UCC 1100
Computer Fundamentals

Computer Structure

Basic operations of a computer

The computer performs basically five major operations of functions irrespective of their size and make:
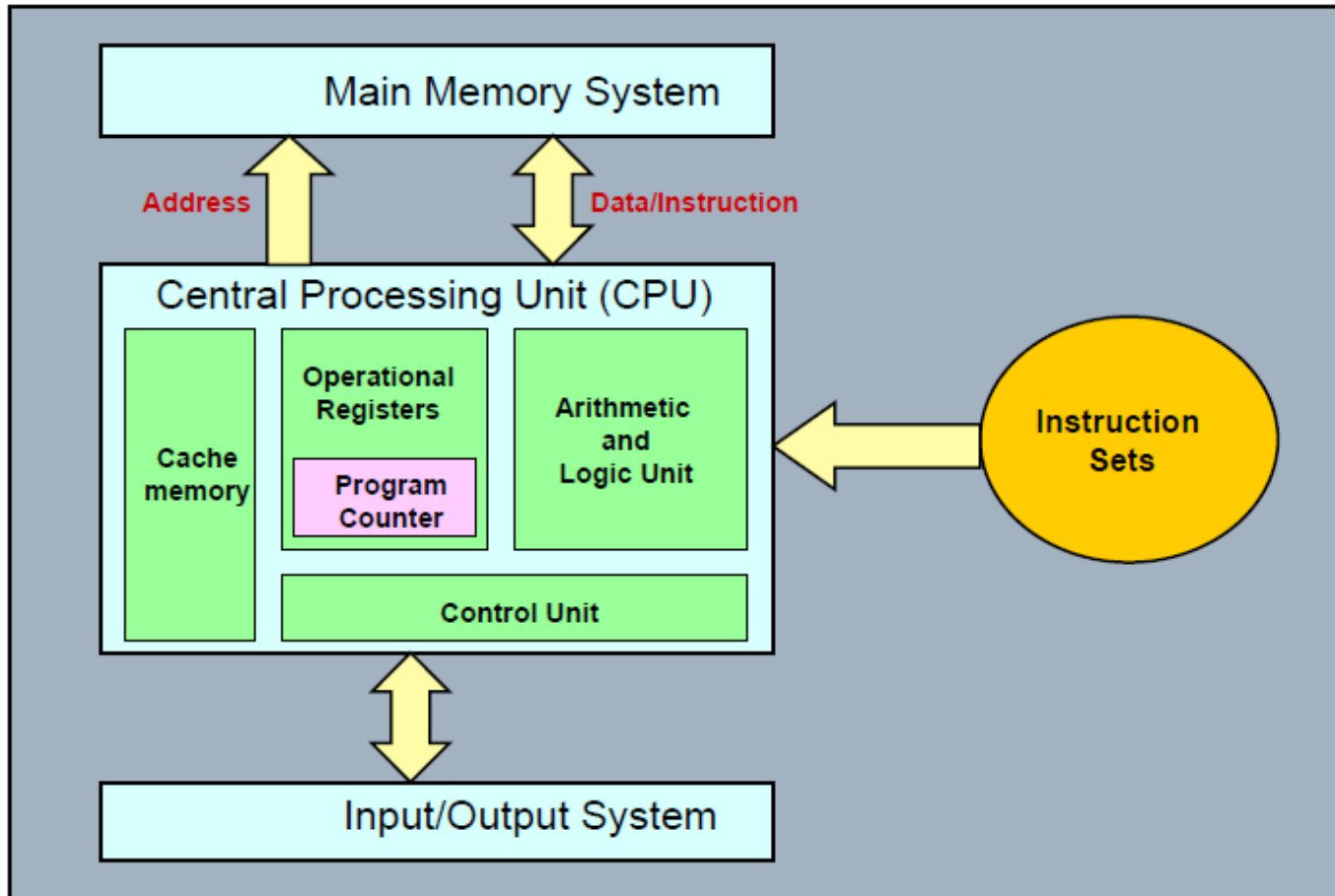
1. It accepts data or instruction by way of input
2. It stores data
3. It can process data as required by the user
4. It gives results in the form of output
5. It controls all operations inside a computer.

