

## **HOW COMPUTERS WORK**

**(The Most Important Discovery by Humans)**

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A computer, a digital information-processing machine, works by changing information into binary numbers (ones and zeros) and then using simple mathematics to make decisions about how to rearrange those numbers into words or actions. A digital system stores and operates on information in a very specific way by storing information in a bit (or multiple collections of bits). A bit is a variable that can have only one of two values: it can either be a 1, or be a 0.

There are two main things to understanding the basics of how a computer works:

- A computer treats any type of information (not only numbers but also letters, words, dates) as if it consisted simply of binary ones and zeros. For example, a computer can translate the letter “A” typed into its keyboard into a string of ones and zeros, such as 1000001. One reason for this is that once it is in a binary form, the information can be stored and moved about more easily. On a hard disc, the “ones” could be stored as magnetized spots on the disc, while the zeroes can be stored as un-magnetized spots. Once information has been converted to ones and zeros, the computer can get to work.
- The second point to consider is that the computer’s functions are based on the movement and transformation of electrical pulses (representing ones and zeroes) in electrical circuits. Inside the computer are electrical circuits that decode the zeros and ones, by adding and subtracting them. These circuits are called the **logic** of the computer, because the calculations they make are similar to simple logic decisions. For example, if you press the A key on the computer keyboard, circuits inside the computer receive pulses of electricity representing the A in binary form - 1000001. Those pulses are sent to logic circuits that make yes or no decisions based on the input they receive. A very simple example would be a circuit that determines whether the input send to it is a one or a zero. The output of the circuit is a new piece of information - a binary one or zero that is the result of the simple yes or no decision.

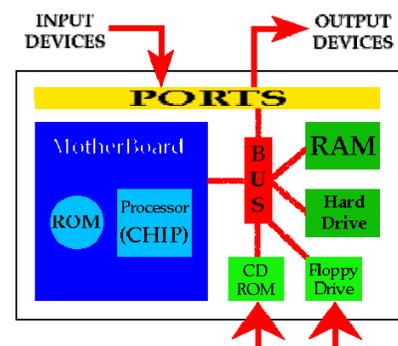
### **Main Computer Parts**

#### **The Three Subsystems of a Computer**

1. **CPU or Central Processing Unit's** main component is its microprocessor or heart of the computer. Microprocessors take in groups of bits that are called *instructions*. These instructions tell the microprocessor what and how it should handle the information.
2. **Memory** does exactly what its name implies - it remembers the values of bits. It can either store bits sent to it by the CPU or return the values of those bits back to the CPU.
  - **Random Access Memory (RAM)** - is named the way it is because it is supposed to signify that you can "randomly access" any bit in the memory at any time. For this reason, when you turn a computer off, all data stored in the RAM is lost; it just leaks away.
  - **Disk Drives** - there are several different types of disk drives:
    - a) **Hard Disk** - uses a spinning magnetic platter(s), bits are stored in the magnetic field of this platter. Hard disks can store enormous amounts of data (40 gigabytes or more), but it is slower to access them than it is to access RAM. They don't lose their value when the power is turned off.
    - b) **Floppy Disk** - similar to a hard disk, just a lot less dense; they usually only store about 1.4 megabytes. Floppy disks get their name because their platter isn't made out of a hard material, but rather out of the same material that tapes are made out of.
    - c) **CD-ROM** - Reads bits stored on a compact disk, usually about 650 or 700 megabytes per disk. Bits are stored as grooves in the disk surface, and an optical laser is used to read the bits.

## The Motherboard

All computers have a motherboard that is a circuit board to connect all of the various parts of a computer together. Its main purpose is to hold the CPU and the connections between the CPU and all the other subsystems. The RAM of the computer is found on the motherboard. Most motherboards have places where other types of devices such as graphics accelerator cards and network cards, can be inserted to extend or enhance the capabilities of the computer.



**Summary**

The computer is one of the most complicated machines built by humans and to understand everything about a computer would take more time than the average person would care to spend. It is really not necessary for most people to do this, but what is more important to know what a computer is capable of doing than it is to understand all the technical details.

A computer can open up a new world of discovery for everyone from a young child to a retired adult. It opens up the whole world for travel, learning about anything that has happened in the past, or what the future may bring. To remove the frustration when beginning on a computer, it is recommended to first have someone teach you how to begin properly.