

MX4LR

Online Manual

DOC. NO.: MX4LR-OL-E0203A



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Before You Start

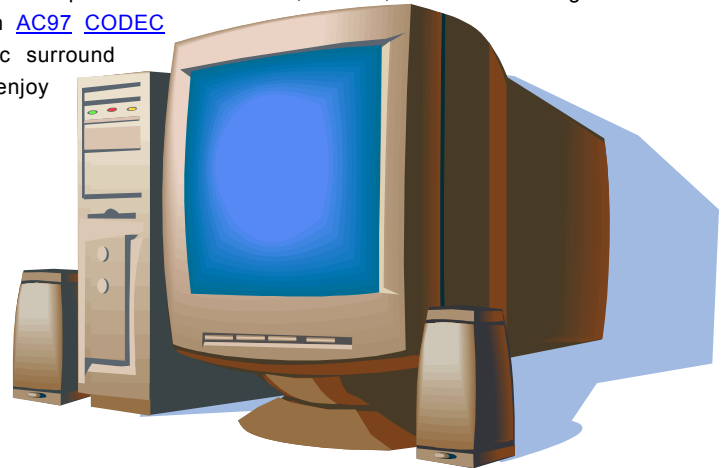
This Online Manual will introduce to the user how this product is installed. All useful information will be described in later chapters. Please keep this manual carefully for future upgrades or system configuration changes. This Online Manual is saved in [PDF format](#), we recommend using Adobe Acrobat Reader 4.0 for online viewing, it is included in [Bonus CD 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 MX4LR motherboard. The MX4LR is Intel® Socket 478 motherboard (M/B) based on the ATX form factor featuring the [Intel® 845GL\(Brookdale\) chipset](#). As high performance chipset built in the M/B, the MX4LR motherboard can support Intel® Socket 478 Pentium® 4 (Brookdale) and 400 MHz [Front Side Bus \(FSB\)](#) clock. According to different customer's requirements, the Intel 845GL chipset memory interface supports DDR266 SDRAM devices with densities of 64, 128, 256, 512Mb DDR SDRAM DIMM modules and the maximum memory size can be up to 2 GB. The onboard IDE controller supports [Ultra DMA 33/66/100](#) mode and the transfer rate up to 100MB/s. Further flexibility can be achieved by taking advantage of the [Communication and Network Riser \(CNR\)](#) card option that allows audio, modem, and/or LAN configuration on a single baseboard design. Besides, the MX4LR 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 MX4LR motherboard.



Feature Highlight

CPU

Supports Intel® Socket 478 Pentium® 4 (Brookdale) 1.4GHz~2.4GHz+ with 400MHz [Front Side Bus \(FSB\)](#) designed for Socket 478 technology.

Chipset

With the Intel® 845GL (Brookdale) chipset, Intel delivers a discrete graphics solution with all the performance, innovative features and proven reliability of the Intel® 845GL chipset. With its highly scalable design, the new 845GL chipset offers an ideal Multiplexed Intel DVO Port for Intel® Pentium® 4 processor platforms. And the smart integration in the Intel 845GL chipset's I/O Controller Hub (ICH4) features USB controllers supporting six USB2.0 ports. With support for AC'97 audio and the ability to make the most of soft audio/modem technology, the 845GL chipset delivers an ideal solution for innovative new form factors.

Expansion Slots

Including six 32-bit/33MHz PCI, one CNR and one Multiplexed Intel DVO Port. The [PCI](#) local bus throughput can be up to 132MB/s. The [Communication & Networking Riser \(CNR\)](#) slot provided from MX4LR can support CNR interface for a Modem/Audio card. The Multiplexed Intel DVO Port specification provides a new level of video display sophistication and speed which supports DVI/TV-Out add-on card. Of three PCI slots provided, all of them are master PCI slots with arbitration and decoding for all integrated functions and LPC bus.

Memory

Provides two 184-pin DDR [SDRAM](#) DIMM sockets that support up to 2GB of PC-266 compliant DDR SDRAM (Synchronous Dynamic Random Access Memory). You may install 64, 128, 256, 512Mb DDR SDRAM DIMM modules into each socket.

Ultra DMA 33/66/100 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](#) 33/66/100, PIO Modes 3 and 4 and Bus Master IDE DMA Mode 5, and supports Enhanced IDE devices.

On-board AC'97 Sound

MX4LR uses the [AC97](#) sound chip. This on-board audio includes a complete audio recording and playback system.

1MHz Stepping Frequency Adjustment

Provides "1MHz Stepping Frequency Adjustment" function in the BIOS. This magic function allows you adjust [FSB](#) frequency from 100~248 by 1MHz stepping adjustment, and lets your system can get maximum performance.

Watch Dog Timer

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

S/PDIF Connectors

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

Six USB2.0 Connectors

Provides three ports, six [USB](#) connectors for USB interface devices, such as mouse, keyboard, modem, scanner, etc.

AGP Protection Technology

With AGP Protection Technology implemented, this motherboard will automatically detect the voltage of AGP card and prevent your chipsets from being burnt out.

Power Management/Plug and Play

Supports the 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 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

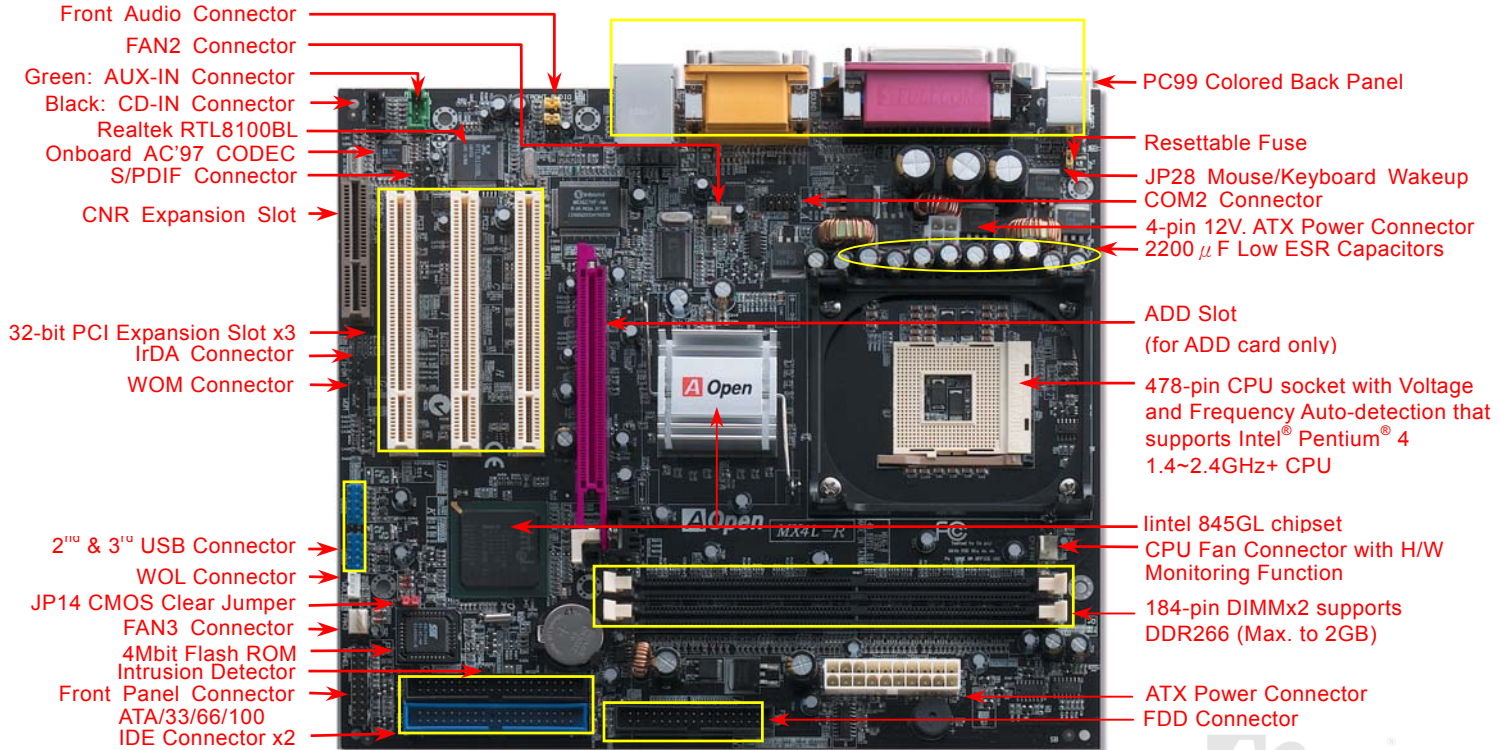
Provides two high-speed UART compatible serial ports and one parallel port with EPP and ECP capabilities. UART can also be directed from COM1 to the Infrared Module for the wireless connections.

Quick Installation Procedure

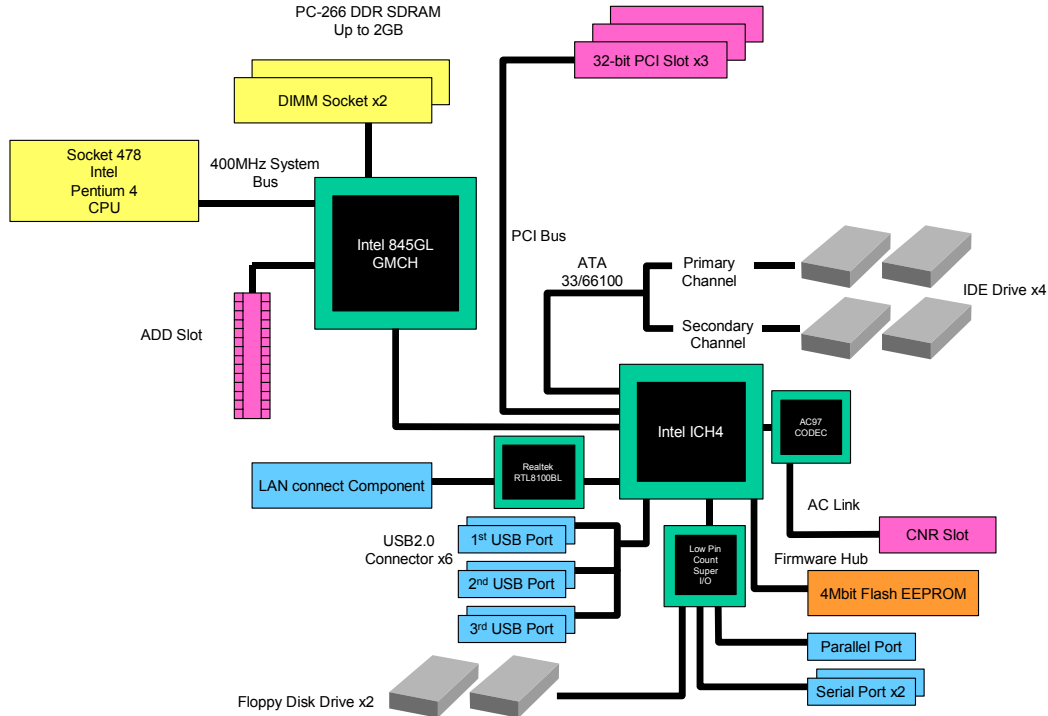
This page gives you a quick procedure on how to install your system. Follow each step accordingly.

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](#)

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 procedure requiring ESD protection.*

About “Optional” and “Upgrade Optional”...

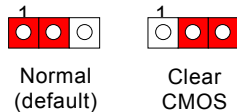
When you read this online manual and start to assemble your computer system, you may find some of functions are called “Optional”, and some are called “Upgrade Optional”. Though all AOpen motherboards include many amazing and powerful features, in some situations, these powerful features are not used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



JP14 Clear CMOS Data

You can clear CMOS to restore system default setting. To clear the 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 pins 1 & pin2.
5. Connect ATX power cable back to connector PWR2.



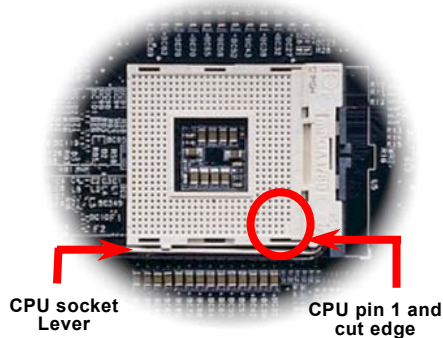
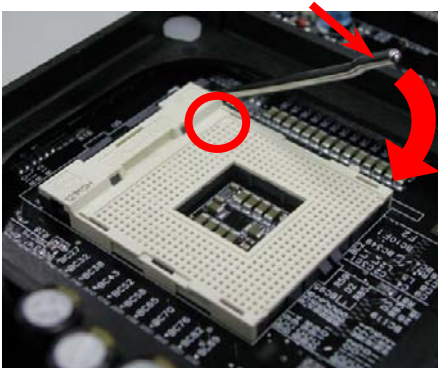
Tip: When should I Clear CMOS?

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

CPU Installation

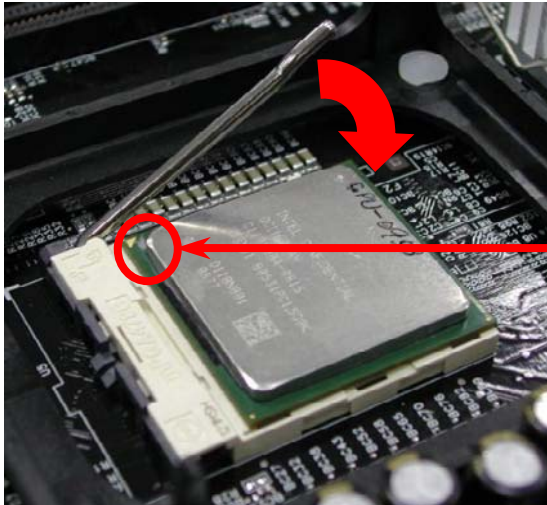
This motherboard supports Intel® Pentium 4 Socket 478 series CPU (Brookdale). Be careful of CPU orientation when you plug it into CPU socket.

1. Pull up the CPU socket lever and up to 90-degree angle.
2. Locate Pin 1 in the socket and look for a cut edge on the CPU upper interface. Match Pin 1 and cut edge, then insert the CPU into the socket.



Note: These pictures are 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.

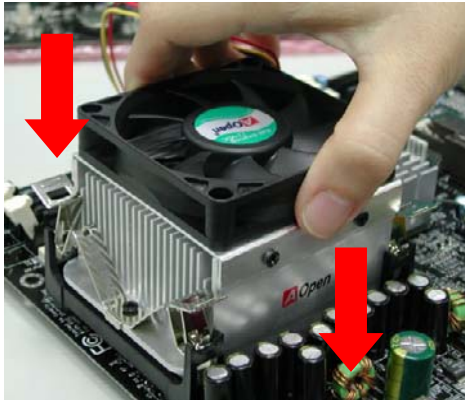
Note: This socket supports Micro-FC-PGA2 package CPU, which is the latest CPU package developed by Intel. Other forms of CPU package are impossible to be fitted in.

