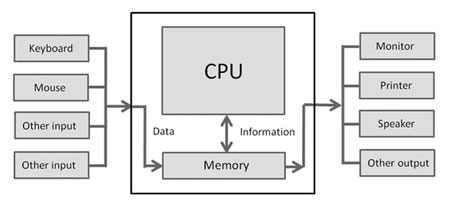
**WHAT IS COMPUTER?**



Computer is an electronic device that is designed to work with Information.

The term computer is derived from the Latin term *‘computare’*, this means to calculate or programmable machine.

**Computer can not do anything without a Program**.

It represents the decimal numbers through a string of binary digits.

The Word 'Computer' usually refers to the [Center Processor](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-cpu) Unit plus Internal [memory](http://ecomputernotes.com/fundamental/input-output-and-memory/what-are-the-different-types-of-ram-explain-in-detail).

**Charles Babbage** is called the "Grand Father" of the computer.

The First mechanical computer designed by Charles Babbage was called **Analytical Engine.**It uses read-only memory in the form of punch cards.

Computer is an advanced electronic device that takes raw data as input from the user and processes these data under the control of set of instructions (called program) and gives the result (output) and saves output for the future use. It can process both numerical and non-numerical (arithmetic and logical) calculations.

**DIGITAL COMPUTER DEFINITION**

The basic components of a modern digital computer are: [Input Device](http://ecomputernotes.com/fundamental/input-output-and-memory/list-various-input-and-output-devices), [Output Device](http://ecomputernotes.com/fundamental/input-output-and-memory/list-various-input-and-output-devices), [Central Processor Unit](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-cpu) ([CPU](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-cpu)), mass storage device and memory.

A Typical modern computer uses LSI Chips.

Four Functions about computer are:

|  |  |
| --- | --- |
| accepts data | Input |
| processes data | Processing |
| produces output | Output |
| stores results | Storage |

**Input (Data):**

Input is the raw [information](http://ecomputernotes.com/fundamental/information-technology/what-do-you-mean-by-data-and-information) entered into a computer from the input devices. It is the collection of letters, numbers, images etc.

**Process:**

Process is the operation of data as per given instruction. It is totally internal process of the computer system.

**Output:**

Output is the processed data given by computer after data processing. Output is also called as Result. We can save these results in the [storage devices](http://ecomputernotes.com/fundamental/input-output-and-memory/explain-secondary-storage-devices) for the future use.

**COMPUTER CLASSIFICATION: BY SIZE AND POWER**

 Computers differ based on their data processing abilities. They are classified according to purpose, data handling and functionality.

According to functionality, [computers](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer) are classified as:

**• Analog Computer:**

A [computer](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer) that represents numbers by some continuously variable physical quantity, whose variations mimic the properties of some system being modeled.

**• Personal computer:**

A [**personal computer**](http://ecomputernotes.com/fundamental/introduction-to-computer/personal-computer) is a computer small and low cost. The term"personal computer" is used to describe desktop computers (desktops).

**• Workstation:**

A terminal or desktop computer in a network. In this context, workstation is just a generic term for a user's machine (client machine) in contrast to a "server" or "mainframe."

**• Minicomputer:**

A **minicomputer**isn't very mini. At least, not in the way most of us think of mini. You know how big your personal [computer](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer) is and its related family.

**• Mainframe:**

It refers to the kind of large computer that runs an entire corporation.

**• Supercomputer:**

It is the biggest, fastest, and most expensive computers on earth.

**• Microcomputer:**

Your *personal*[*computer*](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer)is a **microcomputer.**

# [USES OF COMPUTER](http://ecomputernotes.com/fundamental/introduction-to-computer/uses-of-computer)

## ****Education :****

Getting the right kind of [information](http://ecomputernotes.com/fundamental/information-technology/what-do-you-mean-by-data-and-information) is a major challenge as is getting information to make sense.

College students spend an average of 5-6 hours a week on the internet.

Research shows that [computers](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer) can significantly enhance performance in learning.

Students exposed to the internet say they think the web has helped them improve the quality of their academic research and of their written work.

One revolution in education is the advent of distance learning.

This offers a variety of internet and video-based online courses.

## ****Health and Medicine :****

[Computer](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer) technology is radically changing the tools of medicine.

All medical information can now be digitized.

Software is now able to [computer](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer) the risk of a disease.

