GAGE UNIVERSITY COLLEGE

BASIC COMPUTER SKILL

PART I
Introduction to Computer Hardware and Software

Goals For today

- To know What a computer and computer system is.
- To Define hardware and software
- To know about main parts of a computers hardware components
- Assembling a computer,

What is a computer?

- A ***compute***r can be defined as a machine (composed of electronic and electric circuits), which can perform arithmetic operations and logical decisions with defined pattern of instructions called software.
- Electronic device operating under the control of instructions stored in its own memory
- The computer
  - first, Accepts data such as raw facts, figures, and symbol
  - then, Processes data into information (Data that is organized, meaningful, and useful)
  - finally, Produces and stores results

Classification according to functionality

- Based on physical size, performance and application areas,
- Microcomputer: a small, low cost digital computer
  - Desktop:
  - Laptop (notebooks)
    - portable
    - rechargeable battery
    - More expensive
  - Hand held (PDA) (palmtop)
    - stored in a pocket

Classification according to functionality

- Mini Computer: developed around 1960s
- costs more than a micro computer
- Have limited functionality
- Typically supported many users
- More powerful than micro
- in terms of processing power and capability
  - industries, research organizations, colleges, and universities.

Classification according to functionality

- **Mainframe Computers**

- Used by large businesses
- Typically supported thousands of users
- Very expensive
- Used for very large processing tasks
- Because of the computer's cost and the value of the information stored there, the rooms in which mainframes are located have security systems allowing only authorized personnel to enter.

Classification according to functionality

- Super computers
  - fast processing power
  - It basically contains a number of CPUs that operate in parallel to make it faster.
  - for solving scientific and engineering problems. (complex mathematical equations**) aerodynamics, metrology**
  - used by NASA and similar organizations

Classification by the method of operation (processing)

- *Analog*
- *Digital*
- *and hybrid Computers*

Classification by the method of operation (processing)

Analog Computers

- Analog computers operate by measuring. They deal with continues variables, they don't compute directly with numbers, rather, they operate by measuring physical magnitude such as pressure, temperature, voltage, current etc.

Examples

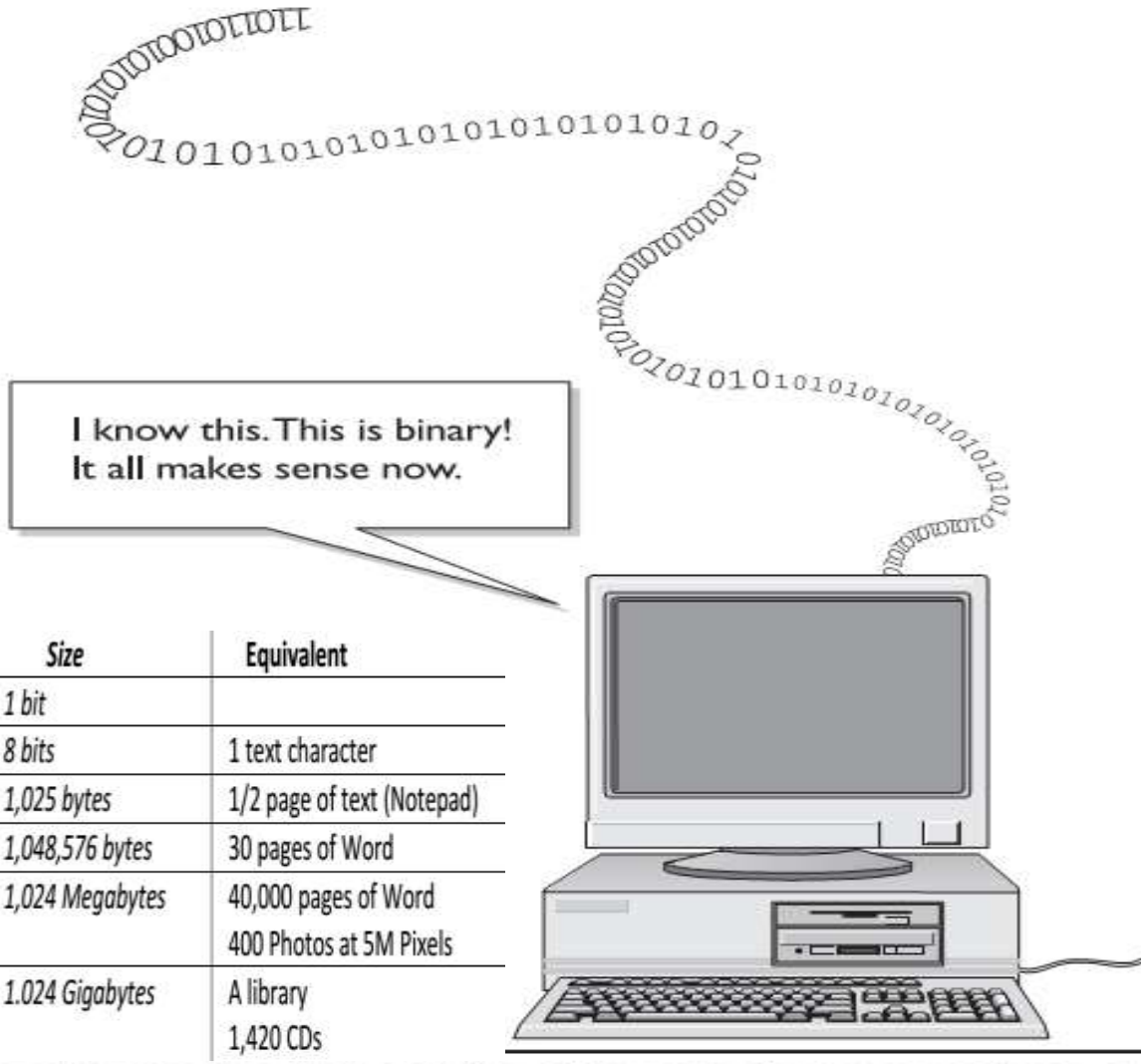
- Thermometer
- Voltmeter
- Speedometer
- They are special purpose computers.
- However, analog computers have limited accuracy

Classification by the method of operation (processing)

Digital Computers

- Digital computers deal with discrete variables, they operate by counting rather than measuring. They operate directly up on numbers (or digits) that represent numbers, letters, or other special symbols.
- Examples:
- Abacus
- Desk & pocket computers
- The general purpose computers
- Digital computers have very high accuracy and speed than the analog ones.

These commands are just ones and zeroes that the computer's hardware understands.



Unit	Abb.	Size	Equivalent
Bit		*1 bit*	
Byte		*8 bits*	1 text character
Kilobyte	K	*1,025 bytes*	1/2 page of text (Notepad)
Megabyte	MB	*1,048,576 bytes*	30 pages of Word
Gigabyte	GB	*1,024 Megabytes*	40,000 pages of Word 400 Photos at 5M Pixels
Terabyte	TB	*1.024 Gigabytes*	A library 1,420 CDs

-1 Computer musing that a string of ones and zeroes makes per

ALPHABET IN BINAR

A	01000001
B	01000010
C	01000011
D	01000100
E	01000101
F	01000110
G	01000111
H	01001000
I	01001001
J	01001010
K	01001011
L	01001100
M	01001101
N	01001110
O	01001111
P	01010000
Q	01010001
R	01010010
S	01010011
T	01010100
U	01010101
V	01010110
W	01010111
X	01011000
Y	01011001
Z	01011010

ALPHABET IN BINAR

a	01100001

Classification by the method of operation (processing)

Hybrid computers

- The best features of analog and digital computers can be combined into a single device to form a hybrid computer. *A hybrid computer processes the information by collecting input data with analog method, converts it into digital quantities, processes the digital values, and converts the output from digital to analog form.*

- Example:
- In hospital insensitive-care unit analog devices may measure a patient's heart function, temperature and other vital signs. These measurements may then be converted into numbers and supplied to a digital component in the system. This component is used to monitor the patient's vital signs and to send an immediate signal to the nurse's station if any abnormal readings are detected.
-

APPLICATIONS OF COMPUTERS

- ***Education: (CAE)***
- ***Medicine and Health Care:*** CAT scans or MRI scans
  - Hearing aid, monitoring patient's status during complex surgery
- ***Entertainment:***
- **Commercial or business applications:** Several computer applications are available to assist business in working with large volumes of data.
  - Text processing , Accounting and Finance management , Inventory control, Database management, Statistical analysis
- ***Communication: (E-mail)***
- ***Scientific-engineering and research application:***
  - Space technology, Meteorological observatory system, Astronomical investigations, Design of machines
- **Weather and Environment**
- **Transportation:** Many aircraft can fly under the control of the computer; in this situation, the captain simply serves as a manger by telling the computer what to do. In cars for fuel control
- ***Banking:*** People can use the ATM (Automated Teller Machine) services 24 hours of the day in order to deposit and withdraw cash. (NETWORKING)