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

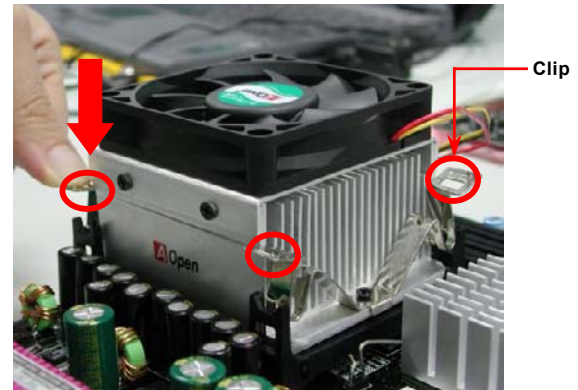
CPU Fan Installation

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.

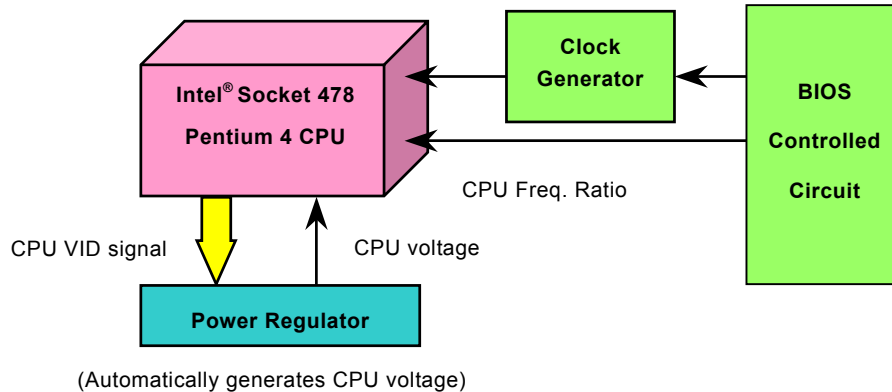


2. Pressing down the four clips with force one by one on the retention module.



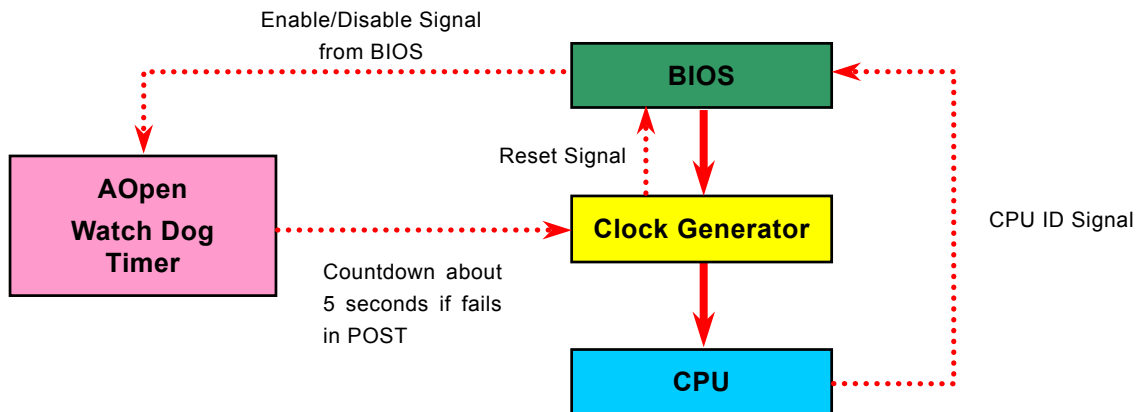
CPU Jumper-less Design

CPU VID signal and [SMBus](#) clock generator provide CPU voltage auto-detection and allows the user to set the CPU frequency through the [BIOS setup](#), therefore no jumpers or switches are used. The disadvantages of the Pentium based jumper-less designs are eliminated. There will be no worry of wrong CPU voltage detection.



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.



Full-range Adjustable CPU Core Voltage

This function is dedicated to overclockers and supports Adjustable CPU Core Voltage from 1.10V to 1.85V. But this motherboard can also automatically detects 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.

CPU Ratio	8x, 9x, 10x,...22x, 23x, 24x
CPU FSB	100~248MHz



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 Timer" reset the system after five seconds and system will auto-detect hardware again.

Core Frequency = CPU FSB Clock * CPU Ratio

PCI Clock = CPU FSB Clock / Clock Ratio

AGP Clock = PCI Clock x 2

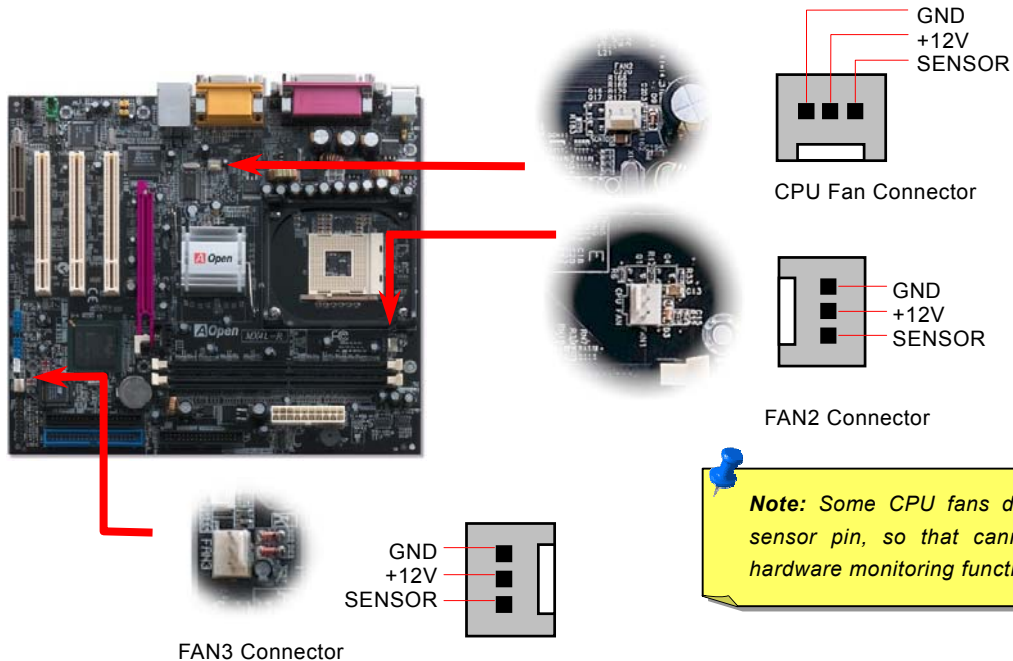
Northwood CPU	CPU Core Frequency	FSB Clock	System Bus	Ratio
Pentium 4 1.6G	1600MHz	100MHz	400MHz	16x
Pentium 4 1.8G	1800MHz	100MHz	400MHz	18x
Pentium 4 2.0G	2000MHz	100MHz	400MHz	20x
Pentium 4 2.2G	2200MHz	100MHz	400MHz	22x
Pentium 4 2.4G	2400MHz	100MHz	400MHz	24x
Williamett CPU	CPU Core Frequency	FSB 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

Warning: Intel® 845GL (MX4LR) chipset supports maximum 400MHz (100MHz*4) system bus and 66MHz AGP clock; higher clock setting may cause serious system damage.

Warning: To avoid possible CPU damage caused by overheating, an automatic shutdown of system had been especially designed on this motherboard. System would be automatically power off when this motherboard with implementation of THERMTRIP circuit detected a CPU temperature above 135 degree.

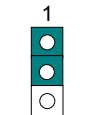
CPU and System Fan Connector (with H/W Monitoring)

Plug in the CPU fan cable to the 3-pin **CPU FAN** connector. If you have chassis fan, you can also plug it on **System Fan (FAN2)** or **FAN3 (AUX Fan)** connector.



JP28 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. The factory default setting is set to "Disable"(1-2), and you may enable this function by setting the jumper to 2-3.



Enable
(Default)



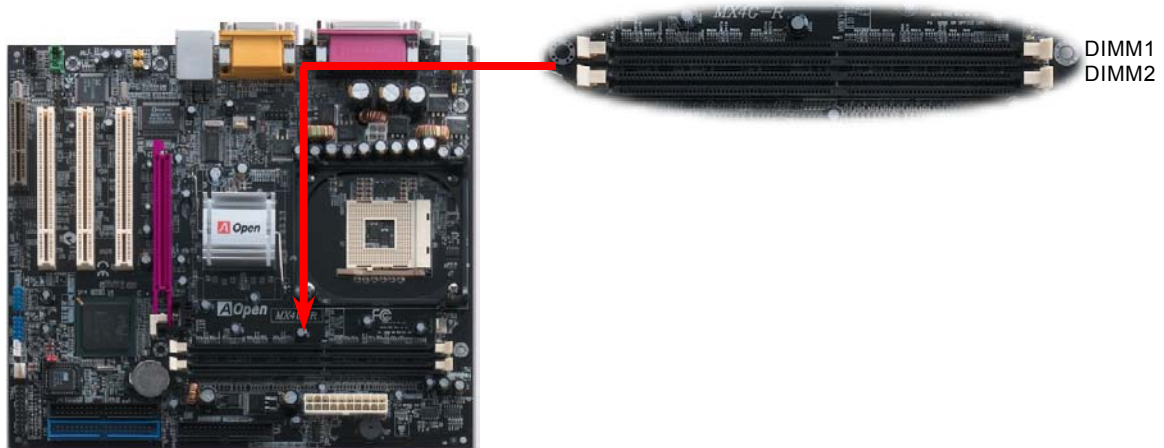
Disable



JP28
KB/Mouse Wake-up

DIMM Sockets

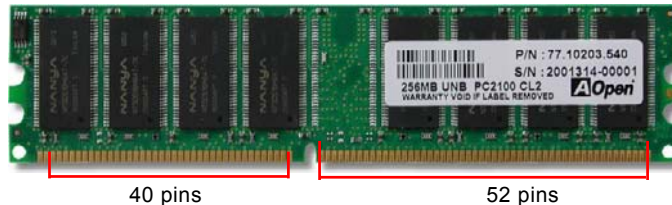
This motherboard has two 184-pin DDR [DIMM](#) sockets that allow you to install [PC266](#) memory up to 2GB. Both ECC and Non-ECC DDR SDRAM are supported, but you can't install them both on DIMM. Otherwise, it will cause serious damage on memory sockets or SDRAM module.



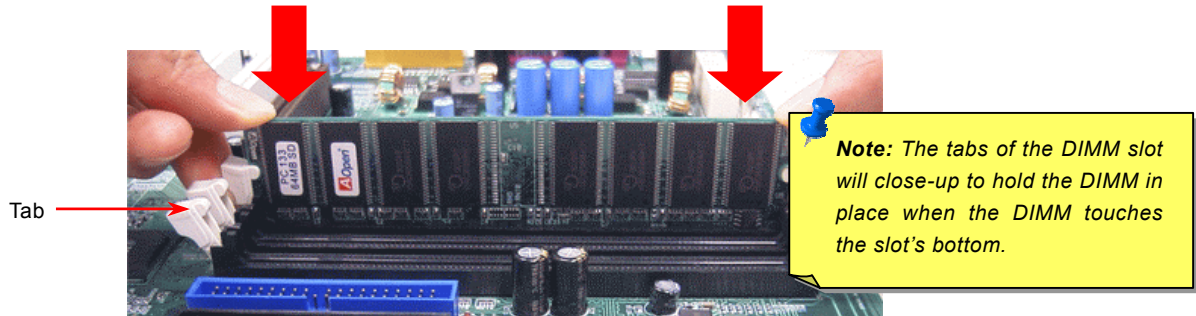
How to Install Memory Modules

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.

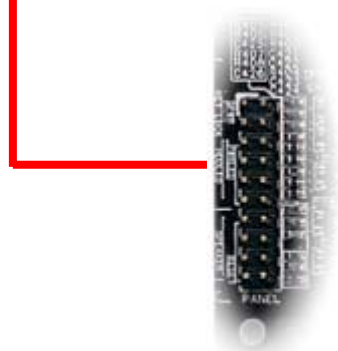


2. Insert the module straight down to the DIMM slot with both hands and press down firmly until the DIMM module is securely in place.



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

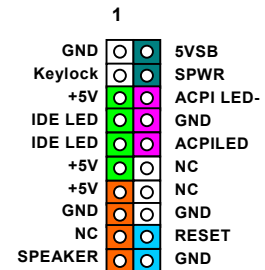
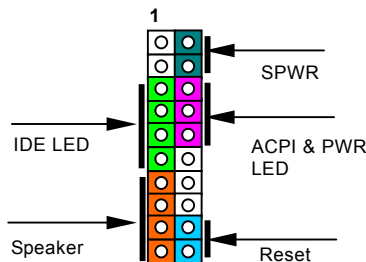
Front Panel Connector



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.

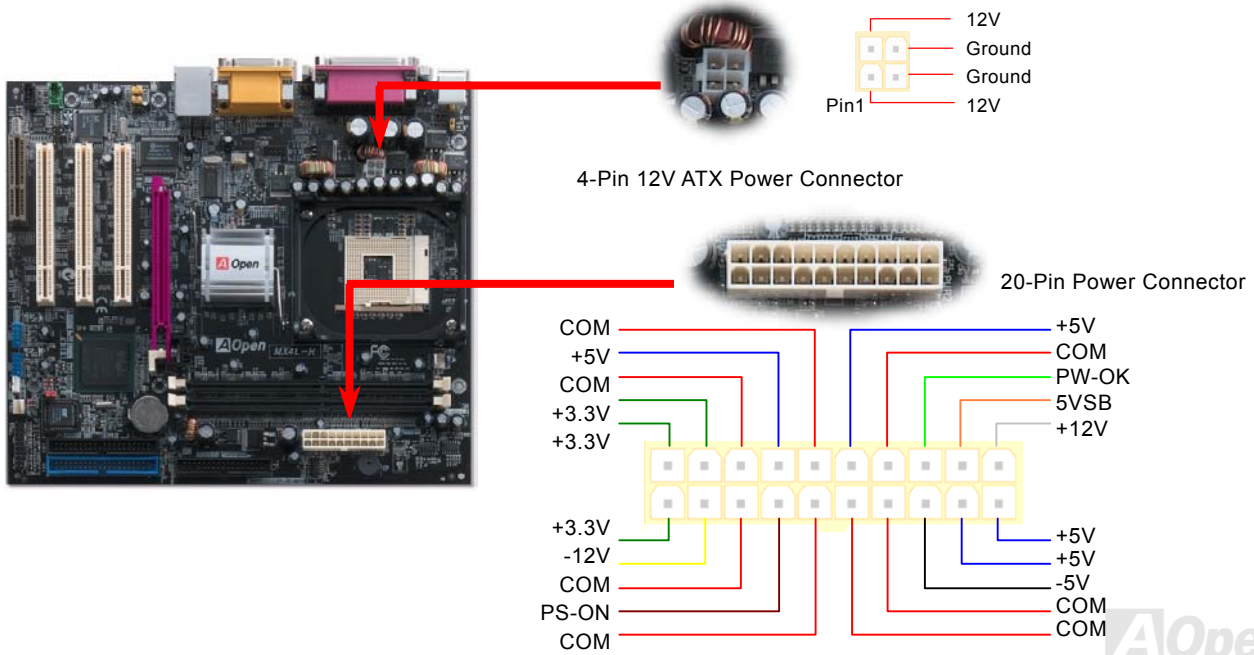
Locate the power switch cable from your ATX housing. It is 2-pin female connector from the housing front panel. Plug this connector to the soft-power switch connector marked **SPWR**.

