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Batch – 2024
Application No - 158377
Subgroup – 1H3

Experiment: Half Wave and Full Wave Rectifier

Aim: To study Half Wave and Full Wave Rectifier and plot their output on CRO

Apparatus: Online (using Virtual Lab (http://vlabs.iitkgp.ernet.in/be/)

Theory:

A rectifier is a device that converts alternating current (AC) to direct current (DC), a process known as rectification. Rectifiers are essentially of two types – a half wave rectifier and a full wave rectifier.

Half Wave Rectification

On the positive cycle the diode is forward biased and on the negative cycle the diode is reverse biased. By using a diode we have converted an AC source into a pulsating DC source. In summary we have 'rectified' the AC signal.

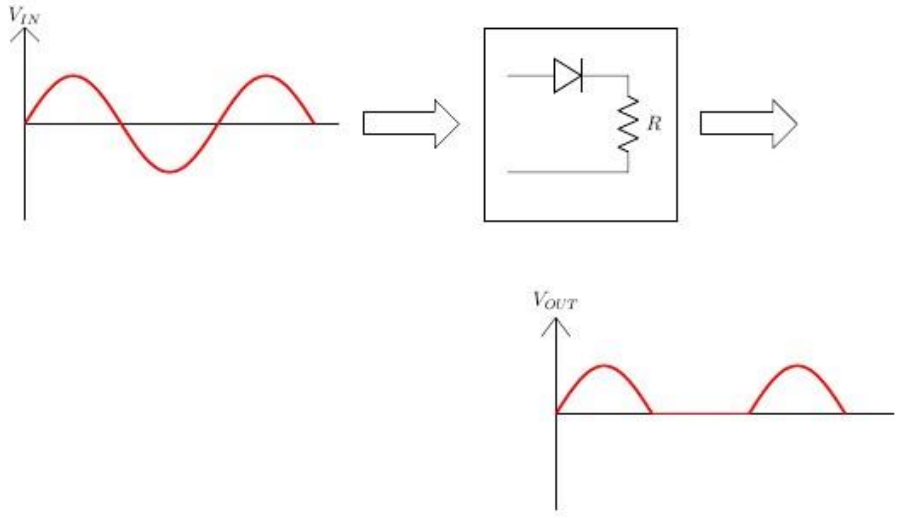


Fig. Half Wave Rectification Process

The simplest kind of rectifier circuit is the half-wave rectifier. The half-wave rectifier is a circuit that allows only part of an input signal to pass. The circuit is simply the combination of a single diode in series with a resistor, where the resistor is acting as a load.

Full Wave Rectifier :

A full-wave rectifier is exactly the same as the half-wave, but allows unidirectional current through the load during the entire sinusoidal cycle (as opposed to only half the cycle in the half-wave). A full-wave rectifier converts the whole of the input waveform to one of constant polarity (positive or negative) at its output. Let us see our half wave rectifier example and deduce the circuit.

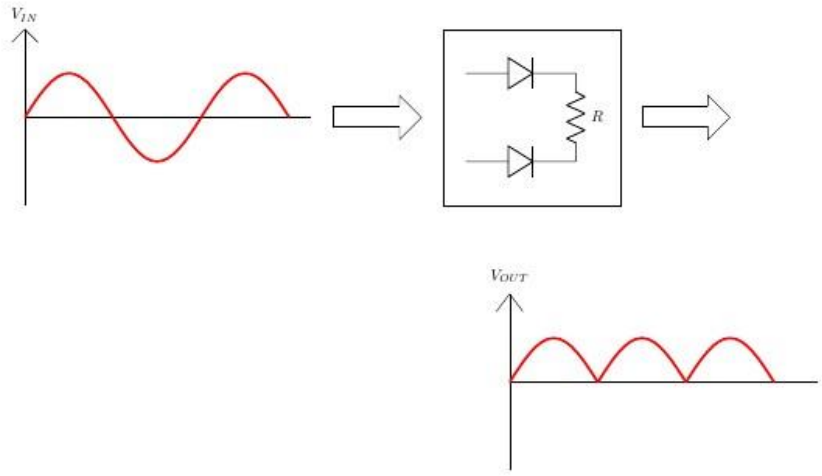


Fig. Full Wave Rectification Process

Bridge Rectifier :

Bridge rectifier uses 4 rectifying diodes connected in a "bridged" configuration to produce the desired output but does not require a special centre tapped transformer, thereby reducing its size and cost. The single secondary winding is connected to one side of the diode bridge network and the load to the other side as shown below.

