
Chapter 2

Hardware Installation

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



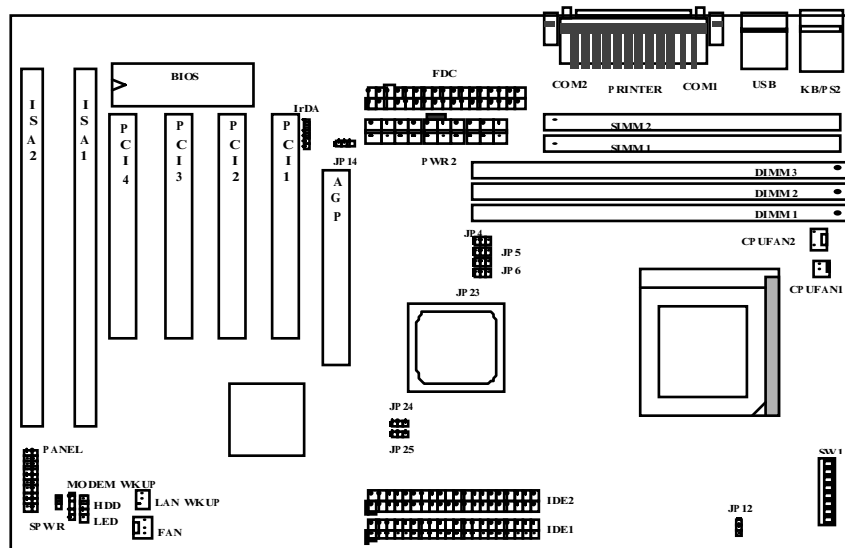
Caution: *Electrostatic discharge (ESD) can damage your processor, disk drives, expansion boards, and other components. Always observe the following precautions before you install a system component.*

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:

SW1:	DIP Switch for CPU voltage and clock ratio
JP4,JP5,JP6,JP25:	CPU external (bus) clock
JP12	I/O Voltage
JP23,JP24	DRAM Clock
JP14:	Clear CMOS

Connectors:

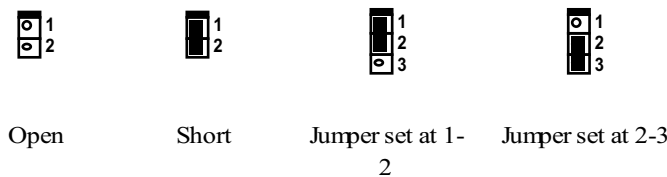
PS2:	PS/2 mouse connector
KB:	PS/2 keyboard connector
COM1:	COM1 connector
COM2:	COM2 connector
PRINTER:	Printer connector
PWR2:	ATX power connector
USB:	USB connector
FDC:	Floppy drive connector
IDE1:	IDE1 primary channel
IDE2:	IDE2 secondary channel
CPUFAN1:	CPU Fan connector
CPUFAN2:	CPU Fan connector
FAN:	Fan Connector
IrDA:	IrDA (Infrared) connector
HDD LED:	HDD LED connector
PANEL:	Front panel (Multifunction) connector
SPWR:	ATX Soft-Power Switch Connector
MODEM-WKUP:	MODEM Wake Up Connector
LAN-WKUP:	LAN Wake Up Connector

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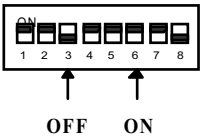
2.2 Jumpers

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.



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.

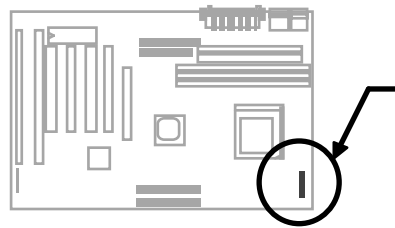


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2.2.1 Setting the CPU Voltage

<u>S4</u>	<u>S5</u>	<u>S6</u>	<u>S7</u>	<u>S8</u>	<u>Vcore</u>
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	OFF	ON	OFF	OFF	2.4V
OFF	ON	OFF	OFF	OFF	2.2V

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



3.2V

K6-233



2.9V

K6-166/200 or M2



2.8V

P55C (MMX)



2.4V

K6-2 400/450 and K6-III



3.52V

6x86 or K5



3.45V

P54C



3.3V



2.2V

Hardware Installation

IDT C6

K6-266/300 and K6-2

Following table lists possible settings of current CPU available on the market. Note that the correct setting may vary because of new CPU product, refer 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 K6-2	Dual Voltage	2.2V	OFF	ON	OFF	OFF	OFF
AMD K6-2 400/450	Dual Voltage	2.4V	OFF	OFF	ON	OFF	OFF
AMD K6-III	Dual Voltage	2.4V	OFF	OFF	ON	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	ON	ON	ON	ON	OFF
		3.3V	ON	OFF	ON	ON	OFF



Warning: This high performance AX59 Pro motherboard that AOpen presented to you has a capability to overclock to 112MHz external clock while still conforming the design guide from VIA. This overclock scheme is accomplished by AOpen's technical expertise as well as manufacturing capabilities. However, please understand that some of the add-on cards might not work with this board properly when overclock scheme is engaged. Please use designated speed when you encountered such a problem

Warning: Note that overclocking may cause thermal problem. Please make sure that the cooling fan and the heatsink were adequate to dissipate excessive heat that's generated by overclocking the CPU.

