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History of Computers

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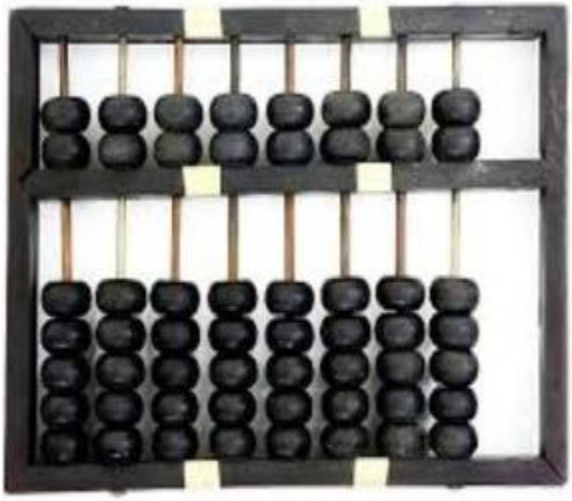
HISTORY OF COMPUTERS

The first counting device was used by the primitive people. They used sticks, stones and bones as counting tools. As human mind and technology improved with time more computing devices were developed. Some of the popular computing devices starting with the first to recent ones are described below;

Abacus

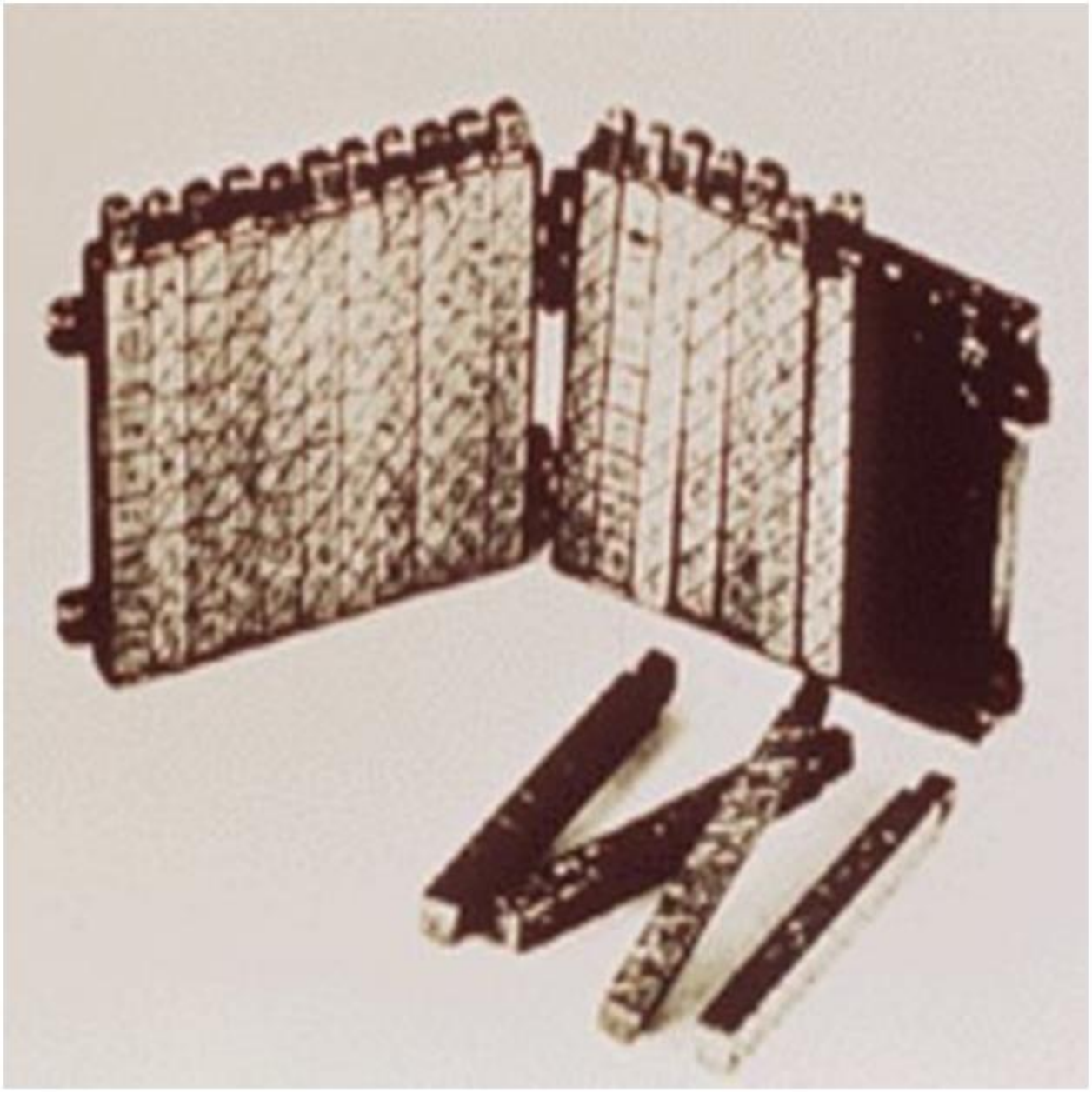
The history of computer begins with the birth of abacus which is believed to be the first computer. It is said that Chinese invented Abacus around 4,000 years ago.