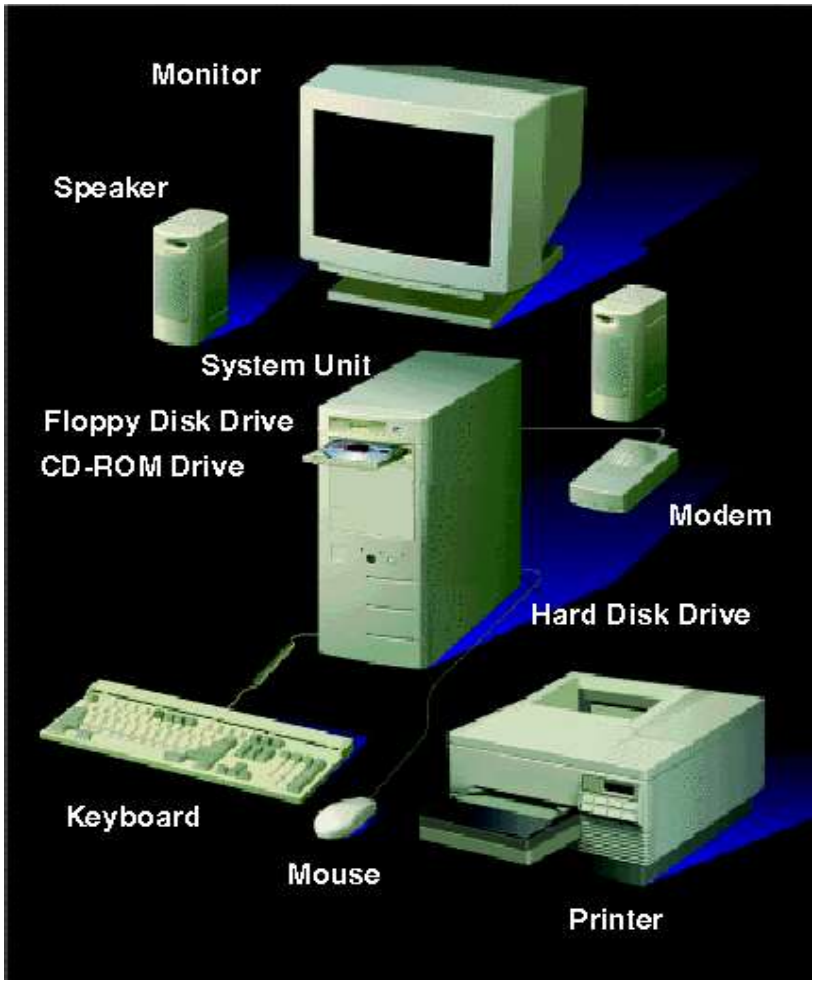
Introducing the main parts of the computer system

What is a computer System?

- **System**:-Is a set of connected things or parts forming a complex whole.
- …..
- **Computer System:-**Includes a computer along with any software and peripheral devices that are necessary to make the computer function.
- composed of components that are classified either as ***Computer hardware*** or ***Computer software***.

Hardware versus Software

- **Hardware** = The physical components that make up a computer system.
- Something you can touch and feel



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Hardware versus Software

- **Software** = The programs (instructions) that tell the computer what to do.
  - System Software
  - Application Software
  - Stored on a storage media such as hard disk, CD-ROM, floppy disk, tape, etc.

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The Component of a Computer

- What is an input device?
  - **Hardware used to enter data and instructions**

The Components of a Computer

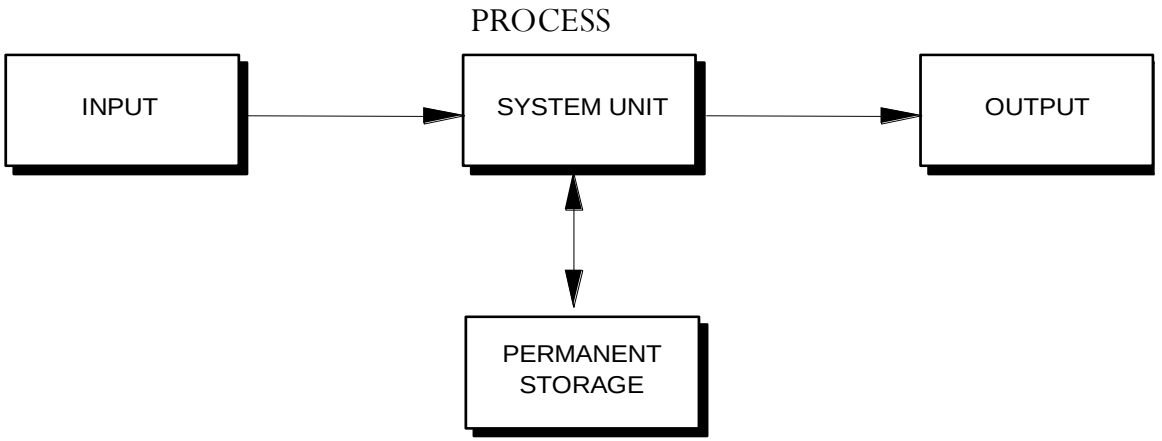
- What is an output device?
  - **Hardware that conveys information to a user**

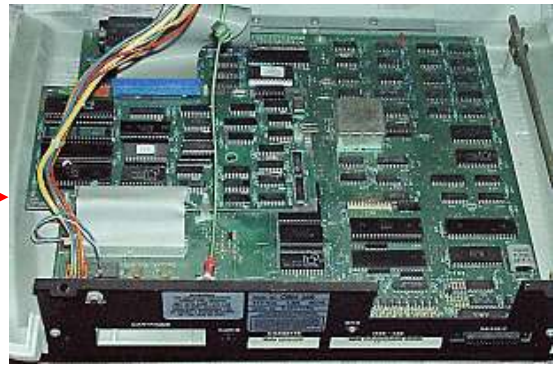
The Components of a Computer

- What is the system unit?
  - **Box-like case containing electronic components used to process data**

Hardware

Hardware Components





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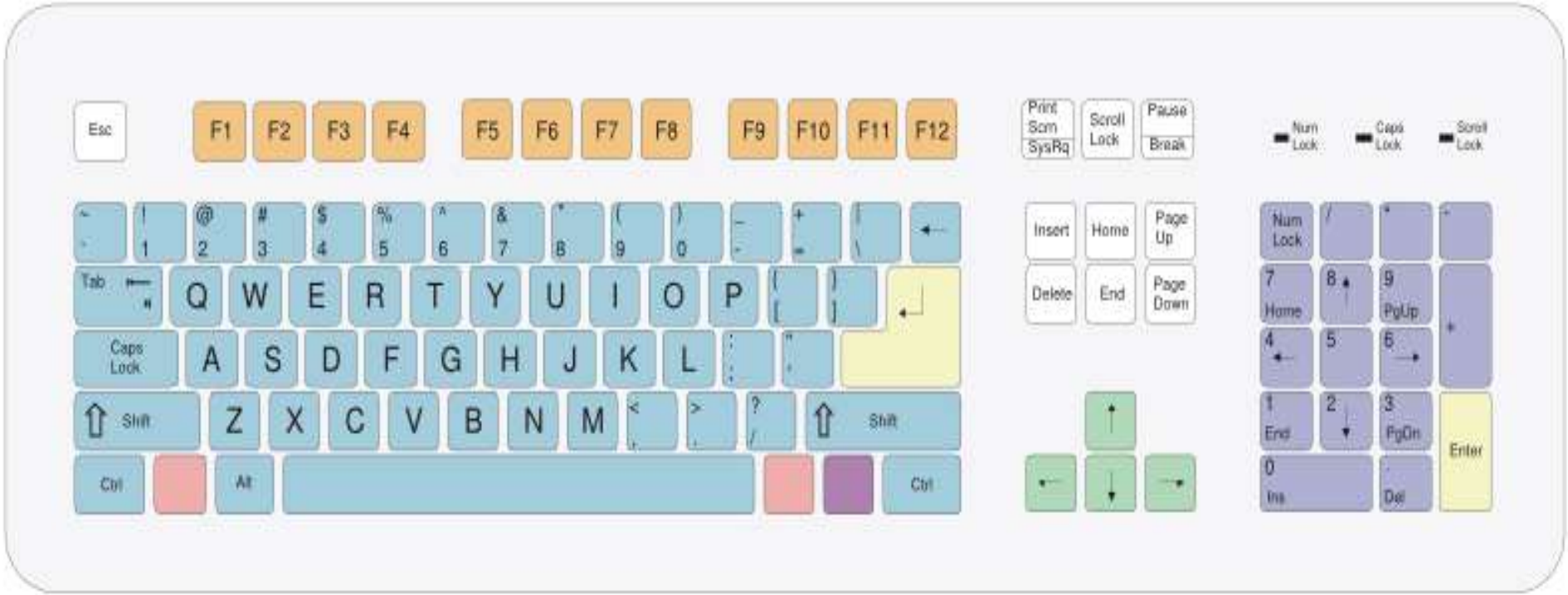
Hardware

- Refers to all the physical components of a computer.
- Includes all input devices, processing devices, storage devices, and output devices.
- Examples of hardware are:
  - keyboard
  - mouse
  - motherboard
  - monitor
  - hard disk
  - cables
  - printer

Input Devices

- Mouse
- Keyboard
- Microphone
- Scanner
- Digital camera

Using a Keyboard



Keyboard

- **Escape key** - Generally used to abort some actions.
- **Function keys** - functions vary from program to program.
- **Enter key** - used to enter commands and to create blank lines in a document.
- **Backspace key** – deleting, backward.
- **Tab key** - used to access tab stop.
- **Caps lock key** - works like the shift lock. - Key on a typewriter.
- **Shift key** - used to produce upper case letters and sometimes to invoke commands
- **Control key & Alt key** - commonly used in combination with other keys to enter commands e g. Control home.
- **Insert key** - used to enter characters.
- **Arrow keys** - used to move the cursor around the display screen.
- **Delete keys** - used to delete characters.
- **Number lock keys** - used to activate the numeric keypad.
- **Print screen keys** - used to print the contents of the screen

Mouse (Pointing device)

- A mouse is a small device that you can use to move, select, and open items displayed on your monitor.
- Most mouse devices have at least two buttons, left and right.
- As you move the mouse on your desk, a pointer moves correspondingly on your screen.
- Mouse's action:
  - Point
  - Double Click: You can open an item by moving the pointer to it, and clicking the left mouse button twice.
  - Left Click: Most of the actions are performed by clicking the left button.
  - Right Click: Popup menu
  - Click-and-Drag or Drag-and-Drop

Mouse cont..

- **Mechanical** - has a rubber or metal ball on its underside that can roll in all directions.
  - Mechanical sensors within the mouse detect the direction the ball is rolling and move the screen pointer accordingly.
- **Optical** : it doesn't have mechanical moving part and uses a laser to detect the mouse's movement.

