KEEN-3304

33MHz 386™ SYSTEM

KEEN-3304

Personal Computer

User's Manual

Edition 1.0

Documentation design and writing by: Amy Hsieh, Patty Lee and Alan Patterson.

Federal Communications Commission (FCC) Statement

Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any special accessories needed for compliance must be specified in the instruction manual.

Warning: A shielded-type power cord is required in order to meet FCC emission limits and also to prevent interference to nearby radio and television reception. It is essential that only the attached power cord be used.

Use only shielded cables to connect I/O devices to this computer.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparautus as set out in the radio interference regulations of the Canadian Department of Communication.

Le Present appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de Class B preescrites dans le règlement sur le brouillage radioélectrique édicté parle Ministére des Communications du Canada.

Warning

Reconfiguring

- To keep the computer from being damaged, NEVER reconfigure the board while the power is ON.
- If you wish to reconfigure the computer at any time, ensure that the power is turned OFF before changing any hardware settings, such as DIP switches or jumpers.

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About This Manual

What's Inside

Here's what you'll find in this manual:

Chapter 1 — *"System Overview",* gets you acquainted with the basic concepts of your system.

Chapter 2 — *"Setting Up Your System",* shows you how to install or upgrade your system.

Chapter 3 — *"Operating Your System",* shows you the basics of BIOS program and the MS-DOS functions.

Chapter 4 — *"Keyboard",* explains the keyboard's features, layout and basic functions.

Chapter 5 — *"Troubleshooting"* covers simple troubleshooting procedures and provides directions for additional help.

Chapter 6 — *"Appendix",* provides some technical specifications for your system.

Chapter 7 — *"Glossary",* explains some microcomputer terms.

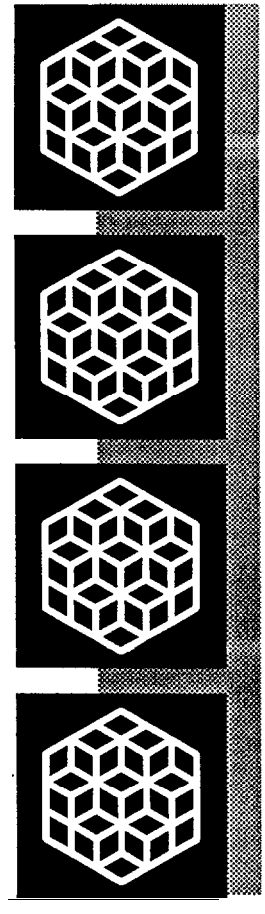
For the advanced user

If you are an experienced PC user and do not want to upgrade your system now and you want to start using your personal computer as quickly as possible, refer to the Quick Start section at the beginning of chapter one.

Quick Start will provide you all the information you need to set up the hardware.

For the beginner

Chapter 1 gives you the basic information you need to use this system. Chapter 2 provides greater detail on the hardware and on how to upgrade your system. Your system is quite simple to set up. However if you are unsure of yourself, find an experienced PC hand to help out.



Chapter 1
System Overview

System Overview

This chapter covers:

- the basics of your system
- the system's features and specifications
- control panel features and connectors outside of the case
- how to maintain your computer

If you are an experienced user who wants to get to work as soon as possible, the *Quick Start* section at the beginning of this chapter provides you all the information you need to set up the hardware.

If you want to upgrade your hardware later, read Chapter 2, *INSTALLATION*.

If you want to gain a more thorough understanding of your computer, read the entire manual.

Note: You may refer to the *"Glossary"* section for definitions of computer terminology.

1-1 Introduction

This manual will guide you through the setup of your computer and provide the information necessary to tailor the system to fit your needs. If you are a novice, you will be able to have your computer up and running with a minimum of fuss. You will also gain valuable hands-on experience by following the easy step-by-step instructions. If you are an advanced user, you will appreciate the affordable power of this system.

Your system uses an Intel Corporation™ 386 microprocessor. While maintaining complete compatiblity with software written for IBM PC/AT 80286-type computers, your computer vastly exceeds them in capability and processing power. The PEI-306 RAM Card maintains the highest performance and flexibility for the whole system. Also, a wide variety of expansion cards are available for your choice of peripherals.

Quality, flexibility, and functionality are the key design features of your system. This system provides optimum performance at an affordable price.

Operating System

Your computer uses the MS-DOS® operating system. For more details on this operating system, please refer to the Microsoft® *MS-DOS User's Guide and User's Reference.* This manual is included with your system.

If you are an experienced user anxious to start using your computer, observe the figure below to set up your personal computer. You will still want to use this manual later as a reference book.

Note: Save all packing materials in case you need to ship or resell your computer in the future.

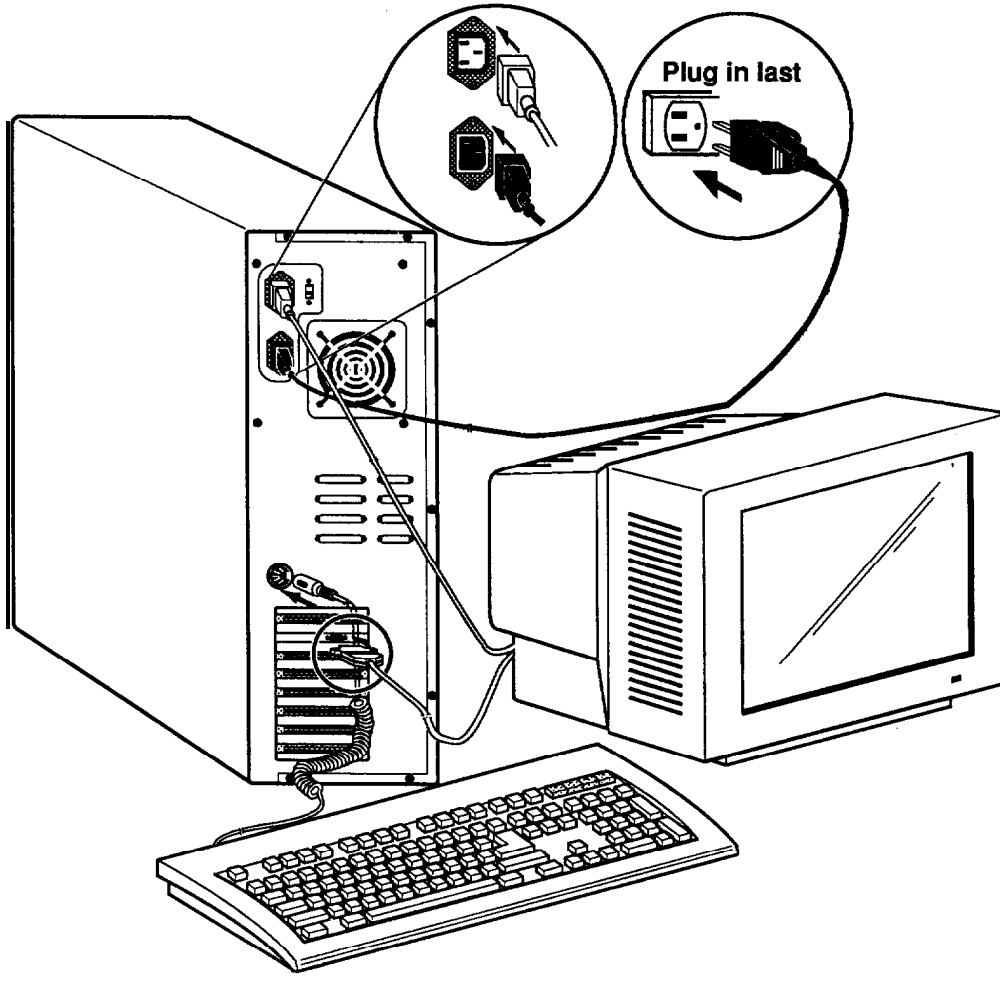


Figure 7-7: Quick Start

A brief description of your system is given below:

- Compatibility with PC/AT
- Intel® 80386 - 33 microprocessor
- Optional 80387 - 33 or Weitek® WTL3167 - 33 coprocessors
- Dual speed, 33MHz cache support in ultra-high speed and emulation without cache in low speed, both switchable by either software or hardware switches
- Discrete components to complete cache functions
- l/2/4/5/8 MB 32-Bit DRAM onboard
- 64/256 KB direct-mapped high-speed SRAM cache memory
- Write-Back cache update for 0-watt state memory-write operations
- DTK, Phoenix, Award, or AMI BIOS support
- Shadow RAM function for BIOS and video (for PEM-3301 motherboard)
- One 32bit memory expansion slot for a PEI-306 32-bit memory expansion card to provide up to 16MB of 32-bit memory
- Six 16-bit AT compatible I/O slots
- One 8-bit AT compatible I/O slots
- Standard 8MHz AT bus speed
- DALLAS DS1287 chip to maintain system configuration and real time clock setting
- Keyboard and speaker attachments
- Seven DMA channels
- 16 level interrupt
- Three programmable timers

1-4 Specifications

- **CPU** — Intel 386™ microprocessor, 33MHz
- **RAM** — Maximum - 16MB with PEI-306 RAM Card
  Cycle Time - 80ns
  Data Bus Bandwidth - 32 bits
- **ROM** — 32KB legal BIOS
- **Expansion slots —** one 32-bit, six 16-bit, one 8-bit
- **Disk Drive(s) —** Floppy disk drive: 3.5" and 5.25" bay
  — Hard disk drive: 3.5" halt high and 5.25" bay
- **Power Size —** 165mm X 150mm X 150mm
- **Options —** Math coporocessor - Intel® 387-33
  - Weitek® 3167-33

1-5 Example of a System Configuration

The basic system is pictured below. You may choose peripherals and upgrades for the system as your needs require. Even if your system is different from the one pictured, it should operate in the same basic manner.

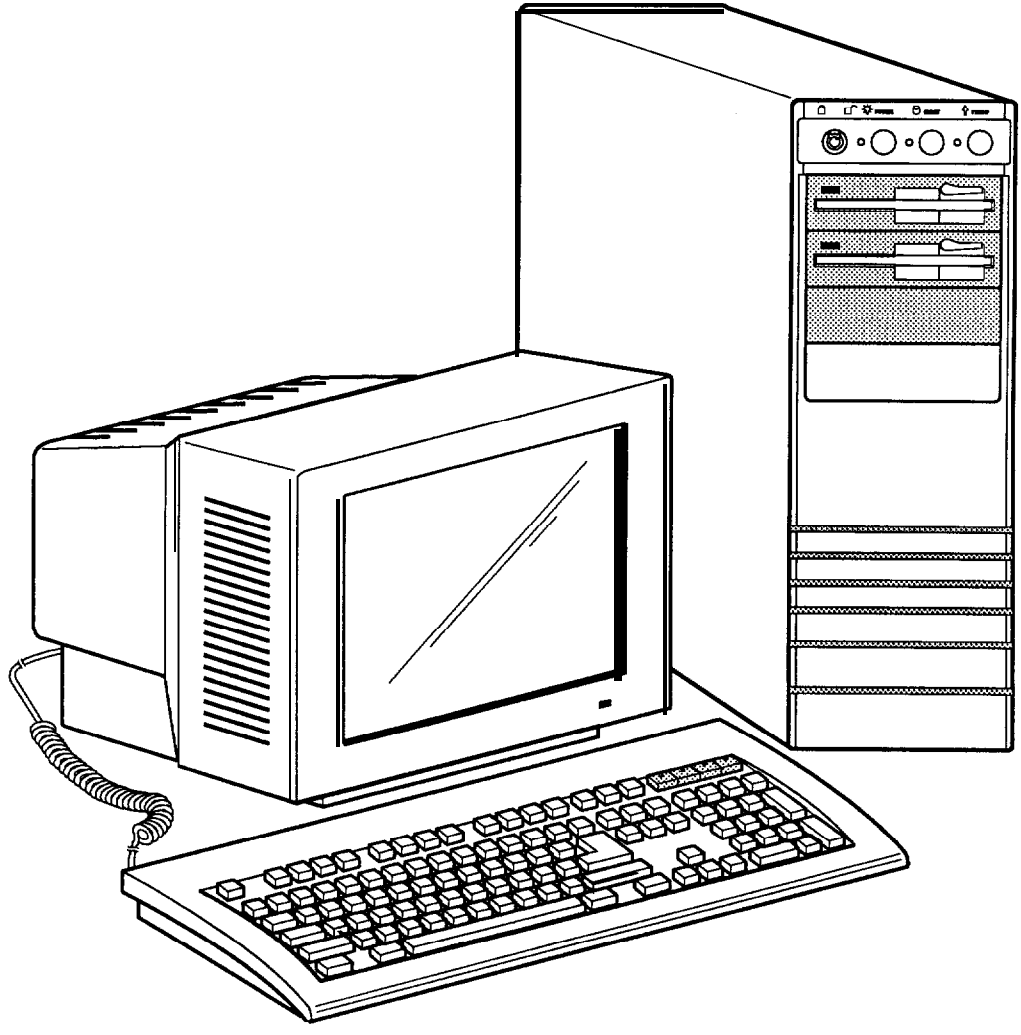


Figure 1-2: System Configuration

The system unit may house a motherboard, disk drives, a power supply and optional expansion cards.

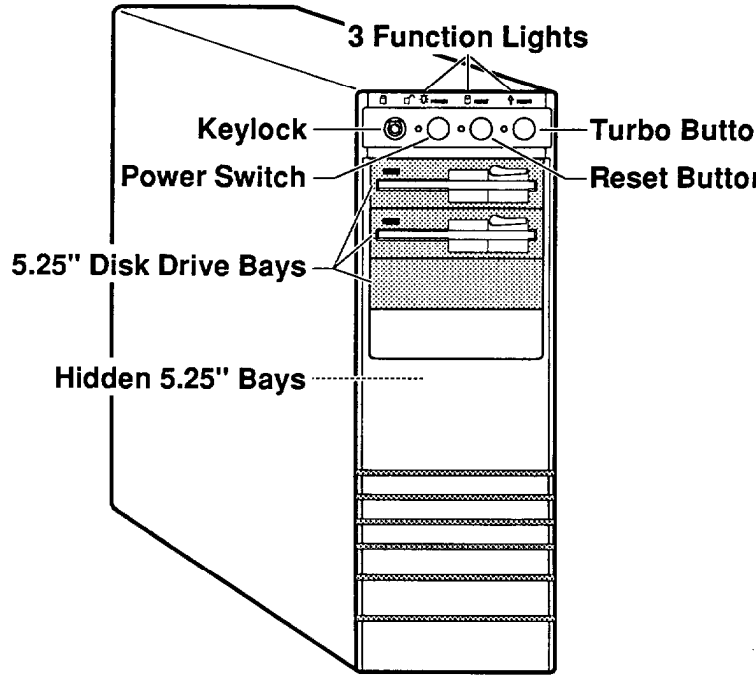


Figure 1-3: System Unit Case

1-7 Control Panel

The control panel provides several useful functions which are explained below. You are likely to use the front panel frequently, so let's start there.

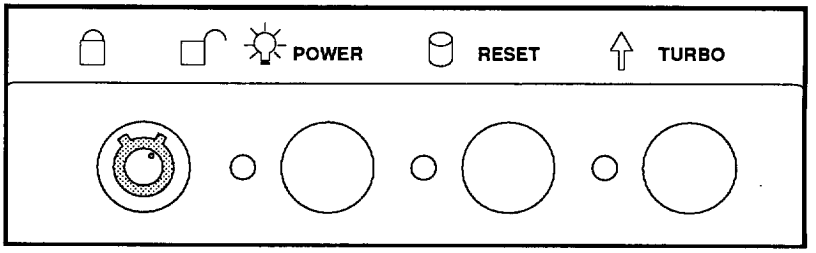


Figure 1-4: Front Panel

Reset Button

The reset button allows you to restart the system without turning the power off.

you encounter any problems while using unfamiliar software, you can always restart quickly from the RAM test stage by pressing the reset button. Note, however, that any data which have not been saved to disk will be lost.

Turbo Button

The Turbo button allows you to change the running speed of the microprocessor to accommodate software requirements. Some software applications must be run at a slow clock speed.

Indicator Lights

These lights indicate the operation status of your computer. The red LED comes on when the hard disk is being accessed. The *green* LED is lit when the power is on. The *yellow* LED comes on when Turbo clock peed is activated.

Keylock

The keylock enables or disables the keyboard. In the unlock mode the keyboard is activated. In the lock mode the keyboard is disabled to deny unauthorized users access to the computer.

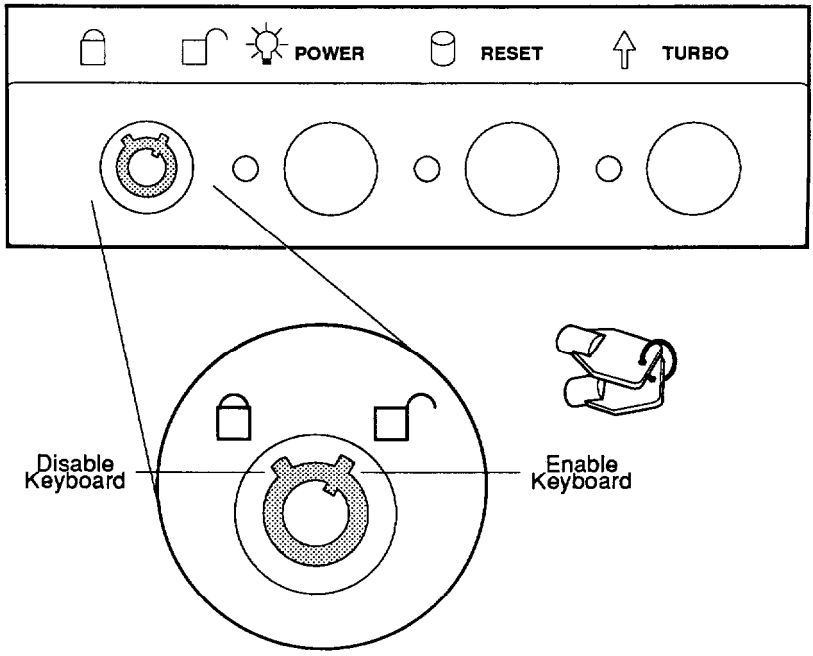


Figure 1-5: Keylock and Two Security-Lock Keys

System Power Switch

The system power switch is located on the control panel.

You should always be certain that the power is turned off before modifying the hardware configuration in any way.

1-8 Rear Panel

The rear panel has all the connections that lead from the system unit to external peripherals and the power source. Turn off all power switches before connecting or disconnecting cables/wires! Ensure that cables/wires are attached to the external device first and connected to the outlet unit later. Turn the system unit power switch off before you plug the power cable into an electrical outlet.

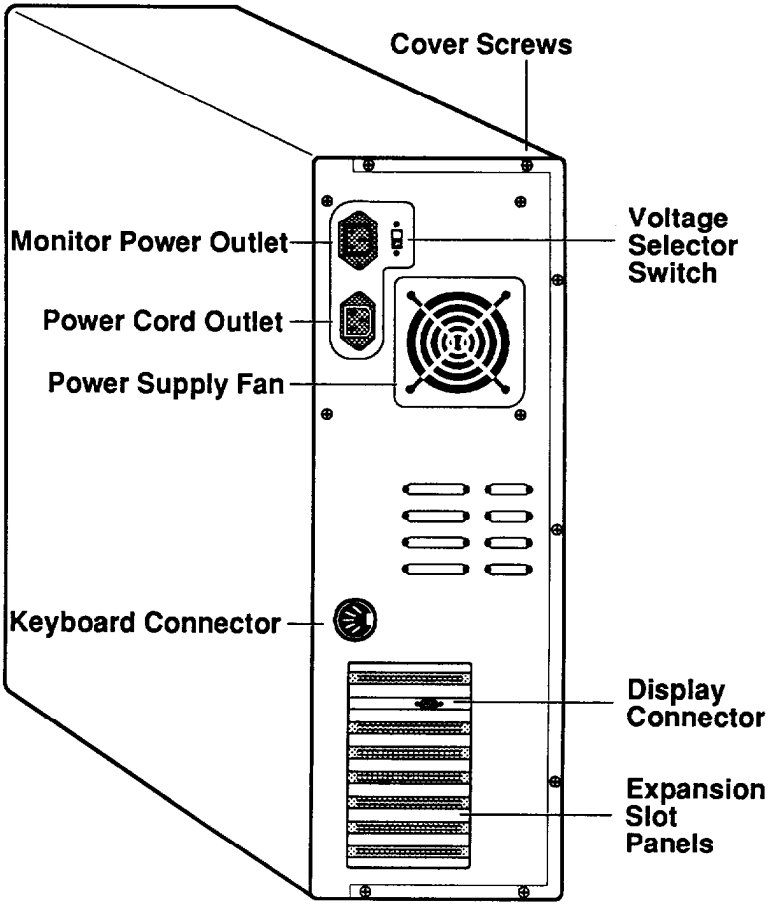


Figure 1-6: Rear Panel

Keyboard Connector

The keyboard supplied with your system can be plugged into sockets in front of the case. Plug the keyboard cable into the socket shown below.

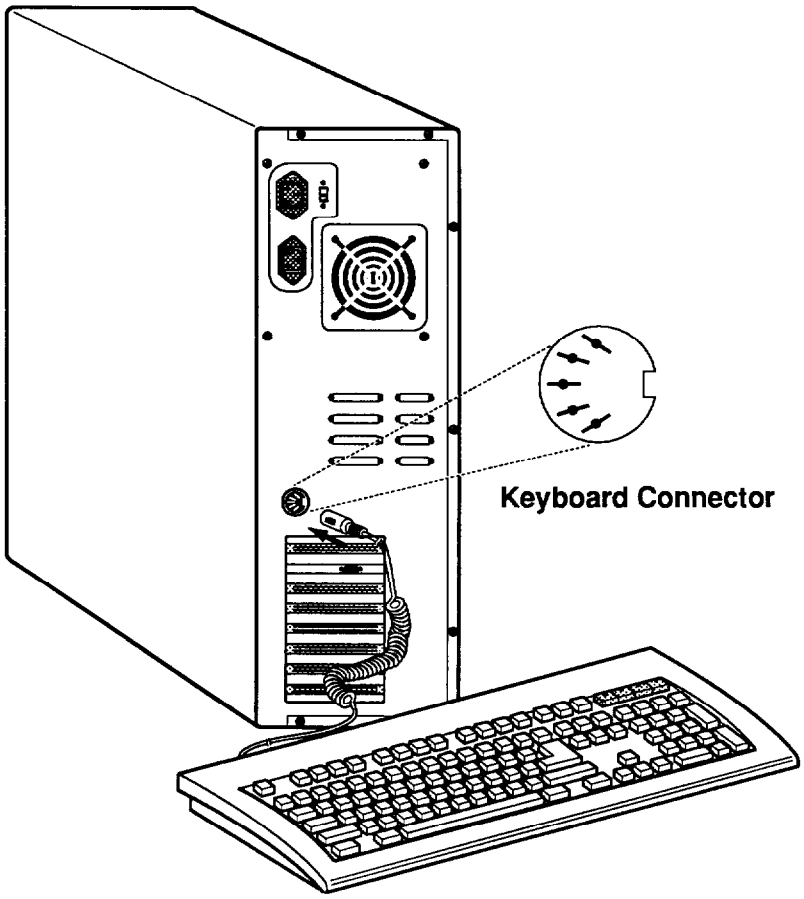


Figure 1-7: Connecting the Keyboard Cable

Power Cord Connector

The power supply has two receptacles: one supplies power to a monitor; the other connects to the main power source.

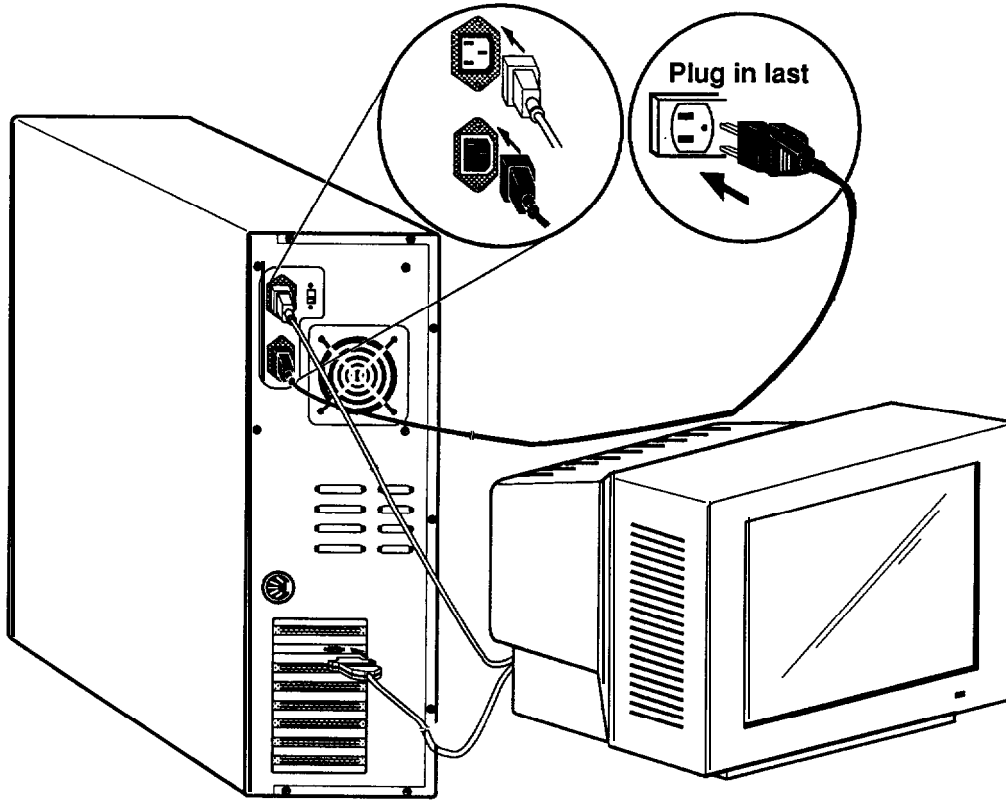


Figure 1-8: System Power Cord

Display Port

You will also need to connect your monitor to the system unit at a female display port in one of the expansion slots as shown on the previous page.

To attach the monitor cable to the video port, plug the cable into the port and screw the cable connector down securely.

Your computer gives you a wide range of video options to meet your needs.

You have a wide choice of the following video standards.

- MGA (Monochrome Graphics Adapter) also referred to as Hercules
- CGA (Color Graphics Adapter)
- EGA (Enhanced Graphics Adapter)
- VGA (Video Graphics Adapter)

Your monitor power plug may not fit the system unit's monitor power outlet. If not, connect the monitor cable to a wall electrical outlet. Refer to the figures below for mono and color display connections.

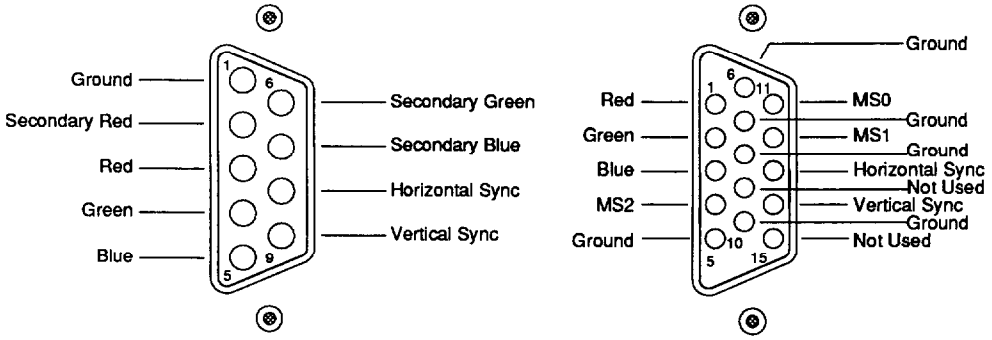


Figure 1-9: Two Kind of Display Connectors

Power Voltage Setting

The system unit can run on either 115V or 230V as indicated in Figure 1-10. The voltage setting switch is located above the monitor power outlet. Refer to the Table 1-1 for power cord specifications.

