Chapter 2

Hardware Installation

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

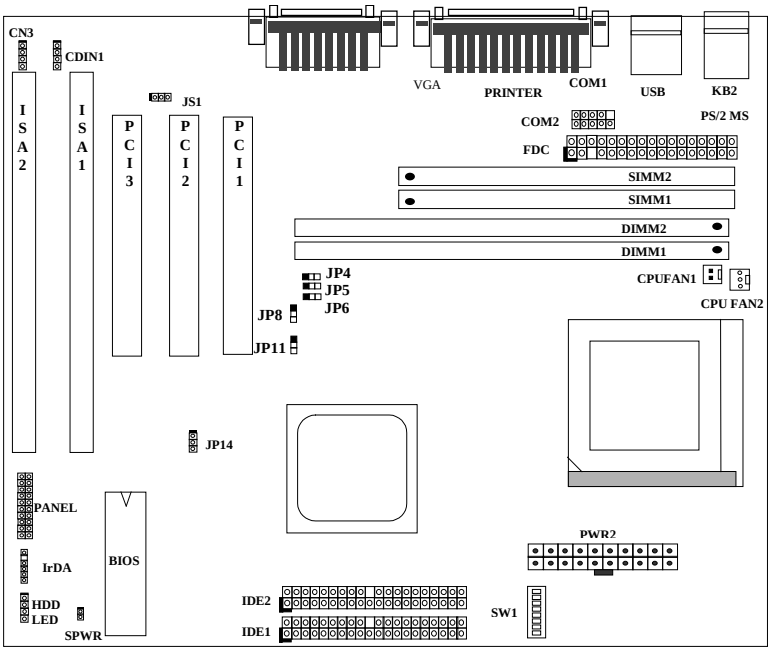
Caution: *Electrostatic discharge (ESD) can damage your processor, disk drives, expansion boards, and other components. Always observe the following precautions before you install a system component.*

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 Jumper and Connector Locations

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



Jumpers:

JP14:	Clear CMOS
JS1:	Disable Onboard Audio

Connectors:

PS2:	PS/2 mouse connector
KB:	PS/2 keyboard connector
COM1:	COM1 connector
COM2:	COM2 connector
PRINTER:	Printer connector
PWR2:	ATX power connector
USB:	USB connector
FDC:	Floppy drive connector
IDE1:	IDE1 primary channel
IDE2:	IDE2 secondary channel
VGA:	VGA connector
CPUFAN1:	CPU fan connector
CDUFAN2:	CPU fan connector
IrDA:	IrDA (Infrared) connector
HDD LED:	HDD LED connector
PANEL:	Front panel (Multifunction) connector
SPWR:	ATX Soft-Power Switch Connector
CDIN1:	CD-audio connector
CN3:	Mono in (Pin 1-2) and Mic out (Pin 3-4)

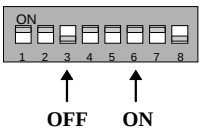
2.2 Jumpers

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

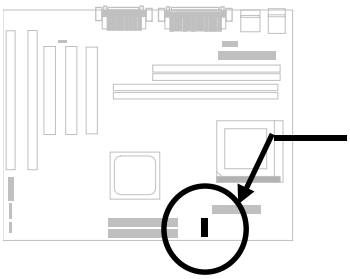
For your convenience to install a CPU, this motherboard also use a DIP switch to set CPU voltage and frequency ratio. The following figure simply shows you how to set this DIP switch, please see also to next sections for more details.



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 CPU, remember to set the switch 4-8 to specify a proper Vcore.



3.52V

6x86 or K5

3.45V

P54C

3.3V

IDT C6

3.2V

K6-233

2.9V

K6-166/200 or M2

2.8V

P55C (MMX)

2.2V

K6-266/300 or K6-II

The following table lists possible settings of current CPU available on the market. Note that the correct setting may vary because of new CPU product, please see to your CPU specification for more details.

