Experiment 3
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Aim

- To study PN junction diode as series and shunt clippers.

Results

We shall use the Blue colour for input signal and Red for output. Also note that in some of the diagrams, the red line is not neatly visible in the portions where the red and blue overlap.

Series clipper circuit

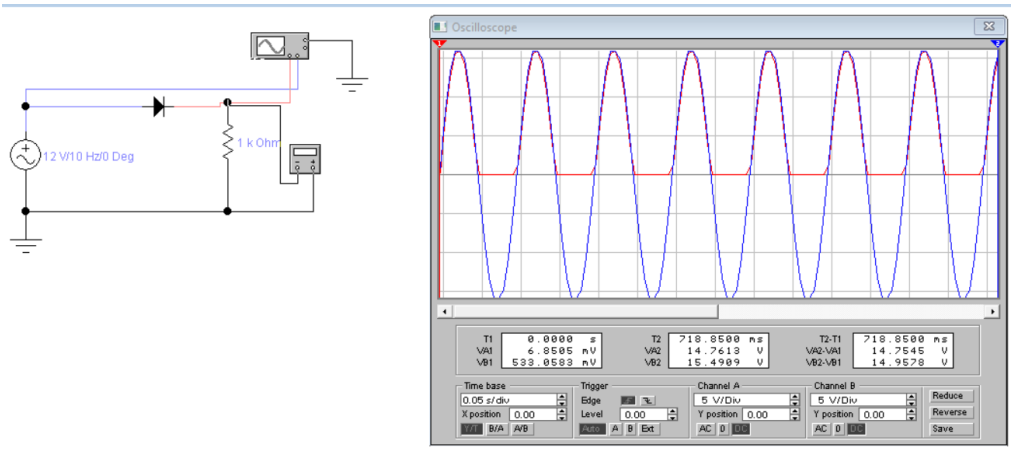

Figure 1: Series clipper circuit

This circuit clips away the negative AC voltage part of the input since the diode gets reverse biased during the negative half cycle.

Series clipper circuit with reversed diode

This circuit clips away the positive part of the input since the diode gets reverse biased during the positive half cycle.

Series clipper circuit with bias voltage

This circuit clips away the negative part of the input since the diode gets reverse biased during the negative half cycle. The peak output voltage is lowered by 5V due to the introduction of extra bias voltage.

