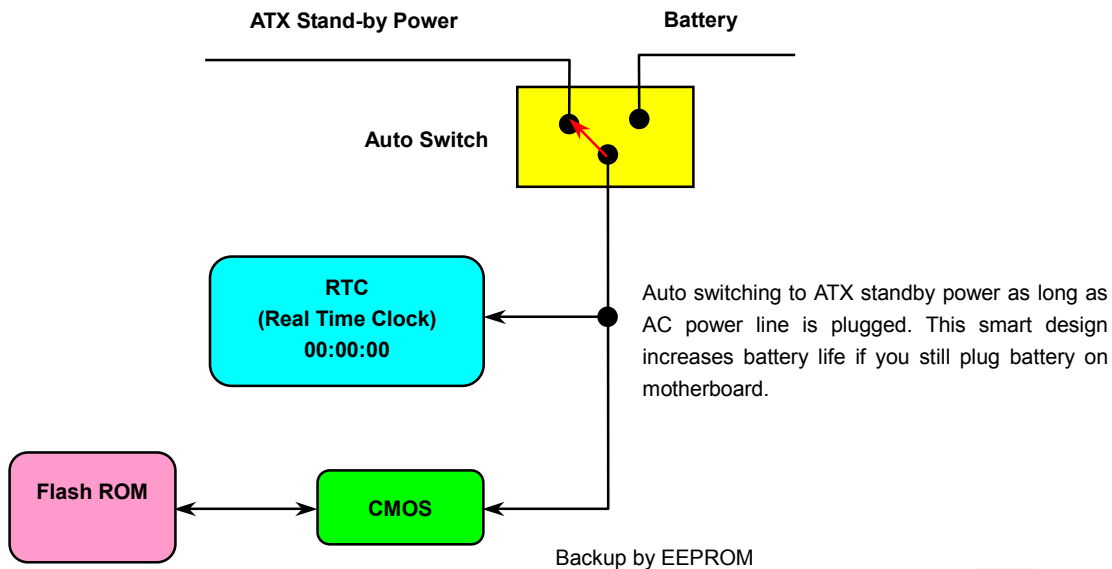
Over-current Protection

The Over Current Protection is a popular implementation on ATX 3.3V/5V/12V switching power supply. However, the new generation CPU uses different voltage with a regulator to transfer 12V to CPU voltage (for example, 2.0V), and thus makes 5V over current protection useless. This motherboard is with switching regulator onboard supporting CPU over-current protection; in conjunction with 3.3V/5V/12V power supply provide the full line over-current protection.

```
┌─────────────────────┐     ──→ 3.3V (Protected by power supply) ──────→
│                     │
│ ATX Switching       │     ──→ 5V (Protected by power supply) ────────→
│ Power Supply        │
│                     │     ──→ 12V (Protected by power supply) ───────→
└─────────────────────┘
                            ┌──────────┐    ┌──────────┐
                            │ Onboard  │    │Over-Current│
                            │ Power    │ ──→│Protection│ ──→ CPU Core Voltage
                            │ Regulator│    │ Circuit  │
                            └──────────┘    └──────────┘
```
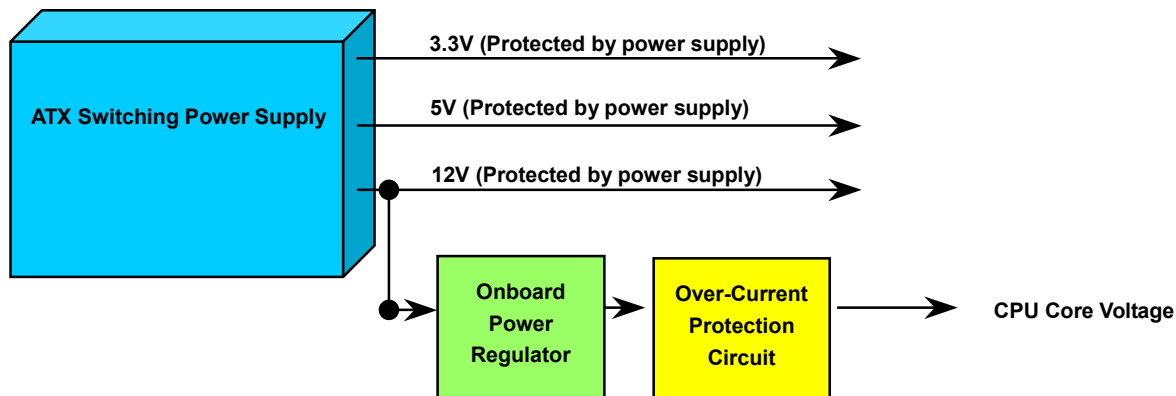
Note: Although we have implemented protection circuit and tried to prevent any human operating mistake, certain risks might still happen when CPU, memory, HDD or add-on cards installed on this motherboard is damaged due to component failure, human operating error or other unknown natural reasons. AOpen cannot guarantee that the protection circuit will always work perfectly.