Input device

- ***Scanner:*** is a device that used to convert hard copy in to soft copy form.
  - A device that is similar to a photocopy machine. You can use this device to transfer an exact copy of a photograph or document into a computer.
  - Save the scanned image as a graphic file in the computer.
- ***Digital Camera***: - Stores images digitally rather than recording them on a film. Once a picture has been taken, it can be downloaded to a computer system and then manipulated with an image editing software.

Output Devices

- Monitor
- Printer
- Speaker/Headphone
- Projector

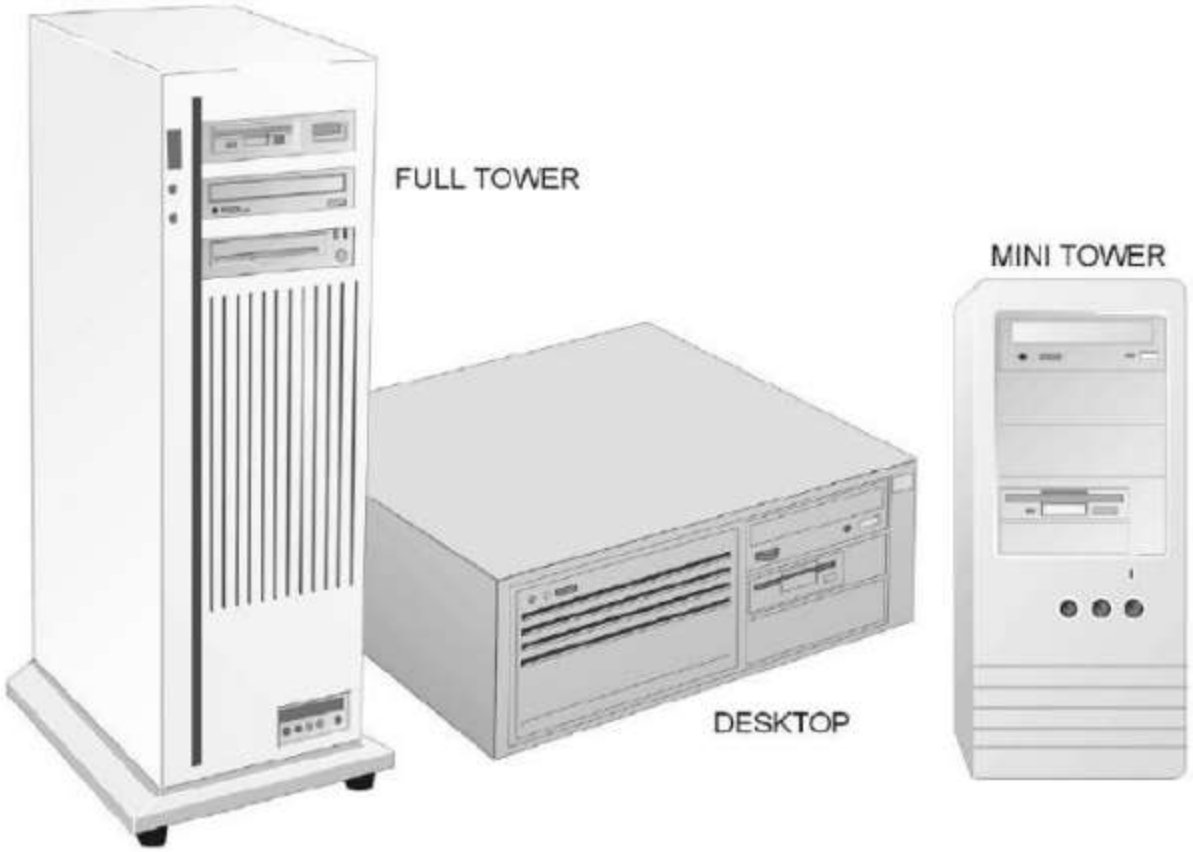
Output Device

- You use output devices to get feedback from a computer after it performs a task.
- **Monitor:** A device that is similar to a television. It is used to display information, such as text and graphics, on the computer.
- **Printer:** A device that you use to transfer text and images from a computer to a paper or to another medium, such as a transparency film. You can use a printer to create a paper copy of whatever you see on your monitor.
- **Speaker/Headphone:** Devices that allow you to hear sounds. Speakers may either be external or built into the computer.

Parts of a System Unit

The Complete PC

- A typical PC is more than one device, and you need all the parts (or at least most) to make the PC work.
- The most important part of the PC is the box that usually sits underneath your desk called system unit.
- All of the other parts of the PC—the printer, the keyboard, the monitor—connect to the system unit and are known collectively as *peripherals*.

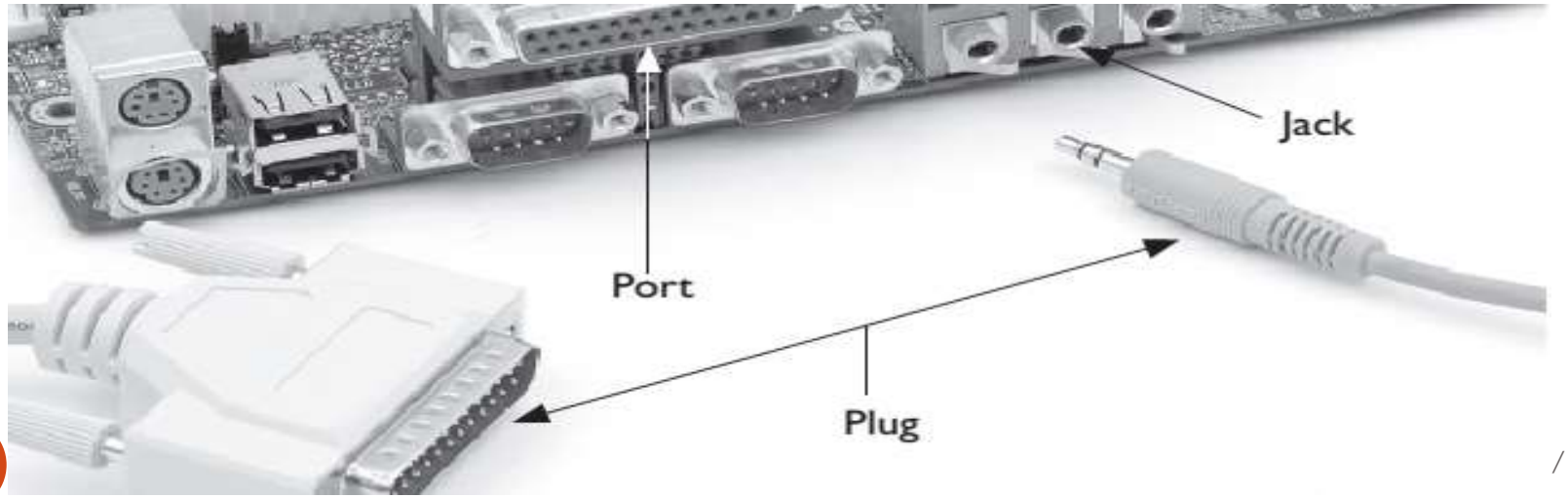

FULL TOWER
MINI TOWER
DESKTOP

External Connections

- Every peripheral connects to the system unit through one of the many types of ports.
- The back of a typical system unit has lots of cables running from the system unit to the different peripherals.
- To connect one device to another, you need a cable containing the wires that make the connection.
- Because these are usually electrical connections, you need one part to fit inside another to make a snug, safe connection.

Connection Terms
Plugs, Ports, Jacks, and Connectors

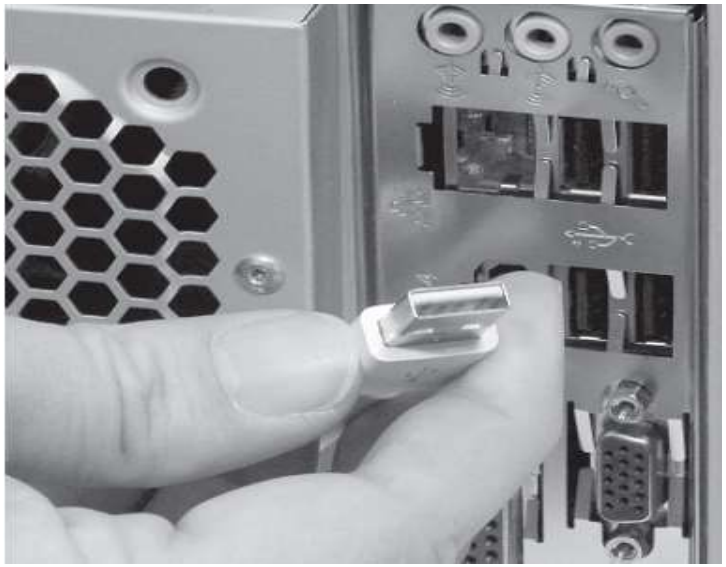
- A *plug* is a part with some type of projection that goes into a *port*.
- A port is a part that has some type of matching hole or slot that accepts the plug.
- The term *jack* is used as an alternative to port, so you may also put a plug into a jack.
- *connector* describes either a port or a plug.



Mini-DIN & USB Connectors

•(DIN)Deutsches Institute for Normung.

•Older-style keyboards and mice plug into mini-DIN ports.



USB *Universal serial bus (USB)*

connects mouse, keyboards, scanners, cameras, and printers etc….

USB-A……very common

USB-B…… USB B connectors are for the other end of the USB cable where it attaches to the USB device.

USB-mini B(less common)….. for small devices such as cameras,

DB Connectors

- *DB connectors* have been used for almost any type of peripheral you can think of, with the exception of keyboards.
- Technically, they're known as *D-sub* or *D-subminiature* connectors, but most techs call them DB.
- DB connectors in the PC world can have from 9 to 37 pins or sockets.
- A typical modern system might only have one or two, usually for a printer or video.

