
Chapter 2

Hardware Installation

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



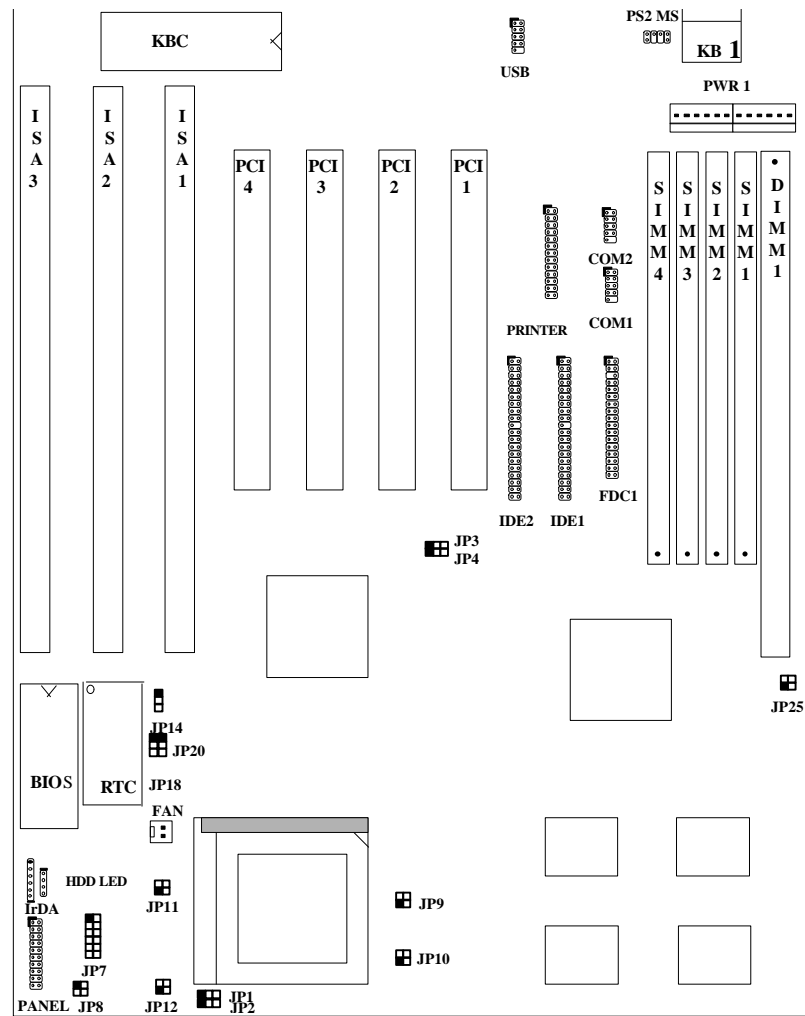
Caution: *Electrostatic discharge (ESD) can damage your processor, disk drives, expansion boards, and other components. Always observe the following precautions before you install a system component.*

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.*

Hardware Installation

2.1 Jumper and Connector Locations

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



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Jumpers:

<i>JP1,JP2:</i>	<i>CPU frequency ratio select</i>
<i>JP3,JP4:</i>	<i>CPU external (bus) clock select</i>
<i>JP7:</i>	<i>CPU core voltage setting (Vcore)</i>
<i>JP8:</i>	<i>I/O voltage setting (Vio)</i>
<i>JP9,JP10, JP11,JP12</i>	<i>CPU type (Single/Dual voltage, Vcpuio) selection</i>
<i>JP14:</i>	<i>For clearing CMOS</i>
<i>JP18:</i>	<i>Enable/disable onboard super I/O controller</i>
<i>JP20:</i>	<i>Enable/disable onboard PS/2 mouse</i>
<i>JP25:</i>	<i>DIMM memory type select</i>

Connectors:

<i>KB1:</i>	<i>AT keyboard connector</i>
<i>PWR1:</i>	<i>AT (PS/2) power connector</i>
<i>PS2 MS:</i>	<i>PS/2 mouse connector</i>
<i>USB:</i>	<i>USB connector</i>
<i>COM1:</i>	<i>COM1 connector</i>
<i>COM2:</i>	<i>COM2 connector</i>
<i>FDC1:</i>	<i>Floppy drive connector</i>
<i>PRINTER:</i>	<i>Printer connector</i>
<i>IDE1:</i>	<i>IDE1 primary channel</i>
<i>IDE2:</i>	<i>IDE2 secondary channel</i>
<i>FAN:</i>	<i>CPU fan connector</i>
<i>IrDA:</i>	<i>IrDA (Infrared) connector</i>
<i>HDD LED:</i>	<i>HDD LED connector</i>
<i>PANEL:</i>	<i>Front-panel (Multifunction) connector</i>

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2.2 Jumper Settings

Board jumpers are made of pin headers and plastic connecting caps. These are included in the mainboard design to enable you to customize your hardware. The onboard jumpers are normally set to its default and optimum setting. Be sure you have basic knowledge of computer hardware and understand the function of the jumper before you change any setting.