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



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.



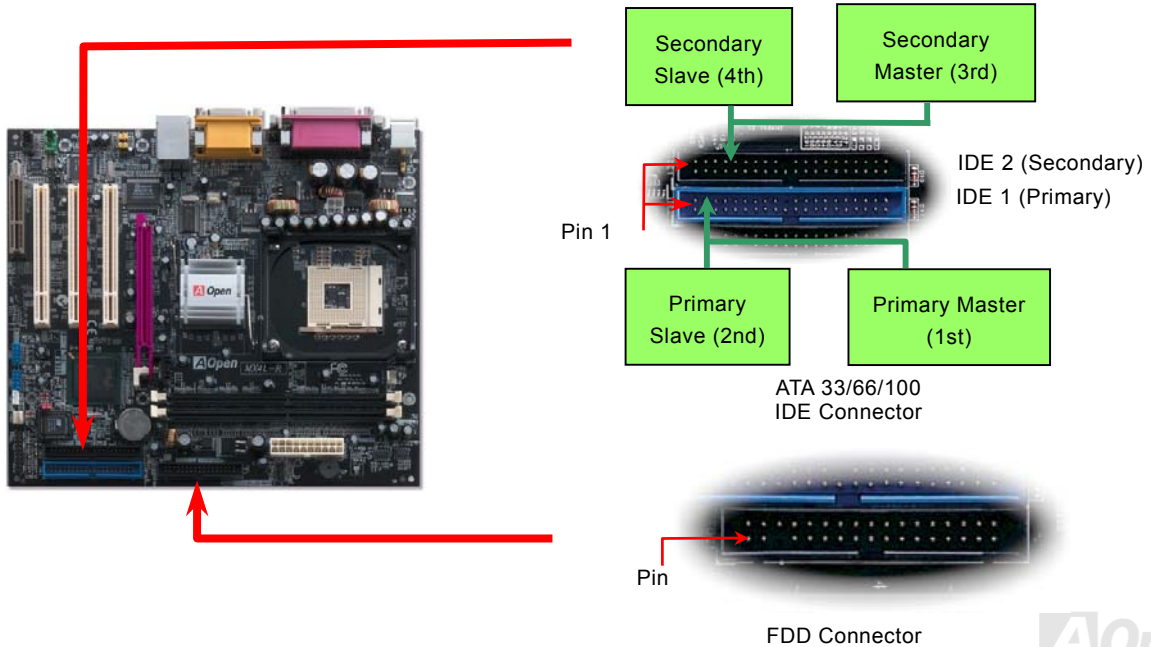
AC Power Auto Recovery

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.



IDE and Floppy Connector

Connect 34-pin floppy cable and 40-pin IDE cable to floppy connector FDC and IDE connector. The blue connector is IDE1 for clear identification. Be careful of the pin1 orientation. Wrong orientation may cause system damage.



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.

This motherboard supports [ATA33](#), [ATA66](#) or [ATA100](#) 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.

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	$(1/120\text{ns}) \times 2\text{byte} = 16.6\text{MB/s}$
ATA 33	30ns	4	120ns	$(1/120\text{ns}) \times 2\text{byte} \times 2 = 33\text{MB/s}$
ATA 66	30ns	2	60ns	$(1/60\text{ns}) \times 2\text{byte} \times 2 = 66\text{MB/s}$
ATA100	20ns	2	40ns	$(1/40\text{ns}) \times 2\text{byte} \times 2 = 100\text{MB/s}$

Tip:

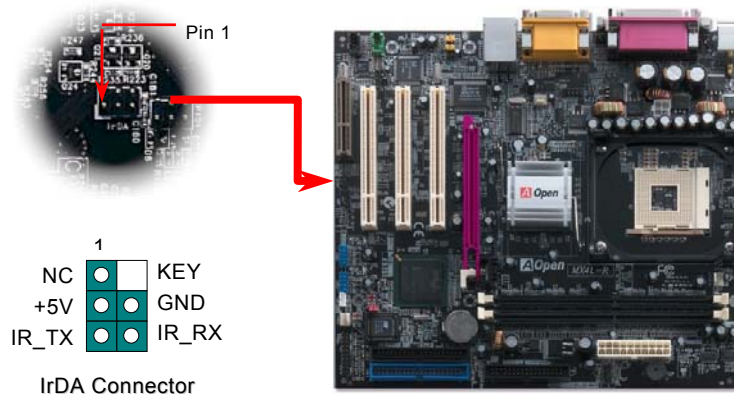
1. For better signal quality, it is recommended to set the far end side device to master mode and follow the suggested sequence to install your new device. Please refer to above diagram
2. To achieve the best performance of Ultra DMA 66/100 hard disks, a special **80-wires IDE cable** for Ultra DMA 66/100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

IrDA Connector

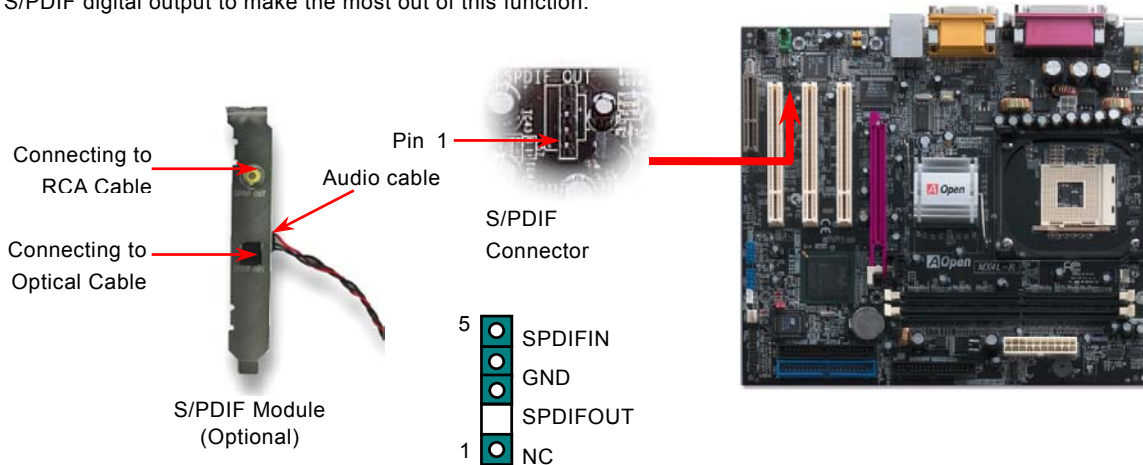
The IrDA connector can be configured to support wireless infrared module, with this module and application software such as Laplink or Windows 95 Direct Cable Connection, the user can transfer files to or from laptops, notebooks, PDA devices and printers. This connector supports HPSIR (115.2Kbps, 2 meters)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



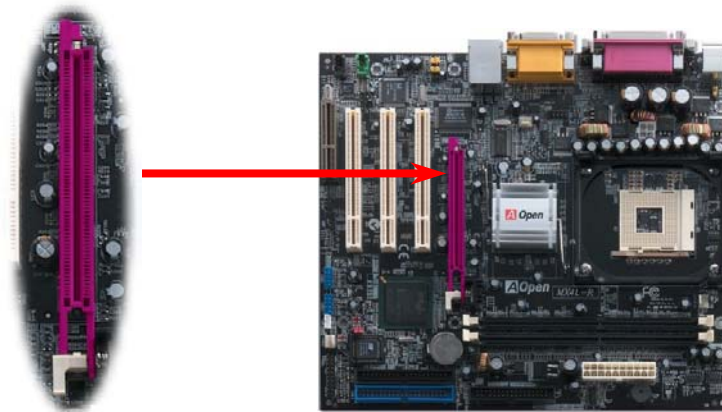
S/PDIF (Sony/Philips Digital Interface) Connector

S/PDIF (Sony/Philips Digital Interface) is a newest audio transfer file format, which provides impressive quality through optical fiber and allows you to enjoy digital audio instead of analog audio. 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. 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. However, you must have a S/PDIF supported speaker with S/PDIF digital input to connect to the S/PDIF digital output to make the most out of this function.



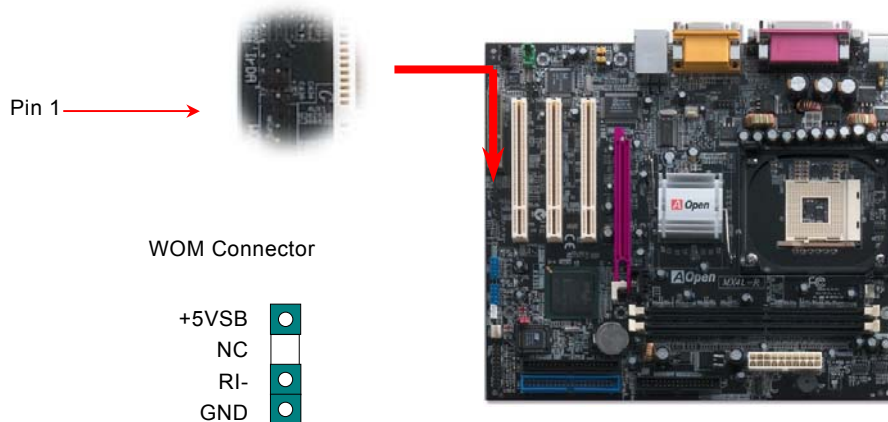
ADD (AGP Digital Display) Slot

AGP Digital Display card is designed by Intel to multiplex the AGP signal interface with two DVO ports, and is designed to plug into the special-designed purple slot as you can see, which we call ADD slot here. The function of these two DVO ports is to support a variety of digital display devices, such as LCDs and Digital-input CRT, and is possible to use in dual-channel mode to support higher resolution and refresh rate, while deliver digital signal from source to display to preserve signal integrity and the viewable image quality. Please note that this ADD slot supports ADD cards only.



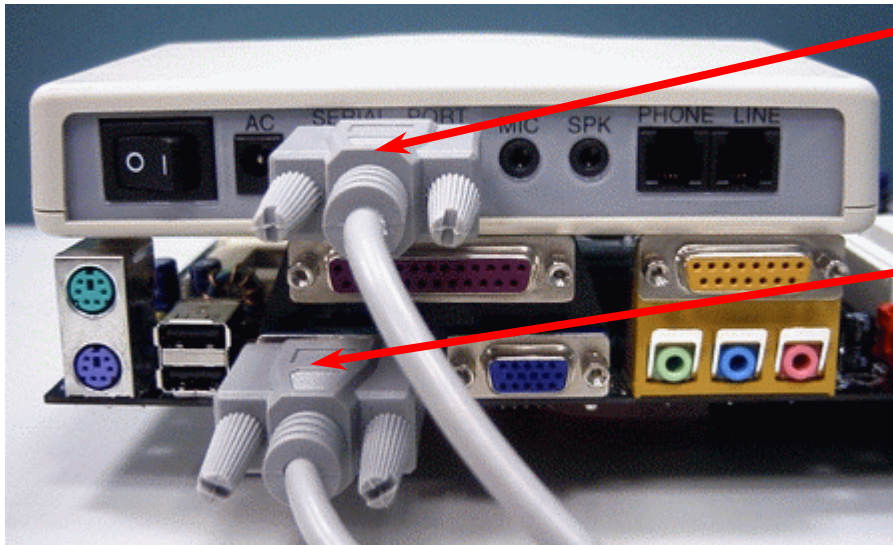
WOM (Zero Voltage Wake on Modem) Connector

This motherboard implements special circuit to support Wake On Modem, both Internal modem card and external box modem are supported. Since Internal modem card consumes no power when system power is off, it is recommended to use an internal modem. To use internal modem, connect 4-pin cable from RING connector of modem card to the WOM connector on the motherboard.



WOM by External BOX Modem

Traditional Green PC suspend mode does not really turn off the system power supply, it uses external box modem to trigger MB COM port and resume back to active.



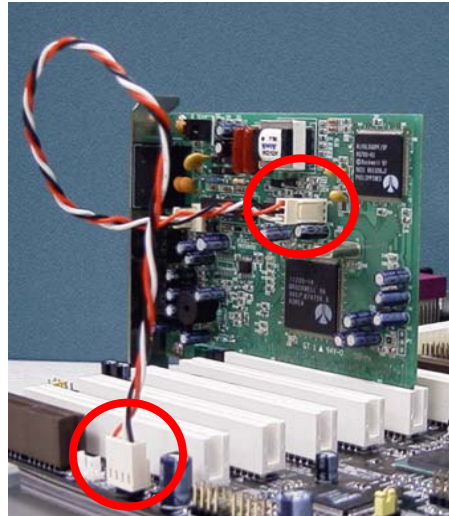
Serial Port
(Modem Side)

Serial Port
(Motherboard Side)

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

WOM by Internal Modem Card

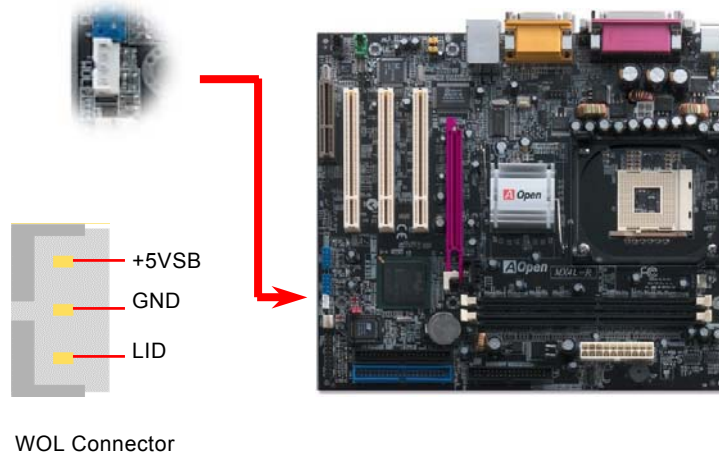
With the help of the ATX soft power On/Off, it is possible to have a system totally power off, and wakeup to automatically answer a phone call as an answering machine or to send/receive a fax. You may identify whether or not your system is in true power off mode by checking to see if the fan of your power supply is off. Both an external box modem and an internal modem card can be used to support Modem Wake Up, but if you use an external modem, you have to leave your box modem on.

