Chapter 2

Hardware Installation

This chapter gives you a step-by-step procedure on how to install your system. Follow each section accordingly.

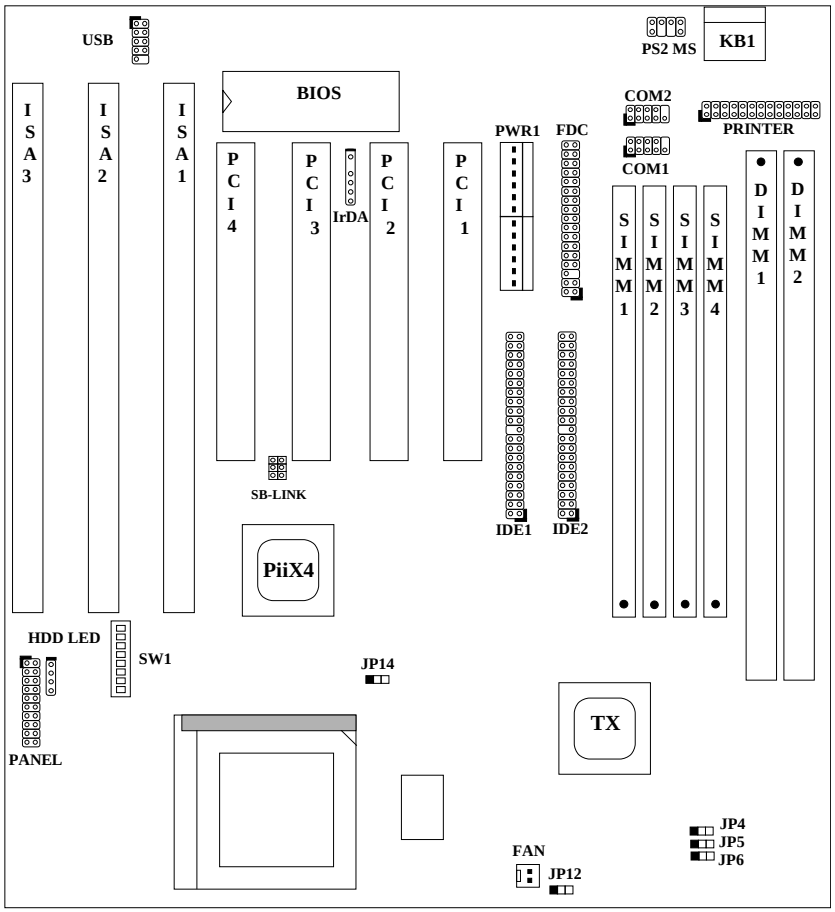
Caution: *Electrostatic discharge (ESD) can damage your processor, disk drives, expansion boards, and other components. Always observe the following precautions before you install a system component.*

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.*

2.1 Jumpers and Connector Locations

The following figure shows the locations of the jumpers and connectors on the system board:



Jumpers

SW1:	DIP Switch for CPU voltage and clock ratio
JP4,JP5,JP6:	CPU external (bus) clock
JP12:	I/O Voltage
JP14:	Clear CMOS

Connectors

KB1:	AT keyboard connector
PWR1:	AT (PS/2) power connector
PS2 MS:	PS/2 mouse connector
USB:	USB connector
COM1:	COM1 connector
COM2:	COM2 connector
FDC:	Floppy drive connector
PRINTER:	Printer connector
IDE1:	IDE1 primary channel
IDE2:	IDE2 secondary channel
FAN:	CPU fan connector
IrDA:	IrDA (Infrared) connector
HDD LED:	HDD LED connector
PANEL:	Front panel (Multifunction) connector
SB-LINK:	Creative PCI sound card connector

2.2 Jumpers

Jumpers are made by pin headers and plastic connecting caps for the purpose of customizing your hardware. Doing so requires basic knowledge of computer hardware, be sure you understand the meaning of the jumpers before you change any setting. The onboard jumpers are normally set to their default with optimized settings.

On the mainboard, normally there is a bold line marked beside pin 1 of the jumper, sometimes, there are numbers also. If we connect (short) plastic cap to pin 1 and 2, we will say set it at 1-2, and when we say jumper is open, that means no plastic cap connected to jumper pins.

Open

Short

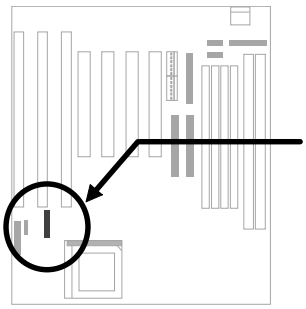
Jumper set at 1-2

Jumper set at 2-3

2.2.1 Setting the CPU Voltage

S4	S5	S6	S7	S8	Vcore
ON	ON	ON	ON	OFF	3.52V
OFF	ON	ON	ON	OFF	3.45V
OFF	OFF	ON	ON	OFF	3.2V
ON	OFF	OFF	ON	OFF	2.9V
OFF	OFF	OFF	ON	OFF	2.8V
OFF	ON	OFF	OFF	OFF	2.2V
OFF	ON	OFF	ON	ON	1.8V

SW1 is used to select CPU core voltage (Vcore) and ratio, there are totally eight switches on the DIP. After installing a CPU, remember to set the switch 4-8 to specify a proper Vcore.



