Virtual Oscilloscope and Function Generator Tutorial

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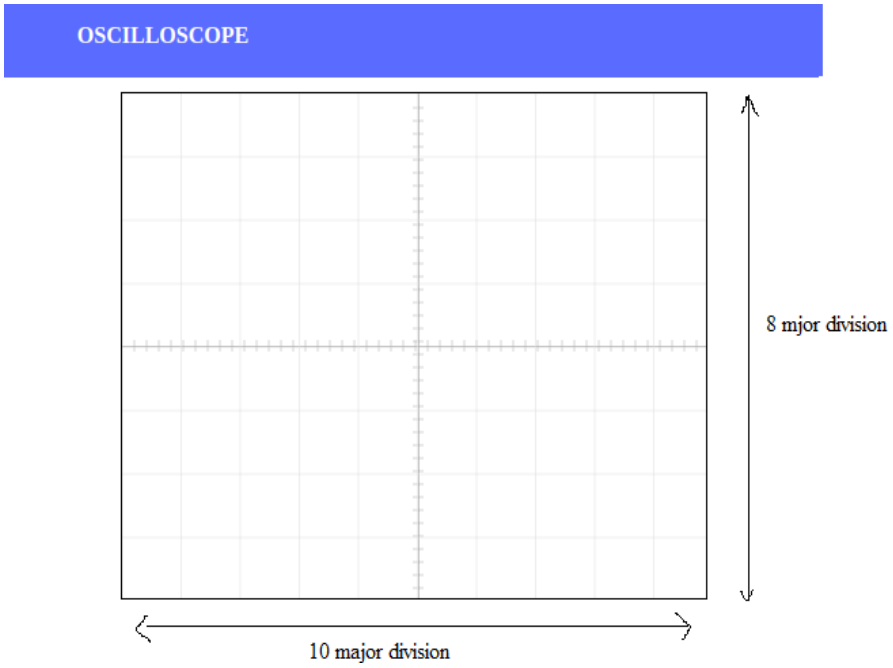
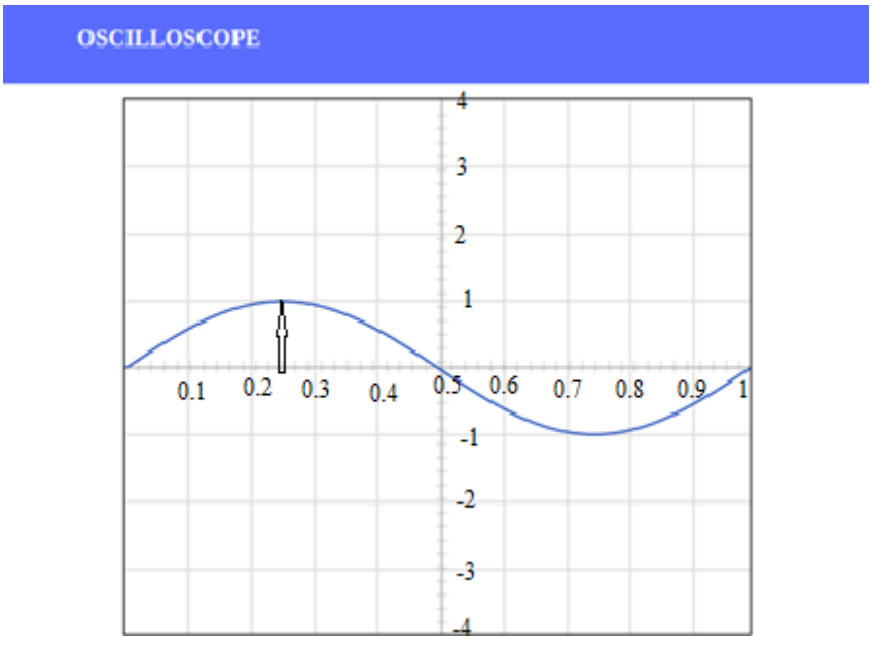
In this experiment we consider 8x10 grid. The vertical grid is divided into 8 (major) divisions and the horizontal grid is divided into 10 major divisions. To improve the precision, each of these divisions is further broken up into 5 minor divisions. The horizontal axis (X-axis) represents time and the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



volt/div= 1 volt. (which means each major division is 1 volt, and each minor division is 0.2 volt)
time/div = 0.1 ms/sec (which means each major division is 0.1ms, and each minor division is 0.02 ms)



SET 1: Setting amplitude to 2 volt (Vp-p), frequency to 1000 Hz (default value)

Step 1: Double click on sine wave button from Function generator 1.