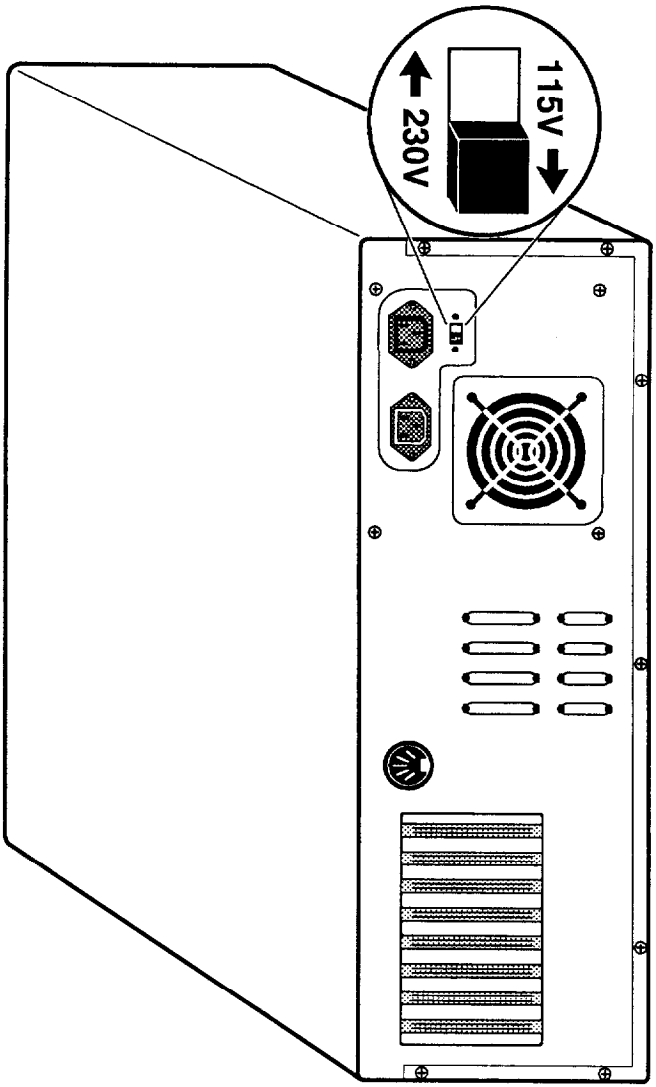


Figure 1-10: Voltage Switch

Voltage Selection	Cord Specification
115V	UL list; SVT/SJT type; three-conductor rated 10A, 125V; <15ft. in length
230V	Appropriate approval listed in that specific country; three-conductor; rated 6A, 250V
230V (U.S.A. only)	UL listed; SVT/SJT type; three-conductor; rated 6A, 125V; <16ft. in length

Table 1-7: Power Cord Specifications

1-9 Other Peripherals

To connect other peripherals (printers, modems, etc.) determine which ports are to be used by referring to your expansion card manuals or peripheral manuals. You may consult your dealer for more about the expansion cards available for your system. Typical peripherals are shown in Figure 1-11 below.

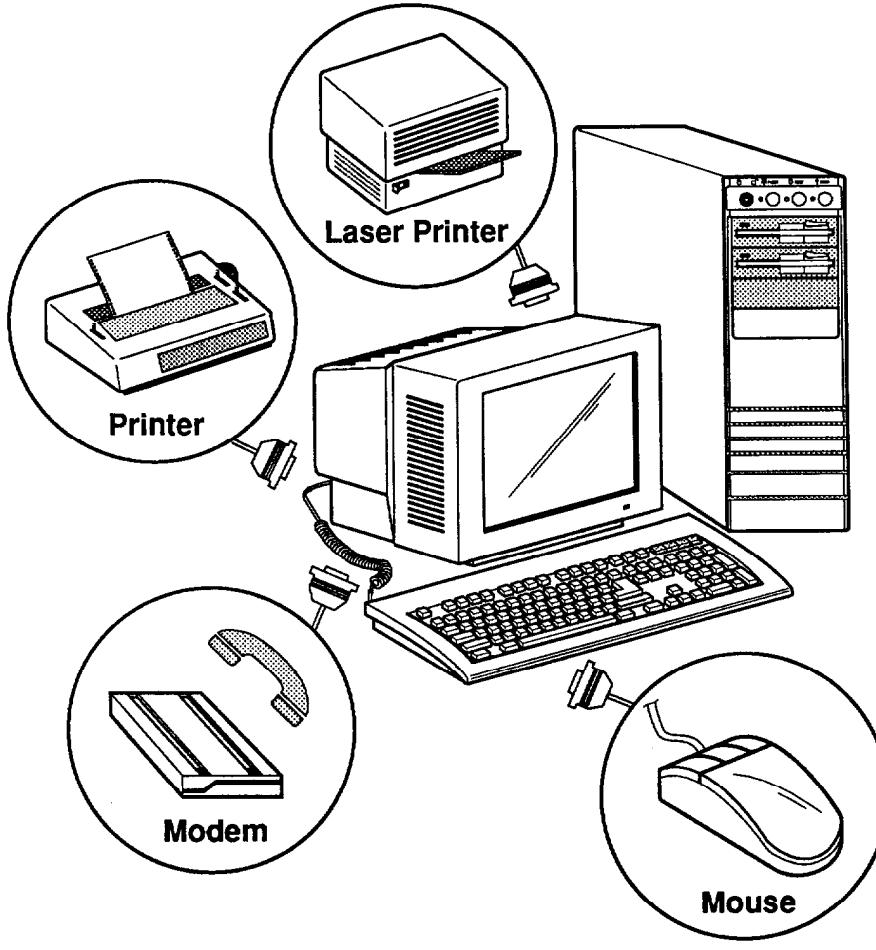


Figure 1-17: System Unit Connected to Peripherals

1-10 Disk Drives

You can install up to six disks drives in the system unit of either with 5.25” or 3.5” sizes. More information about how to install disk drives may be found in the chpater 6.

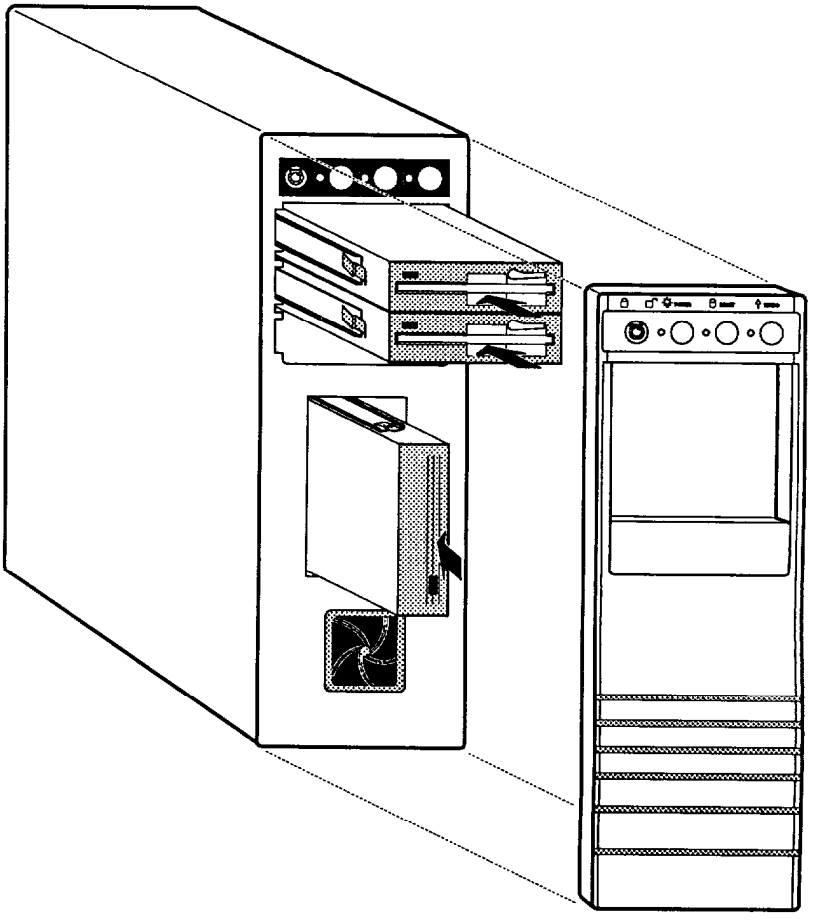


Figure 1-12: Installing Floppy and Hard Disk Drives

Floppy Disk Drive

With a floppy disk drive you can format and use single, double-sided or high-density floppy disks.

One double-sided 5.25" floppy disk can store up to 360KB of data. One double-sided high density 5.25" floppy disk can store up to 1.2MB of data. One standard 3.5" floppy disk can store up to 720KB of data. One high density 3.5" floppy disk can store up to 1.44MB of data.

Quality	Tracks Per Inch	Capacity	
		5.25"	3.5"
Double Density (DD, DS, RH)	48 TPI	360 KB	720 KB
High Density (DH)	96 TPI	1.2 MB	1.44 MB

Table 1-2: Floppy Disk Specifications

Note:

- Only high-density floppy disks can be formatted to high capacities of either 1.2M for 5.25" or 1.44M for 3.5" floppy disks. You may lose data if you use a low-density floppy disk formatted for high density.
- You can't use a high-density disk in a low-density disk drive.

Copy Protection

You can copy protect a disk to prevent accidental storage of information or viral infection onto that disk by covering the notch on the side of a 5.25" disk with a write-protect tab or by sliding the small tab on a 3.5" disk to cover the hole. Refer to the figures below on how to copy protect floppy disks.

When a disk is copy protected, you cannot add new information to it or change any information on it. To enable copying to the disk, remove the copy-protect tab.

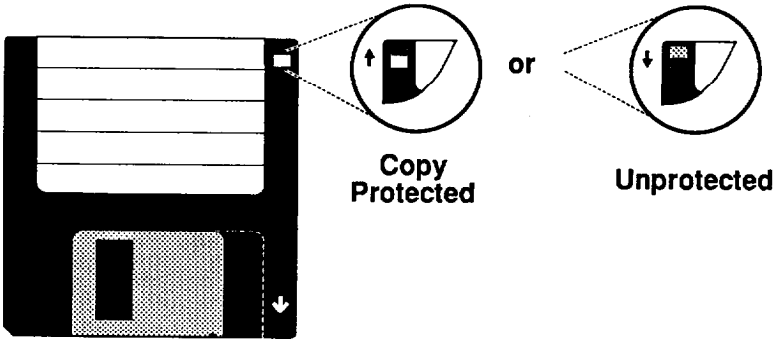


Figure 1-13: Copy Protection for 3.5" Floppy Disk

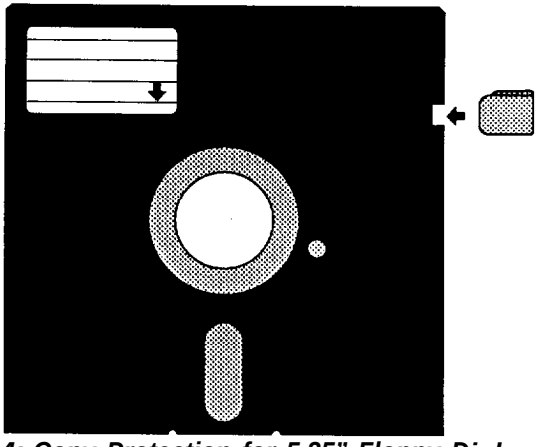


Figure 1-14; Copy Protection for 5.25" Floppy Disk

Hard Disks

Your system is very powerful and versatile. To make full use of all its capabilities, it is best to use a hard disk. A hard disk can raise your efficiency because the hard disk keeps programs and data available at your fingertips.

Moreover, your system gives you a wide range of 3.5" half-high or 5.25' half- and full-high hard disk(s) to meet your needs.

1-11 Keyboard

Your keyboard has a set of function keys, cursor keys and a numeric keypad. The figure below shows a typical keyboard. Refer to Chapter 4 for a more detailed description of the keyboard.

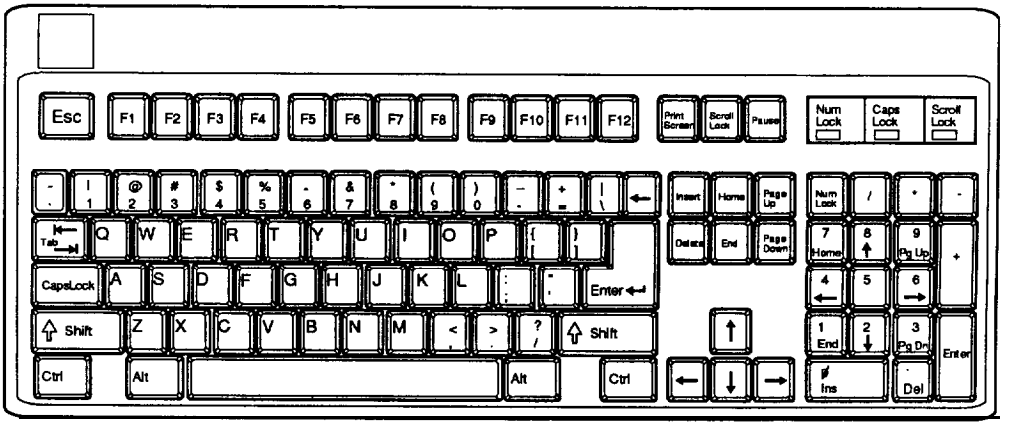
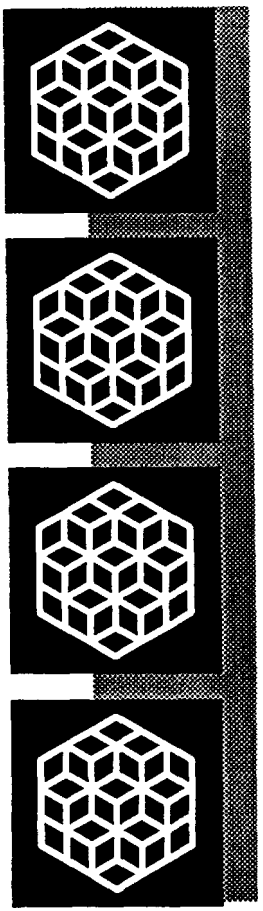


Figure 1-15: Keyboard

1-12 Maintaining Your Equipment

Read and follow carefully all the instructions and warnings in this manual and on these products!

- Only use a damp cloth to clean your system unit and monitor case. **Do not use detergents!**
- Position your system unit, monitor and cables/wires away from direct sunlight, moisture, dust, oil, and thoroughfares.
- Do not submit your equipment to harsh jarring.
- Ensure that all ventilation outlets are always free from obstruction.
- In the event of mechanical/power failure or damage, do not attempt to repair the system unit, monitor/s, cables/wires. Refer all such problems to experienced service personnel.
- Ensure that the back of the system unit is at least 3" away from anything that might obstruct the ventilation outlets and cause overheating.
- Ensure that the power source is grounded correctly. This product is equipped with a 3-wire grounding-type plug. This plug will only fit into a grounded power outlet.
- It is recommended not to service this product yourself, as opening and removing covers exposes dangerous voltage areas and other risks. Refer all servicing to service persons.



Chapter 2

Setting Up Your System

Setting Up Your System

In this chapter you will learn about:

- how to assemble a knocked-down system
- how to upgrade your system

Setting up a system is easy and takes only a short time. If your dealer has set up your system for you, you can skip this chapter. With the system set up you are now ready to load your application software and begin work. This chapter covers topics you are less likely to need to know right away.

You may also skip this chapter unless you want to add to or alter your system unit hardware yourself. It is recommended to have your dealer or technician upgrade your system if you are a novice. Ensure that the power is off before modifying the hardware configuration!

Note: Your motherboard will be either the PEM-3300 or the PEM-3301. These two motherboards operate in the same basic manner. In this manual, you may skip sections concerning the motherboard which is not yours.

2-1 PEM-3301 Motherboard

If your motherboard is the PEM-3301, the layout of your board will be as pictured on the next page.

The PEM-3301 motherboard uses a cache memory subsystem providing a small amount of fast memory (SRAM) and a large amount of slow memory (DRAM). This system is configured to so that all system memory is fast memory and is fast enough to complete bus cycles with no wait states. The cache memory provides high performance with no wait states. The cache memory provides high performance with a cost approaching that of DRAM.

The motherboard contains an Intel® 80386 processor, a 80387 math coprocessor socket, BIOS chips and expansion slots. The figure on the next page will familiarize you with the layout of the PEM-3301 Cache-386 33MHz Mainboard.

Restrictions

Before installing the PEM-3301, we strongly recommend that you follow the restrictions mentioned below:

Access Time:

- 27256 EPROM (BIOS) with 150ns access time
- 1 MbitX9 SIMM DRAM with 100ns access time
- 256KbitX9 SIMM DRAM with 80ns access time
- 16Kbit X 4 DIP Cache RAM (SRAM) with Data: 25ns, TAG: 15ns
- All the SIMM RAM modules must have leads

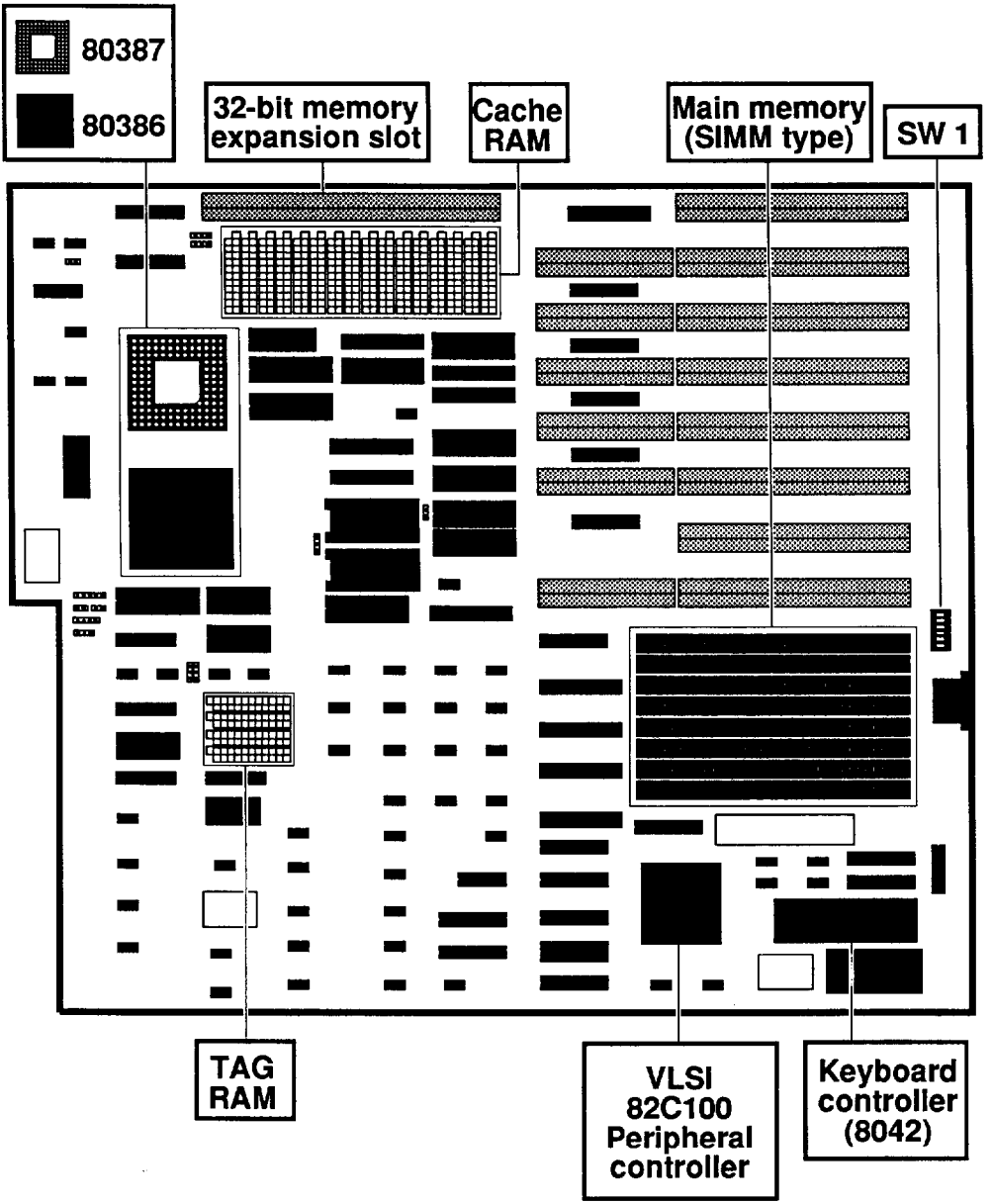


Figure 2-1: PEM-3301 Motherboard Layout

Onboard System Memory Size

The PEM-3301 mainboard has two kinds of dual sockets for Cache RAM and one kind of SIMM socket for DRAM.

Chip Insertion

Remember that when inserting chips/RAM modules, you must make sure the notched or dotted end of the chip/RAM module is lined up with the notched end of the socket. Gently push the chip/RAM module into the socket, and be careful not to bend the pins. See the figures below:

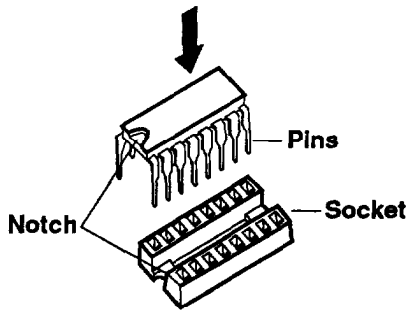


Figure 2-2: DIP-Type Cache RAM

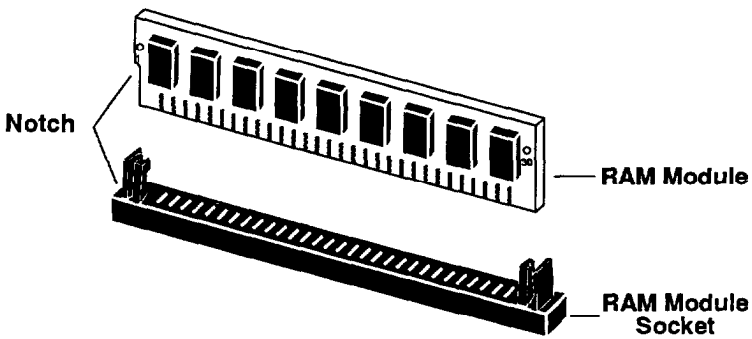


Figure 2-3: SIMM-Type DRAM

Switch Settings

The location of the six-switch DIP SW1 can be seen below. Each switch has an ON and OFF position (usually the ON position is labeled, the OFF position is not). SW1 should be set appropriately, based on the following description.

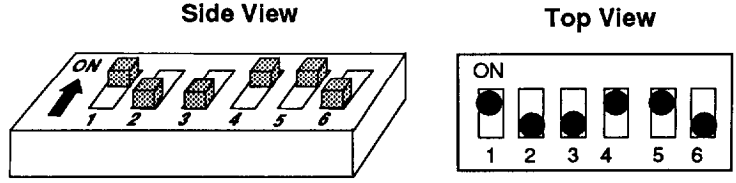


Figure 2-4: The Six-Switch DIP SW1

Memory Size	Switch SW1 (1 - 3)
2MB	
4MB	
8MB	
12MB	
16MB	

Table 2-1: Total 32-Bit Memory

Note: Total 32-bit memory means onboard 32-bit memory plus that on the PEI-306 32-bit extended memory card.

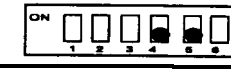
Memory Size (Bank 0, Bank 1)		Switch SW1 (4 - 5)
2MB	(1 MB, 1 MB)	
4MB	(4MB, 0MB)	
5MB	(1 MB, 4MB)	
8MB	(4MB, 4MB)	

Table 2-2: Onboard 32-Bit Memory

Note:

- The switch setting of the onboard 32-bit memory must correspond to the physical memory installed onboard.
- The switch setting of the PEI-306 must correspond to the physical memory installed on the card.
- If you don't have a 16-bit memory extension card, the switch setting for total 32-bit memory must be for an amount larger than or equal to total installed memory (including onboard 32-bit memory and 32-bit memory on the PEI-306).

  For example, if the total memory installed is 8MB (4MB onboard and 4MB on the PEI-306), the switch setting for total 32-bit memory could be 8MB, 12MB or 16MB.

  But if you use some other BIOS with the switch settings (SW1 -1, SW1 -2, SW1 -3) for total 32-bit memory larger than the physical DRAM installed, there will be an error message.

This is caused by different methods of testing memory among BIOSes. The solution is to set the switches for the total 32-bit memory in accordance with the physical DRAM installed. Most of the BlOSes do not have this problem.

If you want to add a 16-bit extension memory card to the PEM-3301 mainboard, total 32-bit memory must match with the switch setting for total onboard 32-bit memory plus that on the PEI-306 32-bit extension memory card.

For example, if the switch setting for total 32-bit memory is 6MB, you'll need 6MB (on the PEI-306 card and onboard together in some combination) of actual system memory before you can add a 16-bit extension memory card. Otherwise, there will be an address conflict for the memory.

Video Selection

The switch SW1-6 is used to select color or monochrome display modes. Refer to the figure below for the jumper settings.

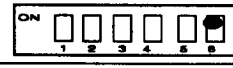
Display Mode	Switch SW1-6
Color	
Monochrome	

Table 2-3: SW1-6 Switch Settings

Jumper Options and Connectors of PEM-3301 Mainboard

After the switches are set correctly, other attachments and jumper option adjustments on the mainboard have to be made. See the illustration below for the location of each of the jumpers and connectors. Most of the jumpers are preset at the factory.

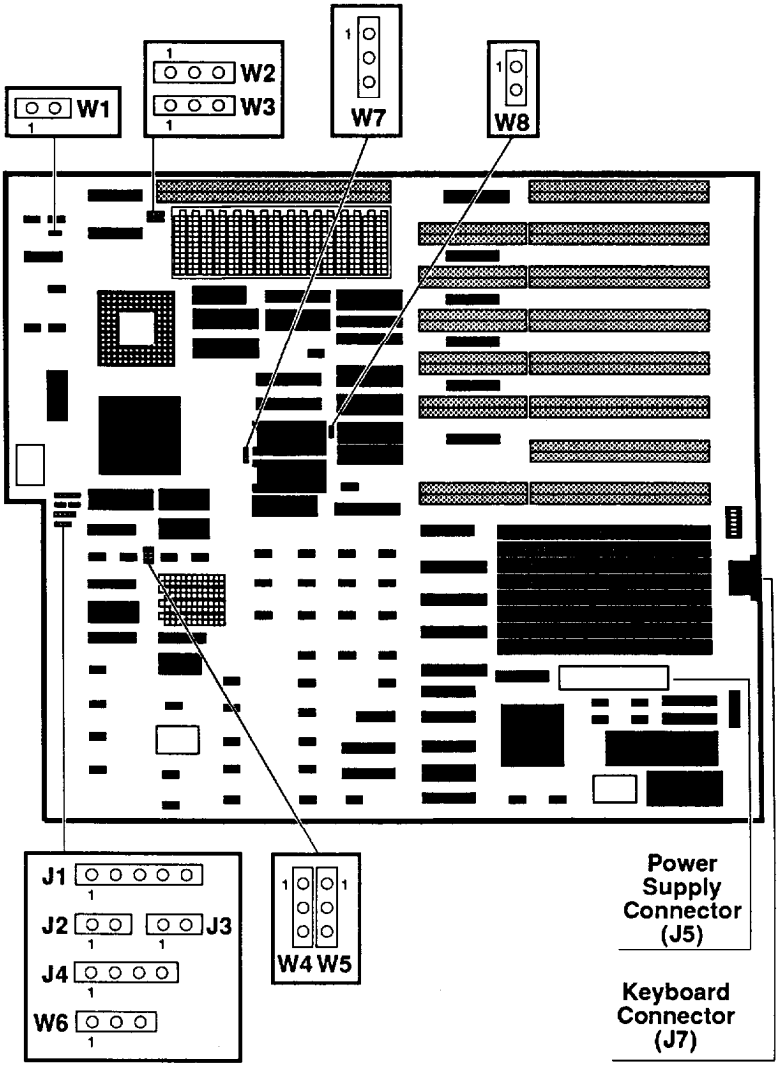


Figure 2-5: Location of Jumpers and Connectors of PEM-3301

Jumper

A jumper is a kind of switch which uses a plastic cap with a metal interior to connect (short) two pins. If a jumper needs to be left open, you should save the cap for future use by covering one pin only of the jumper. This has no effect on the function of the board while it keeps the cap handy. The illustration below shows the side and top views of a three-pin jumper in which pins two and three are shorted.

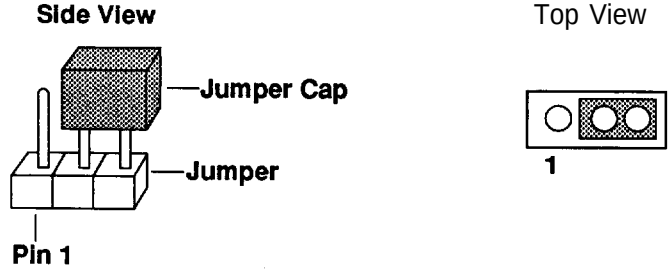


Figure 2-6: An Example of Three-Pin Jumper Setting

With the mainboard oriented in the direction shown in the illustration above, the pins of each jumper are numbered from left to right in ascending order.

J1 — Keyboard Lock-/Power LED

J2 — Turbo LED

J3 — Reset connector

J4 — Speaker Connector

J5 — Power Supply Connector

J7 — Keyboard Connector

W1 — Coprocessor installation
short — not installed
open — installed

W2 — Bank 0 DRAM Type Selection
1-2 short — (1Mbit x 9 SIMM DRAM)
2-3 short — (256Kbit x 9 SIMM DRAM)

W3 — Bank 1 DRAM Type Selection
1-2 short — (1Mbit x 9 SIMM DRAM)
2-3 short — (256Kbit x 9 SIMM DRAM)

W4- W5 — Cache Size Selection
1-2 short — 64KB cache memory
2-3 short — 256KB cache memory

W6 — Turbo Connector
1-2 short — normal (hardware)
open — Turbo (hardware)
2-3 short — speed toggled (software)

W7 — EPROM Type Selection
1-2 short — 27256
2-3 short — 27512

W8 — DMA Clock Speed Selection
short — 8MHz DMA
open — 6MHz DMA

Jumpers for Cache and Main Memory Configuration

The tables on below indicate the jumper settings required for different SRAM cache configurations.