Main Parts of a Computer

A computer consists of three main parts:

1.   A processor (CPU)

2.   A main-memory unit

3.   An I/O system

Computer Structure

Block diagram of Computer Organisation

Processor (CPU)

- Central processing unit: the heart of the computer, it actually executes instructions.

- It comprise of 3 major components:

  - Control Unit

  - Arithmetic Logic Unit (ALU)

  - Registers

Processor (CPU)

- Central processing unit: the heart of the computer, it actually executes instructions.

- The control unit sends signals that fetch each of these instructions in turn from the main memory.

- It then decodes and executes them.

- The ALU is involved from time to time where it is necessary to perform arithmetic calculations or make logical decisions.

- All programs run in this manner.

Control Unit

The control unit is the nerve center that sends and control signals to other units and senses their states. Thus the control unit serves as a coordinator of the memory, arithmetic and logic, and input/output units

The main functions of the control unit are:

1. To interpret these instructions

2. To control/govern all the activities within the computer i.e inputting data, storing data, processing, and outputting.

Control Unit …..

- The control unit can execute only one instruction at a time, but it can execute instructions so quickly (millions per second) that it can appear to do many different things simultaneously.

- In general the control unit is responsible for the running of programs that are loaded into the main memory.

Arithmetic Logic Unit

- ALU its for calculations; it handles all the arithmetic and logic operations for the computer.

- In arithmetical operation: it performs the four basic arithmetic operations of addition, subtraction, multiplication and division

- In the logical operations: it performs the comparison between two pieces of data i.e. Greater Than (>), Less Than (<), Equal To (=)

Registers

- These are temporary storage areas within the processor that are used to hold instructions and data currently being processed by the ALU.
    - The size of the registers(word size) determines the amount of data with which the computer can work at any given time. The bigger the word size, the more quickly the computer can process a set of data.
    - Today, most PCs have 32-bit registers, meaning the CPU can process four bytes of data at one time. Register sizes are rapidly growing to 64 bits.

Memory unit

- **Memory:** is the internal storage area in the computer.

- The *main memory* holds the data that the processor needs immediately.

- Therefore memory is both hardware and software. Its of two types:

  ### Types of memory

  - *Primary memory*

  - *Secondary memory*

Primary Storage

Primary storage (main memory) stores data and program statements for the CPU. It has four basic purposes;

- To store data that have been input until it is transferred to the ALU for processing.

- To store data and results during intermediate stages of processing.

- To hold data after processing until they are transferred to an output/storage device.

- To hold program statements or instructions received from input devices and from secondary storage.

RAM

- **Random Access Memory** (RAM) is the largest part of the main memory.

- RAM chips: to improve system performance they can be added to your computer, increasing the RAM from, say, 256 Mb to 512 Mb.

- **RAM has the following features:**
    - The data in RAM is read/write so it can be changed
    - All data stored in RAM is lost when then computer is switched off (volatile)
    - RAM is sometimes referred to as primary storage.

RAM cont'd

- The larger the memory area, the larger the programs that can be stored and executed.

- In the earlier days, it was common to find personal computers with 4MB of RAM but as multi media becomes common in the market, personal computers require high capacity of RAM i.e 128MB, *256MB, 512MB, 1GB, 4GB, ITB etc*
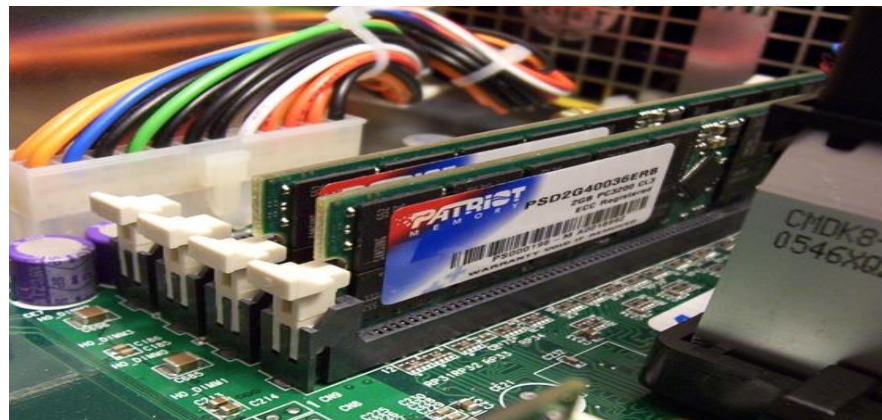
Cache memory

- Moving data between RAM and the CPU's registers is one of the most time consuming operations a CPU must perform.