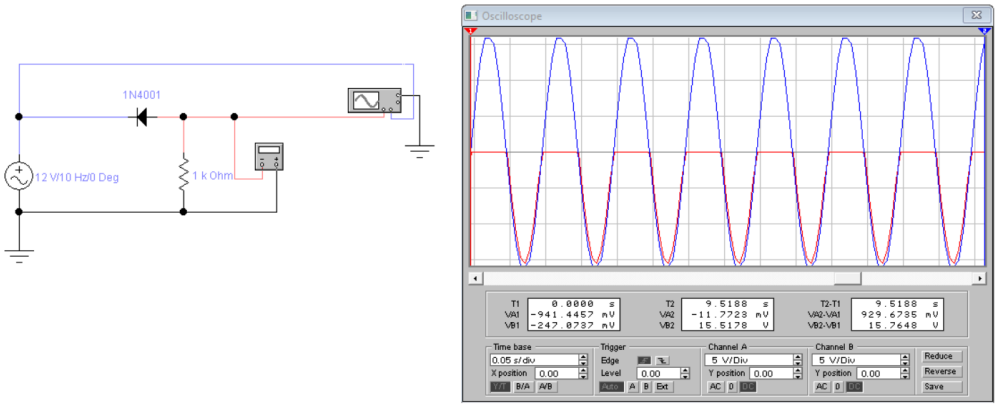

Figure 2: Series clipper circuit with reversed diode

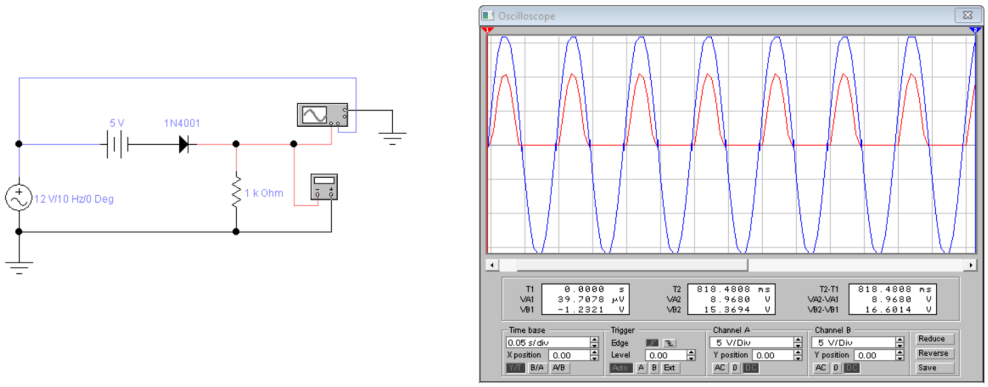

Figure 3: Series clipper circuit with bias voltage

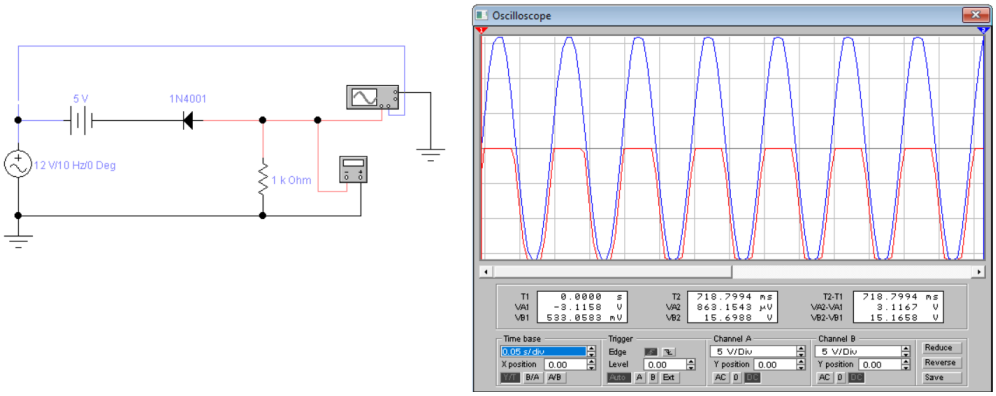

Figure 4: Series clipper circuit with bias voltage with reversed diode

Series clipper circuit with bias voltage with reversed diode

This circuit clips away the positive part of the input since the diode gets reverse biased during the positive half cycle. No contribution from the extra battery remains,only the negative part remains.

Series clipper circuit with bias voltage with a reversed battery

This circuit clips away the negative part of the input since the diode gets reverse biased during the negative half cycle. The peak output voltage is not affected by the 5V battery since the battery contributes only to the negative part.

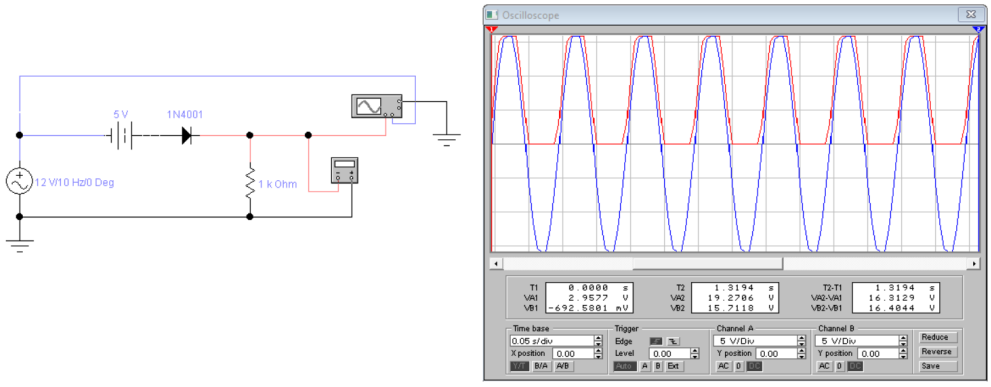

Figure 5: Series clipper circuit with bias voltage with a reversed battery

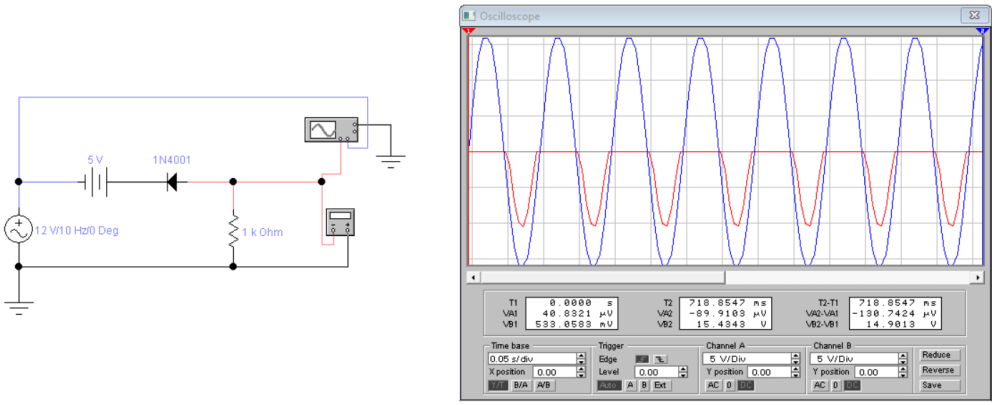

Figure 6: Series clipper circuit with bias voltage with both battery and diode reversed