The cache configurations are listed below:

64KB: 64KB cache (with eight 16Kbit X 4 cache SRAM chips and two 16Kbit X 4 tag SRAM chips)

256KB: 256KB cache (with eight 64Kbit X 4 cache SRAM chips and two 64Kbit X 4 tag SRAM chips)

Refer to the figure on the next page for more information.

The following table lists the jumper settings required for each cache memory configuration listed above.

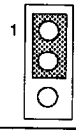
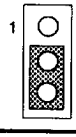
Jumpers W4 & W5	Cache Memory Configuration
	64KB
	256KB

Table 2-4: Cache Memory Configuration

Table 2-5 shows the jumper and switch settings for different onboard memory (DRAM) configurations. Jumpers W2, W3 and switch SW1 are located on the mainboard.

To select the proper jumper setting for the RAM size that you want, refer to the figures on the following pages.

Two banks of main memory are on the PEM-3301 mainboard, BANK 0 and BANK 1. Each bank accommodates the 32-bit wide data bus. BANK 0 must be installed first.

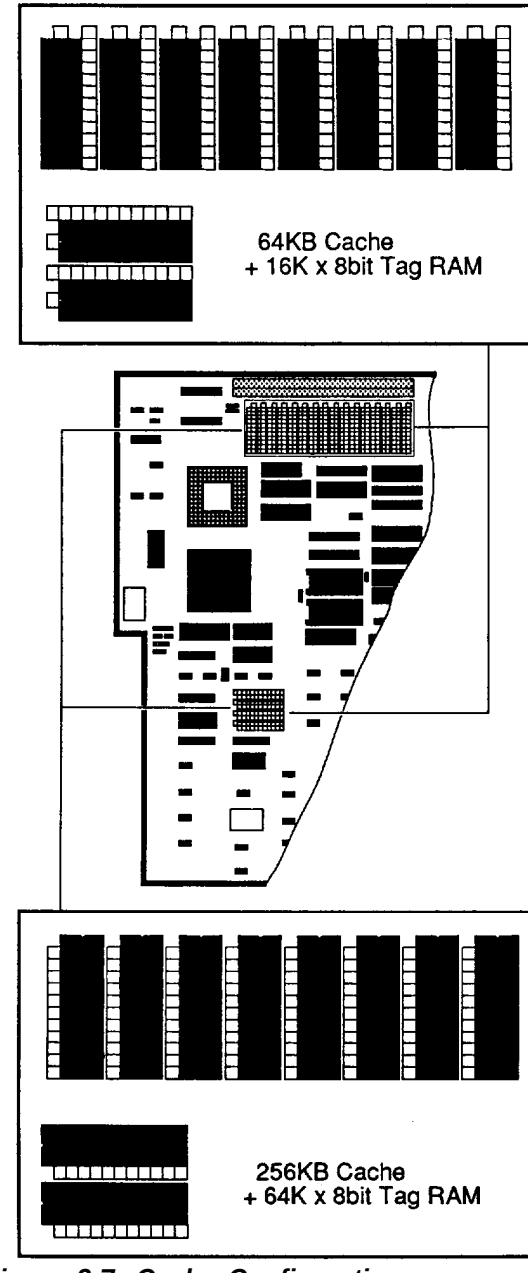
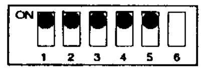
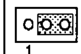
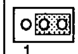
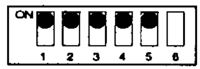
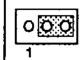
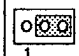
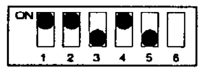
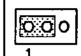
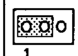
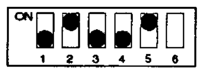
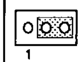
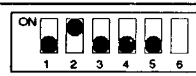
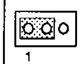


Figure 2-7: Cache Configurations

RAM SIZE	Onboard		Onboard Switch & Jumper settings			
	BANK 0	BANK 1	SW1	W2	W3	Reference
1MB	(256Kbit x 9) x 4 RAM Module	None				Page 14
2MB	(256Kbit x 9) x 4 RAM Module	(256Kbit x 9) x 4 RAM Module				Page 14
4MB	(1Mbit x 9) x 4 RAM Module	None				Page 15
5MB	(256Kbit x 9) x 4 RAM Module	(1Mbit x 9) x 4 RAM Module				Page 15
8MB	(1Mbit x 9) x 4 RAM Module	(1Mbit x 9) x 4 RAM Module				Page 16

Note :  means "ON" and  means "OFF"

Table 2-5: DRAM Configurations

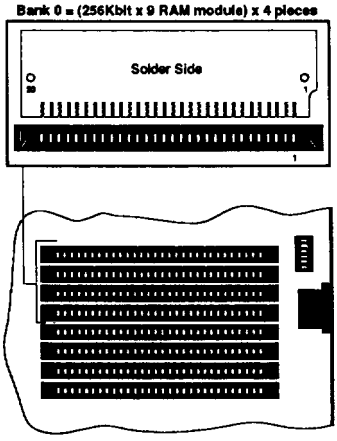


Figure 2-8: 1MB Total Onboard Memory

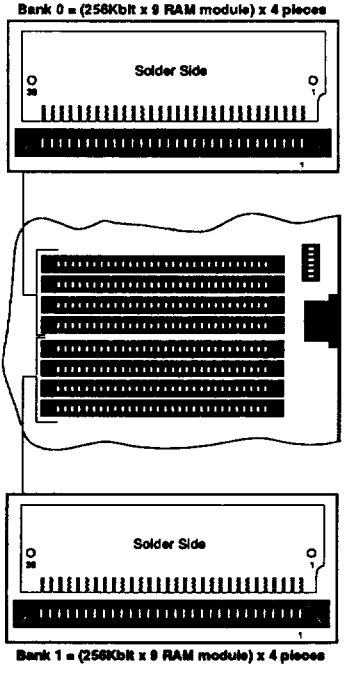


Figure 2-9: 2MB Total Onboard Memory

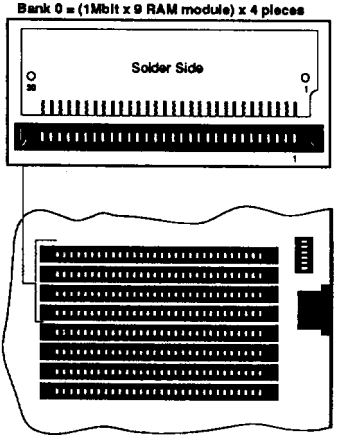


Figure 2-10: 4MB Total Onboard Memory

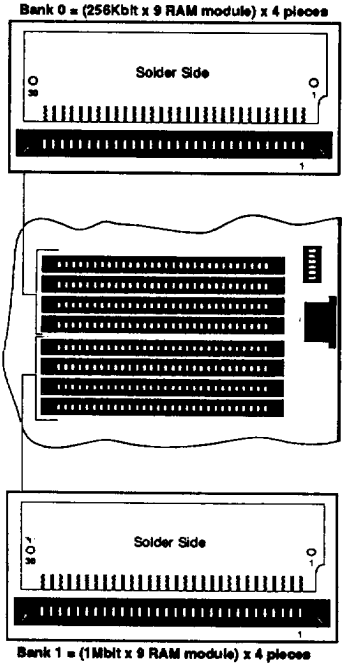


Figure 2-11: 5MB Total Onboard Memory

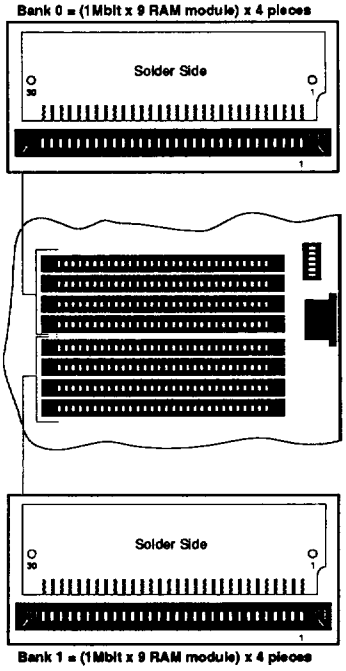


Figure 2-12: 8MB Total Onboard memory

Installing Processor on Mainboard

The PEM-3301 mainboard supports the Intel 80386-33 processor. The processor chip should be inserted into the processor socket (U12), with the notch as shown below.

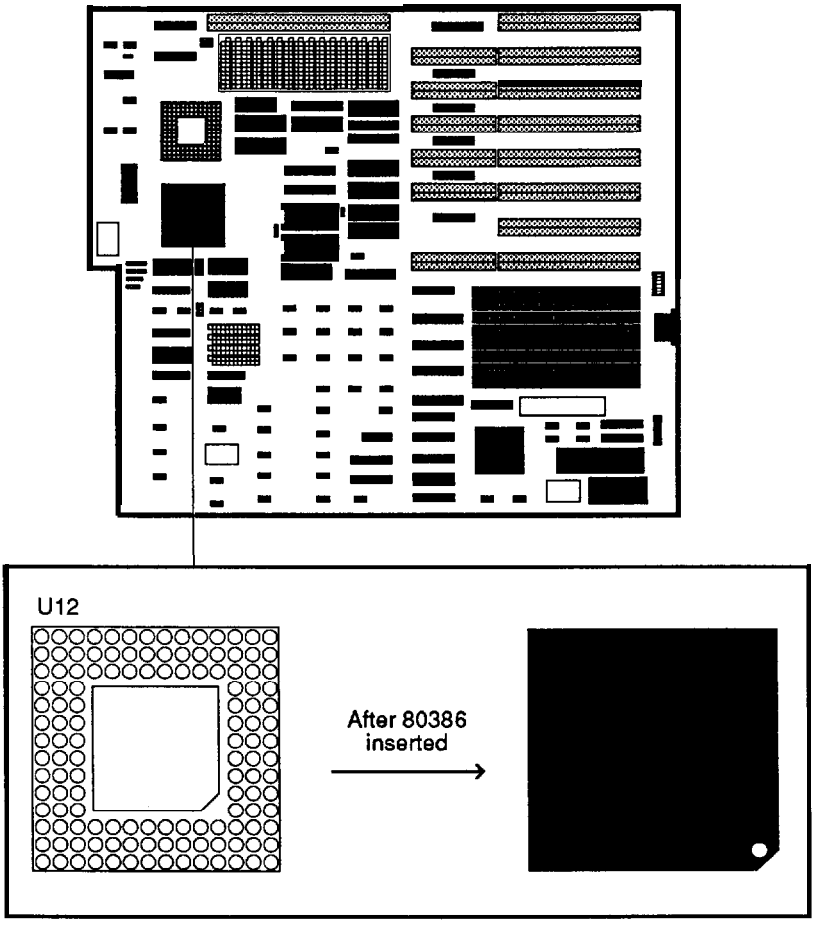


Figure 2-13: Location of Processor

Installing Numeric Coprocessor

If you process numeric data, a math coprocessor will make your work more efficient.

The PEM-3301 mainboard supports the Intel 80387 and Weitek 3167 numeric coprocessors. The coprocessor chip should be inserted into the coprocessor socket (U11), with the notch on the package oriented in the same direction as the corresponding notch on the socket. Jumper W1 should be SHORTED if an Intel 80387 or Weitek 3167 is not installed and OPENED if either one of them is installed. The position of the coprocessor sockets is shown below.

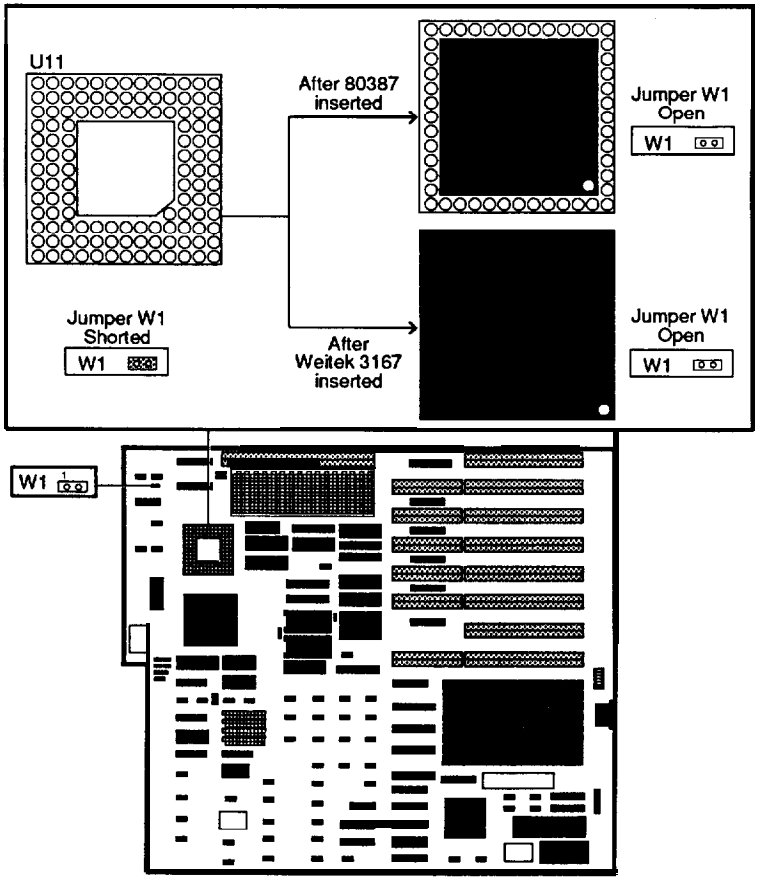


Figure 2-14: Location of Coprocessors

Shadow RAM

For higher performance, the PEM-3301 has two shadow RAM functions. Shadow RAM is one of the features of the PEM-3301. Your BIOS or diskette will support the following:

- A 64KB DRAM space allocated for system BIOS shadow RAM
- A 64KB DRAM space allocated for video BIOS shadow RAM

BIOS and video addresses are allocated for shadow RAM. Both sections are 64KB in size. Refer to the table below for more information.

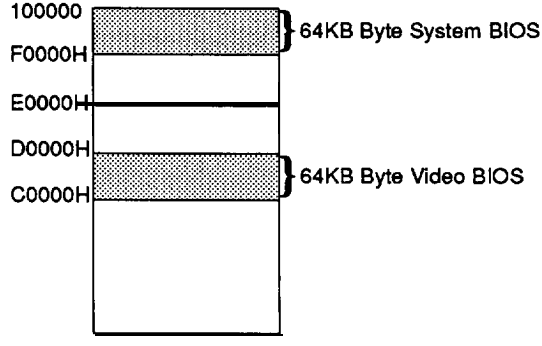


Figure 2-15: System and Video BIOS

Note that a reserved 128K DRAM space is allocated for shadow RAM. You cannot use it for another purpose even if these functions are disabled. Refer to the table below for more information.

I/O Port Address 72H		
Data bit 5	1	Shadow area write protect
	0	Shadow area write enable
Data bit 6	1	Enable video BIOS shadow
	0	Disable video BIOS shadow
Data bit 7	1	Enable system BIOS shadow
	0	Disable system BIOS shadow

Table 2-6: Shadow RAM Control Port

If you use DTK or Phoenix 1.1002 BIOS, you can enable or disable these two shadow RAM functions through your BIOS setup.

If your BIOS does not support shadow RAM, you may use the program on the diskette included with this mainboard to set up the shadow RAM driver. Follow the steps below:

- insert the diskette into drive A and enter a:.
- Enter this command:
  SH INST
- Respond to the prompts on your screen.

The shadow RAM utility is now installed. Your AUTOEXEC.BAT file has been modified by the installation program. The shadow RAM function will automatically activate after you reboot your system.

If you want to update your shadow RAM utility, you may run the "SHADOW.EXE" file and modify shadow RAM as you desire.

Note:

1. Because 128K of DRAM is reserved for shadow RAM, the switch setting for the starting address on the PEI-306 should be xMB + 256KB with x representing the onboard installed memory size.

2. if your adapter uses extended memory area as non-cacheabie memory in the same way as dual-port memory, you have to locate the non-cacheable memory after the cacheable area is set by means of SW1-1, SW1-2 and SW1-3.

3. if your adapter BIOS is located at 0C8000H-0CFFFFH (within 0C0000H-0CFFFFH) and cannot be cached, you should move the address to a non-cacheable area like 0D0000H-0DFFFFH or disable video shadow function..

4. Cacheable area means physical 32-bit memory installed area and shadow RAM area (0F0000H — 0FFFFFH, 0C0000H — 0CFFFFH) if installed.

ROM Installation

To install the ROM chips, refer to the illustration below for the location of the DIP sockets and ROM selection jumper W7 on the mainboard.

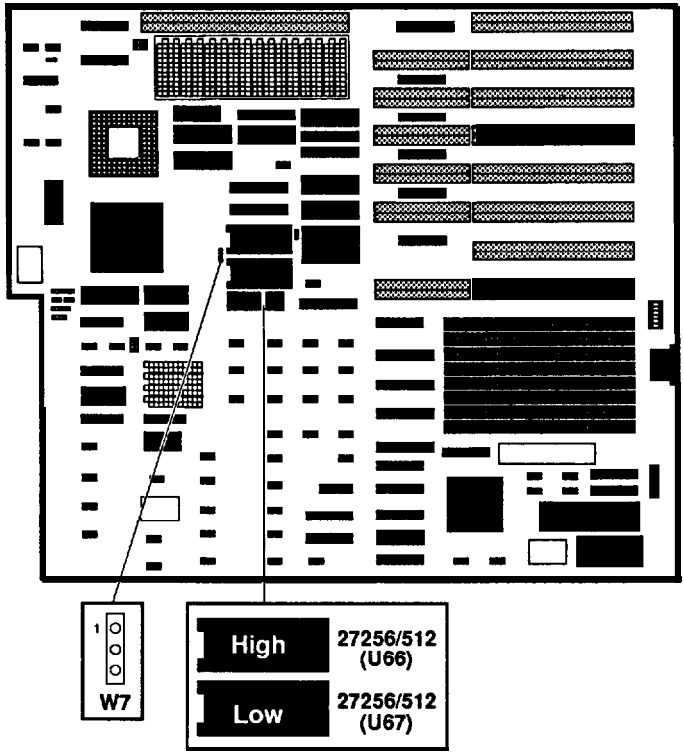


Figure 2-16: ROM Installation of PEM-3301 Mainboard

Type of BIOS	Type of ROM chip	ROM Configuration	Jumper W7
DTK BIOS or any other of 64KB size	27256 x 2	U66 - High byte U67 - Low byte	1
Other BIOS of 128KB size	27512 x 2	U66 - High byte U67 - Low byte	1

ROM access time is 15Ons.

Table 2-7: ROM BIOS Jumper

2-2 PEM-3300 Motherboard

If your motherboard is the PEM-3300, the layout of your board be as pictured on the next page.

The PEM-3300 motherboard uses **a** cache memory subsystem providing a small amount of fast memory (SRAM) and a large amount of slow memory (DRAM). This system is configured to so that all system memory is fast memory — fast enough to complete bus cycles with no wait states. The cache memory provides high performance with no wait states. The cache memory provides high performance with a cost approaching that of DRAM.

The motherboard contains a Intel® 80386 processor, a 80387 math coprocessor socket, BIOS chips and expansion slots. The figure on the next page will familiarize you with the layout of the PEM-3300 Cache-386 33MHz Mainboard.

Restrictions

Before installing the PEM-3300, we strongly recommend that you follow the restrictions mentioned below:

Access Time:

- 27256 EPROM (BIOS) with 150ns access time
- 1MbitX9 SIP DRAM with 100ns access time
- 256KbitX9 SIP DRAM with 80ns access time
- 256KbitX4 DIP DRAM with 100ns access time
- 256KbitXl DIP DRAM with 80ns access time
- 16Kbit X 4 DIP Cache RAM (SRAM) with 20ns access time
- All the SIP RAM modules must have leads

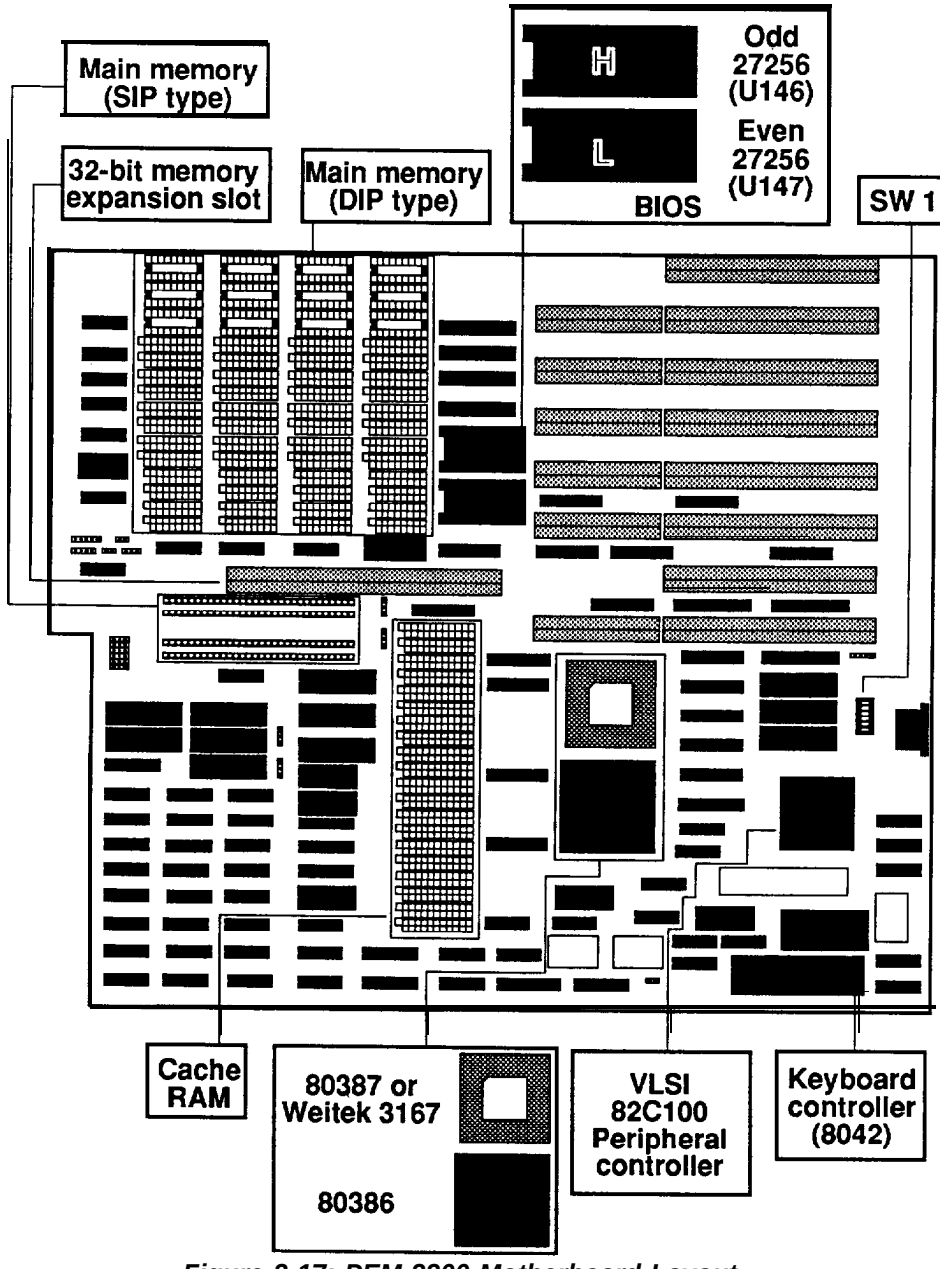


Figure 2-17: PEM-3300 Motherboard Layout

Onboard System Memory Size

The PEM-3300 mainboard has two kinds of dual sockets — one for Cache RAM and a SIP socket for DRAM.

Chip Insertion

Remember that when inserting chips/RAM modules, you must make sure the notched or dotted end of the chip/RAM module is lined up with the notched end of the socket. Gently push the chip/RAM module into the socket, and be careful not to bend the pins. See the figures below:

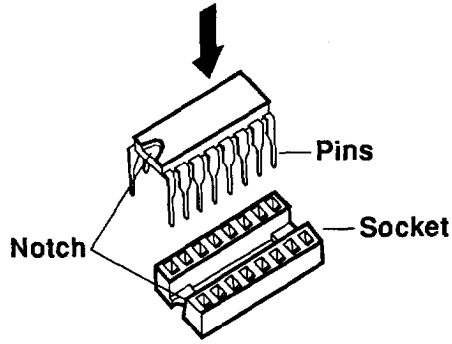


Figure 2-18: DIP-Type Cache RAM

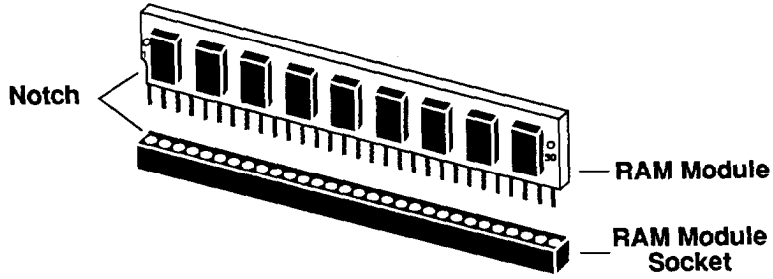


Figure 2-19: SIP-Type DRAM

Switch Settings

The location of the six-switch DIP SW1 can be seen below. Each switch has an ON and OFF position (usually the ON position is labeled, the OFF position is not). SW1 should be set appropriately, based on the following description.

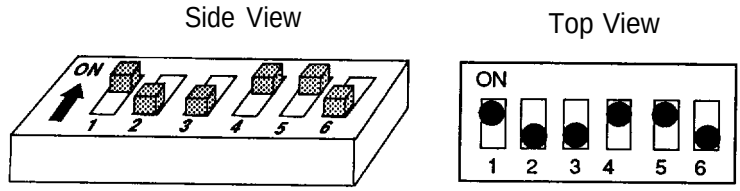


Figure 2-20: The Six-Switch DIP SW1

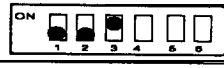
Memory Size	Switch SW1 (1 - 3)
2MB	
4MB	
8MB	
12MB	
16MB	

Table 2-8: Total 32-Bit Memory

Note: Total 32-bit memory means onboard 32-bit memory plus that on the PEI-306 32-bit extended memory card.

Memory Size (Bank 0, Bank 1)		Switch SW1 (4 - 5)
2MB	(1MB, 1MB)	
4MB	(4MB, 0MB)	
5MB	(1MB, 4MB)	
8MB	(4MB, 4MB)	

Table 2-9: Onboard 32-Bit Memory

Note:

- The switch setting for onboard 32-bit memory must match the physical memory installed onboard.
- The switch setting of the PEI-306 must correspond to the physical memory installed on the card.
- If you don't have a 16-bit memory extension card in your system, the switch setting for total 32-bit memory must be for an amount larger than or equal to total installed memory (including onboard 32-bit memory and 32-bit memory on the PEI-306).

  For example, if the total memory installed is 8MB (4MB onboard and 4MB on the PEI-306), the switch setting for total 32-bit memory could be 8MB, 12MB or 16MB.

  But if you use some other BIOS with the switch settings (SW1 -1, SW1 -2, SW1 -3) for total 32-bit memory larger than the physical DRAM installed, there will be an error message.

This is caused by different methods of testing memory among BIOSes. The solution is to set the switches for the total 32-bit memory in accordance with the physical DRAM installed. Most of the BIOSes do not have this problem.

- If you want to add a 16-bit extension memory card to the PEM-3300 mainboard, you have to fill the total 32-bit memory in accordance with the switch setting for total on-board 32-bit memory plus that on the PEI-306 32-bit extension memory card.

  For example, if the switch setting for total 32-bit memory is 6MB, you'll need 6MB (in some combination on the PEI-306 card and on the motherboard and 2MB) in your system before you can add a 16-bit extension memory card. Otherwise, there will be an address conflict for the memory.

Video Selection

Switch SW1-6 is used to select color or monochrome display modes. Refer to the figure below for the jumper settings.

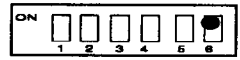
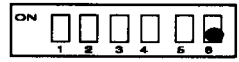
Display Mode	Switch SW1-6
Color	
Monochrome	

Table 2-10: SW1-6 Switch Settings

Jumper Options and Connectors of PEM-3300 Mainboard

After the switches are set correctly, other attachments and jumper option adjustments on the mainboard have to be made. See the illustration below for the location of each of the jumpers and connectors. Most of the jumpers are preset at the factor).

