

PC Defenitions and Background

There are several categories of computers that are on the market; however, in this tutorial, we will concentrate only on the Microcomputers (commonly known as "Personal Computers").

The four basic categories of computers are:

1. **Microcomputer (PC)** - a small desktop or laptop. Common desktop PCs are Gateway2000, IBM Aptiva, Micronics, etc. Common LAPTOPs are Toshiba, IBM ThinkPad, etc. Their cost as new devices may range from \$800.00 to around \$5000.00 or more. A typical desktop personal computer (PC).
2. **Minicomputers.** Mid-size computers, non-portable types. Common minicomputers are DEC Vax/750 models. They often appear as mainframes. They are gradually disappearing from the marketplace.
3. **Mainframe Computers.** These are large computers, often occupying a large room. They are generally used by banks, universities, and some government functions such as IRS, etc. They lost sales during the 1980-1991 era, but were predicted to regain some leverage in 1993 and 1994. They may continue to lose ground with the advent of some smaller computers such as the Zenith Z-Server, DEC AlphaServer, and other multi-CPU products housed in small cabinets.
4. **Supercomputers.** The most powerful computers. They are very fast, and have extremely high storage capacity, probably in the terrabyte range. Used in research, weather forecasting, modeling/simulations, etc.

Let's look at Personal Computers

A Personal Compuer (PC) is a computer, in a small cabinet or case (above illustration), that is sized to fit on a desk. It can be in different cabinet configurations such as a mini-tower, tower, laptop, desktop, etc.

A PC normally consists of a monitor, a cabinet, a keyboard, a mouse, one or more floppy drives, and one or more hard disk drives.

In the majority of cases, a PC will also contain a CD-ROM, a MODEM, and other components.

The configuration of a LAPTOP PC (below) is designed to be lightweight and portable. Its devices are streamlined versions of those devices in a desktop. Each manufacturer differs in where they locate the devices on the laptop, but most are convenient for the user.

Some LAPTOPs have been developed than are "hardened", and can take a drop of approximately 8 feet without errors. Caution: don't try with yours!

Additional PC components may include:

Audio System, Network Interface Cards, Special Video interfaces, Joysticks, PCMCIA Card Drive/Slot, etc.....

Personal Computer - The Absolute and Advanced Basics

The following is presented as a "basic" operating knowledge of computers. You will find that many modern computers are advanced beyond the basics, but they all still operate with these concepts in mind, and with binary representations of information.

First, computers operate using electrical current to represent "states" in the computer. The most basic state is "ON" or "OFF". For simplicity's sake, we will say the "ON" state is represented by a positive voltage, and the "OFF" state is represented by 0 voltage or a voltage negative to the "ON" voltage. The "state" I am talking about is not whether the computer is on or off; but instead if a "bit" (a binary digit) is on or off.

This is analogous to an electric light. If the switch is on, it is receiving approximately 110 volts. If the switch is off, no volts, and you are in the dark.

Most computers prior to the 1990's operated at voltages of +5 volts or greater for the "ON" state, and 0 volts to -5 volts for the "OFF" state. Currently, processors are operating at 3.3, 2.7, and even 2.5 volts. This is great because the lower the voltage, the less heat is generated by the PC's processor and other components.

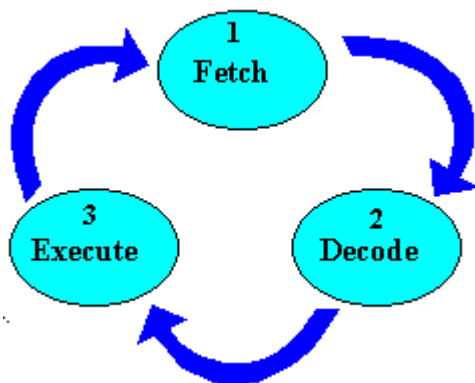
So, a binary bit has 2 values - a 1 or a 0. If we use the "extended ASCII" code, it takes 8 binary bits to make a "byte". A byte can be used to represent a character, number, or symbol. A byte might look like "10001001", and in the ON/OFF representation it would be "ON-OFF-OFF-OFF-ON-OFF-OFF-ON".

Actually, characters, numbers, and symbols are represented by a number of binary bits. In most PCs, we use the "extended ASCII" code and it requires 8 binary bits (a byte) to represent a character, number or symbol. This is analogous to 8 contiguous light switches in a row. Combinations of "ON" bits and "OFF" bits represent the characters, numbers, and symbols.

So, computers use binary numbers to represent everything inside them. Computer instructions at the machine level are composed of binary numbers that direct the computer to perform actions. The instruction must tell the computer what to do (add, move, decision, etc.), what to use (which data to use), where to put the results, etc. Don't stop here, DATA or information is also represented as binary 1's and 0's; but they are sets of specific bit combinations for representing a set of characters.

ASCII and EBCDIC code explanations.

How is a computer instruction executed? The most basic process is like this:



- Fetch Cycle - gets the next instruction to be executed into a register.
- Decode Cycle - break down the instruction to see what to do.
- Execute Cycle - do the thing the instruction is supposed to do.

You see an instruction as "ADD A to B giving X". In computer instructions, this may take up to 20 simple instructions. Special computer programs called "compilers"

take the "ADD A to B giving X", and translate them into "machine" language instructions which can be understood in your CPU!

So, all computer instructions are a set of binary 1's and 0's, arranged in a specific sequence to represent a machine or computer language instruction. A machine language instruction can be decoded and executed by the microprocessor (CPU).

Now, when a computer program is run on a computer, it is first loaded into a 640KB piece of memory. This 640 KB can be the conventional memory, or it can be a part of your extended memory.

1. Each instruction is moved from memory to a register in the CPU by the fetch cycle.
2. The instruction is then decoded, it determines that it is an add instruction, then the data such as A and B in the example above are retrieved and put in registers.
3. The data in A and in B are added together and stored in a register.
4. The register storing the sum of A and B is moved to a location specified as X. X takes on the value of the sum.
5. The next instruction is 'fetched' from memory and the cycle goes on.

Actually the steps above may be many small instructions. We will worry about details later. More sophisticated, modern PCs often use more complex procedures in executing a program's instructions. Some of the modern techniques are:

Pipelining, SuperScalar, Super Pipelining. These are techniques for executing more instructions during a given time, so it can process two or more program parts simultaneously. It goes beyond the speed gained by using shorter micron circuitry, although this helps, those architecture introduces more complexity into its circuitry.

Personal Computer (PC) Components

A Personal Computers has a number of components in common, whatever the brand, and each brand has some unique component or name for a component.

The MOST common components in a Personal Computer (PC) are:

1. Motherboard
2. Storage Devices
3. CPU (or Microprocessor)
4. Expansion Slots (part of motherboard)
5. Random Access Memory.
6. Cache Memory (Internal and External)
7. BIOS and CMOS

8. Expansion Boards
9. Keyboard
10. Monitor
11. Other Input Devices
12. Other Output Devices
13. "CHIPSET"
14. Operating System
15. Application Software
16. Person to operate it.

Some individuals say that the most important part of a computer is the "user", or the person operating the PC. I disagree! Why? Because a computer can be operated by anyone with a minimum skills. But, no computer will function without a basic set of hardware and software components, no matter how skilled or unskilled the user!