Chapter 2

Hardware Installation

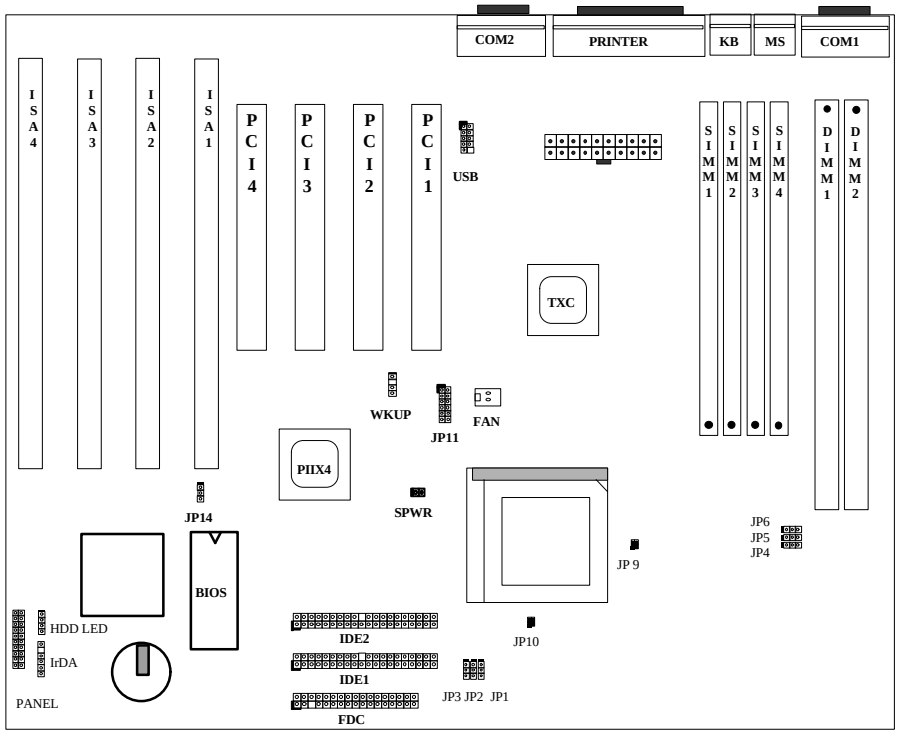
This chapter gives you a step-by-step procedure on how to install your system. Follow each section accordingly.

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 location of the jumpers and connectors on the mainboard.



Jumpers:

JP1,JP2,JP3:	*CPU frequency ratio*
JP4,JP5,JP6:	*CPU external (bus) clock*
JP9,JP10:	*CPU type (Single/Dual voltage/cpuio source selection.)*
JP11:	*CPU core voltage setting (Vcore)*
JP14:	*Clear CMOS*

Connectors:

PS2 MS:	*PS/2 mouse connector*
KB2:	*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*
FAN:	*CPU fan connector*
WKUP:	*IR & MODEM wake-up connector*
IrDA:	*IrDA (Infrared) connector*
HDD LED:	*HDD LED connector*
PANEL:	*Front panel (Multifunction) 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

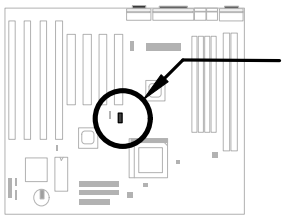
Jumper set at 1-2

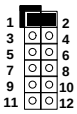
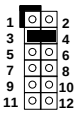
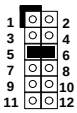
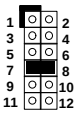
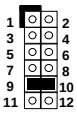
Jumper set at 2-3

2.2.1 Setting the CPU Voltage

JP11	CPU Core Voltage (Vcore)
1-2	3.45V (default for P54C)
3-4	3.52V (Cyrix or AMD)
5-6	2.9V (AMD K6-166/200)
7-8	2.8V (PP/MT P55C)
9-10	3.2V (AMD K6-233)
11-12	2.5V

JP11 is used to select CPU core voltage (Vcore), normally it is set to default 3.45V for INTEL Pentium P54C. It must be changed if you have CPU with different core voltage, such as INTEL PP/MT (P55C), AMD K5/K6 and Cyrix 6x86, refer to the CPU specification for more details.