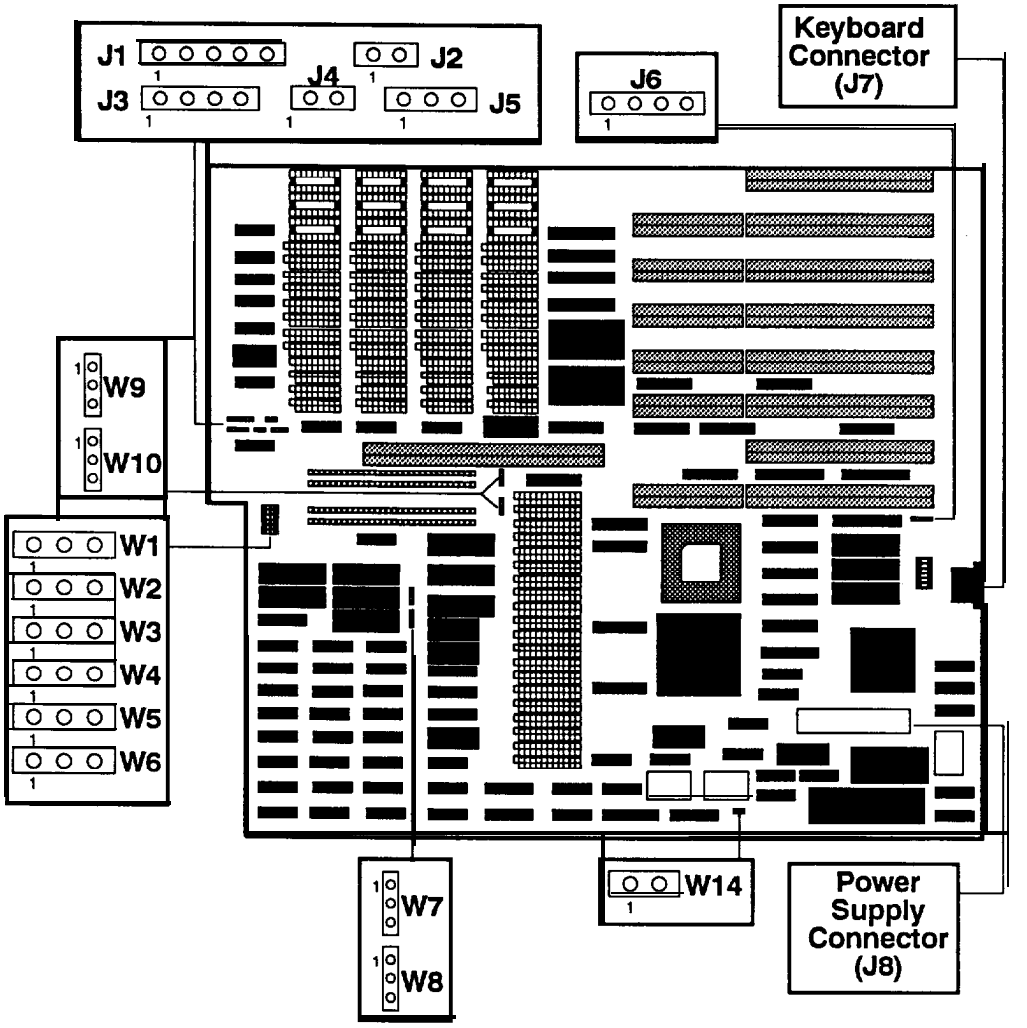


Figure 2-21: Location of Jumpers and Connectors of PEM-3300

Jumper

A jumper is a kind of switch which uses a plastic cap with a metal interior to connect (short) two pins. If a jumper needs to be left open, you should save the cap for future use by covering one pin only of the jumper. This has no effect on the function of the board while it keeps the cap handy. The illustration below shows the side and top views of a three-pin jumper in which pins two and three are shorted.

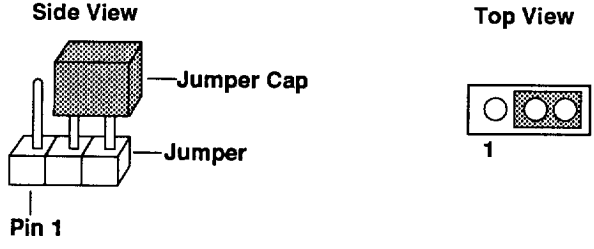


Figure 2-22: Three-Pin Jumper Setting Example

With the mainboard oriented in the direction shown in the illustration above, the pins of each jumper are numbered from left to right in ascending order.

J1 — Keyboard Lock/Power LED

J2 — Reset Connector

J3 — Speaker Connector

J4 — Turbo LED Connector

J5 — Turbo Connector
1-2 short -Normal (hardware)
open — Turbo (hardware)
2-3 short — speed toggled (software)

J7 — Keyboard Connector

J8 — Power Supply Connector

W1 - W6 — Bank Selection
1-2 short — bank 0
2-3 short — bank 1

W7 — DRAM Type of Bank 0
1-2 short — (1Mbit x 9 SIP DRAM) or (1Mbit x 1 DIP DRAM)
2-3 short — (256Kbitx9 SIP DRAM) or (256Kbitx4 DIP RAM)

W8 — DRAM Type of Bank 1
1-2 short — (1Mbit x 9 SIP DRAM) or (1Mbit x 1 DIP DRAM)
2-3 short — (256Kbitx9 SIP DRAM) or (256Kbitx4 DIP RAM)

W9 - WI0 — Cache Size Selection
1-2 short — 64KB cache memory
2-3 short — 256KB cache memory

W14 — Math Coprocessor
short -not installed
open — installed

Jumpers for Cache and Main Memory Configuration

The tables on below indicate the jumper settings required for different SRAM cache configurations.

The cache configurations are listed below:

64KB: 64KB cache (with eight 16Kbit X 4 cache SRAM chips and two 16Kbit X 4 tag SRAM chips)

256KB: 256KB cache (with eight 64Kbit X 4 cache SRAM chips and two 64Kbit X 4 tag SRAM chips)

Refer to the figure on the next page for more information.

The following table lists the jumper settings required for each cache memory configuration listed above.

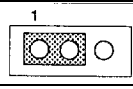
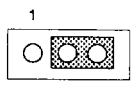
Jumpers W9 & W10	Cache Memory Configuration
	64KB
	256KB

Table 2- 11: Cache Memory Configuration

Table 2-12 shows the jumper and switch settings for different onboard memory (DRAM) configurations. Jumpers W1-6, W7, W8 and switch SW1 are located on the mainboard.

To select the proper jumper setting for the RAM size that you want, refer to the figures on the following pages.

Two banks of main memory are on the PEM-3300 mainboard, BANK 0 and BANK 1. Each bank accommodates the 32-bit wide data bus. BANK 0 must be installed first.

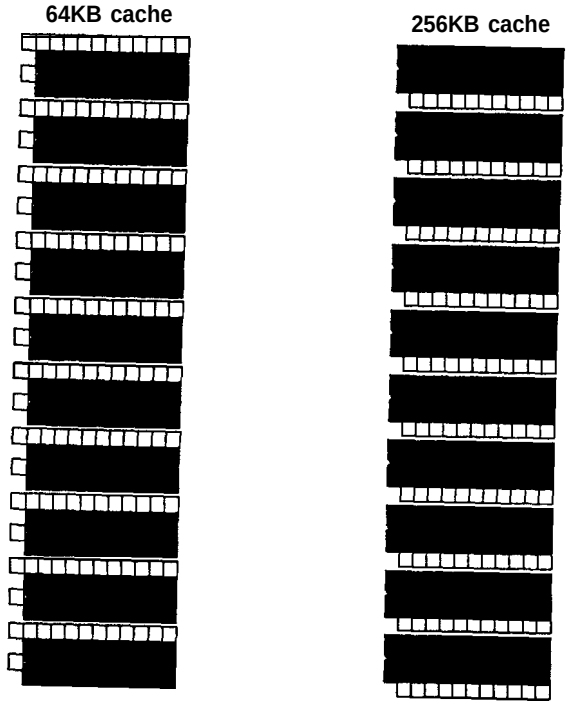
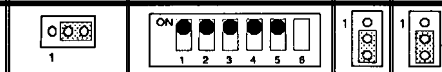
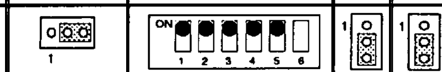
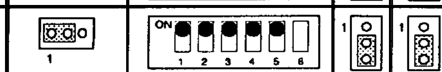
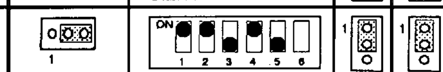
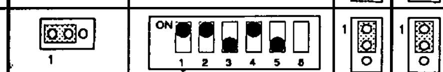
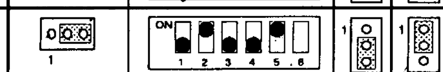
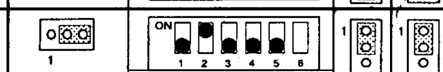


Figure 2-23: Cache Configurations

RAM SIZE \ BANK	Onboard		Onboard Switch & Jumper settings				
	BANK 0	BANK 1	W1-W6	SW1	W7	W8	Reference
1MB	(44256 x 8) + (41256 x4)	None					Page 34
	(256Kbit x 9) x 4 RAM Module	None					Page 34
2MB	(44256 x 8) + (41256 x4)	(44256 x 8) + (41256 x4)					Page 35
	(44256 x 8) + (41256 x4)	(256Kbit x 9) x 4 RAM Module					Page 35
	(256Kbit x 9) x 4 RAM Module	(44256 x 8) + (41256 x4)					Page 36
4MB	1Mbit x 36	None					Page 37
	(1Mbit x 9) x 4 RAM Module	None					Page 37
5MB	(44256 x 8) + (41256 x4)	(1Mbit x 9) x 4 RAM Module					Page 38
8MB	1Mbit x 36	(1Mbit x 9) x 4 RAM Module					Page 38

Note :  means "ON" and  means "OFF"

Table 2-12: DRAM Configurations

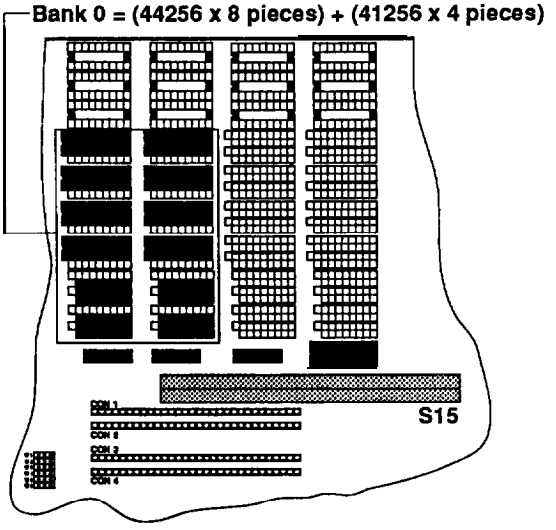


Figure 2-24: 1MB Total Onboard Memory — Configuration A

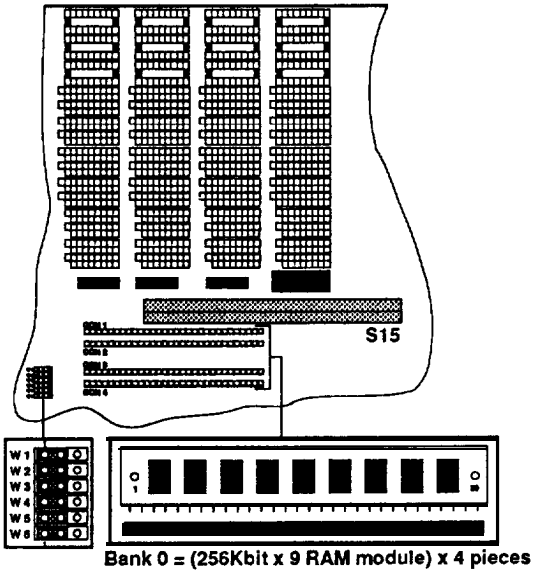


Figure 2-25: 1MB Total Onboard Memory — Configuration B

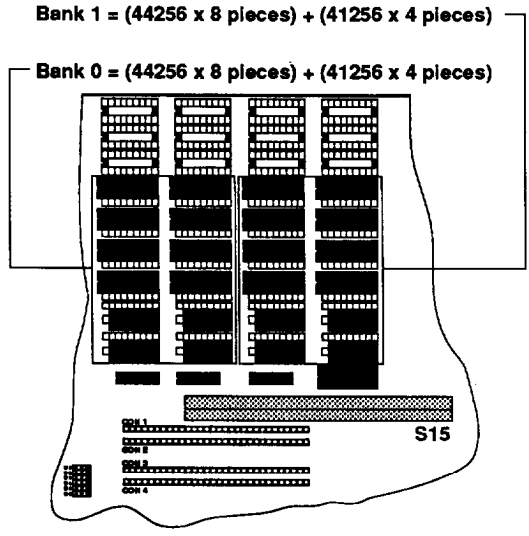


Figure 2-26: 2MB Total Onboard Memory — Configuration A

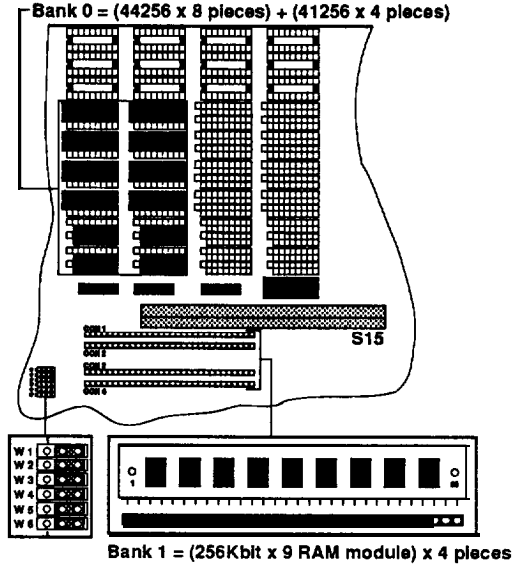


Figure 2-27: 2MB Total Onboard Memory — Configuration B

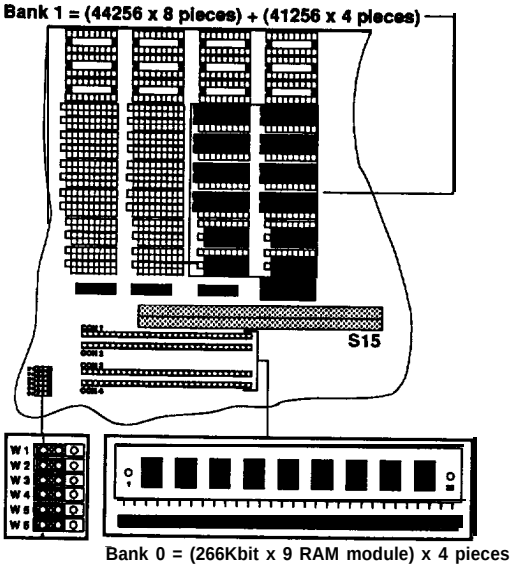


Figure 2-28: 2MB Total Onboard memory — Configuration C

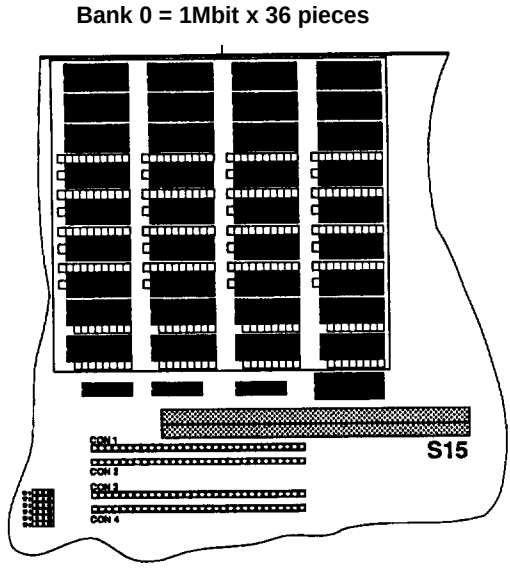


Figure 2-29: 4MB Total Onboard memory — Configuration A

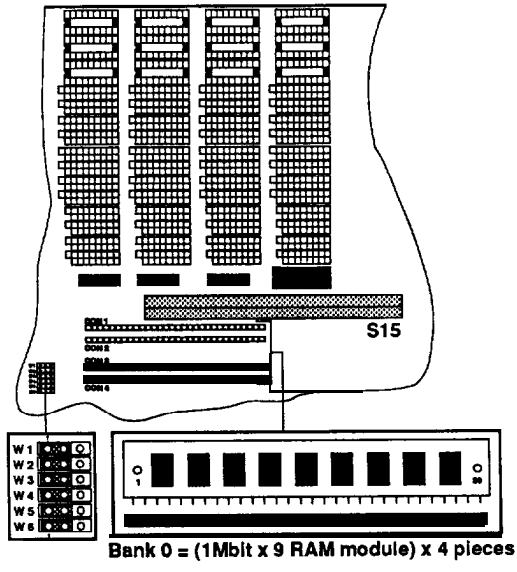


Figure 2-30: 4MB Total Onboard memory — Configuration B

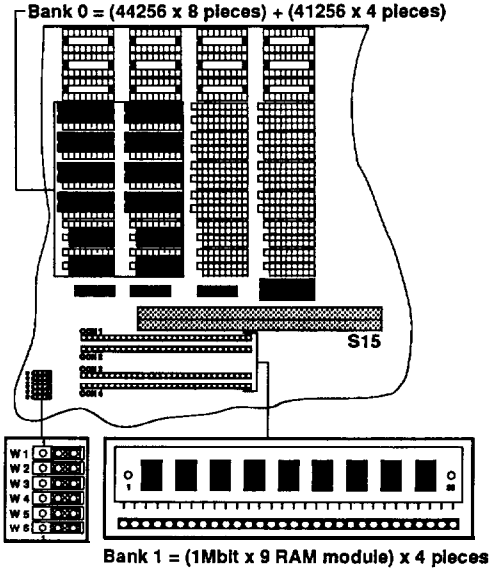


Figure 2-31: 5MB Total Onboard memory

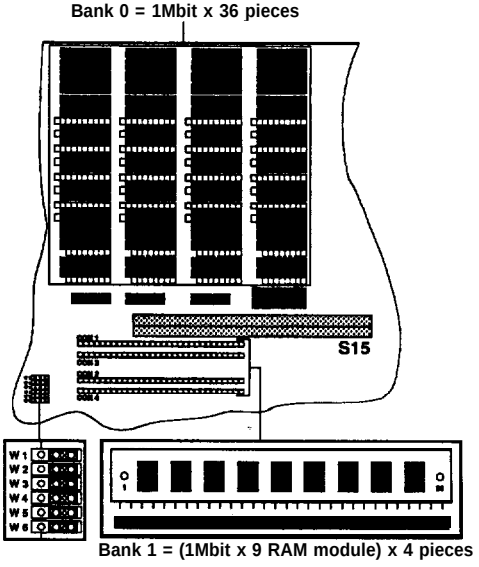


Figure 2-32: 8MB Total Onboard memory

Installing Processor

The PEM-3300 mainboard supports the Intel 80386-33 processor. The processor chip should be inserted into the processor socket (U161), with the notches aligned as shown below.

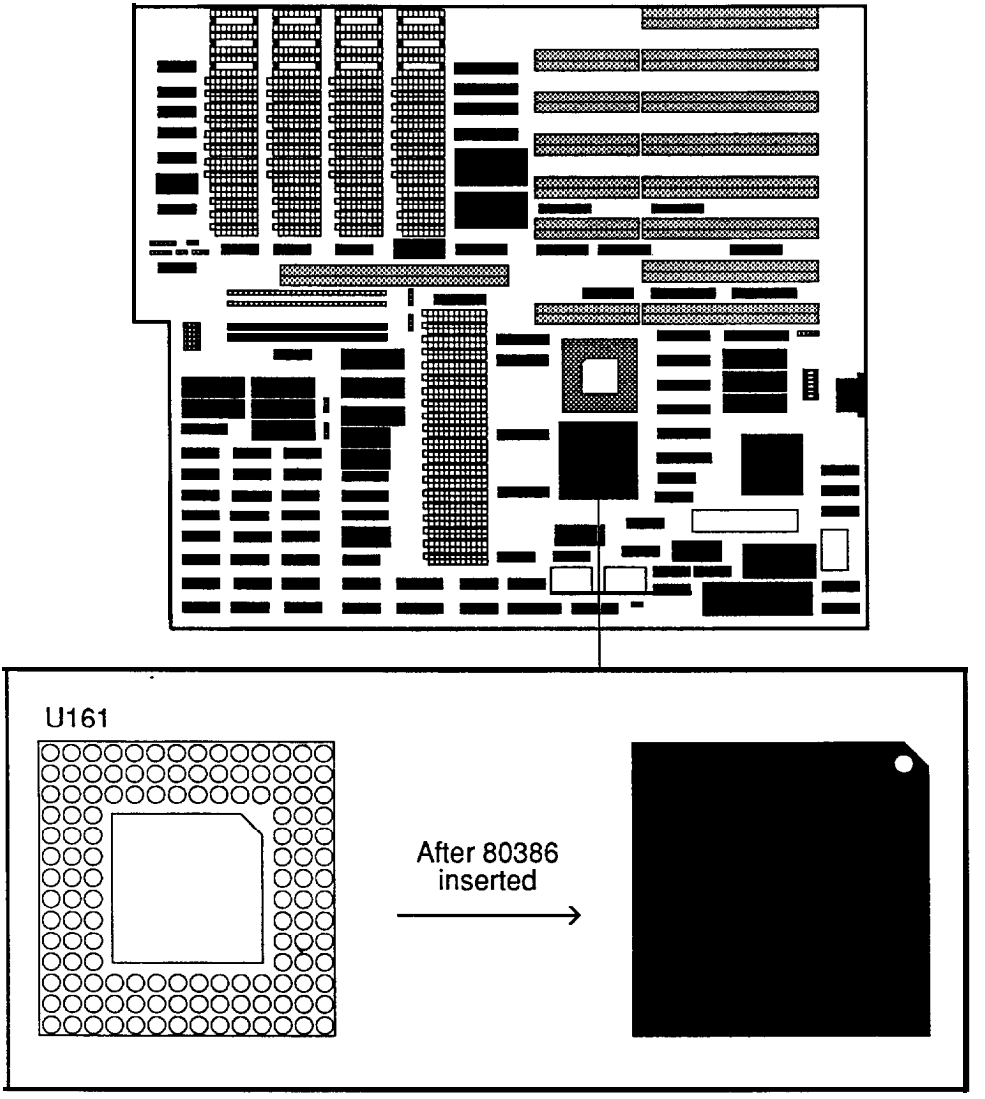


Figure 2-33: Location of Processor

Installing Numeric Coprocessor

If you process numeric data, a math coprocessor will make your work more efficient.

The PEM-3300 mainboard supports the Intel 80387 and Weitek 3167 numeric coprocessors. The coprocessor chip should be inserted into the coprocessor socket (U160), with the notch on the package oriented in the same direction as the corresponding notch on the socket. The jumper W1 should be SHORTED if an Intel 80387 or Weitek 3167 is not installed and OPENED if either one of them is installed. The position of the coprocessor sockets is shown below.

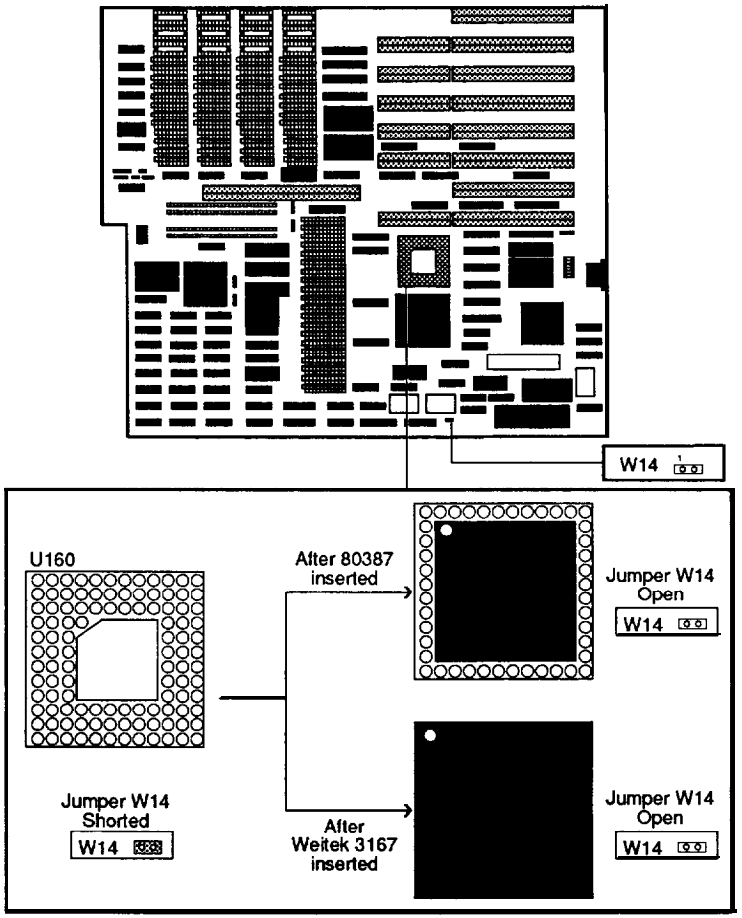


Figure 2-34: Location of Coprocessors

The time may come when you want to upgrade your system. To do so, you may need to remove the cover of the unit. This is easily accomplished with the following tools: a small flat-blade screwdriver and a small Phillips screwdriver.

Be sure that the power to the system is switched OFF before you open the case. Your computer interior is as shown below:

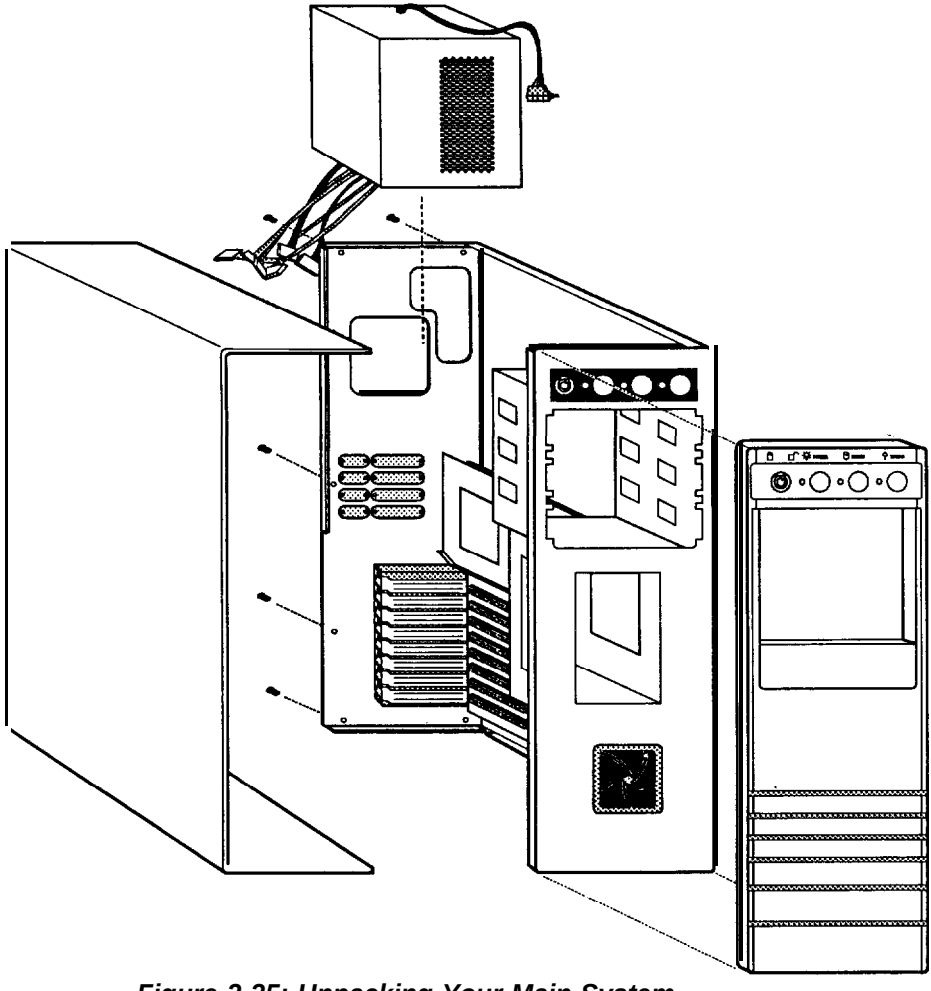


Figure 2-35: Unpacking Your Main System

2-4 Connection to Power Supply

If your power supply has not been attached to your motherboard, you may need to attach the power supply cable to the mainboard at the connector beside the power on the motherboard. In this case, you should connect cables on the power supply to 2 six-pin connectors. You may also need to attach the four-pin connectors for disk drives.

Be sure the four black wires of the power supply cables are located in the middle of the power connectors. Refer to the figure below. Pin 1 is numbered in the picture for your convenience.