- **Cache memory** is similar to RAM, except that it is extremely fast compared to normal memory and it is used in a different way.

- When a program is running and the CPU needs to read data from RAM, the CPU checks first to see whether the data is in cache memory.

- If the data is not there, the CPU reads it from RAM into its registers but also keeps a copy of the data in cache memory.

Cache memory

- The next time the CPU needs the same data, it finds it in the cache memory and saves the time needed to load that data from RAM.

- *Therefore, cache memory speeds up processing by storing frequently used data or instructions in its high speed memory.*

- Today, many CPUs have as much as 256KB cache memory built in.

Secondary Storage

- ***Storage*** refers to the media and methods used to keep information available for later use.

- Some data will be needed right away(*primary storage*) while some won't be needed for extended periods of time (*secondary storage*).

- *Examples:*
  - *Floppy*
  - *Hard disk*
  - *CD/DVD*
  - *flash*

Computer Buses

- *A bus* is a path between the components of a computer.

- There are two main buses in a computer:

  - The system/internal bus resides on the motherboard and connects the CPU to other devices that resides on the motherboard.

  - An expansion/external bus connects external devices, such as keyboard, mouse, modem, printer, etc to the CPU.

  - The system bus has two parts: the data bus and the address bus.

Bus cont'd…

- **The *Data bus*** is an electrical path composed of parallel wires that connects the CPU, memory, and the other hardware devices on the motherboard.

- ***The address bus*** is a set of wires similar to the data bus. The address bus _connects CPU to memory_ and _carries only memory address_

Buses
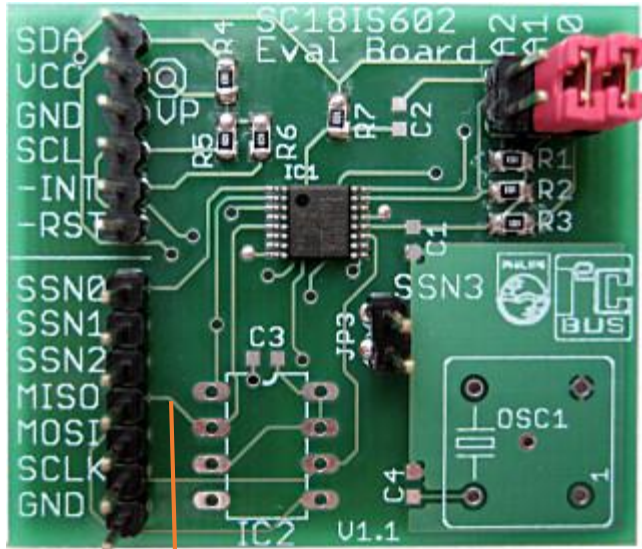
Internal Buses:
Connections to various internal components.

External Buses:
connects external devices to the CPU

Peripheral Devices

- A **peripheral device** designates equipment that might be added to a computer system to enhance its functionality.

- A peripheral device can be attached, either physically or in a wireless fashion to a computer system.

- Any device that is ready to communicate to a computer is said to be online. One that is not ready to communicate is said to be offline.

Peripherals

Peripherals are divided into four categories:

- Input devices

- Output devices

- Storage devices

- Processing devices

Peripherals

Peripherals are divided into four categories:

- Input devices

- Output devices

- Storage devices

- Processing devices

Ports

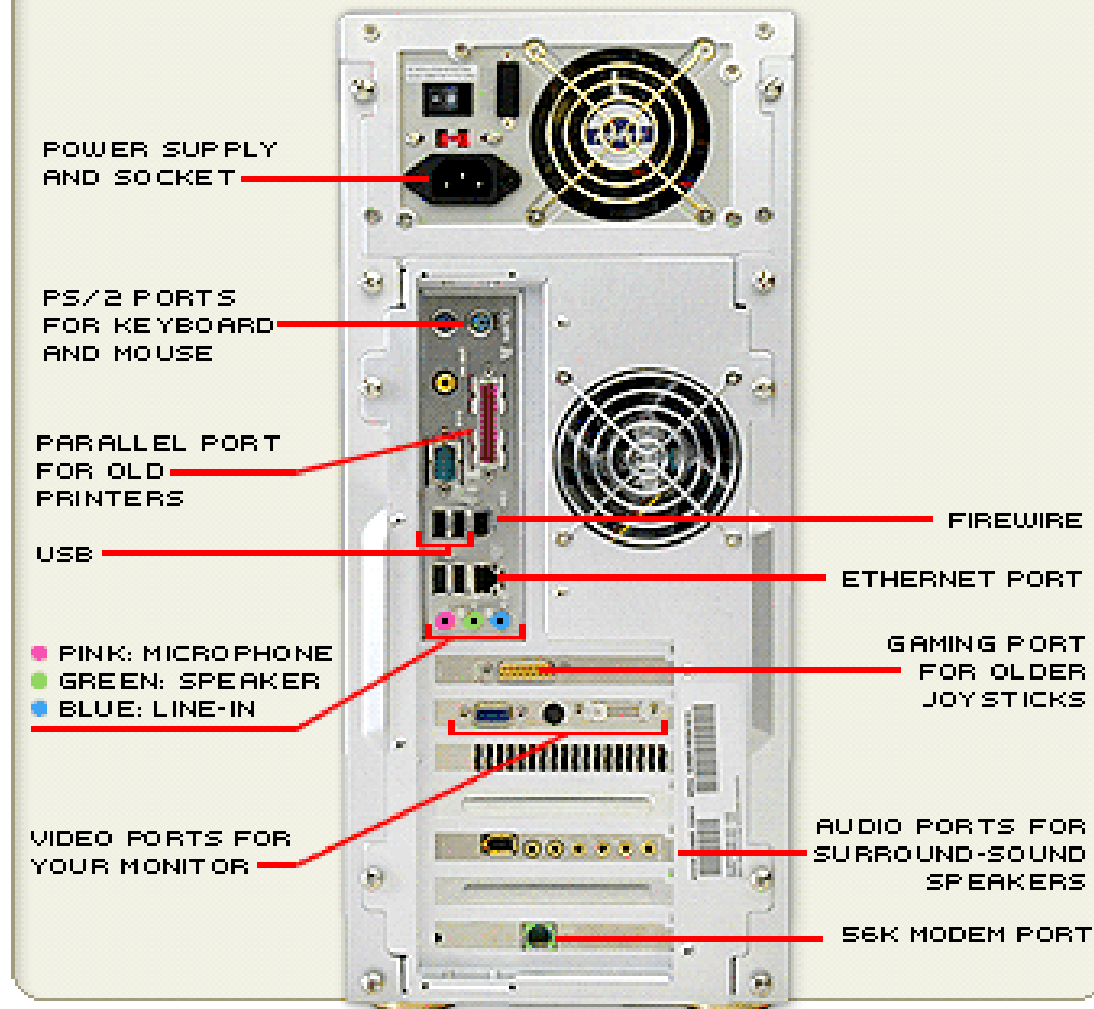|	Connector	Cable
Parallel port for printer		
Serial port for printers, modems, or scanners		
Keyboard or mouse		
VGA video (monitor)		
Phone line		
Local area network (LAN)		
Firewire		
Universal service bus		
Microphone, speakers, or headphones		

- *Port:* A connector through which input/output devices can be plugged into the computer.

