Digital electronics - gates

Logic circuits are used for processing binary information. By 'binary', we mean that the information has only two possible states. For example, a switch is open or it is closed. It can not be half-open or half-closed. There are two switches in the circuit below. There is one lamp. The circuit has two binary inputs and one binary output.

Inputs B	Inputs A	Output Z
0	0	0
0	1	0
1	0	0
1	1	1

There is only one way to light the lamp — close A AND B. The circuit performs a logical operation, the AND operation. The action of the circuit can be summarised if we represent the binary states of inputs and output by '0' and '1'. For the switches, 0='switch open' and 1='switch closed'. For the lamp, 0='lamp off' and 1='lamp on'. Now we can set out the four states of the switches in a truth table.

Electronic logic circuits work with two levels of voltage:

- Low: 0 V or close to 0 V.
- High: The positive supply voltage, or close to it. In some types of logic circuit, 'high' is always 5 V. In others, it may have other values.

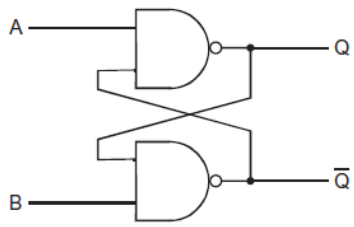
Usually the low voltage level corresponds to logical' 0' and the high level to logical '1'.

Combinational Logic circuits are only determined by their current input state as they have no feedback, and any changes to the signals being applied to their inputs will immediately have an effect at the output. There are a lot of combinational circuits – decoders, multiplexers, adders, atc.

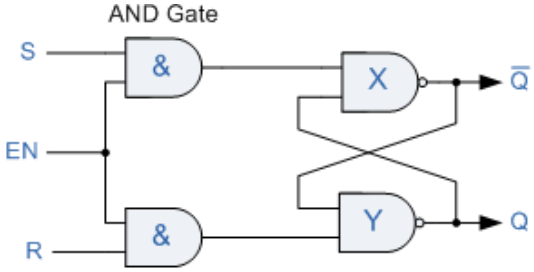
Sequentional logic

Unlike Combinational logic circuits that change state depending upon the actual signals being applied to their inputs at that time, **Sequential Logic** circuits have some form of inherent "**Memory**" built in to them and they are able to take into account their previous input state as well as those actually present. They are generally termed as **Two State** or Bistable devices which can have their output set in either of two basic states, a logic level "**1**" or a logic level "**0**" and will remain "latched" indefinitely in this current state or condition until some other input trigger pulse or signal is applied which will cause it to change its state once again. The word "Sequential" means that things happen in a "sequence", one after another and in s**equential logic** circuits, the actual clock signal determines when things will happen next.

Bistable circuit



The output of each gate connects back to an input of the other gate. This is a reminder of the circuits. These circuits have two possible states, but are stable in only one state or neither state, respectively. This circuit also has two possible states, but it is stable in both of them. It is called a bistable circuit. The circuit described is a set-reset bistable. It is also known as a **set-reset flip-flop.**



Clocked SR Flip-Flop

It is sometimes desirable in sequential logic circuits to have a bistable SR flip-flop that only changes state when certain conditions are met regardless of the condition of either the Set or the Reset inputs.