AOpen

Resetable Fuse

Traditional motherboard uses fuses to prevent Keyboard and USB port from over-current or shortage. These fuses are soldered onboard that when it is broken (function to protect motherboard), user cannot replace them and result in malfunction of motherboard.

With expensive Resetable Fuse, the motherboard can be resumed back to normal function even after the fuse had done its protection job.

Resettable
Fuse

AOpen
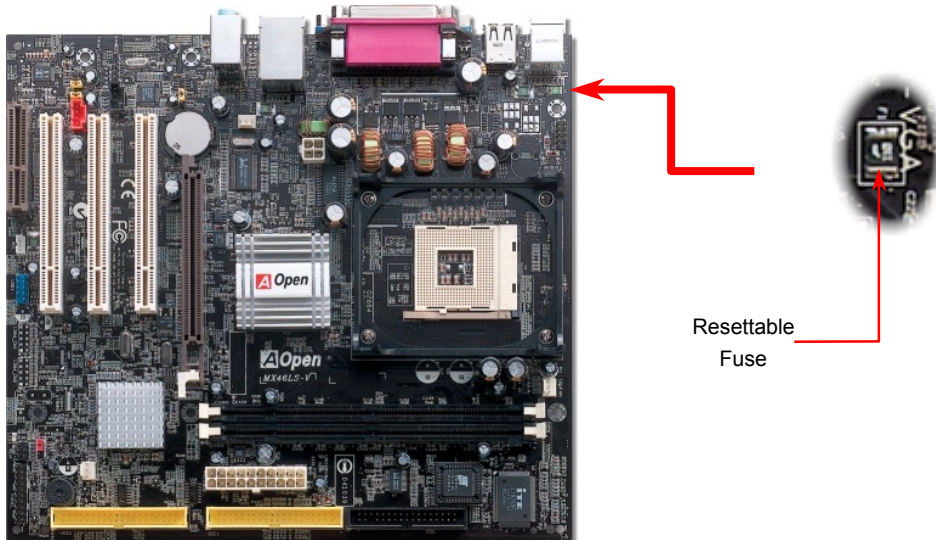
Low ESR Capacitor

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, MX46LS-V / MX46LS-533V implements 2200 μF capacitors, which is much larger than normal capacitor (1000 & 1500 μF) and it provides better stability for CPU power.

AOpen
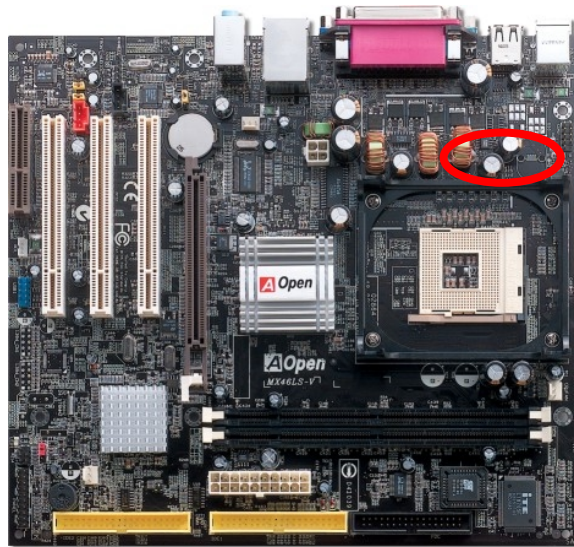
The power circuit of the CPU core voltage must be checked to ensure system stability for high speed CPUs (such as the new Pentium III, or when overclocking). A typical CPU core voltage is 2.0V, so a good design should control voltage between 1.860V and 2.140V. That is, the transient must be below 280mV. Below is a timing diagram captured by a Digital Storage Scope, it shows the voltage transient is only 143mv even when maximum 60A current is applied.
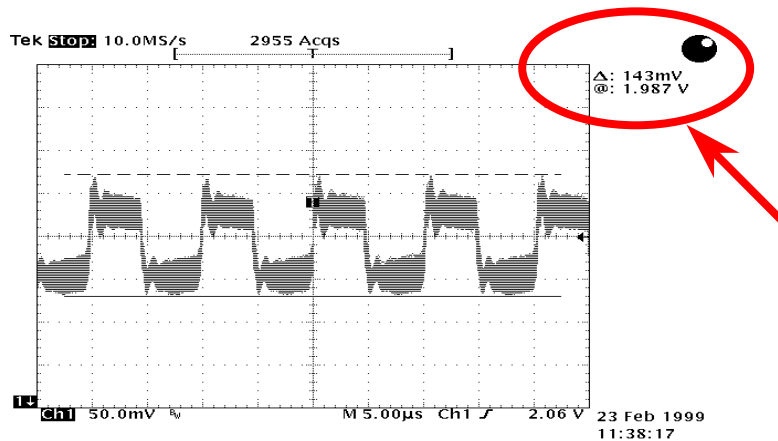
Note: This diagram for example only, it may not be exactly the same as the motherboard you purchased.
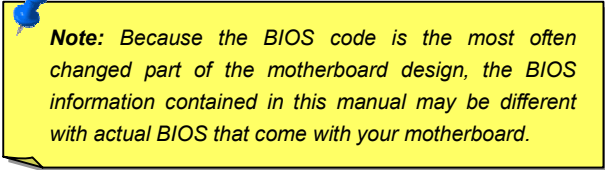
Phoenix-AWARD BIOS