Ports cont'd

BACK PANEL & SYMBOLS

A CPU'S BACK PANEL HAS COLOR-CODING AND SYMBOLS TO GUIDE YOU IN THE INSTALLATION PROCESS

POWER SUPPLY AND SOCKET

PS/2 PORTS FOR KEYBOARD AND MOUSE

PARALLEL PORT FOR OLD PRINTERS

USB

FIREWIRE

ETHERNET PORT

● PINK: MICROPHONE
● GREEN: SPEAKER
● BLUE: LINE-IN

GAMING PORT FOR OLDER JOYSTICKS

VIDEO PORTS FOR YOUR MONITOR

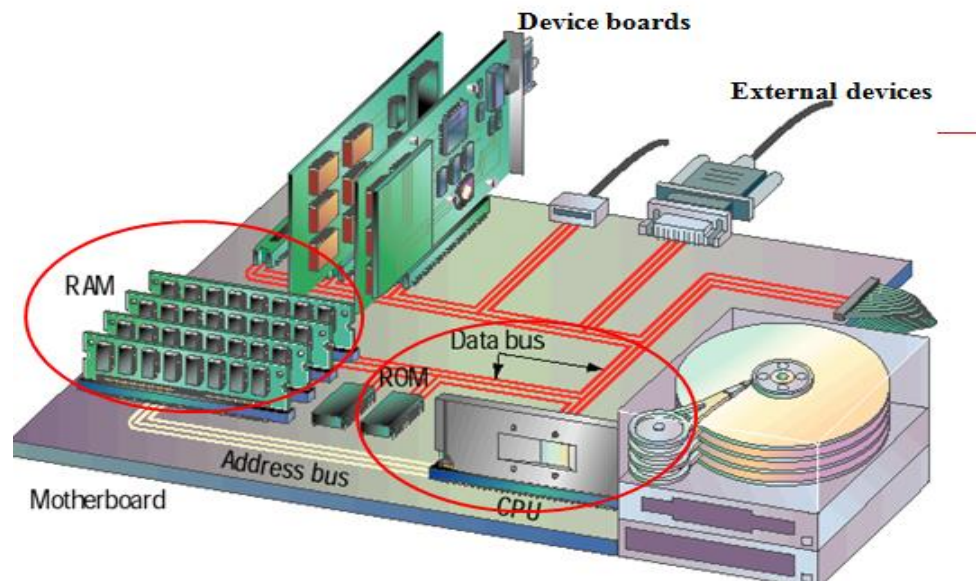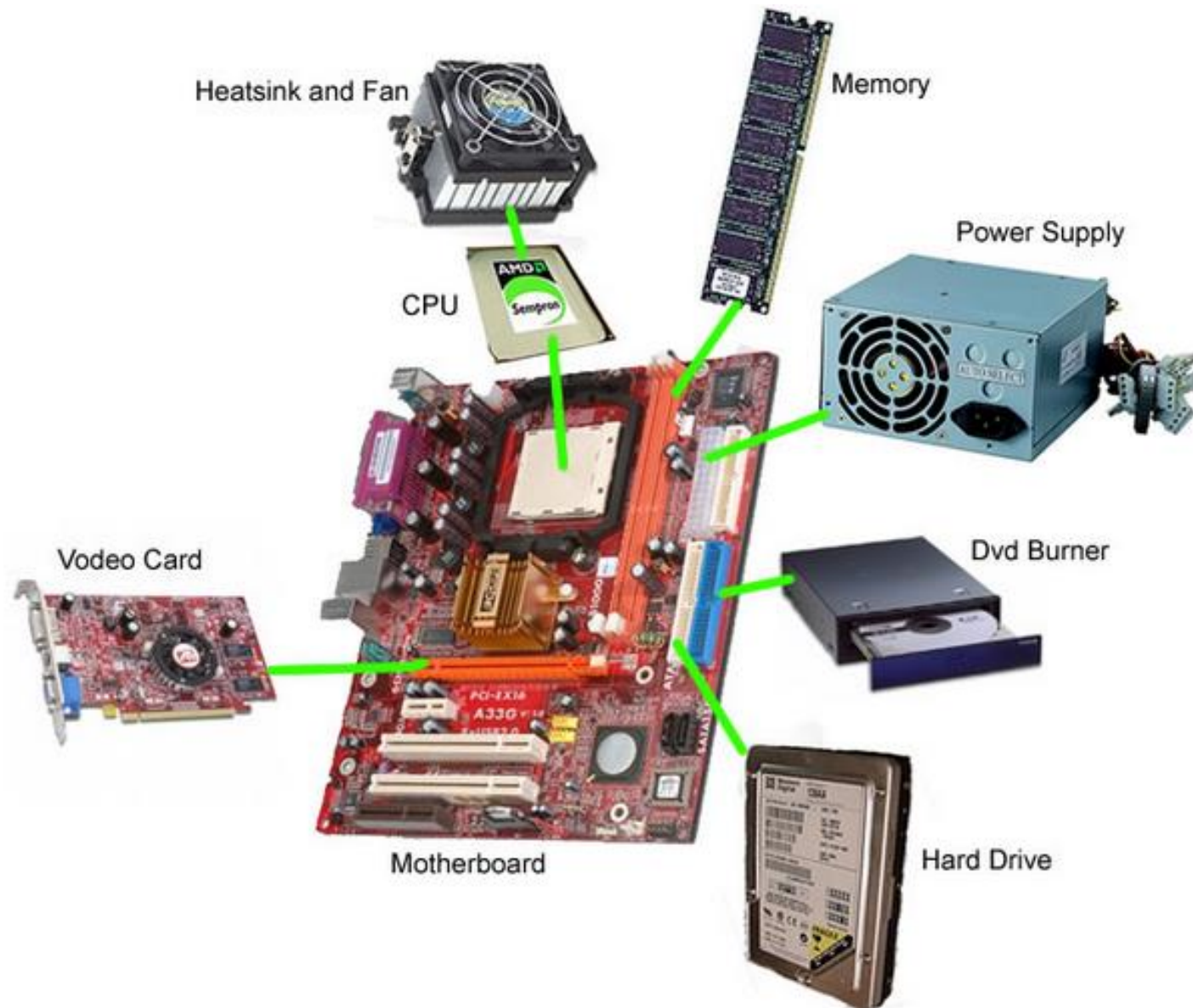AUDIO PORTS FOR SURROUND-SOUND SPEAKERS