In the figure 1, channel 1 volt/div is set to 1 volt and amplitude (Vp-p) of the input signal is 2 volt. Here, time/div is set to 0.1 ms/div, the frequency is 1 kHz and its period is 1 complete cycle in 1 ms.
As, channel 1: volt/div is 1 volt and amplitude is set to 2 volt, input signal in the oscilloscope screen is upto 2 division peak-to-peak, i.e. positive half is upto 1 div and negative half upto 1 div.. And time/div is 0.1 ms/div, 1complete cycle is 1ms.

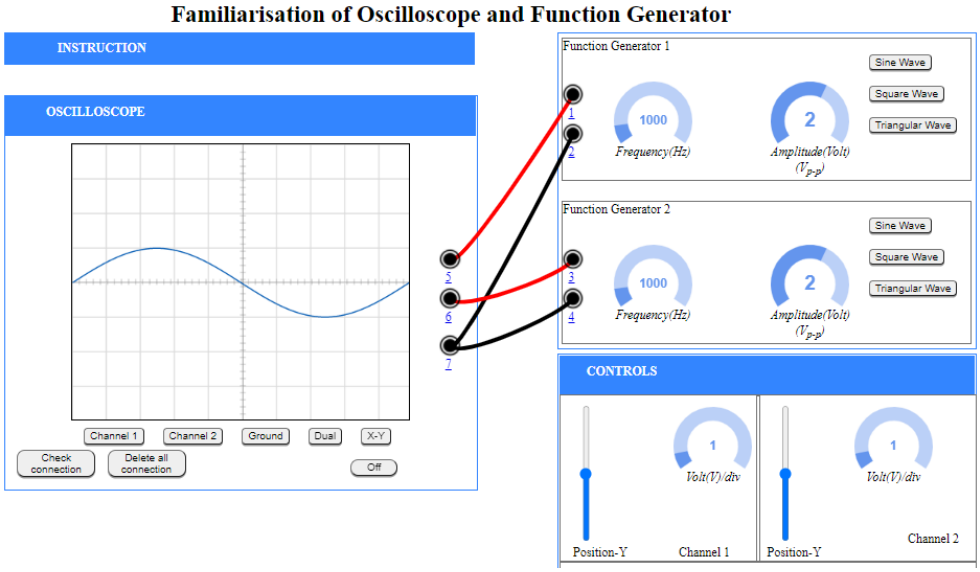


Figure 1

Step 2: Click on sine wave button from Function generator 2.

Here as, channel 2: volt/div is 1 volt and amplitude (Vp-p) of the input signal is 2 volt. Here, time/div is set to 0.1 ms/div, the frequency is 1 kHz and period is 1 complete cycle in 1 ms.
As, channel 2: volt/div is 1 volt and amplitude is set to 2 volt, input signal in the oscilloscope screen is upto 2 division peak-to-peak, i.e. positive half is upto 1 div and negative half upto 1 div.. And time/div is 0.1 ms/div, 1complete cycle is 1ms.