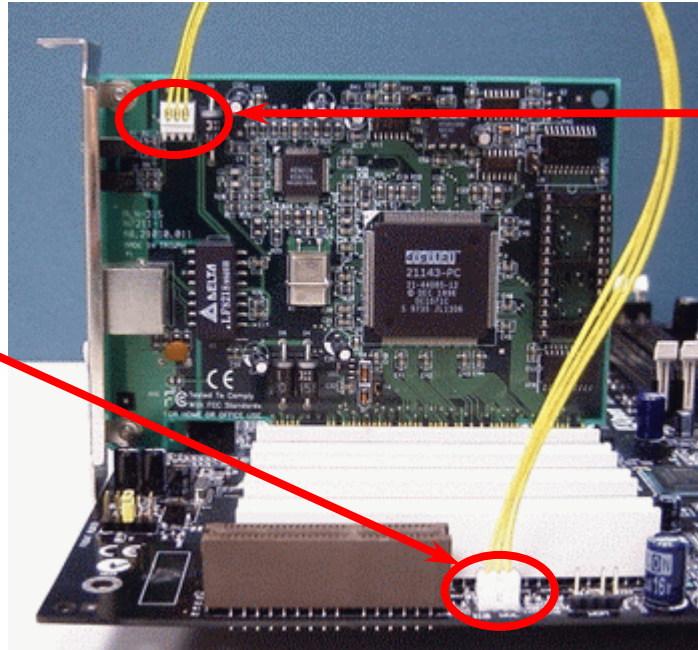


Note: This picture is for example only, it may not be exactly the same as this motherboard.

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 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.





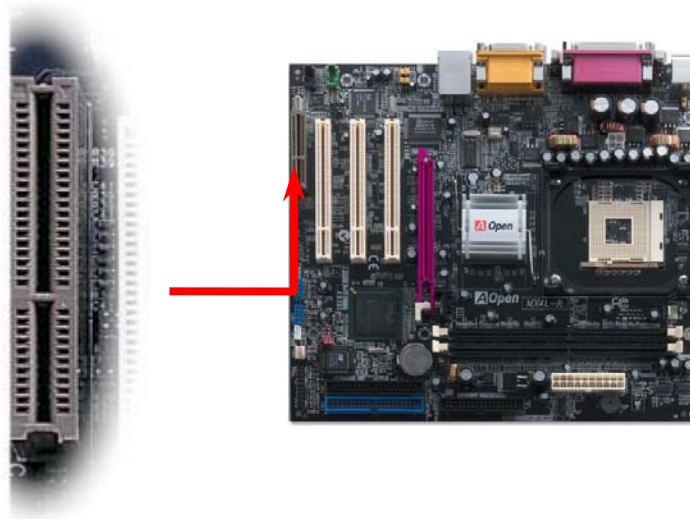
WOL Connector
(Ethernet Card Side)

WOL Connector
(Motherboard Side)

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

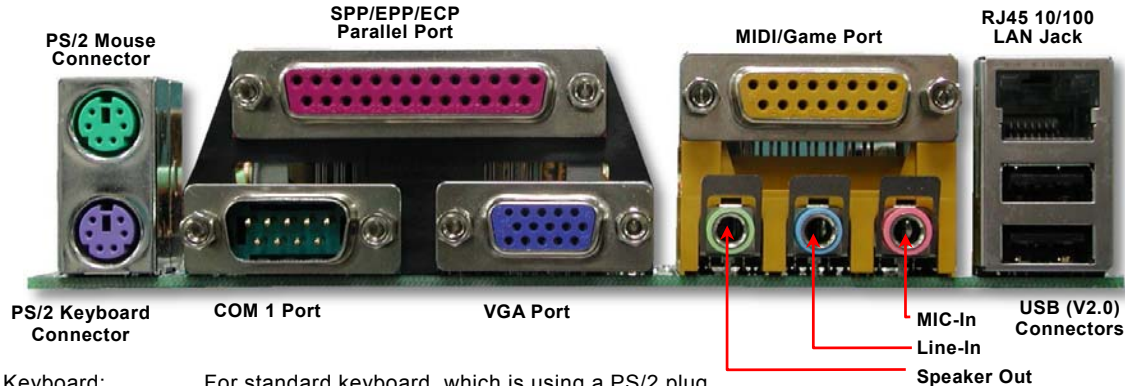
CNR (Communication and Network Riser) Expansion Slot

[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 analog 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.



PC99 Color Coded Back Panel

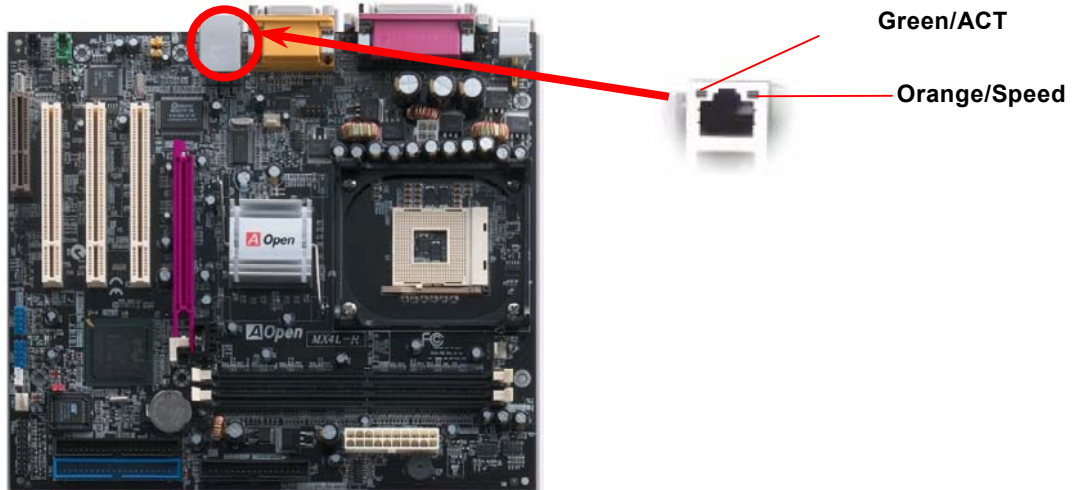
The onboard I/O devices are PS/2 Keyboard, PS/2 Mouse, COM1 and VGA, Printer, [USB](#), AC97 sound and game ports. The view angle of drawing shown here is from the back panel of the housing.



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.
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.
MIDI/Game Port:	For 15-pin PC joystick, game pad or MIDI devices.

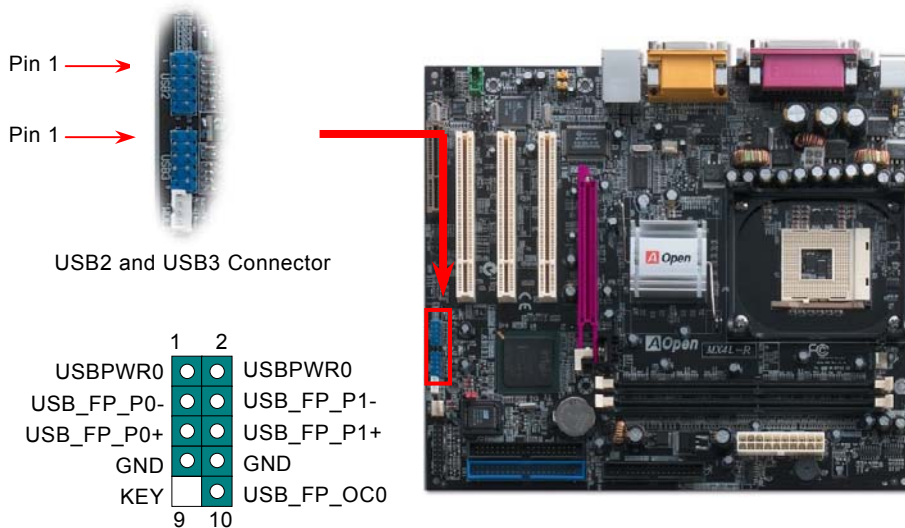
Support 10/100 Mbps LAN onboard

The South Bridge ICH4 includes a fast Ethernet controller on chip. On the strength of Realtek 8100BL LAN controller 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.



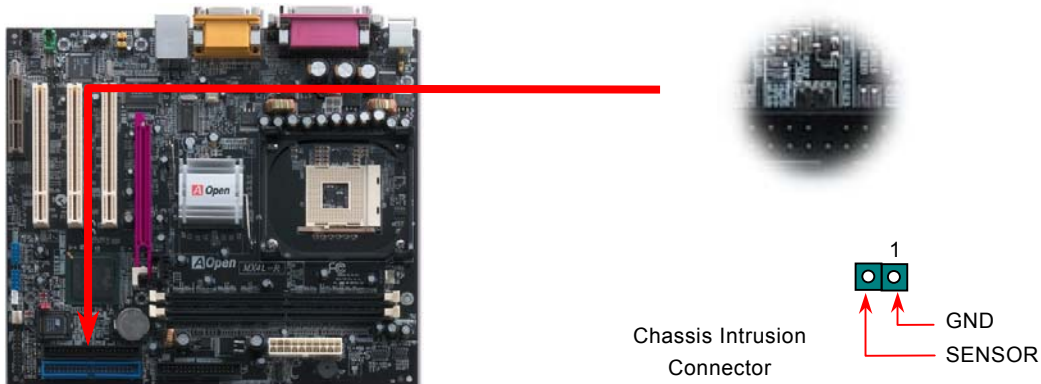
Support 2nd and 3rd USB2.0 Ports

Compared to traditional USB 1.0/1.1 with the speed of 12Mbps, USB 2.0 has a fancy speed up to 480Mbps which 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, USB2 and USB3 connectors support USB 2.0 function. To connect those two headers, you have to use proper USB cables and connect them to any USB models.



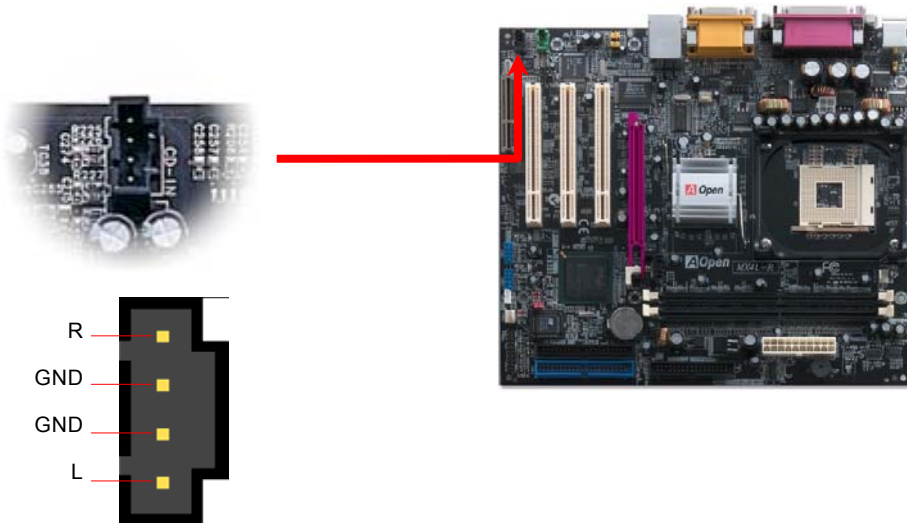
Chassis Intrusion Connector

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 the 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

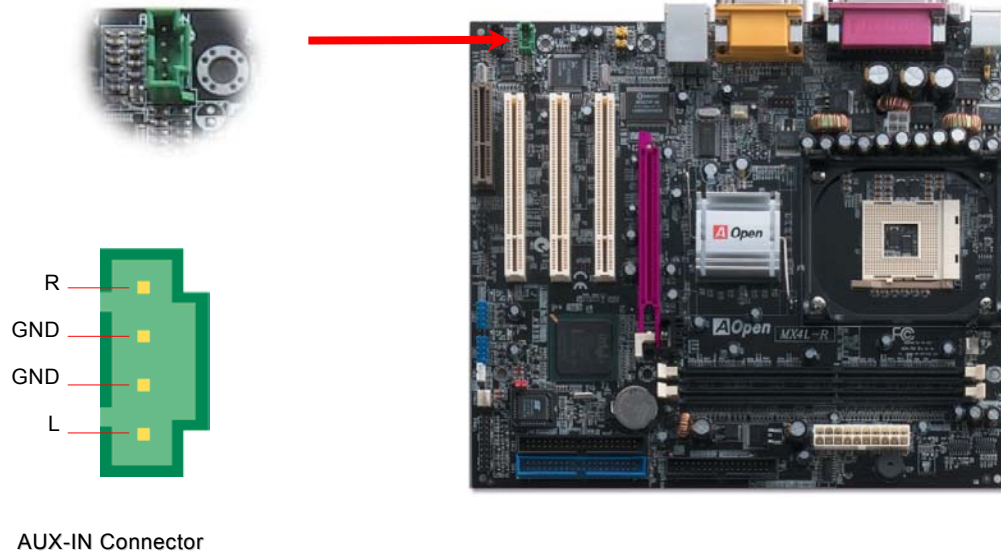
This connector is used to connect CD Audio cable from CDROM or DVD drive to onboard sound.



CD-IN Connector

AUX-IN Connector

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



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

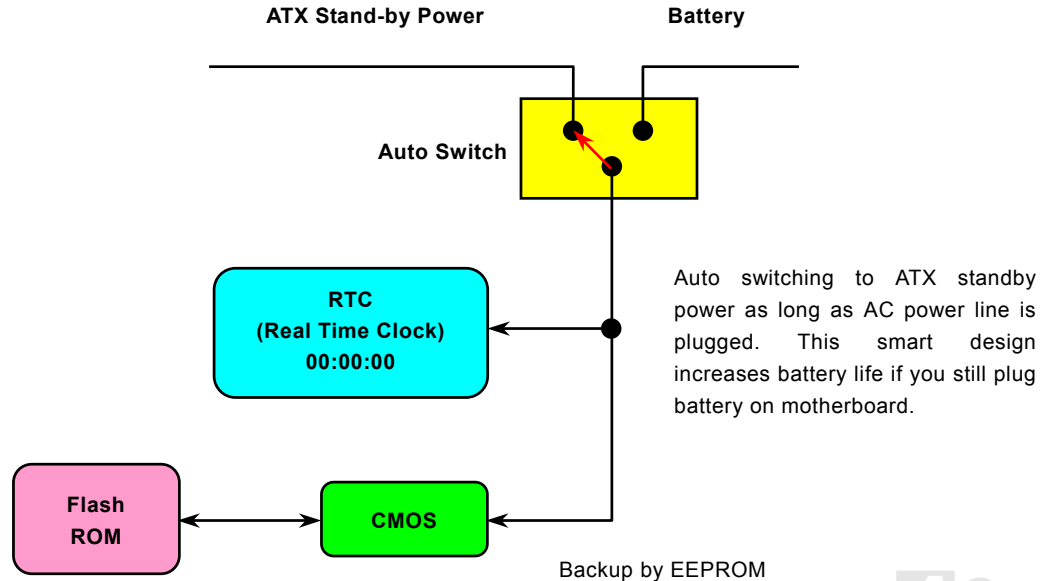


	1	2	
AUD_MIC	●	●	AUD_GND
AUD_MIC_BIAS	●	●	AUD_VCC
AUD_FPOUT_R	●	●	AUD_RET_R
NC	●	□	KEY
AUD_FROUT_L	●	●	AUD_RET_L
	9	10	

Note: Please remove the jumper cap from the Front Panel Audio Connector before you connect the cable. Do not remove this yellow jumper cap if housing without an audio port on the front panel.