It was a wooden rack which has metal rods with beads mounted on them. The beads were moved by the abacus operator according to some rules to perform arithmetic calculations. Abacus is still used in some countries like China, Russia and Japan. An image of this tool is shown below;



Napier's Bones

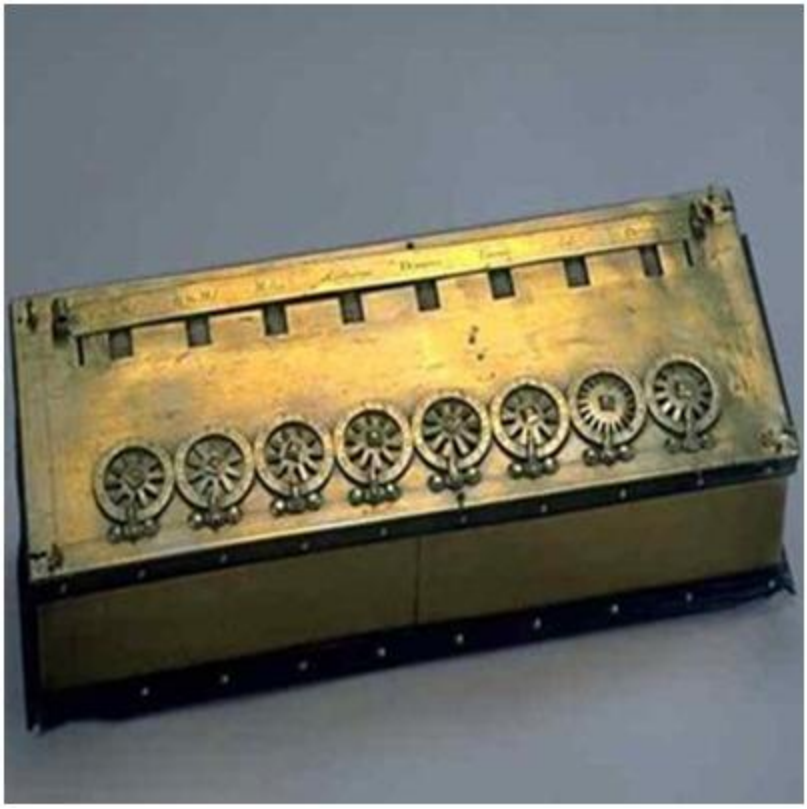
It was a manually-operated calculating device which was invented by John Napier (1550-1617) of Merchiston. In this calculating tool, he used 9 different ivory strips or bones marked with numbers to multiply and divide. So, the tool became known as "Napier's Bones. It was also the first machine to use the decimal point.



Pascaline

Pascaline is also known as Arithmetic Machine or Adding Machine. It was invented between 1642 and 1644 by a French mathematician-philosopher Biaise Pascal. It is believed that it was the first mechanical and automatic calculator.