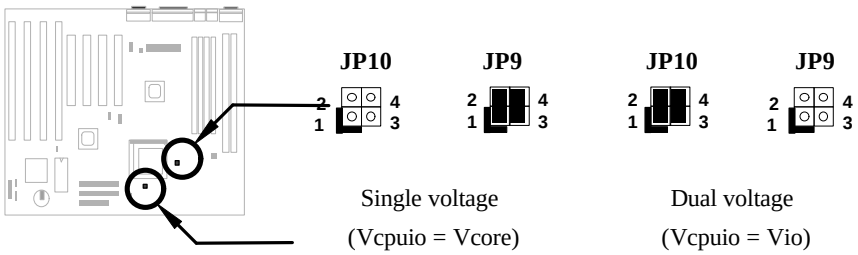
JP11	JP11	JP11	JP11	JP11
				
3.45V (P54C)	3.52V (6x86 or K5)	2.9V (K6-166/ K6-200)	2.8V (PP/MT P55C)	3.2V (K6-233)

Warning: *The heat dissipation of Intel PP/MT-233Hz, AMD K6-200/233MHz exceed the original design of this mainboard. Please make sure that you have installed CPU fan properly if Intel PP/MT-233 or AMD K6-200/233 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.*

JP9	JP10	CPU Type (Vcpuio)
1-2 & 3-4	Open	Single Voltage CPU Vcpuio = Vcore (default)
Open	1-2 & 3-4	Dual Voltage CPU Vcpuio = Vio (PP/MT P55C)

Set the jumper **JP9** and **JP10** according to the type of CPU. They are actually the selection of CPU I/O Voltage (Vcpuio). Normally, for single voltage CPU, Vcpuio is equal to Vcore, but for CPU that needs dual voltage such as PP/MT (P55C), Cyrix 6x86L, Vcpuio must be set to Vio, and it is different from Vcore.

Note: *Vio is the voltage of onboard chipset and PBSRAM. It is 3.45V.*



CPU Type	Vcore	Vio	Vcpuio	JP11	JP9	JP10
INTEL P54C	3.45V	3.45V	Vcore	1-2	1-2 &3-4	Open
INTEL PP/MT	2.8V	3.45V	Vio	7-8	Open	1-2 & 3-4
AMD K5	3.52V	3.45V	Vcore	3-4	1-2 & 3-4	Open
AMD K6-166/200	2.9V	3.45V	Vio	5-6	Open	1-2 & 3-4
AMD K6-233	3.2V	3.45V	Vio	9-10	Open	1-2 & 3-4
Cyrix 6x86	3.52V	3.45V	Vcore	3-4	1-2 &3-4	Open
Cyrix 6x86L	2.8V	3.45V	Vio	7-8	Open	1-2 & 3-4

Caution: *Above table is 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.*

2.2.2 Selecting the CPU Frequency

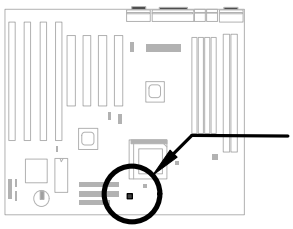
JP1	JP2	JP3	CPU Frequency Ratio
1-2	1-2	1-2	1.5x (3.5x)
2-3	1-2	1-2	2x
2-3	2-3	1-2	2.5x (1.75x)
1-2	2-3	1-2	3x

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 **JP1, JP2**, which CPU is using to multiply external clock and produce internal frequency. Note that **JP3** is reserved for future CPU.