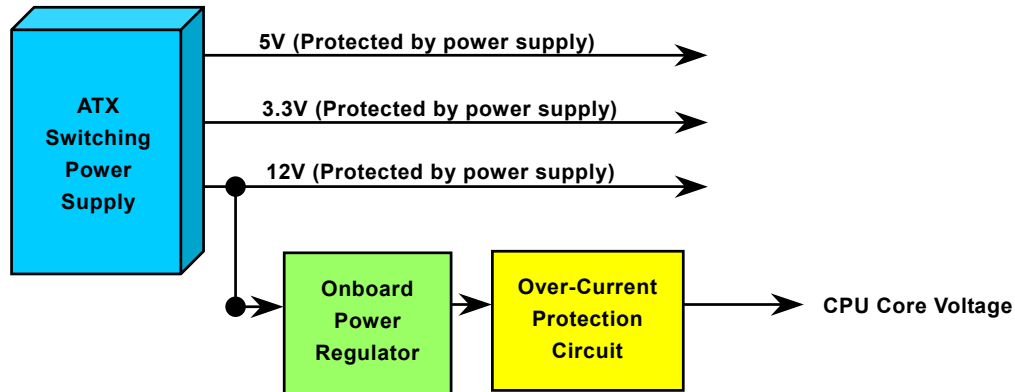
Battery-less and Long Life Design

This Motherboard implements [Flash ROM](#) and a special circuit that allows you to save your current CPU and CMOS Setup configurations without the need of a 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.



CPU Over-current Protection

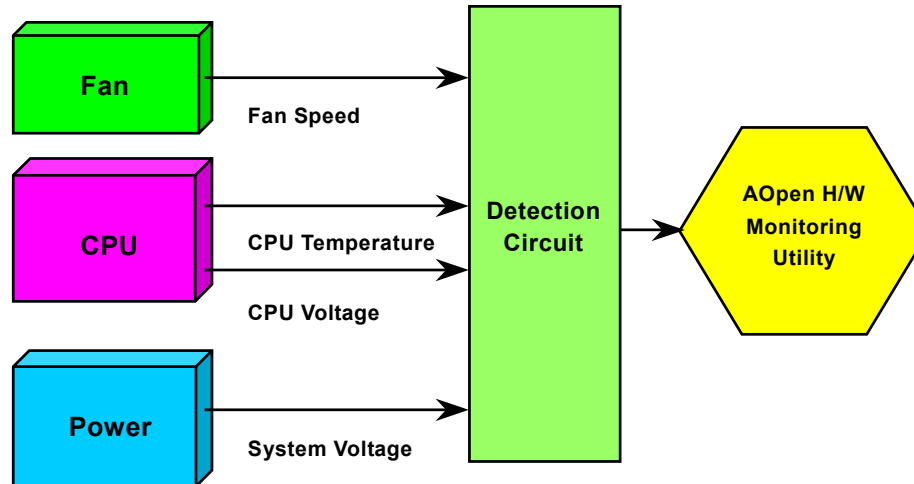
Over Current Protection has been popularly implemented on ATX 3.3V/5V/12V switching power supply for a while. However, new generation CPU is able to use regulator of different voltages to transfer 12V to CPU voltage (for example, to 2.0V). This motherboard is with switching regulator onboard that supports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

Hardware Monitoring

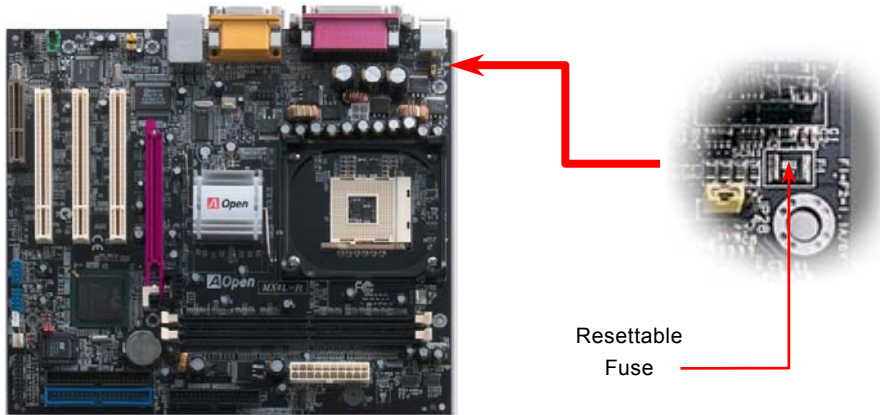
This motherboard implements a hardware monitoring system. As you turn on your system, this smart design will continue to monitor your system's working voltage, fan status and CPU temperature. If any of these systems' status goes wrong, there will be an alarm through the chassis external speaker or buzzer of motherboard (if existed) to warn the user.



Resettable Fuse

Traditional motherboard has fuse for Keyboard and [USB](#) port to prevent over-current or shortage. These fuses are soldered onboard that when it is broken (function as protecting the motherboard), user still cannot replace it and the motherboard is still malfunctioning.

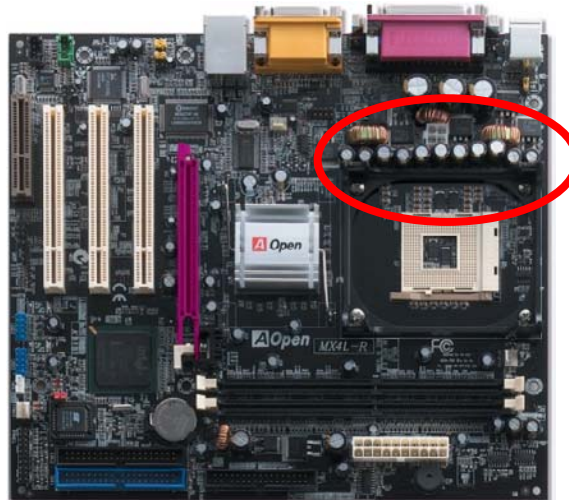
With expensive Resettable Fuse, the motherboard can be resumed back to normal function after the fuse had done its protection job.



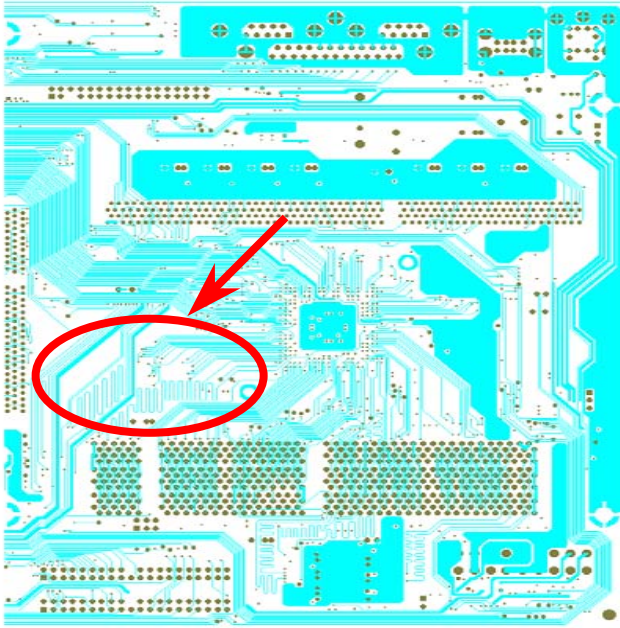
2200 μ F Low ESR Capacitor

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, MX4LR implements 2200 μ F capacitors, which is much larger than normal capacitor (1000 and 1500 μ f) and it provides better stability for CPU power.



Layout (Frequency Isolation Wall)

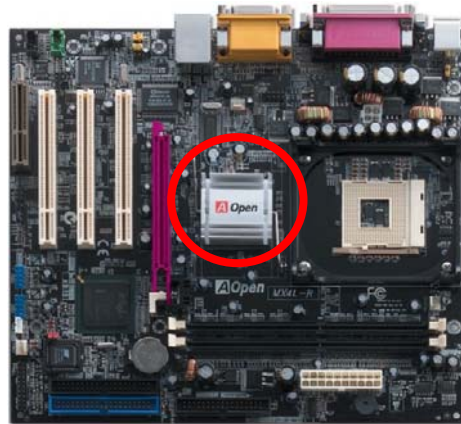


For high frequency operation, especially overclocking, layout is the most important factor to make sure chipset and CPU working in stable condition. The layout of this motherboard implements AOpen's unique design called " Frequency Isolation Wall". Separating each critical portion of motherboard into regions where each region operates in a same or similar frequency range to avoid cross talk and frequency interference between each region's operations and condition. The trace length and route must be calculated carefully. For example, the clock trace must be equal length (not necessarily as short as possible) so that clock skew will be controlled within few a pico second ($1/10^{12}$ Sec)

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

Enlarged Aluminum Heatsink

Cool down CPU and Chipset is important for system reliability. Enlarged aluminum heat sink provides better heat consumption especially when you are trying to over clocking the CPU.



Driver and Utility

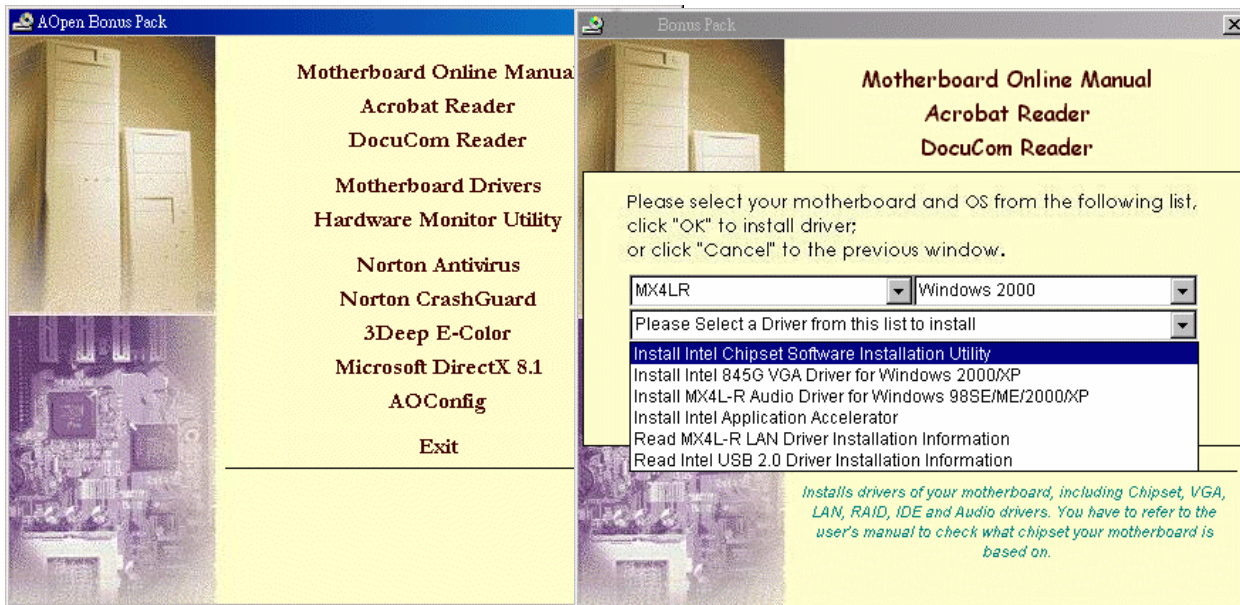
There are motherboard drivers and utilities included in [AOpen Bonus CD disc](#). You don't need to install all of them in order to boot your system. But after you finish the hardware installation, you have to install your operation system first (such as Windows 98) before you can install any drivers or utilities. Please refer to your operation system's installation guide.



Note: Please follow recommended procedure to install [Windows 2000](#) and [Windows 98](#)

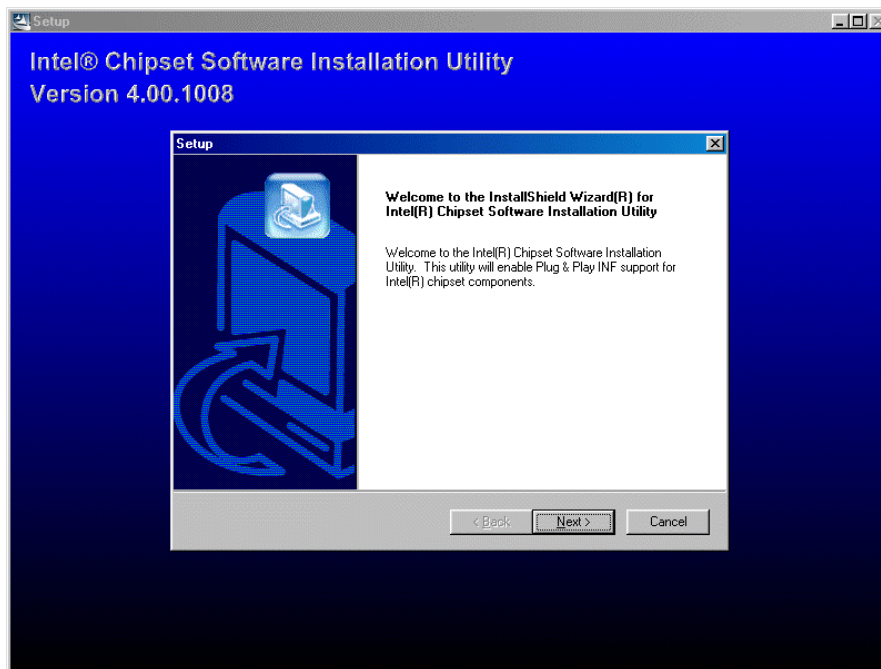
Auto-run Menu from Bonus CD Disc

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



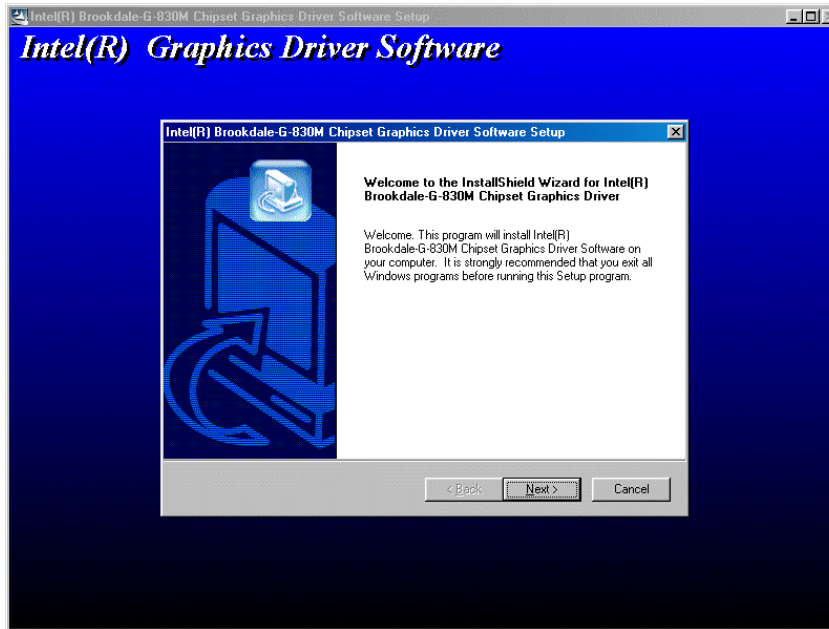
Installing Intel® Chipset Software Installation Utility

Windows 95/98 cannot recognize this chipset, because it was released before the Intel 845GL chipset. You can install the Intel INF Update Utility from the Bonus Pack CD disc auto-run menu to eliminate the “?” marks.