Pin 1 of a jumper is indicated by a bold line on the mainboard. You may also find number indications on the board to specify the proper configuration of the jumper.

To set a jumper, simply connect the plastic cap to the required pins. For example, to set a jumper to 1-2, place the plastic cap on pins 1-2 of the jumper. An OPEN setting means that no plastic cap connected to the jumper pins.



Open



Short



Jumper set at 1-2



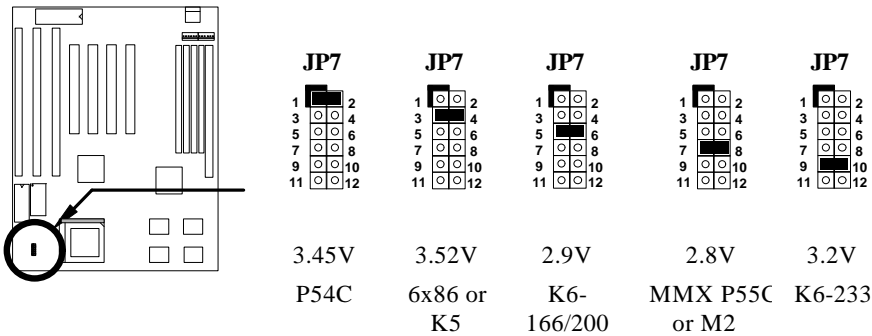
Jumper set at 2-3

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2.2.1 Setting the CPU Voltage

<u>JP7</u>	<u>CPU Core Voltage (Vcore)</u>
1-2	3.45V (Intel P54C)
3-4	3.52V (Cyrix or AMD K5)
5-6	2.9V (AMD K6-166/200)
7-8	2.8V (MMX P55C or Cyrix M2)
9-10	
11-12	3.2V (AMD K6-233) 2.5V

JP7 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 MMX (P55C), AMD K5/K6 and Cyrix 6x86, refer to the CPU specification for more details.

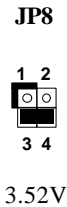
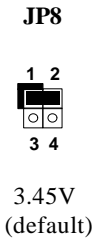
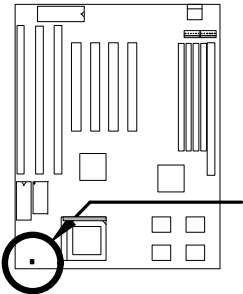


Warning: The heat dissipation of Intel PP/MT-233Hz, AMD K6-200/233MHz exceed the original design of this mainboard. Please make sure that you have installed CPU fan properly if Intel PP/MT-233 or AMD K6-200/233 is being selected to use. It may cause your system unstable if you can not meet the heat dissipation requirement from above CPU type. It is recommended to adopt larger fan on these CPU for better air flow in the system.

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JP8	I/O Voltage (Vio)
1-2	3.45V (default)
3-4	3.52V

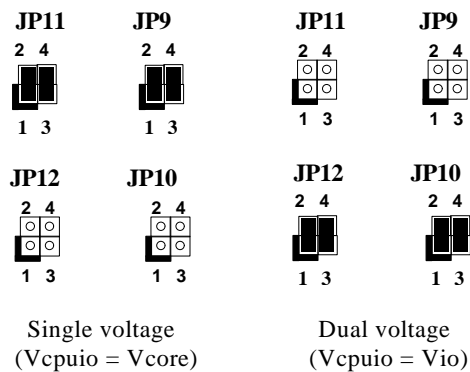
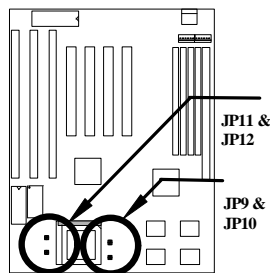
JP8 is reserved for testing purposes only. This jumper enables you to set the voltage of the onboard chipset and PBSRAM (Vio). For dual-voltage CPU, JP8 also functions as CPU I/O voltage (Vcpuio) controller. The default voltage setting is 3.45V.