Pascal invented this machine to help his father, a tax accountant. It could only perform addition and subtraction. It was a wooden box with a series of gears and wheels. When a wheel is rotated one revolution, it rotates the neighboring wheel. A series of windows is given on the top of the wheels to read the totals. An image of this tool is shown below;



Stepped Reckoner or Leibnitz wheel

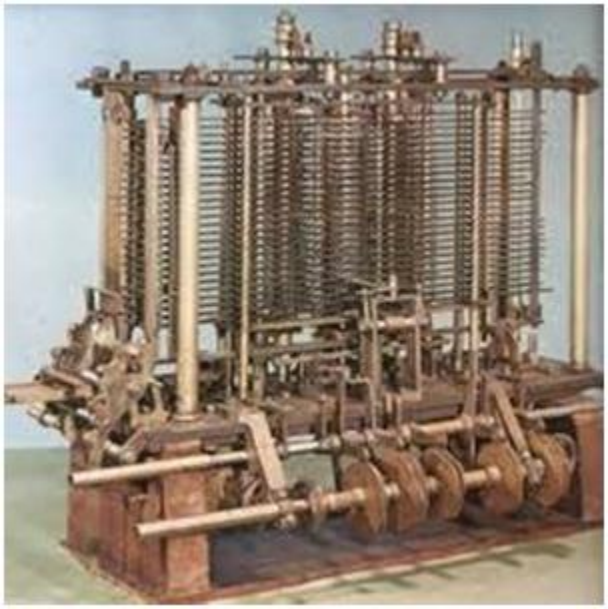
It was developed by a German mathematician-philosopher Gottfried Wilhelm Leibnitz in 1673. He improved Pascal's invention to develop this machine. It was a digital mechanical calculator which was called the stepped reckoner as instead of gears it was made of fluted drums. See the following image;

Difference Engine

In the early 1820s, it was designed by Charles Babbage who is known as "Father of Modern Computer". It was a mechanical computer which could perform simple calculations. It was a steam driven calculating machine designed to solve tables of numbers like logarithm tables.

Analytical Engine

This calculating machine was also developed by Charles Babbage in 1830. It was a mechanical computer that used punch-cards as input. It was capable of solving any mathematical problem and storing information as a permanent memory.

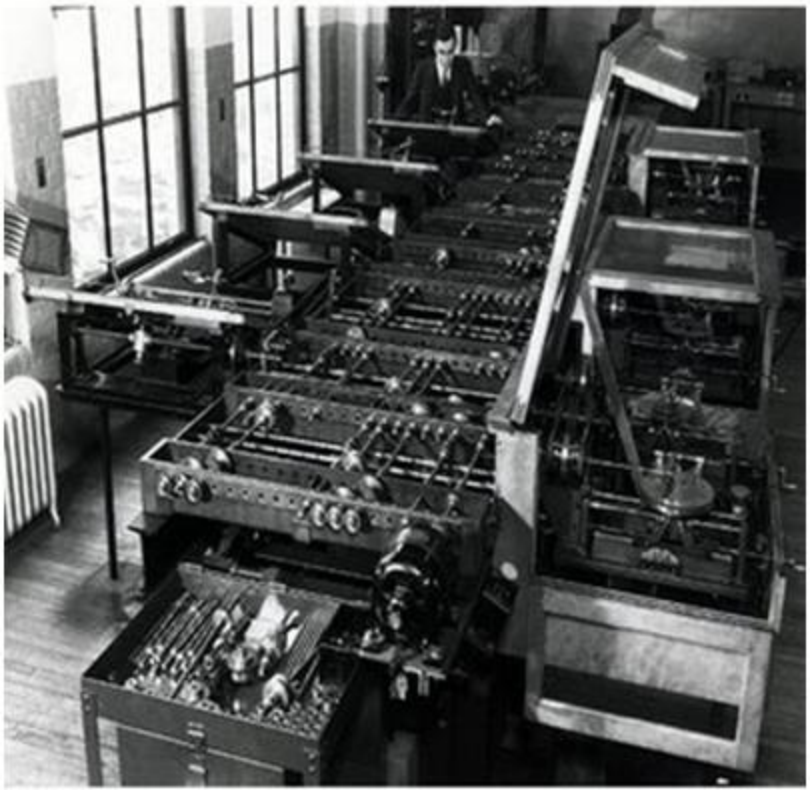


Tabulating Machine

It was invented in 1890, by Herman Hollerith, an American statistician. It was a mechanical tabulator based on punch cards. It could tabulate statistics and record or sort data or information. This machine was used in the 1890 U.S. Census. Hollerith also started the Hollerith?s Tabulating Machine Company which later became International Business Machine (IBM) in 1924.