CPU	Type	Vcore	S4	S5	S6	S7	S8
INTEL P54C	Single Voltage	3.45V	OFF	ON	ON	ON	OFF
INTEL P55C	Dual Voltage	2.8V	OFF	OFF	OFF	ON	OFF
AMD K5	Single Voltage	3.52V	ON	ON	ON	ON	OFF
AMD K6-166/200	Dual Voltage	2.9V	ON	OFF	OFF	ON	OFF
AMD K6-233	Dual Voltage	3.2V	OFF	OFF	ON	ON	OFF
AMD K6-266/300	Dual Voltage	2.2V	OFF	ON	OFF	OFF	OFF
AMD K6-II	Dual Voltage	2.2V	OFF	ON	OFF	OFF	OFF
Cyrix 6x86	Single Voltage	3.52V	ON	ON	ON	ON	OFF
Cyrix 6x86L	Dual Voltage	2.8V	OFF	OFF	OFF	ON	OFF
Cyrix M2	Dual Voltage	2.9V	ON	OFF	OFF	ON	OFF
IDT C6	Single Voltage	3.52V 3.3V	ON ON	ON OFF	ON ON	ON ON	OFF OFF

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.*

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.*

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
2.1V	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

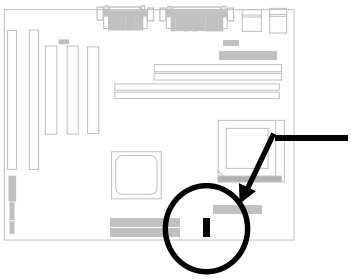
2.2.2 Selecting the CPU Frequency

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
OFF	OFF	ON	5.5x

Intel Pentium, Cyrix 6x86 and AMD K5/K6 CPU are designed to have different Internal (Core) and External (Bus) frequency. The ratio of Core/Bus frequency is selected by the switch 1-3 of **SW1**.

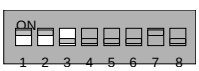
Note: *Intel PP/MT MMX 233MHz is using 1.5x jumper setting for 3.5x frequency ratio, and AMD PR166 is using 2.5x setting for 1.75x frequency ratio.*

Core frequency = Ratio * External bus clock



1.5x (3.5x)

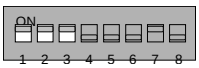
2x



2.5x (1.75x)

3x

4x



4.5x

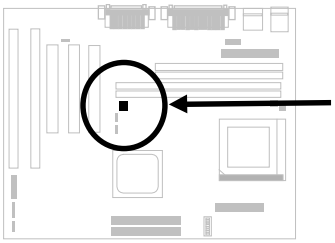
5x

5.5x

JP4	JP5	JP6	CPU External Clock
2-3	2-3	1-2	50MHz
2-3	2-3	2-3	55MHz
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	83MHz

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

JP4, JP5, JP6 and **J25** are the selections of CPU external clock (bus clock), AGP Clock and PCI Clock.



JP4 & JP5 & JP6

50MHz

JP4 & JP5 & JP6

66MHz

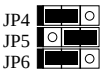
JP4 & JP5 & JP6

55MHz

JP4 & JP5 & JP6

75MHz

JP4 & JP5 & JP6



60MHz

JP4 & JP5 & JP6

83MHz

Warning: *SIS 5598 chipset supports maximum 75 MHz external CPU bus clock, the 83MHz settings are for internal test only, set to 83MHz exceeds the specification of the chipset, which may cause serious system damage.*

Caution: *The 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.*

INTEL	CPU Core	Ratio	External	S1	S2	S3	JP4 & JP5 & JP6

Pentium	Frequency		Bus Clock				
P54C 75	75MHz =	1.5x	50MHz	OFF	OFF	OFF	2-3 & 2-3 & 1-2
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

Cyrix 6x86 & 6x86L	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4 & JP5 & JP6
P120+	100MHz =	2x	50MHz	ON	OFF	OFF	2-3 & 2-3 & 1-2
P133+	110MHz =	2x	55MHz	ON	OFF	OFF	2-3 & 2-3 & 2-3
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	83MHz	ON	OFF	OFF	2-3 & 1-2 & 2-3
MX-PR266	233MHz =	3.5x	66MHz	OFF	OFF	OFF	2-3 & 1-2 & 1-2
MX-PR300	225MHz=	3x	75MHz	OFF	ON	OFF	1-2 & 2-3 & 2-3
	233MHz=	3.5x	66MHz	OFF	OFF	OFF	2-3 & 1-2 & 1-2
	240MHz	4x	60MHz	ON	OFF	ON	1-2 & 2-3 & 1-2