3.52V

Cyrix 6x86 or AMD K5

3.45V

Intel P54C or IDT C6

3.2V

AMD K6-233

2.9V

K6-166/200 or M2

2.8V

Intel P55C (MMX)

2.2V

K6-266/300

1.8V

Reserved for future use

Warning: *Please make sure that you have installed CPU fan properly if Intel PP/MT-233 or AMD K6 CPU is being selected to use. It may cause your system unstable if you can not meet the heat dissipation requirement from above CPU type. It is recommended to adopt larger fan on these CPU for better air flow in the system. Please refer to AOpen 's web site (http://www.aopen.com.tw) to choose a proper CPU fan.*

Tip: *Normally, for single voltage CPU, Vcpuio (CPU I/O Voltage) is equal to Vcore, but for CPU that needs dual voltage such as PP/MT (P55C) or Cyrix 6x86L, Vcpuio is different from Vcore and must be set to Vio (PBSRAM and Chipset Voltage). The single or dual voltage CPU is automatically detected by hardware circuit.*

Tip: *For supporting more different CPUs in future, this motherboard uses five switchs to specify Vcore. There are 32 settings totally, and the range is from 1.3V to 3.5V.*

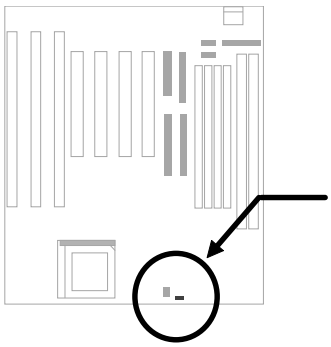
CPU	Type	S4	S5	S6	S7	S8	Vcore
INTEL P54C	Single Voltage	OFF	ON	ON	ON	OFF	3.45V
INTEL MMX P55C	Dual Voltage	OFF	OFF	OFF	ON	OFF	2.8V
AMD K5	Single Voltage	ON	ON	ON	ON	OFF	3.52V
AMD K6-166/200	Dual Voltage	ON	OFF	OFF	ON	OFF	2.9V
AMD K6-233	Dual Voltage	OFF	OFF	ON	ON	OFF	3.2V
AMD K6-266/300	Dual Voltage	OFF	ON	OFF	OFF	OFF	2.2V
Cyrix 6x86	Single Voltage	ON	ON	ON	ON	OFF	3.52V
Cyrix 6x86L	Dual Voltage	OFF	OFF	OFF	ON	OFF	2.8V
Cyrix M2	Dual Voltage	ON	OFF	OFF	ON	OFF	2.9V
IDT C6	Single Voltage	OFF	ON	ON	ON	OFF	3.45V

This motherboard supports the CPU core voltage from 1.3V to 3.5V, that can be applied to the various CPU type in future. For your reference, all settings are listed in the following table.

Vcore	S4	S5	S6	S7	S8
1.30V	OFF	OFF	OFF	OFF	ON
1.35V	ON	OFF	OFF	OFF	ON
1.40V	OFF	ON	OFF	OFF	ON
1.45V	ON	ON	OFF	OFF	ON
1.50V	OFF	OFF	ON	OFF	ON
1.55V	ON	OFF	ON	OFF	ON
1.60V	OFF	ON	ON	OFF	ON
1.65V	ON	ON	ON	OFF	ON
1.70V	OFF	OFF	OFF	ON	ON
1.75V	ON	OFF	OFF	ON	ON
1.80V	OFF	ON	OFF	ON	ON
1.85V	ON	ON	OFF	ON	ON
1.90V	OFF	OFF	ON	ON	ON
1.95V	ON	OFF	ON	ON	ON
2.00V	OFF	ON	ON	ON	ON
2.05V	ON	ON	ON	ON	ON
2.0V	OFF	OFF	OFF	OFF	OFF
2.1V	ON	OFF	OFF	OFF	OFF
2.2V	OFF	ON	OFF	OFF	OFF
2.3V	ON	ON	OFF	OFF	OFF
2.4V	OFF	OFF	ON	OFF	OFF
2.5V	ON	OFF	ON	OFF	OFF
2.6V	OFF	ON	ON	OFF	OFF
2.7V	ON	ON	ON	OFF	OFF
2.8V	OFF	OFF	OFF	ON	OFF
2.9V	ON	OFF	OFF	ON	OFF
3.0V	OFF	ON	OFF	ON	OFF
3.1V	ON	ON	OFF	ON	OFF
3.2V	OFF	OFF	ON	ON	OFF
3.3V	ON	OFF	ON	ON	OFF
3.4V	OFF	ON	ON	ON	OFF
3.5V	ON	ON	ON	ON	OFF

JP12	I/O Voltage (Vio)
1-2	3.3 (default)
3-4	3.45V

JP12 is reserved for testing purposes only. This jumper enables you to set the voltage of the onboard chipset and PBSRAM (Vio). For dual-voltage CPU, JP12 also functions as CPU I/O voltage (Vcpuio) controller.



JP12
1 2 3

3.3V
(default)

JP12
1 2 3

3.45V

2.2.2 Selecting the CPU Frequency

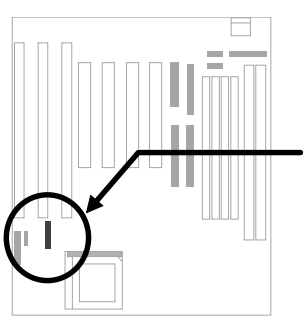
Intel Pentium, Cyrix 6x86, AMD K5/K6 and IDT C6 CPU are designed to have different Internal (Core) and External (Bus) frequency.

Core frequency = Ratio * External bus clock

S1	S2	S3	CPU Frequency Ratio
OFF	OFF	OFF	1.5x (3.5x)
ON	OFF	OFF	2x
ON	ON	OFF	2.5x (1.75x)
OFF	ON	OFF	3x
ON	OFF	ON	4x
ON	ON	ON	4.5x
OFF	ON	ON	5x

The ratio of Core/Bus frequency is selected by the switch 1-3 of **SW1**.