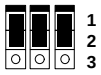
Note: *JP3 is reserved for future CPU. It is NC pin (no connection) for current CPU on the market. It should be no harm to connect to 1-2 or 2-3. If you find any unstable problem, please try to remove the jumper cap, and leave it Open.*

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.*

*Core frequency = Ratio * External bus clock*



JP3 & JP2 & JP1



1.5x (3.5x)

JP3 & JP2 & JP1

2x

JP3 & JP2 & JP1

2.5x (1.75x)

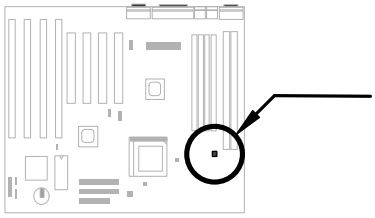
JP3 & JP2 & JP1

3x

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

Note: *The setting of 83.3MHz is not available for IMI SC652B clock generator.*



JP4 & JP5 & JP6

60MHz

JP4 & JP5 & JP6

66MHz

JP4 & JP5 & JP6

75Mz

JP4 & JP5 & JP6

83.3Mz

Warning: *INTEL TX chipset supports only 60/66MHz external CPU bus clock, the 75/83.3 MHz 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.*

INTEL Pentium	CPU Core Frequency	Ratio	External Bus Clock	JP1 & JP2 & JP3	JP4 & JP5 & JP6
P54C 90	90MHz =	1.5x	60MHz	1-2 & 1-2 & 1-2	1-2 & 2-3 & 1-2
P54C 100	100MHz =	1.5x	66MHz	1-2 & 1-2 & 1-2	2-3 & 2-3 & 1-2
P54C 120	120MHz =	2x	60MHz	2-3 & 1-2 & 1-2	1-2 & 2-3 & 1-2
P54C 133	133MHz =	2x	66MHz	2-3 & 1-2 & 1-2	2-3 & 2-3 & 1-2
P54C 150	150MHz =	2.5x	60MHz	2-3 & 2-3 & 1-2	1-2 & 2-3 & 1-2
P54C 166	166MHz =	2.5x	66MHz	2-3 & 2-3 & 1-2	2-3 & 2-3 & 1-2
P54C 200	200MHz =	3x	66MHz	1-2 & 2-3 & 1-2	2-3 & 2-3 & 1-2

INTEL Pentium	CPU Core Frequency	Ratio	External Bus Clock	JP1 & JP2 & JP3	JP4 & JP5 & JP6
PP/MT 150	150MHz =	2.5x	60MHz	2-3 & 2-3 & 1-2	1-2 & 2-3 & 1-2
PP/MT 166	166MHz =	2.5x	66MHz	2-3 & 2-3 & 1-2	2-3 & 2-3 & 1-2
PP/MT 200	200MHz =	3x	66MHz	1-2 & 2-3 & 1-2	2-3 & 2-3 & 1-2
PP/MT 233	233MHz =	3.5x	66MHz	1-2 & 1-2 & 1-2	2-3 & 2-3 & 1-2

Cyrix 6x86 & 6x86L	CPU Core Frequency	Ratio	External Bus Clock	JP1 & JP2 & JP3	JP4 & JP5 & JP6
P150+	120MHz =	2x	60MHz	2-3 & 1-2 & 1-2	1-2 & 2-3 & 1-2
P166+	133MHz =	2x	66MHz	2-3 & 1-2 & 1-2	2-3 & 2-3 & 1-2

AMD K5	CPU Core Frequency	Ratio	External Bus Clock	JP1 & JP2 & JP3	JP4 & JP5 & JP6
PR90	90MHz =	1.5x	60MHz	1-2 & 1-2 & 1-2	1-2 & 2-3 & 1-2
PR100	100MHz =	1.5x	66MHz	1-2 & 1-2 & 1-2	2-3 & 2-3 & 1-2
PR120	90MHz =	1.5x	60MHz	1-2 & 1-2 & 1-2	1-2 & 2-3 & 1-2
PR133	100MHz =	1.5x	66MHz	1-2 & 1-2 & 1-2	2-3 & 2-3 & 1-2
PR166	116MHz =	1.75x	66MHz	2-3 & 2-3 & 1-2	2-3 & 2-3 & 1-2