AMD K5	CPU Core	Ratio	External	S1	S2	S3	JP4 & JP5 & JP6

	Frequency		Bus Clock				
PR75	75MHz=	1.5x	50MHz	OFF	OFF	OFF	2-3 & 2-3 & 1-2
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

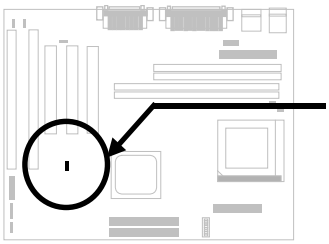
IDT C6	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4 & JP5 & JP6
C6-150	150MHz =	2x	75MHz	ON	OFF	OFF	1-2 & 2-3 & 2-3
C6-180	180MHz =	3x	60MHz	OFF	ON	OFF	1-2 & 2-3 & 1-2
C6-200	200MHz =	3x	66MHz	OFF	ON	OFF	2-3 & 1-2 & 1-2

Note: *Cyrix 6x86, 6x86MX (M2) 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.*

2.2.4 Clearing the CMOS

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

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



JP14

Normal Operation (default)

JP14

Clear CMOS

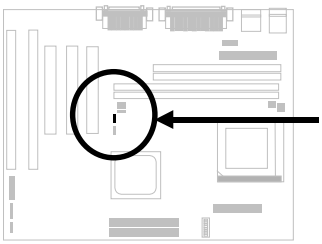
The procedure to clear CMOS:

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 1-2.
5. Connect ATX power cable back to connector PWR2.
6. Turn on the system power.
7. Press DEL during bootup to enter the BIOS Setup Utility and specify a new password, if needed.

2.2.5 Setting PCI Clock

JP8	Setting PCI Clock
1-2	Sync (default)
2-3	Async

JP8 is used to set PCI clock. The default setting is synchronous, that means PCI clock will be half of external clock. (For example, if CPU external clock is set to 66MHz, then the PCI clock will be 33MHz.) However, the specification of PCI clock is maximum 33 MHz. In order to avoid system unstable, we recommend you set the PCI clock to Async if the CPU external clock is set to 75/83 MHz.



JP8

Sync (default)

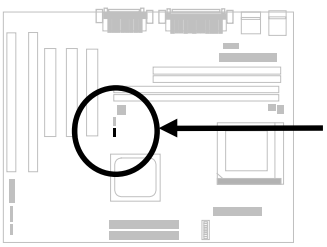
JP8

Async

2.2.5 Disable Onboard VGA

JP11	Disable Onboard VGA
1-2	Enabled (default)
2-3	Disabled

You have to set this jumper to Disabled if you want to install another VGA card.



JP11

Enabled (default)

JP11

Disabled

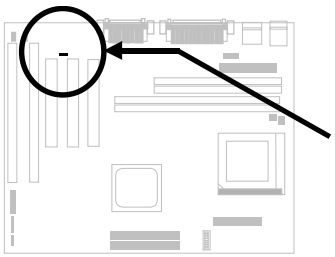
Note: *The onboard VGA shares a part of system memory, you can set the shared memory size from BIOS Setup. In addition, you have to install your DIMM on DIMM1 slot if you have only a single DIMM. The same idea is also applied to insert a single SIMM, you should install the SIMM on SIMM1 slot.*

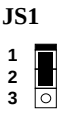
Note: *The AOpen Bonus Pack CD-ROM contains VGA drivers for this board. For more information, please see the Readme.txt file in the CDROM.*

2.2.5 Disable Onboard Audio

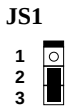
JS1	Disable Onboard Audio
1-2	Enabled (default)
2-3	Disabled

If you want to install other sound card, you have to disable the onboard audio by setting this jumper to Disabled.