Note: *Intel PP/MT MMX 233MHz is using 1.5x jumper setting for 3.5x frequency ratio, and AMD PR166 is using 2.5x setting for 1.75x frequency ratio.*



1.5x (3.5x)

4x

2x

4.5x

2.5x (1.75x)

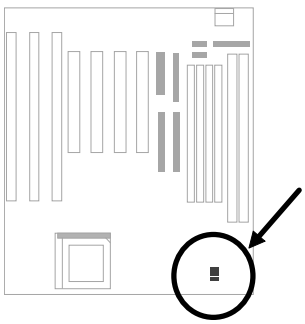
5x

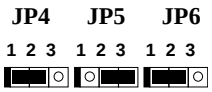
3x

Note: *Intel PP/MT 233MHz is using 1.5x jumper setting for 3.5x frequency ratio, and AMD PR166 is using 2.5x setting for 1.75x frequency ratio.*

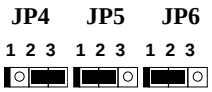
JP4	JP5	JP6	CPU External Clock
1-2	2-3	1-2	60MHz
2-3	1-2	1-2	66MHz
1-2	2-3	2-3	75MHz
2-3	1-2	2-3	83.3MHz

JP4, **JP5** and **JP6** are the selections of CPU external clock (bus clock), which is actually the clock from clock generator.

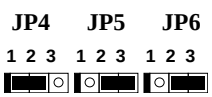




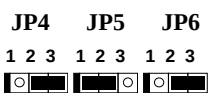
60MHz



66MHz



75MHz



83.3mhz

Warning: *INTEL TX chipset supports only 60/66MHz external CPU bus clock, the 75/83.3MHz settings are for internal test only,* ***set to 75/83.3MHz exceeds the specification of TX chipset, which may cause serious system damage****.*

Caution: *Following table are possible settings of current CPU available on the market. The correct setting may vary because of new CPU product, refer to your CPU specification for more details.*

Warning: *Cyrix 6x86 P200+ uses 75MHz external clock, the jumper setting shown on the table below is for user's convenient. It may cause serious system damage to use 75MHz clock.*

INTEL Pentium	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4 & JP5 & JP6
P54C 90	90MHz =	1.5x	60MHz	OFF	OFF	OFF	1-2 & 2-3 & 1-2
P54C 100	100MHz =	1.5x	66MHz	OFF	OFF	OFF	2-3 & 1-2 & 1-2
P54C 120	120MHz =	2x	60MHz	ON	OFF	OFF	1-2 & 2-3 & 1-2
P54C 133	133MHz =	2x	66MHz	ON	OFF	OFF	2-3 & 1-2 & 1-2
P54C 150	150MHz =	2.5x	60MHz	ON	ON	OFF	1-2 & 2-3 & 1-2
P54C 166	166MHz =	2.5x	66MHz	ON	ON	OFF	2-3 & 1-2 & 1-2
P54C 200	200MHz =	3x	66MHz	OFF	ON	OFF	2-3 & 1-2 & 1-2

INTEL Pentium MMX	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4 & JP5 & JP6
PP/MT 150	150MHz =	2.5x	60MHz	ON	ON	OFF	1-2 & 2-3 & 1-2
PP/MT 166	166MHz =	2.5x	66MHz	ON	ON	OFF	2-3 & 1-2 & 1-2
PP/MT 200	200MHz =	3x	66MHz	OFF	ON	OFF	2-3 & 1-2 & 1-2
PP/MT 233	233MHz =	3.5x	66MHz	OFF	OFF	OFF	2-3 & 1-2 & 1-2

AMD K5	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4 & JP5 & JP6
PR90	90MHz =	1.5x	60MHz	OFF	OFF	OFF	1-2 & 2-3 & 1-2
PR100	100MHz =	1.5x	66MHz	OFF	OFF	OFF	2-3 & 1-2 & 1-2
PR120	90MHz =	1.5x	60MHz	OFF	OFF	OFF	1-2 & 2-3 & 1-2
PR133	100MHz =	1.5x	66MHz	OFF	OFF	OFF	2-3 & 1-2 & 1-2
PR166	116MHz =	1.75x	66MHz	ON	ON	OFF	2-3 & 1-2 & 1-2

AMD K6	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4 & JP5 & JP6
PR2-166	166MHz =	2.5x	66MHz	ON	ON	OFF	2-3 & 1-2 & 1-2
PR2-200	200MHz =	3x	66MHz	OFF	ON	OFF	2-3 & 1-2 & 1-2
PR2-233	233MHz =	3.5x	66MHz	OFF	OFF	OFF	2-3 & 1-2 & 1-2
PR2-266	266MHz=	4x	66MHz	ON	OFF	ON	2-3 & 1-2 & 1-2
PR2-300	300MHz=	4.5x	66MHz	ON	ON	ON	2-3 & 1-2 & 1-2

Cyrix 6x86 & 6x86L	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4 & JP5 & JP6
P150+	120MHz =	2x	60MHz	ON	OFF	OFF	1-2 & 2-3 & 1-2
P166+	133MHz =	2x	66MHz	ON	OFF	OFF	2-3 & 1-2 & 1-2
P200+	150MHz =	2x	75MHz	ON	OFF	OFF	1-2 & 2-3 & 2-3

Cyrix M2	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4 & JP5 & JP6
MX-PR166	150MHz =	2.5x	60MHz	ON	ON	OFF	1-2 & 2-3 & 1-2
MX-PR200	166MHz =	2.5x	66MHz	ON	ON	OFF	2-3 & 1-2 & 1-2
	150MHz=	2x	75MHz	ON	OFF	OFF	1-2 & 2-3 & 2-3
MX-PR233	200MHz =	3x	66MHz	OFF	ON	OFF	2-3 & 1-2 & 1-2
	166MHz=	2x	83.3MHz	ON	OFF	OFF	2-3 & 1-2 & 2-3
MX-PR266	233MHz =	3.5x	66MHz	OFF	OFF	OFF	2-3 & 1-2 & 1-2

IDT C6	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4 & JP5 & JP6
C6-150	150MHz =	2x	75MHz	ON	OFF	OFF	1-2 & 2-3 & 2-3
C6-180	180MHz =	3x	60MHz	OFF	ON	OFF	1-2 & 2-3 & 1-2
C6-200	200MHz =	3x	66MHz	OFF	ON	OFF	2-3 & 1-2 & 1-2