Mental health researchers are using computers to screen troubled teenagers in need of psychotherapy.

A patient paralyzed by a stroke has received an implant that allows communication between his brain and a computer; as a result, he can move a cursor across a screen by brainpower and convey simple messages.

## ****Science :****

Scientists have long been users of it.

A new adventure among scientists is the idea of a “collaboratory”, an internet based collaborative laboratory, in which researchers all over the world can work easily together even at a distance.

An example is space physics where space physicists are allowed to band together to measure the earth’s ionosphere from instruments on four parts of the world.

## ****Business :****

Business clearly see the interest as a way to enhance productivity and competitiveness.

Some areas of business that are undergoing rapid changes are sales and marketing, retailing, banking, stock trading, etc.

Sales representatives not only need to be better educated and more knowledgeable about their customer’s businesses, but also must be comfortable with computer technology.

The internet has become a popular marketing tool.

The world of cybercash has come to banking – not only smart cards but internet banking, electronic deposit, bill paying, online stock and bond trading, etc.

## ****Recreation and Entertainment:****

Our entertainment and pleasure-time have also been affected by computerization. For example:

i) In movies, computer generated graphics give freedom to designers so that special effects and even imaginary characters can play a part in making movies, videos, and commercials.

ii) In sports, computers compile statistics, sell tickets, create training programs and diets for athletes, and suggest game plan strategies based on the competitor’s past performance.

iii) In restaurants, almost every one has eaten food where the clerk enters an order by indicating choices on a rather unusual looking cash [register](http://ecomputernotes.com/fundamental/input-output-and-memory/what-is-registers-function-performed-by-registers-types-of-registers); the device directly enters the actual data into a computer, and calculates the cost and then prints a receipt.

## ****Government:****

Various departments of the Government use computer for their planning, control and law enforcement activities.

To name a few – Traffic, Tourism, Information & Broadcasting, Education, Aviation and many others.

## ****Defence:****

There are many uses computers in Defence such as:

1) Controlling UAV or unmanned air-crafts an example is Predator. If you have cable I would recommend watching the shows “Future Weapons" and “Modern Marvels". The show future weapon gives an entire hour to the predator.

2) They are also used on Intercontinental Ballistic Missiles (ICBMs) that uses GPS and Computers to help the missile get to the target.

3) Computers are used to track incoming missiles and help slew weapons systems onto the incoming target to destroy them.

4) Computers are used in helping the military find out where all their assets are (Situational Awareness) and in Communications/Battle Management Systems.

5) Computers are used in the logistic and ordering functions of getting equipments to and around the battlefield.

6) Computers are used in tanks and planes and ships to target enemy forces, help run the platform and more recently to help diagnose any problems with the platforms.

7) Computers help design and test new systems.

## ****Sports:****

In today's technologically growing society, computers are being used in nearly every activity.

## ****Recording Information****

Official statistics keepers and some scouts use computers to record statistics, take notes and chat online while attending and working at a sports event.

## ****Analyzing Movements****

The best athletes pay close attention to detail. Computers can slow recorded video and allow people to study their specific movements to try to improve their tendencies and repair poor habits.

## ****Writers****

Many sportswriters attend several sporting events a week, and they take their computers with them to write during the game or shortly after while their thoughts are fresh in their mind.

## ****Scoreboard****

While some scoreboards are manually updated, most professional sports venues have very modern scoreboards that are programmed to update statistics and information immediately after the information is entered into the computer.

## ****Safety****

Computers have aided in the design of safety equipment in sports such as football helmets to shoes to mouth guards

# [Block Diagram of Computer and Explain its Various Components](http://ecomputernotes.com/fundamental/introduction-to-computer/draw-the-block-diagram-of-computer-and-explain-its-various-components)

A computer can process data, pictures, sound and graphics.

They can solve highly complicated problems quickly and accurately.

A computer as shown in Fig.  performs basically five major computer operations or functions irrespective of their size and make.

These are

1) it accepts data or instructions by way of input,

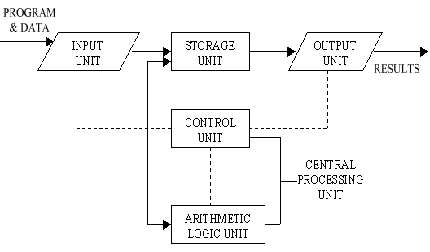
2) it stores data,

3) it can process data as required by the user,

4) it gives results in the form of output, and

5) it controls all operations inside a computer.