Enabled (default)



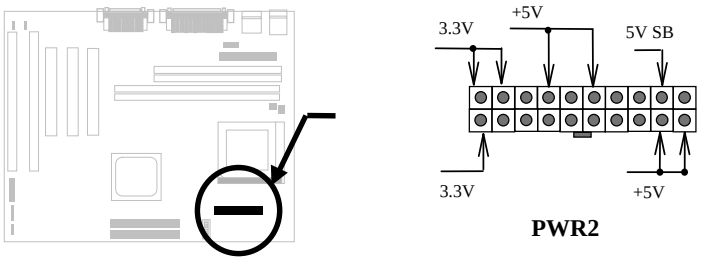
Disabled

2.3 Connectors

2.3.1 Power Cable

The ATX power supply uses 20-pin connector shown below. Make sure you plug in the right direction.

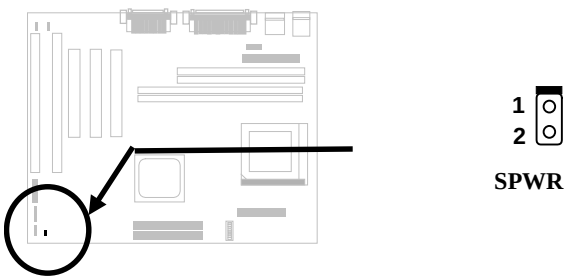
Caution: *Make sure that the power supply is off before connecting or disconnecting the power cable.*



PWR2

2.3.2 ATX Soft-Power Switch Connector

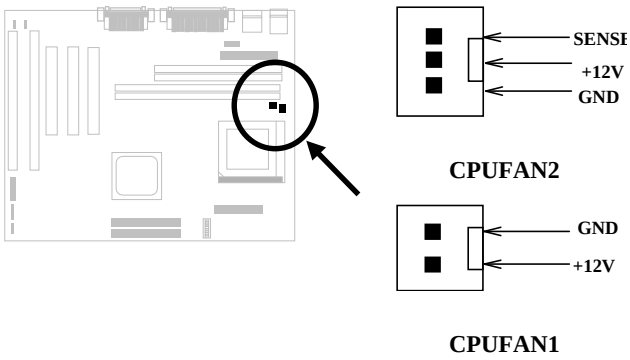
The ATX soft-power switch connector is a 2-pin header on the system board. Locate the power switch cable from your ATX housing. It is 2-pin female connector from the housing front panel. Plug this connector to the soft-power switch connector marked **SPWR**.



SPWR

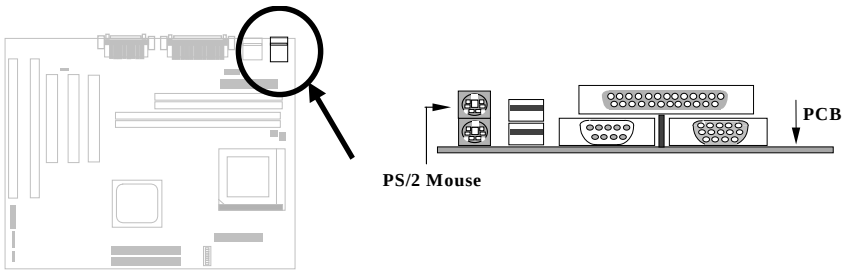
2.3.3 Fan

Plug in the fan cable to the fan connectors onboard. The fan connectors are marked as **CPUFAN1** and **CPUFAN2** on the system board. You can plug the CPU fan cable to both the 2-pin fan connector CPUFAN1 and the 3-pin fan connector CPUFAN2. Note that only CPUFAN2 supports the fan monitoring function, because 3-pin fan has an extra pin called SENSE, which periodically sends fan signal out.



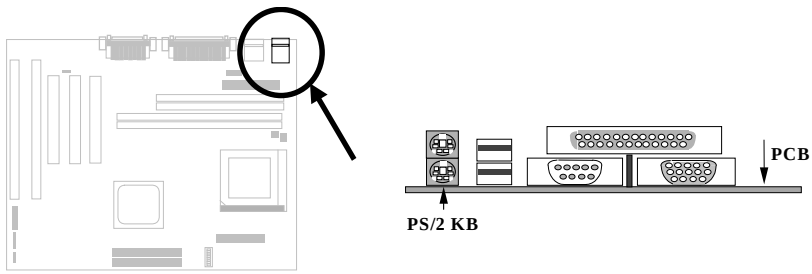
2.3.4 PS/2 Mouse

The onboard PS/2 mouse connector is a 6-pin Mini-Din connector marked **PS2**. The view angle of drawing shown here is from back panel of the housing.



