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# Chapter 1

## Overview

AX6BC Pro is a new generation Pentium II / Pentium III based system board that utilizes Intel **82440BX** AGPset on **ATX** PCI/ISA platform. This AGPset is designed for the Pentium II / Pentium III CPU, and supports new architectures such as a high speed **AGP** graphics port, **SDRAM**, **Ultra DMA/33**, **Bus master IDE** and **USB** ports. It has **three Dual in-line Memory Module (DIMM)** slots that allow to install SDRAM memory and expand up to a maximum of **768MB**. Since the cache is on the **Pentium II CPU card (connector SLOT1)**, there is no secondary level cache onboard. Also, AX6BC Pro uses a **2M bit Flash ROM** BIOS to reserve for future new functions.

In addition to the above features, AX6BC Pro also implements many special features as follows.

**Jumper-less Design** Pentium II / Pentium III VID signal and SMBus clock generator provide CPU voltage auto-detection and allows the user to set the CPU frequency through the CMOS setup, therefore no jumpers or switches are used. The correct CPU information is saved into the EEPROM. With these technologies, the disadvantages of the Pentium based jumper-less designs are eliminated. There will be no worry of wrong CPU voltage detection and no need to re-open the housing in case of CMOS battery loss. The only jumper left is to clear the CMOS, which is a safety hook if you forget the password.

**Full-range CPU Core Voltage** This motherboard supports a CPU core voltage from 1.3V to 3.5V, that can be applied to various CPU types in future.

**Adjustable CPU Voltage** This motherboard supports Pentium II / Pentium III / Celeron VID function, the CPU core voltage is automatically detected, and ranges from 1.3V to 3.5V. But for the convenience of overclockers, the CPU voltage is also adjustable in the BIOS Setup.

**Battery-less Motherboard** This motherboard implements EEPROM and a special circuit (patent applied) 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

## Overview

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your CMOS data by accident, you can just reload the CMOS configurations from EEPROM and the system will recover as usual.

**APM Suspend To Hard Drive** "Immediately" turns on system and goes back to the original screen before power down. You can resume your original work directly from hard disk without go through the Win95 booting process and run your application again. Suspend to Hard Drive saves your current work (system status, memory image) into hard disk. Note that you have to use VESA compatible PCI VGA, Sound Blaster compatible sound card with APM driver, for Suspend to Hard Drive to work properly.

**ACPI Suspend to Hard Drive** The conventional "Suspend to Hard Drive" function is a private design of AOpen motherboards, the requirement to run it is a BIOS revision and correct chipset that supports this function. However, nowadays "Suspend to Hard Drive" has been become widely known as the "S4 - Hibernation" state defined in the ACPI specification; in this case not only the BIOS itself but also the operation system (i.e. Windows98) and even the display card are involved in the execution of this function. With regard to how to implement this function, please refer to section "1.4 ACPI Suspend to Hard Drive".

**OV Wake On Modem** In conjunction with ATX soft power On/Off, it is possible to have the system totally power off and wakeup to automatically answer a phone call to serve as an answering machine or to send/receive a fax. The most important break through is not only an externally cased modem but also an internal modem card can be used to support Wake On Modem. The AX6BC Pro and MP56 internal modem card implement a special circuit (patent applied) to make sure the modem card works properly without any power.

**Wake On LAN** This feature is very similar as the Wake On Modem feature, but it is through a local area network. To use the Wake On LAN function, you must have a network card that supports this feature and have installed proper network management software.

**Wake On RTC Timer** The Wake Up Timer is more like an alarm, which wakes up and powers on your system at a pre-defined time for a specific application. It can be set to wake up everyday or on specific date within a month. The date/time is accurate to within a second.

**Wake On Keyboard** This function allows you to power on your system by clicking the hot key that you specified. Besides, you also may disable the function of power button and let the system can only be powered on through the preset keys (like a password).

**Wake On Mouse** This function allows you power on the system by clicking a specified mouse button twice successively.

**High Efficiency Synchronous Switching Regulator** Most of the current switching designs are Asynchronous mode, which from a technical point of view, still consumes very high power and generates heat. This motherboard

## Overview

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implements a high efficient synchronous switching design so that the temperature of MOS FET is far less than the Schottky diode of the asynchronous design.