We discuss below each of these [Computer](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer) operations

[](http://ecomputernotes.com/images/Basic-computer-Operations.gif)

**Fig : Basic computer Operations**

**1. Input:**

This is the process of entering data and programs in to the computer system.

You should know that computer is an electronic machine like any other machine which takes as inputs raw data and performs some processing giving out processed data.

Therefore, the input unit takes data from us to the computer in an organized manner for processing.

**2. Storage:**

The process of saving data and instructions permanently is known as storage.

Data has to be fed into the system before the actual processing starts.

It is because the processing speed of Central Processing Unit ([CPU](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-cpu)) is so fast that the data has to be provided to CPU with the same speed.

Therefore the data is first stored in the storage unit for faster access and processing.

This storage unit or the primary storage of the computer system is designed to do the above functionality.

It provides space for storing data and instructions.

The storage unit performs the following major functions:

• All data and instructions are stored here before and after processing.

• Intermediate results of processing are also stored here.

**3. Processing:**

The task of performing operations like arithmetic and logical operations is called processing.

The Central Processing Unit (CPU) takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. It is then sent back to the storage unit.

**4. Output:**

This is the process of producing results from the data for getting useful information.

Similarly the output produced by the computer after processing must also be kept somewhere inside the computer before being given to you in human readable form.

Again the output is also stored inside the computer for further processing.

**5. Control:**

The manner how instructions are executed and the above operations are performed.

Controlling of all operations like input, processing and output are performed by control unit.

It takes care of step by step processing of all operations inside the computer.

## ****FUNCTIONAL UNITS****

In order to carry out the operations mentioned in the previous section the computer allocates the task between its various functional units.

The computer system is divided into three separate units for its operation.

They are

1) arithmetic logical unit

2) control unit.

3) central processing unit.

**Arithmetic Logical Unit (ALU)  Logical Unit**

**Logical Unit** :

After you enter data through the input device it is stored in the primary storage unit.

The actual processing of the data and instruction are performed by Arithmetic Logical Unit.

The major operations performed by the ALU are addition, subtraction, multiplication, division, logic and comparison.

Data is transferred to ALU from storage unit when required.

After processing the output is returned back to storage unit for further processing or getting stored.

### ****Control Unit (CU)****

The next component of computer is the Control Unit, which acts like the supervisor seeing that things are done in proper fashion.

Control Unit is responsible  for  co ordinating various operations using time signal.

The control unit determines the sequence in which computer programs and instructions are executed.

Things like processing of programs stored in the main memory, interpretation of the instructions and issuing of signals for other units of the computer to execute them.

It also acts as a switch board operator when several users access the computer simultaneously.

Thereby it coordinates the activities of computer’s peripheral equipment as they perform the input and output.

### ****Central Processing Unit (CPU)****

The ALU and the CU of a computer system are jointly known as the central processing unit.

You may call CPU as the brain of any computer system.

It is just like brain that takes all major decisions, makes all sorts of calculations and directs different parts of the computer functions by activating and controlling the operations.

# [CLASSIFICATION OF COMPUTERS](http://ecomputernotes.com/fundamental/introduction-to-computer/write-a-detailed-note-on-classification-of-computers)

Computers differ based on their data processing abilities.

They are classified according to purpose, data handling and functionality.

According to purpose, [computers](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer) are either general purpose or specific purpose.

**General purpose computers** are designed to perform a range of tasks.

They have the ability to store numerous programs, but lack in speed and efficiency.

Specific purpose computers are designed to handle a specific problem or to perform a specific task.

* A set of instructions is built into the machine.
* According to data handling, computers are analog, digital or hybrid.
* Analog computers work on the principle of measuring, in which the measurements obtained are translated into data.
* Modern analog computers usually employ electrical parameters, such as voltages, resistances or currents, to represent the quantities being manipulated.
* Such computers do not deal directly with the numbers.
* They measure continuous physical magnitudes.
* Digital computers are those that operate with [information](http://ecomputernotes.com/fundamental/information-technology/what-do-you-mean-by-data-and-information), numerical or otherwise, represented in a digital form.
* Such computers process data into a digital value (in 0s and 1s).
* They give the results with more accuracy and at a faster rate.
* Hybrid computers incorporate the measuring feature of an analog [computer](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer) and counting feature of a digital computer.
* For computational purposes, these computers use analog components and for storage, digital memories are used.