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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 switches to specify Vcore. There are 32 settings totally, and the range is from 1.3V to 3.5V.

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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.

<u>Vcore</u>	<u>S4</u>	<u>S5</u>	<u>S6</u>	<u>S7</u>	<u>S8</u>
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

Hardware Installation

2.2.2 Selecting the CPU Frequency

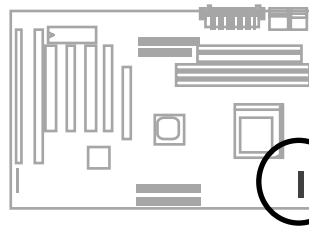
<u>S1</u>	<u>S2</u>	<u>S3</u>	<u>CPU Frequency Ratio</u>
OFF	OFF	OFF	1.5x (3.5x)
ON	OFF	OFF	2x (3.33x, 6x)
ON	ON	OFF	2.5x (1.75x)
OFF	ON	OFF	3x
ON	OFF	ON	4x
ON	ON	ON	4.5x
OFF	ON	ON	5x (2.33x)
OFF	OFF	ON	5.5x (2.66x)

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



3x



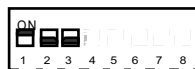
4x



1.5x (3.5x)



4.5x



2x (3.33x, 6x)



5x (2.33x)



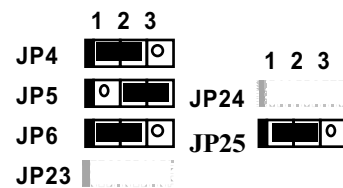
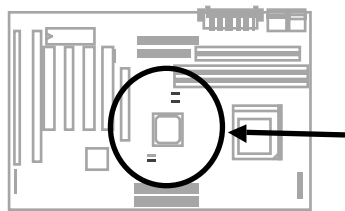
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2.5x (1.75x)

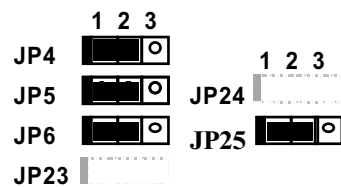
5.5x (2.66x)

<u>CPU CLK</u>	<u>AGP CLK</u>	<u>PCI CLK</u>	<u>JP4</u>	<u>JP5</u>	<u>JP6</u>	<u>JP25</u>
66MHz	66MHz	33MHz	1-2	1-2	1-2	1-2
68MHz	68MHz	34MHz	2-3	2-3	2-3	1-2
75MHz	75MHz	38MHz	1-2	2-3	1-2	1-2
83MHz	56MHz	28MHz	2-3	2-3	1-2	2-3
95MHz	64MHz	32MHz	2-3	1-2	2-3	2-3
100MHz	66MHz	33MHz	1-2	1-2	2-3	2-3
112MHz	75MHz	37MHz	1-2	2-3	2-3	2-3
124MHz	83Mhz	41MHz	2-3	1-2	1-2	2-3

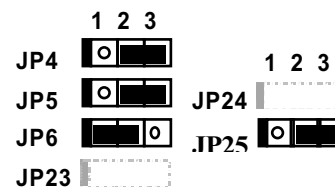
JP4, JP5, JP6 and **J25** are the selections of CPU external clock (bus clock), AGP Clock and PCI Clock.