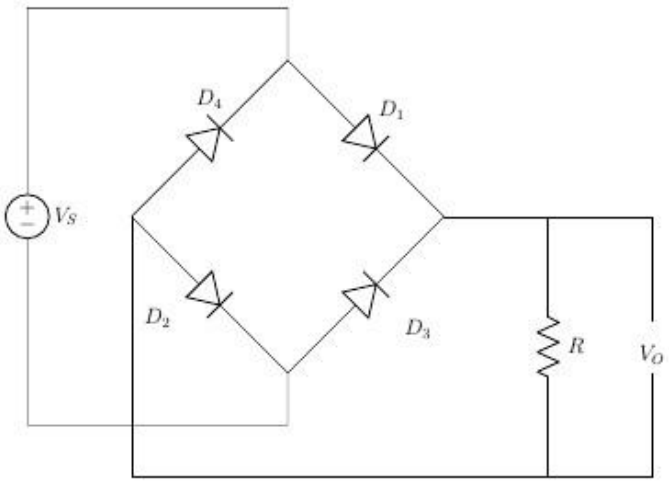


Fig. Bridge Rectifier

Bridge Rectifier – Positive Half Cycle

During the positive half cycle of the supply diodes D1 and D2 conduct in series while diodes D3 and D4 are reverse biased (ideally they can be replaced with open circuits) and the current flows through the load.

Bridge Rectifier – Negative Half Cycle

During the negative half cycle of the supply, diodes D3 and D4 conduct in series, but diodes D1 and D2 switch of as they are now reverse biased. The current flowing through the load is the same direction as before.

Procedure :

Half Wave Rectifier-Experiment (http://vlabs.iitkgp.ernet.in/be/exp6/halfwaverectifier_ver3.html)

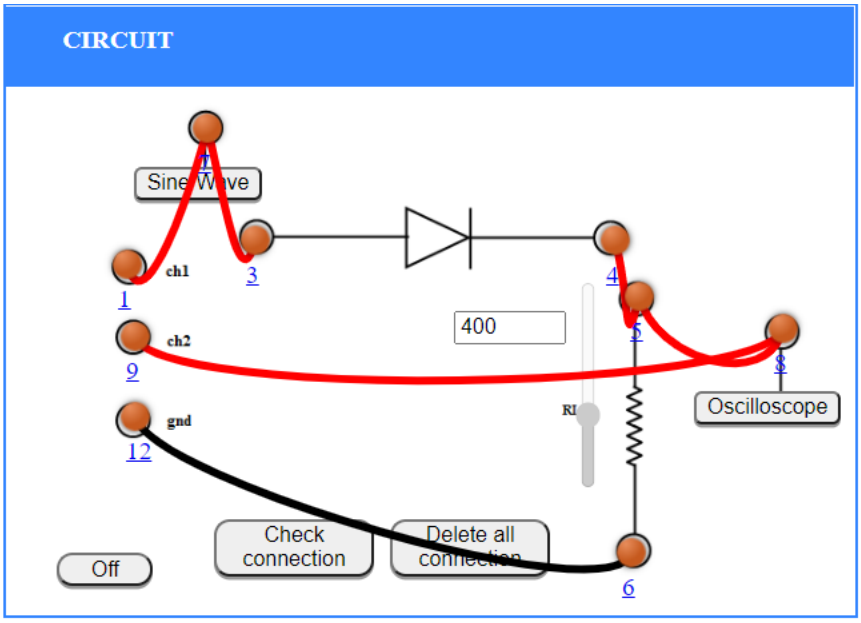
1. Connect the circuit as per procedure given on the simulation page.
2. Set the resistor R_L.
3. Click on 'ON' button to start the experiment.
4. Click on 'Sine Wave' button to generate input waveform
5. Click on 'Oscilloscope' button to get the rectified output.
6. Vary the Amplitude, Frequency, volt/div using the controllers.
7. Click on "Dual" button to observe both the waveform.
8. Channel 1 shows the input sine waveform, Channel 2 shows the output rectified waveform.

Bridge Rectifier – Experiment (http://vlabs.iitkgp.ernet.in/be/exp7/fullwaverectifier_ver3.html)

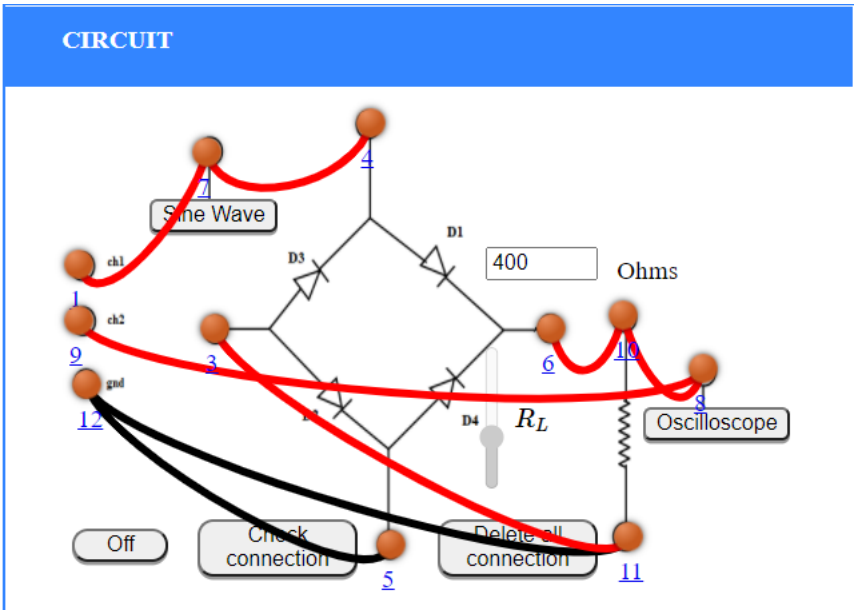
1. Connect the circuit as per procedure given on the simulation page.
2.
3. Set the resistor R_L.
4. Click on 'ON' button to start the experiment.
5. Click on 'Sine Wave' button to generate input waveform
6. Click on 'Oscilloscope' button to get the rectified output.
7. Vary the Amplitude, Frequency, volt/div using the controllers.
8. Click on "Dual" button to observe both the waveform.
9. Channel 1 shows the input sine waveform, Channel 2 shows the output rectified waveform.

