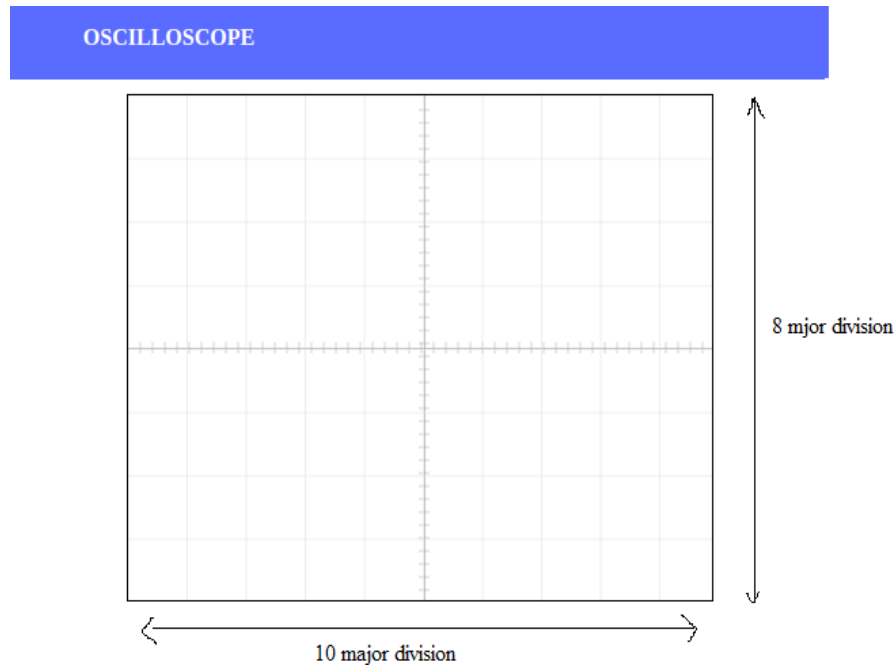


Virtual Oscilloscope Tutorial

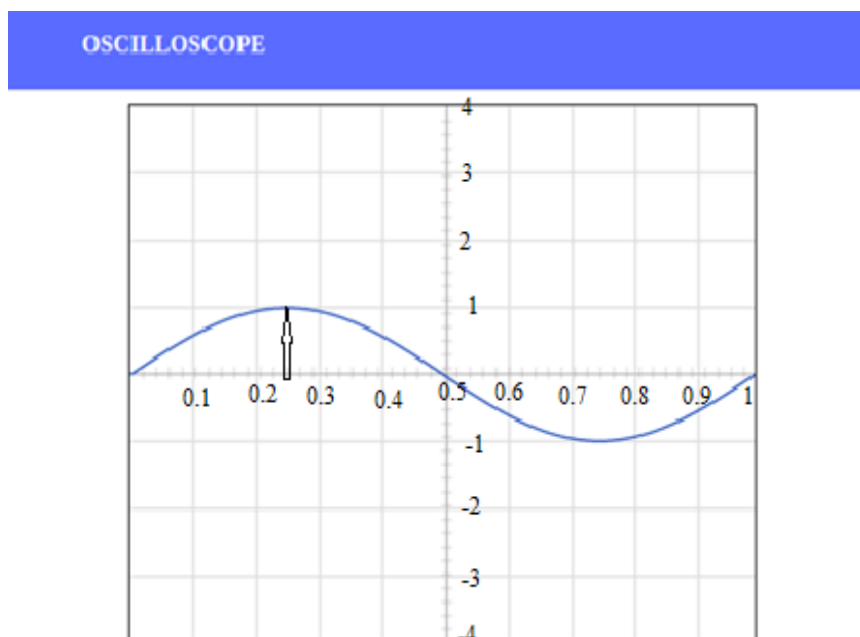
-Sukriti Dhang
VLT IITKgp

In this experiment we consider 8x10 grid. The vertical grid is divided into 8 (major) divisions and the horizontal grid is divided into 10 major divisions. To improve the precision, each of these divisions is further broken up into 5 minor divisions. The horizontal axis (X-axis) represents time and the vertical axis (Y-axis) represents voltage.



volt/div= 1volt. (which means each major division is 1 volt, and each minor division is 0.2 volt)

time/div = 0.1ms/sec (which means each major division is 0.1ms, and each minor division is 0.02 ms)



SET 1: Setting amplitude to 1 volt, frequency to 1000hz (default value)

Step 1: Double click on sine wave.

