

Introduction – Computer Number System (CNS)

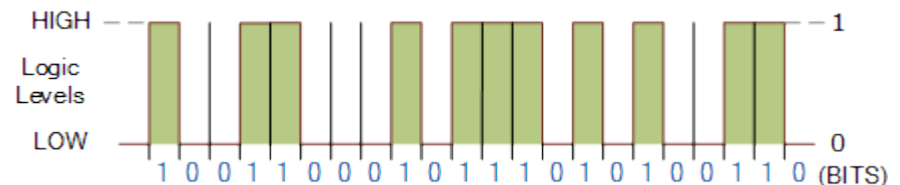
Mathematical operations in our world is based on the base 10 number system (toes...fingers...metric)

Operations in the computer world is based on the **binary** (base 2) number system (1010001001101111). Why?

Before looking at how a computer works, we have to go back to the invention of electric circuits (A. Volta..1800) and more specifically at electrical switches (J. H. Holmes..1884) for controlling the current in a wire. The switch has only 2 states, either ON or OFF.

Mathematically it can be represented as “0” for OFF and “1” for ON

As time and technology progressed, the electric circuits in electronic equipment was superseded by analog and digital circuits (1950-60s) that utilized the binary number system to not only store the data but also to use it to communicate with other components of the computer



Binary, Octal and Hexadecimal Numbers

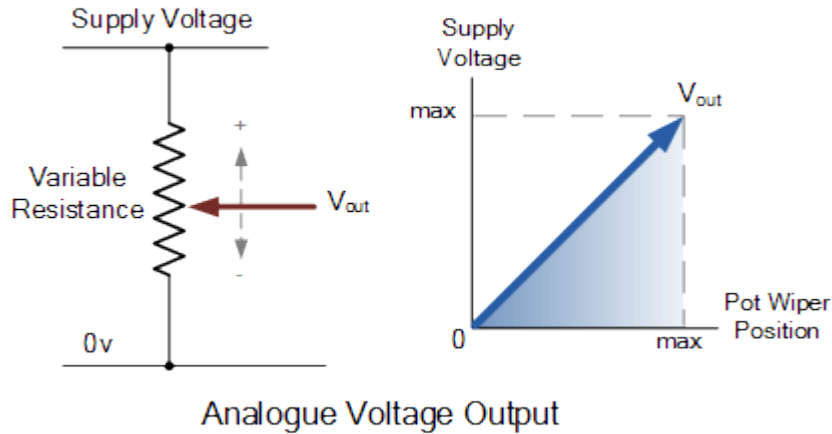
Since entering data into computers in binary format is too cumbersome and prone to errors...we instead use octal (base 8) or hexadecimal (base 16) formats...breakup large binary digits into groups of 3 or 4

Applications of hexadecimal numbers can be found in
RGB color codes for webpages (#000000...#FFFFFFF)
Media Access Control (MAC) addresses (XX:XX:XX:XX:XX:XX)
Memory location of error messages (0x8004393C)

Octal number system not as widely used as hexadecimal system any more since with 32-bit and 64-bit processing, it is more efficient to divide by 16 than 8

One place octal still found today is in UNIX file permission codes
chmod 644

Analog and Digital Circuits



An infinite number of continuous volts between 0 and V_{max} can be produced using a potentiometer.

A series resistor chain can produce a discrete voltage level of 1.0 V in step form