RJ Connectors

RJ-11 and RJ-45

- RJ-11 :-The phone jack is an RJ-11. It is used almost exclusively for modems.
- Modems change analog signal of a telephone line into digital data of a computer
- RJ-45 :- is used for your network connection.

Audio Connectors & Keyboard

•Speakers and microphones connect to audio jacks on the system unit.

•connect into either a dedicated mini-DIN keyboard port or a USB port.

Monitor

A monitor connects to the video connector on the system unit.

•The unique *digital video interface* (DVI) connector
•DVI connectors are white

•The older 15-pin female DB *video graphics array (VGA)* connector.
•colored blue

•These mini-DIN connectors support all sorts of interesting video jobs, such as connecting to output to a television or input from a video camera.

• Video cards with two connectors support two monitors, a very cool thing to do!

Mouse

- A mouse uses either a USB port or a dedicated, light-green mini-DIN connector

Trackball

Review Questions

- What sort of connector does a typical network card have?
  A. DB-9
  B. Mini-DIN
  C. RJ-11
  D. RJ-45
- Modern keyboards connect to which of the following ports? (Select all that apply.)
  A. DIN
  B. FireWire
  C. Mini-DIN
  D. USB
- Which end of the USB cable plugs into the PC?
  A. A
  B. B
  C. Mini-A
  D. Mini-B

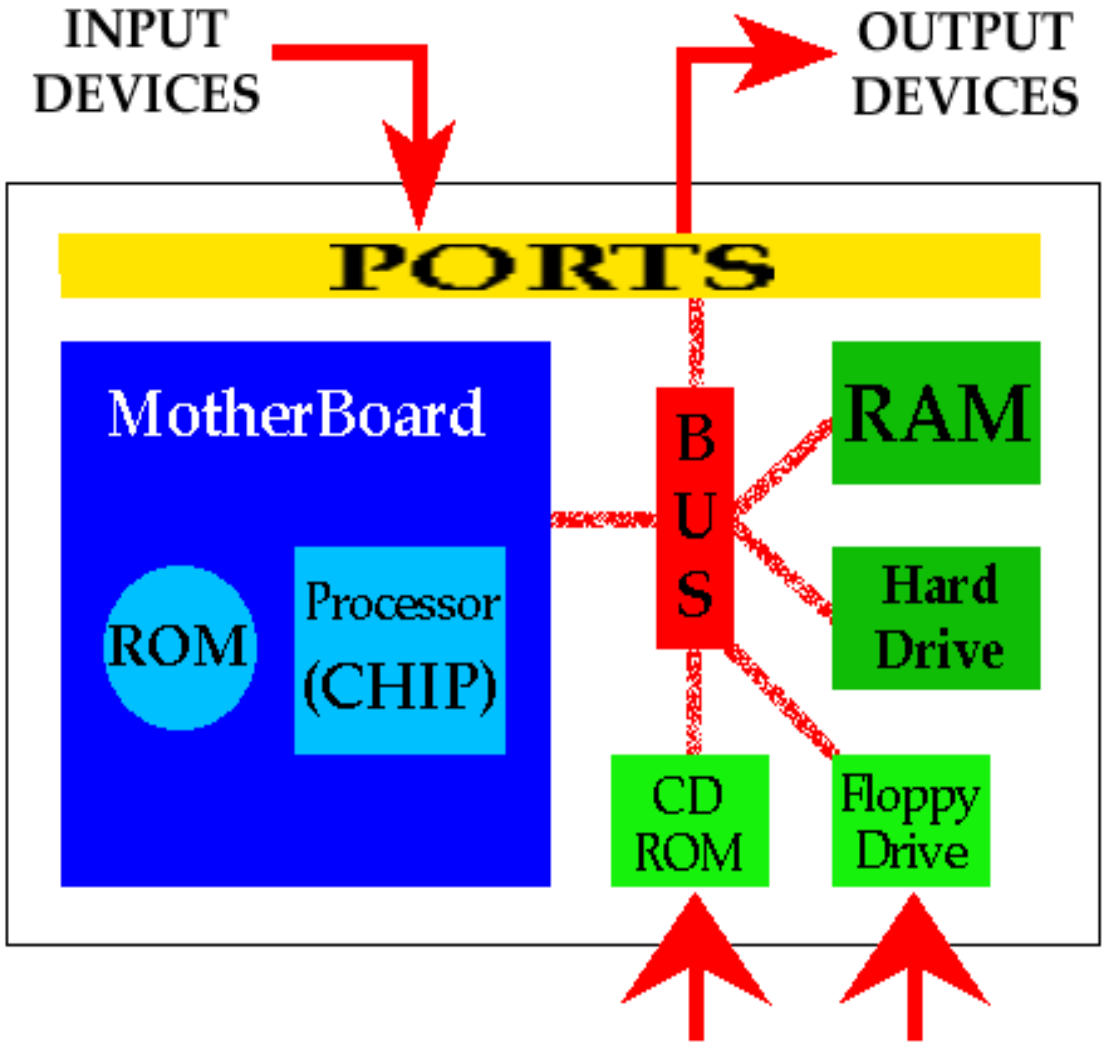
Inside the System Unit

Avoiding Electrostatic Discharge

- If you decide to open a PC you must take proper steps to avoid the greatest killer of PCs.
- *electrostatic discharge (ESD).*
  ESD simply means the passage of a static electrical charge.
- The secret to avoiding ESD, is to keep you and the parts of the PC you touch at the same electrical potential.

parts of a computer

- The Central Processing Unit:
  - (CPU),
  - Buses,
  - Ports and controllers,
  - ROM;
- Main Memory (RAM);
- Input Devices;
- Output Devices;
- Secondary Storage;
  - floppy disks,
  - hard disk,
  - CD-ROM



Central Processing Unit (CPU)

- The central processing unit (CPU) is a device that
- performs all the calculations that take place inside a PC.
- It is the control unit of a computer.
- The CPU is also referred to as the processor.
- A device that interprets and runs the commands that
- you give to the computer.
- Also referred to as the processor.
- Two major brands are Intel and AMD.
- Examples: Intel Core 2 Duo, AMD Turion X2

Modern CPUs generate a lot of heat and thus require a cooling fan and heat sink assembly to avoid overheating

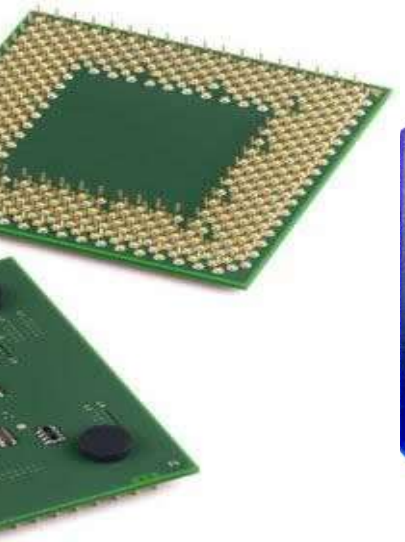
CPU with fan in PC

The Processor: The CPU

CPU (Central Processing Unit) = A complex collection of electronic circuits on one or more integrated circuits (chips) which:

1. executes the instructions in a software program
2. communicates with other parts of the computer system, especially RAM and input devices

The CPU is the computer!



The Processor: Speed

- Imagine there's a buzzer inside the cpu activated by a button on the outside of the box. Each time you press the button to sound the buzzer, the cpu reads the next set of lights on the external data bus

- The buzzer on a real CPU is a special wire called the CLOCK wire
- The maximum number of clock cycles that a CPU can handle in a given period of time is referred to as its *clock speed*.

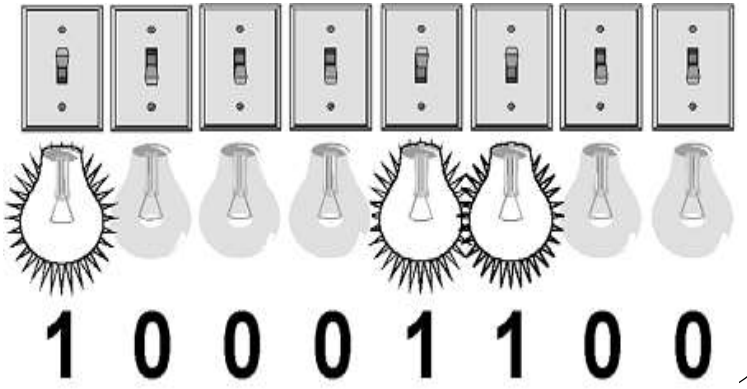
CPUs today run at speeds in excess of 3 GHz (3 billion cycles per second).