75MHz

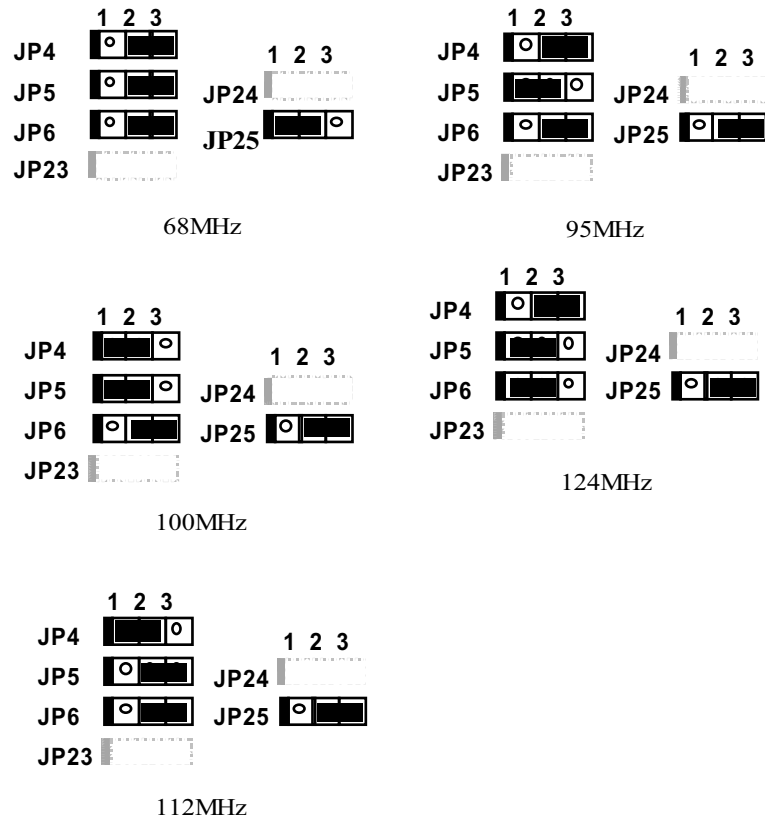


66MHz



83MHz

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Warning: VIA MVP3 chipset supports maximum 100MHz external CPU bus clock, the 112MHz settings are for internal test only, **set to 112 or 124 MHz exceeds the specification of MVP3 chipset, which may cause serious system damage.**

Warning: While 100/112/124 MHz is selected, we strongly recommend you to choose PC100 SDRAM for system stability.

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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.

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INTEL Pentium	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4,JP5,JP6,JP25
P54C 100	100MHz =	1.5x	66MHz	OFF	OFF	OFF	1-2 & 1-2 & 1-2 & 1-2
P54C 133	133MHz =	2x	66MHz	ON	OFF	OFF	1-2 & 1-2 & 1-2 & 1-2
P54C 166	166MHz =	2.5x	66MHz	ON	ON	OFF	1-2 & 1-2 & 1-2 & 1-2
P54C 200	200MHz =	3x	66MHz	OFF	ON	OFF	1-2 & 1-2 & 1-2 & 1-2

INTEL Pentium MMX	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4,JP5,JP6,JP25
PP/MT 166	166MHz =	2.5x	66MHz	ON	ON	OFF	1-2 & 1-2 & 1-2 & 1-2
PP/MT 200	200MHz =	3x	66MHz	OFF	ON	OFF	1-2 & 1-2 & 1-2 & 1-2
PP/MT 233	233MHz =	3.5x	66MHz	OFF	OFF	OFF	1-2 & 1-2 & 1-2 & 1-2

Cyrix 6x86 & 6x86L	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4,JP5,JP6,JP25
P166+	133MHz =	2x	66MHz	ON	OFF	OFF	1-2 & 1-2 & 1-2 & 1-2
P200+	150MHz =	2x	75MHz	ON	OFF	OFF	1-2 & 2-3 & 1-2 & 1-2

Cyrix M2	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4,JP5,JP6,JP25
MX-PR200	166MHz =	2.5x	66MHz	ON	ON	OFF	1-2 & 1-2 & 1-2 & 1-2
	150MHz =	2x	75MHz	ON	OFF	OFF	1-2 & 2-3 & 1-2 & 1-2
MX-PR233	200MHz =	3x	66MHz	OFF	ON	OFF	1-2 & 1-2 & 1-2 & 1-2
	166MHz =	2x	83.3MHz	ON	OFF	OFF	2-3 & 2-3 & 1-2 & 2-3
MX-PR266	233MHz =	3.5x	66MHz	OFF	OFF	OFF	1-2 & 1-2 & 1-2 & 1-2

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							2
MX-PR300	225MHz= 233MHz=	3x 3.5x	75MHz 66MHz	OFF OFF	ON OFF	OFF OFF	1-2 & 2-3 & 1-2 & 1-2 1-2 & 1-2 & 1-2 & 1-2

IDT C6	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4,JP5,JP6,JP25
C6-150	150MHz =	2x	75MHz	ON	OFF	OFF	1-2 & 2-3 & 1-2 & 1-2
C6-200	200MHz =	3x	66MHz	OFF	ON	OFF	1-2 & 1-2 & 1-2 & 1-2

AMD K5	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4,JP5,JP6,JP25
PR100	100MHz =	1.5x	66MHz	OFF	OFF	OFF	1-2 & 1-2 & 1-2 & 1-2
PR133	100MHz =	1.5x	66MHz	OFF	OFF	OFF	1-2 & 1-2 & 1-2 & 1-2
PR166	116MHz =	1.75x	66MHz	ON	ON	OFF	1-2 & 1-2 & 1-2 & 1-2
AMD K6	CPU Core Frequency	Ratio	External Bus Clock	S1	S2	S3	JP4,JP5,JP6,JP25
K6-166	166MHz =	2.5x	66MHz	ON	ON	OFF	1-2 & 1-2 & 1-2 & 1-2
K6-200	200MHz =	3x	66MHz	OFF	ON	OFF	1-2 & 1-2 & 1-2 & 1-2
K6-233	233MHz =	3.5x	66MHz	OFF	OFF	OFF	1-2 & 1-2 & 1-2 & 1-2
K6-266	266MHz =	4x	66MHz	ON	OFF	ON	1-2 & 1-2 & 1-2 & 1-2
K6-300	300MHz =	4.5x	66MHz	ON	ON	ON	1-2 & 1-2 & 1-2 & 1-2
K6-2 333	333MHz	3.5x	95MHz	OFF	OFF	OFF	2-3 & 1-2 & 2-3 & 2-3
K6-2 350	350MHz	3.5x	100MHz	OFF	OFF	OFF	1-2 & 1-2 & 2-3 & 2-3
K6-2 366	366MHz	5.5x	66MHz	OFF	OFF	ON	1-2 & 1-2 & 1-2 & 1-2

