OP-AMP COMPARATOR

A comparator finds its importance in circuits where two voltage signals are to be compared and to be distinguished on which is stronger. A comparator is also an important circuit in the design of non-sinusoidal waveform generators as relaxation oscillators.
In an op-amp with an open loop configuration with a differential or single input signal has a value greater than 0, the high gain which goes to infinity drives the output of the op-amp into saturation. Thus, an op-amp operating in open loop configuration will have an output that goes to positive saturation or negative saturation level or switch between positive and negative saturation levels and thus clips the output above these levels. This principle is used in a comparator circuit with two inputs and an output. The 2 inputs, out of which one is a reference voltage (Vref) is compared with each other.

Working of 741 IC Op-amp Comparator Circuit

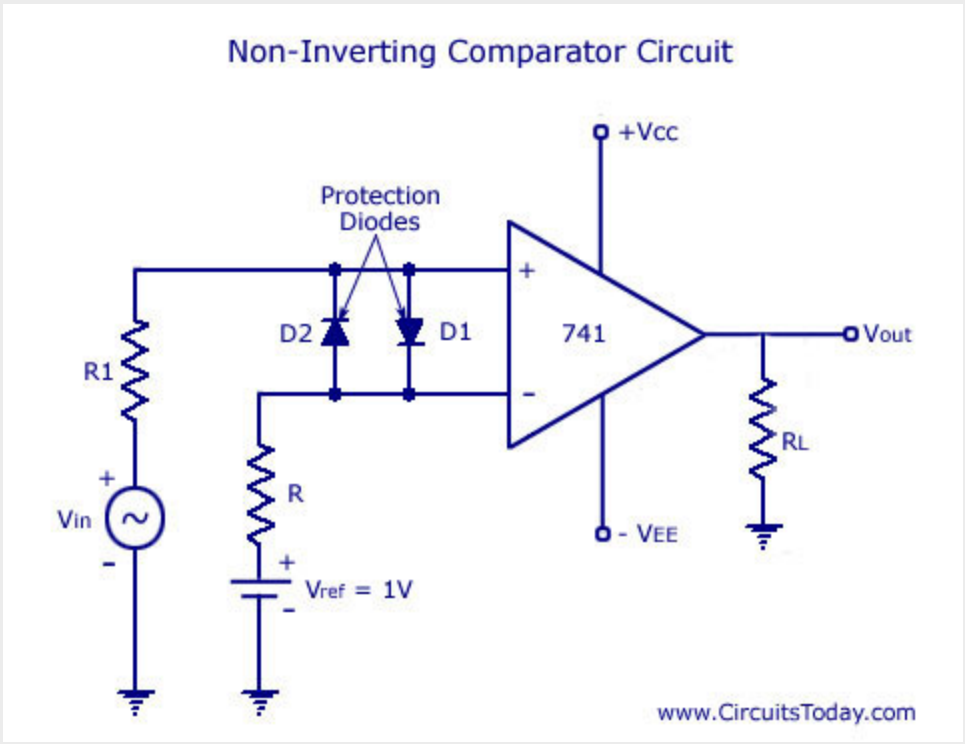
Non-inverting 741 IC Op-amp Comparator Circuit

A non-inverting 741 IC op-amp comparator circuit is shown in the figure below. It is called a non-inverting comparator circuit as the sinusoidal input signal Vin is applied to the non-inverting terminal. The fixed reference voltage Vref is give to the inverting terminal (-) of the op-amp.
When the value of the input voltage Vin is greater than the reference voltage Vref the output voltage Vo goes to positive saturation. This is because the voltage at the non-inverting input is greater than the voltage at the inverting input.

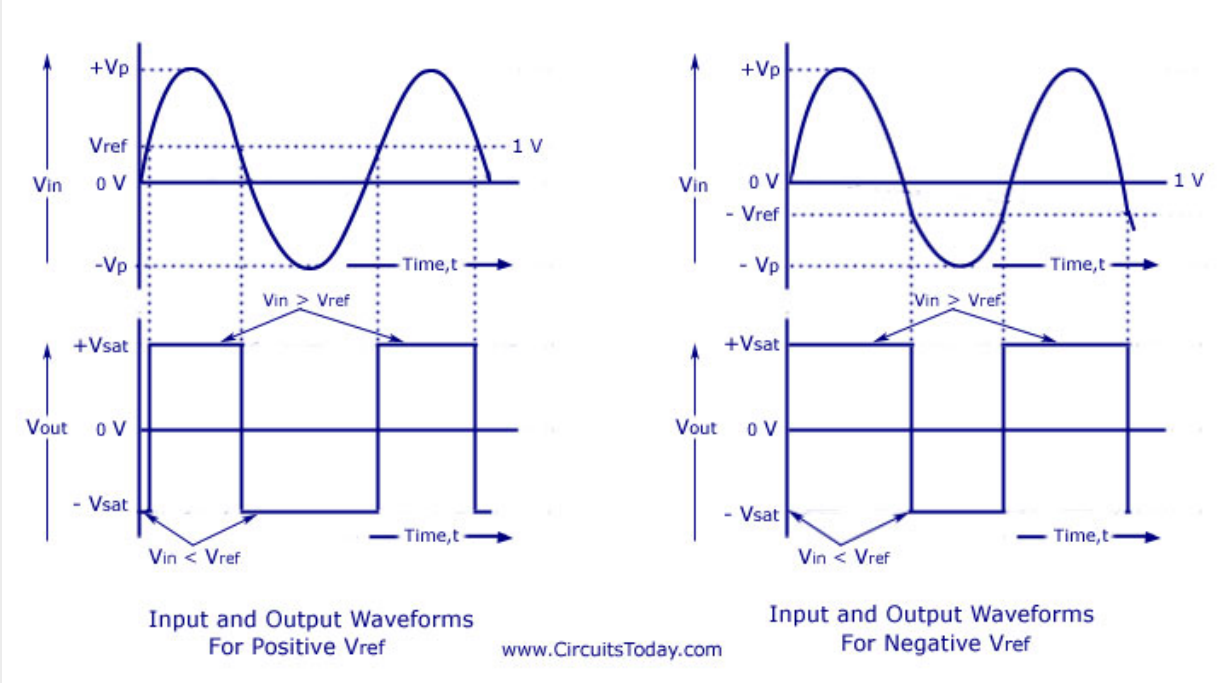
When the value of the input voltage Vin is lesser than the reference voltage Vref, the output voltage Vo goes to negative saturation. This is because the voltage at the non-inverting input is smaller than the voltage at the inverting input. Thus, output voltage Vo changes from positive saturation point to negative saturation point whenever the difference between Vin and Vref changes. This is shown in the waveform below. The comparator can be called a voltage level detector, as for a fixed value of Vref, the voltage level of Vin can be detected.

The circuit diagram shows the diodes D1and D2. These two diodes are used to protect the op-amp from damage due to increase in input voltage. Thes diodes are called clamp diodes as they clamp the differential input voltages to either 0.7V or -0.7V. Most op-amps do not need clamp diodes as most of them already have built in protection. Resistance R1 is connected in series with input voltage Vin

and R is connected between the inverting input and reference voltage Vref. R1 limits the current through the clamp diodes and R reduces the offset problem.



741 IC Non-Inverting Comparator Circuit



741 IC Op-Amp Non-Inverting Comparator Waveform

Source : http://www.circuitstoday.com/op-amp-comparator