In the figure 1, channel 1 volt/div is set to 1 volt and amplitude of the input signal is 1 volt. Here, time/div is set to 0.1msec/div, the frequency is 1 kHz and its period is 1 complete cycle in 1msec.

As, channel 1 ---> volt/div is 1 volt and amplitude is set to 1 volt, input signal in the oscilloscope screen is upto 1 division. And time/div is 0.1ms/div, 1 complete cycle is 1ms.

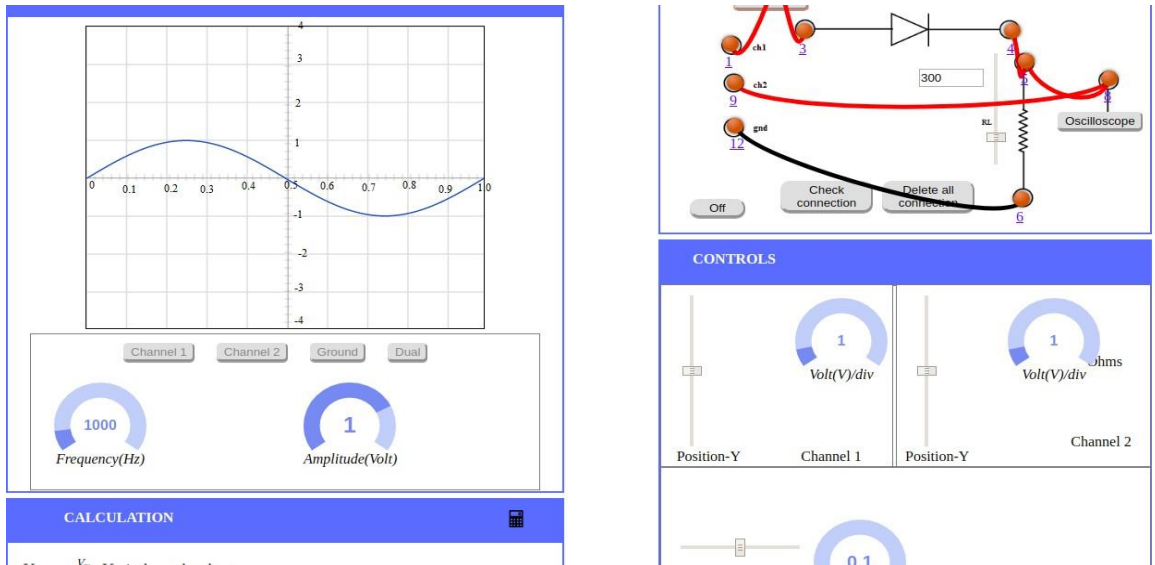


Figure 1

Step 2: Click on oscilloscope.

Here as, channel 2---> volt/div is 1 volt and amplitude is set to 1 volt, output signal in the oscilloscope screen is upto 1 division. And time/div is 0.1ms/div. In the figure 2 shows the output signal.

