

Clampers

In the previous chapter, we discussed about clippers. Now, let us discuss about other type of wave shaping circuits, namely clampers.

Op-amp based Clampers

A **clammer** is an electronic circuit that produces an output, which is similar to the input but with a shift in the DC level. In other words, the output of a clamper is an exact replica of the input. Hence, the peak to peak amplitude of the output of a clamper will be always equal to that of the input.

Clampers are used to introduce or restore the DC level of input signal at the output. There are **two types** of op-amp based clampers based on the DC shift of the input.

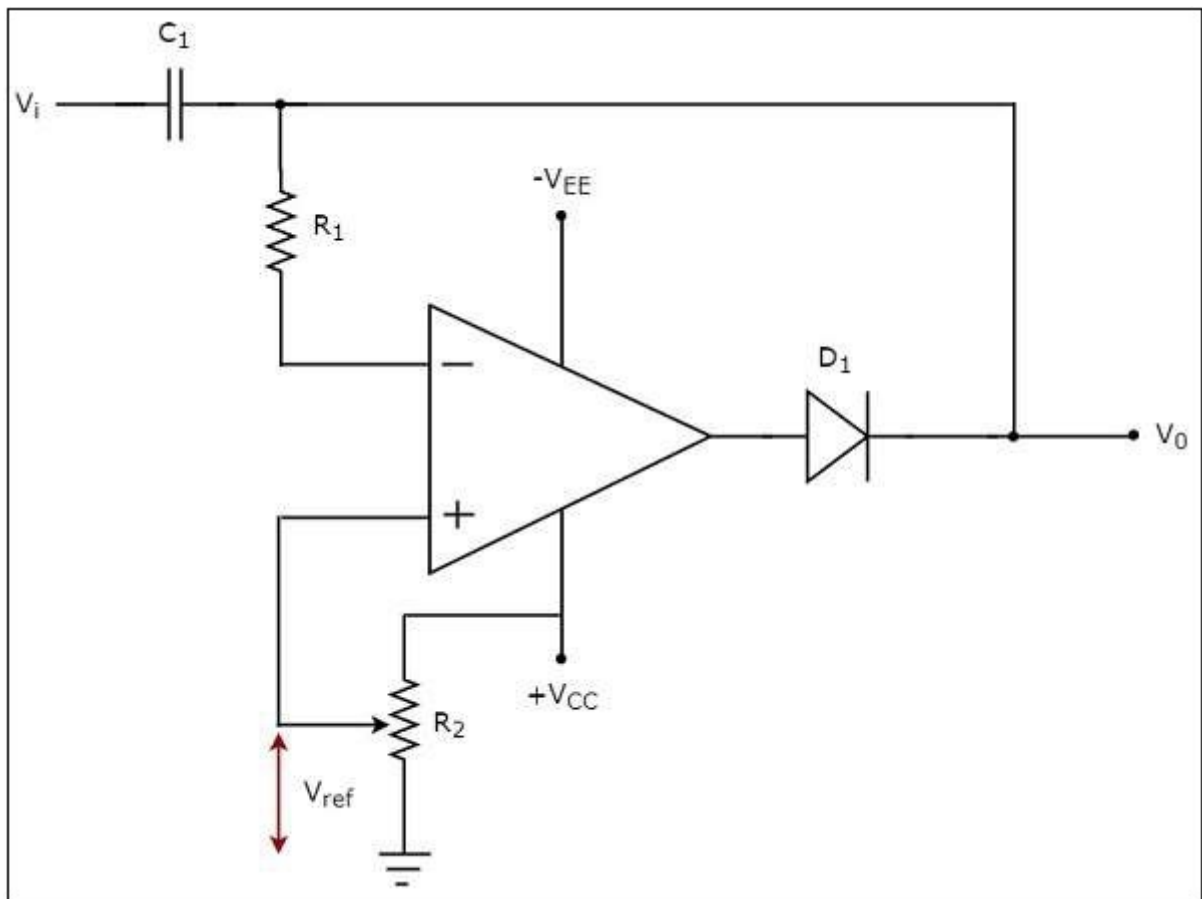
- Positive Clamper
- Negative Clamper

This section discusses about these two types of clampers in detail.

Positive Clamper

A positive clamper is a clamper circuit that produces an output in such a way that the input signal gets shifted vertically by a positive DC value.