1 hertz (1 Hz) = 1 cycle per second

1 megahertz (1 MHz) = 1 million cycles per second

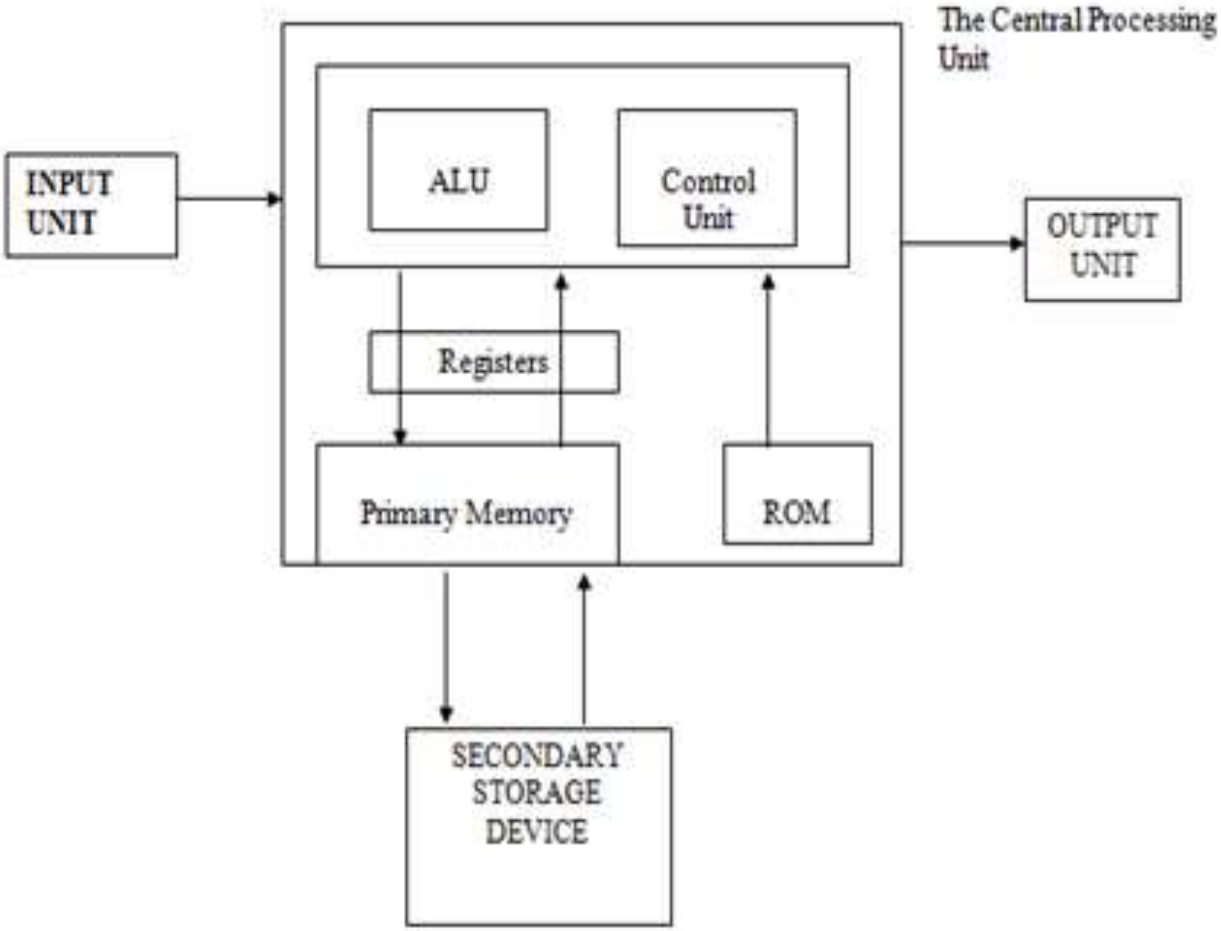
1 gigahertz (1 GHz) = 1 billion cycles per second

Here "1" means on;
"0" means off.



Registers provide the CPU with a workplace for the problems you give him.

CPU Component



CPU Components

- Control Unit: The control unit can be thought of as the heart of the CPU. It controls the I/O devices and transfer of data to and from the primary storage
- Generally, it performs all the control functions of the computer.
- It retrieves the instruction from memory.
- Translates those instructions into computer functions and sends signals to other computer hardware units to carry out those functions.
- It is also responsible for determining the next instruction to be executed by the computer.

CPU components cont...

- **Arithmetic Logical Unit**
  - **Arithmetic** Unit: - contains the circuitry that is responsible for performing the actual computing and carrying out the arithmetic calculations, such as addition, subtraction, multiplication, and division. It can perform these operations at a very high speed.
  - **Logical** Unit: - The importance of the logical unit is the ability it provides to the CPU to make logical operations based on the instructions provided to it. Logical unit uses statements such as AND, OR, and NOT. This is useful when you have a set of instructions to execute only if certain conditions are true.
- **Registers**: Registers are the temporary storage areas for instructions or data within the processor.
  - Registers are basically special storage locations somewhat similar to a computer's memory though contained within the processor and exceptionally faster.
  - Registers are paths or conduits that connect the Arithmetic Logical Unit to the main memory.
  - When an instruction loaded from main memory, it is placed first in the register to wait instructions from the control unit.
  - Data are also stored in registers prior to execution in the ALU.

Primary storage device

- Memory is where information is stored and retrieved by the CPU.

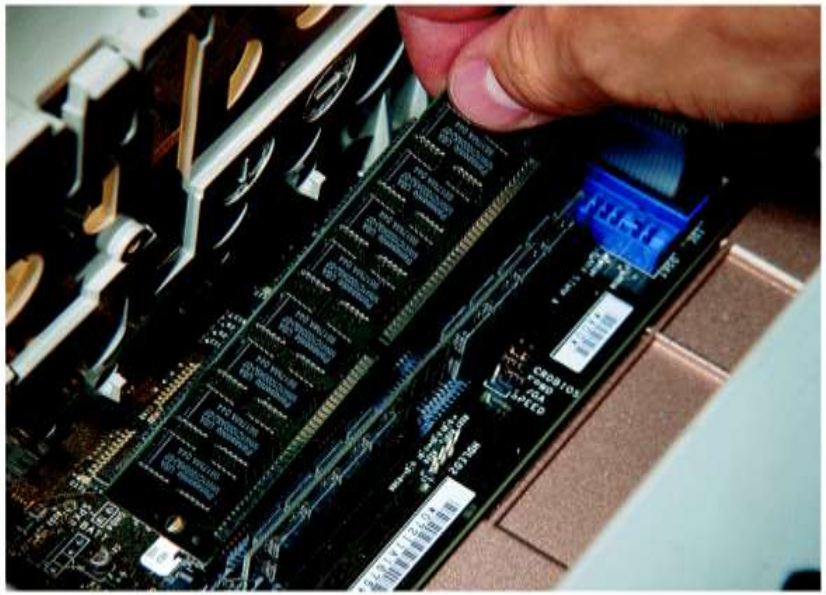
- There are two main types of memory:
  - Random Access Memory (RAM): It is the main memory and allows you to temporarily store commands and data.

  - Read Only Memory (ROM): It is the memory that retains its contents even after the computer is turned off.

Primary storage device

- Memory is where information is stored and retrieved by the CPU. There are two main types of memory.
- **Random Access Memory (RAM):** It is the main memory and allows you to temporarily store commands and data. The CPU reads data and commands from RAM to perform specific tasks.
- RAM is volatile, which means it is available only while the computer is turned on. The contents of RAM must be copied to a storage device if you want to save the data in the RAM.
- **Read Only Memory (ROM):** It is the memory that retains its contents even after the computer is turned off.
- ROM is nonvolatile, or permanent, memory that is commonly used to store commands, such as the commands that check whether everything is working properly.

RAM



RAM is TEMPORARY memory

RAM is volatile

- stores ON and OFF bits (software and data) electrically
- when power goes off, everything in RAM is lost
- ***Dynamic Random Access Memory(DRam)***: It holds the data in dynamic (keeping on refreshing) manner with the help of a refresh circuitry.