AMD K6	CPU Core Frequency	Ratio	External Bus Clock	JP1 & JP2 & JP3	JP4 & JP5 & JP6
PR2-166	166MHz =	2.5x	66MHz	2-3 & 2-3 & 1-2	2-3 & 2-3 & 1-2
PR2-200	200MHz =	3x	66MHz	1-2 & 2-3 & 1-2	2-3 & 2-3 & 1-2
PR2-233	233MHz =	3.5x	66MHz	1-2 & 1-2 & 1-2	2-3 & 2-3 & 1-2

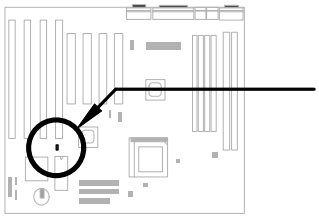
Note: *Cyrix 6x86 and AMD K5 CPU use P-rating for the reference of CPU benchmark compared with INTEL P54C, their internal core frequency is not exactly equal to P-rating marked on the CPU. For example, Cyrix P166+ is 133MHz but performance is almost equal to P54C 166MHz and AMD PR133 is 100MHz but performance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

Note: *INTEL TX chipset does not support CPU with 50/55MHz external bus clock, so that INTEL 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:

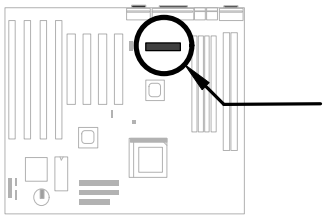
1. Turn off the system power.
2. Locate **JP14** and short pins 2-3 for a few seconds.
3. Return **JP14** to its normal setting by shorting pins 1-2.
4. Turn on the system power.
5. Press DEL during bootup to enter the BIOS Setup Utility and specify a new password, if needed.

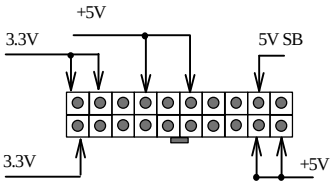
2.3 Connectors

2.3.1 Power Cable

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.*



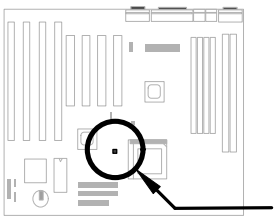


PWR2

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.**

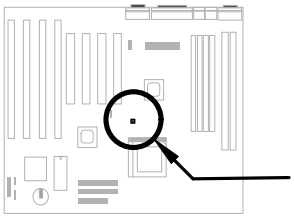
This switch is default for system power on/off, but if you enable the "Power Bottom Override" function in BIOS setup, this switch can be used as suspend switch, push and release this switch less than 4 seconds, the system will go into suspend mode. Push this switch longer than 4 seconds, system will then power off. Refer to section 3.5 "Power Management Setup" for detail.

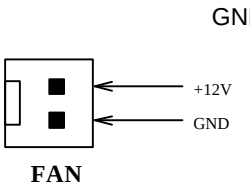


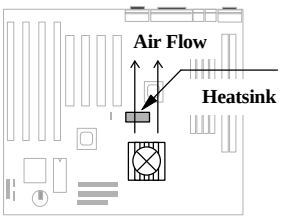
SPWR

2.3.3 CPU Fan

Plug in the fan cable to the two-pin fan connector onboard. The fan connector is marked **FAN** on the system board.



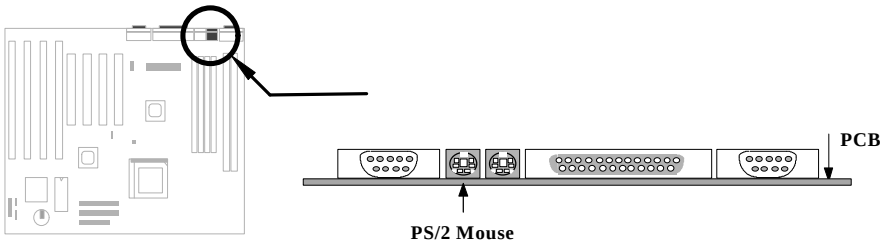




Attach the heatsink and fan to the CPU. Check its orientation, make sure the air flow go through the heatsink.