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JP9	JP10	JP11	JP12	CPU Type (Vcpuio)
1-2 & 3-4	Open	1-2 & 3-4	Open	Single Voltage CPU Vcpuio = Vcore (default)
Open	1-2 & 3-4	Open	1-2 & 3-4	Dual Voltage CPU Vcpuio = Vio (PP/MT P55C)

Set the jumpers **JP9**, **JP10**, **JP11**, and **JP12** according to the type of CPU currently supported. These jumpers are actually for selecting the CPU I/O voltage (Vcpuio). Normally, for single-voltage CPU such as P54C, AMD K5 and Cyrix 6x86, Vcpuio is equal to Vcore. However, for CPU that needs dual voltage such as PP/MT (P55C) and Cyrix 6x86L, Vcpuio is different from Vcore and must be set to Vio.



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CPU Type	Vcore	Vio	Vcpuio	JP7	JP8	JP9	JP10	JP11	JP12
Intel P54C	3.45V	3.45V	Vcore	1-2	1-2	1-2, 3-4	Open	1-2, 3-4	Open
Intel MMX (P55C)	2.8V	3.45V	Vio	7-8	1-2	Open	1-2, 3-4	Open	1-2, 3-4
AMD K5 (Single voltage)	3.52V	3.45V	Vcore	3-4	1-2	1-2, 3-4	Open	1-2, 3-4	Open
Cyrix 6x86	3.52V	3.45V	Vcore	3-4	1-2	1-2, 3-4	Open	1-2, 3-4	Open
Cyrix 6x86L	2.8V	3.45V	Vio	7-8	1-2	Open	1-2, 3-4	Open	1-2, 3-4
Cyrix M2	2.8V	3.45V	Vio	7-8	1-2	Open	1-2, 3-4	Open	1-2, 3-4



Caution: The above table lists the possible settings only for the current CPUs on the market. The settings may vary in case there is a new CPU product introduced in the market. See your CPU specifications for details.

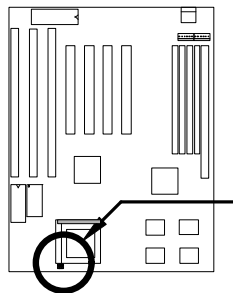
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2.2.2 Selecting the CPU Frequency

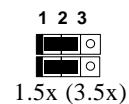
<u>JP1</u>	<u>JP2</u>	<u>CPU Frequency Ratio</u>
1-2	1-2	1.5x (3.5x)
2-3	1-2	2x
2-3	2-3	2.5x (1.75x)
1-2	2-3	3x

The Intel Pentium, Cyrix 6x86 and AMD K5/K6 CPUs have different internal (Core) and external (Bus) frequency. The ratio of Core/Bus frequency that the CPU uses to multiply the external clock and produce internal frequency is selected by setting **JP1** and **JP2**.

$$\text{Core frequency} = \text{Ratio} \times \text{External bus clock}$$

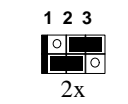


JP1 & JP2



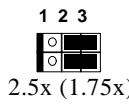
1.5x (3.5x)

JP1 & JP2



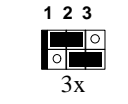
2x

JP1 & JP2



2.5x (1.75x)

JP1 & JP2



3x

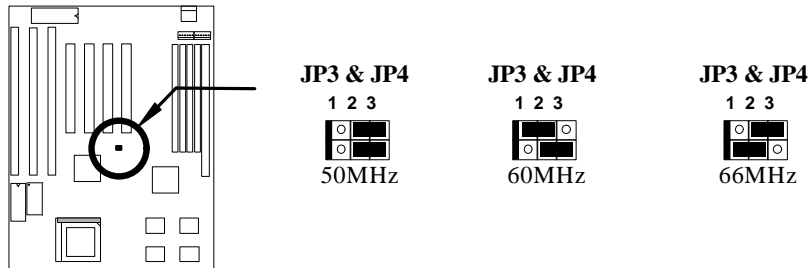


Note: Intel PP/MT MMX 233MHz is using 1.5x jumper setting for 3.5x frequency ratio, and AMD PR166 is using 2.5x setting for 1.75x frequency ratio.