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).

Phoenix-AwardBIOS™ 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.

Most BIOS settings of this model have been optimized by AOpen's R&D engineering team. But, the default setting of BIOS still can't fine-tune the chipset controlling entire system. Therefore, the rest of this chapter intends to guide you the process of configuring your system setup.

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.*

AOpen

About BIOS Function Description…

AOpen always dedicates to give user a friendlier computer system. Now, we include all function descriptions of BIOS setup program into the BIOS Flash ROM. When you select one function of BIOS setup program, the function description will appear at the right side of screen. Therefore, you don't need to read this manual while you change BIOS settings.

```
            CMOS Setup Utility - Copyright (C) 1984-2000 Award Software
                            Advanced BIOS Features

      Virus Warning              Disabled    ▲         Item Help
      CPU Internal Cache         Enabled
      External Cache             Enabled           Menu Level    ▶
      CPU L2 Cache ECC Checking  Enabled
      Quick Power On Self Test   Disabled          Allows you to choose
      First Boot Device          Floppy            the VIRUS warning
      Second Boot Device         HDD-0             feature for IDE Hard
      Third Boot Device          LS120             Disk boot sector
      Boot Other Device          Enabled           protection. If this
      Swap Floppy Drive          Disabled          function is enabled
      Boot Up Floppy Seek        Enabled           and someone attempt to
      Boot Up NumLock Status     On                write data into this
      Gate A20 Option            Fast              area ,  BIOS will show
      Typematic Rate Setting     Disabled          a warning message on
    x Typematic Rate (Chars/Sec) 6                 screen and alarm beep
    x Typematic Delay (Msec)     250
      Security Option            Setup
      OS Select For DRAM > 64MB  Non-OS2
      Video BIOS Shadow          Enabled    ▼

    ↑↓→←:Move  Enter:Select  +/-/PU/PD:Value  F10:Save  ESC:Exit  F1:General Help
         F5:Previous Values    F6:Fail-Safe Defaults    F7:Optimized Defaults
```

Menu Items Select Window   Item Function Description Window

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How To Use Phoenix-Award™ BIOS Setup Program

Generally, you can use 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 values. You can also 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 provide a special function in BIOS setup; you can press <F3> key selecting you preferred menu language.

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.
F1	Get menu or item help description.
F3	Changing menu language.
F5	Load previous setting value from CMOS.

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Key	Description
F6	Load fail-save setting value from CMOS.
F7	Load turbo setting value from CMOS.
F10	Save changed setting and exit setup program.

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How To Enter BIOS Setup

After you finish jumper settings and connect correct cables, power on and enter the BIOS Setup. Press <Del> during POST (Power-On Self Test) and choose "Load Setup Defaults" for recommended optimal performance.

```
              CMOS Setup Utility - Copyright (C) 1984-2001 Award Software
    ┌──────────────────────────────────────────────────────────────────────┐
    │  ► Standard CMOS Features              Load Setup Defaults             │
    │                                                                        │
    │  ► Advanced BIOS Features              Load Turbo Defaults             │
    │                                                                        │
    │  ► Advanced Chipset Features           Set Password                    │
    │                                                                        │
    │  ► Integrated Peripherals              Save & Exit Setup               │
    │                                                                        │
    │  ► Power Management Setup              Exit Without Saving             │
    │                                                                        │
    │  ► PnP/PCI Configura            ┌─────────────────────────┐ faults     │
    │                                 │ Load Setup Defaults (Y/N)? Y │        │
    │  ► PC Health Status             └─────────────────────────┘ faults     │
    │                                                                        │
    │  ► Frequency/Voltage                                                   │
    ├──────────────────────────────────────────────────────────────────────┤
    │  Esc : Quit                       ↑ ↓ → ←  : Select Item              │
    │  F10 : Save & Exit Setup          (Shift)F3 : Change Language          │
    ├──────────────────────────────────────────────────────────────────────┤
    │                    Load Setup Defaults                                 │
    └──────────────────────────────────────────────────────────────────────┘
```