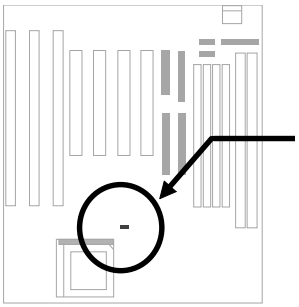
Note: *Cyrix 6x86 and AMD K5 CPU use P-rating for the reference of CPU benchmark compared with INTEL P54C, their internal core frequency is not exactly equal to P-rating marked on the CPU. For example, Cyrix P166+ is 133MHz but performance is almost equal to P54C 166MHz and AMD PR133 is 100MHz but performance is almost equal to INTEL P54C 133MHz.*

Note: *INTEL TX chipset does not support CPU with 50/55MHz external bus clock, so that P54C 75MHz, Cyrix P120+,P133+ and AMD PR75 are not supported by this mainboard.*

2.2.3 Clearing the CMOS

JP14	Clear CMOS
1-2	Normal operation (default)
2-3	Clear CMOS

You need to clear the CMOS if you forget your system password. To clear the CMOS, follow the procedures listed below:



Normal Operation (default)

Clear CMOS

The procedure to clear CMOS:

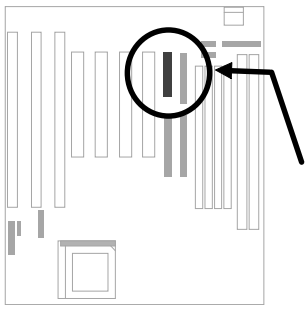
1. Turn off the system power.
2. Locate **JP14** and short pins 2-3 for a few seconds.
3. Return **JP14** to its normal setting by shorting pins 1-2.
4. Turn on the system power.
5. Press DEL during bootup to enter the BIOS Setup Utility and specify a new password, if needed.

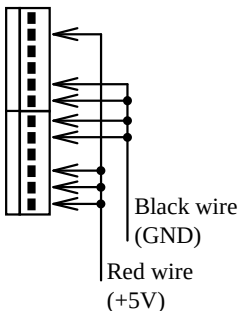
2.3 Connectors

2.3.1 Power Cable

A standard baby AT (PS/2) power supply has two cables with six wires on each. Plug in these cables to the onboard power connector in such a way that all the black wires are in the center. The power connector is marked as **PWR1** on the system board.

Caution: *Make sure that the power supply is off before connecting or disconnecting the power cable.*

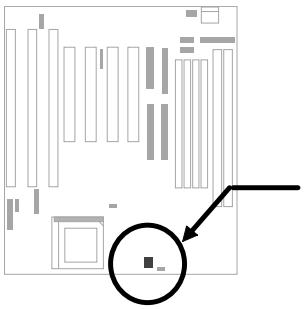


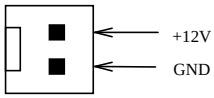


PWR1

2.3.2 CPU Fan

Plug in the fan cable to the two-pin fan connector onboard. The fan connector is marked **CPUFAN** on the system board. Attach the heatsink and fan to the CPU. Check its orientation, make sure the air flow go through the heatsink.



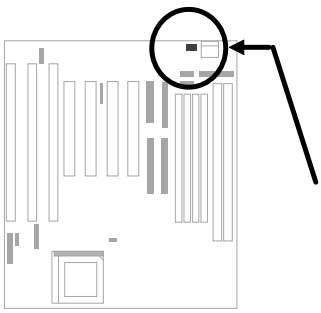


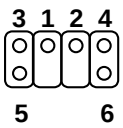
CPUFAN

2.3.3 PS/2 Mouse

To connect a PS/2 mouse, insert the PS/2 mouse bracket connector to **PS2 MS** on the system board. Then plug in the PS/2 mouse cable to the mouse port on the bracket.

Pin	Description
1	MS DATA
2	NC
3	GND
4	+5V
5	MS CLK
6	NC

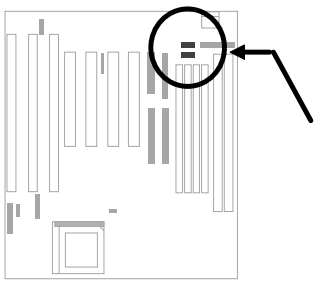


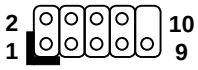


PS2 MS

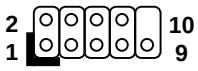
2.3.4 Serial Devices (COM1/COM2)

To support serial devices, insert the serial device connector into the serial port on the bracket. Plug in the 10-pin flat cable to the appropriate onboard connectors. The serial port 1 connector is marked as **COM1** and the serial port 2 connector is marked as **COM2** on the system board.





COM2

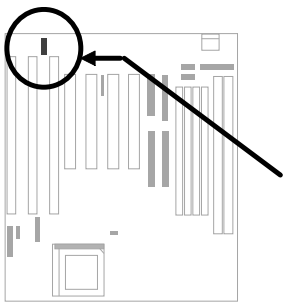


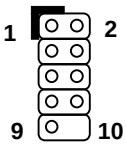
COM1

2.3.5 USB Device (optional)

You need a USB bracket to have your system to support additional USB device(s). To attach a USB bracket, simply insert the bracket cable to the onboard USB connector marked as **USB.**

Pin	Description	Pin	Description
1	V0	2	V1
3	D0-	4	D1-
5	D0+	6	D1+
7	GND	8	GND
9	NC	10	NC

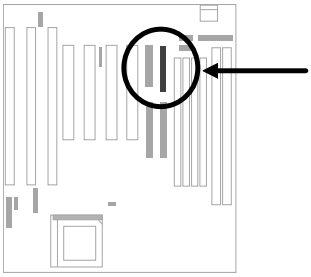


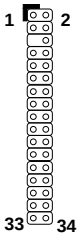


USB

2.3.6 Floppy Drive

Connect the 34-pin floppy drive cable to the floppy drive connector marked as **FDC** on the system board.