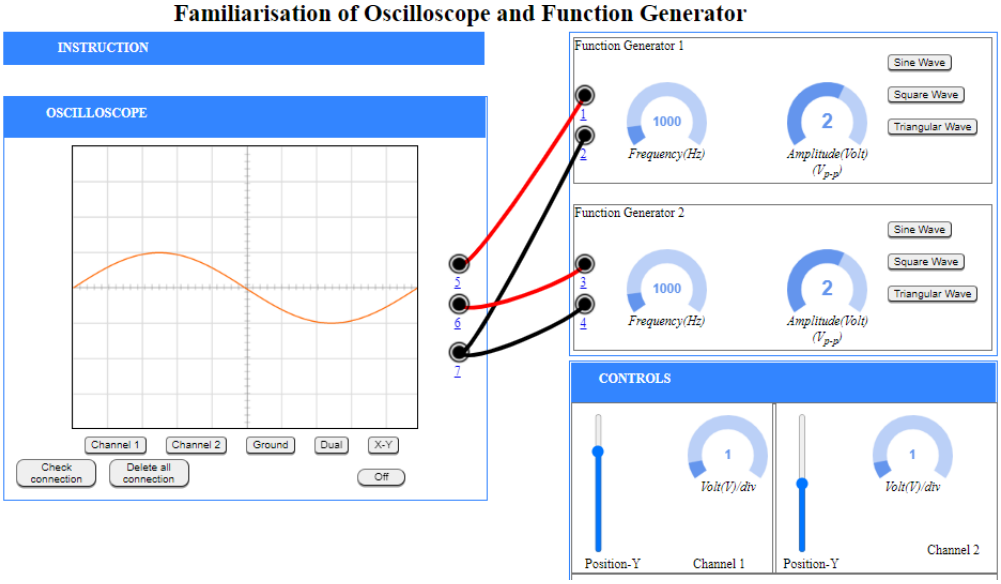


Figure 2

Step 3: Click on Ground function.

(Note: Ground button, The ground setting disconnects the input signal from the vertical system, which lets you see where zero volts is located on the screen.)

Here as, both the waveform overlaps each other. Move the controller Position-Y for channel 1 up or down. Or Move the controller Position-Y for channel 2 up or down.

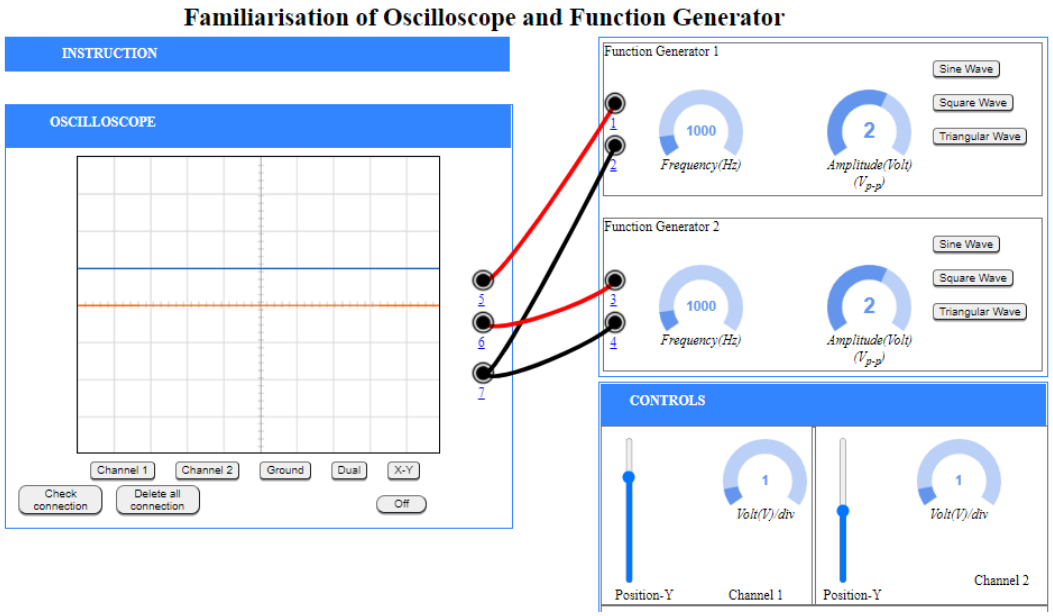


Figure 3

Step 4: Click on dual function.

(Note: Dual button, display both the waveform i.e. channel 1 and channel 2.)

Here as, controller of channel 1 and channel 2 is set to the 1 volt/div: The signal in the oscilloscope screen displays accordingly. And time/div is 0.1 ms/div. The figure 4 shows both the waveform. As frequency is 1000 Hz, and 0.1ms/div, therefore to complete 1 cycle it takes 1 ms.