Del

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

AOpen

BIOS Upgrade under Windows environment

NEW!

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.

Caution: By updating your motherboard, you are taking a risk of BIOS flash failure. If your motherboard is working stable, and there are no major bugs that had been fixed by a latter BIOS revision, we recommend that you DO NOT try to upgrade your BIOS.

If you intent on upgrading, PLEASE BE SURE to get the right BIOS revision for the right motherboard model to avoid any possibility failure.

You may accomplish BIOS upgrade procedure with EzWinFlash by the following steps, and it's STRONGLY RECOMMMANDED 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: WMX46LSV102.ZIP) with WinZip (http://www.winzip.com) in Windows environment.

3. Save the unzipped files into a folder, for example, WMX46533V102.EXE & WMX46LSV102.BIN.

4. Double click on the WMX46LSV102.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.*

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Driver and Utility

There are motherboard drivers and utilities in AOpen Bonus CD. You don't need to install all of them to boot your system. But after you finish the hardware installation, you have to install your operation system first (such as Windows 98) before you 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.
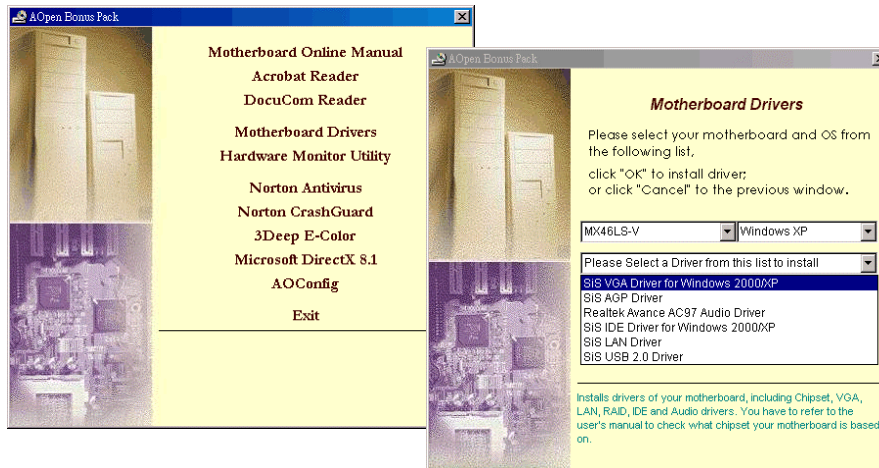
Install IDE Driver

To use IDE devices you have to install IDE driver from Bonus Pack CD.

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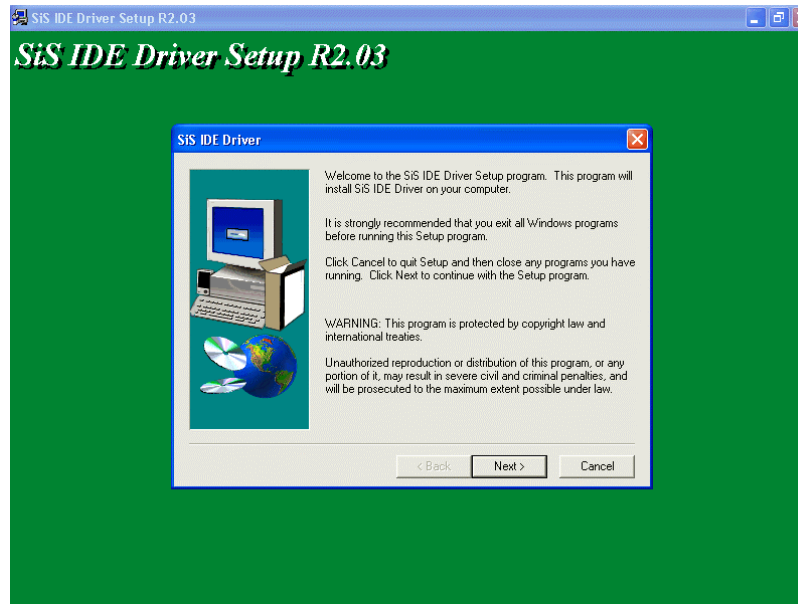
Installing AGP Driver