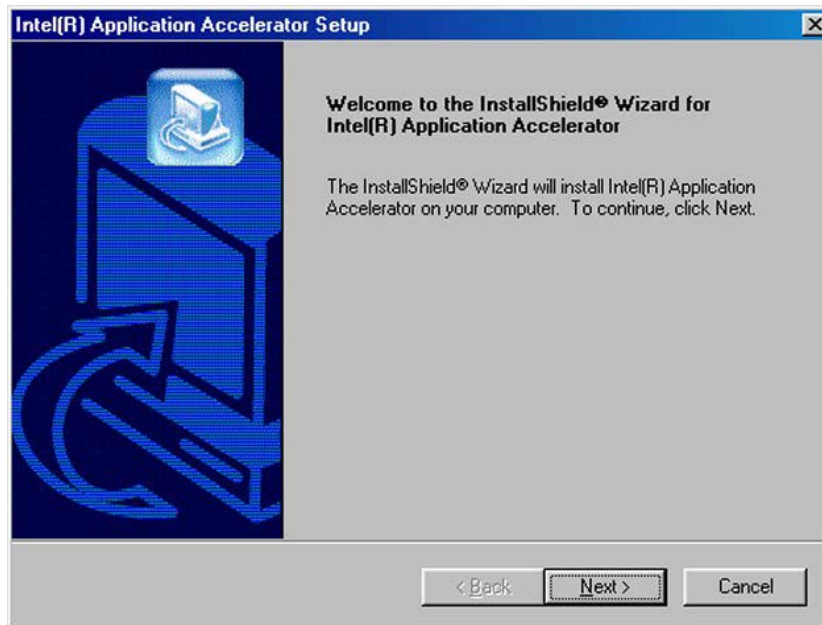
Intel VGA driver

You can install Intel VGA Driver to get the best graphics function of the chipset. You can find it in the [AOpen Bonus Pack](#) CD disc.



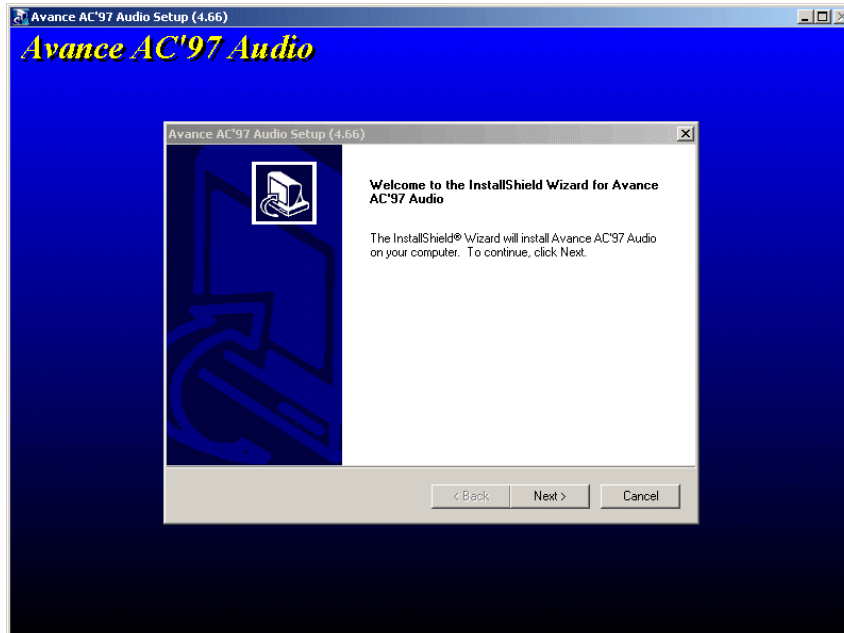
Installing Intel IAA Driver

You can install Intel IAA Driver to increase the performance of software applications and reduce PC boot times. You can find it in the [AOpen Bonus Pack](#) CD disc.



Installing Onboard Sound Driver

This motherboard comes with [AC97 CODEC](#). You can find the audio driver from the Bonus Pack CD disc auto-run menu.



Installing LAN Driver

You can install LAN Driver under Windows95/98, Windows NT and Windows 2000 for RealTek 8100BL PCI Fast Ethernet adapter by following steps.

Installing driver procedure on Microsoft Windows 95 :

1. Select "Driver from disk provided by hardware manufacturer" when being asked which driver you would like to install.
2. Specify the setup file pathname
[CD-ROM]:Driver\LAN\RTL8100\Windows\Win95\WIN95A (for Windows 95 and Win95A) or
[CD-ROM]:Driver\LAN\RTL8100\Windows\Win95 (for Windows 95 OSR2).
3. Follow the procedure and insert Windows 95 system disk to complete setup step.
4. Windows 95 will finish the other installation procedures automatically, and then restart your system.

Installing driver for Win98/Win98 SE/Windows2000/Windows ME :

1. Select "Driver from disk provided by hardware manufacturer" when being asked which driver you would like to install.
2. Specify the setup file pathname
[CD-ROM]:Driver\LAN\RTL8100\Windows\WIN98 (for Windows 98/98 SE) or
[CD-ROM]:Driver\LAN\RTL8100\Windows\WIN2000 (for Windows 2000) or
[CD-ROM]:Driver\LAN\RTL8100\Windows\Windows ME (for Windows ME)
3. Follow the procedure and insert your system disk (Win98/Win98 SE/Windows2000/Windows ME) to complete setup step.
4. Win98/Win98 SE/Windows2000/Windows ME will finish the other installation procedures automatically, and then restart your system.

Installing USB2.0 Driver

* Windows 2000 Installation Guide

Installing Driver in Existing Windows 2000 System

After enabling the USB 2.0 controller and rebooting your system, Windows 2000 setup will show a "New Hardware Found" dialog box. Under Windows 2000, "Universal Serial Bus (USB) Controller" will be displayed.

1. Choose "Search for a suitable driver for my device (Recommended)". from the list, and then press "Enter".
2. Choose "Specify a location." and then press "Next"
3. Insert the Bonus CD in CD-ROM.
4. Type "[CD-ROM]:\Driver\Intel\USB2.0" in the text box that appears. Press " OK ".
5. Click on "Next." A message informing you that Windows has found "Intel (R) USB Enhanced Host Controller (ICH4)" should appear.
6. Click on "Next," and then on "Finish."

Confirming Windows 2000 Installation

1. From Windows 2000, open the Control Panel from "My Computer" followed by the System icon.
2. Choose the "Hardware" tab, and then click the "Device Manager" tab.
3. Click the "+" in front of "Universal Serial Bus controllers". "Intel (R) USB Enhanced Host Controller (ICH4)" should appear.

* Windows XP Installation Guide

Installing Driver in Existing Windows XP System

After enabling the USB 2.0, Windows XP setup will show a "Found New Hardware" dialog box. Under Windows XP, "Universal Serial Bus (USB) Controller" will be displayed.

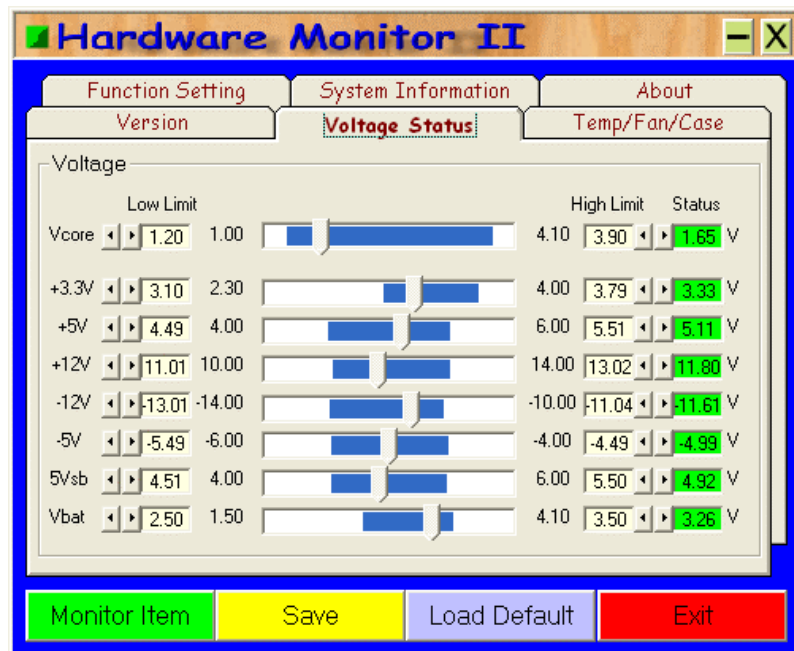
1. Click on "Next," and from the generated list box, choose "Install from a list or special location (Advanced)", click "Next"
2. Click on "Next," and from the generated choices, choose "Include this location in the search:"
3. Insert the Bonus CD in CD-ROM.
4. Type "[CD-ROM]:\Driver\Intel\USB2.0" in the text box that appears.
5. Click on "Next." A message informing you that Windows XP has found "Intel (R) USB Enhanced Host Controller (ICH4)" should appear.
6. When the New Hardware Wizard has finished installing the USB driver, click on "Finish"

Confirming Windows XP Installation

1. From Windows XP, open the Control Panel from "My Computer".
2. Click on "Performance and maintenance".
3. Click on the "System" icon.
4. Choose the "Hardware" tab, and then click the "Device Manager" tab.
5. Click the "+" in front of "Universal Serial Bus Controllers". "Intel (R) USB Enhanced Host Controller (ICH4)" should appear.

Installing Hardware Monitoring Utility

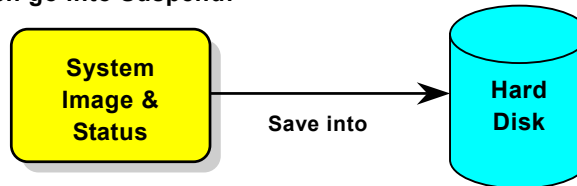
You can install Hardware Monitoring Utility to monitor CPU temperature, fans and system voltage. The hardware monitoring function is automatically implemented by the BIOS and utility software. No hardware installation is needed.



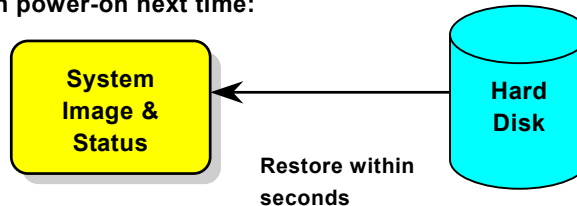
ACPI Suspend to Hard Drive

[ACPI](#) Suspend to Hard Drive is basically controlled by Windows operation system. It saves your current work (system status, memory and screen image) into hard disk, and then the system can be totally power off. Next time, when power is on, you can resume your original work directly from hard disk within few seconds without go through the Windows booting process and run your application again. If your memory is 64MB, normally, you need to reserve at least 64MB HDD space to save your memory image.

When go into Suspend:



When power-on next time:



System Requirement

1. **AOZVHDD.EXE 1.30b** or later.
2. Delete **config.sys** and **autoexec.bat**.

Fresh installation of Windows 98 on a new system

1. Execute "**Setup.exe /p j**" to install Windows 98
2. After Windows 98's installation is complete, go to the **Control Panel > Power Management**.
 - a. Set **Power Schemes > System Standby** to "Never".
 - b. Click on "Hibernate" and select "Enable Hibernate Support" then "Apply".
 - c. Click on the "Advanced" tab, you'll see "Hibernate" on "Power Buttons". Note that this option will only be seen after step b mentioned above has been completed; otherwise only "Standby" and "Shutdown" will be shown. Select "Hibernate" and "Apply".
3. Clean boot into DOS and run AOZVHDD utility.
 - a. If you assign the whole disk to your Win 98 system (FAT 16 or FAT 32), please run "**aozvhd /c /file**". Please remember sufficient free space has to be reserved in the disk, e.g. if you have 64 MB DRAM and 16 MB VGA card installed, the system needs at least 80 MB free space. The utility will locate the space automatically.
 - b. If you assign an individual partition for Win 98, please run "**aozvhd /c /partition**". Of course, the system needs to provide unformatted an empty partition.
4. Reboot system.
5. You've already implemented ACPI Suspend to-Hard Drive. Click "**Start > Shut Down > Standby**" then the screen will go off

immediately. And 1 minute or so will be taken for the system to save what's in the memory to the hard drive; the larger the memory size the longer this process will take.

Changing from APM to ACPI (Windows 98 only)

1. Run "Regedit.exe"

- a. Go through the following path

HKEY_LOCAL_MACHINE

SOFTWARE

MICROSOFT

WINDOWS

CURRENT VERSION

DETECT

- b. Select "ADD Binary" and name it as "**ACPIOPTION**".
- c. Right click and select Modify, add "01" after "0000" to make it "0000 01".
- d. Save changes.

2. Select "Add New Hardware" under Control Panel. Allow Windows 98 to detect new hardware. (It will find "**ACPI BIOS**" and remove "**Plug and Play BIOS**")

3. Reboot system.

4. Clean boot into DOS and run "AOZVHDD.EXE /C /File"

Changing from ACPI to APM

1. Run "Regedit.exe"

- a. Go through the following path

HKEY_LOCAL_MACHINE
SOFTWARE
MICROSOFT
WINDOWS
CURRENT_VERSION
DETECT
ACPI_OPTION

b. Right click and select "Modify, change "01" to "02" to make it "0000 02".



Tip: "02" means Windows 98 is ACPI acknowledged but the ACPI function is disabled.

c. Save changes.

2. Select "Add New Hardware" under Control Panel. Allow Windows 98 to detect new hardware. (It will find "**Plug and Play BIOS**" and **remove "ACPI BIOS"**)
3. Reboot system.
4. Run "Add New Hardware" again and it will find "Advanced Power Management Resource".
5. Click "OK".