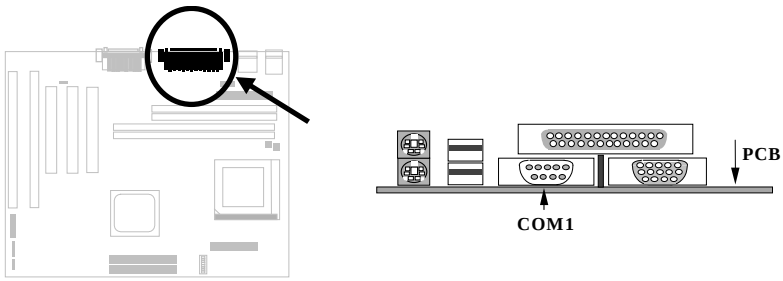
2.3.5 Keyboard

The onboard PS/2 keyboard connector is a 6-pin Mini-Din connector marked **KB2**. The view angle of drawing shown here is from back panel of the housing.



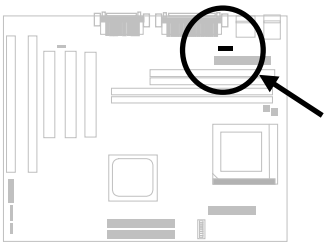
2.3.6 Serial Devices (COM1)

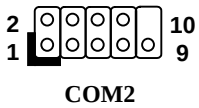
The onboard serial connector **COM1** is a 9-pin D-type connector on the back panel of the mainboard.



2.3.6 Serial Devices (COM2)

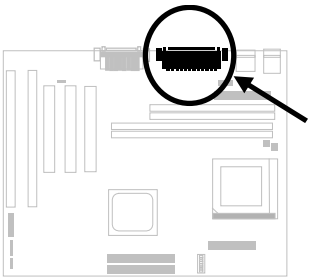
Plug in the 10-pin flat cable to the **COM2** connectors.

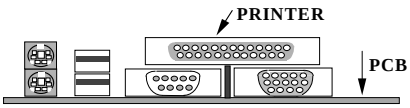




2.3.7 Printer

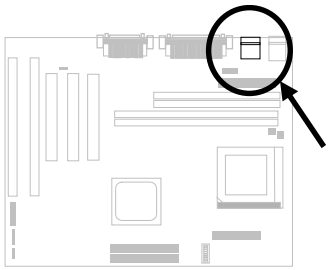
The onboard printer connector is a 25-pin D-type connector marked **PRINTER**. The view angle of drawing shown here is from back panel of the housing.

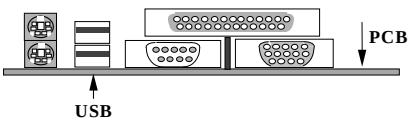




2.3.8 USB Device

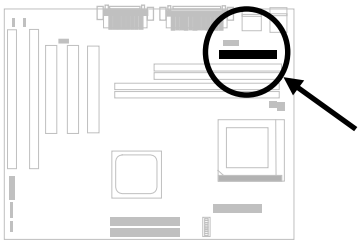
You can attach USB devices to the USB connector. The motherboard contains two USB connectors, which are marked as **USB.**

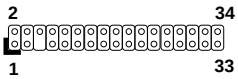




2.3.9 Floppy Drive

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





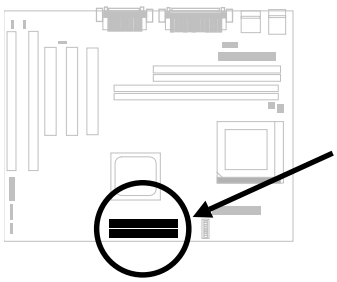
FDC

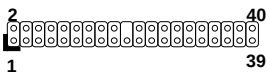
2.3.10 IDE Hard Disk and CD ROM

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.