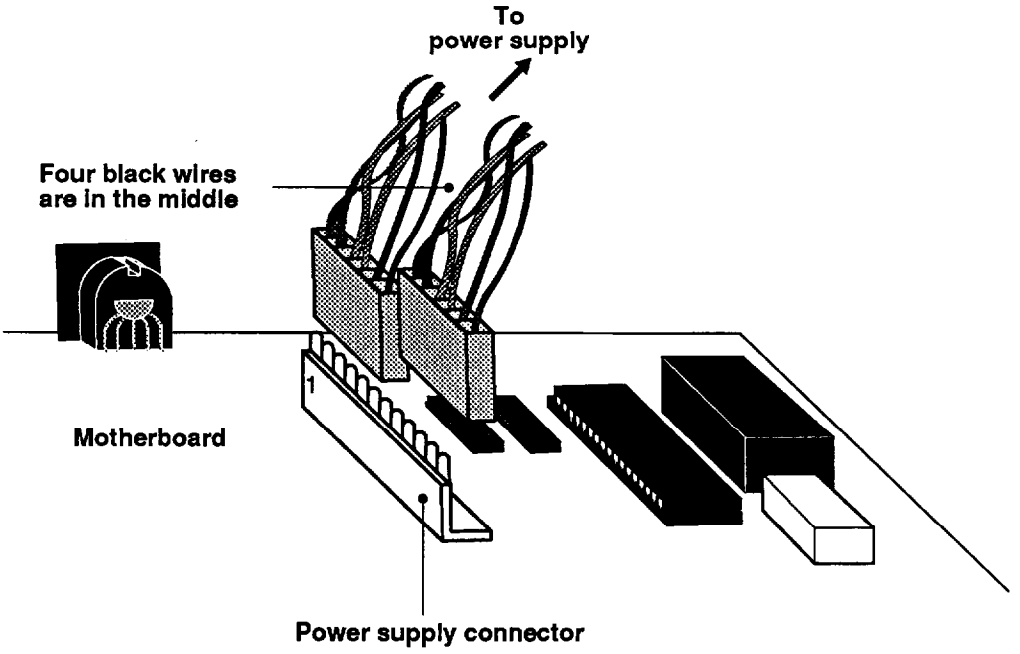


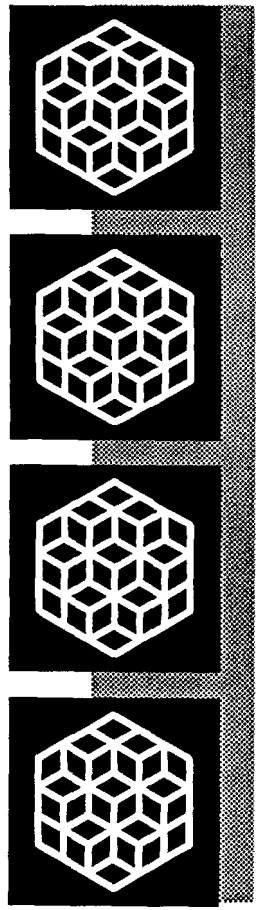
Figure 2-38: Connecting to a Power Supply

The pinouts for the power supply connectors are as follows:

Pin	Assignment
1	Power Good
2	+5 VDC
3	+12 VDC
4	-12 VDC
5	Ground
6	Ground
7	Ground
8	Ground
9	-5 VDC
10	+5 VDC
11	+5 VDC
12	+5 VDC

Table 2-13: Power Supply Pinouts

Once you have completed connecting the cables the RAM Card is installed and ready to go. If you have nothing else left to do, close the case according to the instructions in your system manual.



Chapter 3

Operating Your System

Operating Your System

In this chapter you will learn:

- the basics of system BIOS
- a few MS-DOS functions

The software that your system will use falls into two categories. First there is the operating system, the language that tells the system what to do. The operating system this computer uses is Microsoft Corporation's MS-DOS, the world's most widely used operating system for PC/XT/ATs.

Next, there is the application software that you use for work and play. Finding application software is a simple matter of going to your nearest PC store.

Note: This is not an MS-DOS manual. It mentions only a few of the DOS functions available. To learn more about DOS, refer to your *MS-DOS User's Guide and Reference* manual included with the system.

3-1 An Introduction to DOS

DOS stands for Disk Operating System. This is a set of commands used to control the operations of a computer and its peripheral components. DOS makes it easy for you to use applications and create and manage files on your computer. DOS also lets you use devices with the computer.

Loading DOS

Loading DOS means to copy all the DOS programs into the computer's electronic memory. You should follow the instructions below to start DOS.

Starting DOS when the computer is off

- Insert DOS disk 1 into disk drive A and close the drive lever.
- Turn on the computer and respond to the prompts displayed on the monitor.

Starting DOS with the Computer on

If you don't have a DOS disk in your disk drive when you start your computer, you will see the following message on the screen following the RAM test:

```
Non-system disk or disk error
Replace and strike any key when ready
```

You should:

- Insert DOS disk 1 into disk drive A and close the drive lever.
- Press the reset button on your front panel (hardware reset) or hold down the <*Ctrl*>, <*Alt*> and <*Del*> keys at the same time (software reset) to reboot your system.

Starting DOS from your hard disk

If you have a hard disk, install **DOS** on the disk. Your PC will boot automatically whenever you turn on the power.

System Messages

Refer to your *MS-DOS User's Guide and Reference* manual for information on system messages.

3-2 Setup Utility

A system setup program is included in your BIOS on the motherboard. The setup program is used to key in the configuration you want for your system. Specifically, you can set the date, time, base memory, expansion memory, number of floppy and hard disk drives and display configuration as well as get information on hard disk types. Your system BIOS is fully compatible with IBM BIOS. In addition, many special functions are supported:

- High density disk drives
- A password
- User-defined hard disk type
- System utilities -timer and calculator

The setup program is simple to use. It is extremely important that you respond correctly to prompts about your computer.

System Setup Program

You will need to run the setup program in the following situations:

- your computer is turned on for the first time,
- when adding or removing any hardware, or
- when the rechargeable battery is dead.

If the battery for the CMOS chip is dead or the system configuration was keyed in incorrectly, you will have to rerun the system setup program. The computer will give you this screen message:

```
Press Fl key to enter SETUP program or
press any other key to continue
```

Pressing <F1> will automatically start the SETUP program. You can also use the DOS DEBUG command as follows:

```
A:> DEBUG      <Enter>
     -g=F000:FF60      <Enter>
```

If you reconfigure your system, you will need to enter the setup program. When you restart the system, press the <ESC> key quickly just after the RAM test. If you miss the chance to do so, press the hardware reset switch, or just press the software reset switch *<Ctrl>, <Alt>* and *<Del>* simultaneously to enter the setup program. Before the setup program appears, the following message will be shown on the screen:

```
SETUP utility will be starting
```

When the RAM test is completed, the SETUP program will take over.

Once you have entered the SETUP program, you will see the following initial screen:

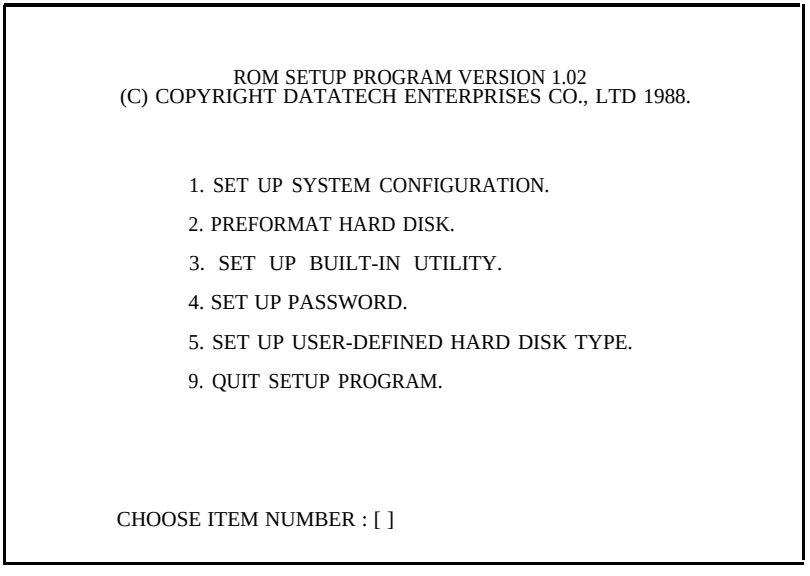


Figure 3-1: Initial Screen

Following are examples of the setup program screen and prompt windows you will see in using the program. If you choose item 1 from The screen on the previous page to configure your system, the following will appear. You should correctly respond to prompts about your computer.

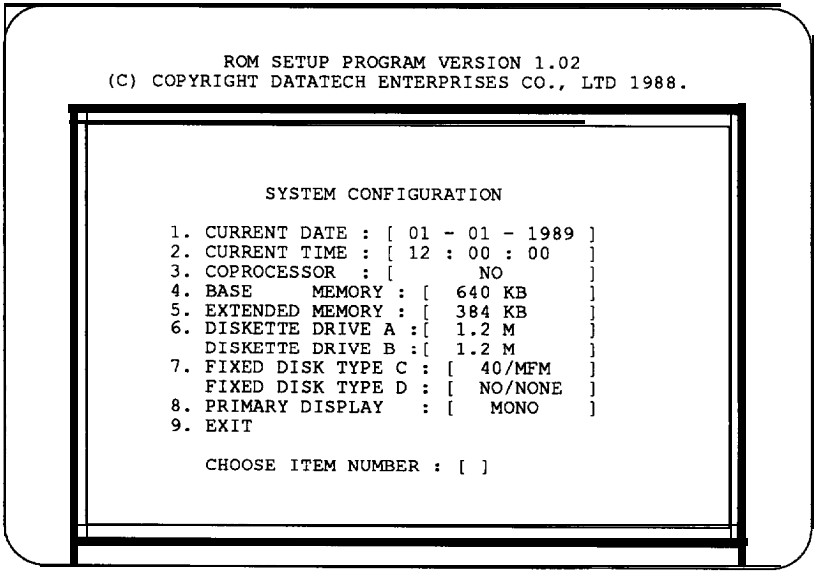


Figure 3-2: Setup Program Screen

Once you have entered all appropriate information and exited by choosing item 9, you will be asked to confirm that the configuration data are correct.

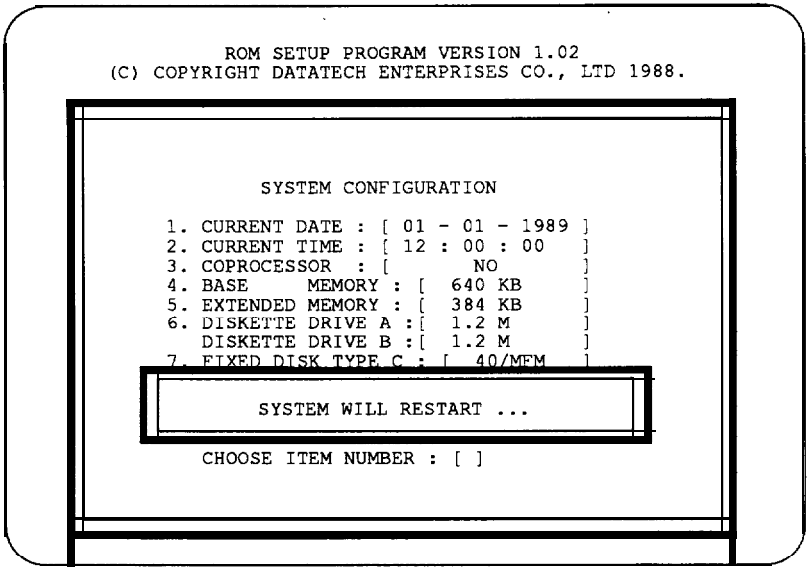


Figure 3-3: Before Restarting

If at a later date you alter the configuration of your system, you will need to go through the program again and make the appropriate changes.

Calculator

The calculator can be used if you press <Ctrl>, <Alt>, <5> (on the key pad). Pressing <*Esc*> will exit this utility.

Note that these two utilities can be used in the 80-column text display mode only. Refer to the figure below for the Calculator.

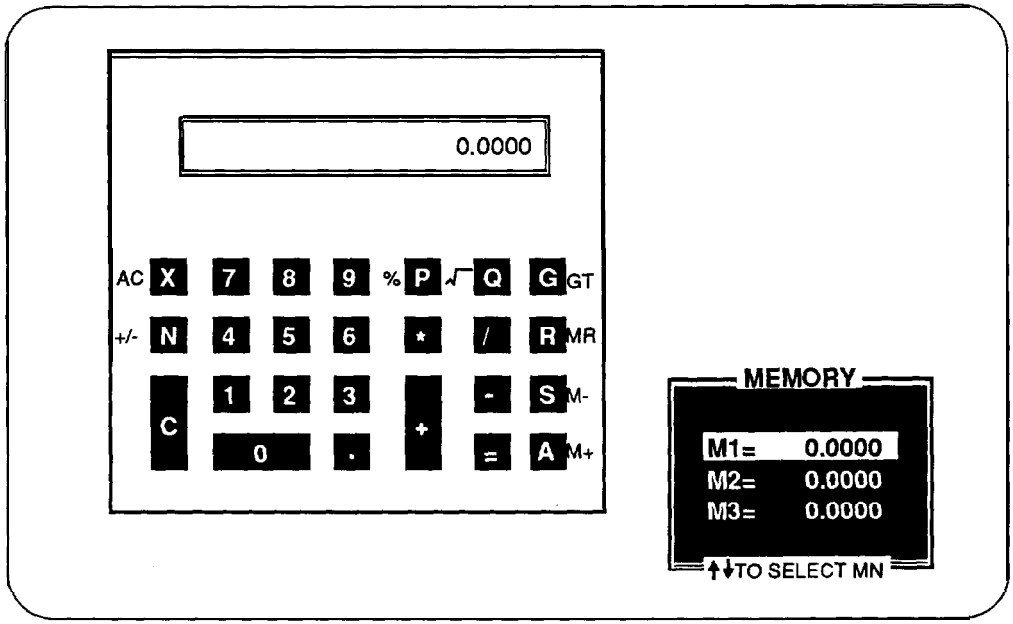


Figure 3-4: Calculator

3-3 DOS Operations

Following is a brief explanation of a few DOS functions. If you want a detailed explanation of all the DOS commands, refer to your DOS user manual.

Starting MS-DOS

If you are using a hard disk with DOS already installed, the computer will "boot" or start itself.

If you are using a floppy disk drive, insert the DOS system disk in drive "A" and switch on your computer. You will see a message similar to the following:

```
Current date is Fri  01-01-1990
Enter new date (MM-DD-YY):
```

For the new date, key in the month, day and year, separated by hyphens. Press *<Enter>.*

Time is displayed and corrected as follows:

```
Current time is 0 : 02 : 15.00
Enter new time: 2:20
```

Your computer is now booted and ready to run application programs.

Formatting Disk

You must format a floppy disk before it can be used.

Formatting high-density disk:

To format a high-density disk, type the following at the drive prompt:

```
C>Format A:      <Enter>
```

After your disk has been formatted, you will see the following prompt:

```
Format another diskette (Y/N)?
```

Press <*N*> if you do have nothing else to be formatted.

Formattlng a low-density disk:

To format a lowdensity disk, type the following at the drive prompt:

```
C>Format A:/4      <Enter>
```

After your disk has been formatted, you will see the following prompt:

```
Format another diskette (Y/N)?
```

Press <*N*> if you have nothing else to be formatted.

Backing up your Diskettes and Files

In order not to lose your files through disk damage or accidental deletion it is important to back up all your files and diskettes regularly.

Backing up a diskette on a two-floppy disk drive system:

At the A> prompt type the following

```
A> diskcopy a: b:
```

Press <*Enter*> and respond to the prompts on your screen.

Backing up a diskette on a single floppy disk drive system:

At the A> prompt type the following-

```
A> diskcopy
```

Press <*Enter*> and respond to the prompts on your screen.

After your target disk has been copied, you will see the following prompt:

```
Copy another diskette (Y/N)?
```

Press <*N*> if you have nothing else to be copied.

Backing up a file:

To back up a single file, key in the backup command and directory as follows:

```
A>backup <path> <filename> <drive>/A
```

Deleting your Diskettes and Files

You may want to erase diskettes or unnecessary files to make room for other data.

Erasing a diskette:

To erase a whole directory of files, type the following at the drive prompt:

```
A>del *,*      <Enter>
```

All the files in the open directory are now erased.

Deleting a file:

To delete a single file, type the following at the drive prompt:

```
A>del filename.ext     <Enter>
```

Listing Disk Files

If you want to find out what files are on a disk, you can list its directory by using the <*DIR*> command. If you want to display the directory of the disk in drive A, you would use the following command:

```
DIR A:
```

After you hit the enter key, all the file information will be displayed on the screen.

If you use the <*DIR*> command without a drive letter, MS-DOS lists the directory of the disk which was most recently accessed.

There are three ways to stop the screen from scrolling:

- pressing the <*Ctrl*> and the <*S*> keys simultaneously
- pressing <*Pause*>
- typing *DIR/P to* see one screen each time

3-4 Hard Disk Drive Format

A hard disk must be formatted before it can be read from or written to. If your hard disk requires this, you should carry out the following steps:

Step 1 — Preformat

The preformat utility is supplied by the system BIOS. You can press *the <Esc>* key quickly just after the RAM test to enter the SETUP program. Choose item 2 from the initial screen to preformat a hard disk. See Figure 3-1.

Step 2 — Partition

This process creates DOS partitioning on a preformatted hard disk drive. The DOS command "FDISK" handles this partitioning process.

Insert your DOS diskette in drive A and type a: to get the A prompt. Then type:

```
A> FDISK  <J>
```

The "FDISK" command displays a series of menus to help you partition your hard disk for MS-DOS. With the "FDISK" command, you can...

- create a primary partition,
- create an extended partition,
- change the active partition,
- delete a partition,
- display partition data, and
- select the next fixed disk drive for partitioning on a system with multiple fixed disks.

If your hard disk is 40MB, you may have partitions of up to 33MB in size. 33MB is the maximum space for a partition allowed by DOS.

For more information on how to use create DOS partitions, see *Appendix D* in the *MS-DOS User's Guide and Reference.*

Step 3 — Format

The DOS command “Format” verifies the media and moves the system file onto the hard disk drive. The command should be keyed in as:

```
A> FORMAT C:/S
```

If you want to make two partitions, you have to format the new partition as follows:

```
A> FORMAT D:
```

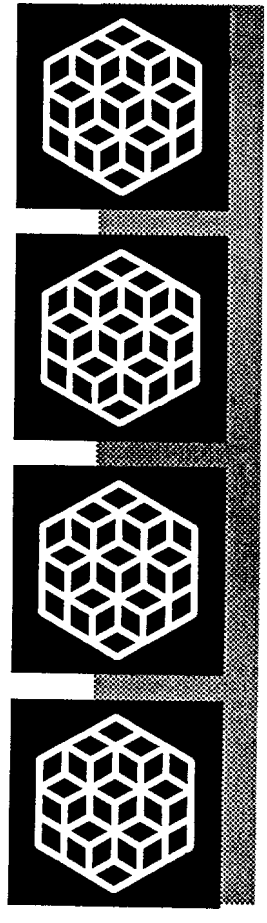
If you want to use partition 1 (drive C) to start DOS, you have to specify the */S* option when formatting the disk. You can use this system disk to boot your system later.

Note that you don’t need to perform this procedure if you want to use new partitions for other operating systems like Xenix, Novell or Unix. Refer to their manuals for details.

3-5 Helpful Hints

This chapter ends with a few hints -they may save you some time or help you as you use your computer.

- Make copies of your diskettes regularly.
- To make sure that a command works, you should:
  - Check your typing (make sure you don't confuse \ with /).
  - Have the correct diskette in the drive.
  - Check the contents of the diskette with the *DIR* command.
  - Specify the correct diskette drive.
  - Remember to include the colon (:) when specifying the name of a drive.
  - Spell the filename correctly
  - Use the appropriate extension (such as .doc or .exe)
- Refer to the DOS Reference for additional information if a command still doesn't work.
- Print contents of a disk (if you have a printer) and keep the list with the diskette.
- All commands (except DISKCOPY and DISKCOMP) are files that will work on both diskettes and hard disk drives.
- The date and time shown with each directory entry are the date and time of the last addition or change to that file. The date and time are not changed during a COPY or a DISKCOPY.



Chapter 4

Keyboard

Keyboard

In this chapter you will learn:

- the basics of your keyboard and its functions
- how to adjust your keyboard angle

A computer keyboard sends messages from you to the computer. It has:

- QWERTY keys
- Function keys
- Cursor control keys
- A numeric keypad
- Special keys
- Keyboard indicator lights

4-1 Keyboard Layout

Currently several keyboard styles are available for PC/AT/XT compatible computers. The most popular are the PC keyboard, the PC/AT keyboard, and the enhanced keyboard. Figure 4-1 below illustrates the basic layout of a typical enhanced keyboard.

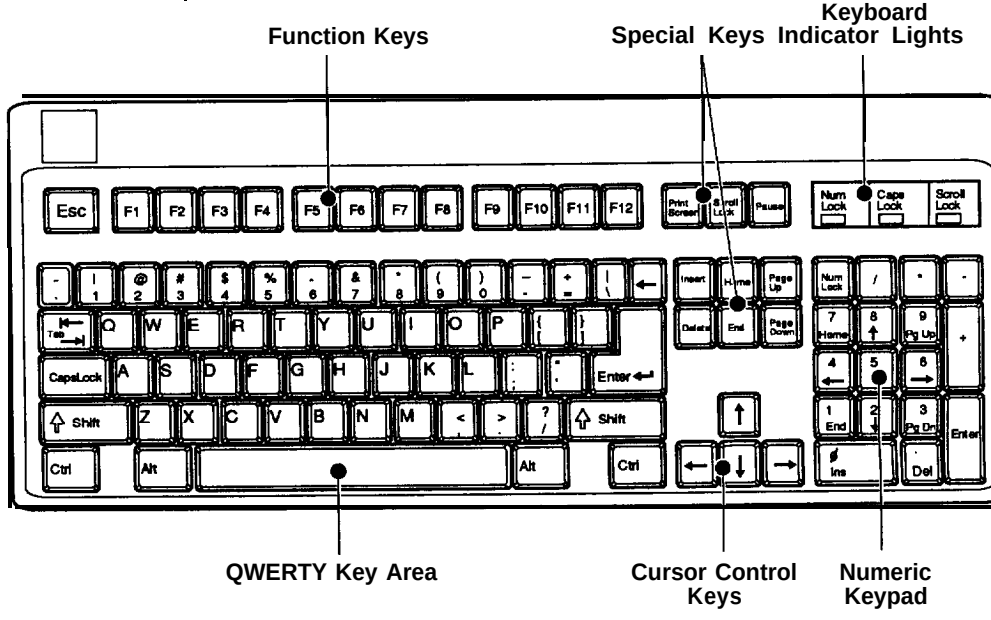


Figure 4-1: Keyboard Layout

4-2 Getting Acquainted with Your Keyboard

Before you begin using your computer, you should become familiar with some keyboard functions. Your keyboard is divided into six sections. Refer to the previous page for the layout. The following gives an explanation of these keys.

Function Keys

These are located on the left or at the top of the keyboard. Function keys have specially defined uses preassigned by the software you use. They are used independently or in combination with other keys.

Figure 4-2: Function Keys

Numeric Keypad

This is located on the right of the keyboard. At the center of the keypad are nine numeric keys. These keys are used to move the cursor as well as to enter numbers when either the Caps Lock key or Num Lock key is pressed. Refer to the figure below:

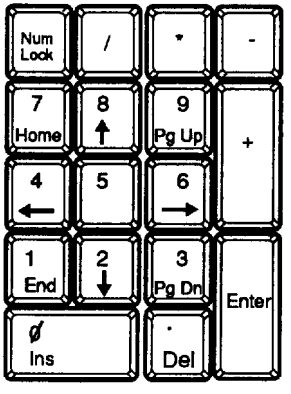


Figure 4-3: Numeric Keypad

Keys	Function
	Turns on and off the numeric mode on the numeric keypad
	Used for division operations.
	Used for multiplication operations.
	Used for subtraction operations.
	Activating Num Lock makes 7 operative. Home returns cursor to the beginning of the line it is on.
	Activating Num Lock makes 8 operative. Otherwise the up cursor key is active.
	Activating Num Lock makes 9 operative. Otherwise page up is active.
	Used for addition operations.
	Activating Num Lock makes 4 operative. Otherwise the cursor key is activated.
	Activating Num Lock makes 5 operative.
	Activating Num Lock makes 6 operative. Otherwise the cursor key is activated.
	Activating Num Lock makes 1 operative. Otherwise end moves the cursor to the end of the line it is on.
	Activating Num Lock makes 2 operative. Otherwise the cursor key is activated.
	Activating Num Lock makes 3 operative. Otherwise page down is activated.
	Activating Num Lock makes 0 operative. Otherwise the key functions to insert characters at the position of the cursor.
	Used for decimal points, Otherwise it deletes characters where the cursor is positioned.
	Enters commands or inserts invisible paragraph characters

Table 4-1: Function of Numeric Keypad Keys

Mode Indicator Lights

In addition to the character, number and control keys, every keyboard has three lights that indicate the typing mode. These lights and their functions are explained as follows:

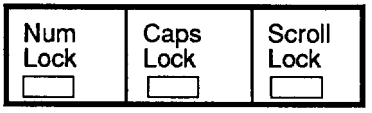


Figure 4-4: Indicator Lights

Caps Lock

When this light is on, characters are in uppercase mode.

Num Lock

When this light is off, the cursor-control function of the numeric keypad is disabled and the numeric mode is activated.

Scroll Lock

When this light is on, text can be scrolled without moving the cursor.

Special Keys

Below are some special keys on your keyboard.

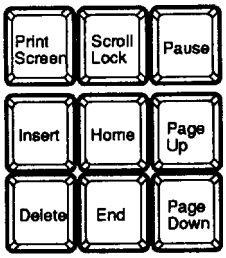


Figure 4-5: Special Keys

Check out the above key functions in the table below and in Table 4-1.

Keys	Function
Print Screen	Pressing this key together with the shift key will print all data on the screen.
Scroll Lock	With Scroll Lock activated, you can move text vertically in line units.
Pause	Pressing this key halts the current operation; pressing it again allows the operation to continue.
Esc	Moves the cursor for corrections, but the line is not deleted from memory.
Enter	Skips to new line.
Ctrl	Used with alphanumeric keys to enter BASIC key words.
Alt	Used with another key to execute a command.

Table 4-2: Functions of Special Keys

These are the same keys which are used on a typewriter.

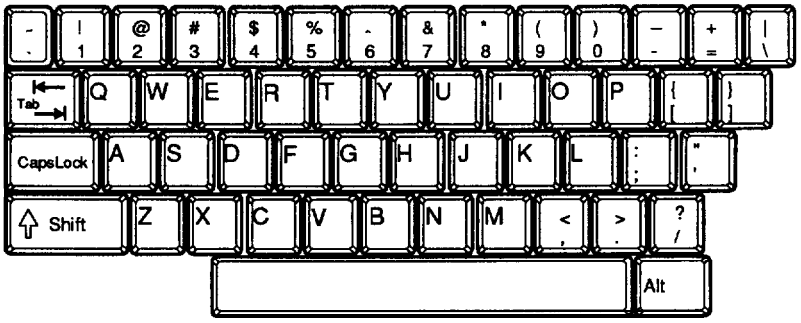


Figure 4-6: QWERTY Keys

Keys	Function
Tab	Performs a tab function similar to that of a typewriter.
Shift	Changes lowercase letters to capitals.
Backspace	Moves cursor back one space and erases characters.
CapsLock	Pressing this key activates uppercase letters; pressing it again activates lowercase letters.

Table 4-3: Functions of Special QWERTY Keys

Cursor Keys

These keys move the cursor in the indicated direction.

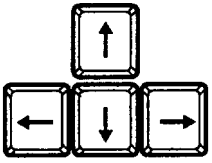


Figure 4-7: Cursor Keys

Key Combinations

The keys shown below have special functions when pressed simultaneously.

Keys	Function
Ctrl + Scroll Lock	Both keys used together stop a program while it's running and identify the line where it stops.
Ctrl + S	Both keys used together stop a program from running. Pressing any key again allows you to continue.
Ctrl + 7 Home	These two keys remove all informations on the screen and move the cursor to the upper left corrner.
Ctrl + Alt + Del	There three keys reset the system so that the machine is at the RAM test stage.

Table 4-4: Special Functions

4-3 Keyboard Tilt Adjustment

Under the rear of the keyboard are two small legs that can be pulled out or pushed in to change the keyboard angle to suit you.