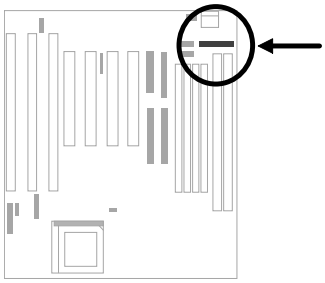


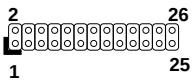


FDC

2.3.7 Printer

Plug in the 26-pin printer flat cable to the onboard parallel connector marked as **PRINTER** on the board.





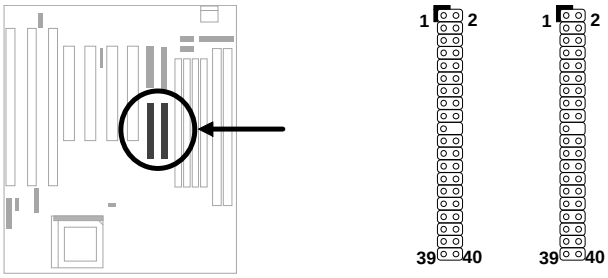
PRINTER

2.3.8 IDE Hard Disk and CD ROM

This mainboard supports two 40 pin IDE connectors marked as **IDE1** and **IDE2.** IDE1 is also known as primary channel and IDE2 as secondary channel, each channel supports two IDE devices that makes 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 hard disk or CDROM. The setting as master or slave mode depends on the jumper on your IDE device, please refer to your hard disk and CDROM manual accordingly.

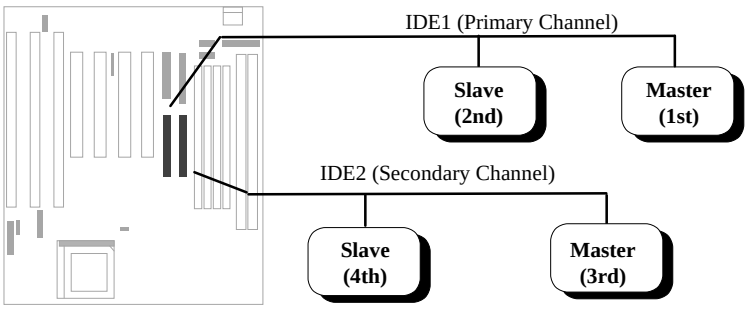
Connect your first IDE hard disk to master mode of the primary channel. If you have second IDE device to install in your system, connect it as slave mode on the same channel, and the third and fourth device can be connected on secondary channel as master and slave mode respectively.



IDE1 **IDE2**

***Caution**: The specification of IDE cable is maximum 46cm (18 inches), make sure your cable does not excess this length.*

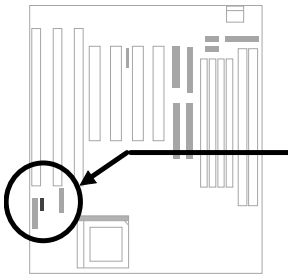
***Caution:** For better signal quality, it is recommended to set far end side device to master mode and follow the suggested sequence to install your new device . Please refer to following figure.*

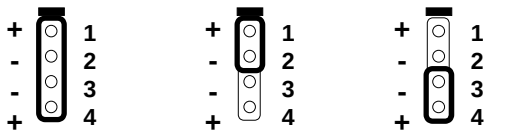


2.3.9 Hard Disk LED

The HDD LED connector is marked as **HDD LED** on the board. This connector is designed for different type of housing, actually only two pins are necessary for the LED. If your housing has four pin connector, simply plug it in. If you have only two pin connector, please connect to pin 1-2 or pin 3-4 according to the polarity.

Pin	Description
1	HDD LED
2	GND
3	GND
4	HDD LED





HDD LED

4-pin connector

HDD LED

2-pin connector at pin 1-2

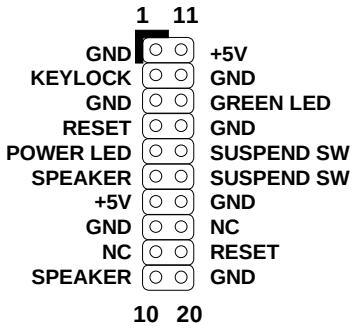
HDD LED

2-pin connector at pin 3-4

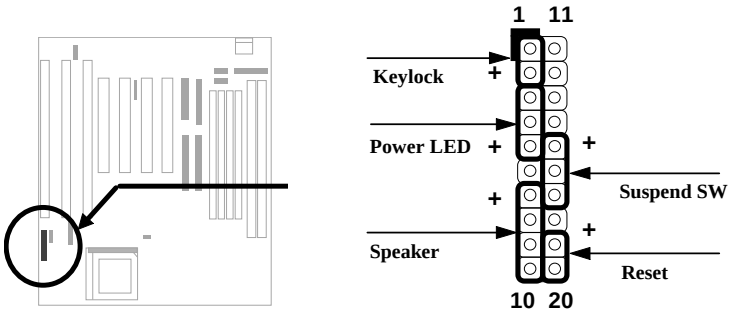
2.3.10 Panel Connector

The Panel (multifunction) connector is a 20-pin connector marked as **PANEL** on the board. Attach the power LED, keylock, speaker, reset switch, suspend switch, and green mode LED connectors to the corresponding pins as shown in the figure.

Some housings have a five-pin connector for the keylock and power LED Since power LED and keylock are aligned together, you can still use this kind of connector.

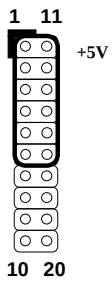


PANEL



PANEL

Other housings may have a 12-pin connector. If your housing has this type of connector, connect it to PANEL as shown in the figure. Make sure that the red wire of the connector is connected to +5V.