The **circuit diagram** of a positive clamper is shown in the following figure –

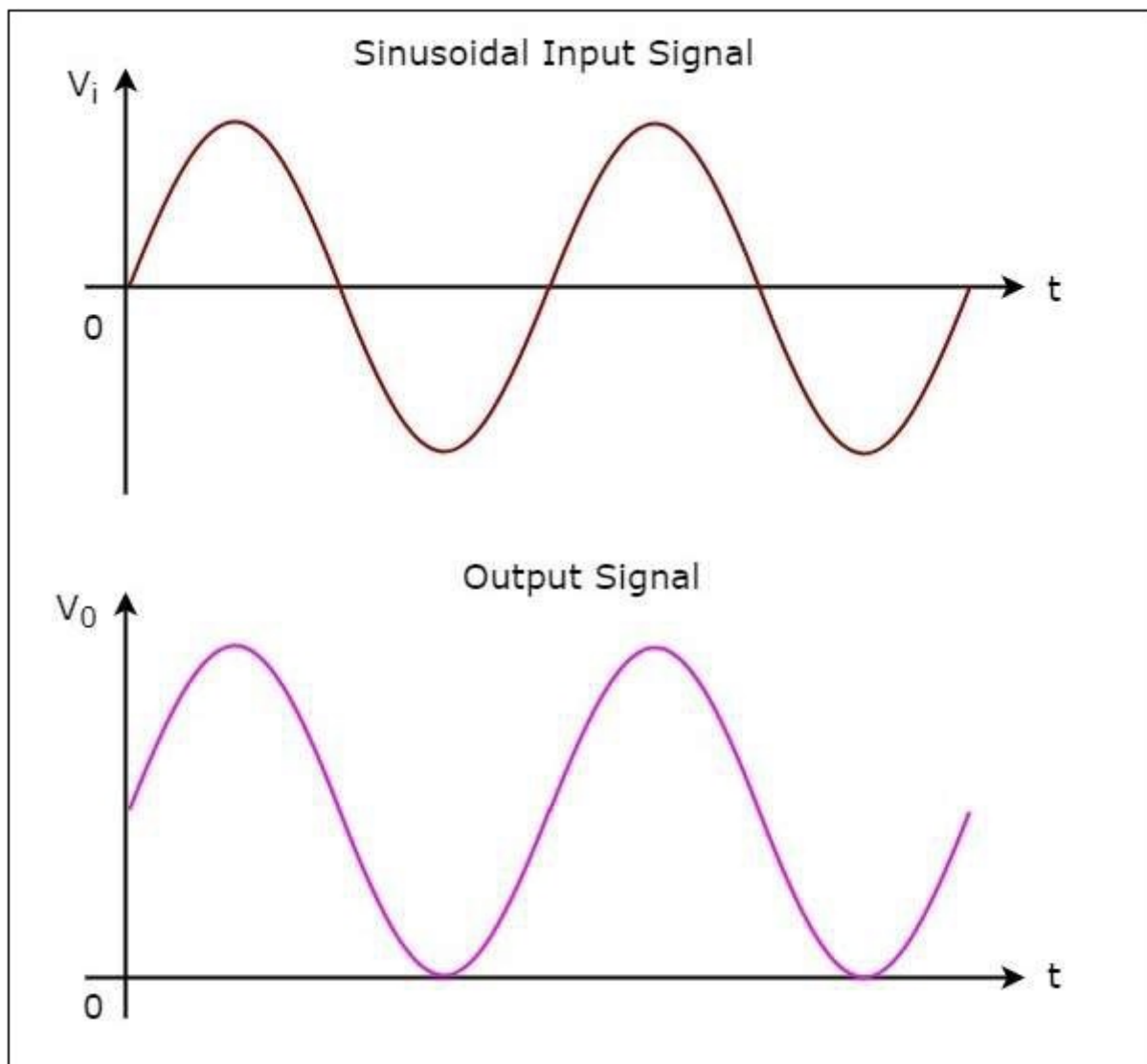


In the above circuit, a **sinusoidal voltage signal**, V_i is applied to the inverting terminal of op-amp through a network that consists of a capacitor C_1 and a resistor R_1 . That means, AC voltage signal is applied to the inverting terminal of the op-amp.

The **DC reference voltage** V_{ref} is applied to the non-inverting terminal of the op-amp. The value of reference voltage V_{ref} can be chosen by varying the resistor R_2 . In this case, we will get a reference voltage V_{ref} of a positive value.

The above circuit produces an **output**, which is the **combination (resultant sum)** of the sinusoidal voltage signal V_i and the reference voltage V_{ref} . That means, the clamper circuit produces an output in such a way that the sinusoidal voltage signal V_i gets shifted vertically upwards by the value of reference voltage V_{ref} .

