

Computer Hardware



Notes

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Notes

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CHAPTER 1 IDENTIFYING COMPONENTS AND THEIR USE

3

Unit 1.Chapter 1

1

Name : Identifying components and their use

1.1.1 What is a computer?

The term computer is used to describe a device made up of electronic and electro mechanical components. The computer itself cannot perform any task and is referred to as hardware.

A computer system consists of three elements.



Fig 1.1.1 Components of a Computer System

1. Hardware
2. Software
3. People

Hardware : The physical components which you can see, touch and feel in the computer system are called hardware Eg monitor, keyboard, mouse etc.

Software : Software is used to describe the instructions that tells the computer how to perform a task. Software is categorized

- 1) System softwares (eg . operating systems, compilers, editors etc)
- 2) Application softwares (MS-word, excel, accounting packages etc)

People : People who operate the computer and also create computer software instructions.

1.1.2 Computer hardware

Basic components in a computer system are central processing unit (CPU), memory, the input device and output device.

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Computer systems - Micros, Minis and Mainframes.

Micro computer : Micro computer is also called as personal computer or PC. It has a processor based on a single silicon chip. Personal computers come in three different physical sizes, pocket pc's, lap pc's and desktop pc's. Pocket pc's and lap pc's belong to portable category. Microcomputer is used in small businesses.

Ex : IBM compatible or IBM clone and Apple Macintosh systems.

Multiuser microcomputers. Until recently microcomputers were personal computers for individual use only. But now days several microcomputers can be networked together for simultaneous used by several people.

Mini computers: Mini computer is simply a small mainframe computer. It is a reduced version of mainframe. Attached printers are not so fast. So it has less storage capacity less processing speed of that of mainframe computers. They are usually used by small businesses. For example research groups, engineering firms, colleges etc. use mini computers.

Mainframe computers: A mainframe computer is a large expensive machine whose processing speed is very high and has large amount of secondary storage and fast printers. A large mainframe computer may be used to meet the data processing requirements of the entire organization.

Examples: airline booking systems, Railway booking systems , weather forecast etc.

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Name : Identifying components and their use

PC stands for personal computers, XT stands for eXTended PC, and AT stands for an advance technology PC.

The XT basically was a PC system that included a hard disk for storage in addition to the floppy drive found in the basic PC system. These systems has an

8- bit processor and an 8-bit INDUSTRY STANDARD ARCHITECTURE (ISA) bus for system expansion. Bus is the name given to expansion slots in which additional plug in circuit board can be installed.

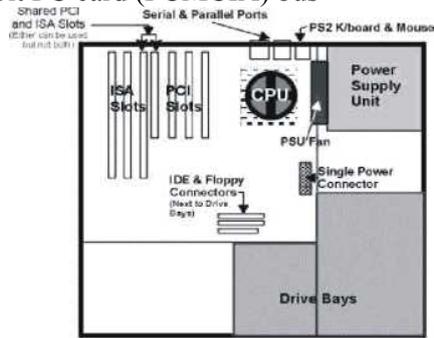
16-bit and greater systems are said to be AT class. 16-bit (and latter 32 and 64 bit) processors and expansion slots are included. The first AT class systems

had a 16-bit version of the ISA bus which is an extension of the original 8-bit ISA bus found in the PC/XT class systems. Afterwards several expansion slots were developed for AT class systems.

Example

16/32 bit PS/2 microchannel architecture (MCA) bus.

16-bit PC card (PCMCIA) bus



ATX Format (Basics only shown)



Fig 1.1.3 PS/2 Port

Fig 1.1.2 ATX Format

16 bit ISA bus

16/32 bit Extended ISA(EISA) bus

32/64 - bit card Peripheral Component Interconnect (PCI) bus.

The easiest way to identify a PC/XT system is by the 8-bit ISA expansion slots regardless of the processor present in the system. AT systems can be similarly identified by having 16-bit or greater slots of any type (ISA, EISA, PCI) slots.

1.1.3 System components

Component needed to assemble a basic modern PC system.

- ◆◆◆ Motherboard
- ◆◆◆ Processor
- ◆◆◆ Memory (Primary)
- ◆◆◆ Hard disk
- CD-ROM ◆◆◆
- Floppy Drive ◆◆◆
- Keyboard
- Mouse ◆◆◆
- Monitor
- ◆◆◆ Power Supply
- ◆◆◆ Cabinet

Motherboard : motherboard is the important component of the computer as everything else is connected to it. And it controls everything in the system. Motherboard are available in several different shapes.