Differential Analyzer

It was the first electronic computer introduced in the United States in 1930. It was an analog device invented by Vannevar Bush. This machine has vacuum tubes to switch electrical signals to perform calculations. It could do 25 calculations in few minutes.



Mark I

The next major changes in the history of computer began in 1937 when Howard Aiken planned to develop a machine that could perform calculations involving large numbers. In 1944, Mark I computer was built as a partnership between IBM and Harvard. It was the first programmable digital computer.

Generations of Computers

A generation of computers refers to the specific improvements in computer technology with time. In 1946, electronic pathways called circuits were developed to perform the counting. It replaced the gears and other mechanical parts used for counting in previous computing machines.

In each new generation, the circuits became smaller and more advanced than the previous generation circuits. The miniaturization helped increase the speed, memory and power of computers. There are five generations of computers which are described below;

First Generation Computers

The first generation (1946-1959) computers were slow, huge and expensive. In these computers, vacuum tubes were used as the basic components of CPU and memory. These computers were mainly depended on batch operating system and punch cards. Magnetic tape and paper tape were used as output and input devices in this generation;

Some of the popular first generation computers are;

- **ENIAC** (Electronic Numerical Integrator and Computer)
- **EDVAC** (Electronic Discrete Variable Automatic Computer)
- **UNIVACI**(Universal Automatic Computer)
- **IBM-701**
- **IBM-650**

Second Generation Computers

The second generation (1959-1965) was the era of the transistor computers. These computers used transistors which were cheap, compact and consuming less power; it made transistor computers faster than the first generation computers.

In this generation, magnetic cores were used as the primary memory and magnetic disc and tapes were used as the secondary storage. Assembly language and programming languages like COBOL and FORTRAN, and Batch processing and multiprogramming operating systems were used in these computers.

Some of the popular second generation computers are;

- **IBM 1620**
- **IBM 7094**
- **CDC 1604**
- **CDC 3600**
- **UNIVAC 1108**

Third Generation Computers

The third generation computers used integrated circuits (ICs) instead of transistors. A single IC can pack huge number of transistors which increased the power of a computer and reduced the cost. The computers also became more reliable, efficient and smaller in size. These generation computers used remote processing, time-sharing, multi programming as operating system. Also, the high-level programming languages like FORTRON-II TO IV, COBOL, PASCAL PL/1, ALGOL-68 were used in this generation.

Some of the popular third generation computers are;

- **IBM-360 series**
- **Honeywell-6000 series**
- **PDP(Personal Data Processor)**
- **IBM-370/168**
- **TDC-316**

Fourth Generation Computers

The fourth generation (1971-1980) computers used very large scale integrated (VLSI) circuits; a chip containing millions of transistors and other circuit elements. These chips made this generation computers more compact, powerful, fast and affordable. These generation computers used real time, time sharing and distributed operating system. The programming languages like C, C++, and DBASE were also used in this generation.

Some of the popular fourth generation computers are;

- **DEC 10**
- **STAR 1000**
- **PDP 11**
- **CRAY-1(Super Computer)**
- **CRAY-X-MP(Super Computer)**

Fifth Generation Computers

In fifth generation (1980-till date) computers, the VLSI technology was replaced with ULSI (Ultra Large Scale Integration). It made possible the production of microprocessor chips with ten million electronic components. This generation computers used parallel processing hardware and AI (Artificial Intelligence) software. The programming languages used in this generation were C, C++, Java, .Net, etc.

Some of the popular fifth generation computers are;

- **Desktop**
- **Laptop**
- **Notebook**
- **Ultra Book**
- **Chrome Book**

What is Computer

The term "computer" is derived from Latin word "computare" which means to calculate.

Computer is a programmable electronic device that accepts raw data as input and processes it with set of instructions to produce result as output. It renders output just after performing mathematical and logical operations. The device also has memory that stores the data, programs and result of processing.