The input wave form and the corresponding output wave form of positive clamper are shown in above figure –

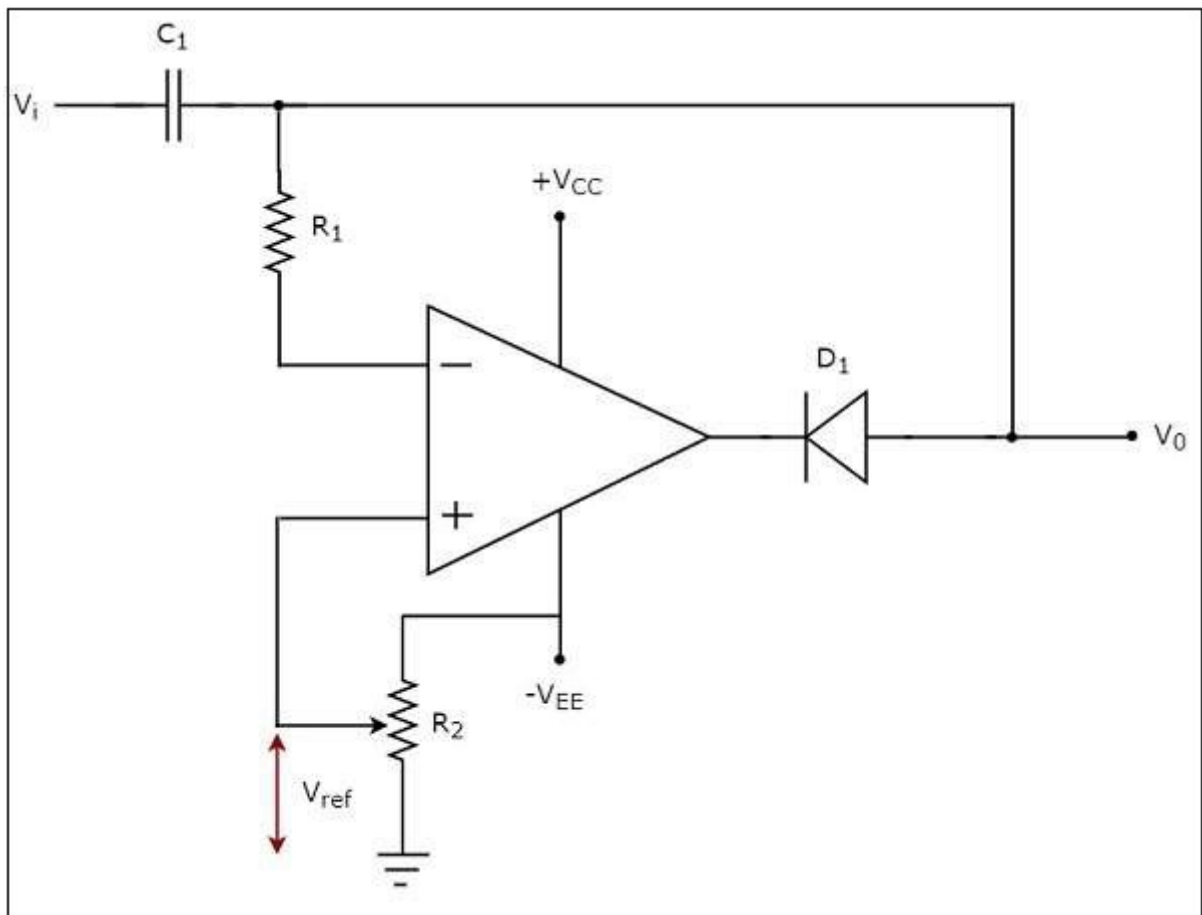


From the figure above, you can observe that the positive clamper shifts the applied input waveform **vertically upward** at the output. The amount of shift will depend on the value of the DC reference voltage.

Negative Clamper

A **negative clamper** is a clamper circuit that produces an output in such a way that the input signal gets shifted vertically by a negative DC value.