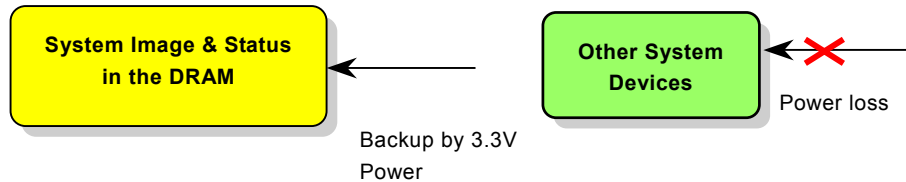


Tip: Currently we found only ATI 3D Rage Pro AGP card would support ACPI suspend to disk. Please refer to AOpen web site for latest update

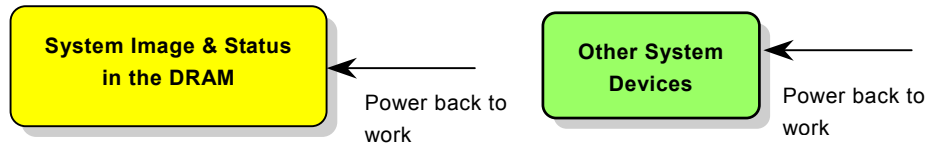
ACPI Suspend to RAM (STR)

This motherboard supports [ACPI](#) Suspend to RAM function. With this function, you can resume your original work directly from DRAM without going through the Windows 98 booting process and run your application again. Suspend to DRAM saves your current work in the system memory, it is faster than Suspend to Hard Drive but requires power supplied to DRAM, while Suspend to Hard Drive requires no power.

When go into Suspend:



When power-on next time:



To implement ACPI Suspend to DRAM, please follow the procedures as below:

System Requirement

1. An ACPI OS is required. Currently, except Windows 95 and Windows NT, all other Windows Systems support ACPI.
2. The Intel® Chipset Software Installation Utility must have been installed properly.

Procedures

1. Changed the following BIOS settings.

BIOS Setup > Power Management Setup > ACPI Function: Enabled

BIOS Setup > Power Management Setup > ACPI Suspend Type: S3.

2. Go to Control Panel > Power Management. Set "Power Buttons" to "Standby".
3. Press power button or standby button to wake up the system.

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 AwardBIOS™ 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.

Most BIOS setting of MX4LR had 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. 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 2nd 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.

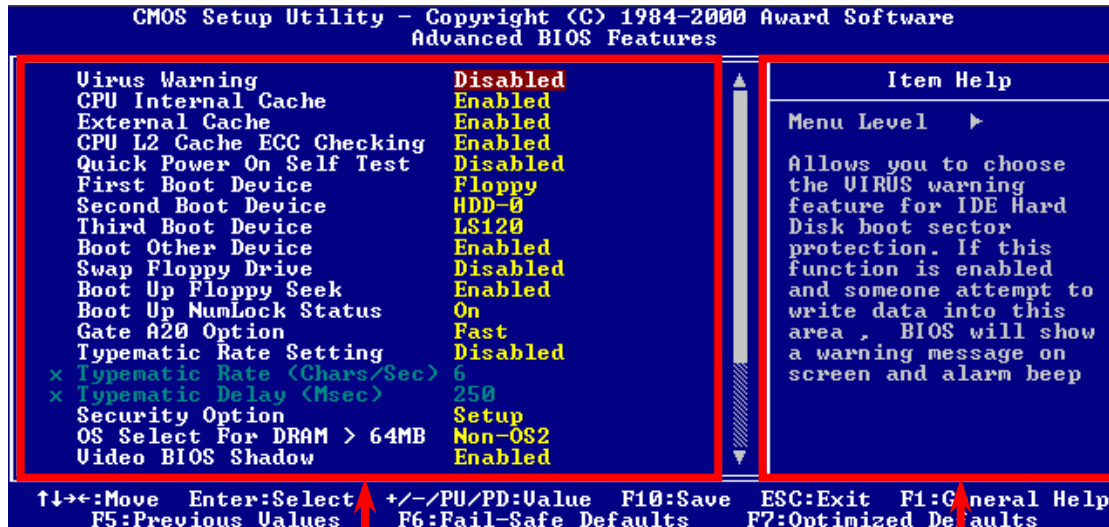
[To enter to BIOS setup menu](#), press when [POST \(Power-On Self Test\)](#) screen is shown on your monitor.



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.*

About BIOS Function Description...

AOpen always dedicates to give users a more friendly 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 appeared at right side of screen. Hence, you don't need read this manual while you changing the BIOS setting.



Menu Items Select Window

Item Function Description Window



How To Use Award™ BIOS Setup Program

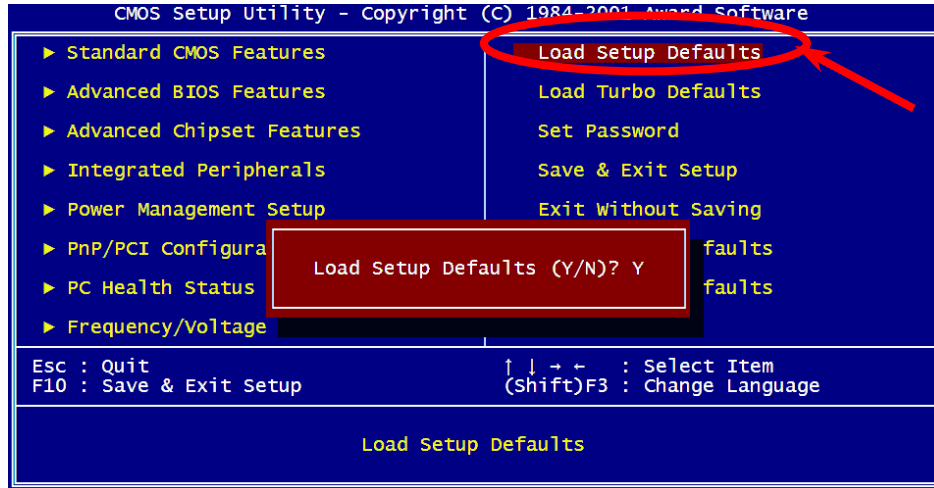
Generally, you can use the arrow keys to highlight items that you want to choose, then press <Enter> key to select, and use the <Page Up> and <Page Down> key to change setting value. You also can press <F1> key for help and press <Esc> key to quit Award™ BIOS setup program. The following table provides details about how to use keyboard in the 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.
F1	Get menu or item help description.
F3	Changing menu language.
F5	Load previous setting value from CMOS.

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.

How To Enter BIOS Setup

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



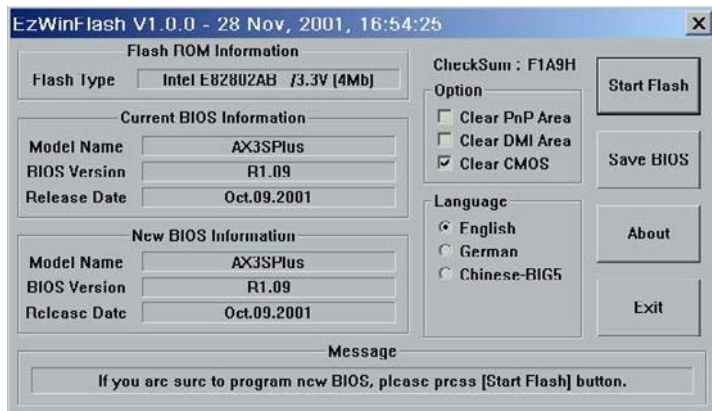
Warning: Please avoid of using "Load Turbo Defaults", unless you are sure your system components (CPU, DRAM, HDD, etc.) are good enough for turbo setting.



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.



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.

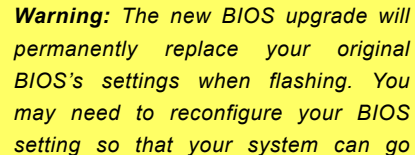
If you intent on upgrading, PLEASE BE SURE to get the right BIOS revision for the right motherboard model to avoid any

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://www.aopen.com>)
2. Unzip the download BIOS package (ex: WMX4LR102.ZIP) with WinZip (<http://www.winzip.com>) in Windows environment.
3. Save the unzipped files into a folder, for example, WMX4LR102.EXE & WMX4LR102.BIN.
4. Double click on the WMX4LR102.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 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*

Overclocking

As a leading manufacturer in motherboard industry, AOpen always listens to what customers want and develop products to fit different user's requirements. Reliability, compatibility, leading technology and friendly features are our basic goals when designing motherboards. Other than above mentioned design criteria, there are power users who are always seeking to push the limitation of the system performance by overclocking which we call them "Overclocker".

This section is dedicated to overclockers.

This high performance motherboard is designed for maximum **400MHz** CPU bus clock. But it comes with clock generator of **248MHz** when we design it to accommodate with future CPU bus clock. Our lab test results showed that **120MHz** is achievable when proper setting and qualified components were presented. Not only that, the CPU clock ratio can be up to 24x that supports almost all of Pentium® 4 CPUs in the future and provides flexibility for overclockers. For your reference, the configuration we feel appropriate for this motherboard is **120MHz** bus clock.

But not guaranty. 😊

***Tip:** Note that overclocking may also cause thermal problem. Please make sure that the cooling fan and the heatsink were adequate to dissipate excessive heat that's generated by overclocking the CPU.*

***Warning:** The design of this product follows CPU and chipset vendor's design guideline. Any attempts to push beyond product specification are not recommended and you are taking your own risk to damage your system or important data. Before doing overclocking, you must make sure your components are able to tolerate such abnormal setting, especially CPU, DRAMs, hard disks, and AGP VGA cards.*

VGA Card & Hard Disk

VGA and HDD is key components for overclocking, for your reference, the following list are what have been successful overclocked in our lab. Please note that AOpen can not guaranty they can be successful overclocked again. Please check the **Available Vendor List (AVL)** by link to our official website.

VGA: <http://www.aopen.com/tech/report/overclk/mb/vga-oc.htm>

HDD: <http://www.aopen.com/tech/report/overclk/mb/hdd-oc.htm>

Glossary

AC97

Basically, AC97 specification separates sound/modem circuit to two parts, digital processor and a [CODEC](#) for analog I/O they are linked by AC97 link bus. Since digital processor can be put into motherboard main chipset, the cost of sound/modem onboard solution can be reduced.

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.

AGP (Accelerated Graphic Port)

AGP 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 $66\text{MHz} \times 4\text{byte} \times 2 = 528\text{MB/s}$. AGP is now moving to 4X mode, $66\text{MHz} \times 4\text{byte} \times 4 = 1056\text{MB/s}$. AOpen is the first company to support 4X AGP motherboards by both AX6C (Intel 820) and MX64/AX64 (VIA 694x), started from Oct 1999.

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.

AOpen Bonus Pack CD

A disc bundled with AOpen motherboard product; there are motherboard drivers, Acrobat Reader for [PDF](#) online manual and other useful utilities.

APM (Advanced Power Management)

Unlike [ACPI](#), BIOS controls most APM power management functions. AOpen Suspend to Hard Drive is a good example of APM power management.

ATA (AT Attachment)

ATA is the specification of diskette interface. In 80's, many software and hardware manufacturers instituted the ATA specification together. The AT is meaning International Business Machines Corporation (IBM) personal computer/AT's bus structure.

ATA/66

ATA/66 uses both rising edge and falling edge but doubles [UDMA/33](#) transfer rate. The data transfer rate is 4 times of the PIO mode 4 or DMA mode 2, 16.6MB/s x4 = 66MB/s. To use ATA/66, you need special ATA/66 IDE cable.

ATA/100

ATA/100 is a new IDE specification under developing. ATA/100 uses both rising edge and falling edge as [ATA/66](#) but clock cycle time is reduced to 40ns. The data transfer rate is $(1/40\text{ns}) \times 2 \text{ bytes} \times 2 = 100\text{MB/s}$. To use ATA/100, you need special 80-wire IDE cable, the same as ATA/66.

ATA/133

ATA/133 is a new IDE specification under developing. ATA/133 uses both rising edge and falling edge as [ATA/66](#) but clock cycle time is reduced to 30ns. The data transfer rate is $(1/30\text{ns}) \times 2 \text{ bytes} \times 2 = 133\text{MB/s}$. To use ATA/133, you need special 80-wire IDE cable, the same as ATA/66.

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.

Bus Master IDE (DMA mode)

The traditional PIO (Programmable I/O) IDE requires the CPU to involve in all the activities of the IDE access including waiting for the mechanical events. To reduce the workload of the CPU, the bus master IDE device transfers data from/to memory without interrupting CPU, and releases CPU to operate concurrently while data is transferring between memory and IDE device. You need the bus master IDE driver and the bus master IDE HDD to support bus master IDE mode.

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.

CODEC (Coding and Decoding)

Normally, CODEC means a circuit that can do digital to analog conversion and also the analog to digital conversion. It is part of [AC97](#) sound/modem solution.

DDR (Double Data Rated) SDRAM

DDR SDRAM utilizes the existing DRAM infrastructure and technology while doubling the nominal bandwidth available to systems in an easy to design and simple to adopt way. Initially a perfect solution for memory intensive server and workstation applications, DDR low cost and low voltage will ultimately make it an ideal solution for all segments of the PC market, high performance desktop and mobile PCs, Value PCs and even Internet Appliances and mobile devices.

DIMM (Dual In Line Memory Module)

DIMM socket has total 168-pin and supports 64-bit data. It can be single or double side, the golden finger signals on each side of PCB are different, and that is why it was called Dual In Line. Almost all DIMMs are made by [SDRAM](#), which operate at 3.3V. Note that some old DIMMs are made by FPM/[EDO](#) and only operate at 5V. Do not confuse them with SDRAM DIMM.

DMA (Direct Memory Access)

Channel for communications between the memory and surrounding devices.

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.

EDO (Extended Data Output) Memory

The EDO DRAM technology is actually very similar to FPM (Fast Page Mode). Unlike traditional FPM that tri-states the memory output data to start the pre-charge activity, EDO DRAM holds the memory data valid until the next memory access cycle, that is similar to pipeline effect and reduces one clock state.

EEPROM (Electronic Erasable Programmable ROM)

Also known as E²PROM. 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 in the technology of Alpha processor from Digital Equipment Corporation. EV6 bus uses both rising and falling clock edge to transfer data, similar as DDR SDRAM or ATA/66 IDE bus.

EV6 Bus Speed = CPU external bus clock x 2.

For example, 200 MHz EV6 bus is actually using 100 MHz external bus clock, but the equivalent speed is 200 MHz.

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 new package of Intel for Pentium III CPU. It can plug into SKT370 socket, but require motherboard to add some signals on socket 370. That is, the motherboard needs to be redesigned. Intel is going to ship FC-PGA 370 CPU and phase out slot1 CPU.

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 256KB (2M bit). AOpen AX5T is the first board to implement 256KB (2Mbit) Flash ROM. Now flash ROM size is moving to 4M bit on AX6C (Intel 820) and MX3W (Intel 810) motherboard. , AOpen motherboard uses EEPROM for jumper-less and battery-less design.

FSB (Front Side Bus) Clock

FSB Clock means CPU external bus clock.

CPU internal clock = CPU FSB Clock x CPU Clock Ratio

I²C Bus

See [SMBus](#).