PANEL

Note: *If your housing comes with a Turbo switch, you may use this connector for Suspend switch function.*

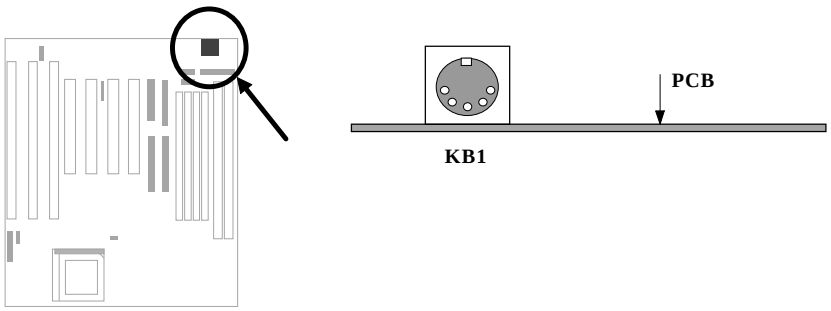
Note*: Pressing the Suspend switch allows you to manually force the system to suspend mode. However, this is possible only if the Power Management function in the BIOS Setup menu is enabled.*

Warning: *If you use toggle mode Turbo switch as Suspend switch, be sure to push it twice to simulate momentary mode. Otherwise the system may hang or fail to reboot.*

2.3.11 Keyboard

The onboard keyboard connector is a five-pin AT-compatible connector marked as **KB1**. The view angle of drawing shown here is from back panel of the housing.

Note*: The mini DIN PS/2 keyboard connector is optional.*



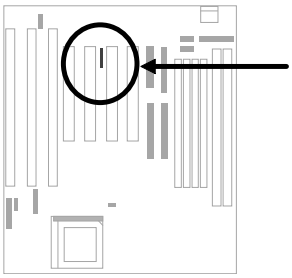
2.3.12 IrDA Connector

Serial port 2 can be configured to support wireless infrared module, with this module and application software such as Laplink, user can transfer files to or from laptops, notebooks, PDA and printers. This mainboard supports IrDA (115Kbps, 1 meter) as well as ASK-IR (19.2Kbps).

Install infrared module onto **IrDA** connector and enable infrared function from BIOS setup, make sure to have correct orientation when you plug onto IrDA connector.

Pin	Description
1	+5V
2	NC
3	IRRX
4	GND
5	IRTX
6	NC

***Note**: Onboard serial port 2 (COM2) will not be available after IrDA connector is enabled.*

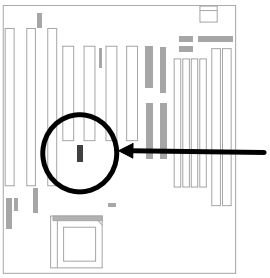


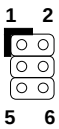
IrDA

2.3.13 SB-LINK

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

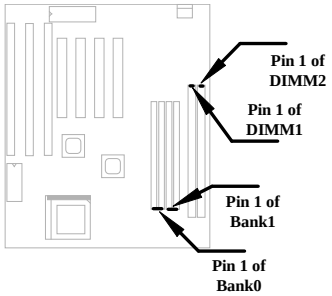
Pin	Description
1	GNT#
2	GND
3	NC
4	REQ#
5	GND
6	SIRQ#





SB-LINK

2.4 Installing the System Memory



This mainboard has four 72 pin SIMM sockets (Single-in-line Memory Module) and two 168 pin DIMM socket (Dual-in-line Memory Module) that allow you to install system memory from minimum 8MB up to maximum 256MB.

The SIMM supported by this mainboard can be identified by 4 kinds of factors:

I. Size: single side, 1Mx32 (4MB), 4Mx32 (16MB), 16Mx32 (64MB), and double side, 1Mx32x2 (8MB), 4Mx32x2 (32MB), 16Mx32x2 (128MB).

II. Speed: 60ns or 70ns access time

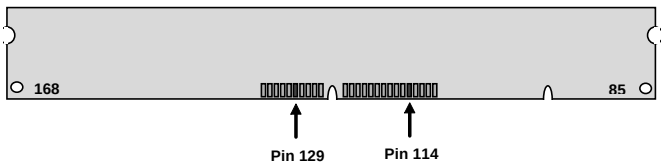
III. Type: FPM (Fast page mode) or EDO (Extended data output)

IV. Parity: without parity (32 bit wide) or with parity (36 bit wide).

The DIMM supported by this motherboard are always 64-bit wide SDRAM, which can be identified by following factors:

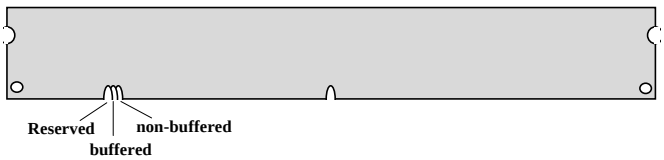
I. Size: single side, 1Mx64 (8MB), 2Mx64 (16MB), 4Mx64 (32MB), 8Mx64 (64MB), 16Mx64 (128MB), and double side, 1Mx64x2 (16MB), 2Mx64x2 (32MB), 4Mx64x2 (64MB), 8Mx64x2 (128MB).

Tip: *Here is a trick to check if your DIMM is single-side or double-side -- if there are traces connected to golden finger pin 114 and pin 129 of the DIMM, the DIMM is probably double-side; otherwise, it is single-side. Following figure is for your reference.*



II. **Speed:** normally marked as -12, which means the clock cycle time is 12ns and maximum clock of this SDRAM is 83MHz. Sometimes you can also find the SDRAM marked as -67, which means maximum clock is 67MHz.