You can find AGP driver from the Bonus Pack CD auto-run menu.
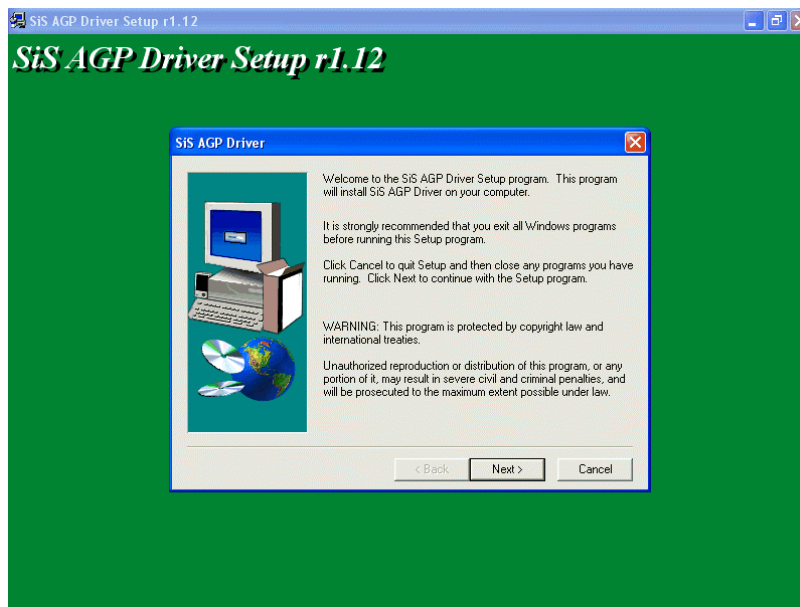
Installing VGA Driver

SiS 650GX/651 supports VGA on this motherboard. You can install VGA driver form the Bonus Pack CD.

SiS Compatible VGA Multimedia Package 2.09L
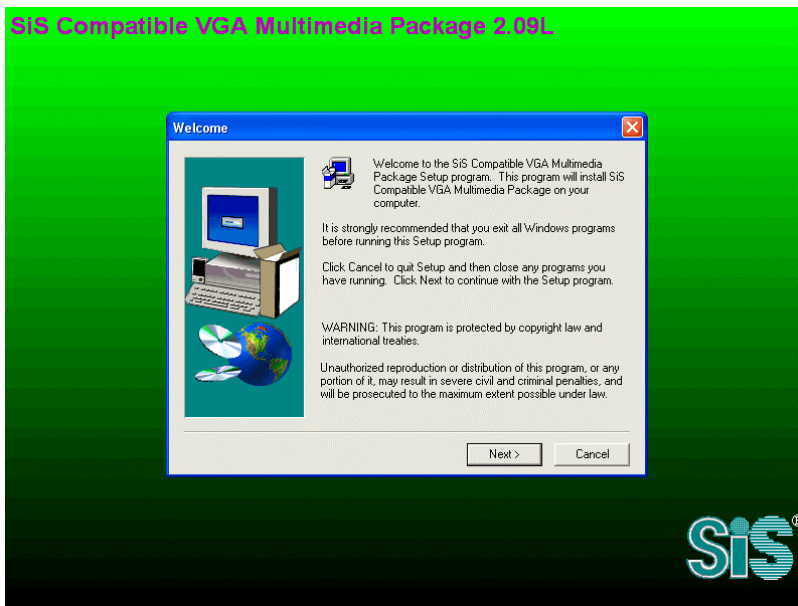
Install USB2.0 Driver