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K6-2 380	380MHz	4x	95MHz	ON	OFF	ON	2-3 & 1-2 & 2-3 & 2-3
K6-2 400	400MHz	4x	100MHz	ON	OFF	ON	1-2 & 1-2 & 2-3 & 2-3
K6-2 450	450MHz	4.5x	100MHz	ON	ON	ON	1-2 & 1-2 & 2-3 & 2-3
K6-III 400	400MHz	4x	100MHz	ON	OFF	ON	1-2 & 1-2 & 2-3 & 2-3
K6-III 450	450MHz	4.5	100MHz	ON	ON	ON	1-2 & 1-2 & 2-3 & 2-3

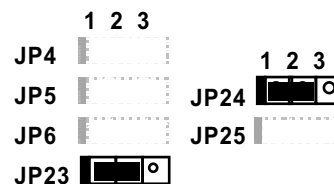
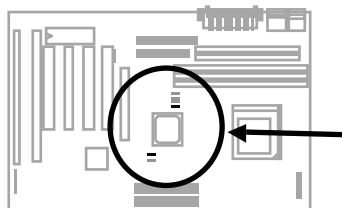


Note: Cyrix 6x86, 6x86MX (M2) and AMD K5 CPU use P-rating for the reference of CPU benchmark compared with INTEL P54C, their internal core frequency is not exactly equal to P-rating marked on the CPU. For example, Cyrix P166+ is 133MHz but performance is almost equal to P54C 166MHz and AMD PR133 is 100MHz but performance is almost equal to INTEL P54C 133MHz.

2.2.3 DRAM Clock

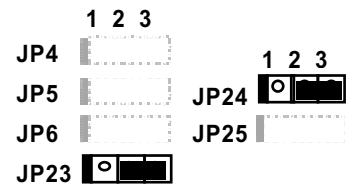
JP23	JP24	DRAMCLK
1-2	1-2	CPU CLK
2-3	2-3	AGP CLK

JP23, JP24 are used to decide if DRAM clock is synchronous with CPU or AGP clock.



CPU CLK

Hardware Installation

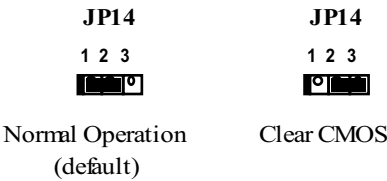
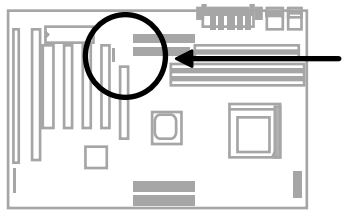


AGP CLK

2.2.4 Clearing the CMOS

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

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



The procedure to clear CMOS:

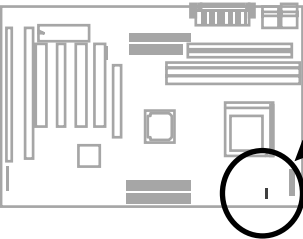
1. Turn off the system and unplug the AC power.
2. Remove ATX power cable from connector PWR2.
3. Locate **JP14** and short pins 2-3 for a few seconds.
4. Return **JP14** to its normal setting by shorting pins 1-2.
5. Connect ATX power cable back to connector PWR2.
6. Turn on the system power.
7. Press **DEL** during bootup to enter the BIOS Setup Utility and specify a new password, if needed.

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2.2.5 I/O Voltage

JP12	I/O Voltage
1-2	3.31
2-3	3.48

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



JP12



3.31 V

JP12



3.48 V

Hardware Installation

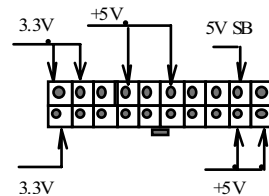
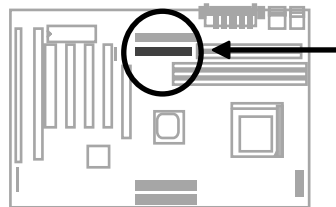
2.3 Connectors

2.3.1 Power Cable

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



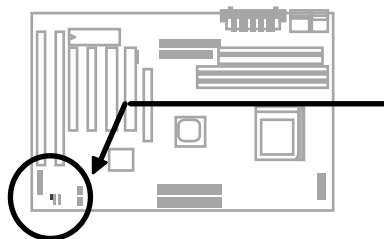
Caution: Make sure that the power supply is off before connecting or disconnecting the power cable.