It is believed that Analytical Engine was the first computer. It was invented by Charles Babbage in 1837. Charles Babbage is also considered as the father of computer.

On the basis of data handling capabilities, the computer is of three types:

- Analogue Computer
- Digital Computer
- Hybrid Computer

Types of Computer

We can categorize computer by two ways: data handling capabilities and size.

On the basis of data handling capabilities, the computer is of *three* types:

- Analogue Computer
- Digital Computer
- Hybrid Computer

1) Analogue Computer

Analogue computers are designed to process the analogue data. Analogue data is continuous data that changes continuously and cannot have discrete values such as speed, temperature, pressure and current.

The analogue computers measure the continuous changes in physical quantity and generally render output as a reading on a dial or scale.

Analogue computers directly accept the data from the measuring device without first converting it into numbers and codes.

Speedometer and mercury thermometer are examples of analogue computers.

2) Digital Computer

Digital computer is designed to perform calculations and logical operations at high speed. It accepts the raw data as digits or numbers and processes it with programs stored in its memory to produce output. All modern computers like laptops and desktops that we use at home or office are digital computers.

3) Hybrid Computer

Hybrid computer has features of both analogue and digital computer. It is fast like analogue computer and has memory and accuracy like digital computers. It can process both continuous and discrete data. So it is widely used in specialized applications where both analogue and digital data is processed. For example, a processor is used in petrol pumps that converts the measurements of fuel flow into quantity and price.

On the basis of size, the computer can be of *five* types:

1) Supercomputer

Supercomputers are the biggest and fastest computers. They are designed to process huge amount of data. A supercomputer can process trillions of instructions in a second. It has thousands of interconnected processors.

Supercomputers are particularly used in scientific and engineering applications such as weather forecasting, scientific simulations and nuclear energy research. First supercomputer was developed by Roger Cray in 1976.

2) Mainframe computer

Mainframe computers are designed to support hundreds or thousands of users simultaneously. They can support multiple programs at the same time. It means they can execute different processes simultaneously. These features of mainframe computers make them ideal for big organizations like banking and telecom sectors, which need to manage and process high volume of data.

3) Miniframe computer

It is a midsize multiprocessing computer. It consists of two or more processors and can support 4 to 200 users at one time. Miniframe computers are used in institutes and departments for the tasks such as billing, accounting and inventory management.

4) Workstation

Workstation is a single user computer that is designed for technical or scientific applications. It has faster microprocessor, large amount of RAM and high speed graphic adapters. It generally performs a specific job with great expertise; accordingly, they are of different types such as graphics workstation, music workstation and engineering design workstation.

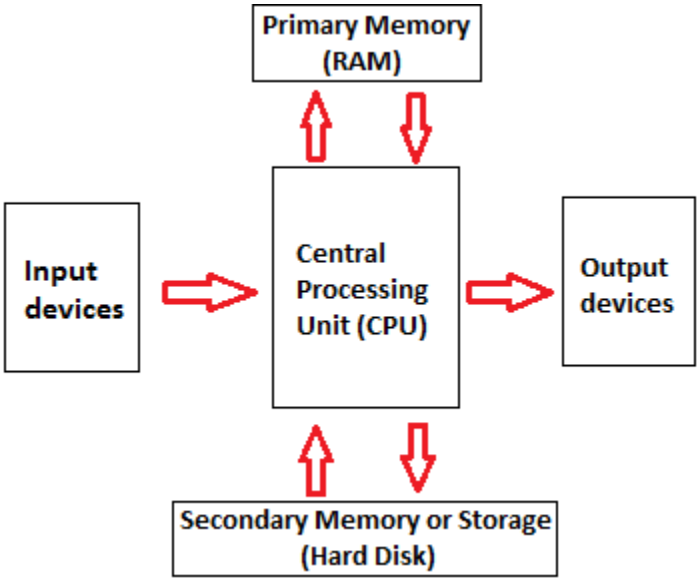
5) Microcomputer

Microcomputer is also known as personal computer. It is a general purpose computer that is designed for individual use. It has a microprocessor as a central processing unit, memory, storage area, input unit and output unit. Laptops and desktop computers are examples of microcomputers.