In Bonus Pack CD, you can install USB2.0 driver from the following screen.
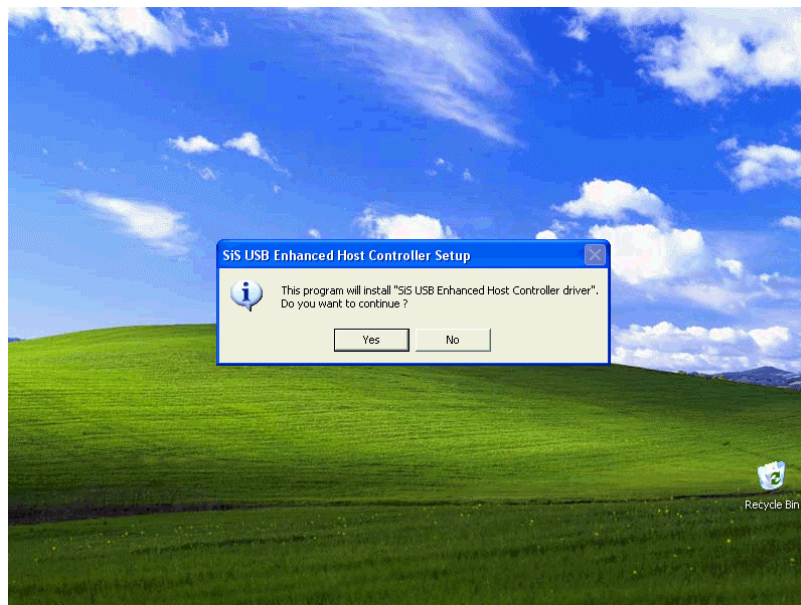
Installing LAN Driver

You can download LAN Driver from the Bonus Pack CD.

Installing Onboard Sound Driver

This motherboard comes with AC97 CODEC. This audio driver supports Windows 98SE and upper Windows OS; you can find the audio driver from the Bonus Pack CD auto-run menu.

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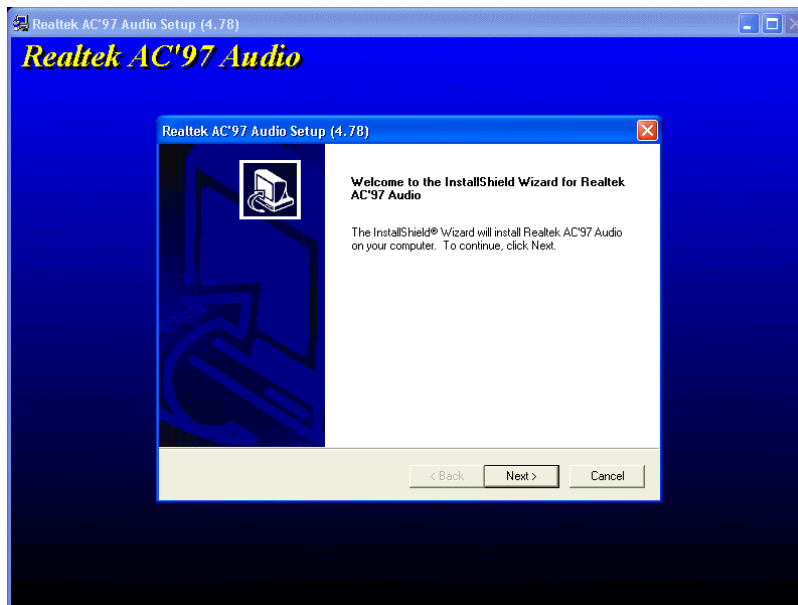
AOConfig Utility

AOpen always dedicated to provide users a much friendly computer environment. We now bring you a comprehensive system detection 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 for further diagnose of system problems.
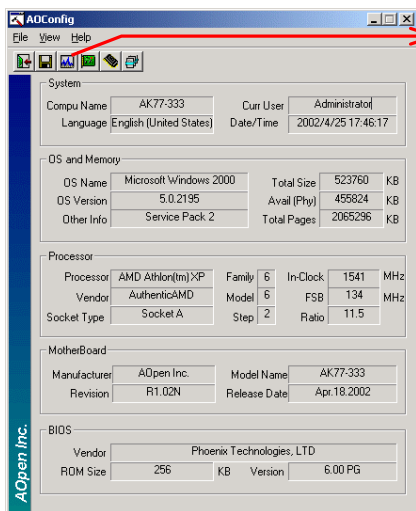
1. The system page shows the detailed information of the motherboard, operating system, processor, and BIOS version.

2. The PCI device page shows the configurations of all PCI devices installed in your motherboard.
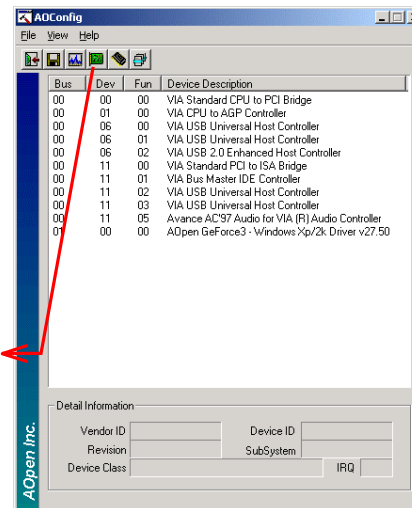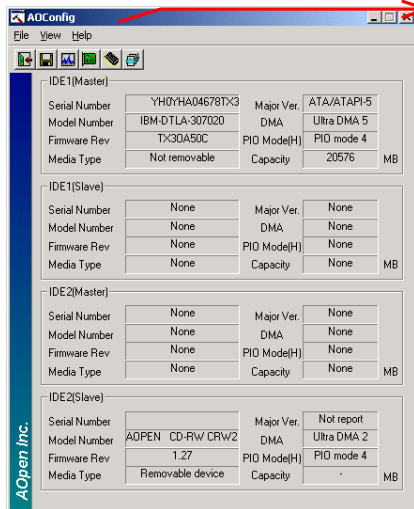
3. This page presents the IDE device information, such as serial number, manufacturer, firmware version, and capacity.

