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Objective:
Study of diode as a clipper and clamper circuit. Draw and measure the input and output waveform.

Required Components:

1) Resistor (1k)
2) Diode (IN4007)
3) AC Voltage
4) DC voltage
5) Oscilloscope
6) Coupling wires
7) Multimeter.

Theory:
For a clipping circuit at least two components an ideal diode and resistor are required and sometimes a dc battery is also employed for fixing the clipping level. The diode acts as a closed switch when reverse biased and an open switch when forward biased. Depending on the orientation of the diode, the positive or negative region of the input signal is "clipped" off and accordingly the diode clippers may be positive or negative clippers. Half wave rectifier circuits can also be called the basic clippers.

Biased Clippers:
The level to which an ac voltage is limited can be adjusted by adding a bias voltage V_2, in series with the diode. Biased clippers are employed for this purpose. The circuit diagram for a biased positive clipper (that is for removing a small portion of positive half cycle) is illustrated in figure. When the input

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signal is positive but does not exceed DC voltage V_2, the diode D remains reverse biased and most of the input voltage appears across the output. When during the positive half cycle of input signal, the signal voltage exceeds the DC voltage V_2, the diode D is forward biased i.e conducts heavily.

Procedure :-

1) The components are connected according to the given circuit diagram, taking Vin = 5Vrms, V_{bias} = 2.5 V
2) CRO/DSO is connected across the load R and input source.
3) Both the input and output waveform are measured in CRO ch-1 and ch-2 respectively.

Positive Bias diode clipping :

Likewise, by reversing the diode and the battery bias voltage, when a diode conducts the negative half cycle of the output waveform is held to a level V_{bias} - 0.7V as shown.

Negative Bias diode clipping :

A variable diode clipping or diode limiting level can be achieved by varying the bias voltage of the diodes. If both the positive and the negative half cycles are to be clipped, then two biased clipping diodes are used. Both for both positive and negative diode clipping the bias voltage need not be the same. The positive bias voltage could be at one level, for example, 1 volt, and the negative bias voltage at another, for example 6 volts as shown.

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A clamping network must have a capacitor, a diode and a resistive element. The magnitude of R and C must be chosen such that the time constant RC is large enough to ensure that the voltage across the capacitor doesn't discharge significantly during the interval the diode is non-conducting.

Positive Clamper :-

The circuit for a positive damper is shown in the figure during the negative half cycle of the input signal. The diode conducts and acts like a short circuit. The output voltage $V_o = 0V$. The capacitor is charged to the peak value of input voltage V_m and it behaves like a battery. During the positive half of the input signal the diode does not conduct and acts as an open circuit. Hence, the output voltage $V_o = V_m + V_m$. This gives a positively clamped voltage.

Observation :-

1. Positive Bias Diode Clipping :

Input	Output
$V_{p-p} = 14.4V$	$V_{max} = 3.4V$
	$V_{min} = -7.4V$
	Frequency = 50 Hz

2. Negative Bias Diode Clipping :-

input	Output
$V_{p-p} = 14.4V$	$V_{max} = 7.4V$ $f = 50$ Hz
	$V_{min} = -3.4V$

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Diode Clipping at different bias levels.

When the voltage of the positive half cycle reaches +4.7 v diode D_1, conducts and limits the wave form at +4.7v. Diode D_2 doesn't conduct until the voltage reaches −6.7v. Therefore, all positive voltages above +4.7 and negative voltages. Below −6.7v are automatically clipped. The advantage of biased diode clipping circuits is that it prevents. The output signal from exceeding present voltage limits for both half cycles of the input wave form, which could be an input from a noisy sensor or the positive and negative supply rails of a power supply. If the diode, clipping levels are set too low or the input waveform is too great then the diminution of both waveform peaks could end up with a square wave shaped wave form.

Diode as a Clampler.

Object: Study of diode as a positive clampers.

Requirements:

1) Capacitor (100nF)
2) Resistor (100kΩ)
3) Diode (IN4007)
4) AC voltage source
5) DC voltage
6) DSO

Theory:

Clamper is a circuit that "clamps" a signal to a different dc level. The different types of clampers are positive and negative clampers.

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3 Diode clipping at different bias voltage :-

Input	Output
$V_{pk-pk} = 14.4V$	$V_{max} = 5V$
	$V_{min} = -6.8V$
	$V_{rms} = 4.8V$

Conclusion :-

In this experiment, we came to know about the various types of clipper circuits and clamper circuits, and their difference. Clippers and clamper are widely used in analog television, FM transmitters do remove variable frequency interfase of excessive falls.