Computer Components

There are 5 main computer components that are given below:

- Input Devices
- CPU
- Output Devices
- Primary Memory
- Secondary Memory



The operations of computer components are given below:

1) Inputting: It is the process of entering raw data, instructions and information into the computer. It is performed with the help of input devices.

2) Storing: The computer has primary memory and secondary storage to store data and instructions. It stores the data before sending it to CPU for processing and also stores the processed data before displaying it as output.

3) Processing: It is the process of converting the raw data into useful information. This process is performed by the CPU of the computer. It takes the raw data from storage, processes it and then sends back the processed data to storage.

4) Outputting: It is the process of presenting the processed data through output devices like monitor, printer and speakers.

5) Controlling: This operation is performed by the control unit that is part of CPU. The control unit ensures that all basic operations are executed in a right manner and sequence.

Input Devices

Input device enables the user to send data, information or control signals to computer. Central processing unit of computer receives the input and processes it to produce output.

Some of the popular input devices are:

1. Keyboard
2. Mouse
3. Scanner
4. Joystick
5. Light Pen
6. Track ball
7. Digitizer
8. Microphone
9. Magnetic Ink Character Recognition (MICR)
10. Optical Character Reader (OCR)

Keyboard

It is a basic input device that is used to enter data by pressing keys. It has different sets of keys for letters, numbers, characters and functions. QWERTY keyboard is the commonly used keyboard to enter data.

Mouse

It is a hand held input device. It is used to move cursor or pointer across the screen. It generally has left and right button and a scroll wheel between them. Laptop computers come with a touch pad that works as a mouse. It lets you control the movement of cursor or pointer by moving your finger over the touchpad.

Scanner

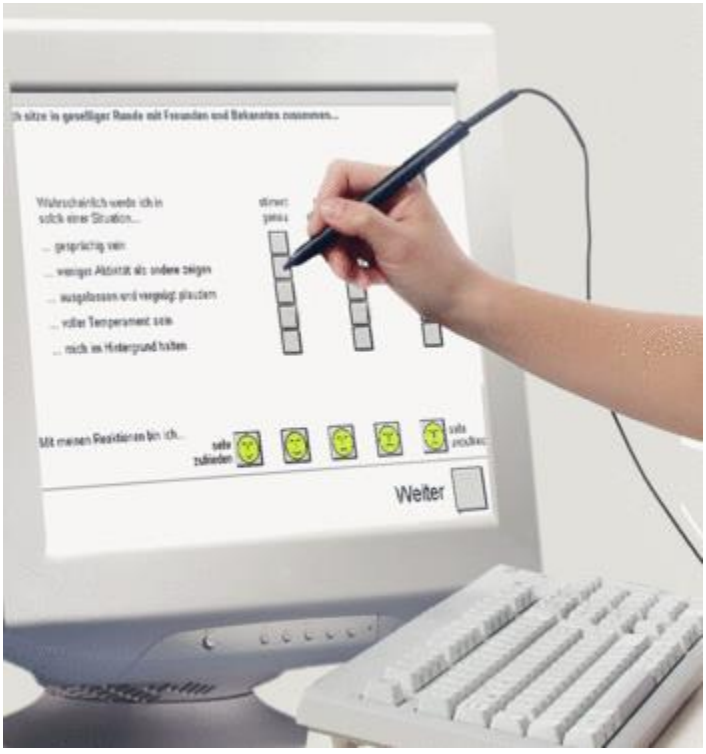
Scanner uses the pictures and pages of text as input. It scans the picture or document. The scanned picture or document then converted into digital format or file and is displayed on the screen as output. Flatbed scanners are the commonly used scanners.

Joystick

It is also a pointing input device like the mouse. It is made up of a stick with spherical base. The base is fitted in socket that allows free movement of stick. The movement of stick controls the cursor or pointer on the screen.

Light Pen

Light pen is a computer input device that looks like a pen. The tip of light pen contains a light sensitive detector that enables the user to point to or select objects on the display screen. Its light sensitive tip detects the object location and sends the corresponding signals to the CPU. It also helps you draw on the screen if needed.



Track ball

It is a stationary input device that has ball mechanism to move the pointer or cursor on the screen. The ball is half inserted in the device and can be easily rolled with finger or thumb. The device has sensor to detect the rotation of ball. It is an ideal device if you have limited desk space as you don?t need to move it like a mouse.