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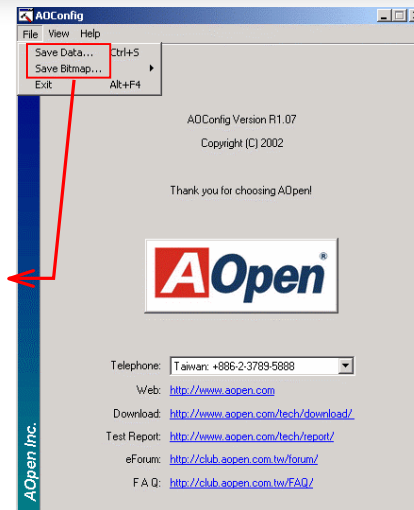
NOTE:

AOConfig can be used under Windows 98SE/ME, NT4.0/2000, or even the latest Windows XP. Please also note that AOConfig can only be operated in a system equipped with an AOpen motherboard. Before running AOConfig, all applications must be closed.

Installing Hardware Monitoring Utility

You can install Hardware Monitoring Utility to monitor CPU temperature, fans and system voltage. The hardware monitoring function is automatically implemented by BIOS and utility software. No hardware installation is needed.
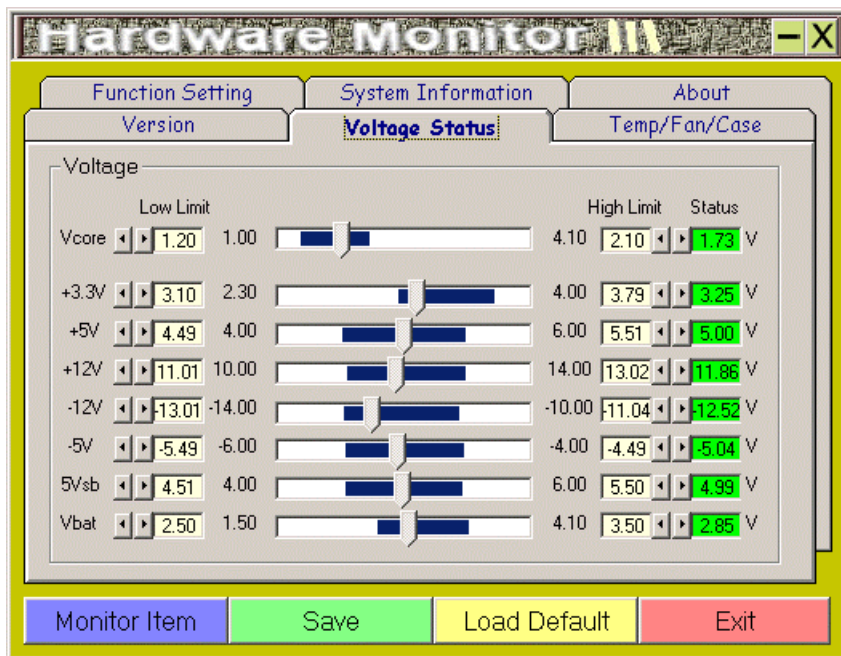
Glossary

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 66MHz x 4byte x 1 = 264MB/s

2X AGP, data transfer rate is 66MHz x 4byte x 2 = 528MB/s

4X AGP, data transfer rate is 66MHz x 4byte x 4 = 1056MB/s.

8X AGP, data transfer rate is 66MHz x 4byte x 8 = 2112MB/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

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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 16.6MHz x 2 = 33MB/s.

ATA/66, data transfer rate is 16.6MHz x 4 = 66MB/s.

ATA/100, data transfer rate is 16.6MHz x 6 = 100MB/s.

ATA/133, data transfer rate is 16.6MHz x 8 = 133MB/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 200x64/8=1600MB/s (PC1600)

DDR266, transfer bandwidth up to 266x64/8=2100MB/s (PC2100)

DDR333, transfer bandwidth up to 333x64/8=2700MB/s (PC2700)

DDR400, transfer bandwidth up to 400x64/8=3200MB/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^{2}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.