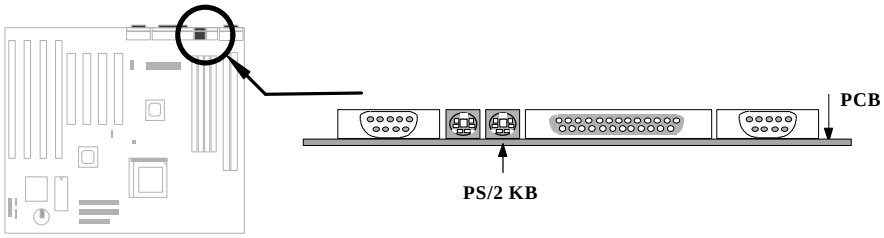
2.3.4 PS/2 Mouse

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



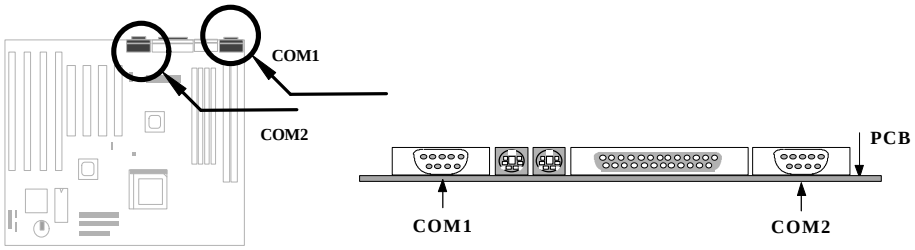
2.3.5 Keyboard

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.



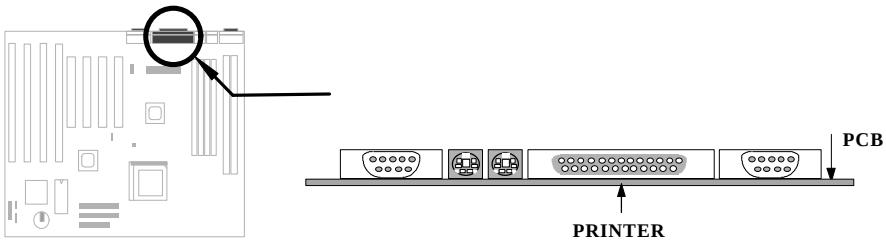
2.3.6 Serial Devices (COM1/COM2)

The onboard serial connectors are 9-pin D-type connector on the back panel of mainboard. The serial port 1 connector is marked as **COM1** and the serial port 2 connector is marked as **COM2.**



2.3.7 Printer

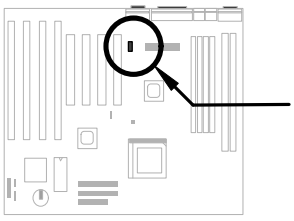
The onboard printer connector is a 25-pin D-type connector marked **PRINTER**. The view angle of drawing shown here is from back panel of the housing.

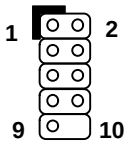


2.3.8 USB Device

You 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

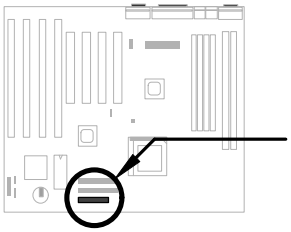




USB

2.3.9 Floppy Drive

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



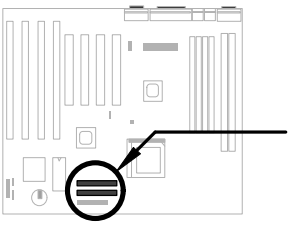
FDC

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.