Motherboard usually contain the following individual components.

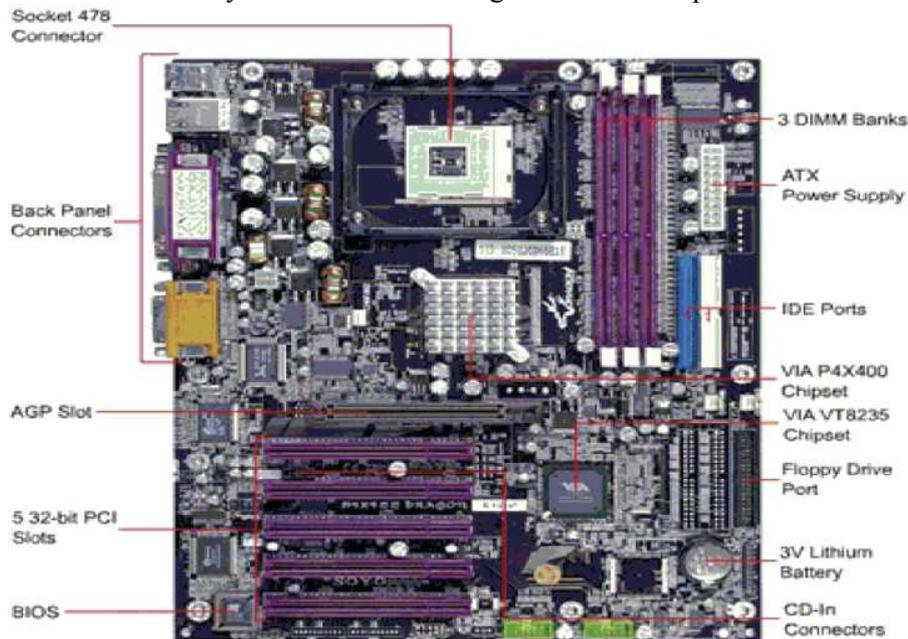


Fig 1.1.4 Motherboard

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- 1) Processor slot
- 2) Processor voltage regulators
- 3) Motherboard chipset
- 4) Level 2 cache
- 5) Memory SIMM or DIMM sockets
- 6) Bus slots
- 7) ROM BIOS
- 8) Clock / CMOS battery
- 9) Super I/O chips **Processor**



Fig 1.1.5 Processor Chips

The processor is often thought of as the engine of the computer. Then the processor reads the commands from the memory and then executes them. The processor is one of the most expensive parts of the computers and is also one of the smallest parts.

Primary Memory

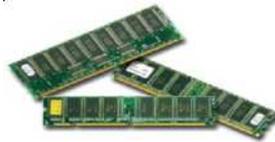


Fig 1.1.6 Memory Chips

Memory : Is used to hold programs and data during execution.

Primary memory is often called as RAM(Random Access Memory). It holds all the programs and data the processor is using at a given time. RAM is volatile because its contents are erased when power is switched off.

The other type of system memory is ROM(Read only Memory)which is permanent because its contents are not erased even when power is switched off. It is usually used to load an operating system.

8 Hard disk drive

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Fig 1.1.7 Hard Disk Drive A hard drive consists of spinning platters made up of aluminum or ceramic that is coated with magnetic media. The platters come in various sizes. The hard drive with many different storage capacities can be created depending upon the density, size and number of platters.

This is also called as Secondary memory. There can be several programs in the system, which cannot be stored in RAM, so we need a very huge non-volatile memory, which can be used for storing all the programs, and data when the system is not in use are called as Hard disks.

CD-ROM drive



Fig 1.1.8 CDROM Drive CD-ROM stands for compact disk read only memory. It consists of small disks similar to the gramophone records to hold digital information. As the name applies they are read only medium. With the advancement in technology writable CD's are also available.

Floppy Disk Drive



Fig 1.1.9 Floppy Disk Drive Floppy disks are the slowest and the smallest form of secondary storage. They provide a simple way to carry information from one place to another, and backup small amount of files. In modern days floppy drive component is not as important as it was years ago. All PC's made in the last 10 years use a standard 3 ^ inch, 1.44 MB capacity floppy drive.