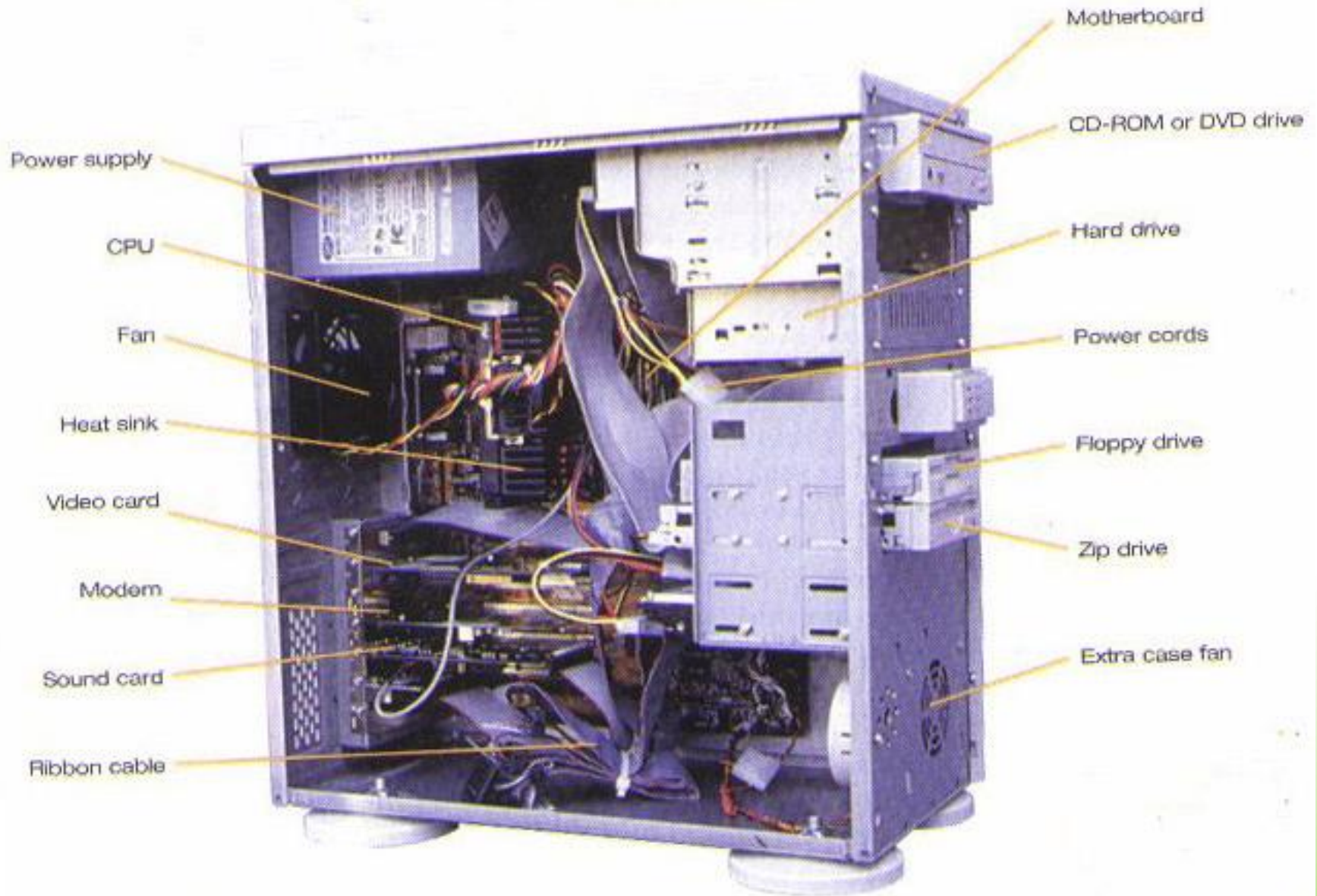56K MODEM PORT

Universal Serial Bus

- *Universal Serial Bus (USB):* A general purpose port that can connect up to 128 devices, and also hot swappable, meaning that devices can be plugged in or unplugged without having to shut down or reboot the system.

- **Plug and Play:** The ability to install devices into a computer when the computer itself makes any necessary internal adjustments.

Note

- Processing takes place in the PC's central processing unit (CPU). The system's memory plays a crucial role in processing data. Both the CPU and memory are attached to the system's motherboard, which connects all the computer's devices together, enabling them to intercommunicate.