<u>JP3</u>	<u>JP4</u>	<u>CPU External Clock</u>
2-3	2-3	50MHz
1-2	2-3	60MHz
2-3	1-2	66MHz

JP3 and **JP4** let you set the CPU external clock (bus clock), i.e., the clock generator frequency.

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Caution: The below table lists the possible settings only for the current CPUs on the market. The settings may vary in case there is a new CPU product introduced in the market. See your CPU specifications for details.

Intel Pentium	CPU Core Frequency	Ratio	External Bus Clock	JP1 & JP2	JP3 & JP4
P54C 75	75MHz =	1.5x	50MHz	1-2 & 1-2	2-3 & 2-3
P54C 90	90MHz =	1.5x	60MHz	1-2 & 1-2	1-2 & 2-3
P54C 100	100MHz =	1.5x	66MHz	1-2 & 1-2	2-3 & 1-2
P54C 120	120MHz =	2x	60MHz	2-3 & 1-2	1-2 & 2-3
P54C 133	133MHz =	2x	66MHz	2-3 & 1-2	2-3 & 1-2
P54C 150	150MHz =	2.5x	60MHz	2-3 & 2-3	1-2 & 2-3
P54C 166	166MHz =	2.5x	66MHz	2-3 & 2-3	2-3 & 1-2
P54C 200	200MHz =	3x	66MHz	1-2 & 2-3	2-3 & 1-2

Intel Pentium	CPU Core Frequency	Ratio	External Bus Clock	JP1 & JP2	JP3 & JP4
PP/MT 150 (P55C)	150MHz =	2.5x	60MHz	2-3 & 2-3	1-2 & 2-3
PP/MT 166 (P55C)	166MHz =	2.5x	66MHz	2-3 & 2-3	2-3 & 1-2
PP/MT 200 (P55C)	200MHz =	3x	66MHz	1-2 & 2-3	2-3 & 1-2
PP/MT 233 (P55C)	233MHz =	3.5x	66MHz	1-2 & 1-2	2-3 & 1-2

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Cyrix 6x86	CPU Core Frequency	Ratio	External Bus Clock	JP1 & JP2	JP3 & JP4
P120+	100MHz =	2x	50MHz	2-3 & 1-2	2-3 & 1-2
P150+	120MHz =	2x	60MHz	2-3 & 1-2	1-2 & 2-3
P166+	133MHz =	2x	66MHz	2-3 & 1-2	2-3 & 1-2

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

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



Notes: The Cyrix 6x86 and AMD K5 CPUs use P-rating for the reference of CPU benchmark. Unlike the Intel P54C, their internal core frequency is not exactly equal to P-rating marked on the CPU. For example, the AMD PR133 frequency is 100MHz, but its performance is almost equal to Intel P54C 133MHz.

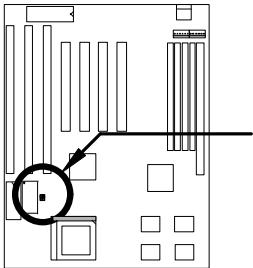
The Intel VX chipset does not support CPU with 55MHz external bus clock; thus, this mainboard cannot support Cyrix P133+.

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2.2.3 Disabling the Onboard Super I/O Controller

JP18	Onboard Super I/O
1-2	Enabled (default)
2-3	Disabled

The board is default by the manufacturer to enable the onboard Super I/O controller. In case you wish to use an external I/O controller, you need to disable the onboard I/O before the external I/O card functions. To disable, set jumper **JP18** to 2-3.



JP18



Enabled
(default)

JP18



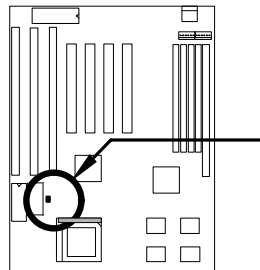
Disabled

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2.2.4 Disabling the PS/2 Mouse Function

JP20	PS/2 Mouse
1-2	Enabled (default)
2-3	Disabled

The PS/2 mouse function is normally enabled and occupies IRQ12. To reassign IRQ12 to another function, disable the PS/2 mouse function by setting jumper **JP20** to 2-3.



JP20



Enabled
(default)

JP20



Disabled

Hardware Installation

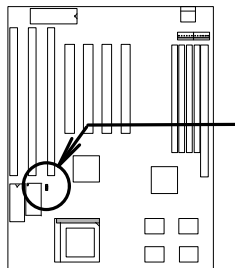
2.2.5 Clearing the CMOS

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, do the steps that follow the figure below.