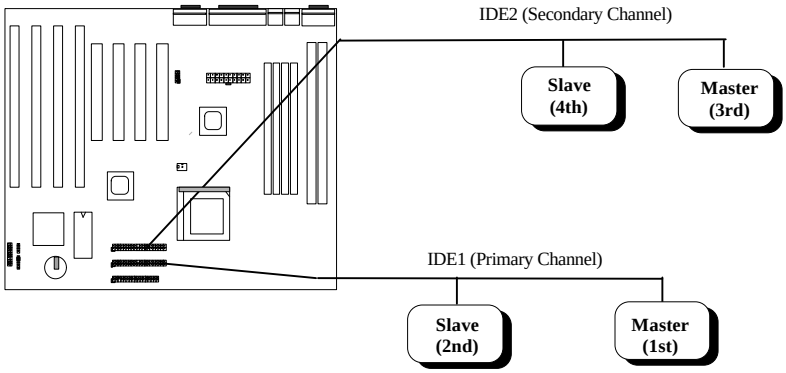


IDE2

IDE1

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

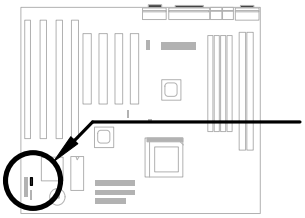
***Caution:** For better signal quality, it is recommended to set far end side device to master mode and follow the suggested sequence to install your new device . Please refer to following figure.*

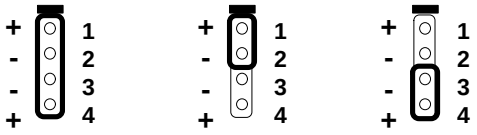


2.3.11 Hard Disk LED

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

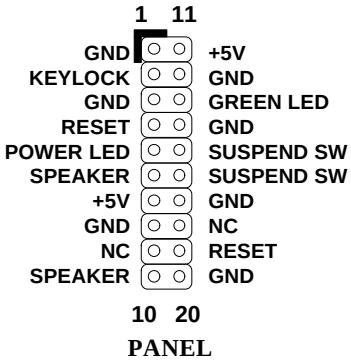
HDD LED
2-pin connector
at pin 1-2

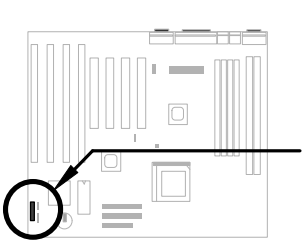
HDD LED
2-pin connector
at pin 3-4

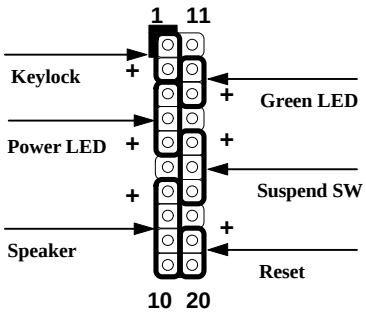
2.3.12 Panel Connector

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

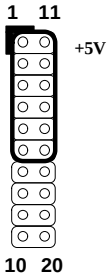
Some housings have a five-pin connector for the keylock and power LED Since power LED and keylock are aligned together, you can still use this kind of connector.







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 Turbo switch and Turbo LED connectors, you may use these connectors for Suspend switch and Green mode LED functions, respectively.*

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.*

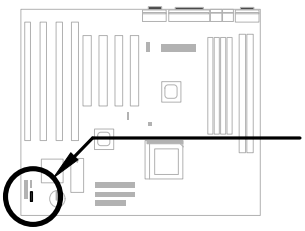
2.3.13 IrDA Connector

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	+3.3V

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



IrDA

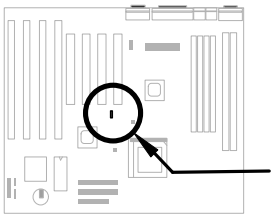
2.3.14 Wake-up Connector

This mainboard implements special circuit to support Modem Ring-On, both Internal Modem Card (AOpen F34I) and external box Modem are supported. Since Internal Modem card consumes no power when system power is off. it is recommended to use Internal Modem. To use AOpen MP32 or F34I, connect 4-pin cable from **RING** connector of MP32/F34I to **WKUP** connector on the mainboard. Refer to Appendix B "Frequently Asked Question" for detail.