**CPU and Housing Fan Monitoring** The AX6BC Pro has one more "fan monitoring" function to prevent system overheat. There are two fan connectors. One is for the CPU and the other can be an extra housing fan. The system will report an alarm fan malfunction through utility software such as Hardware Monitoring Utility.

**CPU Thermal Protection** The AX6BC Pro has a special thermal detection circuit to provide warning through application software when the temperature is higher than a predefined value.

**System Voltage Monitoring** Further more, the AX6BC Pro implements a voltage monitoring system, As you turn on your system, this smart design will continue to monitor your system's working voltage. If any of the system's voltage is over the component's standard an alarm will be sounded through utility software such as a Hardware Monitoring Utility for a warning to user.

**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. In BIOS Setup settings if this item is set to "Enabled" the system will automatically power-on after AC power resumes.

**Sound Blaster Link** The SB-LINK connector can be used to link Creative PCI sound card. If you have a Creative PCI sound card installed, it is necessary to link the card to this connector for compatibility issue under DOS environment.

**Multi-language BIOS** This breakthrough will help you set BIOS items without the language barrier.

**FCC DoC Certificate** The AX6BC Pro has passed the FCC DoC test. The radiation is very low, you can use any kind of housing.

**Powerful Utility Software** A Open Bonus Pack CD disc contains many useful utilities, such as Norton Antivirus, AOpen chip, Hardware Monitoring Utility, etc.



**Note:** This motherboard is battery-less, that means the RTC (real time clock) can continue running without a battery as long as the power cord is plugged. But in case of power failure or the power cord being unplugged, you will need to reset the date and time from the "Standard CMOS Setup" section of the BIOS Setup. For more information, please see "Chapter 3 BIOS Setup".

## Overview

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### 1.1 Specifications

<b>Form Factor</b>	ATX
<b>Board Size</b>	305 mm x 202 mm
<b>CPU</b>	Intel Pentium II / Pentium III / Celeron Processor
<b>System Memory</b>	SDRAM or Registered SDRAM, 168-pin DIMM x3, maximum 768MB.
<b>Second-level Cache</b>	On the CPU card (Slot1 connector)
<b>Chipset</b>	Intel 82440BX AGPset
<b>Expansion Slots</b>	ISA x2, PCI x5 and AGP x1
<b>Serial Port</b>	Two serial ports UART 16C550 compatible, and the 3rd UART for IR function.
<b>Parallel Port</b>	One parallel port supports standard parallel port (SPP), enhanced parallel port (EPP) or extended capabilities port (ECP).
<b>Floppy Interface</b>	Floppy interface supports 3.5 inches drives with 720KB, 1.44MB or 2.88MB format or 5.25 inches drives with 360KB, 1.2MB format
<b>IDE Interface</b>	Dual-channel IDE interface support maximum 4 IDE hard disks or CDROM, mode 4 , bus master hard disk drives and Ultra DMA/33 mode hard drives are also supported.
<b>USB Interface</b>	Two USB ports supported by USB bracket, the BIOS also supports USB driver to simulate legacy keyboard.
<b>PS/2 Mouse</b>	Mini-Din PS/2 mouse connector onboard.
<b>Keyboard</b>	Mini-Din PS/2 keyboard connector onboard.
<b>RTC and Battery</b>	RTC within Intel PIIX4E chipset. Lithium (CR-2032) battery is an option, no battery is needed if power cord is plugged.
<b>BIOS</b>	AWARD Plug-and-Play, 2M bit Flash ROM BIOS. Multi-language versions supported.

### 1.2 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 AX6BC Pro motherboard is designed for maximum 100MHz CPU bus clock. But it comes with clock generator of 153MHz when we design it to accommodate future CPU bus clock. Our lab test results shown that 133.3MHz is achievable when proper setting and qualified components were presented, we feel quite comfortable overclocking to 133.3MHz. Not only that, AX6BC Pro has full-range (CPU core voltage) settings and an option to adjust CPU core voltage. The CPU clock ratio can be up to 8X, that supports almost all of Pentium II / Pentium III /Celeron CPUs in the future and provides flexibility for overclockers. For your reference, the following configurations are what we feel comfortable at 133.3 MHz bus clock. But not guaranty.J



**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.

**Warning:** 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.

VGA and HDD are 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.