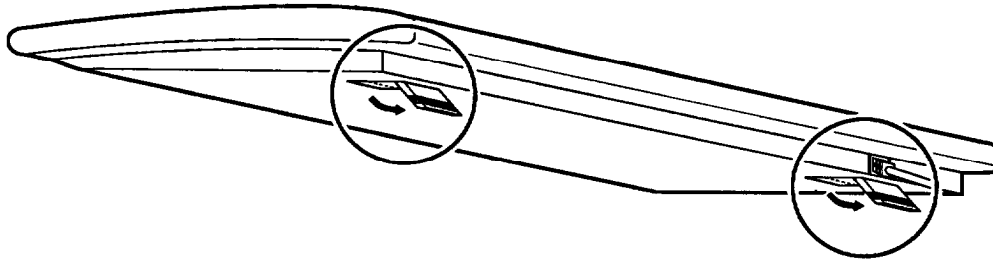
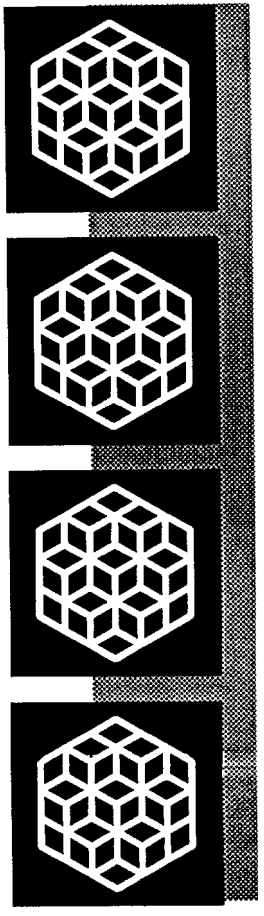


Figure 4-8: Adjustment of Keyboard Angles



Chapter 5
Troubleshooting

Troubleshooting

In this chapter you will learn about:

- the basics of how to solve software/hardware problems
- when to get technical help for your computer

Your computer has been designed to last for years of optimum performance. But if some problems do occur, more likely than not you will be able to solve them by referring to this chapter.

No matter whether you are a new or experienced user, you should become familiar with the material in this chapter. For detailed explanations of computer problems and how to solve them, you are urged to buy personal computer troubleshooting books from your nearest hardware or software dealer.

5-1 Command Problems

Often what appears to be a big problem is in fact just a matter of a small oversight. Before taking your computer in to the shop for major surgery, check the following items:

- ☐ Make sure that all devices (computer and peripherals) have power and are turned on.
- ☐ If you encounter a problem while you are working, stop what you are doing immediately.
- ☐ On paper, make notes of what is happening. List the actions you have taken and the responses from the computer. You may want to print a copy of the screen by using the <*Shift*> + <*PrtSc*> keys combination.
- ☐ Use the diagnostic software on your computer. Try to find out the conditions under which the malfunction occurs. Try also to isolate where the problem is occurring. Is it with a certain software program or with your hardware? If the problem is with software, you should probably talk to your software dealer. If the problem is with the hardware, try to narrow down the source of the problem. Is it your disks or disk drives? Keyboard? Printer? Screen?
- ☐ If some messages appear on the screen, refer to your MS-DOS manual for an explanation of the message. You may want to write down the message or print it out with the <*Shift*> + <*PrtSc*> key combination. Problems (except blackouts) can be avoided if you run your system on a dedicated electrical line. That is, ensure that your computer and peripheral electric cords are not shared by other appliances such as a refrigerator or air conditioner. Also, it is highly advisable to purchase a surge suppressor. This is a set of electric sockets enclosed in a single housing. A surge suppressor prevents sudden pulses of high electric power (spikes) from damaging the computer. This appliance is inexpensive and can be purchased at any computer or electronic hardware store.

- ☐ Are you using a startup disk?
- ☐ Is your disk formatted?
- ☐ Is the system configuration correct?
- ☐ Are all the external and internal connectors are connected well?
- ☐ Make sure that you are running software compatible with your display port, because some software can only run in the MGA display mode.
- ☐ Is the power fuse burned out?

If you have gone through the above checklist and your system still does not function properly, check the following pages. The following instructions will help you solve some common problems. However, you should be aware that other problems might stem from system software, applications or other peripherals.

5-2 Electrical Problems

Most electrical problems (except blackouts) can be avoided if you run your system on a dedicated electrical line. That is, ensure that your computer and peripheral electric cords are not shared by other appliances such as a refrigerator or air conditioner. Also, it is highly advisable to purchase a surge suppressor. This is a set of electric sockets enclosed in a single housing. A surge suppressor prevents sudden pulses of high electric power (spikes) from damaging the computer. This appliance is inexpensive and can be purchased at any computer or electronic hardware store.

System Error Messages

Basically there are three levels of system error messages that you might see displayed on your computer. These are related to the software you use. Following are the ones most commonly encountered.

Software error* messages *are a result of:

- **Software lockup;** the application becomes stuck and the cursor will not move. When this happens, remove your application program from the disk drive (unless a hard disk is used) and reboot your computer. if the problem persists, contact your nearest software dealer.
- **Software crash;** the application suddenly displays garbled text on the monitor or the cursor locks up. Try to reboot the computer. if the problem persists, you will need to contact the software dealer from whom you purchased the package. He/she should replace the package, depending on the service contract, or have it repaired.

Hardware error messages:

These messages are related to the computer's internal components, your monitor, mouse, or printer. Hardware problems are usually ones that the user cannot solve alone. Professional services are therefore required.

Error messages generated by MS-DOS, BASIC or other high-level applications:

These messages relate to problems due to incorrect use or malfunction of a high-level application under which you might run your software. Again, it is advisable to contact your software dealer for assistance with such problems.

Consult your dealer if you have any questions about troubleshooting.

System crash

The cursor cannot be moved and does not respond to the keyboard. This could indicate a software crash. Mark where you are in your document. Reboot your system and reload your software. Scroll the cursor to where you last saved your data. Retype the information up to where the cursor could not be moved. Enter the rest of the data. If the cursor continues to function normally, the problem was probably caused by accidently pressing the wrong key. if the problem occurs again, go over the same procedure. If the problem persists, contact your software dealer.

System does not boot

This can be caused by defective hardware or a faulty system disk. Turn off your computer and try again. if unsuccessful, try using your backup system disk because your working disk may be damaged. If the problem persists, you might have a hardware problem, in which case you should contact the dealer from whom you purchased your computer.

Monitor displays garbled, unrecognizable characters on the screen

This usually indicates the monitor is set to an incorrect baud rate. Ask your computer dealer the correct baud rate for the computer's output board. Locate the baud rate switches on your monitor and reset the baud rate.

8254 Error

- Indicates a 8254 timer controller failure.

8237 Error

- Indicates a 8237 DMA controller failure.

74612 Error

- Indicates a 74612 page register failure.

8259 Error

- Indicates a 8259 interrupt controller failure.

8742 Error

- indicates a 8742 controller failure.

Check Battery

- Indicates a system backup battery disconnection or power loss.

RTC Checksum Error

- Indicates that the system memory refresh function does not work.

Refresh Indicator Error

- Indicates that the system memory refresh does not work.

Base 64K Memory Error

- Indicates that the system's first 64K memory does not work.

FDC Error User Check

- Indicates that the floppy diskette does not work.

FDC Seek Failure

- Indicates a failure of the floppy diskette "seek" operation.

Keyboard Error User Check

- Indicates the disconnection of the keyboard from the system or a keyboard device failure.

Parity Error but Segment isn't Found, Press any Key to Continue

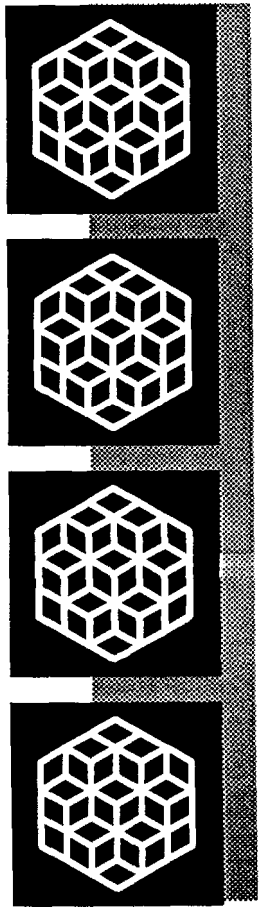
- Indicates that the NMI circuit has detected a RAM parity error.

System Memory Mismatch, Run Setup

- Indicates a mismatch of memory size in the real-time clock as well as onboard. You need to run the setup program.

Display Card Mismatch, Run Setup

- Indicates a mismatch of a record typed in the real-time clock as well as onboard. You need to run the setup program.



Chapter 6

Appendix

Appendix

This chapter provides:

- technical information
- jumper settings in your system
- information on moving your computer

This manual is not a technical reference manual. This chapter provides some technical information about your system, but if you need more, check out a technical library or bookstore. You will find technical reference books in most bookstores.

6-1 Disk Drives

Up to seven floppy/hard disk drives may be installed in the system unit. installation of a hard disk is essentially the same as that for a floppy disk.

You may at sometime want to add to or exchange your floppy or hard disk drives. Follow the instructions below to do so.

Be certain to refer to the manuals for both the disk drive and the controller card for any additional specific information regarding them that may be of importance.

Floppy Disk

To install or remove floppy disk drives, follow the step below:

- Open the system unit case as described on Figure 2-35.
- Screw the metal guides to the disk drive as shown below:

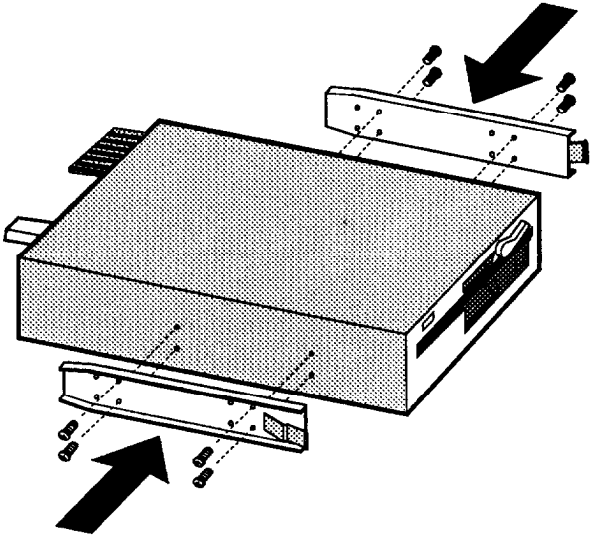


Figure 6-1: Fasten the Brackets on a Floppy Disk Drive

- Slide the disk drive, back end first, into the disk drive bay.

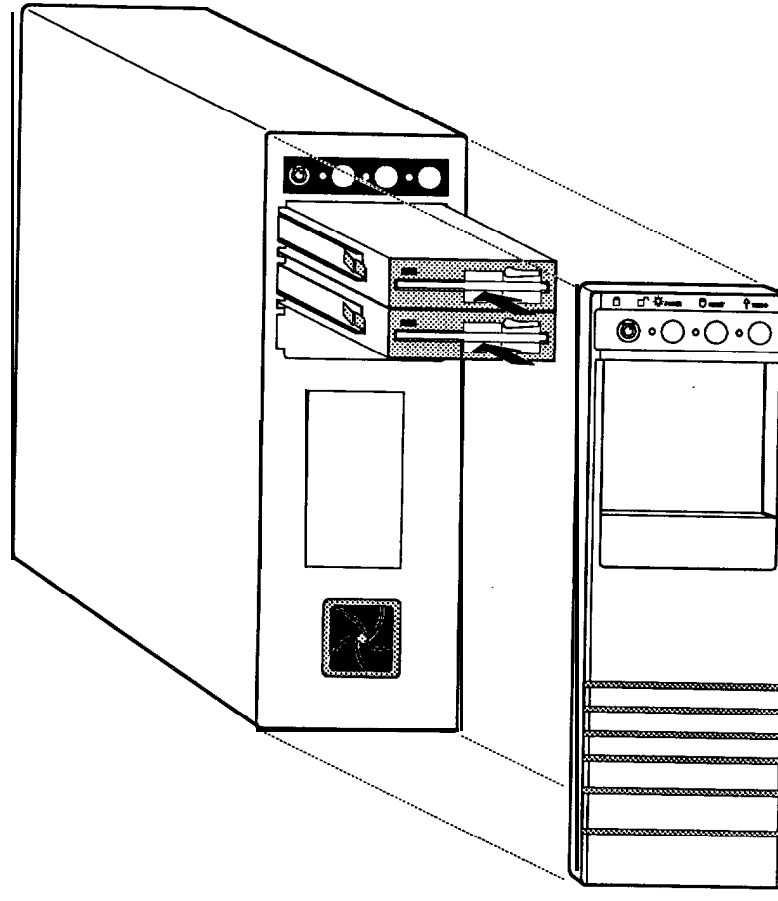


Figure 6-2: Installing the Floppy Disk Drives

Next, connect the floppy/hard disk controller cable and one of the four cables from the power supply. The power cable is simple to connect: simply plug it in to the correct adapter. The shape of the plug ensures that no mistakes will be made.

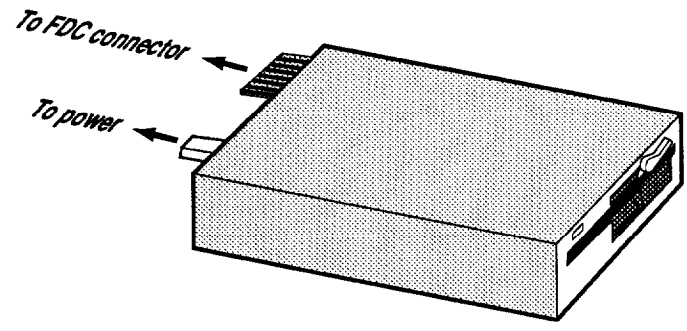


Figure 6-3: Connecting a Floppy Disk Drive

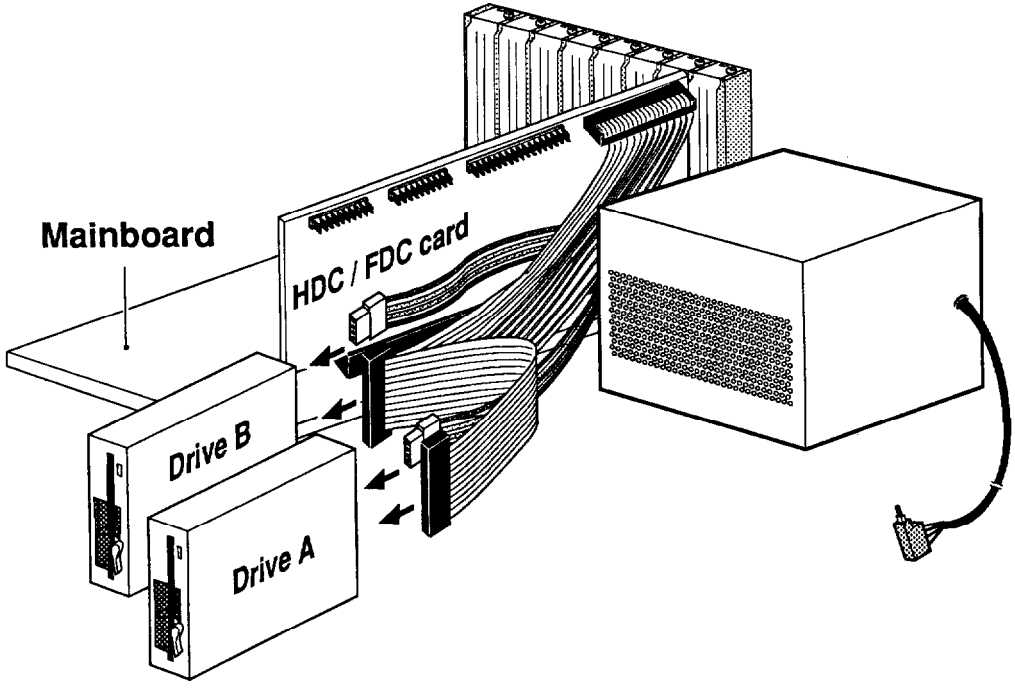


Figure 6-4: Connecting a Floppy Disk Drive to an FDC Card

One edge of the ribbon cable is marked with a color line. This specific line side of the connector should be at pin 1 when attached to the card. Pin 1 is clearly marked on the card. See the figure below:

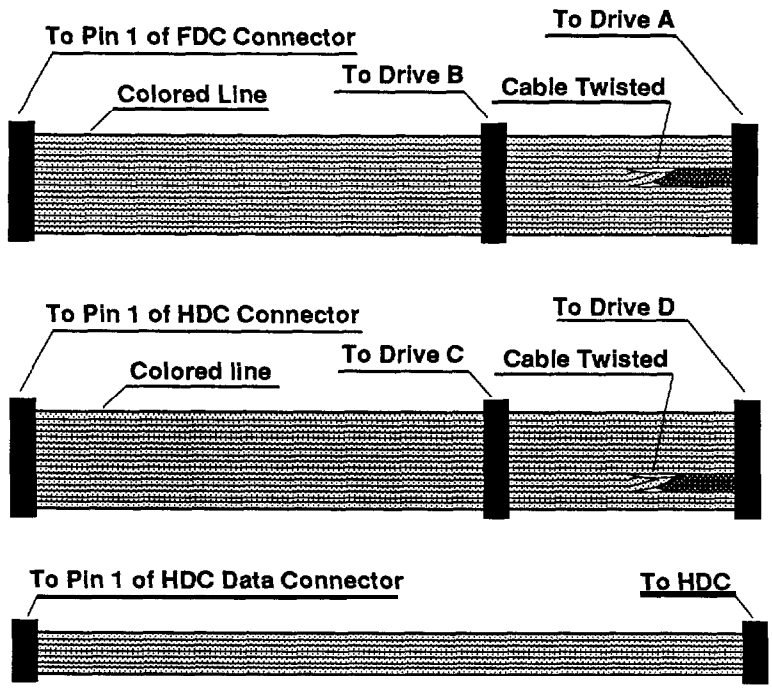


Figure 6-5: Cables for Disk Drives

Follow the same procedure for any additional drives you want to install.

Removal

To remove a drive, just reverse the procedure described above. Disconnect the cables, undo the screws and slide the drive out.

Hard Disk

The installation of a hard disk drive is similar to that for a floppy disk drive.

- First fasten the bracket on the drive.

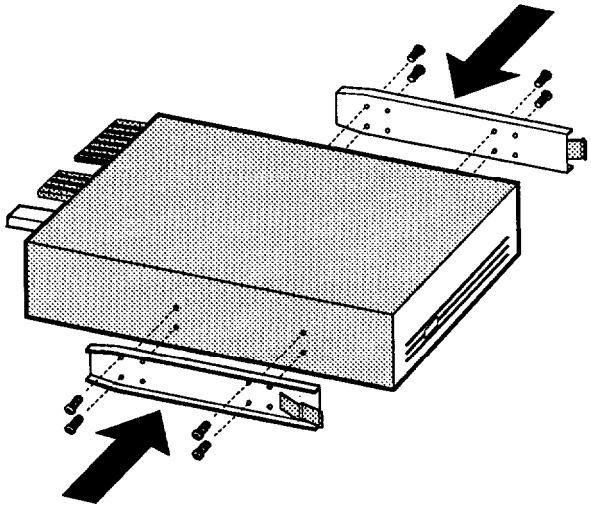


Figure 6-6: Fasten the Brackets on a Hard Disk Drive

- Next, place the disk drive inside the bay and fasten the brackets to the chassis. Refer to the figure below:

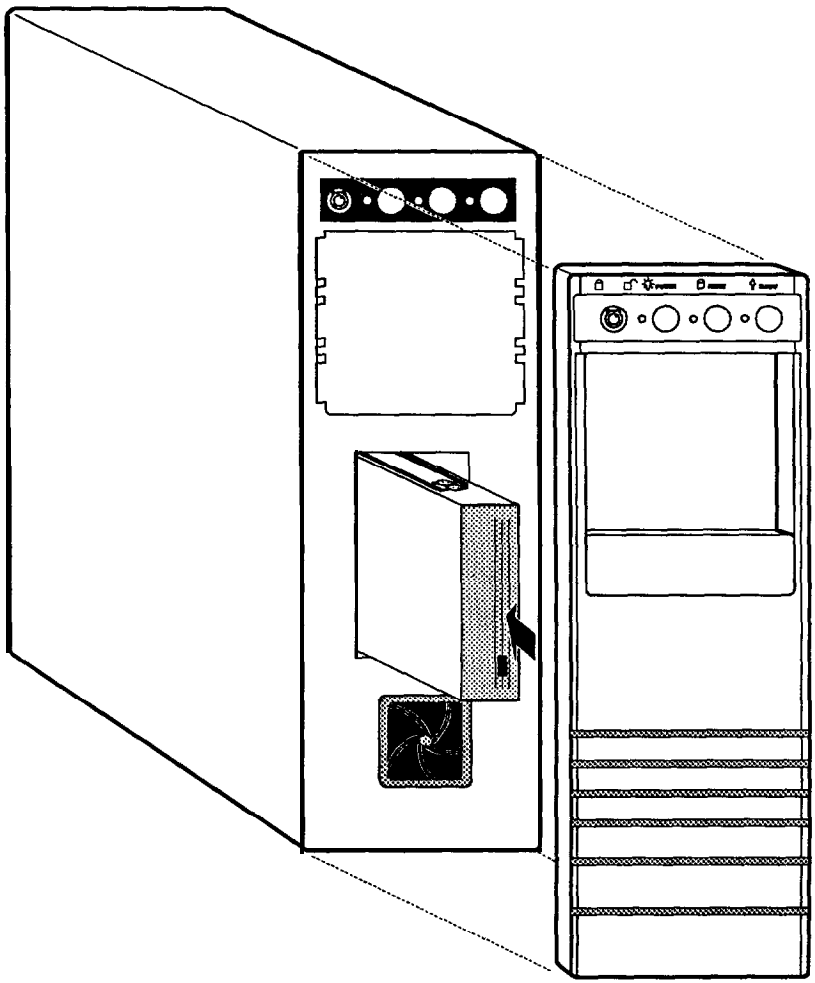


Figure 6-7: Installing a Hard Disk Drive

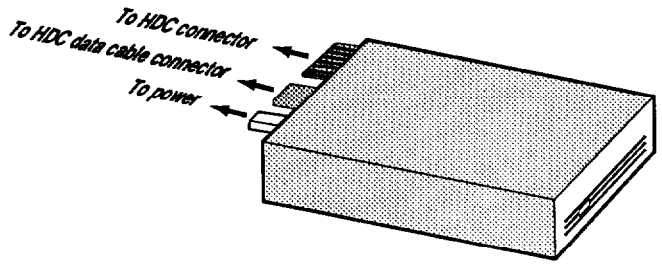


Figure 6-6: Connecting a Hard Disk Drive

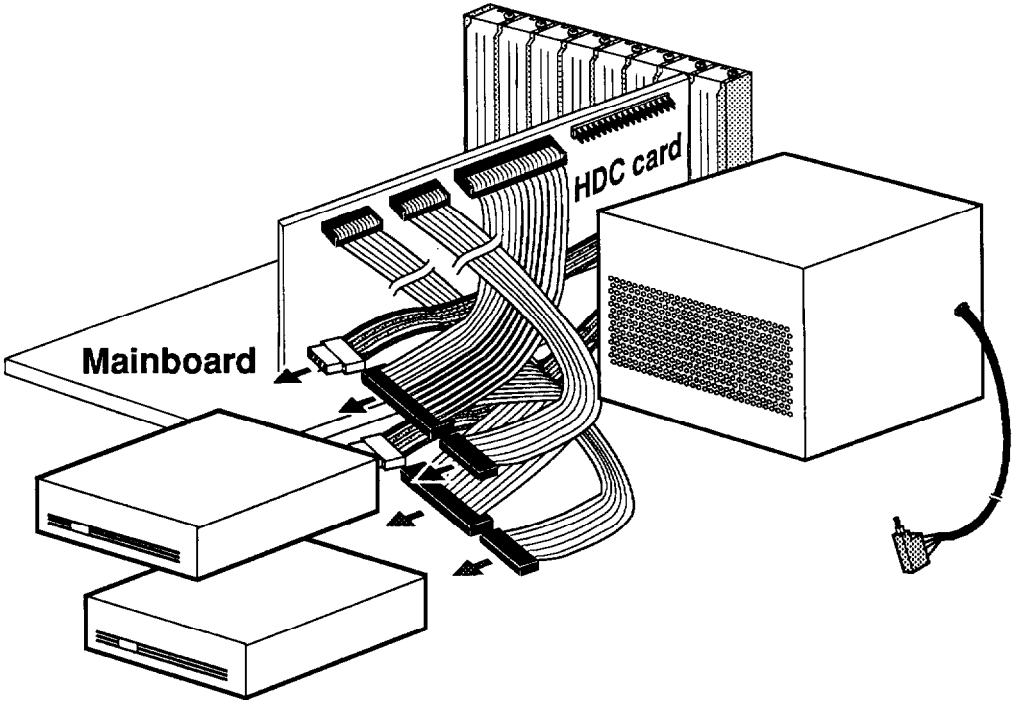


Figure 6-9: Connecting a Hard Disk to a HDC Card

Connect the power cable and the hard disk controller cables. Note that there is only one possible way to connect the power cable and hard disk cables owing to the shape of the connectors, so it is impossible to make a mistake.

The two hard disk controller cables are of different sizes: the red wires on the cables should be connected so that they are toward the central portion of the case.

Removal

To remove a hard disk drive, reverse the procedure described above. Disconnect the cables, undo the mounting screws, slide the drive out and remove the mounting guides.

6-2 Expanding Your Memory with a PEI-306 RAM Card

The PEI-306 '386 RAM Card is a flexible memory solution for your system's motherboard. The PEI-306 '386 RAM Card can be installed in a 32-bit expansion slot designed for this purpose.

The '386 RAM Card makes use of a combination of 256KB and 1 MB SIMM modules which allow for up to 12MB of memory for maximum expandability.

With so many memory configurations, setup becomes a major consideration. The PEI-306 '386 RAM Card has been designed with maximum ease of use in mind with all configuration settings made on one DIP switch and a few jumpers.

Card Layout

The figures below will familiarize *you* with the layout of the '386 RAM Card, the jumpers, the DIP switch, and banks 0, 1, and 2.

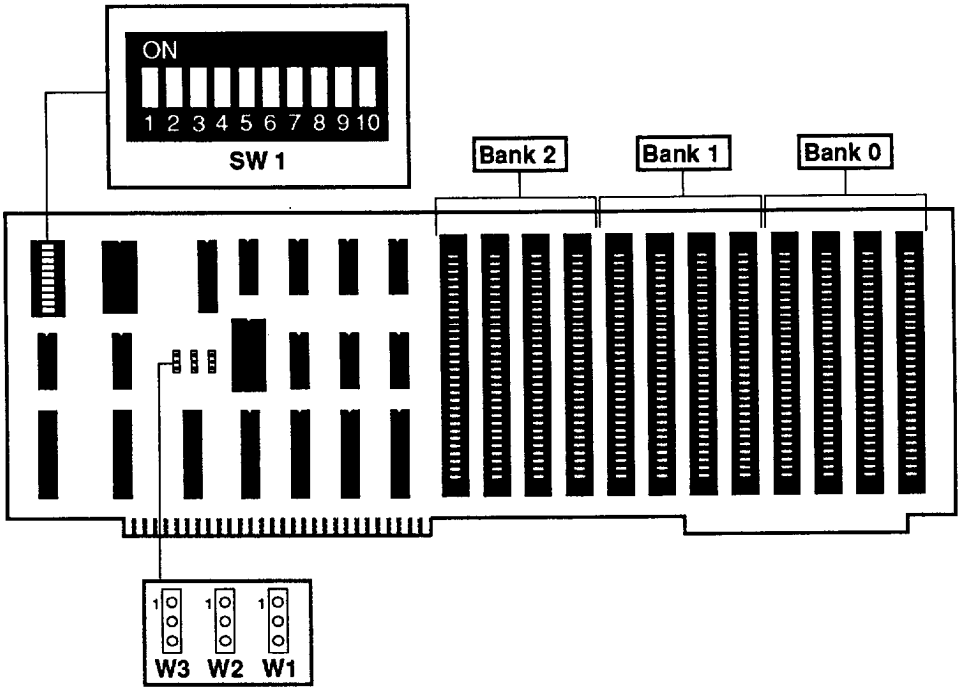


Figure 6-10: PEI-306 RAM Card Layout

Memory Banks

The '386 RAM Card memory is divided into three banks. At the very least, bank 0 must be full for the card to function. By setting DIP switch SW1 and jumpers W1 - W3 the PEI-306 '386 RAM Card can be set up with a minimum of 1 MB and **a** maximum of 12MB memory.

The PEI-306 RAM Card has SIMM-type RAM module sockets. These 30-pin single-in-line sockets are aligned at an angle of 25 degrees. Refer to the figure below.

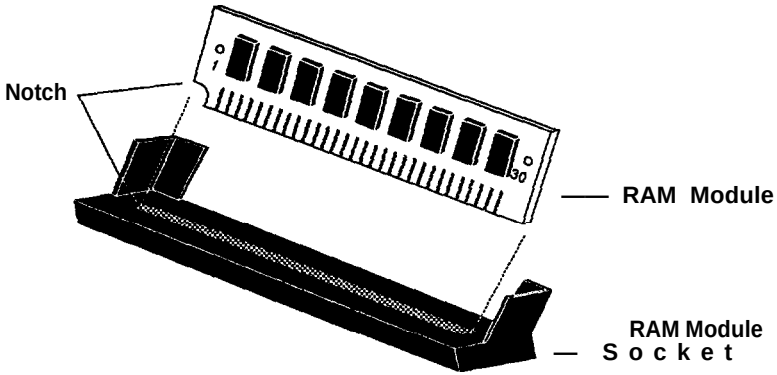


Figure 6-11: SIMM-Type RAM Module

Remember that when inserting the RAM module, you must make sure the notched or dotted end of the module is lined up with the notched end of the socket. Gently push the RAM module into the socket.