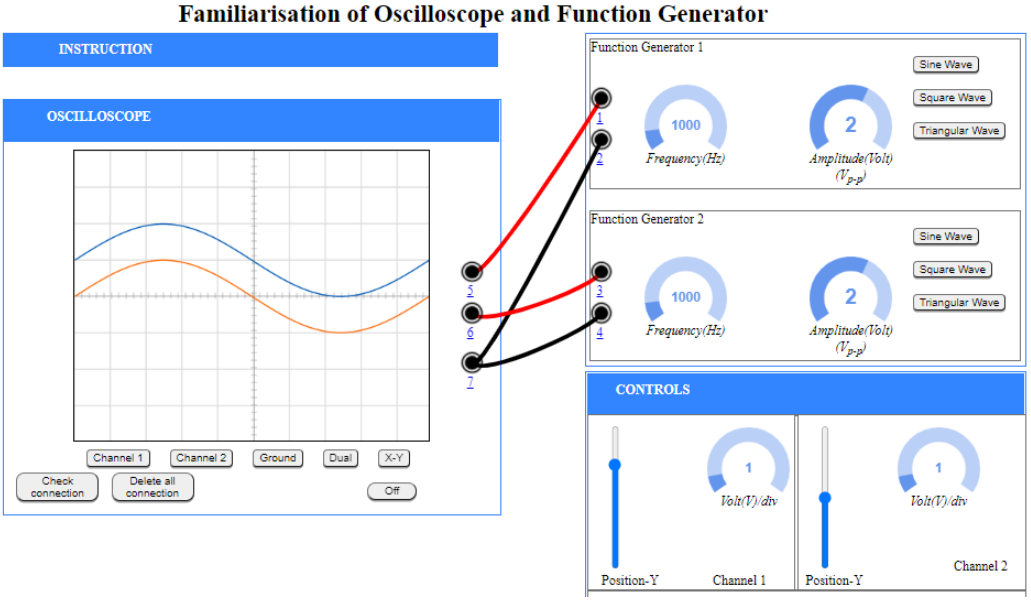


Figure 4

Step 5: Click on XY function.

(Note**:** The XY time mode converts the oscilloscope from a volts-versus-time display to a volts-versus-volts display using two input channels. Channel 1 is the X-axis input, channel 2 is the Y-axis input.)

In XY mode, when frequency for both the channel input is 1 kHz (1000 Hz). A tilted straight line as shown in Figure 5.

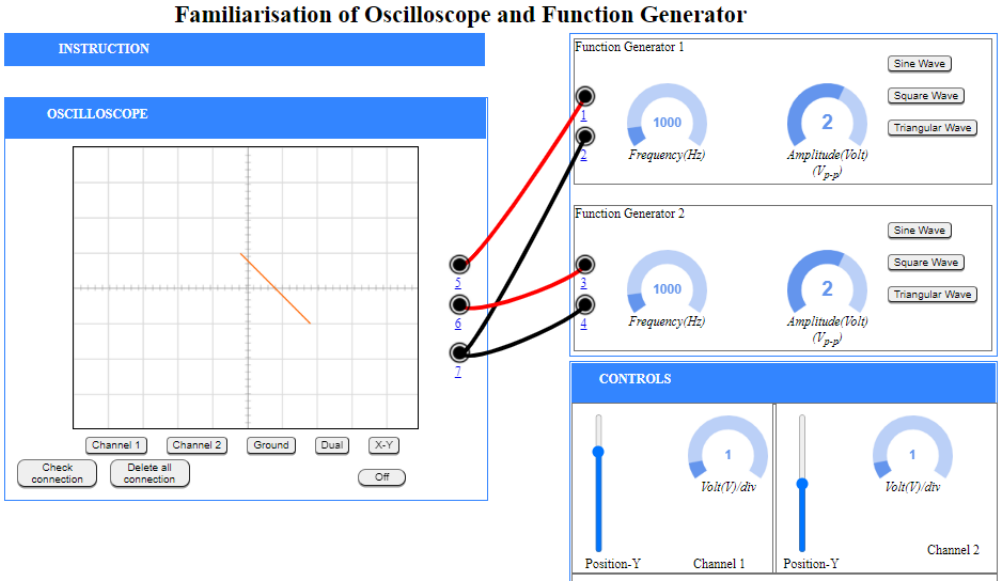


Figure 5

Change the frequency of input channel 1 to 1500 Hz, and observe the lissajous figure as shown in Figure 6.