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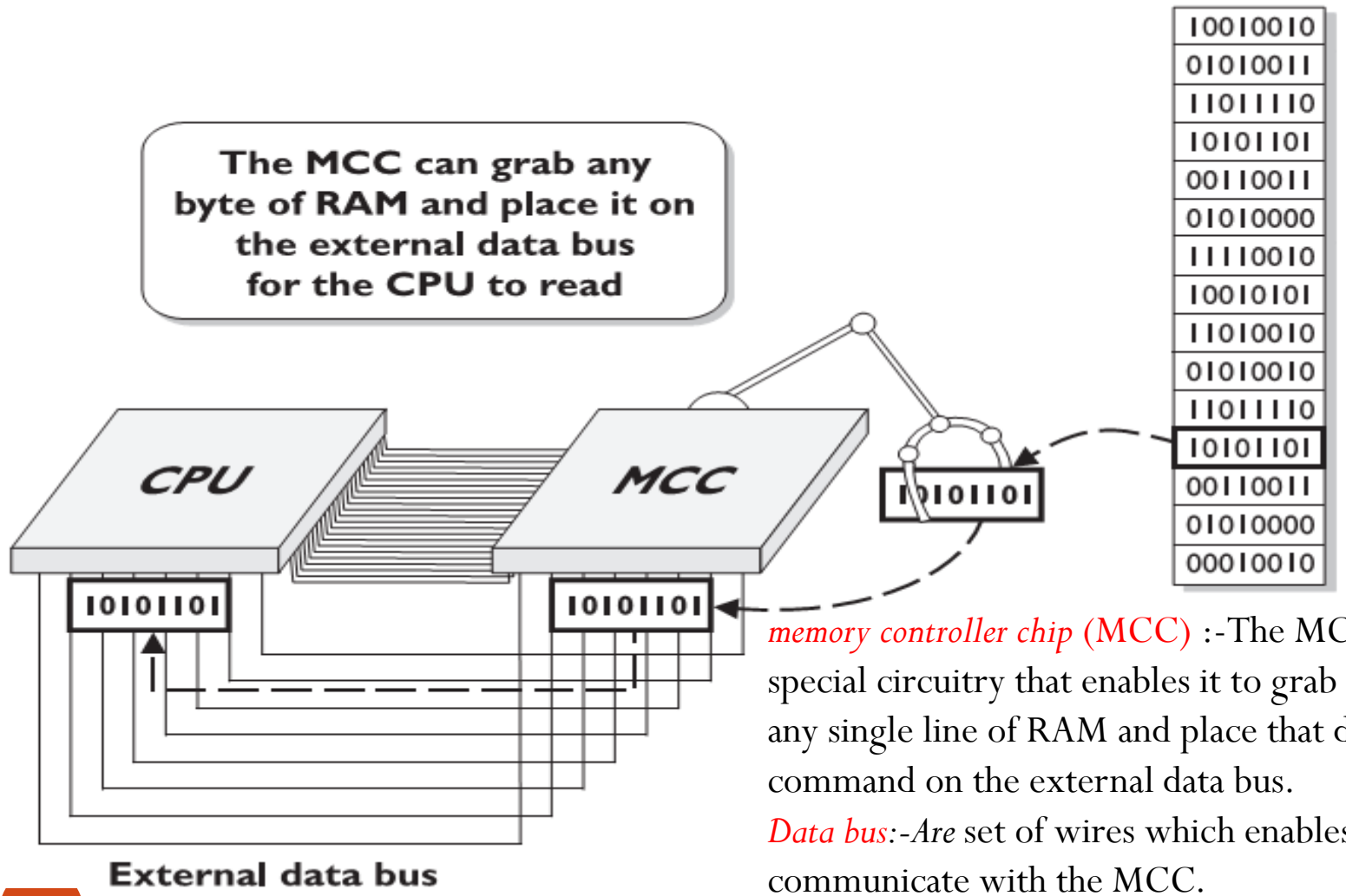
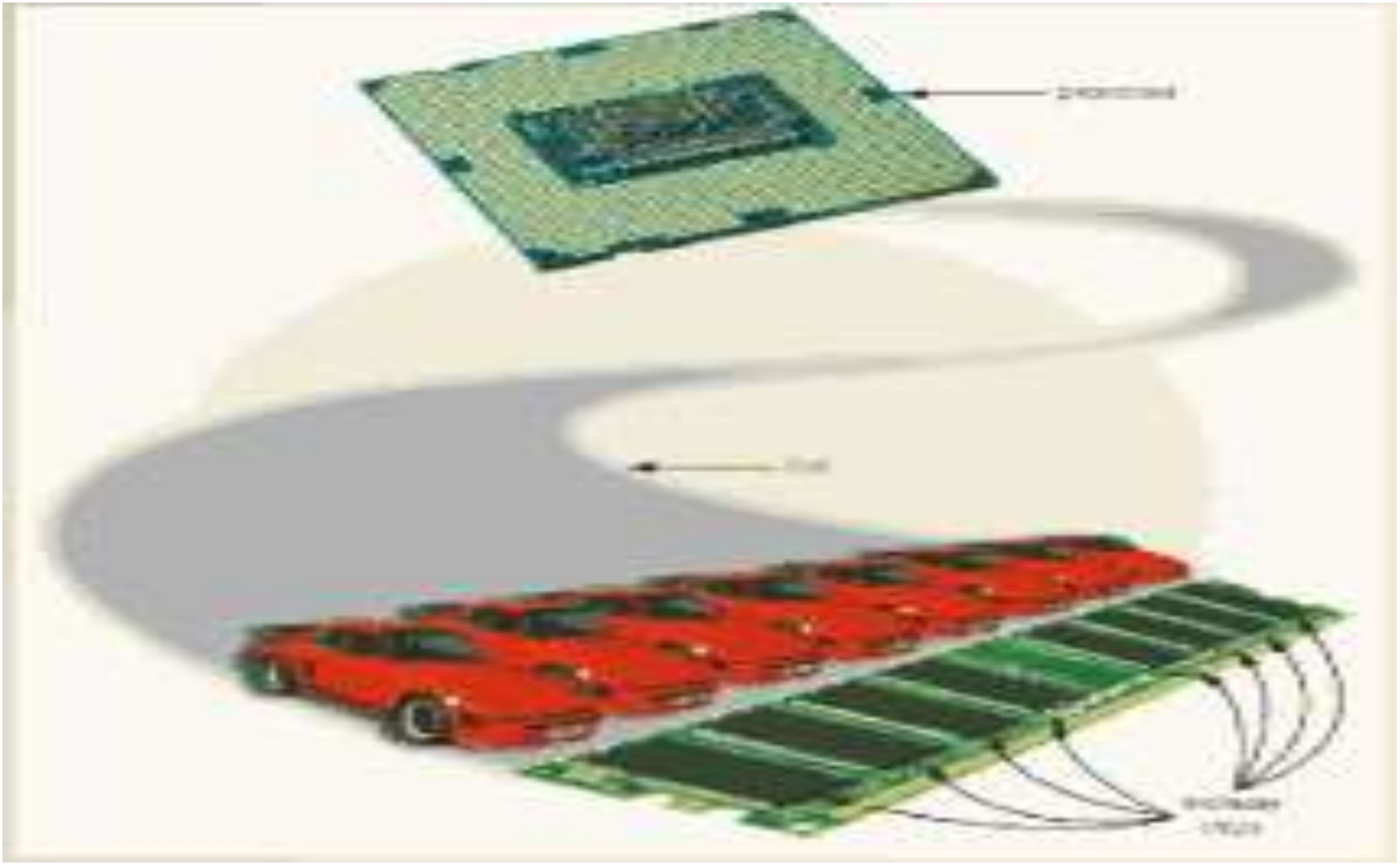
How it Works



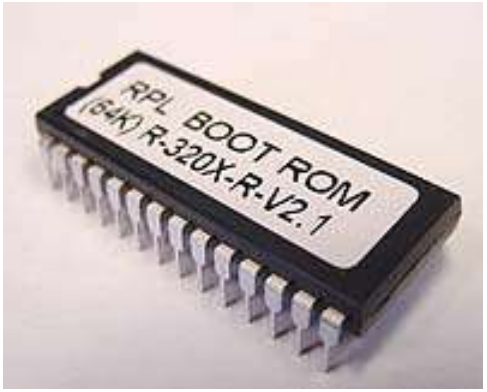
memory controller chip (MCC) :-The MCC contains special circuitry that enables it to grab the contents of any single line of RAM and place that data or command on the external data bus.

Data bus:-*Are* set of wires which enables the CPU to communicate with the MCC.

CPU & RAM



ROM (Read Only Memory)



ROM (Read Only Memory) = integrated circuits (microchips) that are used to permanently store start-up (boot) instructions and other critical information

Read Only = information which:

- Cannot be changed
- Cannot be removed
- Fixed by manufacturer

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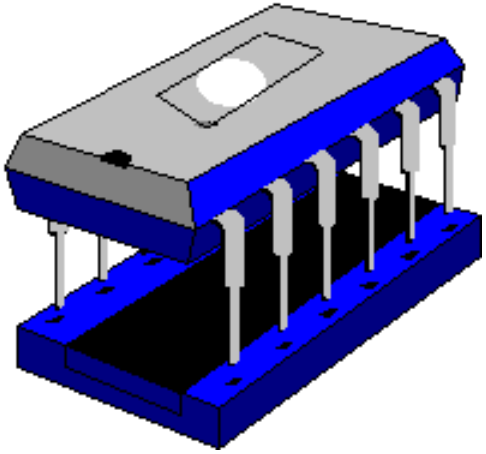
ROM (Read Only Memory)



ROM is sometimes known as **ROM <u>BIOS</u>** (Basic Input Output System software)

ROM contains:

- <u>start-up (boot) instructions</u>
- instructions to do "low level" processing of input and output devices, such as the communications with the keyboard and the monitor

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Secondary Storage Devices

- Hard Disk

- Flash Drive

- CD-ROM

- DVD-ROM

Computer Storage Media

Media	Size	Equivalent
Floppy	1.44MB	50 page Word document 1 photos at 2M Pixels
CD	700MB 700,000KB	An encyclopedia 300 Digital Picture (5MB Pixel) 350,000 text pages
DVD	4.7 GB	6.7 times CD 200,000 pages in Word 2,000 Digital Pictures
BluRay Disc	54GB	High Def Video
Flash Drive	2GB– 64GB	3-100 CD's

Secondary Storage Devices

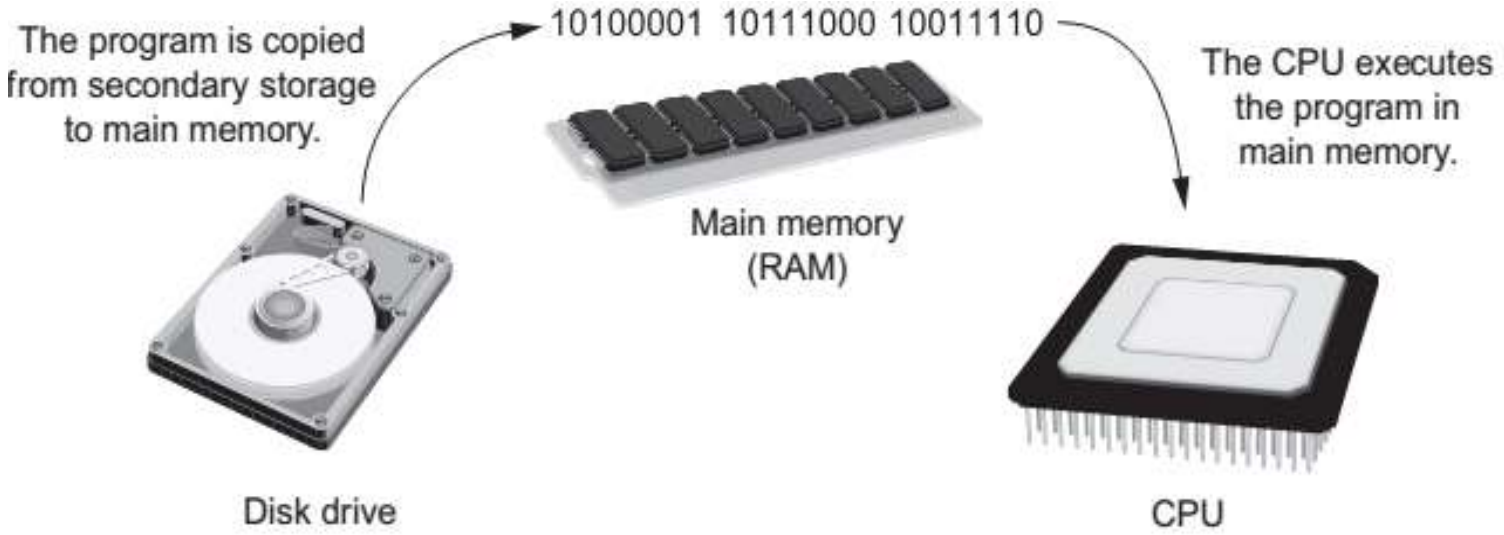
- **Hard Disk:** A magnetic disk that is usually the main storage device on most computers. It can be an external or an internal device.
- **Floppy Disk:** A portable storage device that allows you to store a small amount of data. A disadvantage of this disk is that it can be easily damaged by heat, dust, or magnetic fields.
- **CD-ROM:** A portable storage medium that allows you to store 400 times more data than on a floppy disk. It is less prone to damage than a floppy disk.
- **DVD-ROM:** A portable storage medium that is similar to a CD-ROM; however, it can store larger amounts of data than a floppy disk or a CD-ROM. A DVD-ROM is commonly used to store movies and videos
  - CD RW

Secondary Storage Devices

- **Non-volatile**- it does not lose its content even when its power is turn of.
- **Capacity** – they can store large amount of data.
- **Cost**- it is less expensive than Primary storage device.
- **Portability** – they can be easily ported from one computer to another.