Three banks (bank 0, 1 and 2) for memory are on the PEI-306. Each bank accomdates a 32-bit wide data bus. Bank 0 must be filled first. **The three banks must be filled with the same type of RAM: either 41256 or 411000.**

Jumper Settings

Jumpers W1 - W3 allow you to set the DRAM type of banks 0 - 2 for either 411000 RAM or 41256 RAM.

Jumper W1 selects bank 0, W2 selects bank 1 and W3 selects bank 2. Refer to the table below for more information.

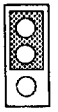
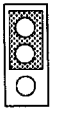
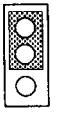
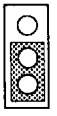
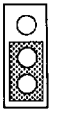
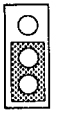
DRAM Type	Bank 0 Jumper Selection W1 Settings	Bank 1 Jumper Selection W2 Settings	Bank 2 Jumper Selection W3 Settings
411000 RAM module x 4 pieces			
41256 RAM module x 4 pieces			

Table 6 - 1: ***Jumpers W1 - W3*** *Settings*

DRAM Chip Speed

The PEM-3300/PEM-3301 mainboard has a clock speed which requires the use of 80ns DRAM on the '386 RAM Board. For other mainboards, refer to your mainboard manual or contact your dealer.

Both types of DRAM (256KB and 1MB) are available in both speeds so you can take full advantage of the '386 RAM Board's various configurations. Refer to the charts below for a synopsis of this information.

Your mainboard's Clock Speeds - 33MHz	
PEI-306 32-bit RAM Card:	100ns DRAM 256KB or 1MB SIMM-Type RAM Modules Static Column/Page Mode

Table 6-2: DRAM Chip Speed

Total System Memory Size

The PEI-306 RAM Board provides you up to 16MB of total system memory.

Total system memory means the onboard memory of mainboard plus that of the PEI-306 extension memory card.

Note: You only can have 16MB maximum of total system memory.

Refer to the following pages for more information.

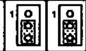
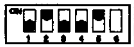
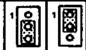
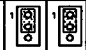
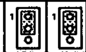
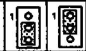
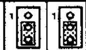
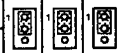
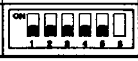
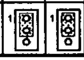
Note for the following pages:

* We support this kind of module RAM. There are two banks of DRAM mounted on each RAM module.

**Due to address limitations, this configuration cannot accommodate an AT bus RAM card.

** 16MB maximum total system memory has no starting address.

Table 6-3: PEM-3301 Total System Memory Configurations - A

Total Memory Size	PEM-3301 Mainboard					PEI-306							Start Addr. of AT Bus RAM Card
	Bank 0	Bank 1	SW1	W2	W3	Bank 0	Bank 1	Bank 2	DIP SW1	W1	W2	W3	
1MB	41256 SIMM x 4	None											140000H
2MB	41256 SIMM x 4	41256 SIMM x 4											240000H
4MB	411000 SIMM x 4	None				Not Used			Not Used	Not Used			440000H
5MB	41256 SIMM x 4	411000 SIMM x 4											540000H
8MB	411000 SIMM x 4	411000 SIMM x 4											840000H
3MB	41256 SIMM x 4	41256 SIMM x 4											340000H
5MB	411000 SIMM x 4	None				41256 SIMMx4	Not Used						540000H
6MB	41256 SIMM x 4	411000 SIMM x 4											640000H
9MB	411000 SIMM x 4	411000 SIMM x 4											940000H
6MB	41256 SIMM x 4	41256 SIMM x 4											640000H
8MB	411000 SIMM x 4	None				411000 SIMMx4	Not Used						840000H
9MB	41256 SIMM x 4	411000 SIMM x 4											940000H
12MB	411000 SIMM x 4	411000 SIMM x 4											C40000H

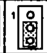
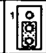
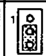
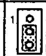
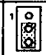
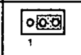
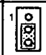
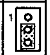
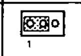
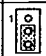
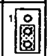
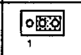
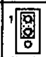
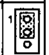
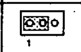
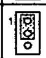
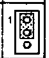
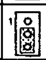
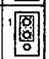
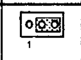
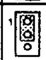
Note :  means "ON" and  means "OFF"

Table 6-4: PEM-3301 Total System Memory Configurations - B

Total Memory Size	PEM-3301 Mainboard					PEI-306							Start Addr. of AT Bus RAM Card
	Bank 0	Bank 1	SW1	W2	W3	Bank 0	Bank 1	Bank 2	DIP SW1	W1	W2	W3	
4MB	41256 SIMM x 4	41256 SIMM x 4				41256 SIMMx4	41256 SIMMx4	Not Used					440000H
6MB	411000 SIMM x 4	None											640000H
7MB	41256 SIMM x 4	411000 SIMM x 4											740000H
10MB	411000 SIMM x 4	411000 SIMM x 4											A40000H
10MB	41256 SIMM x 4	41256 SIMM x 4				411000 SIMMx4	411000 SIMMx4	Not Used					A40000H
12MB	411000 SIMM x 4	None											C40000H
13MB	41256 SIMM x 4	411000 SIMM x 4											D40000H
16MB	411000 SIMM x 4	411000 SIMM x 4											***
5MB	41256 SIMM x 4	41256 SIMM x 4				41256 SIMMx4	41256 SIMMx4	41256 SIMMx4					540000H
7MB	411000 SIMM x 4	None											740000H
8MB	41256 SIMM x 4	411000 SIMM x 4											840000H
11MB	411000 SIMM x 4	411000 SIMM x 4											B40000H
14MB	41256 SIMM x 4	41256 SIMM x 4				411000 SIMMx4	411000 SIMMx4	411000 SIMMx4					E40000H
16MB	411000 SIMM x 4	None											***

Note : means "ON" and means "OFF"

Table 6-5: PEM-3300 Total System Memory Configurations - A

Total Memory Size	PEM-3300 Mainboard						PEI-306							Start Addr. of AT Bus RAM Card
	Bank 0	Bank 1	W1-W6	SW1	W7	W8	Bank 0	Bank 1	Bank 2	DIP SW1	W1	W2	W3	
1MB	(44256 x 8) + (41256 x4)	None					Not Used			Not Used	Not Used			160000H
	41256 SIP x 4	None												
2MB	(44256 x 8) + (41256 x4)	(44256 x 8) + (41256 x4)												260000H
	(44256 x 8) + (41256 x4)	41256 SIP x 4												
	41256 SIP x 4	(44256 x 8) + (41256 x4)												
4MB	1Mbit x 36	None												460000H
	411000 SIP x4	None												
5MB	(44256 x 8) + (41256 x4)	411000 SIP x4												560000H
8MB	1Mbit x 36	411000 SIP x 4												860000H

Note :  means "ON" and  means "OFF"

Total Memory Size	PEM-3300 Mainboard						PEI-306							Start Addr. of AT Bus RAM Card
	Bank 0	Bank 1	W1-W6	SW1	W7	W8	Bank 0	Bank 1	Bank 2	DIP SW1	W1	W2	W3	
3MB	(44256 x 8) + (41256 x4)	(44256 x 8) + (41256 x4)					41256 SIM x 4	Not Used						360000H
	(44256 x 8) + (41256 x4)	41256 SIP x 4												
	41256 SIP x 4	(44256 x 8) + (41256 x4)												
5MB	1Mbit x 36	None												560000H
	411000 SIP x4	None												
6MB	(44256 x 8) + (41256 x4)	411000 SIP x4												660000H
9MB	1Mbit x 36	411000 SIP x 4												960000H
6MB	(44256 x 8) + (41256 x4)	(44256 x 8) + (41256 x4)					411000 SIM x 4	Not Used						660000H
	(44256 x 8) + (41256 x4)	41256 SIP x 4												
	41256 SIP x 4	(44256 x 8) + (41256 x4)												
8MB	1Mbit x 36	None												860000H
	411000 SIP x4	None												
9MB	(44256 x 8) + (41256 x4)	411000 SIP x4												960000H
12MB	1Mbit x 36	411000 SIP x 4												C60000H

Note : ▀ means "ON" and ▄ means "OFF"

Table 6-6: PEM-3300 Total System Memory Configurations - B

Total Memory Size	PEM-3300 Mainboard Bank 0	PEM-3300 Mainboard Bank 1	W1-W6	SW1	W7	W8	PEI-306 Bank 0	PEI-306 Bank 1	PEI-306 Bank 2	DIP SW1	W1	W2	W3	Start Addr. of AT Bus RAM Card
4MB	(44256 x 8) + (41256 x4)	(44256 x 8) + (41256 x4)					41256 SIM x 4	41256 SIM x 4	Not Used					460000H
	(44256 x 8) + (41256 x4)	41256 SIP x 4												
	41256 SIP x 4	(44256 x 8) + (41256 x4)												
6MB	1Mbit x 36	None												660000H
	411000 SIP x4	None												
7MB	(44256 x 8) + (41256 x4)	411000 SIP x4												760000H
10MB	1Mbit x 36	411000 SIP x 4												A60000H
10MB	(44256 x 8) + (41256 x4)	(44256 x 8) + (41256 x4)					411000 SIM x 4	411000 SIM x 4	Not Used					A60000H
	(44256 x 8) + (41256 x4)	41256 SIP x 4												
	41256 SIP x 4	(44256 x 8) + (41256 x4)												
12MB	1Mbit x 36	None												C60000H
	411000 SIP x4	None												
13MB	(44256 x 8) + (41256 x4)	411000 SIP x4												D60000H
16MB	1Mbit x 36	411000 SIP x 4												***

Note : ▮ means "ON" and ▯ means "OFF"

Table 6-7: PEM-3300 Total System Memory Configurations - C

Table 6-8: PEM-3300 Total System Memory Configurations - D

Total Memory Size	PEM-3300 Mainboard						PEI-306							Start Addr. of AT Bus RAM Card
	Bank 0	Bank 1	W1-W6	SW1	W7	W8	Bank 0	Bank 1	Bank 2	DIP SW1	W1	W2	W3	
5MB	(44256 x 8) + (41256 x4)	(44256 x 8) + (41256 x4)					41256 SIM x 4	41256 SIM x 4	41256 SIM x 4					560000H
	(44256 x 8) + (41256 x4)	41256 SIP x 4												
	41256 SIP x 4	(44256 x 8) + (41256 x4)												
7MB	1Mbit x 36	None												760000H
	411000 SIP x4	None												
8MB	(44256 x 8) + (41256 x4)	411000 SIP x4												860000H
11MB	1Mbit x 36	411000 SIP x 4												B60000H
14MB	(44256 x 8) + (41256 x4)	(44256 x 8) + (41256 x4)					411000 SIM x 4	411000 SIM x 4	411000 SIM x 4					E60000H
	(44256 x 8) + (41256 x4)	41256 SIP x 4												
	41256 SIP x 4	(44256 x 8) + (41256 x4)												
16MB	1Mbit x 36	None												***
	411000 SIP x4	None												

Note : means "ON" and means "OFF"

Installing Your PEI-306 RAM Card

Having ensured that the power to the system is switched OFF, refer to Figure 2-35 for your computer to open it up.

You will see expansion slot CON5 on your mainboard as below:

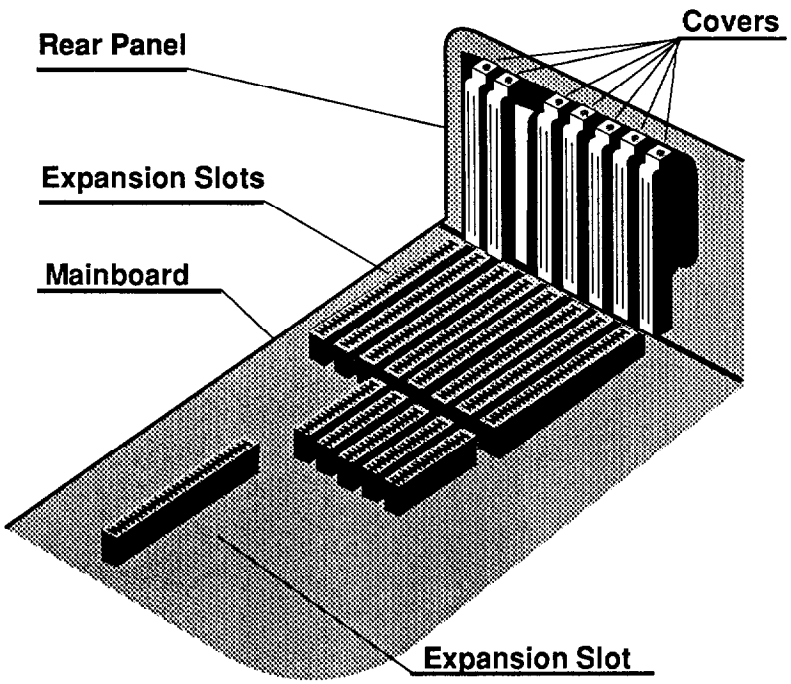


Figure 6-12: 32-Bit Expansion Slot for PEI-306 RAM Card

Expansion Slots and Slot Covers

Before you install the PEI-306 RAM Card in your computer, make sure the computer is unplugged, and remove any static electric charge from your body by placing one hand on the power supply box inside your computer.

Pick up the card by its non-conductive edges. Avoid touching the connector contacts or any components with your hands as this could damage the card. Insert the card into an empty expansion slot as shown in the illustration below:

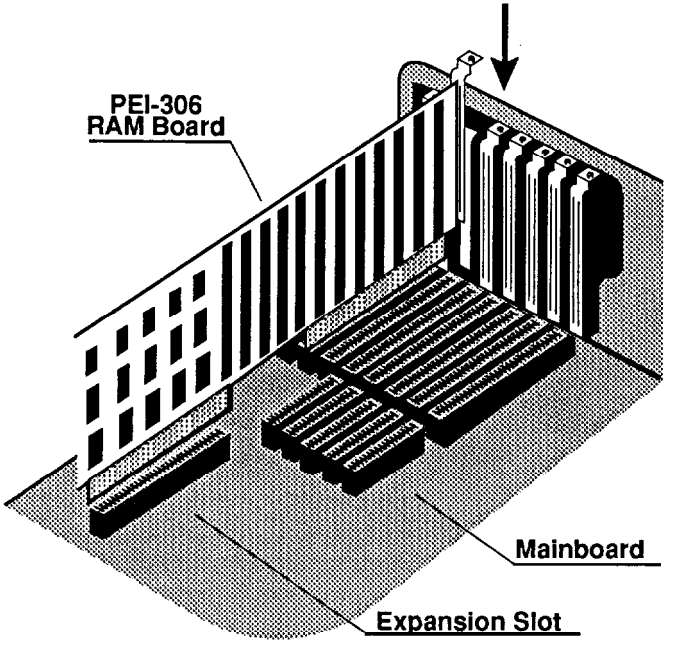


Figure 6-13: Installing** a **PEI-306 RAM Card

Expansion Card Insertion

Press the card firmly into the slot. Be careful not to exert excess force or torque the card. Attach the mounting bracket of the card securely to the rear panel of your computer with the slot cover screw you saved.

6-3 Moving Your Computer and Peripherals

Your personal computer and its peripheral components are highly sensitive machines that can be damaged easily through bad shipping and handling. We recommend that you take the following steps before moving the equipment to another location.

Short Move

An example of this is moving from one location to another in the same building. Ensure that you have taken the following steps before moving any items:

- Be sure that all data in your hard disk is backed up onto floppy disks.
- Enter the DOS system program and invoke the PARK command. This command will lock up your hard disk to protect it from damage while the computer is being moved
- Turn off all power switches
- Insert the cardboard diskette/s supplied with the system unit into the disk drive/s and close the disk drive levers
- Detach all cables and cords. Next, coil and tie them to protect the connectors
- Move each item separately

Long Move

This kind of move involves use of a motor a vehicle to carry your computer and its peripherals from one location to another. Before moving any items, follow the instructions stated above. Next, repack all items in their original packing cases.

6-4 Technical Information

The Intel 80386 Microprocessor

Your mainboard uses an Intel 80386-33 microprocessor running at 33MHz.

The Intel 80386 is a high-performance 32-bit microprocessor designed for multitasking operating systems. The processor can address up to 4 gigabytes of physical memory and 64 terabytes of virtual memory.

It incorporates integrated memory management and protection in its architecture in the form of address-translation registers, advanced multitasking hardware, and a protect mechanism to support operating systems. In addition, its object code is compatible with the 8086 family of microprocessors.

The 80386 has built-in features to support coprocessor-s, DMA and interrupts (both maskable and non-maskable). It has two modes of operation: Real Address mode and the Protected Virtual Address mode.

In Real Address mode, the 80386 operates as a fast 8086 with a 32-bit extension if necessary. The Protected Virtual Address mode is the natural environment of the 80386. Software can perform a task switch into tasks designated as virtual 8086 mode tasks. Virtual 8086 tasks can be isolated and protected from one another by use of paging and I/O-permission bit mapping.

Cache Algorithm

In a cache memory system, all data are stored in main memory and some data are duplicated in the cache. When the processor accesses memory, it checks the cache first. If the desired data are in the fast-memory cache, the processor can access the data quickly. If the desired data are not in the cache, the data must be fetched from main memory. If the requested data are found in the cache, the memory access is called a cache hit; if not, it is called a cache miss. The hit rate is the percentage of accesses that are hits; it is affected by the size and physical organization of the cache, the cache algorithm, and the program being run.

The following section describes the cache algorithm of your mainboard.

Cache Organization — Direct-Mapped Cache

The direct-mapped cache memory is an alternative to associative-cache memory, which uses a single address comparator for the memory system and standard RAM cells for the address and data cells. The direct-mapped cache is based on an idea borrowed from software called hash coding.

This is a method for simulating an associative memory. In the hash coding approach, the memory address space is divided into a number of sets of words with the goal of each set having no more than one word of most-frequently-used data.

Each direct-mapped cache address has two parts. The first part, called the cache index field, contains enough bits to specify a block location within the cache. The second field, called the tag field, contains enough bits to distinguish one block from other blocks that may be stored at a particular location.

For example, consider a 64KB direct-mapped cache that contains 16K 32-bit locations and caches 16MB of main memory. The cache index field must include 14 bits to select one 16K block in the cache, plus 2 bits to select a byte from the 4-byte sub-block. The tag field must be 8 bits wide to identify one of the 256 blocks that can occupy the selected cache location. Therefore, the system requires 64KB of cache RAM (16K 4-byte sub-blocks) to hold the data and code and 16K of 8 bit RAM to hold the tag. The direct-mapped cache organization is shown as follows.

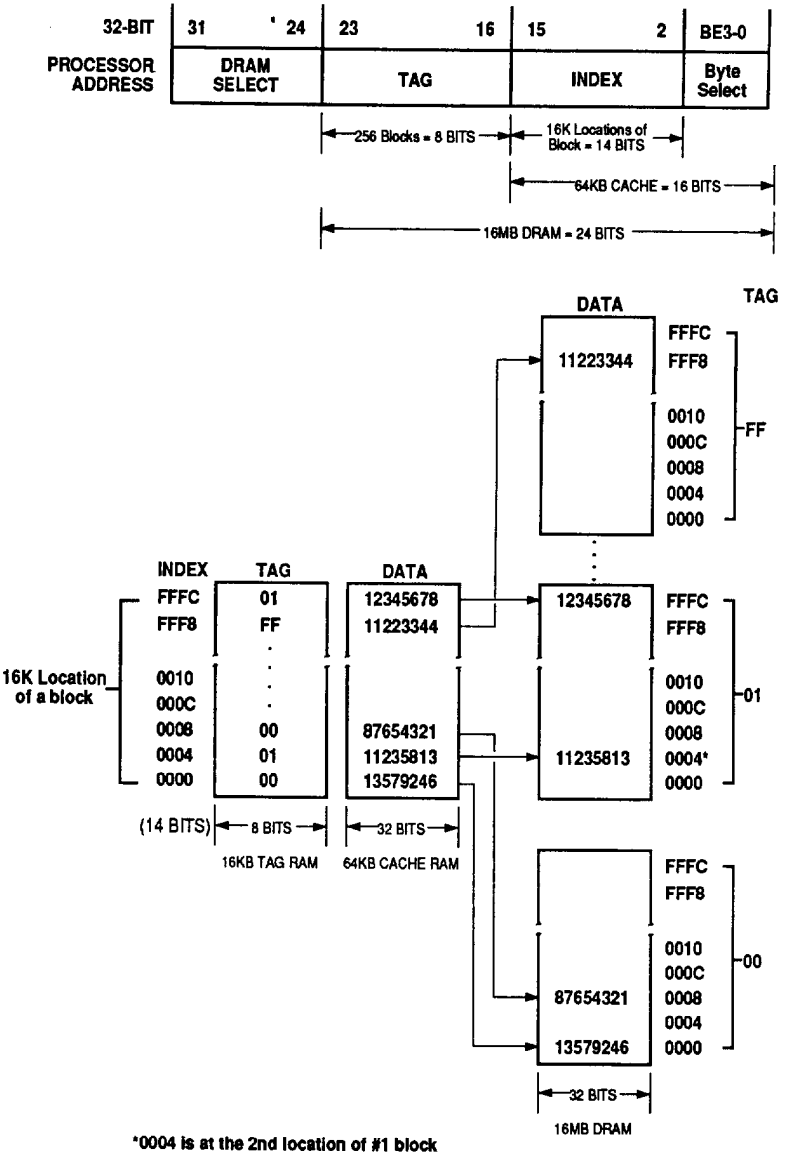


Figure 6-14: Direct-Mapped Cache Organization

The direct-mapped cache organization diagram above shows how data contained in cache are accessed.

For example, if the 80386 requests data at the address FFFFF9h in the main memory, the procedure is as follows:

- The cache-controlled logic determines the cache location from the 14 least significant bits of the index field (FFF8h).
- The cache controlled logic compares the tag field (FFh) with the tag stored at location FFF8h in the tag RAM.
- If the tag matches, the processor reads the second byte of the 4-byte sub-block from the data in the cache RAM.
- If the tag does not match, the cache logic fetches the 4-byte sub-block at address FFFFF8h in the main memory and loads it into location FFF8h of the cache RAM, replacing the current sub-block. The logic also changes the tag stored at locations FFF8h to FFh. The processor then reads the second byte of the new four-byte sub-block.

Cache Updating - Write-Back System

In a write-back system, the tag field of each block in the cache includes a bit called the ALTERED bit. The bit is set if the block has been written with new data and therefore contains data that is more recent than the corresponding data in the main memory. Before writing any block in the cache, the cache-controlled logic checks the altered bit. If it is set, the cache controlled logic writes the block to the main memory before loading new data into the cache.

The write-back system is faster than the write-through system because the number of times an altered block must be copied into the main memory is usually less than the number of write accesses.

Cache Coherency — Hardware Transparency

Write-Back eliminates stale data in the main memory caused by a cache-write operation. However, if a cache is used in a system in which more than one device has access to the main memory (a multi-processing system or a DMA system, for example), another stale data problem is introduced.

If new data is written to main memory by one device, the cache maintained by another device will contain stale data. A system that prevents the stale cache data problem is said to maintain cache coherency. The PEM-3301 uses the method of hardware transparency to maintain cache coherency.

Hardware ensures cache coherency by allowing all accesses to memory mapped by a cache to be seen by the cache. This is accomplished by routing the accesses of the all devices to the memory through the same cache.

The following figures show the cache memory organization and cache memory system implementation of the your mainboard.

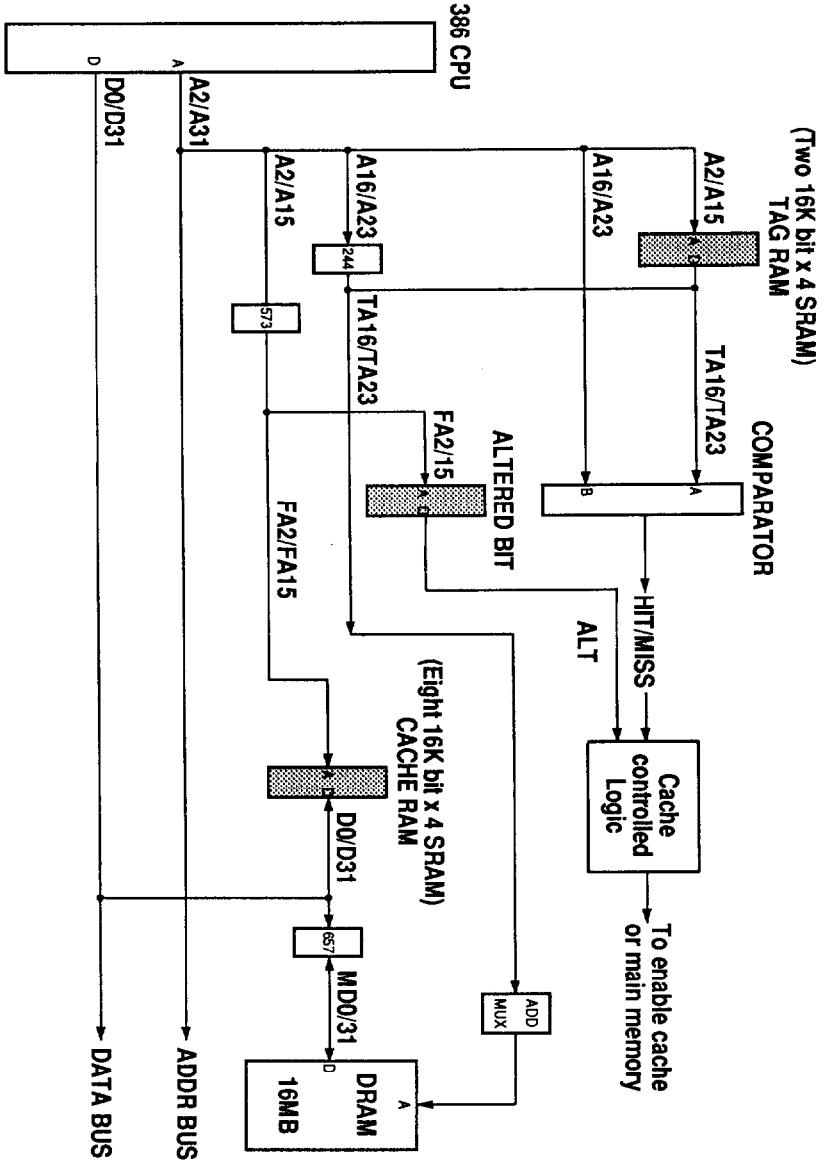


Figure 6-15: Cache Architecture

Bus Width

The 80386 microprocessor supports two types of accesses: Memory, and Input/Output. Each type of access can be 32, 24, 16, or 8 bits wide. Memory and I/O devices can have paths 32, 16, or 8 bits wide. Your mainboard allows any type of access to a device of any width. If necessary, the hardware can break up a 80386 cycle into the required number of cycles(up to 3218 = 4) to allow access to a 16 or 8 bit device.

All the onboard memory devices except the EPROM which contains the BIOS are organized into a 32-bit wide memory. These include the DRAM and the high-speed cache memory.

Memory Subsystem

In the IBM PC-AT, conventional memory or base memory extends from 0 to 640KB. This is the user area, and is available for use by application software.

Physical memory address space from 640KB to 1MB is reserved for the system.

DOS can recognize and use the memory area from 0 to 1MB only. Refer to the figure for the memory map on page 41.

One way of overcoming the 640KB barrier is by using expanded memory. This requires the use of additional bank-switched physical memory (memory organized in banks which can individually be switched on or off) along with LIM Expanded Memory Specification (EMS) compatible Expanded Memory Manager (EMM) software and an application program that is capable of working with the EMM software.

The EMM software first finds a 64KB page frame in the unused part of system memory, divides the frame into four 16KB windows and swaps in four 16KB pages from different areas of the additional physical memory. The Additional page memory used along with an EMS emulator is known as Expanded Memory.

Applications programs (Netware and the XENIX operating system) can use physical memory beyond 1MB without the EMM manager. This additional memory is referred to as Extended Memory.

Your mainboard can have up to 8MB DRAM onboard with different types of DRAM in various configurations (refer to the Configuration section). If necessary, the PEI-306 32-bit memory board can accomodate up to 16MB of system memory.