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FC-PGA (Flip Chip-Pin Grid Array)

FC means Flip Chip, FC-PGA is a package of Intel for Pentium III for 0.18μm 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 0.13μm 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.

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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.

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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).

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.

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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 PBSRAM 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 I²C 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 completed 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.

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Troubleshooting

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

```
                            ┌──────────────┐
                            │    Start     │
                            └──────────────┘
                                   │
                                   ▼
     ┌────────────────────────────────────────────────────────────┐
     │  Turn off the power and unplug the AC power cable, then     │
     │  remove all of the add-on cards and cables, including VGA,  │
     │  IDE, FDD, COM1, COM2 and printer.                          │
     └────────────────────────────────────────────────────────────┘
                                   │
                                   ▼
          ┌──────────────────────────────────────────────┐
          │  Make sure if all jumper settings are correct.│
          └──────────────────────────────────────────────┘
                                   │
                                   ▼
               ┌──────────────────────────────┐
               │         Clear CMOS            │
               └──────────────────────────────┘
                                   │
                                   ▼
               ┌──────────────────────────────┐
               │           Next               │
               └──────────────────────────────┘
```

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Continue

Install the VGA card. Then connect your monitor and keyboard.

Yes

Turn on the power and check if the power supply and CPU fan work properly.

No

Next

The problem is probably caused by power supply or motherboard failure. Please contact your reseller or local distributor for repairing.

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```
                          ┌─────────────────┐
                          │    Continue     │
                          └─────────────────┘
                                   │
                                   ▼
                                             No
                      ◇ Check if there is display? ◇ ──────────►  Perhaps your VGA card
                                                                  or monitor is defective.
                                   │
                                  Yes
                                   ▼
              ┌──────────────────────────────────────────┐
              │ Press <Ctrl> and <Alt> key at the same    │
              │ time, hold them and then press <Del> to   │
              │ reboot the system.                        │
              └──────────────────────────────────────────┘
                                   │
                                   ▼
                                             No
                      ◇ Check if the system reboots? ◇ ────────►  It is very possible that your
                                                                  keyboard is defective.
                                   │
                                  Yes
                                   ▼
                          ┌─────────────────┐
                          │      Next       │
                          └─────────────────┘
```

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Continue

During system rebooting, press <Del> to enter BIOS setup.
Choose "Load Setup Default".

Turn off the system and re-connect IDE cable.

Check if the system can
reboot successfully?

No

The problem should be
caused by the IDE cable
or HDD itself.

Yes

Re-install the operating system such as Windows 98.

End

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✚ 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:** Please check the manual carefully and make sure the jumper settings and installation procedure are correct. You can also find the manual and EIG in AOpen Bonus Pack.
http://english.aopen.com.tw/tech/download/manual/default.htm

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 be able to find a solution to your problem.
http://club.aopen.com.tw/faq/

4 | **Download Software:** Check out this table to get the latest updated BIOS/utility and drivers. In most case, newer versions of drivers and BIOS have solved earlier bugs or compatibility problems.
http://english.aopen.com.tw/tech/download/default.htm

5

eForum: We welcome you to join AOpen eForum to discuss our products with other users. Your problem probably had been discussed before or will be answered by other power users here.
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:

P/N:91.88110.201   S/N:91949378KN73

Part No.   Serial No.

918811020191949378KN73

Part No.   Serial No.

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

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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:

MX46LS-V R1.20 Jan. 2003 AOpen Inc.

Award Plug and Play BIOS Extension v1.0A

Copyright © 2003, Award Software, Inc.

MX46LS-V is model name of motherboard; **R1.20** is BIOS version.

Product Registration

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.*

How to Contact Us

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

Pacific Rim	Europe	America
AOpen Inc.	AOpen Computer b.v.	AOpen America Inc.
Tel: 886-2-3789-5888	Tel: 31-73-645-9516	Tel: 1-510-489-8928
Fax: 886-2-3789-5899	Fax: 31-73-645-9604	Fax: 1-510-489-1998
China	Germany	Japan
艾爾鵬國際貿易(上海)有限公司	AOpen Computer GmbH.	AOpen Japan Inc.
Tel: 86-21-6225-8622	Tel: 49-1805-559191	Tel: 81-048-290-1800
Fax: 86-21-6225-7926	Fax: 49-2102-157799	Fax: 81-048-290-1820

Web Site: *english.aopen.com.tw*

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*