IEEE 1394

IEEE 1394 is a low-cost digital interface originated by Apple Computer as a desktop LAN and developed by the IEEE 1394 working group. The IEEE 1394 can transport data at 100, 200 or 400 Mbps. One of the solutions to connect digital television devices together at 200 Mbps. Serial Bus Management provides overall configuration control of the serial bus in the form of optimizing arbitration timing, guarantee of adequate electrical power for all devices on the bus, assignment of isochronous channel ID, and notification of errors. There are two type of IEEE 1394 data transfer: asynchronous and isochronous. Asynchronous transport is the traditional computer memory-mapped, load and store interface. Data requests are sent to a specific address and an acknowledgment is returned. In addition to an architecture that scales with silicon technology, IEEE 1394 features a unique isochronous data channel interface. Isochronous data channels provide guaranteed data transport at a pre-determined rate. This is especially important for time-critical multimedia data where just-in-time delivery eliminates the need for costly buffering.

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.

PBSRAM (Pipelined Burst SRAM)

For Socket 7 CPU, one burst data read requires four QWord (Quad-word, 4x16 = 64 bits). PBSRAM only needs one address decoding time and automatically sends the remaining QWords to CPU according to a predefined sequence. Normally, it is 3-1-1-1, total 6 clocks, which is faster than asynchronous SRAM. PBSRAM is often used on L2 (level 2) cache of Socket 7 CPU. Slot 1 and Socket 370 CPU do not need PBSRAM.

PC-100 DIMM

[SDRAM](#) DIMM that supports 100MHz CPU [FSB](#) bus clock.

PC-133 DIMM

[SDRAM](#) DIMM that supports 133MHz CPU [FSB](#) bus clock.

PC-1600 or PC-2100 DDR DRAM

Based on FSB frequency, the DDR DRAM has 200MHz and 266MHz two type of working frequency. Because of DDR DRAM data bus is 64-bit, it provides data transfer bandwidth up to $200 \times 64 / 8 = 1600 \text{MB/s}$, and $266 \times 64 / 8 = 2100 \text{MB/s}$. Hence, the PC-1600 DDR DRAM is working with 100MHz and PC-2100 DDR DRAM is working with 133MHz FSB frequency.

PCI (Peripheral Component Interface) Bus

Bus for the internal connection of peripheral devices, high-speed data channel between the computer and expansion card.

PDF Format

A file format for electronic document, PDF format is independent from platform, you can read PDF file under Windows, Unix, Linux, Mac ... with different PDF reader. You can also read PDF file by web browser such as IE and Netscape, note that you need to install PDF plug-in first (Included in Acrobat Reader).

PnP (Plug and Play)

The PnP specification suggests a standard register interface for both BIOS and operating system (such as Windows 95). These registers are used by BIOS and operating system to configure system resource and prevent any conflicts. PnP BIOS or operating system will automatically allocate the IRQ/DMA/Memory. Currently, almost all the PCI cards and most ISA cards are already PnP compliant.

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.

RDRAM (Rambus DRAM)

Rambus is a memory technology that uses large burst mode data transfer. Theoretically, the data transfer should be high than [SDRAM](#). RDRAM is cascaded in channel operation. For Intel 820, only one RDRAM channel is supported, 16-bit data per channel, and this channel may have maximum 32 RDRAM devices, no matter how many [RIMM](#) sockets.

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. AOpen is the first company to support dual-SDRAM DIMMs onboard (AP5V), from Q1 1996

Shadow E²PROM

A memory space in Flash-ROM to simulate E²PROM operation, AOpen motherboard uses Shadow E²PROM for jumper-less and battery-less design

SIMM (Single In Line Memory Module)

SIMM socket is only 72-pin, and is only single side. The golden finger signals on each side of PCB are identical. That is why it was called Single In Line. SIMM is made by FPM or [EDO](#) DRAM and supports 32-bit data. SIMM had been phased out on current motherboard design.

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.

Ultra DMA

Ultra DMA (or, more accurately, Ultra DMA/33) is a protocol for transferring data between a hard disk drive through the computer's data path (or bus) to the computer's random access memory (RAM). The Ultra DMA/33 protocol transfers data in burst mode at a rate of 33.3MB/s, twice as fast as the previous [Direct Access Memory \(DMA\)](#) interface. Ultra DMA was developed as a proposed industry standard by the Quantum corporation, makes of hard disk drives, and Intel, makes of chipset that support computer bus technology. Ultra DMA support in your computer means that it will boot (start) and open new applications more quickly. It will help users of graphic-intensive and applications that require large amounts of access to data on the hard disk drive. Ultra DMA uses Cyclical Redundancy Checking (CRC), offering a new level of data protection. Ultra DMA uses the same 40-pin IDE interface cable as PIO and DMA.

16.6MB/s x2 = 33MB/s

16.6MB/s x4 = 66MB/s

16.6MB/s x6 = 100MB/s

USB (Universal Serial Bus)

USB is a 4-pin serial peripheral bus that is capable of cascading low/medium speed peripherals (less than 10Mbit/s) such as keyboard, mouse, joystick, scanner, printer and modem. With USB, the traditional complex cables from back panel of your PC can be eliminated.

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.

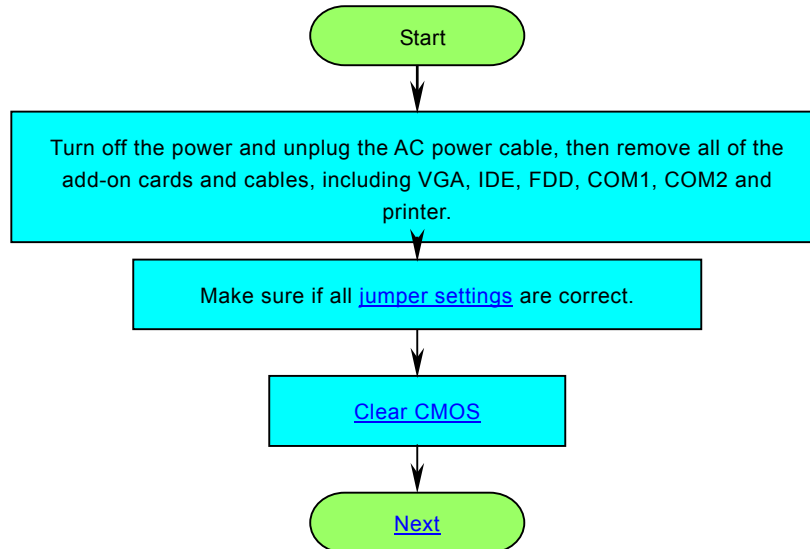
ZIP file

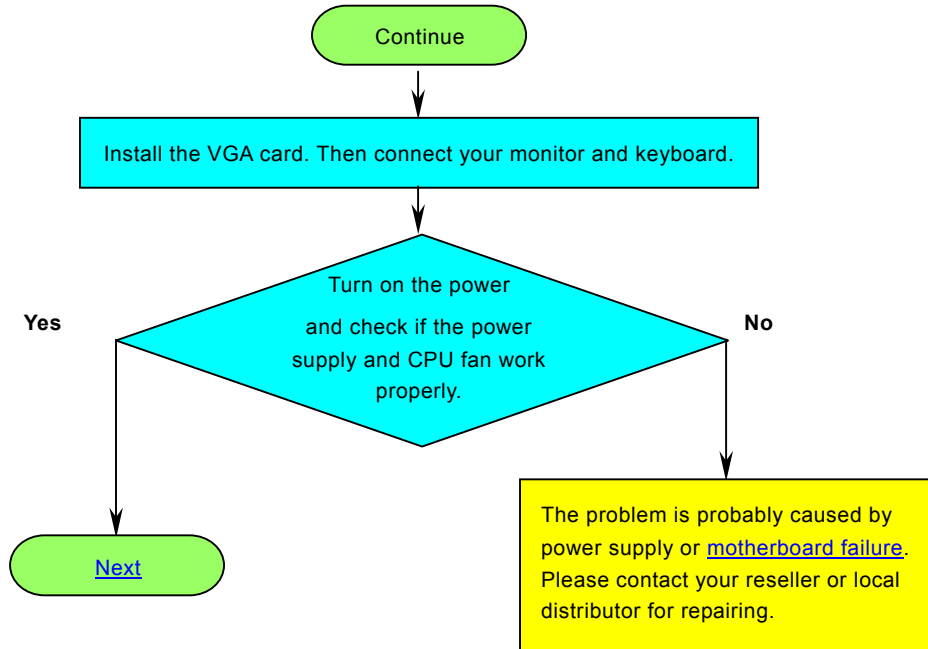
A compressed file format to reduce file size. To unzip file, run shareware PKUNZIP (<http://www.pkware.com/>) for DOS and other operating system or WINZIP (<http://www.winzip.com/>) for windows environment.

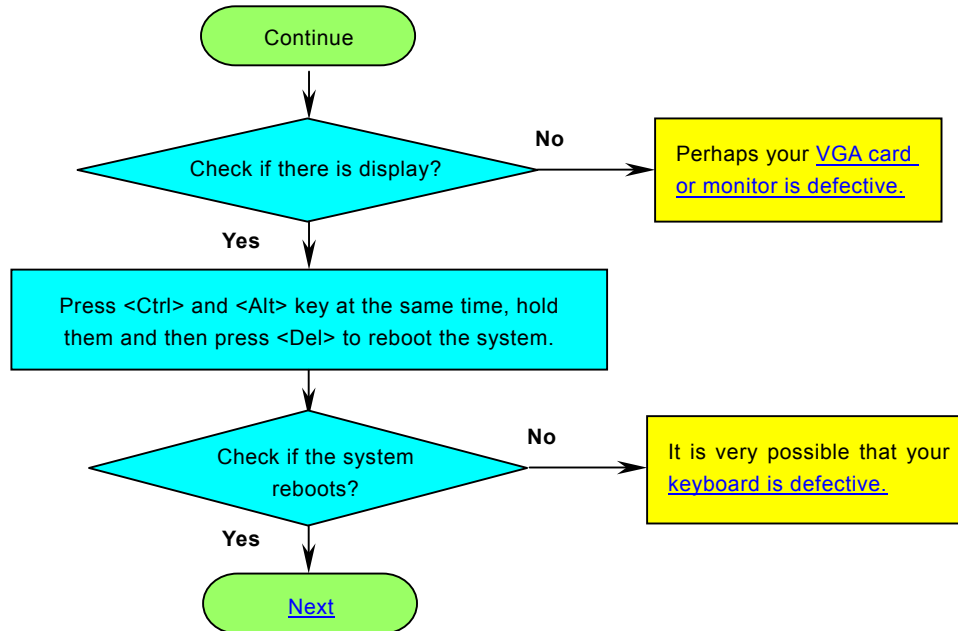


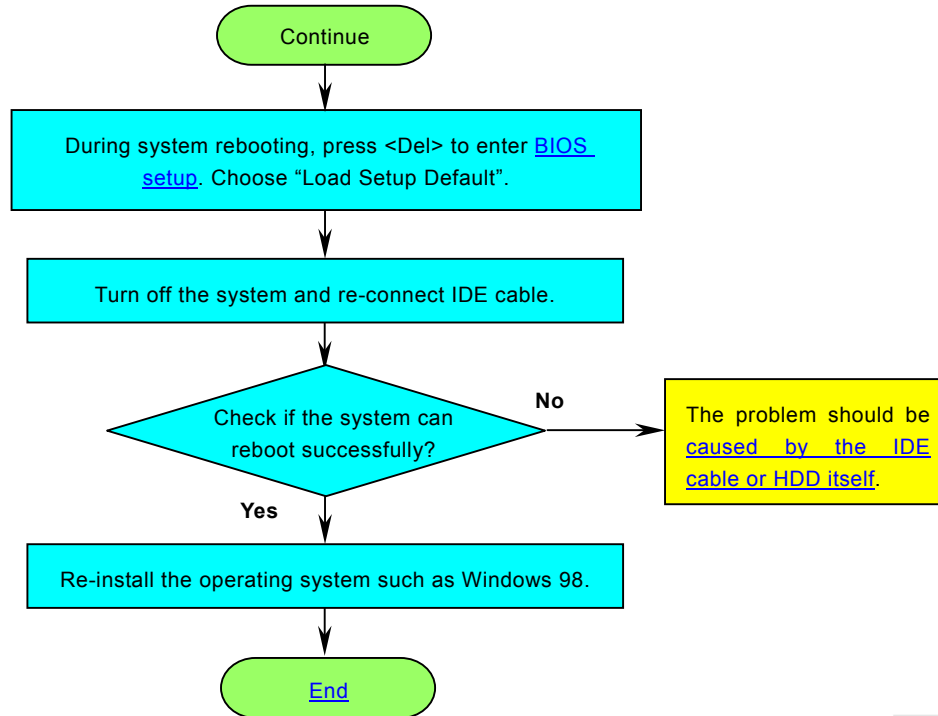
Troubleshooting

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: Please check the manual carefully and make sure the jumper settings and installation procedure are correct.

<http://www.aopen.com/tech/download/manual/default.htm>

2

Test Report: We recommend choosing board/card/device from the compatibility test reports for assembling your PC.

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

3

FAQ: The latest FAQ (Frequently Asked Questions) may contain a solution to your problem.

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

4

Download Software: Check out this table to get the latest updated BIOS/utility and drivers.

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

5

News Group: News posted by computer experts, you are welcome to join any discussion and learning from it.
<http://www.aopen.com/tech/newsgrp/default.htm>

6

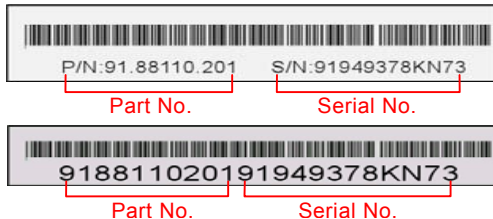
Contact Distributors/Resellers: We sell our products through resellers and integrators. They should know your system configuration very well and should be able to solve your problem more efficiently than us. After all, their attitude of service is an important reference for you if next time you want to buy something else from them.

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

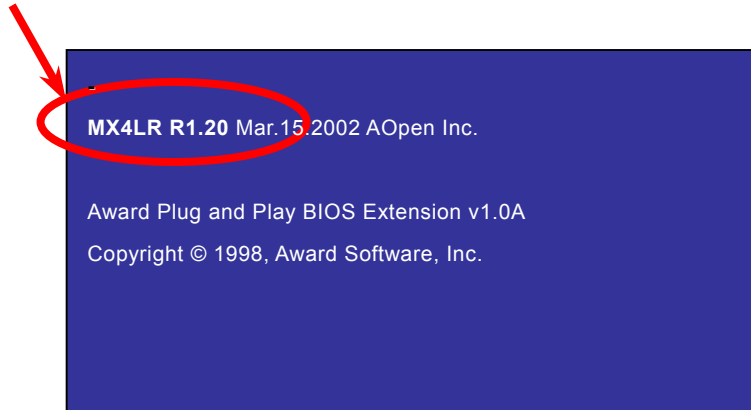
The Part Number and Serial number are printed on bar code label. You can find this bar code label on the outside packing, on PCI slot or on component side of PCB. For example:



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:



MX4LR is model name of motherboard; **R1.20** is BIOS version.



Product Registration

ClubAOpen

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.*



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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