Before you proceed, check your onboard CMOS chip. The “clearing” procedures vary depending on the CMOS chip type. Read the CMOS chip label to determine the chip type.



JP14



Normal Operation
(default)

JP14



Clear CMOS

For Dallas DS12887A

1. Turn off the system power.
2. Locate **JP14** and short pins 2-3 for a few seconds. Check your manual for the correct jumper settings and location of the jumpers.
3. Reset 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.

For Dallas DS12B887, BENCHMARK bq3287AMT, or SGS ST M48T86 PCI chip:

1. Turn off the system power.

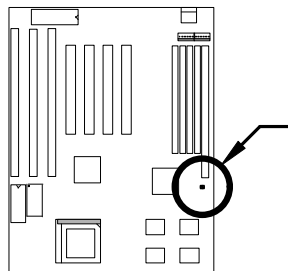
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2. Locate **JP14** and short pins 2-3 for a few seconds. Check your manual for the correct jumper settings and location of the jumpers.
3. Turn on the system power.
4. Turn off the system power again.
5. Reset **JP14** to its normal setting by shorting pins 1-2.

2.2.6 Selecting the DIMM Type

JP25	Memory Type
Open	SDRAM
1-2 & 3-4	EDO

JP25 lets you select your DIMM chip type. The options are EDO or SDRAM.



JP25



SDRAM

JP25



EDO

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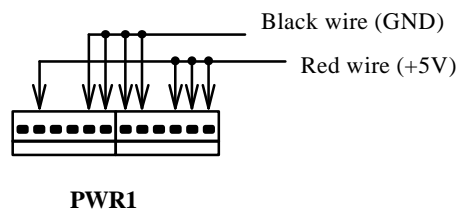
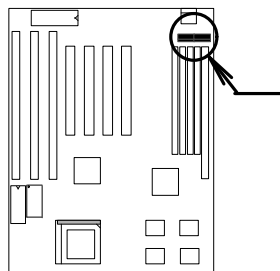
2.3 Connectors

2.3.1 Power Cable

A standard baby AT (PS/2) power supply has two cables with six wires on each cable. 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 **PWR1** on the mainboard.



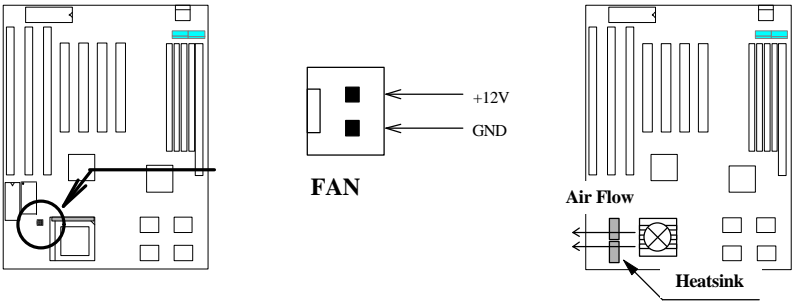
Caution: Make sure that the power supply is OFF before connecting or disconnecting the power cable.



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2.3.2 CPU Fan

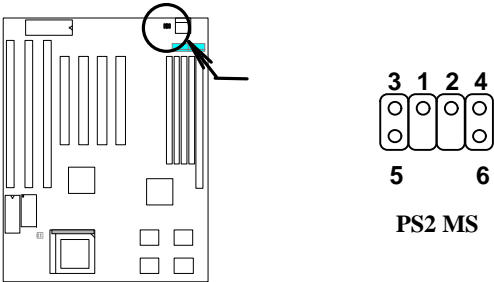
The fan connector is marked **FAN** on the system board. Plug in the fan cable to this 2-pin connector onboard. Attach the heatsink and fan to the CPU. Check its orientation, make sure the air flow go through the heatsink.



2.3.3 PS/2 Mouse

Insert a PS/2 bracket connector to the connector marked **PS2 MS** on the mainboard. Then plug in the PS/2 mouse cable to the mouse port on the bracket.