## Overview

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### VGA Card

VGA model/ Vendor	Chipset model	Driver
Asus	S3 –Virge/dx(86c375)	Asus
VENUS T-775	S3 Trio 64V2(86C775)	Venus
VENUS 67TV	Trident 9685	Venus
GALAXIE	Trident 9685 (PS-68)	Venus
ATI	MACH 64 210888GX00	Win95 default
MATROX	MY220P/4+	MGA
MATROX	MGA-MIL/4+	MGA
MATROX	MIL2P/4+	MGA

### Hard Disk:

Vender	Model	Size
Maxtor	90680D4	6.8G
Maxtor	90845D5	8.4G
Maxtor	72004AP	2.0G
Maxtor	82560A4	2.5G
Seagate	ST36530A	6.5G
Seagate	ST31277A	1.2G
Quantum	FireballST4320AT	4.3G
Quantum	T-Rex Bigfoot TX6.0AT	6.0G
Quantum	T-Rex Bigfoot TX8.0AT	8.0G
Quantum	T-Rex Bigfoot TX12.0AT	12.0G
IBM	DHEA-34330	4.3G
IBM	DTTA-351010	10.1G
IBM	DTTA-350840	8.4G
IBM	DTTA-350640	6.4G
IBM	DAQA-32160	2.1G

## Overview

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### AX6BC Pro Overclocking Settings

The following table lists the overclocking settings in AOpen's lab for your reference.

<b>CPU</b>	Pentium II 350
<b>DRAM</b>	ISEC KOREA 752 KM48S8030BT-GH 32MB
<b>HDD</b>	IBM DHEA-34330
<b>VGA</b>	ATI 3D RAGE PRO AGP 2X
<b>OS</b>	Windows 95 OSR2
<b>BIOS</b>	Load BIOS Turbo Default 100 MHz * 4 = 400 MHz (OK) 112 MHz * 3.5 = 392 MHz (OK) 133.3MHz * 3 = 400 MHz (OK)

## Overview

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### 1.3 APM Suspend to Hard Drive

Suspend to Hard Drive 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 Win95 booting process and run your application again. If your memory is 16MB, normally, you need to reserve at least 16MB HDD space to save your memory image. Note that you have to use VESA compatible PCI VGA (AOpen PV70/PT70), Sound Blaster compatible sound card and sound driver that supports APM (AOpen AW32/AW35) for Suspend to Hard Drive to work properly. Of course, we recommend choosing AOpen products for best compatibility.

To use Suspend to Hard Drive:

1. Go into BIOS setup, Power Management à Suspend Mode Option, select "Suspend to Disk".
2. Go into BIOS setup, PNP/PCI Configuration à PnP OS Installed, select "No". This can give BIOS the capability to allocate system resources for Suspend to Hard Drive.
3. Boot up your system into DOS command prompt. If you are Win'95 user, Please restart your Windows 95 under "Command Prompt" by pressing "F8" while system shows "Windows 95 Starting ...". Choose "Safe Mode Command Prompt Only" from selection so that system will start in DOS command prompt.
4. Copy AOZVHDD.EXE to the root directory of your C: drive.
5. Option 1: Use **/file** switch (applied to FAT16 file system):  
Please use following command to create a hidden file in the root directory of your hard disk for Suspend to Hard Drive to save the system status and memory image.

C:>AOZVHDD /c /file

Please make sure that you have enough continuous HDD space for creating this hidden file. For example, if you have 32MB of system memory and 4MB of VGA memory, you need at least 36MB (32MB + 4MB) of continuous HDD space. If AOZVHDD failed to allocate the HDD space, you may run "DEFRAG" Utility or "Disk Defragmenter" which come with MS-DOS or Win'95 to free HDD space.



## Overview

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Option2: Use **/partition** switch (applied to FAT16/FAT32 file system):

To create a separate partition for Suspend to Hard Drive, please make sure you have reserved a free partition. We suggest you reserve the free partition which space is appropriate for your future memory expansion. For example, if you have 32MB of system memory and 4MB of VGA memory currently, but you plan to upgrade system memory to 64MB in the near future, then you may reserve a 68MB (64MB+4MB) space by using a disk utility (such as fdisk). Next, use following command to create a suspend partition:

```
C:>AOZVHDD /c /partition
```

If there is no extra free partition and you don't want your data lost, please do not use this partition method.

6. After creating above partition or hidden file, please reboot your system.
7. Push suspend switch (momentary mode) or use Win95 Suspend icon to force system goes into Suspend to Hard Drive mode and then turn system power off by power switch of your power supply.
8. Next time when you turn on your system, it will resume to your original work automatically.