Series clipper circuit with bias voltage with both battery and diode reversed

This circuit clips away the positive part of the input since the diode gets reverse biased during the positive half cycle. The peak output voltage is lowered by 5V due to the introduction of extra bias voltage.

Shunt clipper

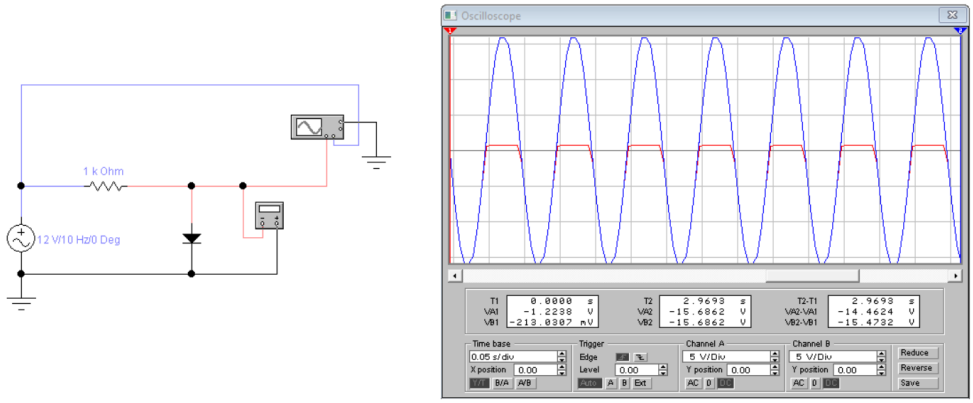

Figure 7: Shunt clipper

This circuit clips away the positive part of the input since the diode gets reverse biased during the positive half cycle.

Shunt clipper with reversed diode

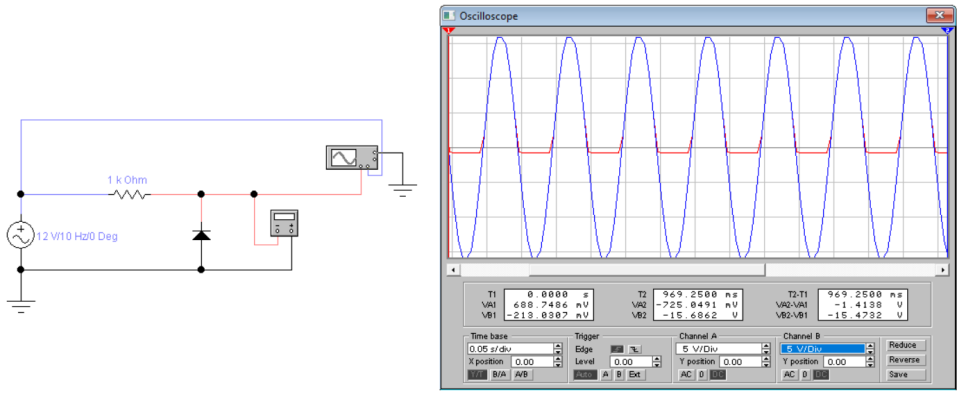

Figure 8: Shunt clipper with reversed diode

This circuit clips away the negative part of the input since the diode gets reverse biased during the negative half cycle.