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**.

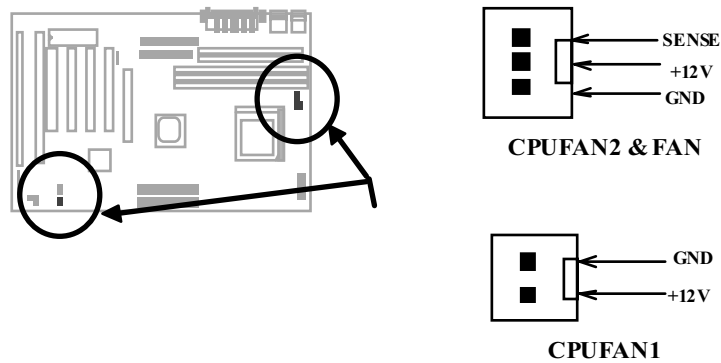


SPWR

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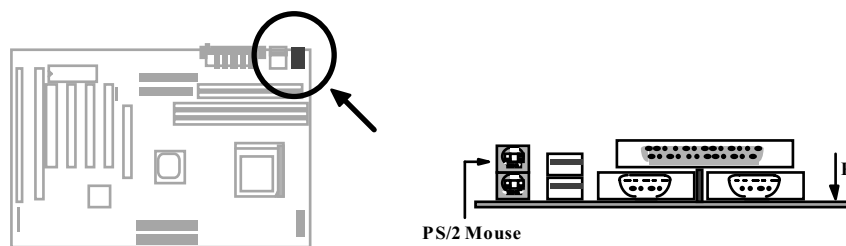
2.3.3 Fan

Plug in the fan cable to the fan connectors onboard. The fan connectors are marked **CPUFAN1**, **CPUFAN2** and **FAN** 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. FAN can be reserved for the housing fan. Note that only CPUFAN2 and FAN support 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

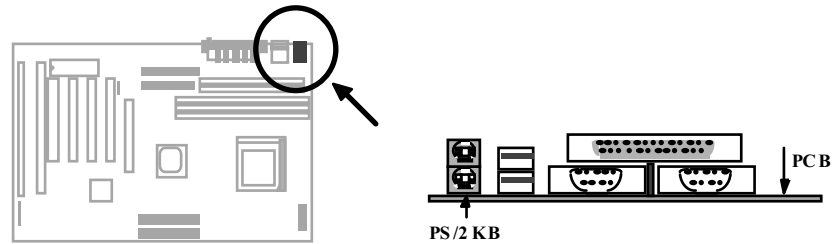
The onboard PS/2 mouse connector is a 6-pin Mini-Din connector marked **PS2 MS**. The view angle of drawing shown here is from back panel of the housing.



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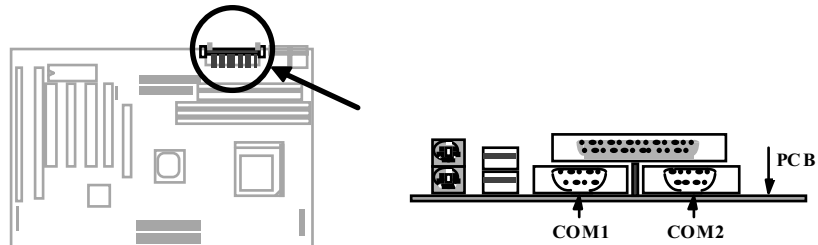
2.3.5 Keyboard

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



2.3.6 Serial Devices (COM1/COM2)

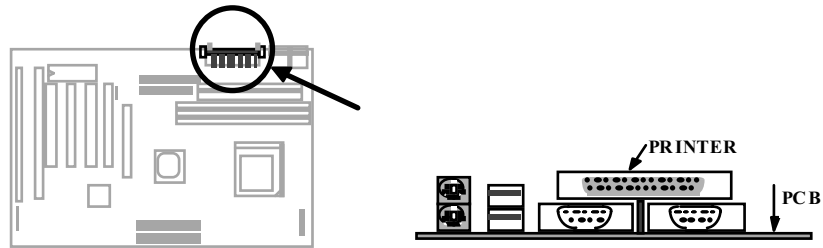
The onboard serial connectors are 9-pin D-type connector on the back panel of mainboard. The serial port 1 connector is marked as **COM1** and the serial port 2 connector is marked as **COM2**.