**Warning:** Note that Intel Bus Master and Ultra DMA/33 IDE driver are not fully compatible with Suspend to Hard Drive function, installing these drivers may cause the system unstable. Under this situation, please uninstall the drivers.

**Warning:** This function does not support SCSI hard disks.

## Overview

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**Tip:** The following VGA cards have been tested & recognized as VESA compatible VGA device.

AOpen PV90 (Trident 9680)  
AOpen PT60 (S3 Virge/BIOS R1.00-01)  
AOpen PV60 (S3 Tiro64V+)  
AOpen PT70 (S3 Virge/DX)  
ProLink Trident GD-5440  
ProLink Cirrus GD-5430  
ProLink Cirrus GD-5446  
ATI Mach 64 GX  
ATI 3D RAGE II  
Diamond Stealth64D (S3 868)  
Diamond Stealth64V (S3 968)  
KuoWei ET-6000  
ATI 3D RAGE PRO 2x (AGP)  
PLOTECH 3D IMAGE 9850 (AGP)  
CARDEX S3 Virge/GX (AGP)



**Tip:** The following sound cards have been tested OK for Suspend to Hard Drive.

AOpen AW32  
AOpen AW35  
AOpen MP32  
Creative SB 16 Value PnP  
Creative SB AWE32 PnP  
ESS 1868 PnP

If your sound card can not work after resume from Suspend to Hard Drive, check your sound card vendor see if there is driver to support APM, and install it again.



**Note:** The USB function has not been tested for Suspend to Hard Drive. If you find any unstable problem, please go into BIOS, Integrated Peripherals à USB Legacy Support. Disable the USB Legacy function.

### 1.4 ACPI Suspend to Hard Drive

For a detailed installation procedure please refer to the following procedure to enable ACPI Suspend to Hard Drive on the AOpen AX6BC Pro motherboard. First please check if your system meets the following requirements, then follow the procedure step by step.

#### I. 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 All Power Schemes to "Never".
  - b. Click on "Hibernate" and select "Enable Hibernate Support".
  - c. Click on the Advance tab and check the "Hibernate" box.
3. Clean boot into DOS and run "AOZVHDD /C /File" to create the suspend hidden file.
4. Reboot system.

#### II. 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")

## Overview

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

### III. 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 "00" to make it "0000 02".



**Note:** "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".

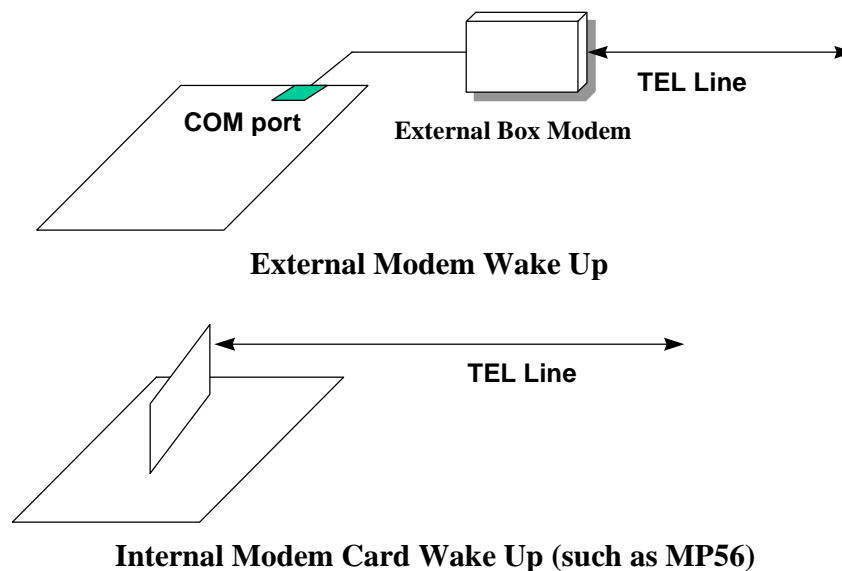


**Note:** currently we found only ATI 3D Rage Pro AGP card would support ACPI suspend to disk; if you need this function implemented be sure to use this card.

### 1.5 Zero Voltage Modem Wake Up

The Wake On Modem discussed here is to wakeup from true power off (defined as the fan of power supply being off), This motherboard still supports traditional green PC suspend mode but is not discussed here.