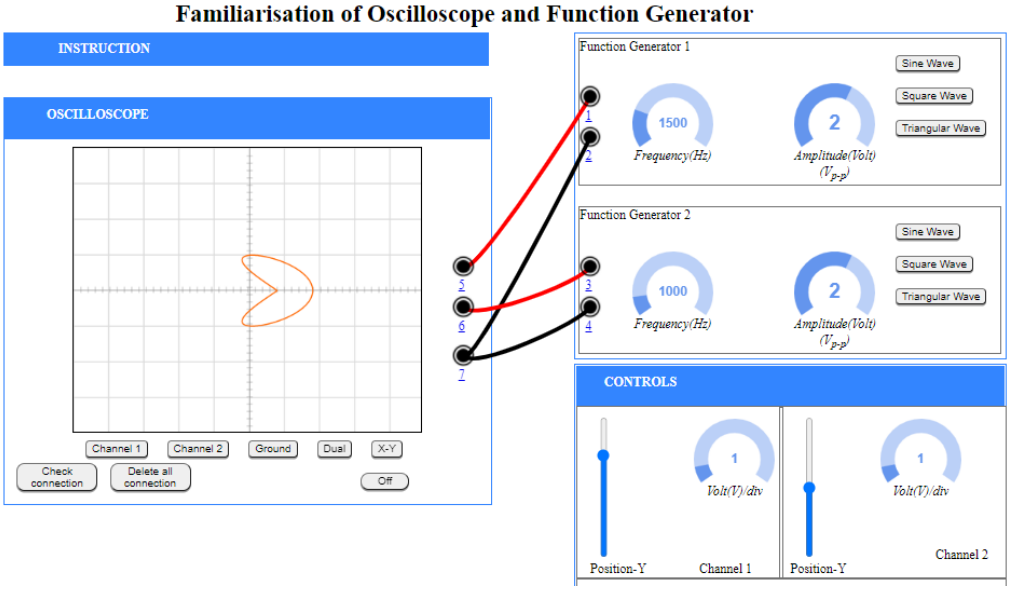


Figure 6

Further, change the frequency of input channel 1 to 2000 Hz, and observe the lissajous figure as shown in Figure 7.

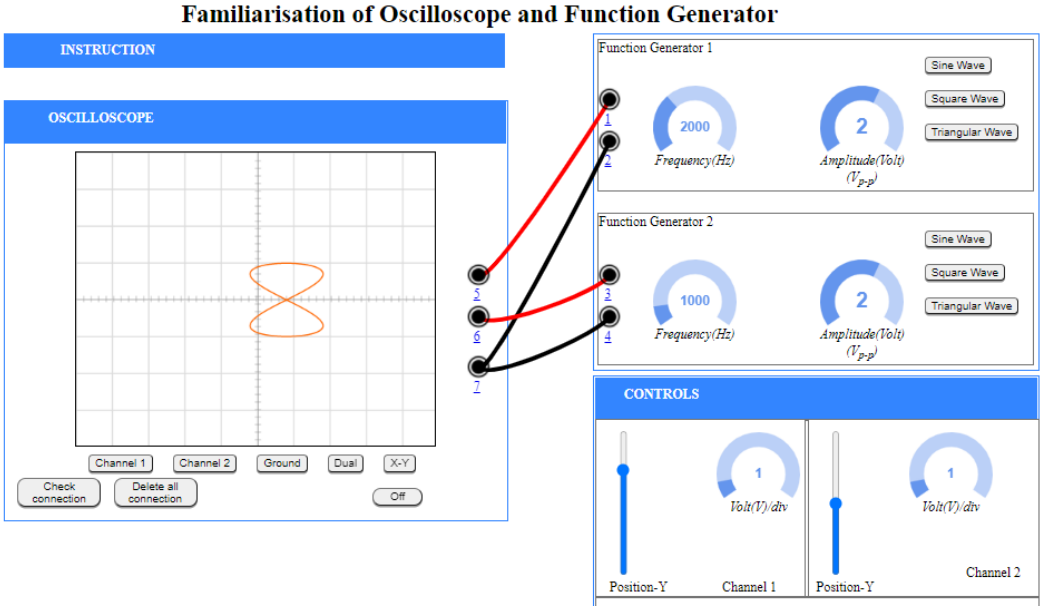


Figure 7

The possible curves that can be drawn by varying the frequency and phase of the sinusoidal functions. Play with the controllers for different frequency combinations and see interesting figures.

Now, double click on Dual button.