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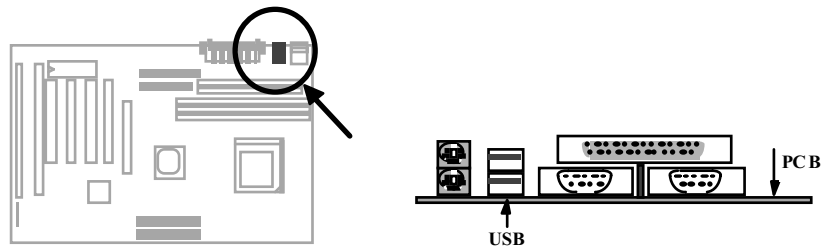
2.3.7 Printer

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

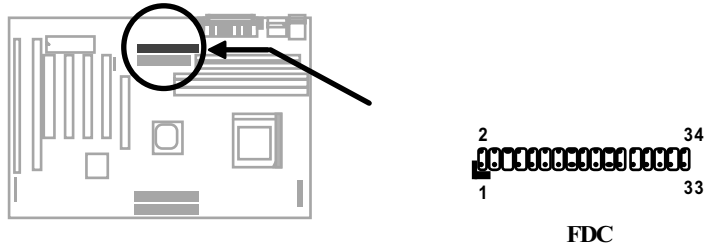
You can attach USB devices to the USB connector. The motherboard contains two USB connectors, which are marked as **USB**.



2.3.9 Floppy Drive

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

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2.3.10

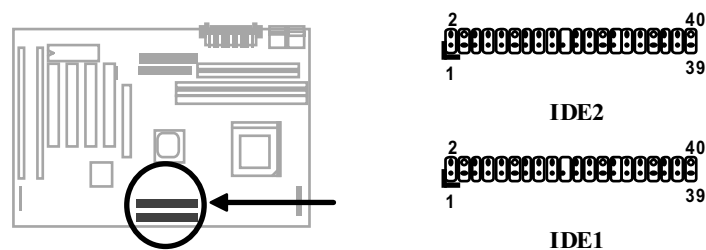
IDE

Hard Disk and CD ROM

This motherboard 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.

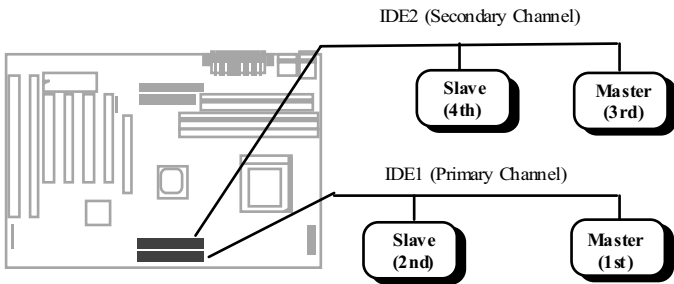


Hardware Installation



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

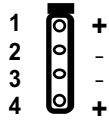
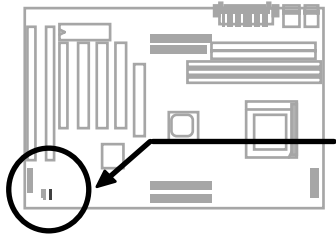
Caution: For better signal quality, it is recommended to set far end side device to master mode and follow the suggested sequence to install your new device. Please refer to following figure.



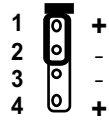
2.3.11 Hard Disk LED

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.

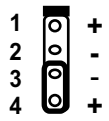
Pin	Description
1	HDD LED
2	GND
3	GND
4	HDD LED



HDD LED
4-pin
connector



HDD LED
2-pin
connector at



HDD LED
2-pin
connector at

connector

connector at
pin 1-2

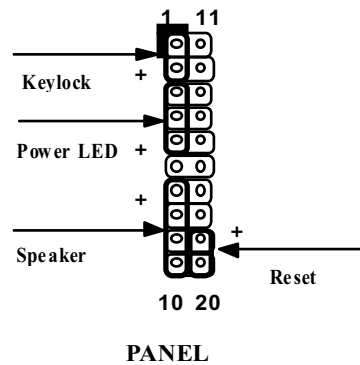
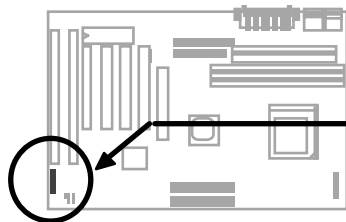
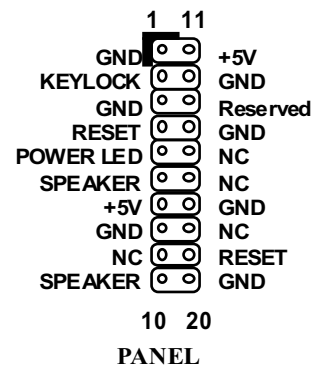
connector at
pin 3-4

2.3.12

Panel Connector

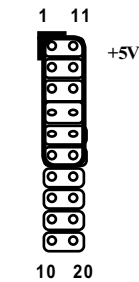
The Panel (multifunction) connector is a 20-pin connector marked as **PANEL** on the board. Attach the power LED, keylock, speaker, and reset switch to the corresponding pins as shown in the figure.