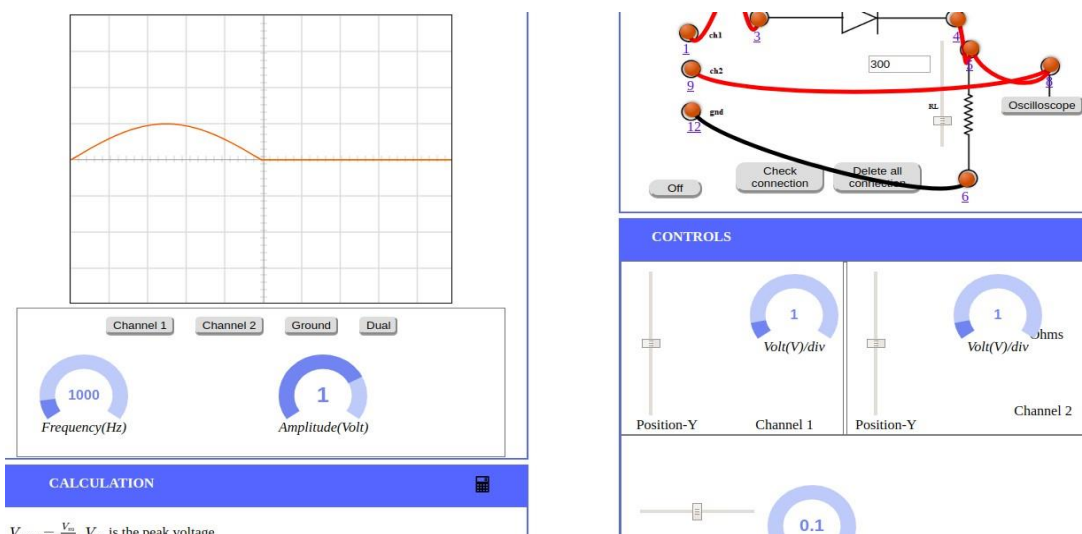


Figure 2

Step 3: Click on dual function.

(Note: For dual output, channel 2 controller controls both the signals.)

Here as, channel 2 is used to set the volt/div---> volt/div is 1 volt and amplitude is set to 1 volt, output signal in the oscilloscope screen is upto 1 division. And time/div is 0.1ms/div. In the figure 3 shows the both signal. As frequency is 1000hz, and 0.1ms/div, therefore to complete 1 cycle it takes 1msec.

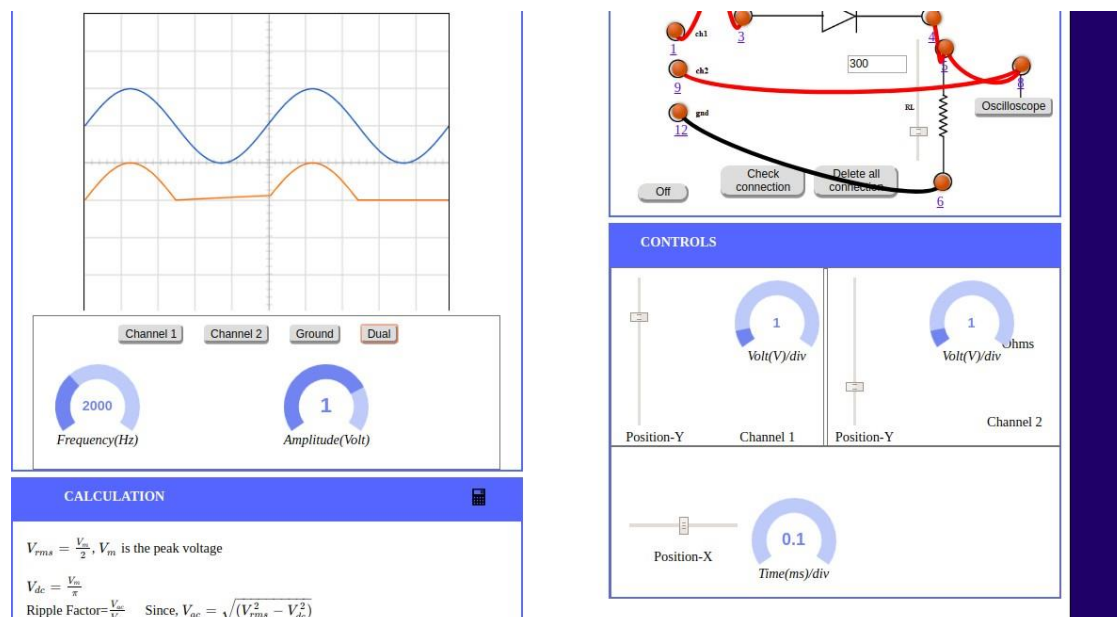


Figure 3

Click on Dual button, and change the frequency to 2000 hz. (Note: double click on Dual, if the waveform does not come accordingly).