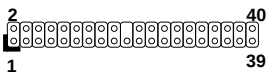
In order to work together, the two devices on each channel must be set differently to master and slave mode, either one can be hard disk or CDROM. The setting as master or slave mode depends on the jumper on your IDE device, please refer to your hard disk and CDROM manual accordingly.

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.





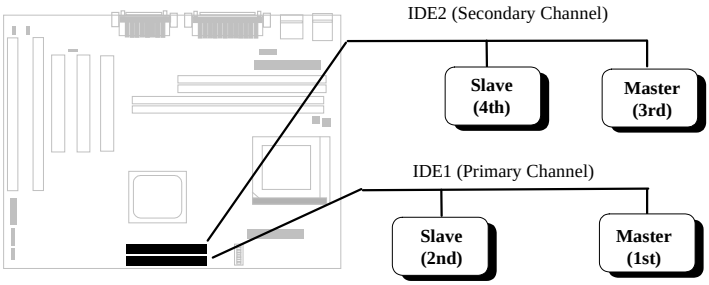
IDE2



IDE1

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

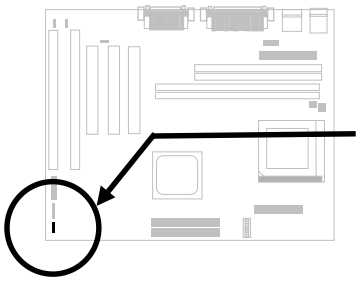
***Caution:** For better signal quality, it is recommended to set far end side device to master mode and follow the suggested sequence to install your new device. Please refer to the following figure.*

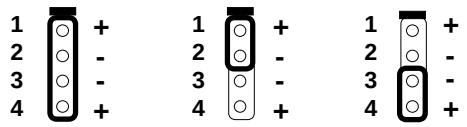


2.3.11 Hard Disk LED

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

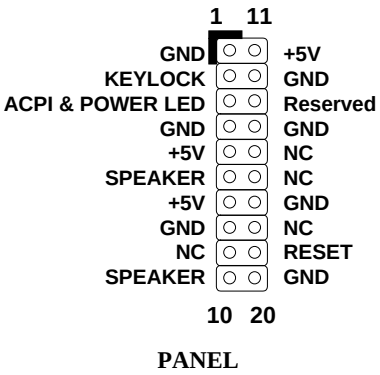
HDD LED

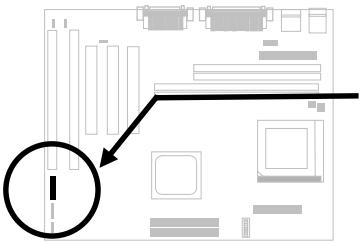
2-pin connector at pin 3-4

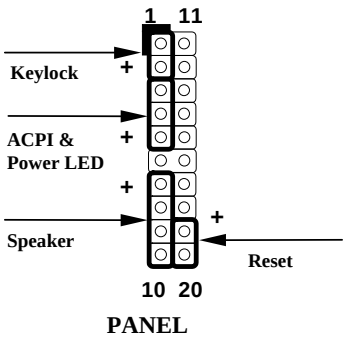
2.3.12 Panel Connector

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

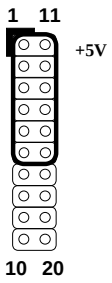
Some housings have a five-pin connector for the keylock and power LED Since power LED and keylock are aligned together, you can still use this kind of connector.







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.

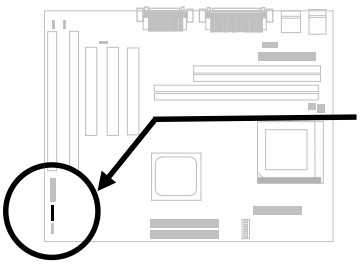


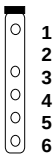
2.3.13 IrDA Connector

The IrDA connector can be configured to support wireless infrared module, with this module and application software such as Laplink or Win95 Direct Cable Connection, user can transfer files to or from laptops, notebooks, PDA and printers. This connector supports HPSIR (115.2Kbps, 2 meters), ASK-IR (56Kbps) and Fast IR (4Mbps, 2 meters).