III. **Buffered and non-buffered:** This motherboard supports non-buffered DIMMs. You can identify non-buffered DIMMs and buffered DIMMs according to the position of the notch, following figure is for your reference:



Because the positions are different, only non-buffered DIMMs can be inserted into the DIMM sockets on this motherboard. Although most of DIMMs on current market are non-buffered, we still recommand you to ask your dealer for the correct type.

IV. **2-clock and 4-clock signals:** Although both of 2-clock and 4-clock signals are supported by this motherboard, we strongly recommand you to choose 4-clock SDRAM in consideration of reliability.

Tip: *To identify 2-clock and 4-clock SDRAM, you may check if there are traces connected to golden finger pin 79 and pin 163 of the SDRAM. If there are traces, the SDRAM is probably 4-clock; Otherewise, it is 2-clock.*

V. **Parity:** This motherboard supports standard 64 bit wide (without parity) SDRAM.

Because Pentium CPU has 64 bit bus width, the SIMM sockets are arranged in two banks of two sockets each, they are Bank0 and Bank1. Both SIMMs in each bank must be in the same size and type. It is allowed to have different speed and type in different bank, for example, 70ns FPM in one bank and 60ns EDO in another bank, in such case, each bank is independently optimized for maximum performance. The memory timing requires at least 70ns fast page mode DRAM chip, but for optimum performance, 60ns EDO DRAM is recommended.

Warning*: The default memory timing setting is 60ns to obtain the optimal performance. Because of the specification limitation, 70ns SIMM is recommended to be used only for CPU external clock 60MHz.*

There is no jumper setting required for the memory size or type. It is automatically detected by the system BIOS. You can use any single side SIMM and DIMM combination list below for BANK0/BANK1 or DIMM socket, and the total memory size is to add them together. **Note that because TX chipset limitation, the maximum is only 256MB.**

SIMM1	SIMM2	Subtotal of Bank0
None	None	0MB
4MB	4MB	8MB
8MB	8MB	16MB
16MB	16MB	32MB
32MB	32MB	64MB
64MB	64MB	128MB
128MB	128MB	256MB

SIMM3	SIMM4	Subtotal of Bank1
None	None	0MB
4MB	4MB	8MB
8MB	8MB	16MB
16MB	16MB	32MB
32MB	32MB	64MB
64MB	64MB	128MB
128MB	128MB	256MB

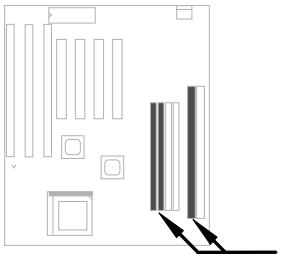
DIMM1	Size of DIMM1
None	0MB
8MB	8MB
16MB	16MB
32MB	32MB
64MB	64MB
128MB	128MB
256MB	256MB

DIMM2	Size of DIMM2
None	0MB
8MB	8MB
16MB	16MB
32MB	32MB
64MB	64MB
128MB	128MB
256MB	256MB

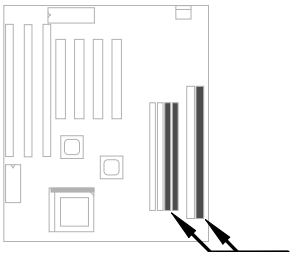
Total Memory Size = Subtotal of Bank0 + Subtotal of Bank1

+ Size of DIMM1 + Size of DIMM2

For double side memory module, there is one limitation. This mainboard supports only 4 RAS# (Row address latch) signals for DRAM control. They can only be occupied by one DRAM module, they can not be shared. **The simple rule is: If double side module at either Bank0 or DIMM1, the other must be empty**. If you use at DIMM1, Bank0 must be empty. **Bank1 and DIMM2 have the same limitation**.



Double side module at either Bank0 or DIMM1, the other must be empty.



Double side module at either Bank1 or DIMM2, the other must be empty.

Following table explains more about the RAS limitation. You can see that Bank0 1st side and DIMM1 2nd side use the same RAS0#, and Bank0 2nd side and DIMM1 1st side use the same RAS1#. If you are using single side SIMM at Bank0 and single side DIMM at DIMM1, it should be no problem. But only one double side DIMM or double side SIMM can be at Bank0 or DIMM1.

	Bank0 1st side	**Bank0 2nd side**	**Bank1 1st side**	**Bank1 2nd side**	**DIMM1 1st side**	**DIMM1 2nd side**	**DIMM2 1st side**	**DIMM2 2nd side**
RAS0#	X					X		
RAS1#		X			X			
RAS2#			X					X
RAS3#				X			X	

Caution: *Make sure that you install the same SIMM type and size for each bank.*

Caution: *There are some old DIMMs made by EDO or FPM memory chip, they can only accept 5V power and probably can not fit into the DIMM socket, make sure you have 3.3V true SDRAM DIMM before your insert it.*

Tip: *If you have DIMM made by 3V EDO, it is possible that TX chipset can support it. But because it is so rare, the only 3V EDO DIMM had been tested by this mainboard is Micron MT4LC2M8E7DJ-6.*

Warning*: Do not use SIMM and SDRAM DIMM together unless you have 5V tolerance SDRAM (such as Samsung or TI). The FPM/EDO operate at 5V while SDRAM operates at 3.3V. If you combine them together the system will temporary work fine; however after a few months, the SDRAM 3.3V data input will be damaged by 5V FPM/EDO data output line.*

There is an important parameter affects SDRAM performance, CAS Latency Time. It is similar as CAS Access Time of EDO DRAM and is calculated as number of clock state. The SDRAM that AOpen had tested are listed below. If your SDRAM has unstable problem, go into BIOS "Chipset Features Setup", change CAS Latency Time to 3 clocks.