As frequency is 2000hz, and 0.1ms/div,

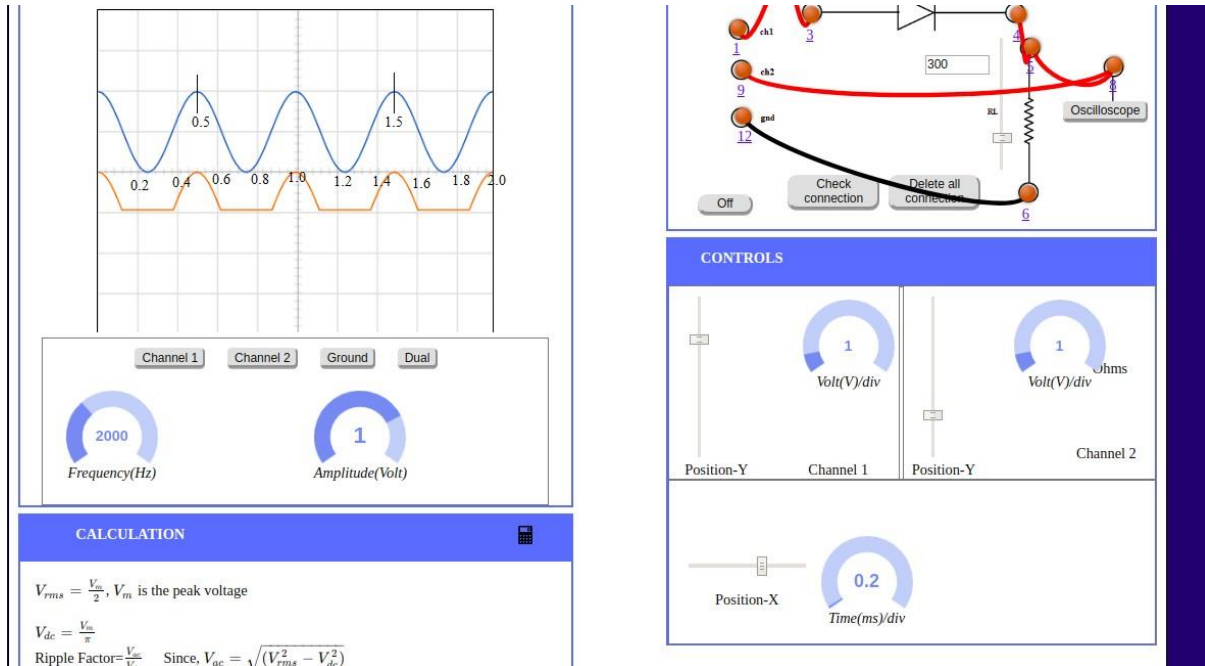
Frequency=(1/period) Period=(1/frequency), which means period=(1/2000) i.e. 0.5msec. Therefore, in 0.5 msec it will complete 1 cycle, and in another 0.5 msec it will complete another cycle. So, in 2000Hz, 0.1msec/div it will complete 2 cycle.



Change the time/div and set to 0.2 ms/div. (Note: double click on Dual, if the waveform does not come accordingly).

As frequency is 2000hz, and 0.2ms/div,

Frequency=(1/period) Period=(1/frequency), which means period=(1/2000) i.e. 0.5msec. Therefore , in 0.5 msec it will complete 1 cycle, and in another 0.5 msec it will complete another cycle and so on. So, in 2000Hz, 0.2msec/div it will complete 4 cycle.