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

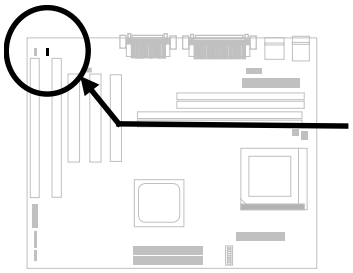


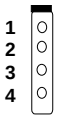


IrDA

2.3.16 CD Audio Connector

This connector is used to connect CD audio cable.





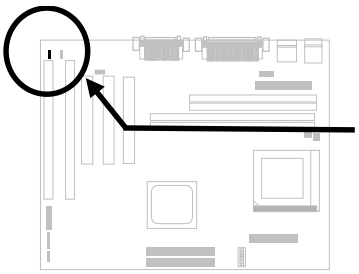
CDIN1

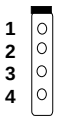
2.3.16 Mono In/Mic Out Connector

This connector is used to connect Mono In/Mic Out connector of an internal modem card. The pin 1-2 is **Mono In**, and the pin 3-4 is **Mic Out**. Please note that there is no standard for this kind of connector yet, only some internal modem cards implement this connector.

Please see the pin definitions to connect the cable.

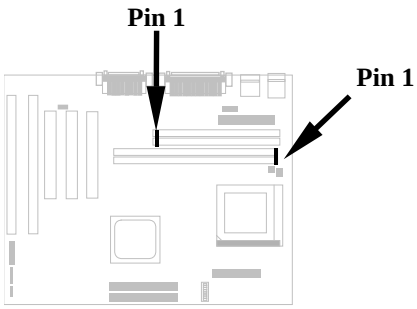
Pin	Description
1	Mono In
2	GND
3	GND
4	Mic Out





Mono In/Mic Out

2.4 Configuring the System Memory



This mainboard has two 168 pin DIMM sockets (Dual-in-line Memory Module) and two 72 pin SIMM sockets that allow you to install system memory up to **256MB**.

If you want to install DRAMs on DIMM2 and SIMM at the same time, it is very important to identify single/double side. Under this configuration, only single side DRAMs are acceptable.

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

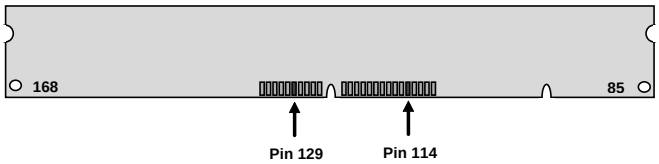
III. Type: FPM (Fast page mode) or EDO (Extended data output)

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 the 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).

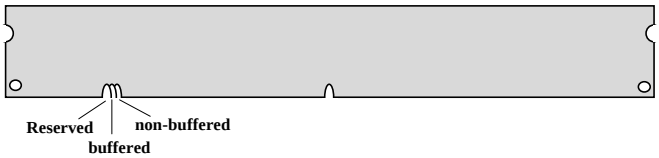
Tip: *Here is a trick to check if your DIMM is single-side or double-side -- if there are traces connected to golden finger pin 114 and pin 129 of the DIMM, the DIMM is probably double-side; otherwise, it is single-side. Following figure is for your reference.*



Warning: *If you want to install DRAMs on DIMM2 and DIMM3 at the same time, it is very important to identify single/double side. Under this configuration, only single side DRAMs are acceptable.*

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 recommend 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 recommend choosing a 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; Otherwise, it is 2-clock.*

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

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 SIMM or DIMM socket, and the total memory size is to add them together. This motherboard supports maximum **256MB** system memory.

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

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

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

Total Memory Size = Subtotal of SIMM1 + Subtotal of SIMM2
+ Size of DIMM1 + Size of DIMM2

***Warning**: It is not recommended to 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.*

***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.*

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. 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.

***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 SIS 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.*

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

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
4M by 16	4Mx64	x2	8	64MB	Yes
4M by 16	4Mx64	x1	4	32MB	Yes
8M by 8	8Mx64	x1	8	64MB	Yes
8M by 8	8Mx64	x2	16	128MB	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.

***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