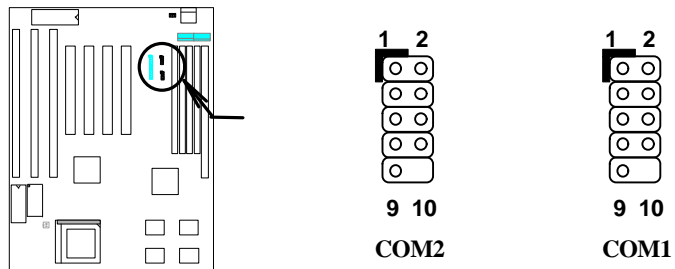
<u>Pin</u>	<u>Description</u>
1	MS DATA
2	NC
3	GND
4	+5V
5	MS CLK
6	NC



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2.3.4 Serial Devices (COM1/COM2)

Plug in the 10-pin flat cable to the appropriate onboard connectors. The COM1 connector is marked **COM1** and the COM2 connector is marked **COM2** on the mainboard. Then insert the serial device connector into the serial port on the bracket.

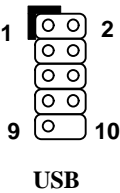
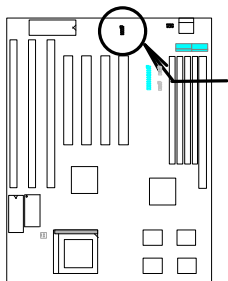


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2.3.5 USB Device (optional)

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

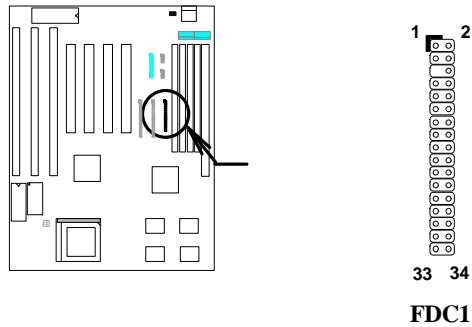
<u>Pin</u>	<u>Description</u>	<u>Pin</u>	<u>Description</u>
1	V0	2	V1
3	D0-	4	D1-
5	D0+	6	D1+
7	GND	8	GND
9	NC	10	NC



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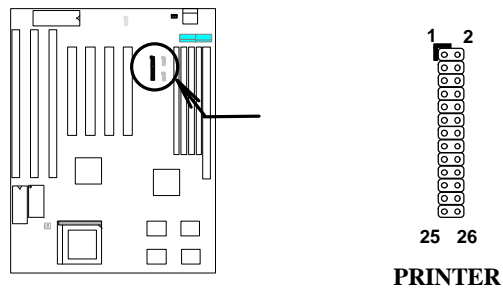
2.3.6 Floppy Drive

To support a floppy drive, connect the 34-pin floppy drive cable to the floppy drive connector marked **FDC1** on the mainboard.



2.3.7 Printer

This connector allows you to install a printer to your system. To install, plug in the 26-pin printer flat cable to the onboard parallel connector marked **PRINTER**.



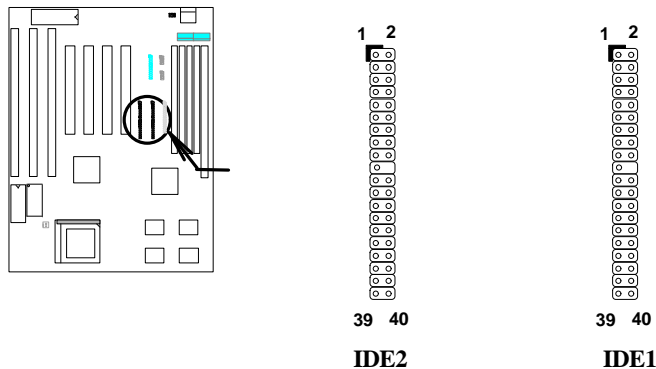
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2.3.8 IDE Hard Disk and CD ROM

This mainboard supports two 40-pin IDE connectors marked as **IDE1** and **IDE2**. The IDE1 is also known as primary channel and IDE2 as secondary channel. Each channel supports two IDE devices.

In order to enable the devices to work together, the two devices on each channel must be set differently to master and slave mode. The device can either be a hard disk or a CD-ROM. The setting of master or slave depends on your IDE device jumper. See to your hard disk and CD-ROM manual.