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

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

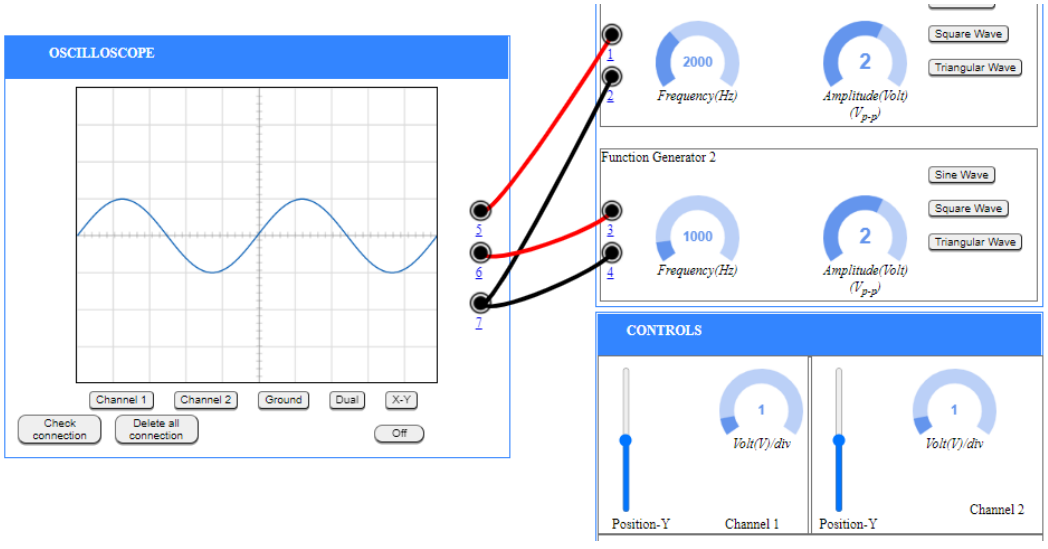


Figure 8

As frequency for channel 1 is 2000 Hz and channel 2 is 1000 Hz, and timebase is 0.1 ms/div,

Frequency= (1/period) Period= (1/frequency), which means period= (1/2000) i.e. 0.5ms. Therefore, for channel 1 waveform, in 0.5 ms it will complete 1 cycle, and in another 0.5 ms it will complete another cycle. So, in 2000 Hz, 0.1ms/div it will complete 2 cycle. And for channel 2, 1 cycle will be completed in 1 ms. So, in 1000 Hz, 0.1 ms/div it will complete 1

cycle. Figure 8 shows the waveform for channel 1 with frequency 2 kHz and channel 2 with frequency 1 kHz.

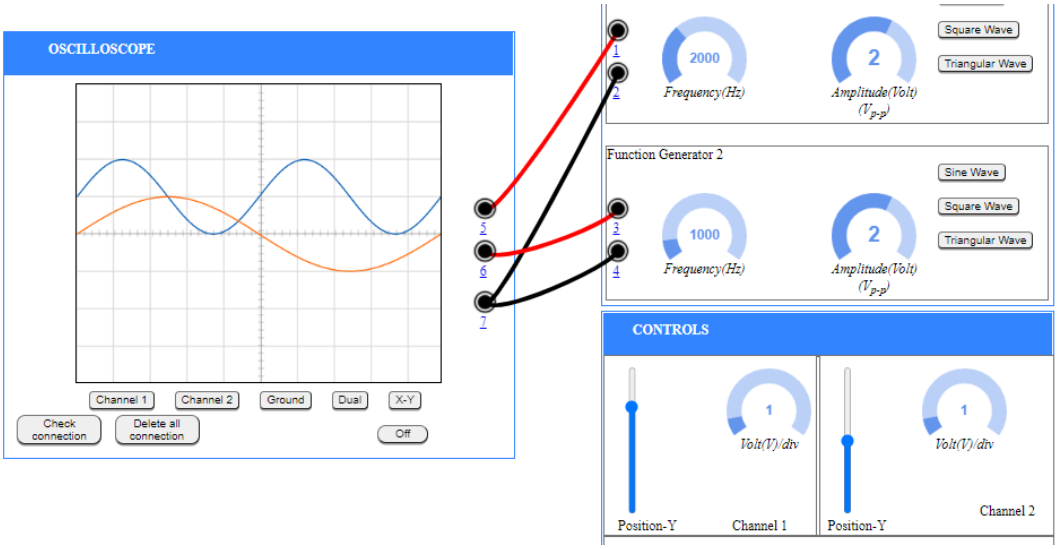


Figure 8

Change the time/div and set to 0.2 ms/div. (Note: double click on channel 1, if the waveform does not come accordingly).