According to functionality, computers are classified as :

**Analog Computer**

 An analog computer (spelt analogue in British English) is a form of computer that uses *continuous*physical phenomena such as electrical, mechanical, or hydraulic quantities to model the problem being solved.

**Digital**[**Computer**](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer)

 A computer that performs calculations and logical operations with quantities represented as digits, usually in the binary number system

**Hybrid Computer (Analog + Digital)**

 A combination of computers those are capable of inputting and outputting in both digital and analog signals.

A hybrid computer system setup offers a cost effective method of performing complex simulations.

**On the basis of Size**

**Super Computer**

The fastest and most powerful type of computer Supercomputers are very expensive and are employed for specialized applications that require immense amounts of mathematical calculations.

For example, weather forecasting requires a supercomputer. Other uses of supercomputers include animated graphics, fluid dynamic calculations, nuclear energy research, and petroleum exploration.

The chief difference between a supercomputer and a mainframe is that a supercomputer channels all its power into executing a few programs as fast as possible, whereas a mainframe uses its power to execute many programs concurrently.

**Mainframe Computer**

A very large and expensive computer capable of supporting hundreds, or even thousands, of users simultaneously.

In the hierarchy that starts with a simple microprocessor (in watches, for example) at the bottom and moves to supercomputers at the top, mainframes are just below supercomputers.

In some ways, mainframes are more powerful than supercomputers because they support more simultaneous programs. But supercomputers can execute a single program faster than a mainframe.

**Mini Computer**

A midsized computer. In size and power, minicomputers lie between *workstations*and *mainframes*.

In the past decade, the distinction between large minicomputers and small mainframes has blurred, however, as has the distinction between small minicomputers and workstations.

But in general, a minicomputer is a multiprocessing system capable of supporting from 4 to about 200 users simultaneously.

**Micro Computer or Personal Computer**

• **Desktop Computer**: a personal or micro-mini computer sufficient to fit on a desk.

• [**Laptop**](http://ecomputernotes.com/fundamental/introduction-to-computer/laptop-computer)**Computer**: a portable computer complete with an integrated screen and keyboard. It is generally smaller in size than a desktop computer and larger than a [notebook](http://ecomputernotes.com/fundamental/introduction-to-computer/laptop-computer) computer.

• **Palmtop Computer/Digital Diary /Notebook /PDAs**: a hand-sized computer. Palmtops have no keyboard but the screen serves both as an input and output device.

**Workstations**

A terminal or desktop computer in a network. In this context, workstation is just a generic term for a user's machine (client machine) in contrast to a "server" or "mainframe."

**BASIC CHARACTERISTICS ABOUT**[**COMPUTER**](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer)**ARE:**

**1. Speed: -**

As you know computer can work very fast.

It takes only few seconds for calculations that we take hours to complete.

You will be surprised to know that computer can perform millions (1,000,000) of instructions and even more per second.

Therefore, we determine the speed of computer in terms of microsecond (10-6 part of a second) or nanosecond (10 to the power -9 part of a second).

From this you can imagine how fast your computer performs work.

**2. Accuracy: -**

The degree of accuracy of computer is very high and every calculation is performed with the same accuracy.

The accuracy level is **7**

determined on the basis of design of computer.

The errors in computer are due to human and inaccurate data.

**3. Diligence: -**

A computer is free from tiredness, lack of concentration, fatigue, etc.

It can work for hours without creating any error.

If millions of calculations are to be performed, a computer will perform every calculation with the same accuracy.

Due to this capability it overpowers human being in routine type of work.

**4. Versatility: -**

It means the capacity to perform completely different type of work.

You may use your computer to prepare payroll slips.

Next moment you may use it for inventory management or to prepare electric bills.

**5. Power of Remembering: -**

Computer has the power of storing any amount of information or data.

Any information can be stored and recalled as long as you require it, for any numbers of years.

It depends entirely upon you how much data you want to store in a computer and when to lose or retrieve these data.

**6. No IQ: -**

Computer is a dumb machine and it cannot do any work without instruction from the user.

It performs the instructions at tremendous speed and with accuracy.