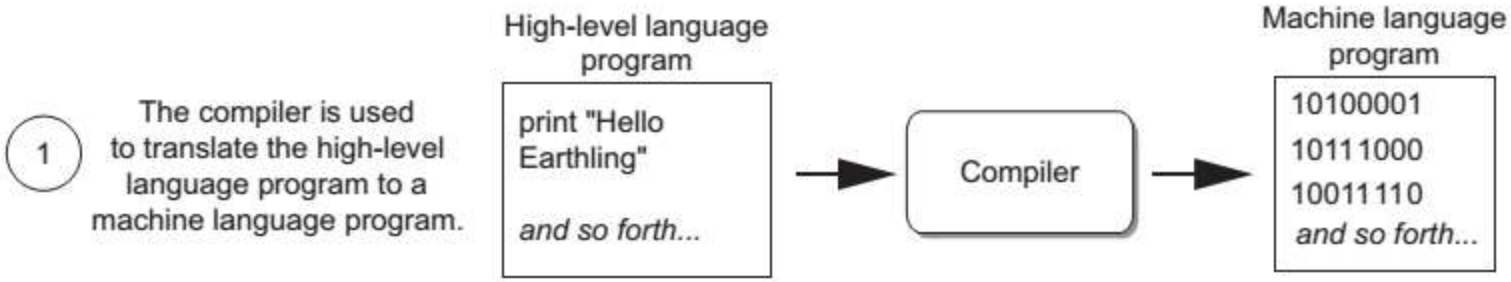
How a Program Works

- **A computer's CPU can only understand instructions that are written in machine language. Because people find it very difficult to write entire programs in machine language, other programming languages have been invented.**



Compilers and Interpreters

- Because the CPU understands only machine language instructions, programs that are written in a high-level language must be translated into machine language.
- Depending on the language that a program has been written in, the programmer will use either a compiler or an interpreter to make the translation.



piler

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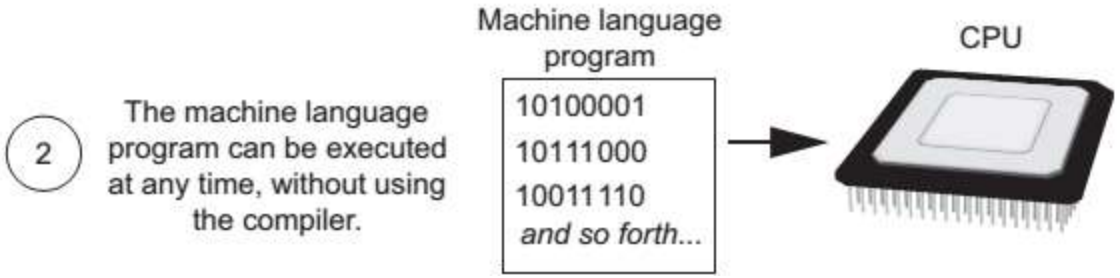
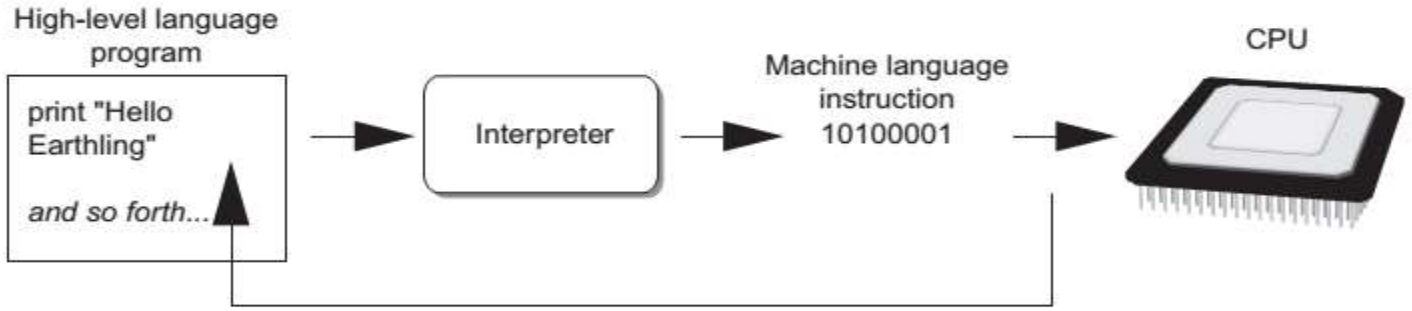




The interpreter translates each high-level instruction to its equivalent machine language instructions and immediately executes them.

This process is repeated for each high-level instruction.

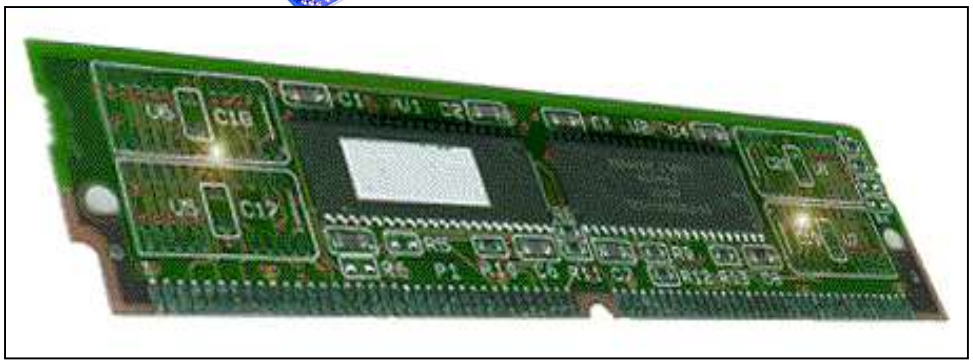
- **Interpreters**

Java Script,python.....

024

Computer Performance:

- CPU speed (and type)
- Amount of RAM (and speed)
- Hard disk capacity



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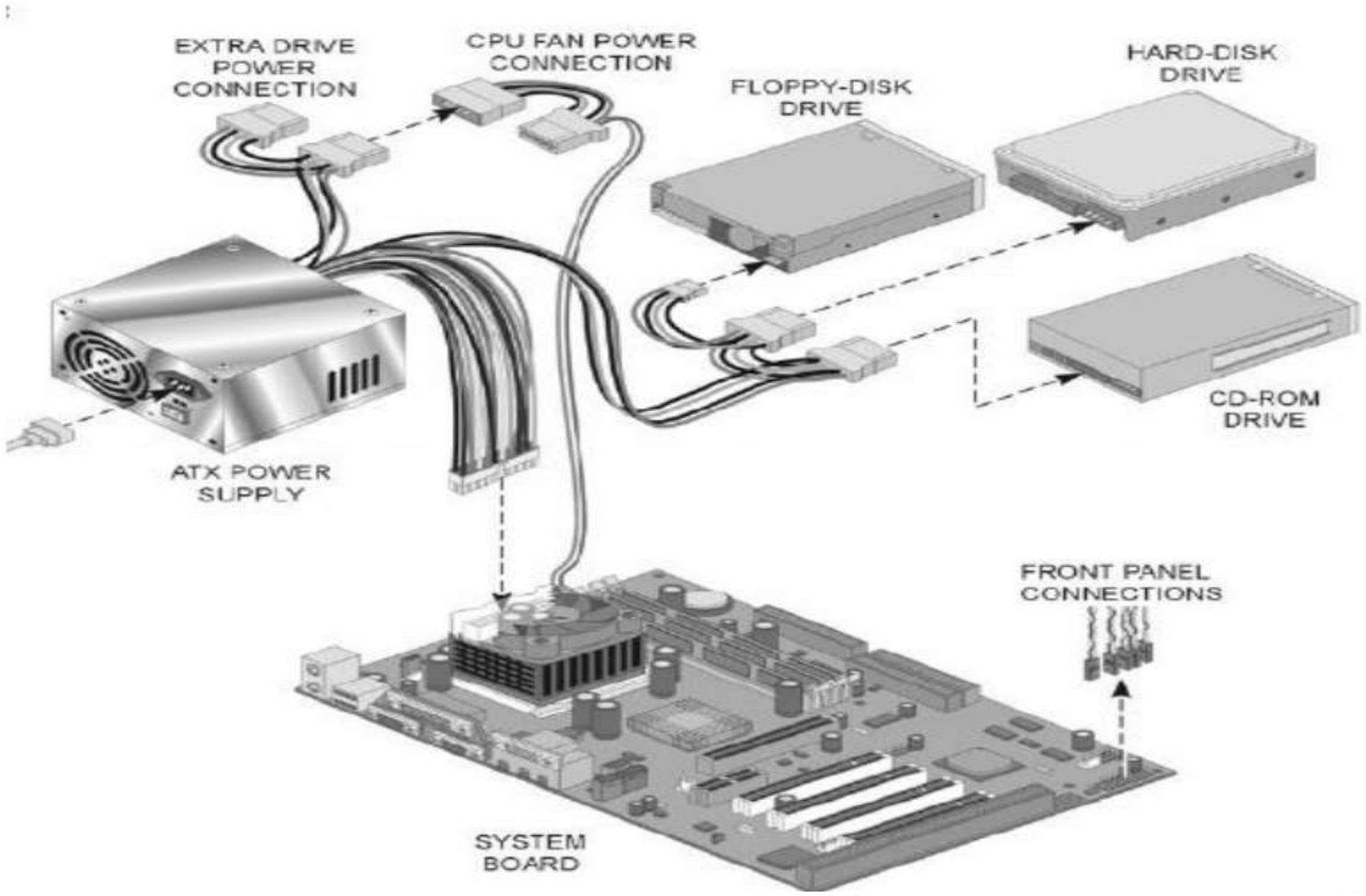
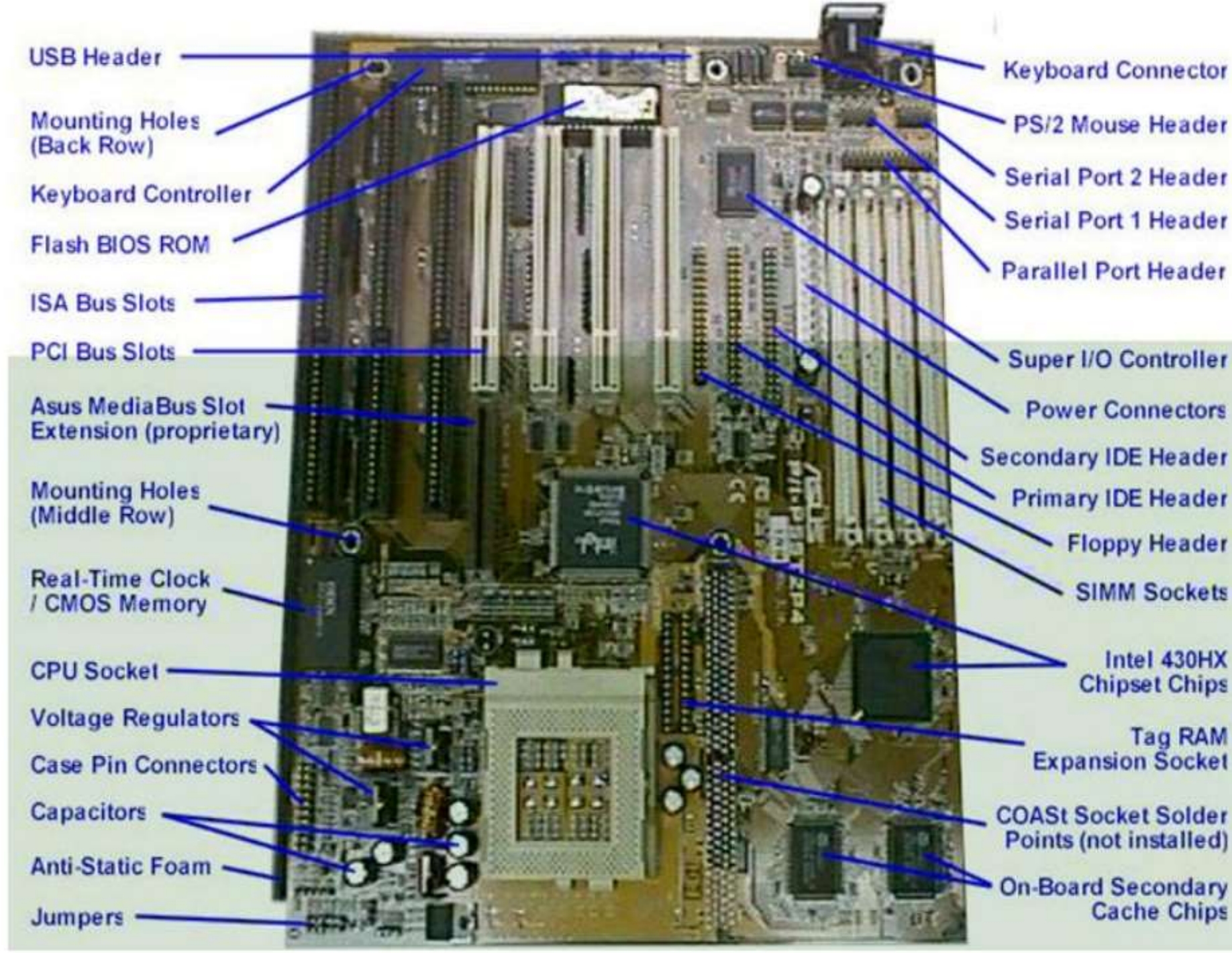
Power Supply

- Power supply provides power for every component inside the system.
- Plays an important role in stability, cooling, energy efficiency and expandability.



Mother board

- The motherboard is the large multi-layered printed circuit board inside your computer's case.
- It's sometimes called the system board, the logic board, the baseboard, or less commonly, the planar board.
- Everything connected to your computer system, plugs either directly or indirectly into the motherboard.
- It is the data and power infrastructure for the entire computer.


USB Header
Mounting Holes (Back Row)
Keyboard Controller
Flash BIOS ROM
ISA Bus Slots
PCI Bus Slots
Asus MediaBus Slot Extension (proprietary)
Mounting Holes (Middle Row)
Real-Time Clock / CMOS Memory
CPU Socket
Voltage Regulators
Case Pin Connectors
Capacitors
Anti-Static Foam
Jumpers
Keyboard Connector
PS/2 Mouse Header
Serial Port 2 Header
Serial Port 1 Header
Parallel Port Header
Super I/O Controller
Power Connectors
Secondary IDE Header
Primary IDE Header
Floppy Header
SIMM Sockets
Intel 430HX Chipset Chips
Tag RAM Expansion Socket
COASt Socket Solder Points (not installed)
On-Board Secondary Cache Chips

Preventive Maintenance

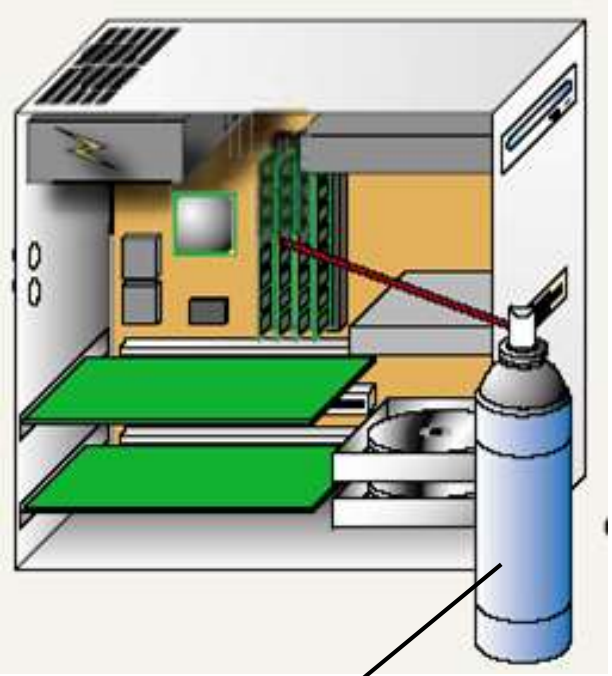
- Clean the computer regularly

Brush: remove dust

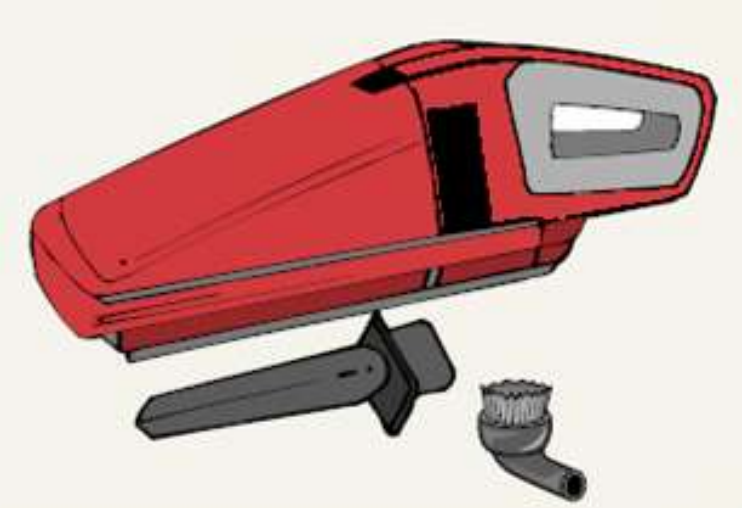
Liquid detergent: clean the outside of computer

Preventive Maintenance

- Clean the computer regularly



Canned compressed air: remove dust inside the computer



Vacuum cleaner: remove dust and dirt inside the computer

Review Questions

Multiple Choice

1. A(n) _____ is a set of instructions that a computer follows to perform a task.
   a. compiler
   b. program
   c. interpreter
   d. programming language
2. The physical devices that a computer is made of are referred to as _____.
   a. hardware
   b. software
   c. the operating system
   d. tools
3. The part of a computer that runs programs is called _____.
   a. RAM
   b. secondary storage
   c. main memory
   d. the CPU
4. Today, CPUs are small chips known as _____.
   a. ENIACs
   b. microprocessors
   c. memory chips
   d. operating systems
5. The computer stores a program while the program is running, as well as the data that the program is working with, in _____.
   a. secondary storage
   b. the CPU
   c. main memory
   d. the microprocessor
6. This is a volatile type of memory that is used only for temporary storage while a program is running.
   a. RAM
   b. secondary storage
   c. the disk drive
   d. the USB drive