Digitizer

It is a computer input device that has flat surface and usually comes with a stylus. It enables the user to draw images and graphics like we draw on paper with a pencil. The images or graphics drawn on the digitizer appear on the display screen. It can be used to capture handwritten signatures and data or images from taped papers.

Microphone

Microphone is a computer input device that is used to input the sound. It receives the sound, converts it into audio signals. The audio signals are converted into digital data and stored in the computer. The microphone also enables the user to telecommunicate with others. It is also used to add sound to presentations and with webcams for video conferencing.

Magnetic Ink Character Recognition (MICR)

MICR computer input device is designed to read the text printed with magnetic ink. It is widely used in banks to process the cheques. The details on the bottom of the cheque (MICR No.) are written with magnetic ink. The device reads the details and sends to computer for processing. It can process three hundred cheques in a minute with hundred-percent accuracy.

Optical Character Reader (OCR)

OCR computer input device is designed to convert the scanned images of handwritten, typed or printed text into digital text. It is widely used in offices and libraries to convert documents and books into electronic files. The converted documents can be edited if required.

Output Devices

Output device displays the result of processing of raw data that is entered in computer through an input device. There are number of output devices that display output in different ways such as text, images, hard copies and audio or video.

Some of the popular output devices are:

1. Monitor

- CRT Monitor
- LCD Monitor
- LED Monitor
- Plasma Monitor

2. Printer
    - Impact Printers
        A. Character Printers
            i. Dot Matrix printers
            ii. Daisy Wheel printers
        B. Line printers
            i. Drum printers
            ii. Chain printers
    - Non-impact printers
        A. Laser printers
        B. Inkjet printers
3. Projector

Monitor

Monitor is the display unit or screen of the computer. It is the main output device that displays the processed data or information as text, images, audio or video.

The types of monitors are given below.

CRT Monitor

CRT monitors are based on the cathode ray tubes. Cathode rays tube produces beam of electrons that strikes on the inner phosphorescent surface of screen to produce images on the screen.

LCD Monitor

LCD monitor is a flat panel screen that is compact and light weight as compared to CRT monitors. It is based on liquid crystal display technology. It has two layers of polarized glass with liquid crystal solution between them. When the light passes through first layer an electric current aligns the liquids crystals. The aligned liquid crystals allow varying level of light to pass through the second layer to create images on the screen.

LED monitor

LED monitors also have flat panel display and use liquid crystal display technology like the LCD monitors. The difference between them lies in the source of light to backlight the display. The LED monitors use light emitting diodes to backlight the display and LCD monitors use cold cathode fluorescent light to backlight the display.

Plasma Monitor

It is also a flat panel display that is based on plasma display technology. It has small tiny cells between two glass panels. These cells contain mixtures of gases. When voltage is applied the gas in the cells turns into plasma and emits ultraviolet light that creates images on the screen.

Printer

Printer produces hard copies of the processed data. It enables the user to print images, text or any other information on paper.

Based on the printing mechanism, the printers are of two types: Impact Printers and Non-impact printers.

- Impact Printers
    - A. Character Printers
        - i. Dot Matrix printers
        - ii. Daisy Wheel printers
    - B. Line printers
        - i. Drum printers
        - ii. Chain printers
- Non-impact printers
    - A. Laser printers
    - B. Inkjet printers

Impact Printer

Impact printer uses hammer or print head to print the character or images on the paper. The hammer or print head strikes or presses an ink ribbon against the paper to print characters and images.

Impact printers are further divided into two types.

A. Character Printers

B. Line printers

Character Printers

Character printer prints a single character at a time or with a single stroke of print head or hammer. Dot Matrix printer and Daisy Wheel printer are examples of character printers.

Dot Matrix Printer

It is an impact printer. The characters and images printed by it are pattern of dots. These patterns are produced by striking the ink soaked ribbon against the paper with print head.

Daisy Wheel Printer

It consists of a wheel or disk that has spokes or extensions. At the end of extensions, molded metal characters are mounted. To print a character the printer rotates the wheel and when the desired character is on print location the hammer hits disk and the extension hits the ink ribbon against the paper to create the impression.