The **circuit diagram** of negative clamper is shown in the following figure –

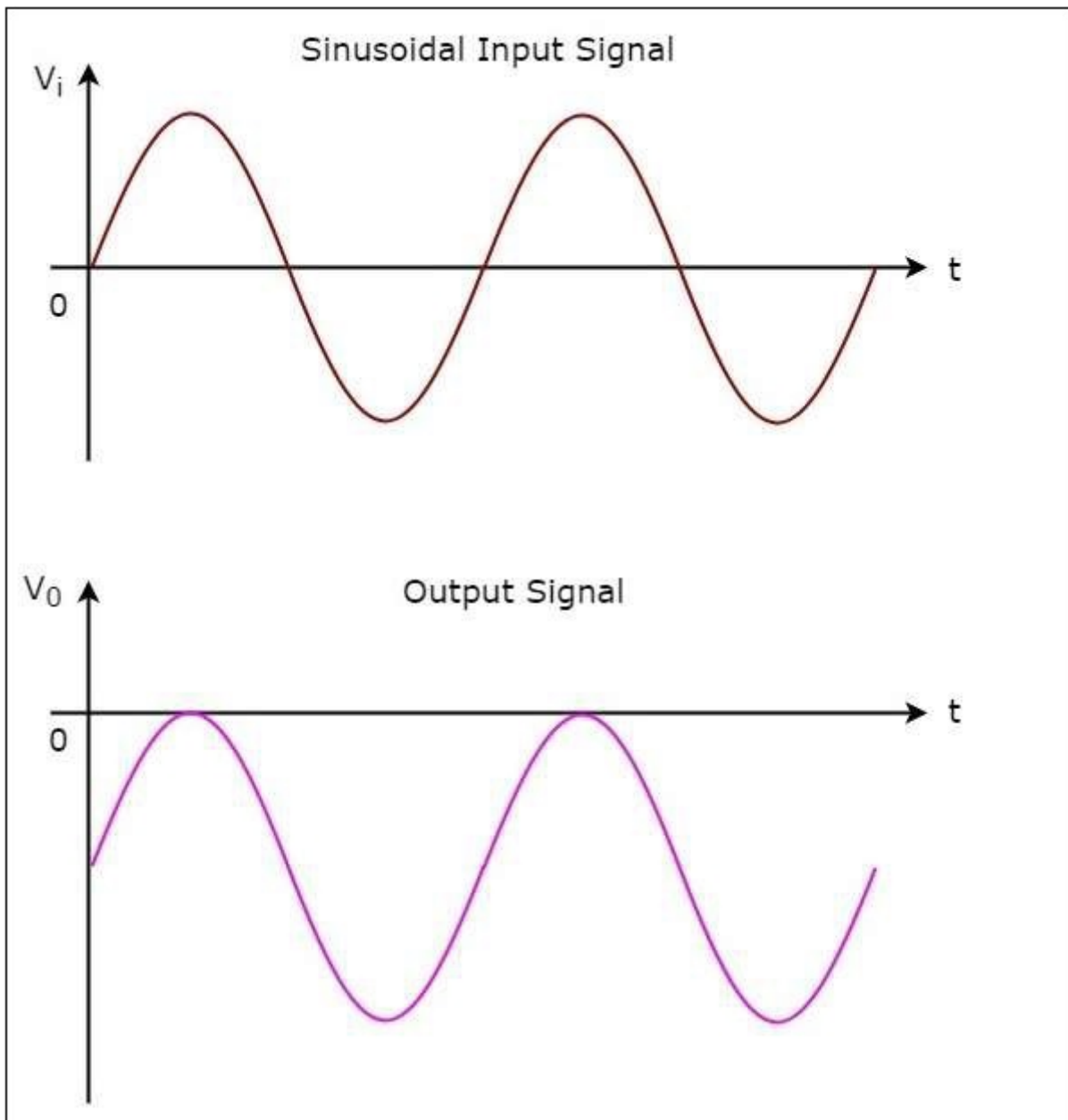


In the above circuit, a **sinusoidal voltage signal** V_i is applied to the inverting terminal of the op-amp through a network that consists of a capacitor C_1 and resistor R_1 . That means, AC voltage signal is applied to the inverting terminal of the op-amp.

The **DC reference voltage** V_{ref} is applied to the non-inverting terminal of the op-amp. The value of reference voltage V_{ref} can be chosen by varying the resistor R_2 . In this case, we will get reference voltage V_{ref} of a negative value.

The above circuit produces an output, which is the combination (resultant sum) of sinusoidal voltage signal V_i and reference voltage V_{ref} . That means, the clamper circuit produces an output in such a way that the sinusoidal voltage signal V_i gets shifted vertically downwards by the value of reference voltage V_{ref} .

The input wave form and the corresponding output wave form of a negative clamper are shown in the following figure –



We can observe from the output that the negative clamper shifts the applied input waveform **vertically downward** at the output. The amount of shifting will depend on the value of DC reference voltage.