Pin	Description
1	+5V SB
2	NC
3	RING
4	GND

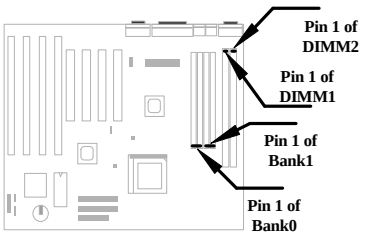
Note: *Wake-Up Connector and Modem Ring-On are patent applied.*

Tip: *Not only for Modem Ring-On, there are many other possible applications. For example, IR wakeup or voice wakeup.*



WKUP

2.4 Configuring 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:

- Size: single side, 1Mx32 (4MB), 4Mx32 (16MB), 16Mx32 (64MB), and double side, 1Mx32x2 (8MB), 4Mx32x2 (32MB), 16Mx32x2 (128MB).
- Speed: 60ns or 70ns access time
- Type: FPM (Fast page mode) or EDO (Extended data output)
- Parity: without parity (32 bit wide) or with parity (36 bit wide).

The DIMM supported by this mainboard are always 64-bit wide SDRAM.

- Size: single side, 1Mx64 (8MB), 2Mx64 (16MB), 4Mx64 (32MB), 8Mx64 (64MB), 16Mx64 (128MB), and double side, 1Mx64x2 (16MB), 2Mx64x2 (32MB), 4Mx64x2 (64MB), 8Mx64x2 (128MB), 16Mx64x2 (256MB).
- Speed: normally marked -67, which means synchronous to maximum 67MHz.
- Parity: without parity (32 bit wide)

Because Pentium and Pentium Pro processor has 64 bit bus width, the four 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.*

***Tip:** EDO DRAM is designed to improve the DRAM read performance. Unlike traditional fast page mode, that tri-states the memory output data to start the precharge activity, EDO DRAM holds the memory data valid until the next memory access cycle, which is similar to pipe-line effect and reduces one clock state.*

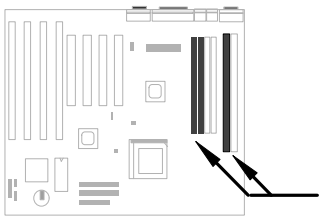
There is no jumper setting required for the memory size or type. It is automatically detected by the system BIOS. You can use any single side SIMM and DIMM combination list below for BANK0/BANK1 or DIMM socket, and the total memory size is to add them together, the maximum is 256MB.

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

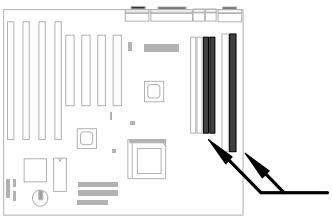
DIMM1	Size of DIMM1
None	0MB
8MB	8MB
16MB	16MB
32MB	32MB
64MB	64MB
128MB	128MB
256MB	256MB

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 double side at Bank0, DIMM1 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.

Type and Location	RAS0#	RAS1#
Single side SIMM at Bank0	Occupied	
Double side SIMM at Bank0	Occupied	Occupied
Single side DIMM at DIMM1		Occupied
Double side DIMM at DIMM1	Occupied	Occupied

Type and Location	RAS2#	RAS3#
Single side SIMM at Bank1	Occupied	
Double side SIMM at Bank1	Occupied	Occupied
Single side DIMM at DIMM2		Occupied
Double side DIMM at DIMM2	Occupied	Occupied

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	KM416S1120AT-G12	2	Yes
NEC	D4516161G5-A12-7JF	2	No
Micron	MT4LC1M16E5TG-6	2	No
TI	TMS626162DGE -15	2	Yes
TI	TMS626162DGE M-67	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 INTEL 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
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.*