It is you to decide what you want to do and in what sequence.

So a computer cannot take its own decision as you can.

**7. No Feeling: -**

It does not have feelings or emotion, taste, knowledge and experience.

Thus it does not get tired even after long hours of work.

It does not distinguish between users.

**8. Storage: -**

The Computer has an in-built memory where it can store a large amount of data.

You can also store data in secondary storage devices such as floppies, which can be kept outside your computer and can be carried to other computers.

# HISTORY OF COMPUTER

Each generation of [computer](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer) is characterized by a major technological development that fundamentally changed the way [computers](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer) operate, resulting in increasingly smaller, cheaper, more powerful and more efficient and reliable devices.

The various generations of computers an listed below :

**(i) First Generation (1946-1954) :**

In **1946** there was no 'best' way of storing instructions and data in a computer [memory](http://ecomputernotes.com/fundamental/input-output-and-memory/what-are-the-different-types-of-ram-explain-in-detail). There were four competing technologies for providing computer memory:

electrostatic storage tubes, acoustic delay lines (**mercury or nickel**), **magnetic drums** (and disks?), and **magnetic core storage.**

The digital computes using **electronic valves** (Vacuum tubes) are known as first generation computers. the first 'computer' to use electronic valves (ie. vacuum tubes).

The high cost of vacuum tubes prevented their use for main memory.

They stored [information](http://ecomputernotes.com/fundamental/information-technology/what-do-you-mean-by-data-and-information) in the form of propagating sound waves.

The vacuum tube consumes a lot of power.

The Vacuum tube was developed by Lee DeForest in 1908.

These computers were large in size and writing programs on them was difficult.

Some of the computers of this generation were:

**Mark I :**

The **IBM Automatic Sequence Controlled Calculator (ASCC)**, called the Mark I by **Harvard University**, was an **electro-mechanical computer**.

Mark I is the first machine to successfully perform a long services of **arithmetic and logical operation**.

Mark I is the **First Generation**[**Computer**](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-computer).

it was the first operating machine that could **execute long computations automatically**. ***Mark I*** computer which was built as a partnership between Harvard and **IBM in 1944**. This was the first programmable digital computer made in the U.S. But it was not a purely electronic computer. Instead the Mark I was constructed out of switches, relays, rotating shafts, and clutches. The machine weighed 5 tons, incorporated 500 miles of wire, was 8 feet tall and 51 feet long, and had a 50 ft rotating shaft running its length, turned by a 5 horsepower electric motor.

**ENIAC:**

It  was the **first general-purpose electronic computer** built in **1946** at **University of Pennsylvania, USA by John Mauchly and J. Presper Eckert**.

The completed machine was announced to the public the evening of **February 14, 1946**.

It was named **Electronic Numerical Integrator and Calculator (ENIAC)**.

ENIAC contained 17,468 vacuum tubes, 7,200 crystal diodes, 1,500 relays, 70,000 resistors, 10,000 capacitors and around 5 million hand-soldered joints.

It weighed more than 30 short tons (27 t), was roughly 8 by 3 by 100 feet (2.4 m × 0.9 m × 30 m), took up 1800 square feet (167 m2), and consumed 150 kW of power.

Input was possible from an **IBM card reader**, and an **IBM card punch** was used for output.

These cards could be used to produce printed output offline using an IBM accounting machine, such as the **IBM 405**.

Today your favorite computer is many times as powerful as ENIAC, still size is very small.

**EDVAC:**

It stands for **Electronic Discrete Variable Automatic Computer** and was developed in **1950**.

it was to be a vast improvement upon ENIAC, it was **binary** rather than **decimal**, and was a stored program computer.

**The concept of storing data and instructions inside the computer was introduced here.**

This allowed much faster operation since the computer had rapid access to both data and instructions.

The other advantage of storing instruction was that computer could do logical decision internally.

The EDVAC was a **binary serial computer** with automatic addition, subtraction, multiplication, programmed division and automatic checking with an ultrasonic serial memory.

EDVAC's **addition time was 864 microseconds** and its **multiplication time was 2900** microseconds (2.9 milliseconds).

The computer had almost 6,000 vacuum tubes and 12,000 diodes, and consumed 56 kW of power.

It covered 490 ft² (45.5 m²) of floor space and weighed 17,300 lb (7,850 kg).