The screenshot shows a virtual oscilloscope interface. At the top, there is a circuit diagram with a transistor, a 300 Ohm resistor, and an inductor. The oscilloscope is connected to the circuit. Below the circuit, there are control knobs for Channel 1 and Channel 2, both set to 1 Volt(V)/div. The Time(ms)/div knob is set to 0.2. The Frequency(Hz) knob is set to 2000. The Amplitude(Volt) knob is set to 1. Below the controls, there is a calculation section with the following formulas:

$$V_{rms} = \frac{V_m}{\sqrt{2}}, V_m \text{ is the peak voltage}$$

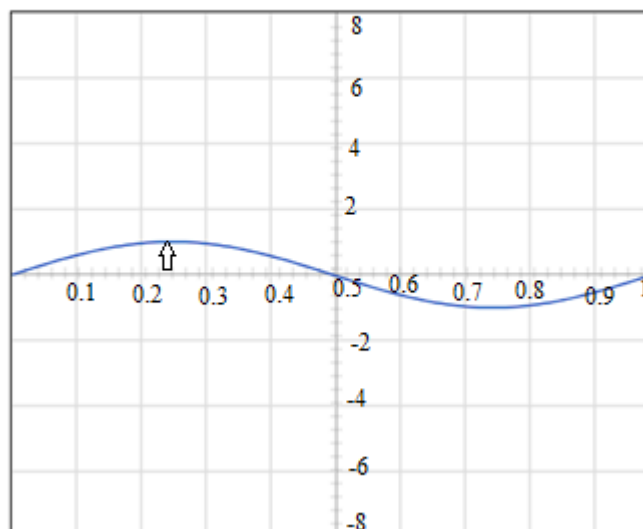
$$V_{dc} = \frac{V_m}{\pi}$$

$$\text{Ripple Factor} = \frac{V_r}{V_{dc}} \text{ Since, } V_{ac} = \sqrt{(V_{rms}^2 - V_{dc}^2)}$$

volt/div= 2volt. (which means each major division is 2 volt, and each minor division is 0.5 volt)

time/div = 0.1ms/sec (which means each major division is 0.1ms, and each minor division is 0.02 ms)

OSCILLOSCOPE



SET 2: Setting amplitude to 2 volt, frequency to 1000hz

Step 1: Set Channel 1-- volt/div=2volt, then double click on channel 1 .

As, channel 1 ---> volt/div is 2volt. Each major division is 2 volt. In figure 4 shows the same.