Shunt clipper with bias voltage

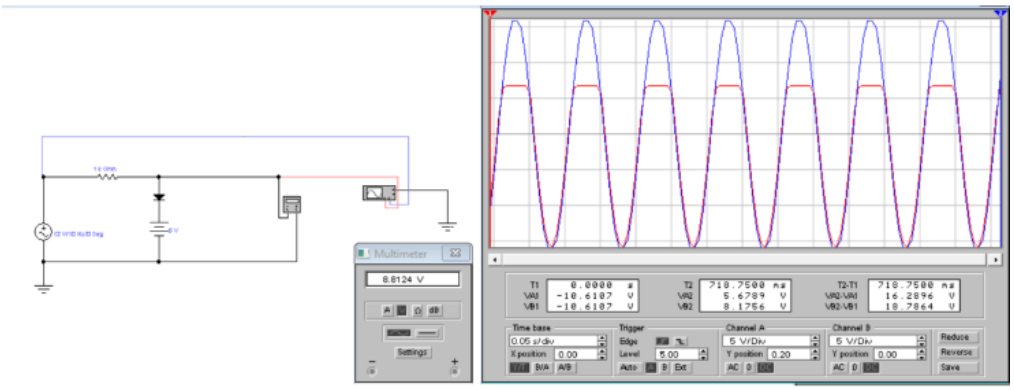

Figure 9: Shunt clipper with bias voltage

This circuit clips away the positive part of the input since the diode gets reverse biased during the positive half cycle. The peak output signal is shifted towards the positive side by 5V due to the introduction of extra bias voltage.

Shunt clipper with bias voltage reversed

This circuit clips away the positive part of the input since the diode gets reverse biased during the positive half cycle. The output signal gets shifted downward by 5V due to the bias voltage.

Shunt clipper with bias voltage reversed and diode reversed

This circuit clips away the negative part of the input since the diode gets reverse biased during the negative half cycle. The peak output signal is shifted towards the negative side by 5V due to the introduction of extra bias voltage.

Shunt clipper with bias voltage, diode reversed

This circuit clips away the negative part of the input since the diode gets reverse biased during the negative half cycle. The peak output signal is shifted upward by 5V due to the introduction of extra bias voltage.