**EDSAC:**

It stands for **Electronic Delay Storage Automatic Computer** and was developed by **M.V. Wilkes at Cambridge University in 1949**.

Two groups of individuals were working at the same time to develop the first stored-program computer.

In the United States, at the University of Pennsylvania the EDVAC (Electronic Discrete Variable Automatic Computer) was being worked on.

In England at Cambridge, the EDSAC (Electronic Delay Storage Automatic Computer) was also being developed.

The **EDSAC** won the race as the first **stored-program computer** beating the United States’ EDVAC by two months.

The EDSAC performed computations in the three millisecond range.

It performed arithmetic and logical operations without human intervention.

The key to the success was in the **stored instructions** which it depended upon solely for its operation.

**This machine marked the beginning of the computer age.**

EDSAC is the first computer is used to store a program

**UNIVAC-1**:

**Ecker and Mauchly produced it in 1951 by Universal Accounting Computer** setup.

it was the**first commercial computer** produced in the United States.

It was designed principally by J. Presper Eckert and John Mauchly, the inventors of the ENIAC.

The machine was 25 feet by 50 feet in length, contained 5,600 tubes, 18,000 crystal diodes, and 300 relays. It utilized serial circuitry, 2.25 MHz bit rate, and had an internal storage capacity 1,000 words or 12,000 characters.

It utilized a **Mercury delay line**, magnetic tape, and **typewriter output**.

The UNIVAC was used for **general purpose computing** with large amounts of input and output.

Power consumption was about 120 kva.

Its reported processing speed was 0.525 milliseconds for arithmetic functions, 2.15 milliseconds for multiplication and 3.9 Milliseconds for division.

The UNIVAC was also the first computer to come equipped with a magnetic tape unit and was the**first computer to use buffer memory**.

**Other Important Computers of First Generation**

Some other computers of this time worth mentioning are the Whirlwind, developed at Massachussets Institute of Technology, and JOHNNIAC, by the Rand Corporation. The Whirlwind was the first computer to display real time video and use core memory. The JOHNNIAC was named in honor of Jon Von Neumann. Computers at this time were usually kept in special locations like government and university research labs or military compounds.

**Limitations of First Generation Computer**

Followings are the major drawbacks of First generation computers.

1.  They used valves or vacuum tubes as their main electronic component.

2. They were large in size, slow in processing and had less storage capacity.

3.  They consumed lots of electricity and produced lots of heat.

4.  Their computing capabilities were limited.

5. They were not so accurate and reliable.

6.  They used machine level language for programming.

7.  They were very expensive.

Example: ENIAC, UNIVAC, IBM 650 etc

(ii)  **Second Generation (1955-1964) :**

The second-generation computer used **transistors** for [CPU](http://ecomputernotes.com/fundamental/introduction-to-computer/what-is-cpu) components & **ferrite cores for main memory** & **magnetic disks** for secondary memory.

They used high-level languages such as **FORTRAN (1956), ALGOL (1960) & COBOL (1960 - 1961)**. I/O processor was included to control I/O operations.

Around 1955 a device called ***Transistor***replaced the bulky Vacuum tubes in the first generation computer.

Transistors are smaller than Vacuum tubes and have higher operating speed.

They have no filament and require no heating. Manufacturing cost was also very low.

Thus the size of the computer got reduced considerably.

It is in the second generation that the concept of Central Processing Unit (CPU), memory, programming language and input and output units were developed.

The programming languages such as COBOL, FORTRAN were developed during this period.

Some of the computers of the Second Generation were

1. **IBM 1620**: Its size was smaller as compared to First Generation computers and mostly used for scientific purpose.

2.**IBM 1401**: Its size was small to medium and used for business applications.

3. **CDC 3600**: Its size was large and is used for scientific purposes.

**Features:**

1.  Transistors were used instead of Vacuum Tube.

2.  Processing speed is faster than First Generation Computers (Micro Second)

3.  Smaller in Size (51 square feet)

4. The input and output devices were faster.

Example: IBM 1400 and 7000 Series, Control Data 3600 etc.

(iii)             **Third Generation (1964-1977) :**

By the development of a small chip consisting of the capacity of the **300 transistors**.

These ICs are popularly known as ***Chips***.