System Memory Map

The AT-compatible system memory map is as follows:

Starting Address	Amount	Function
000000h	640KB	Primary DOS/Application Area
0A0000h	128KB	Used for graphics display buffers
0C0000h	128KB	Reserved for ROM
0E0000h	64KB	Onboard auxiliary ROM
0F0000h	64KB	System BIOS and BOOT ROM
100000h	15MB	AT compatible extended memory
FF0000h	64KB	Same as 0F0000h

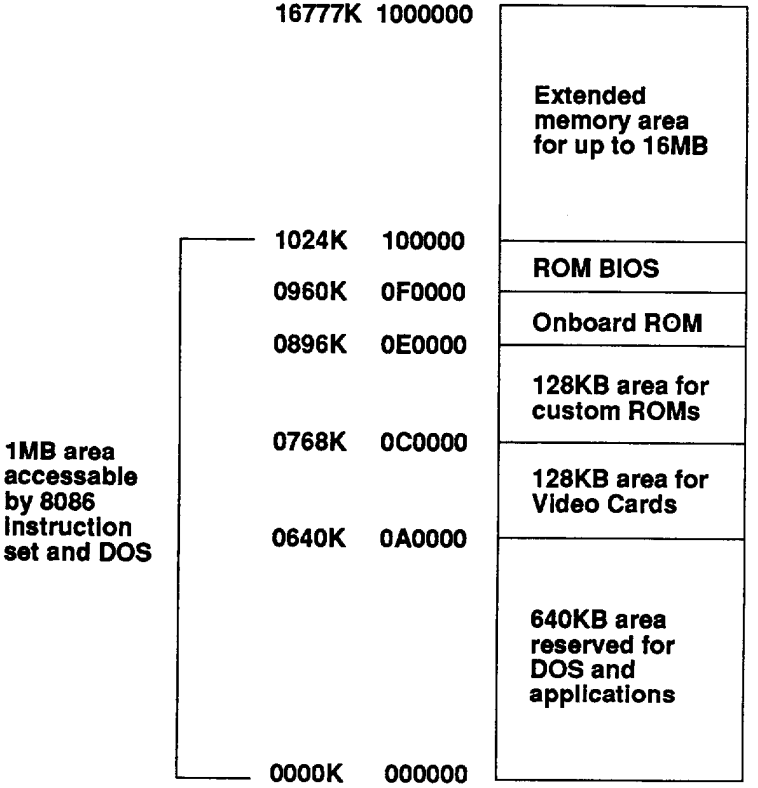


Figure 6-16: System Memory Map

System Timers

There are three programmable timer/counters in the 8254 portion of the VLSI 82C100 chip. The three independent 18-bit counters and six software-programmable counter modes connect to system software

They appear as an array of four external I/O ports. Three ports are used as counters, and the fourth is a control registerfor mode programming. The timer channels are defined as channels 0, 1 and 2.

They are used as follows:

Channel 0	**System Timer**
Gate 0	Always enabled
CLK IN 0	1.190MHz clock
CLK OUT 0	Interrupt Controller, 8259 IRQ0

Channel 1	**Refresh Request Generator**
Gate 1	Always enabled
CLK IN 1	1.190MHz clock
CLK OUT 1	Refresh Request Cycle

Channel 2	**Speaker Tone Generator**
Gate 2	Controlled by bit0 of I/O port hex 61
CLK IN 2	1.190MHz clock
CLK OUT 2	Audio frequency output to speaker

System Interrupts

The CPU may be interrupted by two 8259 Interrupt Controllers in the VLSI 82Cl00 as well as the NMI signal. This allows 16 levels of interrupt, each with its own level of priority. Any interrupt including NMI can be disabled. The following table shows the interrupt level assignments.

Level	**Function**
NMI	Mainboard memory parity or I/O channel check

Level	Function
Microprocessor NMI	Parity or I/O Channel Check
Interrupt Controllers	
CTLR1 CTLR2	
IRQ 0	Timer Output 0
IRQ 1	Keyboard (Output Buffer Full)
IRQ 2	Interrupt from CTLR 2
IRQ 8	Realtime Clock Interrupt
IRQ 9	Software Redirected to INT OAH (IRQ2)
IRQ 10	Reserved
IRQ 11	Reserved
IRQ 12	Reserved
IRQ 13	Coprocessor
IRQ 14	Fixed Disk Controller
IRQ 15	Reserved
IRQ 3	Serial Port 2
IRQ 4	Serial Port 1
IRQ 5	Parallel Port 2
IRQ 6	Diskette Controller
IRQ 7	Parallel Port 1

Table 6-9: Interrupt Controllers

DMA Channels

Your mainboard supports up to seven DMA channels. Two 8237 DMA controllers are in the VLSI 82C100 chip. Each 8237 has four DMA channels. DMA controller 1 has channel 0 through channel 3 and DMA controller 2 contains channel 4 through channel 7. Channel 4 of controller 2 is used to cascade the four channels of the controller 1, namely, channel 0 through channel 3, to the microprocessor. DMA channel assignments are listed below:

CTR 1		CTR 2	
CH0	Spare	CH4	Cascade for CTRL 1
CH1	SDLC	CH5	Spare
CH2	Diskette	CH6	Spare
CH3	Spare	CH7	Spare

Table 6-10: DMA Channels

The channels of DMA Controller 1 support data transfers between 8-bit I/O adapters and 8-bit or 16-bit system memory, and the channels of DMA Controller 2 are used for 16-bit data transfers between 16-bit I/O adapters and 16-bit system memory.

I/O Channel

This section describes the I/O channel, lists the pin assignments, describes each I/O channel signal line and gives the I/O address map.

The I/O channel has the following features:

- I/O address space from 100h to 3FFh
- Selection of data accesses (8-bit or 16-bit)
- 16MB memory address space
- 11 levels of interrupt
- 7 DMA channels
- Open-bus structure (allowing multiple microprocessors to share system resources, including system memory)

- Refresh of system memory by the system microprocessor
- There are six 16-bit adapter (one 62-pin and one 36-pin connector) slots, two 8-bit adapter (one 62-pin connector) slots, and one 32-bit memory board (80-pin connector) slot.

The following illustration shows the pin assignments of the I/O channel connectors.

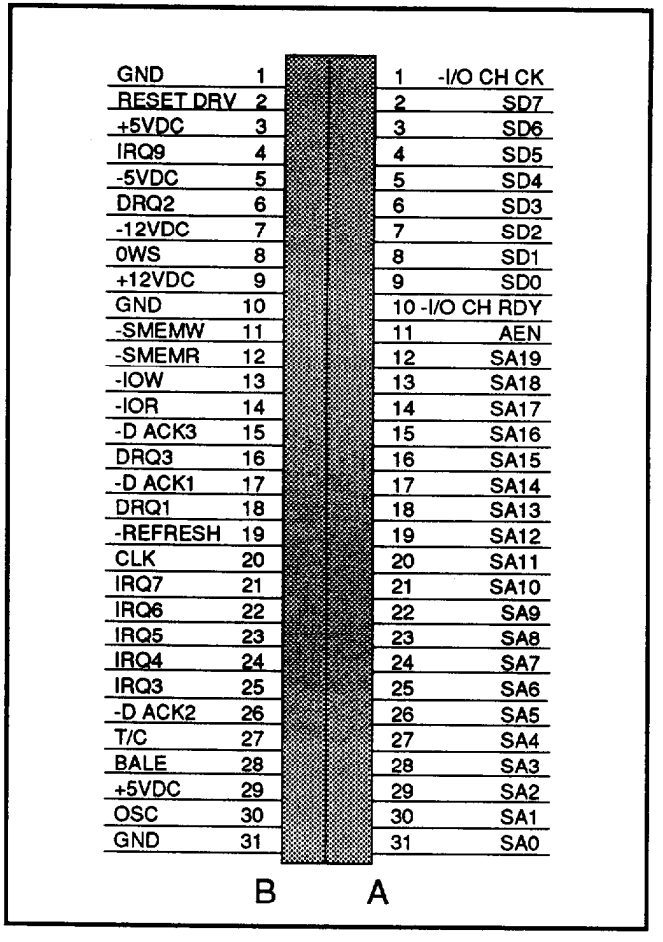


Figure 6-17: Sixty-Two Pin I/O Channels

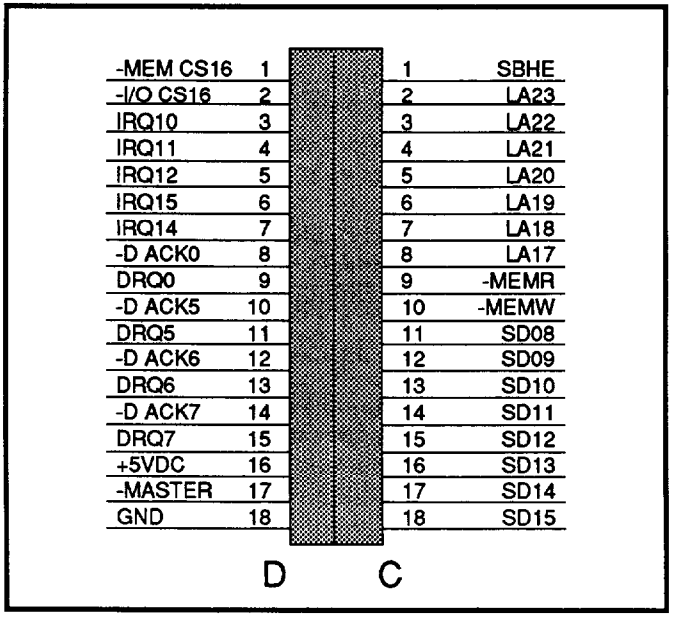


Figure 6-18: Thirty-Slx Pin I/O Channels

I/O Channel Signal Description

The following is a description of the system board's I/O channel signals. All signal lines are TTL-compatible. I/O adapters should be designed with a maximum of two low-power Shottky(LS) loads per line.

SA0 Though SA19 (I/O)

Address bits 0 though 19 are used to address memory and I/O devices within the system. These 20 address lines, in addition to LA17 through LA23, allow access of up to 16Mb of memory. SA0 through SA19 are gated on the system bus when "BALE" is high and are latched on the falling edge of "BALE". These signals are generated by the microprocessor or DMA Controller. They also may be driven by other microprocessors or DMA controllers that reside on the I/O channel.

LA17 Through LA23 (I/O)

These signals (unlatched) are used to address memory and I/O devices within the system. They give the system up to 16 MB of addressability. These signals are valid when "BALE" is high. LA17 through LA23 are not latched during microprocessor cycles and therefore do not stay valid for the whole cycle. Their purpose is to generate memory decodes for 1 wait-state memory cycles. These decodes should be latched by I/O adapters on the falling edge of "BALE". These signals also may be driven by other microprocessors or DMA controllers that reside on the I/O channel.

CLK (0)

This is the 8.25MHz system clock with a cycle time of 121 nanoseconds. The clock has a 50% duty cycle. This signal should only be used for synchronization. It is not intended for uses requiring a fixed frequency.

RESET DRV (0)

"Reset drive" is used to reset or initialize system logic at power-up time or during a low line voltage outage. This signal is active high.

SD0 Through SD15 (I/O)

These signals provide bus bits 0 though 15 for the microprocessor, memory, and I/O devices. DO is the least-significant bit and D15 is the most significant bit.. All 8-bit devices on the I/O channel should use DO through D7 for communications to the microprocessor. The 16-bit devices will use DO through D15. To support 6-bit devices, the data on D8 through D15 will be gated to DO through D7 during 8-bit transfers to these devices: 16-bit microprocessor transfers to 8-bit devices will be converted to two 8-bit transfers.

BALE (0) (Buffered)

"Address latch enable" is provided by the 82288 Bus Controller and is used on the system board to latch valid addresses and memory decodes from the microprocessor. It is available to the I/O channel as an indicator of a valid microprocessor or DMA address (when used with "AEN"). Microprocessor addresses SA0 through SA19 are latched with the falling edge of "BALE" "BALE" is forced high during DMA cycles.

-I/O CH CK (I)

I/O channel check provides the system board with parity (error) information about memory or devices on the I/O channel. When this signal is active, it indicates an uncorrectable system error.

I/O CH RDY (I)

"I/O channel ready" is pulled low (not ready) by a memory or I/O device to lengthen I/O or memory cycles. Any slow device using this line should drive it low immediately upon detecting its vaild address and a Read or Write command. Machine cycles are extended by an integral number of clock cycle (167 nanoseconds). This signal should be held low for no more than 2.5 microseconds.

IRQ3-IRQ7, IRQ9-IRQ12 and IRQ 14 through 15 (I)

Interrupt Requests 3 through 7, 9 through 12, and 14 though 15 are used to signal the microprocessor that an I/O device needs attention. The interrupt requests are prioritized, with IRQ9 through IRQ12 and IRQ14 through IRQ15 having the highest priority (IRQ9 is the highest) and IRQ3 through IRQ7 having the lowest priority (lRQ7 is the lowest). An interrupt request is generated when an IRQ line is raised from low to high. The line must be held high until the microprocessor acknowledges the interrupt request (Interrupt Service routine). Interrupt 13 is used on the system board and is not available on the I/O channel. Interrupt 8 is used for the real-time clock.

-IOR (I/O)

"-I/O Read" instructs an I/O device to drive its data onto the data bus. It may be driven by the system microprocessor or DMA controller, or by a microprocessor or DMA controller resident on the I/O channel. This signal is active low.

-IOW (I/O)

"-I/O Write" instructs an I/O device to read the data on the data bus. It may be driven by any microprocessor or DMA controller in the system. This signal is active low.

-SMEMR (O) -MEMR(I/O)

These signals instruct the memory devices to drive data onto the data bus. “-SMEMR” is active only when the memory decode is within the low 1Mb of memory space. “-MEMR” is active on all memory read cycles. “-MEMR” may be driven by any microprocessor or DMA controller in the system. “-SMEMR” is derived from “MEMR” and the decode of the low 1 Mb of memory. When a microprocessor on the I/O channel wishes to drive “-MEMR”, it must have the address lines valid on the bus for one system clock period before driving “-MEMR” active. Both signals are active LOW.

-SMEMW (O) -MEMW (i/O)

These signals instruct the memory devices to store the data present on the data bus. “-SMEMW” is active only when the memory decode is within the low 1Mb of the memory space. “-MEMW” is active on all memory read cycle. “-MEMW” may be driven by any microprocessor or DMA controller in the system. “SMEMW” is derived from “-MEMW” and the decode of the low 1 Mb of memory. When a microprocessor on the l/O channel wishes to drive “-MEMW”, it must have the address lines valid on the bus for one system clock period before driving “-MEMW” active. Both signals are active low.

DRQ0-DRQ3 and DRQ5-DRQ7 (I)

DMA Requests 0 through 3 and 5 through 7 are asynchronous channel requests used by peripheral devices and the I/O channel micreprocessors to gain DMA service (or control of the system). They are prioritized, with “DRQ0” having the highest priority and “DRQ7” having the lowest. A request is generated by bringing a DRQ line to an active level. A DRQ line must be held high until the corresponding “DMA Request Acknowledge” (DACK) line goes active. “DRQ0” through “DRQ3” will perform El-bit DMA transfers; “DRQ5” through “DRQ7” will perform 16-bit transfers. “DRQ4” is used on the system board and is not available on the I/O channel.

-DACK0 to -DACK3 and -DACK5 to -DACK7 (0)

-DMA Acknowledge 0 to 3 and 5 to 7 are used to acknowledge DMA requests (DRQ0 through DRQ7). They are active low.

AEN (O)

"Address Enable" is used to degate the microprocessor and other devices from the I/O channel to allow DMA transfers to take place. When this line is active, the DMA controller has control of the address bus, the data-bus Read command lines (memory and l/O), and the Write command lines (memory and I/O)

-REFRESH (I/O)

This signal is used to indicate a refresh cycle and can be driven by a microprocessor on the I/O channel.

T/C (0)

"Terminal Count" provides a pulse when the terminal count for any DMA channel is reached.

SBHE (I/O)

"Bus High Enable" (system) indicates a transfer of data on the upper byte of the data bus, SD8 through SD15. Sixteen-bit devices use " SBHE" to condition data bus buffers tied to SD8 though SD15.

-MASTER (I)

This signal is used with a DRQ line to gain control of the system. A processor or DMA controller on the I/O channel may issue a DRQ to a DMA channel in cascade mode and receive a "-DACK". Upon receiving the "-DACK", an I/O microprocessor may pull "-MASTER" low, which will allow it to control the system address, data, and control lines (a condition known as tri-state): After "-MASTER" is low, the I/O microprocessor must wait one system clock period before driving the address and data lines, two clock periods before driving the address and data lines, and two clock periods before issuing a Read or Write command. If this signal is held low for more than 15 microseconds, system memory may be lost because of a lack of refresh.

-MEM CS16 (I)

"-MEM 16 Chip Select" signals the system board whether the present data transfer is a 1 wait-state, 16-bit, memory cycle. It must be derived from the decode of LA17 through LA23. "-MEM CS16" should be driven with an open collector or tri-state driver capable of sinking 20 mA.

OSC (O)

"Oscillator" (OSC) is a high-speed clock with a 70-nanosecond period (14.31818 MHz). This signal is not synchronous with the system clock. It has a 50% duty cycle.

OWS (I)

The "Zero Wait State" (OWS) signal tells the microprocessor that it can complete the present bus cycle without inserting any additional wait cycles. In order to run a memory cycle to a 16-bit device without wait cycles, "OWS" is derived from an address decode gated with a Read or Write command. In order to run a memory cycle to an 8-bit device with a minimum of two wait states, "OWS" should be driven active one system clock after the Read or Write command is active gated with the address decode for the device. Memory Read and Write commands to an 8-bit device are active on the falling edge of the system clock. "OWS" is active low and should be driven with an open collector or tri-state driver capable of sinking 20 mA.

I/O Address Map

The I/O address map of your mainboard is given below. Note that the I/O addresses from hex 000 to hex OFF are reserved for the mainboard, and the addresses from hex 100 to hex 3FF are available on the AT I/O bus.

Address Range	Device
000-01 F	DMA Controller 1, 8237
020-03F	Master Interrupt Controller, 8259
040-05F	Timer, 8254
060-06F	Keyboard Controller, 8042
070-07F	Real-time clock, NMI mask
080-09F	DMA Page Register,74LS612
0A0-0BF	Interrupt Controller2, 8259
0C0-0DF	DMA Controller 2, 8237
0F0	Clear Math Coprocessor Busy
0F1	Reset Math Coprocessor
0F&0FF	Math Coprocessor
1 F0-1F8	Fixed Disk
200-207	Game I/O
278-27F	Parallel Printer Port 2
2F8-2FF	Serial Port 2
300-31 F	Prototype Card
360-36F	Reserved
378-37F	Parallel Printer Port 1
380-38F	SDLC, bisynchronous 2
3A0-3AF	Bisynchronous 1
3B0-3BF	Monochrome Display and Printer Adapter
3C0-3CF	Enhanced Graphics Display Adapter
3D0-3DF	Color Graphics Monitor Adapter
3F0-3F7	Diskette Controller
3F8-3FF	Serial Port 1

Table 6-11: I/0 Address Map

Keyboard Controller

The keyboard controller is based on the 8042(U128) single-chip microprocessor and is used to support the PEM-3301 keyboard interface. The keyboard controller performs the following functions:

- Receives serial data from keyboard, checks parity, translates it into a system scan code, if necessary, transfers data to the data buffer and interrupts the processor.
- Executes system commands, places the results in the data buffer and interrupts the processor if necessary.
- Transmits the system data in the data buffer to the keyboard in the serial format along with the parity bit. Reports the response of the keyboard to the system.
- Reports errors to the system through the status register.

The keyboard controller has two 8-bit ports. One of them serves as an input port, while the other serves as an output port. Besides these, there are two test inputs. One of them, namely TEST0, is used to monitor the state of the clock line, while the other, namely TEST1, is used to read the state of the keyboard's data line.

Input Port Bit	Definition
Pin 27 - Bit 0	Undefined
Pin 28 - Bit 1	Undefined
Pin 29 - Bit 2	Undefined
Pin 30 - Bit 3	Undefined
Pin 31 - Bit 4	Undefined
Pin 32 - Bit 5	Undefined
Pin 33 - Bit 6	Undefined
Pin 34 - Bit 7	Keyboard Inhibit Switch 0 Inhibited 1 Not inhibited

Output Port Bit	Definition
Pin 21 - Bit 0	System Reset
Pin 22 - Bit 1	Gate A20 of system processor 0 A20 inhibited 1 A20 Not inhibited
Pin 23 - Bit 2	Undefined
Pin 24 - Bit 3	System speed selection 0 Normal 1 33MHz, Turbo
Pin 35 - Bit 4	Output buffer full 0 Not full 1 Full (IRQ1)
Pin 36 - Bit 5	Undefined
Pin 37 - Bit 6	Keyboard clock (output)
Pin 38 - Bit 7	Keyboard data (output)

32-Bit Memory Expansion Bus

The 32-bit memory expansion bus optimizes the memory subsystem to take advantage of the 32-bit architecture of the 80386. This bus is not intended to be a general-purpose, industry-standard of the 32-bit expansion bus. It is simply a mechanism to optimize the performance of the PEM-3301 memory subsystem for the 80386 architecture.

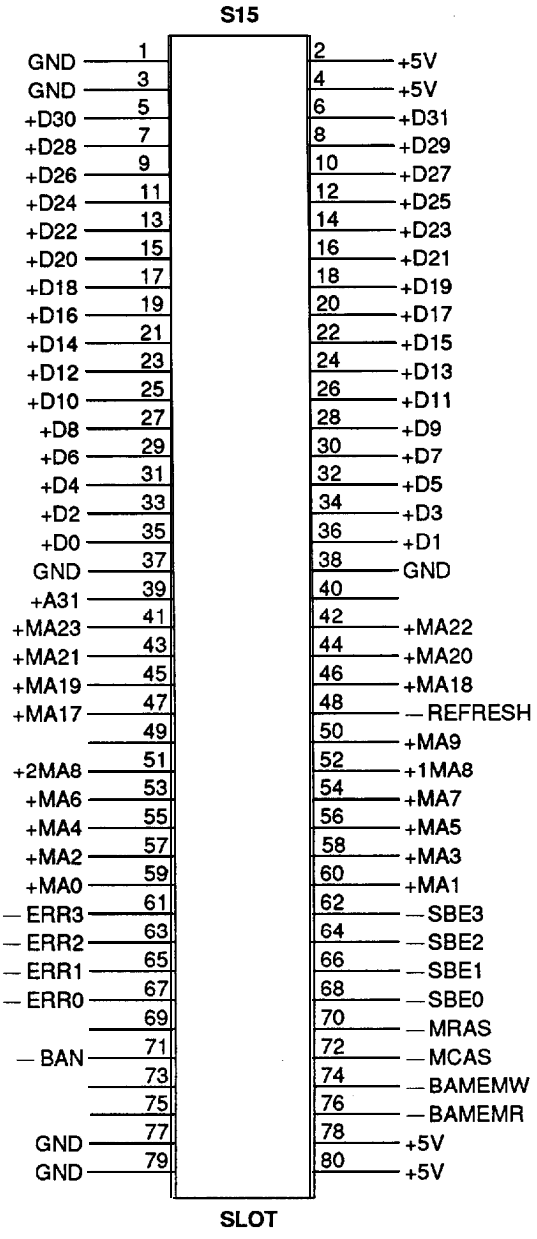
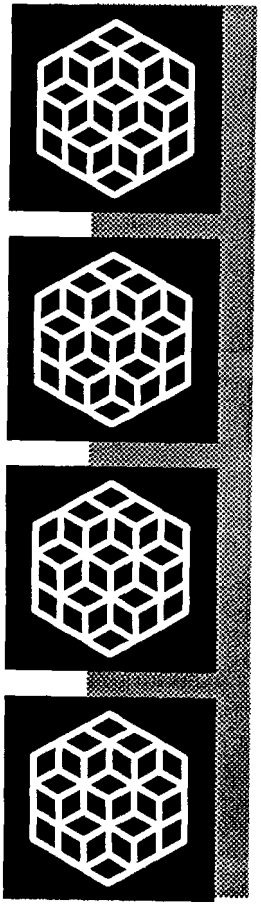


Figure 6-19: Pin Assignments of the 32-bit Memory Expansion Bus



Chapter 7
Glossary

Glossary

Some of the terms you will come across frequently in this manual are defined here.

add-on card

- This card connects through expansion slots to the motherboard. Also known as an adapter, expansion, or interface card, this is used to increase the capabilities of your computer.

address

- A value given to specific memory locations so that data can be read or written is called an address. Make sure that devices do not have the same address. Otherwise, there will be an address conflict.

ASCII

- This is an acronym for the American Standard Code for Information Interchange. ASCII code includes both control and graphic characters, and is used for exchanging information between data-processing systems, data-communication systems and related equipment.

asynchronous communication

- A type of information vehicle whereby data can be transmitted at any time without requiring synchronized timing.

back up (v)

- To make a spare copy of a disk or of a file.

backup (n)

- A copy of a disk or file.

bank

- The area on a printed circuit board for RAM chips is usually divided into rows. These are called banks.

BIOS

- This stands for Basic Input Output System. BIOS controls the real-time clock and disk drives as well as the computer's peripheral equipment.

bit

- This is a binary data digit, either 1 or 0. The digit 1 or 0 represents a single unit of data.

boot

- This means to turn on the power switch and load the operating system (DOS) into the computer so that it is ready to accept software applications.

bus

- This is a set of lines that transmit signals/information between the components within the computer. If the I/O channel is 32-bit, this means the data travels at least twice as fast as data on a 16-bit data bus.

byte

- A group of data units forming a single unit of data. There are eight bits in a single byte.

clock (processing) speed

- This measurement, usually given in MHz (megahertz) tells how fast the microprocessor in your computer handles data. The higher the number, the faster your computer.

CPU

- Central Processing Unit. Also known as a microprocessor. This chip processes all the instructions in the computer.

computer

- An electronic device that can receive, store and transmit data, and process arithmetic or logic operations.

cursor

- The blinking, moving spot of light that marks the active place on the monitor.

data

- Any kind of information. However, this word is generally used to describe computer-related information.

debugging

- A method for correcting computer errors.

default

- This is an existing setting in a computer.

DIP

- This is an acronym for Dual In-line Package, which is a method for packaging integrated circuits.

directory

- A directory works like a desk drawer to store files. It contains not only your files but also the information on the size of the file and the dates they were created and updated. It is always good practice to organize related files in a single directory.

diskette

- This refers to removable data storage disks, sometimes also called floppies or floppy disks. Diskettes generally come in two sizes: 5.25" and 3.5".

disk drive

- A device that stores and retrieves data.

display

- The information/graphics visible on the monitor screen.

DOS

- Disk Operating System. This set of commands is used to control the operations of a computer and its peripheral components.

DRAM

- Dynamic Random Access Memory. This type of RAM chip differs from Static Random Access Memory (SRAM).

driver

- A program that lets a peripheral device and a computer function harmoniously; a hard disk driver controls exchanges between a hard disk and a computer.

expansion slot

- This is a slots in which adapters and/or cards can be housed.

file

- A file is a collection of related information/data you store on a diskette or a hard disk drive.

filename

- Each file on a disk has a name. This name has two parts: a filename and an extension. In DOS, filenames are from one to eight characters long. An extension starts with a period, has three characters and follows immediately after the filename.

fixed or hard disk

- This is a non-removable disk used for storage of large volumes of data.

format

- The arrangement of data on a magnetic disk. Format also means to prepare a disk.

hardware

- All physical components of a computer.

Hz

- Hertz. This signifies one complete cycle of a wave signal.

I/O

- Input/Output. The transfer of data between the computer and its peripheral components.

IC

- Integrated Circuit.

interface

- A means for electronic machines to communicate. Interface also means to communicate with a computer and its peripheral components.

kilobyte (KB)

- A single data unit that is composed of 1024 bytes.

math coprocessor

- A math coprocessor lets you do arithmetic and calculations more efficiently.

megabyte (MB)

- A single data unit that is composed of 1,048,576 bytes.

memory address

- A hexadecimal or decimal value given to a memory location.

microprocessor

- This is an integrated circuit that receives coded instructions for execution. It is also referred to as a CPU.

modem

- A modem connects your computer with other computers over telephone lines.

motherboard

- It is the main printed circuit board in the system case. It is also known as a mainboard or systemboard.

MS-DOS

- The Microsoft Disk Operating System. This is the most popular operating system for IBM PCs and compatibles.

network

- A network lets everyone in your group communicate with one another or share the cost of high-performance resources.

ns

- Nanoseconds. This is a unit of time measurement for processing speed.

operating system

- This is software that controls the execution of programs.

output

- Any information or bits of data that are channeled from one electronic device to another.

partition

- A disk drive can be divided into several logical sections or partitions, each of which becomes a logical device with a drive letter.

peripheral

- Output devices which are driven by the computer.

port

- A communication channel between a computer and its peripheral components.

printed circuit board

- An electronic circuit board sandwiched between fiberglass plates.

program

- A series of instructions that command the computer to perform certain tasks.

prompt

- A screen message or position of the cursor at the beginning of a line.

RAM

- Random Access Memory; read/write memory. The memory in a computer while it is activated. When the power is turned off, this type of memory is cleared.

ROM

- Read Only Memory. This is data stored on an IC in the computer.

RS-232

- RS232 is a standardized communications interface between data communication equipment and your computer.

setup

- This section guides you through the preparations you'll need to make before operating your computer. If this is your first computer, you're advised to read this section carefully. Although this system has been designed to be as foolproof as an ordinary television set, a careful reading of this section will help you to ensure the long life and troublefree operation of your computer.

software

- Computer programs such as a word processor, operating system or programming languages.

synchronous transmission

- Syncopated transmission of signals between devices.

Turbo

- High-speed

virtual disk

- Also referred to as a RAM disk, this is a portion of memory used to simulate a hard disk.

window

- An independent screen that can be invoked onto the monitor and in which data can be viewed, altered or stored.