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.



Hardware Installation

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

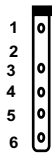
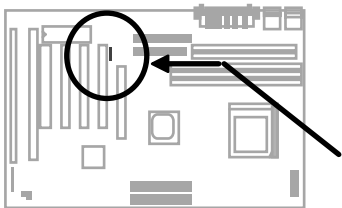
2.3.13 Connector

IrDA

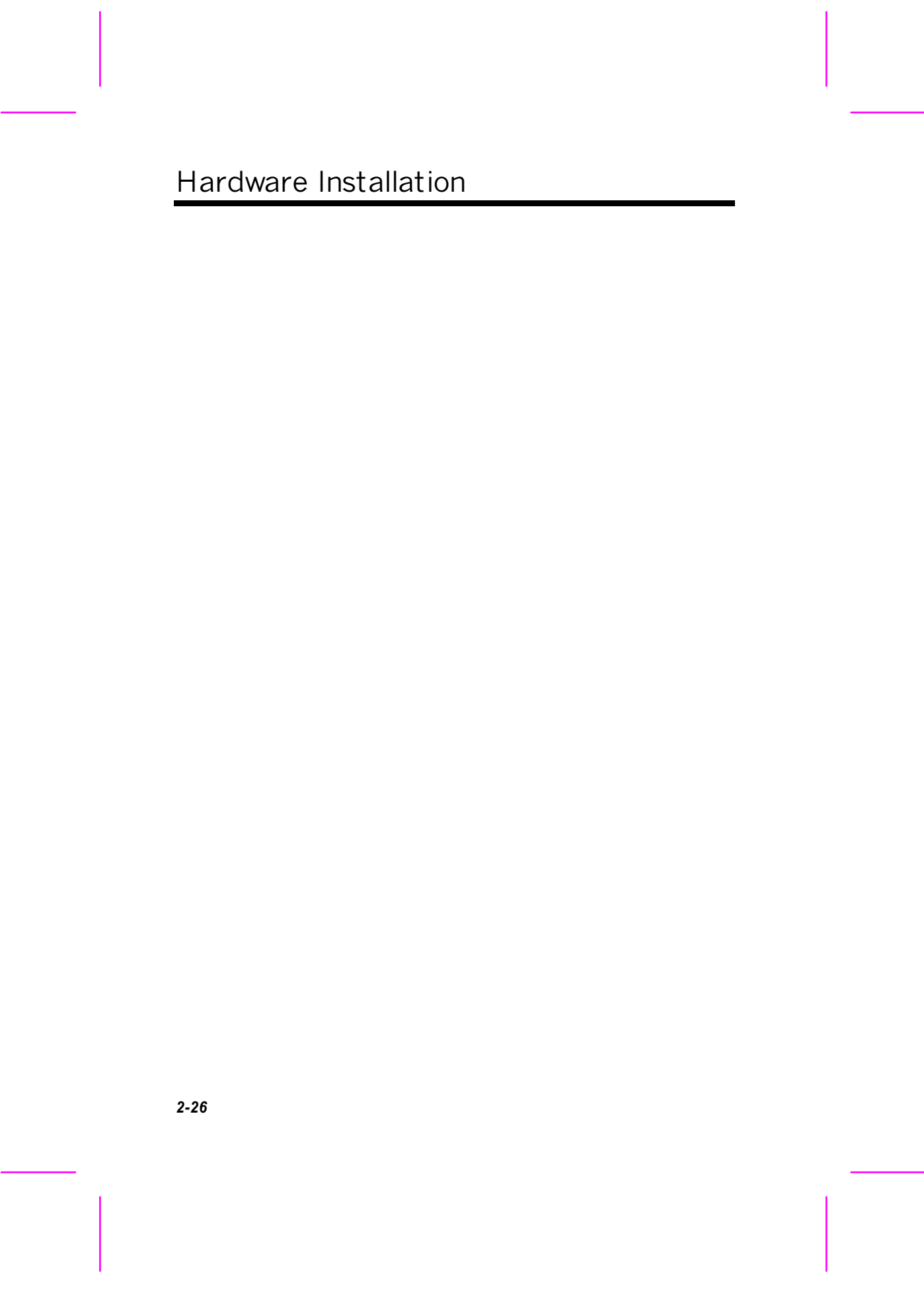
The IrDA connector can be configured to support wireless infrared module, with this module and application software such as Laplink or Win95 Direct Cable Connection, user can transfer files to or from laptops, notebooks, PDA and printers. This connector supports HPSIR (115.2Kbps, 2 meters), ASK-IR (56Kbps).