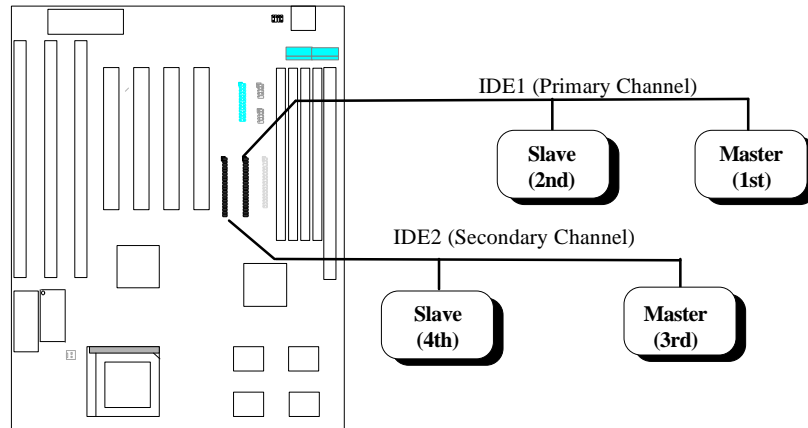
To attach the IDE devices, connect your first IDE hard disk to master mode of the primary channel. If you have second IDE device to install in your system, connect it as slave mode on the same channel. The third and fourth devices, if any, can be connected on secondary channel at master and slave respectively.



Caution: The maximum specification of the IDE cable is 46cm (18 inches). Make sure that your cable does not exceed this length.

For better signal quality, we recommend that you set the device connected to the end of the cable master mode. Follow the suggested sequence to install your new device (see the following figure).

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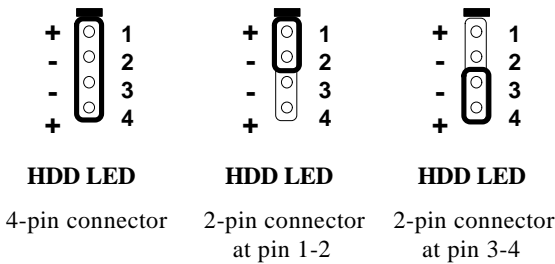
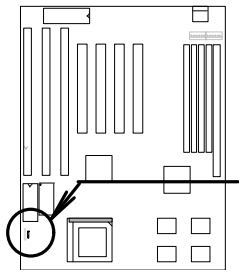


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2.3.9 Hard Disk LED

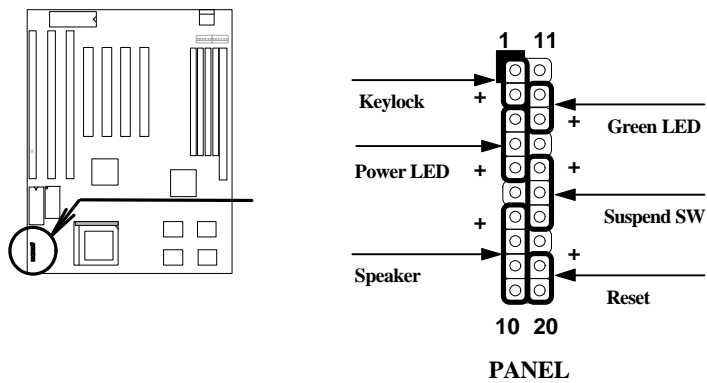
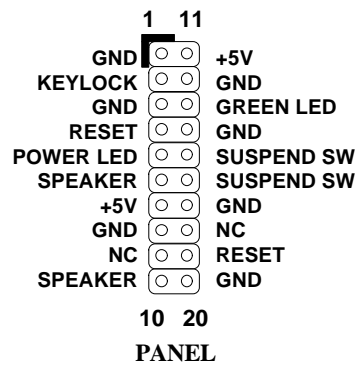
The HDD LED connector is marked **HDD LED** on the board. This connector is designed to support various types of housing. Actually, only two pins are necessary for the LED. If your housing comes with a 4-pin connector, simply attach it to the onboard connector. For a 2-pin connector, you can insert it to pins 1-2 or pins 3-4. However, when connecting, take note of the polarity of the pins.

<u>Pin</u>	<u>Description</u>
1	HDD LED
2	GND
3	GND
4	HDD LED



2.3.10 Panel Connector

Some housings come with a 5-pin connector for the keylock and power LED. Since the pins for power LED and keylock functions remained aligned, you can attach it to the onboard multifunction connector.