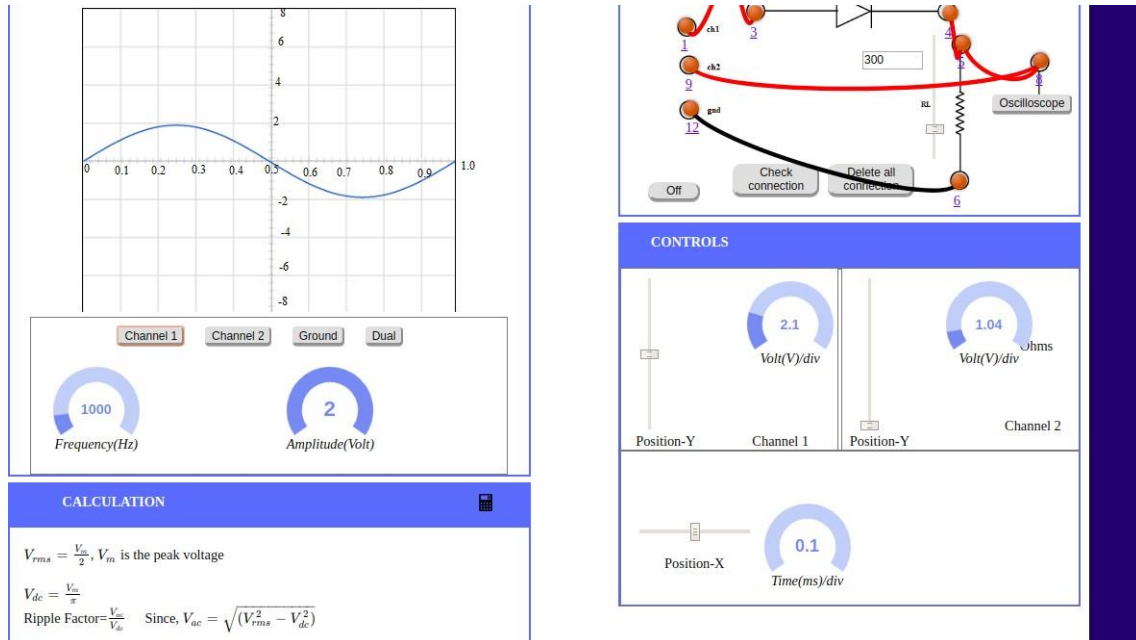


Figure 4

Step 2: In figure5, since channel 2--> volt/div is 1 volt and amplitude is 2 volt. Click on channel 2 function. The output signal shows the same.

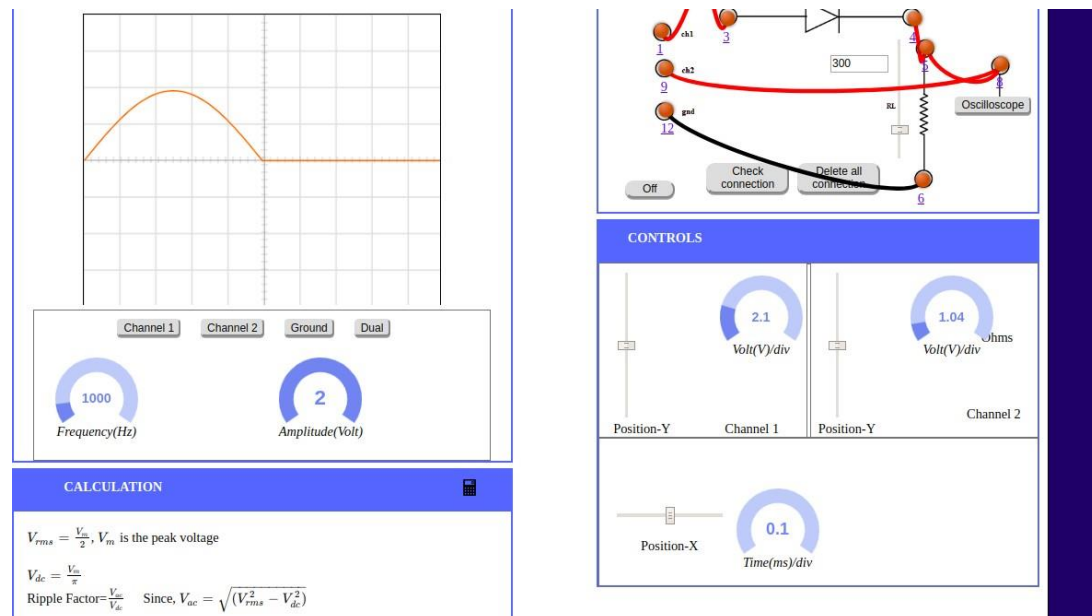


Figure 5

Step 3: In figure 6, Click on dual.

(Note: For dual output, channel 2 controller controls both the signals.)

Here as, channel 2 is used to set the volt/div---> volt/div is 1 volt and amplitude is set to 2 volt, output signal in the oscilloscope screen is upto 1 division. And time/div is 0.1ms/div. In the figure 6 shows the both signal.