As frequency for channel 1 is 2000 Hz, and timebase 0.2 ms/div,

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

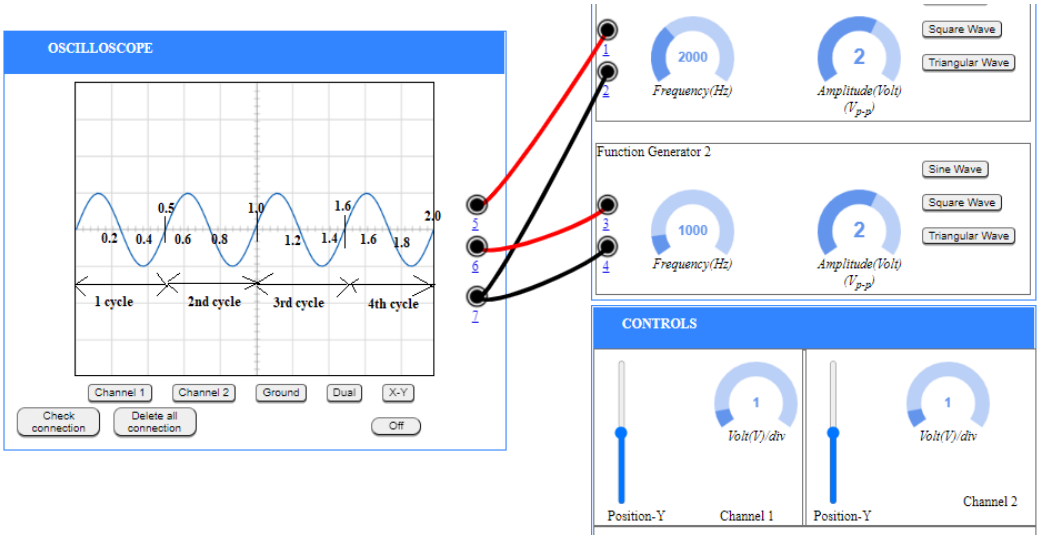


Figure 9

As frequency for channel 1 is 2000 Hz and channel 2 is 1000 Hz, and timebase is 0.2 ms/div,

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

And for channel 2, 1 cycle will be completed in 1 ms. So, in 1000 Hz, 0.1 ms/div it will complete 1 cycle. Figure 10 shows the waveform for channel 1 with frequency 2 kHz and channel 2 with frequency 1 kHz with timebase 0.2 ms/div.

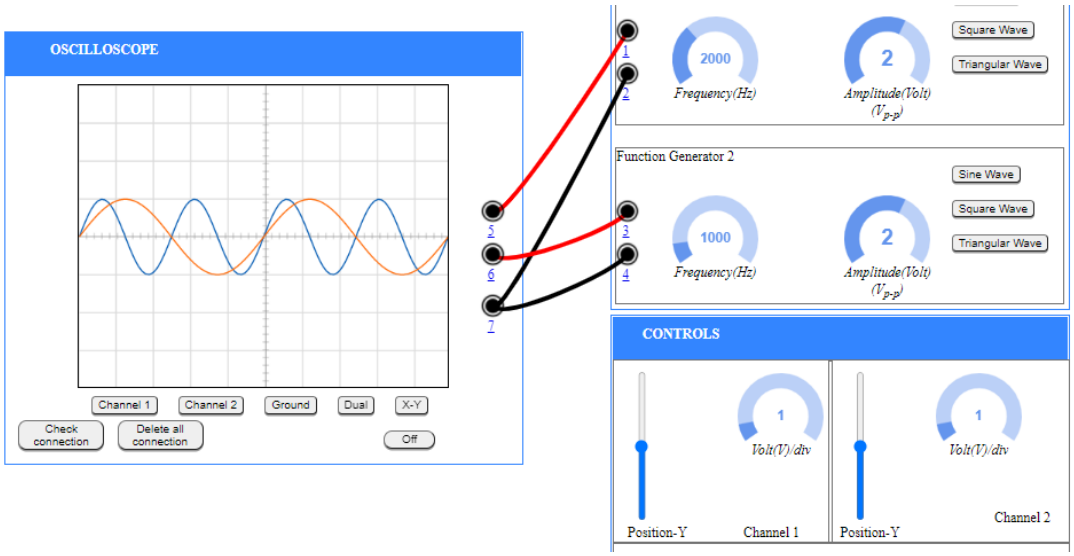
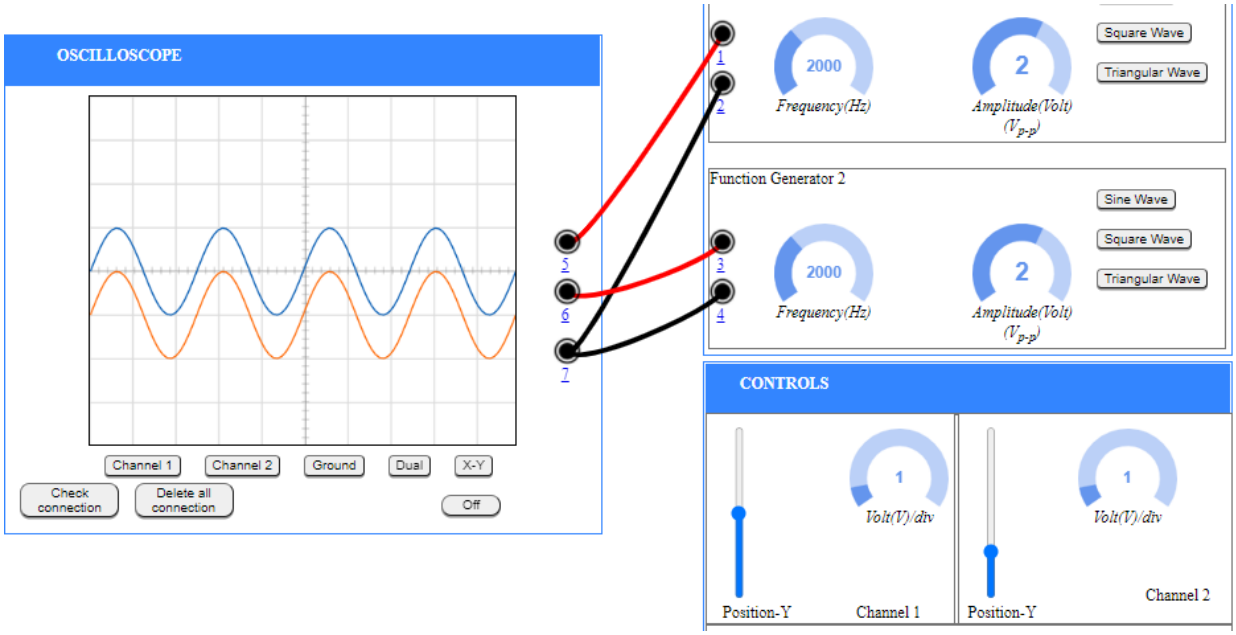