Manufacturer	Model	Suggested CAS Latency Time	5V Tolerance
Samsung	KM416511220AT-G12	2	Yes
NEC	D4S16162G5-A12-7JF	2	No
Hitachi	HM5216805TT10	2	No
Fujitsu	81117822A-100FN	2	No
TI	TMX626812DGE-12	2	Yes
TI	TMS626812DGE-15	3	Yes
TI	TMS626162DGE-15	3	Yes
TI	TMS626162DGE-M67	3	Yes

The driving capability of new generation chipset is limited because the lack of memory buffer (to improve performance). This makes DRAM chip count an important factor to be taking into consideration when you install SIMM/DIMM. Unfortunately, there is no way that BIOS can identified the correct chip count, you need to calculate the chip count by yourself. The simple rule is: By visual inspection, use only SIMM with chip count less than 24 chips, and use only DIMM which is less than 16 chips.

***Warning**: Do not install any SIMM that contains more than 24 chips. SIMMs contain more than 24 chips exceed the chipset driving specification. Doing so may result in unstable system behavior.*

***Warning**: Although Intel TX chipset supports x4 SDRAM chip. Due to loading issue, it is not recommended to use this kind of SDRAM.*

***Tip:** The SIMM/DIMM chip count can be calculated by following example:*

1. *For 32 bit non-parity SIMM using 1M by 4 bit DRAM chip, 32/4=8 chips.*
2. *For 36 bit parity SIMM using 1M by 4 bit DRAM chip, 36/4=9 chips.*
3. *For 36 bit parity SIMM using 1M by 4 bit and 1M by 1 bit DRAM, the chip count will be 8 data chips(8= 32/4) plus 4*

parity chips(4=4/1), total is 12 chips.

4. *For 64 bit DIMM using 1M by 16 bit SDRAM, the chip count is 64/16=4 chips.*

Following table list the recommended DRAM combinations of SIMM and DIMM:

SIMM Data chip	SIMM Parity chip	Bit size per side	Single/ Double side	Chip count	SIMM size	Recommended
1M by 4	None	1Mx32	x1	8	4MB	Yes
1M by 4	None	1Mx32	x2	16	8MB	Yes
1M by 4	1M by 1	1Mx36	x1	12	4MB	Yes
1M by 4	1M by 4	1Mx36	x1	9	4MB	Yes
1M by 4	1M by 4	1Mx36	x2	18	8MB	Yes
1M by 16	None	1Mx32	x1	2	4MB	Yes
1M by 16	None	1Mx32	x2	4	8MB	Yes
1M by 16	1M by 4	1Mx36	x1	3	4MB	Yes
1M by 16	1M by 4	1Mx36	x2	6	8MB	Yes
4M by 4	None	4Mx32	x1	8	16MB	Yes
4M by 4	None	4Mx32	x2	16	32MB	Yes
4M by 4	4M by 1	4Mx36	x1	12	16MB	Yes
4M by 4	4M by 1	4Mx36	x2	24	32MB	Yes

SIMM Data chip	SIMM Parity chip	Bit size per side	Single/ Double side	Chip count	SIMM size	Recommended
16M by 4	None	16Mx32	x1	8	64MB	Yes, but not tested.
16M by 4	None	16Mx32	x2	16	128MB	Yes, but not tested.
16M by 4	16M by 4	16Mx36	x1	9	64MB	Yes, but not tested.
16M by 4	16M by 4	16Mx36	x2	18	128MB	Yes, but not tested.

DIMM Data chip	Bit size per side	Single/ Double side	Chip count	DIMM size	Recommended
1M by 16	1Mx64	x1	4	8MB	Yes
1M by 16	1Mx64	x2	8	16MB	Yes
2M by 8	2Mx64	x1	8	16MB	Yes
2M by 8	2Mx64	x2	16	32MB	Yes

DIMM Data chip	Bit size per side	Single/ Double side	Chip count	DIMM size	Recommended
2M by 32	2Mx64	x1	2	16MB	Yes, but not tested.
2M by 32	2Mx64	x2	4	32MB	Yes, but not tested.
4M by 16	4Mx64	x1	4	32MB	Yes, but not tested.
4M by 16	4Mx64	x2	8	64MB	Yes, but not tested.
8M by 8	8Mx64	x1	8	64MB	Yes, but not tested.
8M by 8	8Mx64	x2	16	128MB	Yes, but not tested.

***Warning**: 64MB SIMMs using 16M by 4 bit chip (64M bit technology) are not available in the market and are not formally tested by AOpen quality test department yet. However they are supported by design specification from Intel and they will be tested as soon as they are available. Note that 64MB SIMMs using 16M by 1 bit chip (16M bit technology) have chip count exceed 24 and are strongly not recommended.*

***Tip:** 8 bit = 1 byte, 32 bit = 4 byte. The SIMM size is represented by number of data byte (whether with or without parity), for example, the size of single side SIMM using 1M by 4 bit chip is 1Mx32 bit, that is, 1M x 4 byte= 4MB. For double side SIMM, simply multiply it by 2, that is, 8MB.*

Following table are possible DRAM combinations that is **NOT** recommended:

SIMM Data chip	SIMM Parity chip	Bit size per side	Single/ Double side	Chip count	SIMM size	Recommended
1M by 1	None	1Mx32	x1	32	4MB	No
1M by 1	1M by 1	1Mx36	x1	36	4MB	No
1M by 4	1M by 1	1Mx36	x2	24	8MB	No
4M by 1	None	4Mx32	x1	32	16MB	No
4M by 1	4M by 1	4Mx36	x1	36	16MB	No
16M by 1	None	16Mx32	x1	32	64MB	No
16M by 1	16M by 1	16Mx36	x1	36	64MB	No

DIMM Data chip	Bit size per side	Single/ Double side	Chip count	DIMM size	Recommended
4M by 4	4Mx64	x1	16	32MB	No
4M by 4	4Mx64	x2	32	64MB	No
16M by 4	16Mx64	x1	16	128MB	No
16M by 4	16Mx64	x2	32	256MB	No

Memory error checking is supported by parity check. To use parity check you need 36 bit SIMM (32 bit data + 4 bit parity), which are automatically detected by BIOS.

Tip: *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.*