Circuit Diagram :

1. **Half Wave Rectification :**

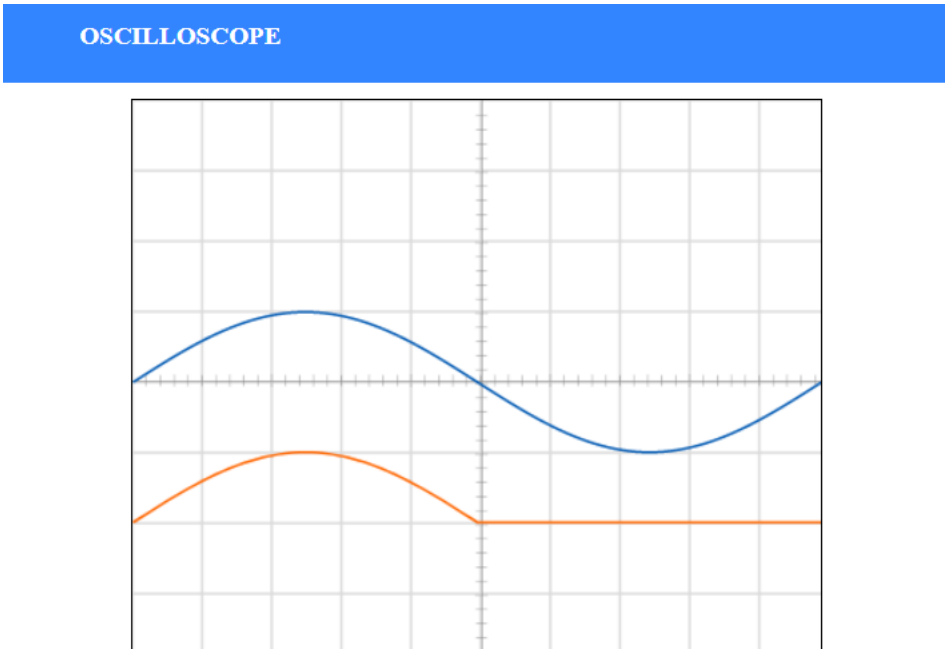


2. **Full Wave Rectifier :**

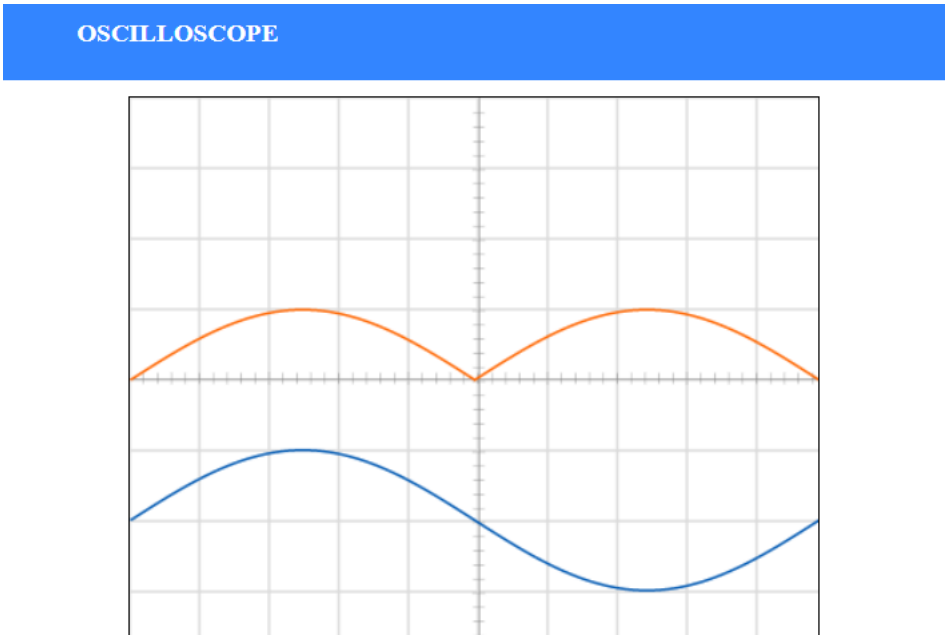


Results:

1. Half Wave Rectifier :



2. Full Wave Rectifier :



Conclusion: We are therefore able to study output waveforms of half wave and full wave rectifiers.