With the help of the ATX soft power On/Off, it is possible to have a system totally power off (The traditional suspend mode of power management function does not really turn off the system power supply), 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. The AOpen AX6BC Pro and internal modem card implement a special circuit (patent applied) and make sure the modem card works properly without any power. We recommend choosing the AOpen modem card (MP56) for Wake On Modem applications.



## Overview

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For Internal Modem Card (AOpen MP56):

1. Go into the BIOS Setup, select Power Management and à 0V Wake On Modem. Select "Enabled."
2. Install your application, put into Windows 95 StartUp.
3. Turn the system power off by soft power switch.
4. Connect the 4-pin Wake On Modem cable from MP56 RING connector to the AX6BC Pro **WOM** connector.
5. Connect your telephone line to the MP56 modem. You are now ready to use Wake On Modem.

For External Box Modem:

1. Go into the BIOS Setup, select Power Management and à 0V Wake On Modem. Select "Enabled."
2. Setup your application, put into Windows 95 StartUp.
3. Turn your system power off by soft power switch.
4. Connect your RS232 modem cable from your external box Modem to COM1 or COM2.
5. Connect telephone line to external box Modem. Turn on Modem power (you must keep Modem power always on). You are now ready to use Wake On Modem.



**Tip:** External modem wake up signal is detected through COM1 or COM2. An internal modem card wake up signal is detected through a cable from the connector RING (on the modem card) to WOM (on the mainboard).

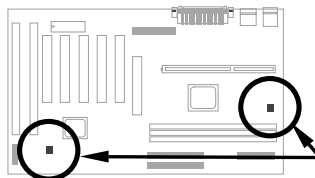


**Note:** If you use an external modem, the power of the external modem must be kept on to receive a signal from the telephone line. An internal modem card has no such limitation.

### 1.6 System Voltage Monitoring

This motherboard implements a voltage monitoring system. As you turn on your system, this smart design will continue to monitor your system's working voltage. If any of the system's voltage is over the component's standard there will be an alarm through application software such as the Hardware Monitoring Utility to warn the user. The system voltage monitoring function monitors CPU core voltage. It is automatically implemented by the BIOS and Hardware Monitoring Utility (the program's file name is like aohwxxx.exe, where xxx means the version number), no hardware installation is needed.

### 1.7 Fan Monitoring



There are two fan connectors, one is for the CPU, and the other can be a housing fan. The fan monitoring function is implemented by connecting a fan to the 3-pin fan connector **CPUFAN1** or **FAN1** and installing the Hardware Monitoring Utility.



**Note:** You need a 3-pin fan that supports *SENSE* signal for the fan monitoring function to work properly.

## Overview

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### 1.8 CPU Thermal Protection

This motherboard implements special thermal protection circuits. When temperature is higher than a predefined value, there will be warning through application software such as the Hardware Monitor utility to notify the user. It is automatically implemented by the BIOS and the Hardware Monitoring Utility, no hardware installation is needed.

### 1.9 Multi-language BIOS

For giving AOpen's worldwide users the best support, AOpen software team made every effort to overcome all difficulties and successfully develop a method to provide multi-language BIOS.

You may download and reflash a specified BIOS version from AOpen 's web site (For example, Chinese). After entering BIOS Setup, you can switch to another language by pressing F9. Then pressing F9 again will let you return to English screen.

This breakthrough will help you set BIOS items without the language barrier.

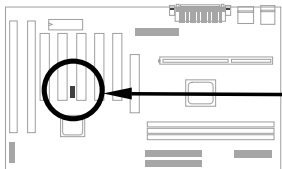


### 1.10 Battery-less Design

To preserve the earth, this motherboard implements the battery-less motherboard design. There is no need to have a battery for RTC (real time clock) and CMOS Setup as long as the ATX power cable is plugged in. In case the AC power is shutdown or the power cord is removed by accident, the CMOS Setup and system configuration can be restored from EEPROM, only the system clock needs to be re-set to current date/time.

For the convenience of the end user, the AX6BC Pro still ships with one Lithium (CR-2032) battery. If you prefer to use a battery, you can still insert it into battery socket. The RTC will still keep running even when the power cord is removed.

### 1.11 Sound Blaster Link



AX6BC Pro implements a SB-LINK connector to support Creative-compatible PCI sound card. If you have a Creative-compatible PCI sound card installed, it is necessary to link the card to SB-LINK connector for compatibility issue under DOS environment.