Figure 10

As frequency for channel 1 is 2000 Hz and channel 2 is 2000 Hz, and timebase is 0.2 ms/div,

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

And for channel 2, 1 cycle will be completed in 0.5 ms, and in another 0.5 ms another cycle and so on. So, in 2000 Hz, 0.2 ms/div it will complete 4 cycle. Figure 11 shows the waveform for channel 1 with frequency 2 kHz and channel 2 with frequency 2 kHz.



volt/div= 2 volt. (which means each major division is 2 volt, and each minor division is 0.5 volt)
time/div = 0.1 ms/sec (which means each major division is 0.1ms, and each minor division is 0.02 ms)

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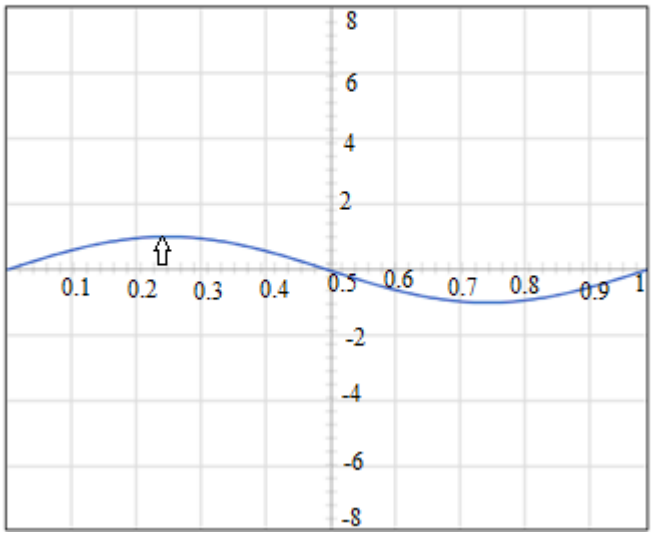

Note 1: If you set the Volts/Div too low, you'll clip the signal. Similarly, setting it too high, and you won't find the signal, i.e. the signal will be flat.
Increasing the Timebase will display more cycles of a periodic signal. Conversely, reducing the Timebase, fewer cycles will be displayed.

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/XY mode to get the respective signals.

** Same way square wave input and triangular input can be done.