Heatsink and Fan

Memory

Power Supply

CPU

Vodeo Card

Dvd Burner

Motherboard

Hard Drive

Power supply

CPU

Fan

Heat sink

Video card

Modem

Sound card

Ribbon cable

Motherboard

CD-ROM or DVD drive

Hard drive

Power cords

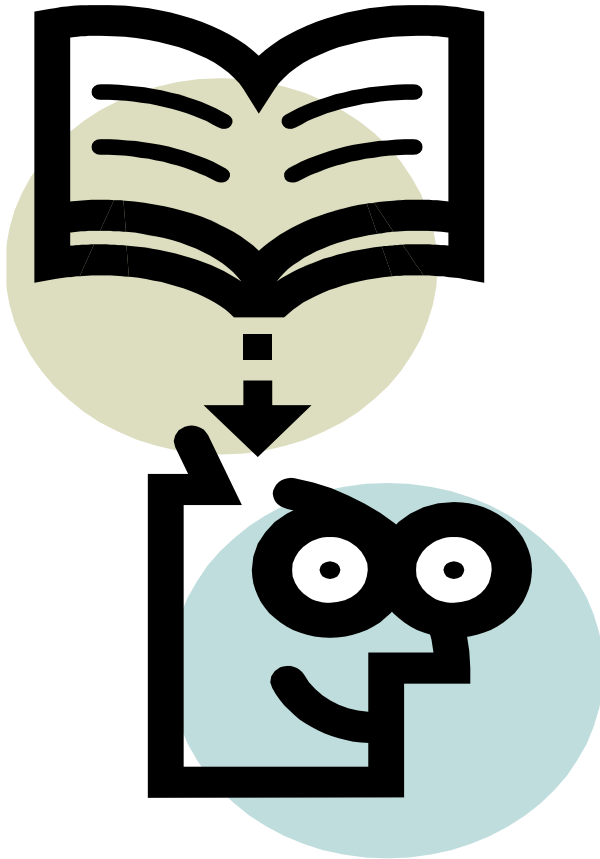Floppy drive

Zip drive

Extra case fan

Factors to consider while buying a computer

- Computer Case

- CD or DVD media

- Storage space

- The size of RAM

- Speed of processor

- Number of USB ports

- Monitor size

- Warranty……..

End of Lesson

Any Question
Or
Comments