A single IC has many transistors, [registers](http://ecomputernotes.com/fundamental/input-output-and-memory/what-is-registers-function-performed-by-registers-types-of-registers) and capacitors built on a single thin slice of **silicon**.

So it is quite obvious that the size of the computer got further reduced.

Some of the computers developed during this period were **IBM-360, ICL-1900, IBM-370, and VAX-750**.

Higher level language such as **BASIC (Beginners All purpose Symbolic Instruction Code)** was developed during this period.

Computers of this generation were small in size, low cost, large memory and processing speed is very high.

Very soon ICs Were replaced by **LSI (Large Scale Integration)**, which consisted about 100 components.

An IC containing about 100 components is called LSI.

**Features:**

1. They used Integrated Circuit (IC) chips in place of the transistors.

2. Semi conductor memory devices were used.

3.  The size was greatly reduced, the speed of processing was high, they were   more accurate and reliable.

4.  Large Scale Integration (LSI) and Very Large Scale Integration (VLSI) were also developed.

5.  The mini computers were introduced in this generation.

6. They used high level language for programming.

Example: IBM 360, IBM 370 etc.

(iv)     **Fourth Generation :**An IC containing about 100 components is called LSI (Large Scale Integration) and the one, which has more than 1000 such components, is called as **VLSI (Very Large Scale Integration)**.

It uses *large scale Integrated Circuits*(LSIC) built on a single silicon chip called microprocessors.

Due to the development of microprocessor it is possible to place computer’s *central processing unit*(CPU) on single chip.

These computers are called microcomputers.

Later *very large scale Integrated Circuits*(VLSIC) replaced LSICs.

Thus the computer which was occupying a very large room in earlier days can now be placed on a table.

The [personal computer](http://ecomputernotes.com/fundamental/introduction-to-computer/personal-computer) ([PC](http://ecomputernotes.com/fundamental/introduction-to-computer/personal-computer)) that you see in your school is a Fourth Generation Computer Main memory used fast semiconductors chips up to 4 M bits size.

Hard disks were used as secondary memory.

Keyboards, dot matrix printers etc. were developed. OS-such as **MS-DOS, UNIX, Apple’s Macintosh** were available.

Object oriented language, **C++ etc** were developed.

**Features:**

1.  They used Microprocessor (VLSI) as their main switching element.

2. They are also called as micro computers or personal computers.

3.  Their size varies from desktop to [laptop](http://ecomputernotes.com/fundamental/introduction-to-computer/laptop-computer) or palmtop.

4.  They have very high speed of processing; they are 100% accurate, reliable,   diligent and versatile.

5.  They have very large storage capacity.

Example: IBM PC, Apple-Macintosh etc.

(v)    **Fifth Generation (1991- continued) :**

5th generation computers use ULSI (Ultra-Large Scale Integration) chips.

Millions of transistors are placed in a single IC in ULSI chips.

64 bit microprocessors have been developed during this period.

Data flow & EPIC architecture of these processors have been developed.

[RISC](http://ecomputernotes.com/fundamental/input-output-and-memory/what-is-cisc-and-risc-explain-risc-in-detail) & [CISC](http://ecomputernotes.com/fundamental/input-output-and-memory/what-is-cisc-and-risc-explain-risc-in-detail), both types of designs are used in modern processors.

Memory chips and flash memory up to 1 GB, hard disks up to 600 GB & optical disks up to 50 GB have been developed.

fifth generation digital computer will be **Artificial intelligence**.

### Compiler Interpreter Assembler Debugger

**What is an Compiler?**

In general, compiler is a computer program that reads a program written in one [language](https://eu3.proxysite.com/process.php?d=4HuRaiubgoUMbRkHQFVlsdNLEEvtIo124%2Bmb3JGjkoLpC5VfGmoplOHiCEpMqBPEX%2BgTjlHa&b=1), which is called the source language, and translates it in to another language, which is called the target language.

Traditionally, source language is a high level language such as C++ and target language is a low level language such as Assembly language.

However, there are compilers that can convert a source program written in Assembly language and convert it to machine code or object code. Assemblers are such tools.

On the other hand, Interpreters are tools that execute instructions written in some programming language.

Interpreter can either directly execute high level source code or translate them to intermediate code and then interpret it or execute precompiled code.

**What is an Assembler?**

Assembler is software or a tool that translates Assembly language to machine code.

So, an assembler is a type of a compiler and the source code is written in Assembly language.