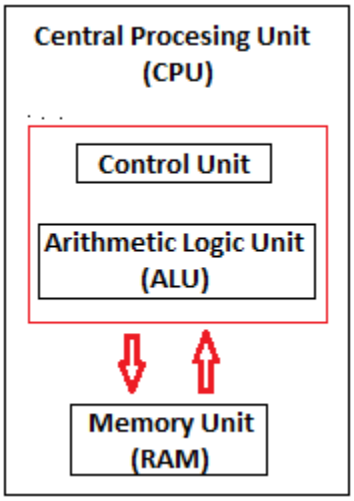
Central Processing Unit (CPU)

Central processing unit carries out all important functions of a computer. It receives instructions from both the hardware and active software and produces output accordingly. It is also called processer, central processor and microprocessor. It stores all important programs like operating system and application software. It also helps Input and output devices to communicate with each other.

Generally, a CPU has three components:

- ALU (Arithmetic Logic Unit)
- Control Unit

- Memory or Storage Unit



Memory: It is called Random access memory (RAM). It temporarily stores data, programs and intermediate and final results of processing.

Control Unit: It controls and coordinates the functioning of all parts of computer. It does not involve in processing and storing data.

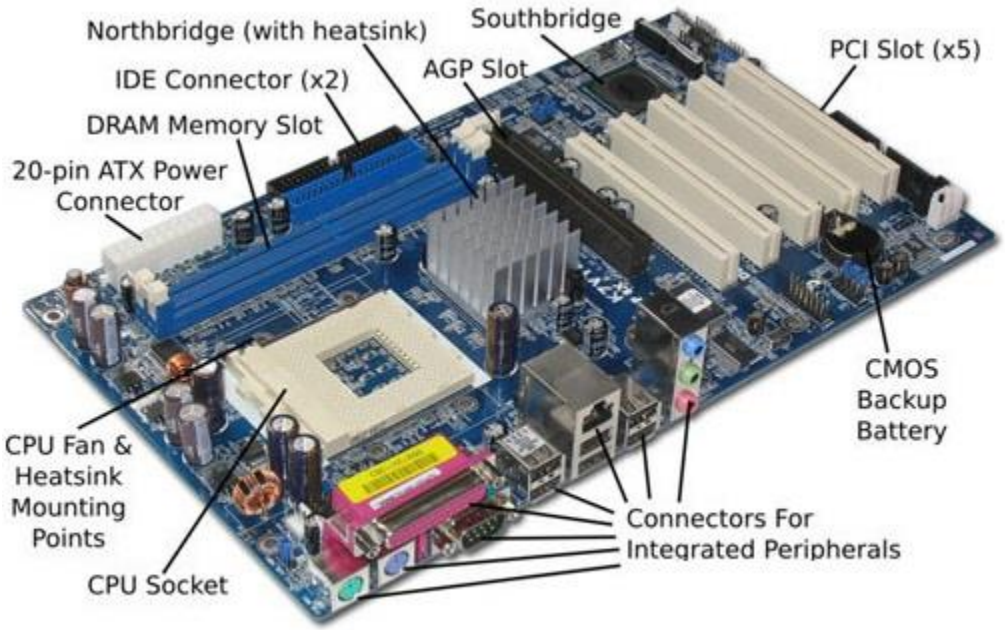
ALU: It performs arithmetic and logical functions. Arithmetic functions include addition, subtraction, multiplication and division. Logical functions mainly include selecting, comparing and merging the data.

Hardware

All tangible physical components of computer and the devices connected to it are hardware. Some of the popular examples of computer hardware are CPU, motherboard, monitor, mouse and keyboard.

Motherboard

Motherboard is generally a thin circuit board that holds together almost all parts of computer except input and output devices. All crucial hardware like CPU, memory, hard drive and ports for input and output devices are located on the motherboard. It allocates power to all hardware located on it and enables them to communicate with each other.



Monitor

It is the display unit of the computer. It is the basic output device that renders the processed data as text, images, audio or video.

Keyboard

It is the basic input device that is used to input data into the computer. It has different sets of keys to enter numbers, characters and symbols.

Mouse

It is an input device that is used to point to or select objects on the display screen of computer.