1 11
+5V
10 20
PANEL

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Notes: *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.*

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

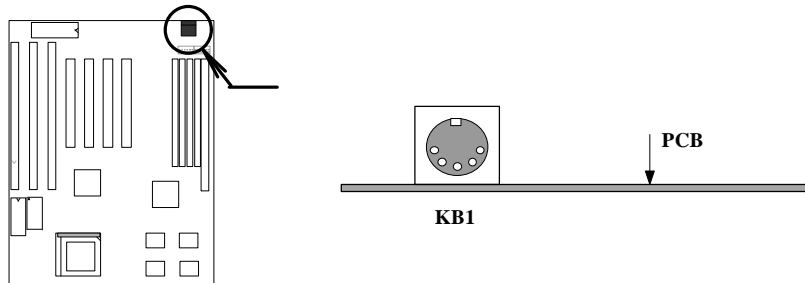
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2.3.11 Keyboard

The onboard keyboard connector is a 5-pin AT-compatible connector marked **KB1**. The figure below shows how the keyboard connector as viewed from the back panel of the housing.



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



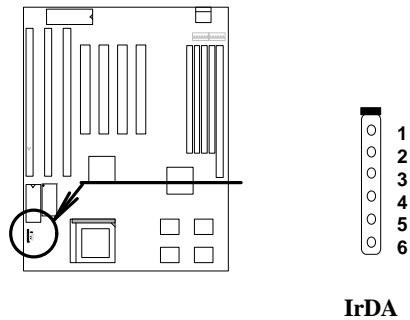
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2.3.12 IrDA Connector

Serial port 2 can be configured to support wireless infrared module via this connector and application software such as Laplink. This module enables the user to transfer files to or from laptops, notebooks, PDA and printers without using cables. This mainboard supports IrDA (115Kbps, 1 meter), as well as ASK-IR (19.2Kbps).

To install an infrared module, insert the module cable to **IrDA** connector then enable infrared function by BIOS setup. Make sure of the correct cable orientation when connecting the cable to the IrDA connector.

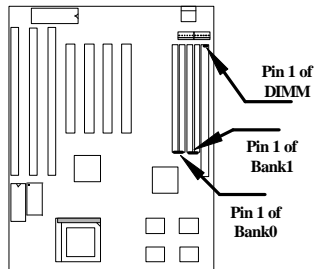
<u>Pin</u>	<u>Description</u>
1	+5V
2	NC
3	IRRX
4	GND
5	IRTX
6	+3.3V



IrDA

Hardware Installation

2.4 Configuring the System Memory



This mainboard has four 72 pin SIMM sockets (Single-in-line Memory Module) and one 168 pin DIMM socket (Dual-in-line Memory Module) that allow you to install system memory from minimum 8MB up to maximum 128MB.

The SIMM supported by this mainboard can be identified by 4 kinds of factors, Intel VX chipset does not support 64M bit technology.

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

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

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

Because Pentium 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.

Hardware Installation



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 pipeline 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. **But because of chipset limitation, the maximum is only 128MB.**

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

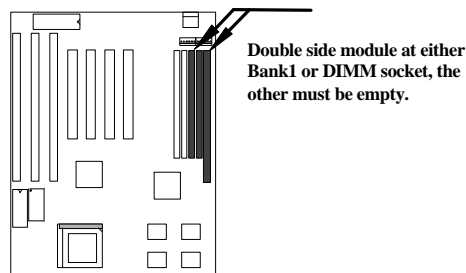
SIMM3	SIMM4	Subtotal of Bank1
None	None	0MB
4MB	4MB	8MB
8MB	8MB	16MB
16MB	16MB	32MB

DIMM1	Size of DIMM Socket
None	0MB
8MB	8MB
16MB	16MB
32MB	32MB

**Total Memory Size = Subtotal of Bank0 + Subtotal of Bank1
+ Size of DIMM socket**

Hardware Installation

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 Bank1 or DIMM, the other must be empty.** Bank0 has no such limitation.



Following table explains more about the RAS limitation. You can see that Bank1 1st side and DIMM 2nd side use the same RAS3#, and Bank1 2nd side and DIMM 1st side use the same RAS4#. If you are using single side SIMM at Bank1 and single side DIMM, it should be no problem. But if you are using double side DIMM or double side SIMM at Bank1, the other must be empty.

	Bank0 1st side	Bank0 2nd side	Bank1 1st side	Bank1 2nd side	DIMM 1st side	DIMM 2nd side
RAS0#	X					
RAS1#		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.

Hardware Installation



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 chipset driving specification. Doing so may result in unstable system behavior.

Warning: Due to loading issue, it is not recommended to use x4 (bit) SDRAM chip.

Hardware Installation



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

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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



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

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