Assembly is a human readable language but it typically has a one to one relationship with the corresponding machine code.

Therefore an assembler is said to perform isomorphic (one to one mapping) translation.

Advanced assemblers provide additional features that support program development and debugging processes.

For example, the type of assemblers called macro assemblers provides a macro facility.

**What is an Interpreter?**

An interpreter is a computer program or a tool that executes programming instructions.

An interpreter may either execute the source code directly or converts the source to an intermediate code and execute it directly or execute precompiled code produced by a compiler (some interpreter systems include a compiler for this task).

Languages like Perl, Python, MATLAB and Ruby are examples of programming languages that use an intermediate code.

UCSD Pascal interprets a precompiled code. Languages like Java, BASIC and Samltalk first compile the source to an intermediate code called bytecode and then interpret it.

**What is a Debugger?**

Debugger is a computer program that is used to find bugs/errors in other programs.

Debugger allows executing a program and inspecting each step in the program execution.

It also allows stopping the execution of the program at some point and changing some variable values and then continuing the execution.

All of these capabilities are provided to help the programmer to make sure that her program is behaving correctly and to help in identifying bugs in the code.

Most of the debuggers provide the ability to execute a program step by step (also called single stepping), pausing to examine the current state of the program by providing a breakpoint and tracking variable values.

Some advanced debuggers allow the programmer to skip a location that causes a crash or a logical error in the code and continue execution from a different location.

Some of the popular debuggers are GNU Debugger (GDB), Microsoft Visual Studio Debugger, etc.

**Compiler  V/s Interpreter V/s Assembler**

**Compiler**

1.Compiler translates a high level language program into machine level language.  
2.translates each high level language instruction into a set of machine level instructions  
3.one to many correspondence.  
4.Examples are C, COBOL, Java, etc. .

**Interpreter**

1.Compiler translates a high level language program into machine level language.  
2.It takes one statement of a high level language program, translates it into machine language instructions and immediately executes it.  
3.a one to one relationship with the corresponding machine code  
4.Languages like Java, BASIC and Samlltalk first compile the source to an intermediate code called bytecode and then interpret it.  
  
**Assembler**

1.Assembler translates a assembly language program into machine level language.  
2.It takes one statement of a assembly language program, translates it into machine language instructions and immediately executes it.  
3.typically has a one to one relationship with the corresponding machine code

**COMPUTER LANGUAGE**

Computer language or programming language is a coded syntax used by computer programmers to communicate with a computer.

Computer language establishes a flow of communication between software programs.

The language enables a computer user to dictate what commands the computer must perform to process data. These languages can be classified into following categories.

1. Machine language

2. Assembly language

3. High level language

***Machine Language***

Machine language or machine code is the native language directly understood by the computer’s central processing unit or CPU.

This type of computer language is not easy to understand, as it only uses a binary system, an element of notations containing only a series of numbers consisting of one and zero, to produce commands.

***Assembly Level Language***

Assembly Level Language is a set of codes that can run directly on the computer’s processor.

This type of language is most appropriate in writing operating systems and maintaining desktop applications.

With the assembly level language, it is easier for a programmer to define commands.

It is easier to understand and use as compared to machine language.

***High Level Language***

High Level Languages are user-friendly languages which are similar to English with vocabulary of words and symbols.

These are easier to learn and require less time to write.

They are problem oriented rather than ‘machine’ based.

Program written in a high-level language can be translated into many machine language and therefore can run on any computer for which there exists an appropriate translator.

***Open source software:***

Open source refers to a program or software in which the source code (the form of the program when a programmer writes a program in a particular programming language) is available to the general public for use and/or modification from its original design free of charge.

Open source code is typically created as a collaborative effort in which programmers improve upon the code and share the changes within the community.

The rationale for this movement is that a larger group of programmers not concerned with proprietary ownership or financial gain will produce a more useful and bug-free product for everyone to use.

The basics behind the Open Source Initiative is that when programmers can read, redistribute and modify the source code for a piece of software, the software evolves.

Open source sprouted in the technological community as a response to proprietary software owned by corporations.

Proprietary software is privately owned and controlled.

In the computer industry, proprietary is considered the opposite of open.

A proprietary design or technique is one that is owned by a company.

It also implies that the company has not divulged specifications that would allow other companies to duplicate the product.