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Name : Identifying components and their use

Keyboai ~

input
most
It is
input



1.1.10 Keyboard

Fig⁹
The keyboard is the main device for computers. It is used to text or enter commands

into the PC. Nowadays keyboards with additional features are available like multimedia keyboard, wireless keyboard.

Mouse



Fig 1.1.11 Mouse

With the invention of graphical user interface mouse is used to input information into the computer. Users simply point and click to enter information. The main advantage of mouse over keyboard is simplicity. And there are many operations that are much easier to perform with a mouse than a keyboard.

Monitor



Fig 1.1.12 Monitor

The monitor is the specialized high-resolution screen similar to a television. The video card sends the contents of its video memory to the monitor at a rate of 60 or more times per second. The actual display screen is made up of red, green and blue dots that are illuminated by an electron beam from behind. The video card DAC chip controls the movement of the electron beam, which then controls what dots are turned on and how bright they are. Which then determines the picture you see on the screen.

Power supply



Fig 1.1.13 Power Supply(SMPS)

SMPS(Switch Mode Power Supply): The power supply supplies power to every single part in the PC. The main function of the power supply is to convert the 230 V AC into 3.3 V, 5 V and 12 V DC power that the system requires for the operations.

In addition to supplying power to run the system, the power supply also ensures that the system does not run unless the power supplied is sufficient to operate the system properly. The power supply completes internal checks and tests before allowing the system to start. If the tests are successful, the power supply sends a special signal to the motherboard called **Power_Good**. If this signal is not present continuously, the computer does not run. Therefore, when the AC voltage dips and the power supply becomes stressed or overheated, the **Power_Good** signal goes down and forces a system reset or complete shutdown

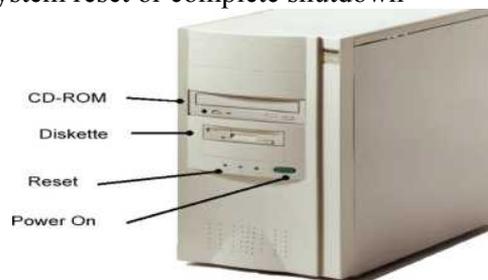


Fig 1.1.14 Cabinet

The box or outer shell that houses most of the computers. The cabinet actually performs several important functions for your PC including protection to the system components, directing cooling airflow, and allowing installation of and access to the system components. The cabinet often includes a matching power supply and must also be designed with shape of the motherboard and other system components in mind.

Chapter 1

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Name : Identifying components and their use **Peripheral Devices**

Any external device, which is not necessary to perform the basic operation of computer, is called as peripherals. They provide additional computing

capabilities. For ex : Printers, Modems, Speakers etc.

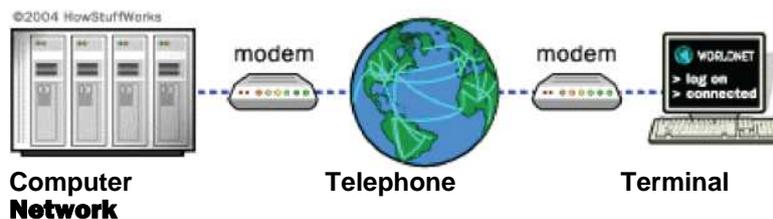
Modem



Fig 1.1.15 Modem

Modem (Modulator and Demodulator) is typically used to send digital data over a phone line. The sending modem converts digital data into analog data, which can be transmitted over telephone lines, and the receiving modem converts the analog data back into digital form. This is used to connect to Internet.

A typical arrangement is shown below in fig 1.1.16



Modems are available in different capacities.

- 300 bps - 1960s through 1983 or so
- 1200 bps - Gained popularity in 1984 and 1985
- 2400 bps
- 9600 bps - First appeared in late 1990 and early 1991
- 19.2 kilobits per second (Kbps)
- 28.8 Kbps
- 33.6 Kbps
- 56 Kbps - Became the standard in 1998
- ADSL, with theoretical maximum of up to 8 megabits per second

(Mbps) - Gained popularity in 1999 **Printers**

The capability to produce a printed version often called a hard copy of a document is the primary function of a printer.

Different types of printers are 1) Laser 2) Inkjet 3) Dot-Matrix.

Summary:

- 1) A computer is made up of electromechanical and electronic compo-

nents.

