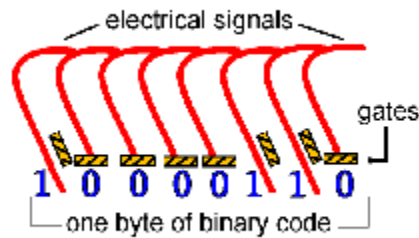
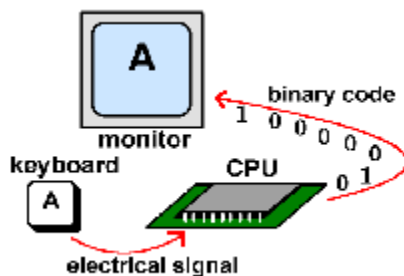


## Computer Connections: Lesson 3 - Bits & Bytes



Did you know that all of the information that travels through your computer is based on two commands? It's true. The only data that a computer can understand is **on** and **off**. But, the millions of combinations of those two commands given in series are what make a computer work.

### Binary Code



Remember the power supply that is inside your computer and how it sends electricity to all of the components? That electricity is what creates an *on* signal. The memory chips inside your computer are divided into thousands of tiny compartments called **bits**. Each bit has an electronic switch or **gate**. *On* means the gate is open and letting electricity go through. The computer reads *on* or *open* switches as a number *1*. Closed gates are *off* because the electricity is blocked and cannot get through. The computer reads *off* bits as *0*. It is by grouping these bits together to form a series of *1/0* commands, that data is formed. Eight bits are grouped together to form a **byte**. In this group of eight, there are 256 possible combinations of *1/0*. The grouping of *1/0* within a byte is called **Binary Code**.

Here's an example of the Binary Code in action: When you type the letter *A* on your keyboard, electrical signals are sent from the keyboard to the CPU. The CPU turns the signals into binary code. Then, the computer reads the code and sends it on to the monitor to display the letter *A*.

## KB, MB & GB

You may have seen these abbreviations many times before. Do you know what they mean?

- KB = kilobyte = about 1,000 (one thousand) bytes, ( $1024$  or  $2^{10}$ )
- MB = megabyte = about 1,000,000 (one million) bytes, ( $1,048,576$  or  $2^{20}$ )
- GB = gigabyte = about 1,000,000,000 (one billion) bytes ( $1,073,741,824$  or  $2^{30}$ )

As you can see, these abbreviations stand for a specific number of bytes. And each byte holds 8 bits capable of forming 256 combinations of 1/0. Wow!

The number that comes before one of these abbreviations represents the computer's **memory** capacity. For example, if a computer has 64MB of RAM that means that the computer can handle 64,000,000 (64 million) bytes of random access memory (that's 64,000,000 microscopic 8-bit panels). Hard disk space is also measured in bytes. So, a 15GB hard drive has 15,000,000,000 (15 billion) bytes for storing memory.

Look at your keyboard. Each character key is represented by a number that is held in a single byte. Remember how the letter *A* is sent to the CPU to be translated into binary code? The numerical value of the uppercase letter *A* is 65. That number 65 is represented in one byte - a combination of 1 and 0 or *on* and *off* switches. The computer cannot understand letters, so it translates them into numbers that are represented by patterns of *on* and *off*. To get an idea of how much on/off data a computer can store, just imagine pressing one key one billion times! How long would it take? If you pressed the key 5 times per second, it would take you over 6 years of continuously typing to reach 1 billion keystrokes equal to 1GB of memory! And many computers today can store over 20GB of memory on their hard disks! Incredible! So, the next time your computer is taking a long time to load a web page, think of how fast it really is going!