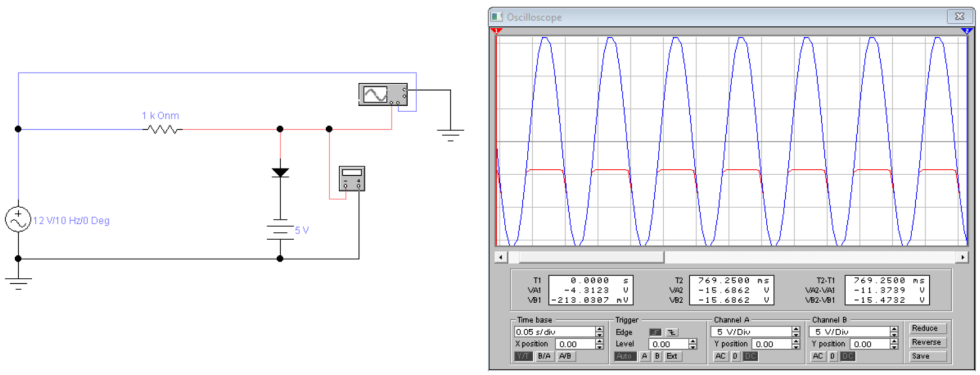

Figure 10: Shunt clipper with bias voltage reversed

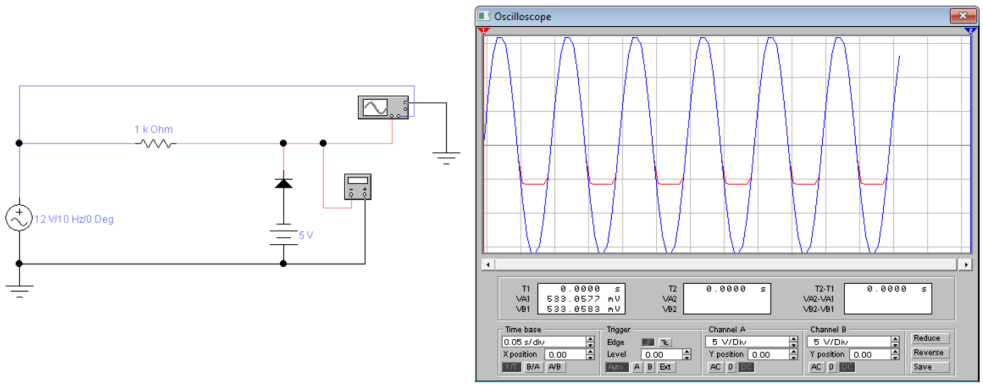

Figure 11: Shunt clipper with bias voltage reversed and diode reversed

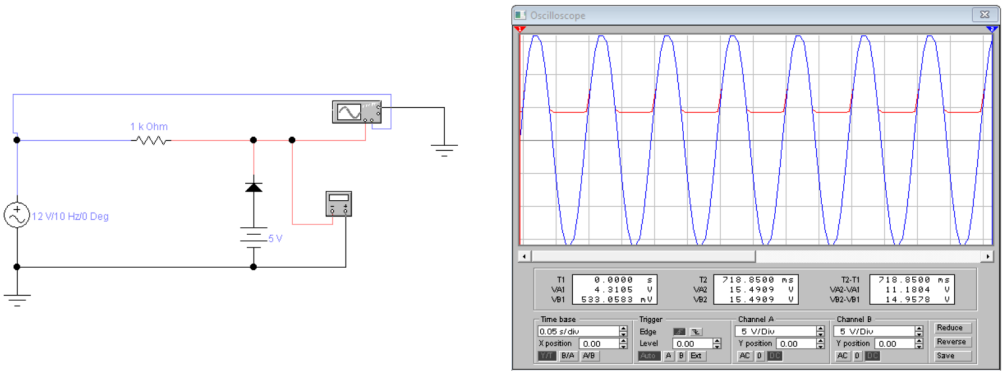

Figure 12: Shunt clipper with bias voltage, diode reversed

Double ended clipper with equal bias voltage

This circuit clips away 7V from both positive as well as negative half cycle and the output waveform has a peak of 5V. This is because the batteries are connected in forward bias with the diodes and contributes to the output during their respective forward bias modes during positive and negative half cycles.

Double ended clipper with unequal bias voltage

This circuit clips away 7V from the positive half cycle and 9V and the output waveform has a positive peak of 5V and negative peak of 3V. This is because, the batteries are connected in forward bias with the diodes and contributes to the output during their respective forward bias modes during positive and negative half cycles. Since the bias voltages are unequal, we get an uneven output signal.

P.S: Some weird latex bug has caused all these images to not be in there subsections.

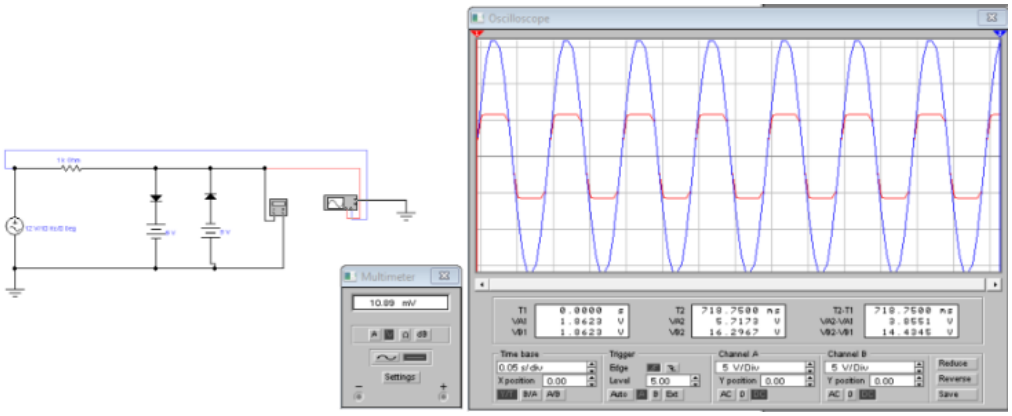

Figure 13: Double ended clipper with equal bias voltage

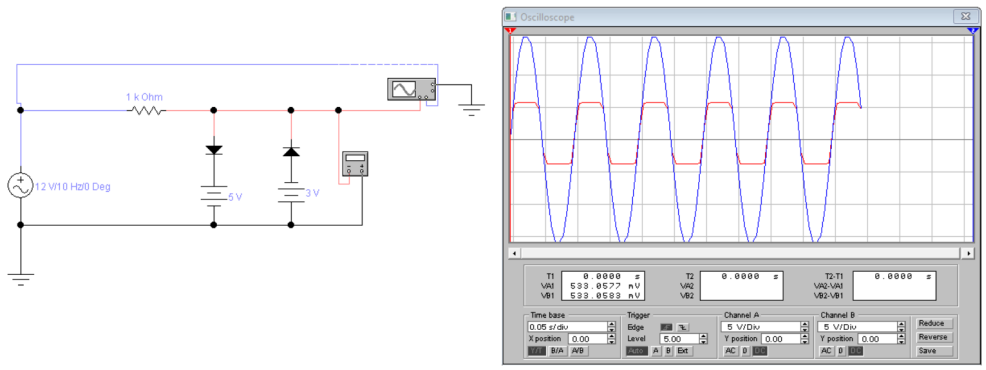

Figure 14: Double ended clipper with unequal bias voltage