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



Hardware Installation

Hardware Installation

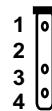
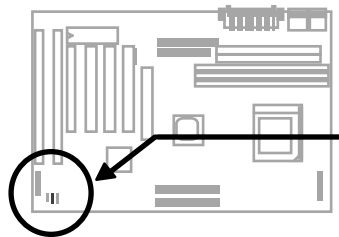
2.3.14 Wake-up Connector

This mainboard implements special circuit to support Modem Ring-On, both Internal Modem Card (AOpen MP56) 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 MP56, connect 4-pin cable from **RING** connector of MP56 to **WKUP** connector on the mainboard.

<u>Pin</u>	<u>Description</u>
1	+5V SB
2	NC
3	RING
4	GND



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



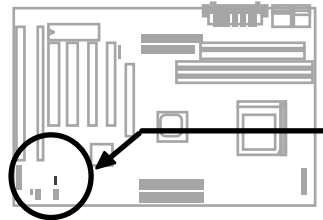
Modem-WKUP

2.3.15 LAN Wake-up Connector

This mainboard implements a **LAN-WKUP** connector. To use LAN Wake-up function, you need a network card that supports this feature. In addition, you also need to install a network management software, such as ADM.

<u>Pin</u>	<u>Description</u>
1	+5V SB
2	GND
3	LID

Hardware Installation

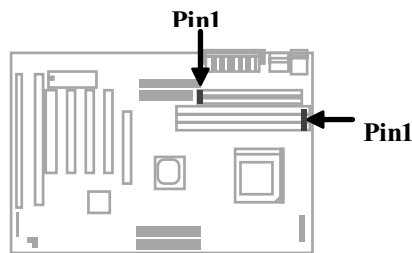


1	0
2	0
3	0

LAN-WKUP

Hardware Installation

2.4 Configuring the System Memory



This motherboard has two 72 pin SIMM sockets (Single-in-line Memory Module) and three 168 pin DIMM socket (Dual-in-line Memory Module) that allow you to install system memory maximum 1GB.

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).

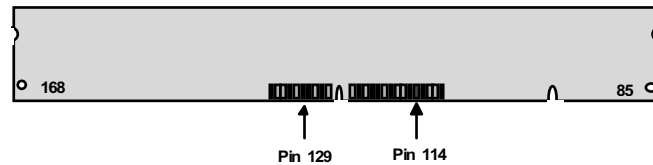
DIMM modules can be identified by following factors:

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



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

Hardware Installation

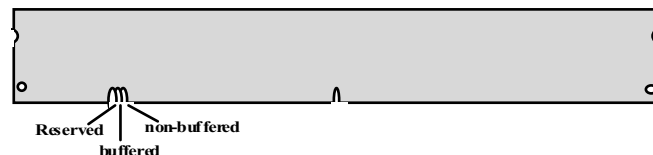


- II. Speed:** normally marked as -12, which means the clock cycle time is 12ns and maximum clock of this SDRAM is 83MHz. Sometimes you can also find the SDRAM marked as -67, which means maximum clock is 67mhz.



Caution: Some SDRAMs marked as -10 may work fine with 100 MHz CPU clock, but not all this kind of modules can work properly under 100MHz external clock. We suggest you choose and install SDRAMs that match **PC 100** specification if 100MHz or above CPU clock is selected.

- 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 you to choose 4-clock SDRAM in consideration of reliability.

Hardware Installation



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) SDRAM.

There is no jumper setting required for the memory size or type. It is automatically detected by the system BIOS.

Total Memory Size = Size of SIMM1 + Size of SIMM2 + Size of DIMM1 + Size of DIMM2 + Size of DIMM3



Caution: Note that DIMM3 shares a bank with SIMM1 and SIMM2, so you couldn't use a double side DIMM if SIMMs were installed.

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.

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. If your SDRAM has unstable problem, go into BIOS "Chipset Features Setup", change CAS Latency Time to 3 clocks.

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 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 DIMM which is less than 16 chips.



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

Hardware Installation

kind of SDRAM.



Tip: The 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.

Hardware Installation

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

Hardware Installation

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



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 bytes = 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

Hardware Installation

4M by 4	4Mx64	x2	32	64MB	No
16M by 4	16Mx64	x1	16	128MB	No

For getting the best performance and stability under 100MHz or above external clock, we strongly recommend you use PC 100 SDRAM. The PC 100 SDRAM that AOpen had tested are listed below.

Size	Vendor	Model	Single/Double	Chip Count
16M	Hyundai	HY57V168010CTC-10	x1	8
32M	NEC	D4516821AG5-A10-7JF	x1	16
32M	SEC	KM48S2020CT-GH	x2	18
32M	Hyundai	HY57V168010CTC-10	x2	16
32M	Micron	MT48LC2M8A1-08	x2	16
32M	Fujitsu	81F16822D-A10-7JF	x2	18
64M	Mitsubishi	M5M4V64S30ATP-10	x1	9
64M	Fujitsu	81F64842B-103FN	x1	9
64M	NEC	D4564841G5-A10-9JF	x1	9
64M	SEC	KM48S8030BT-GH	x1	9
64M	Toshiba	TC59S6408FTL-80H	x1	9

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.