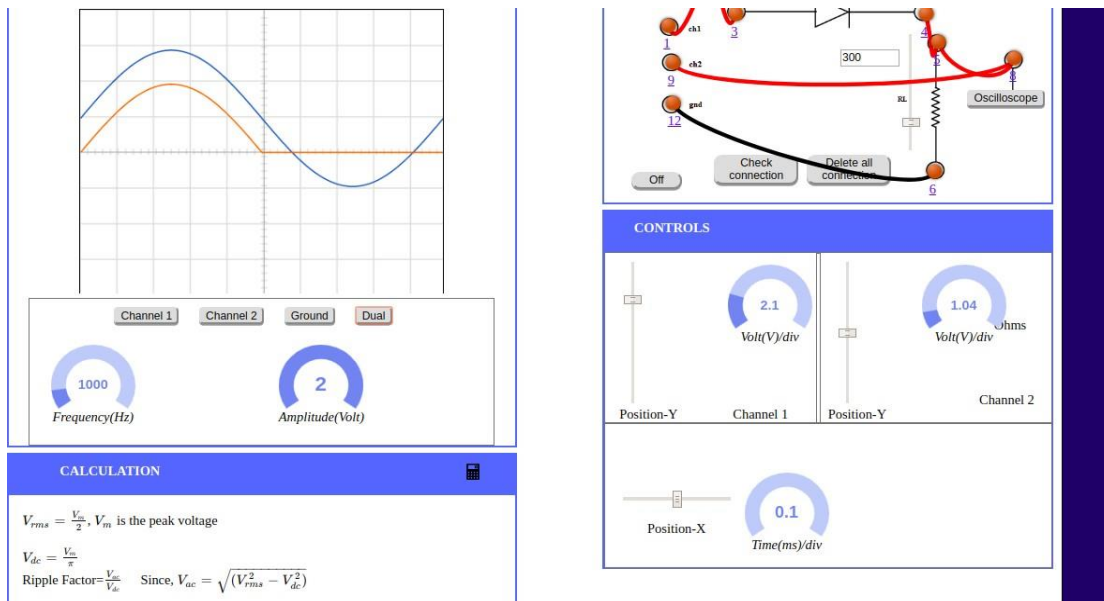


Figure 6

Step 4 : Set channel 2 ---> volt/div is 2 volt and amplitude is set to 2 volt, output signal in the oscilloscope screen is upto 1 division. And time/div is 0.1ms/div. In the figure 7 shows the both signal.

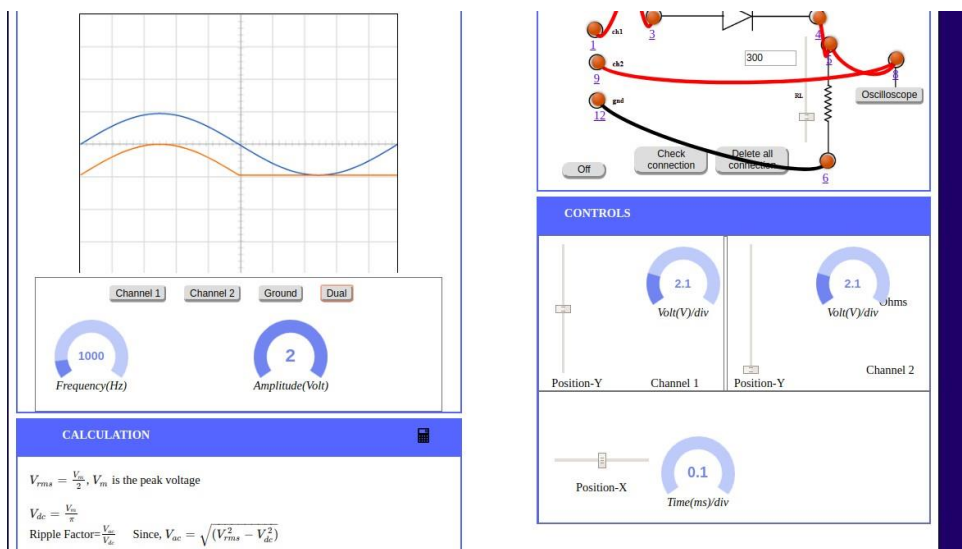


Figure 7

Note 1: If you set the Volts/Div too low, you'll clip the signal. Similarly, setting it too high, and you'll won't find the signal, i.e. the signal will be flat.

Increasing the Timebase will display more cycles of a periodic signal. Conversely, reducing the Timebase, fewer cycles will be displayed.

Note 2: Sometimes due to page load or cache, the graph may not come exact at one click. So it is better to double click on the channel-1 function/ channel-2 function/ dual function/ ground function to get the respective signals.