- 2) Software is used to make computer usable.
- 3) Based on the microprocessor systems are classified as PC-XT and PC-AT
- 4) Important components of a system are processor, memory, keyboard, mouse, monitor etc.
- 5) SMPS converts AC (Alternate Current) into DC (Direct Current).

Short type Questions: -

1. What is a computer?
2. Name different types of computers?
3. Name the system components?
4. How many types of memories are there?
5. What is SMPS?
6. Which type of input is given to SMPS?
7. What is the difference between ROM and RAM?

Essay type questions: -

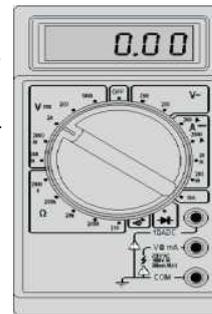
1. Name the types of system components and explain them briefly?
2. What is a MODEM? What is its use?
3. Discuss the use of SMPS?

Name : Measuring Voltages at different levels

1.2.1 What is a multimeter? A meter is a measuring instrument. An **ammeter** measures current, a **voltmeter** measures the potential difference (voltage) between two points, and an **ohmmeter** measures resistance. A **multimeter** combines these functions, and possibly some additional ones as well, into a single instrument

A multimeter can serve many purposes including checking for voltage signals at different points in a system, testing the output of the power supply and checking for continuity in a circuit or cable.

Fig 1.2.1 Digital Monitor



Digital multimeter (DMM)?

One simple test that you can perform on a power supply is to check the output voltages. This shows whether a power supply is operation correctly and whether the output voltages are within the correct tolerance range.

You must measure all voltages with the power supplies connected to a proper load. Which usually means testing while the power supply is installed in the system.

Measuring voltage: To measure voltage on the system that is operating you must use a technique called back probing on the connectors (These are the red, yellow, orange, black and white wires coming out of power supply). You must measure the voltages when system is powered on. Nearly all the connectors you need to probe have openings in the back where the wires enter the connector.

The meter leads are narrow enough to fit into the connector beside the wire and make contact with the metal terminal inside. The technique is called back probing because you are probing the connector from the back. You must use this back probing technique to perform all of the following measurements.

To test a power supply for the proper output, check the voltage at the Power_Good pin for +3v to +6v of power. If the measurement is not within this range, the system never sees the Power_Good signal and therefore does not start or run properly. In most cases, the power supply is bad and must be replaced.

Continue by measuring the voltage ranges of the pins on the motherboard and

Hard Disk power connectors. If you are measuring voltages for testing purposes any reading within 10 % of the specified voltage is considered acceptable, although most manufactures of high quality power supplies specifies a tighter 5% tolerance. For ATX power supplies, the specification requires that voltages must be within 5% of the rating , except for the 3.3v current which must be within 4%.

| Desired Voltage | Loose tolearance Min (-10%) Max(+8%) | | Tight tolerance Min (-5%) Max(+5%) | |
|-----------------|--------------------------------------|-------|------------------------------------|--------|
| | | | | |
| +3.3v | 2.97v | 3.63v | 3.135v | 3.465v |
| +/- 5.0v | 4.5v | 5.4v | 4.75v | 5.25v |
| +/- 12.0v | 10.8v | 12.9v | 11.4v | 12.6v |

within the to Power_Good signal has tolerances that are different from the other signals, although it is nominally a +5v signal in most systems. The trigger point for Power_Good is about +2.5v,

| Signal | Minimum | Maximum |
|----------------|---------|---------|
| Power_good +5v | 3.0v | 6.0v |

but most systems require the signal voltage to be

Replace the power supply if the voltages are measured out of these ranges. Again, it is worth noting that any and all power supply tests and measurements must be made with the power supply properly loaded, which usually means that it must be installed in a system and the system must be running.

2.1.2 Meters

The DMM has a pair of wires called test leads or probes. The test leads make the connections so that you can take readings, depending on the meters setting; the probes measure electrical resistance, direct current (DC) voltage, or alternating Current (AC) voltage.

Usually, each system-unit measurement settings has several ranges of operations. DC voltage, for example, usually can be read in several scales, to a maximum of 200mv, 2v, 20v, 200v and 1000v. Because computers use both +5v and +12v for various operations you should use the 20v maximum scale for making your measurements. Making these measurements on the 200mv or 2v scale would possibly damage the meter because the voltage would be much

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