

Clock Sources and Function Generators (Written for MultiSim V8)

MultiSim includes four sources of TTL waveforms:

- The Clock Voltage Source (also called the TTL Clock Source)
- The Function Generator
- The Word Generator (separate document)

The Clock Voltage Source (Sources Bin):

One of the things which you need in a digital circuit is a **TTL signal source**. This source is defined as a **rectangular wave source** which goes from **0v to 5v**. At no time does the signal go below ground level. One end must be grounded (**earth ground**). Double click on the device and the window shown in **Figure 1** appears. You can change the **frequency, Duty cycle, and peak voltage**.

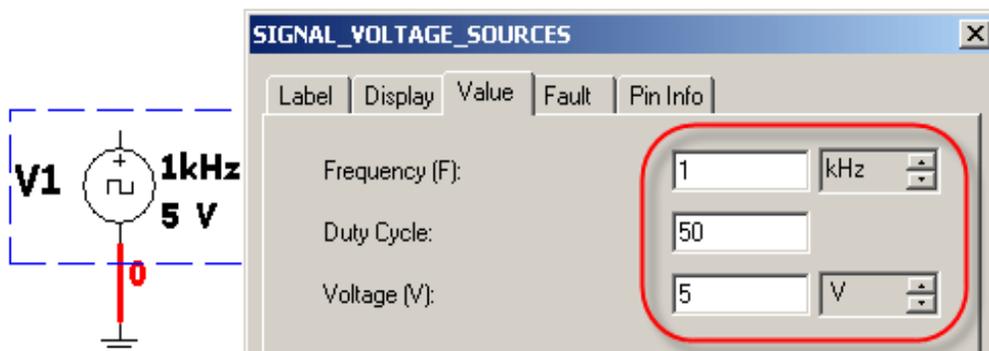


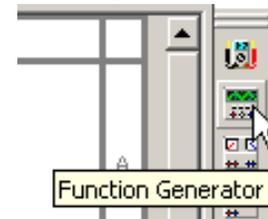
Figure 1

This source is the normal method of triggering digital circuits. When it is being used to clock TTL devices only it must be set for a max Voltage (V) of 5 volts. If it is being used to trigger CMOS then the Voltage may be set higher based on the CMOS devices Max settings.

The Function Generator (Virtual Instrument Section):

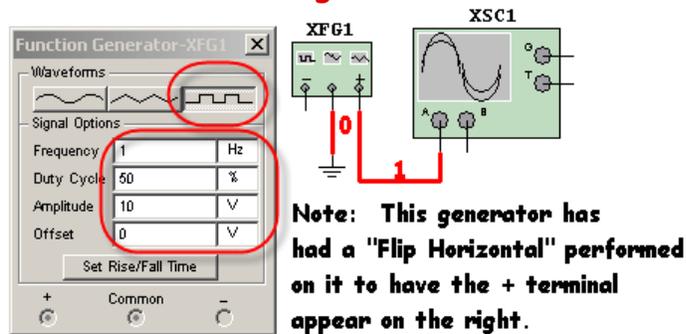
Multisim's Function Generator can be found with the Virtual Instruments as shown in Figure 2.

Figure 2



As can be seen in Figure 3 below, it can provide several different types of waveforms. Besides the rectangular waveform it can also provide a sine wave and a triangular waveform. Each of these waveforms can have the following values adjusted: Frequency, Duty Cycle, Amplitude, and Offset.

Figure 3



Note: This generator has had a "Flip Horizontal" performed on it to have the + terminal appear on the right.

The **Offset** is equivalent to the **DC Offset** which can be found on actual Lab Machines. With the **Offset** at its **default value of 0**, the signal will be centered around the zero line, in effect, its **DC component** will be zero. If however the **Offset** is set to some value greater than zero then the waveform's average value will be above zero and the waveform itself will have more area above zero than below zero.

It is important to note that in order for the Function Generator to be used as a TTL clock source both the amplitude and the offset will have to be adjusted. **Figure 4** below shows the rectangular waveform in its default configuration. If this were used on a digital device it would at the very least not work, at the worst it would destroy the device.

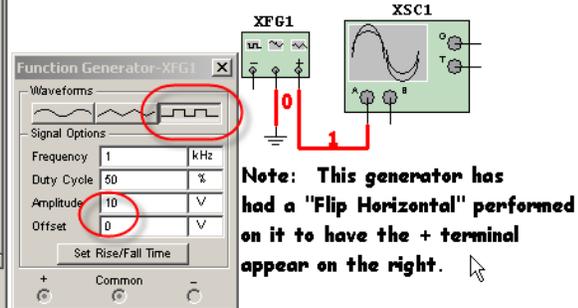
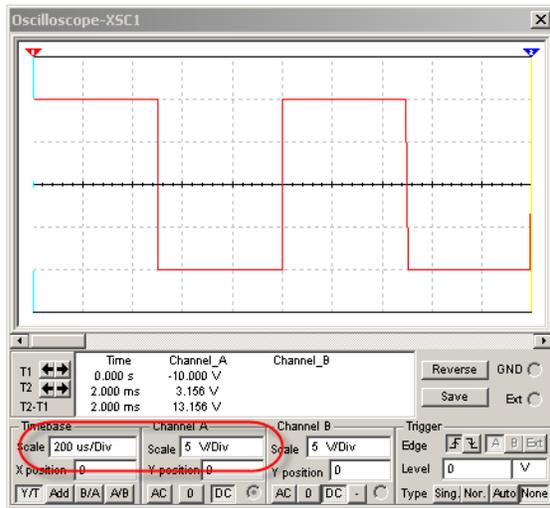
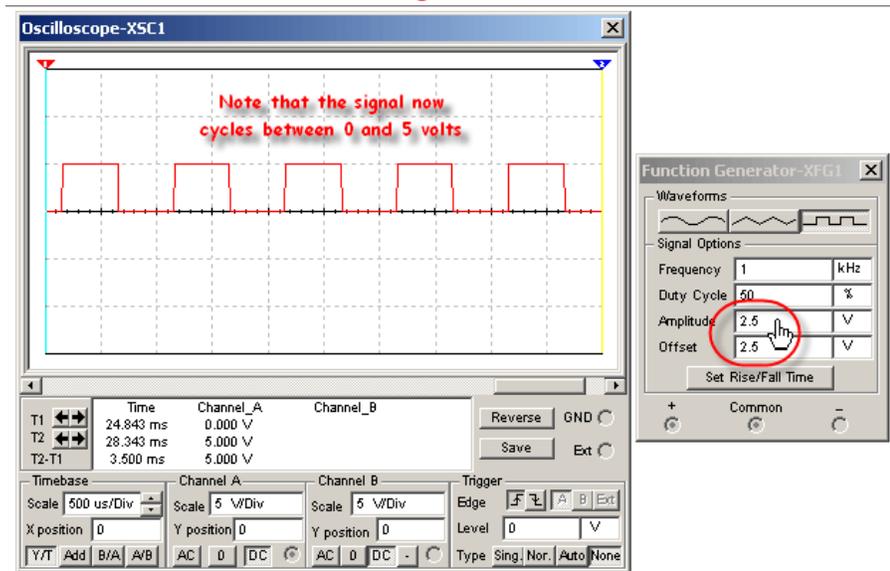


Figure 4

Figure 5

However, if the Amplitude and the offset are both adjusted to 2.5 volts the waveform is now in a form which is equivalent to the Clock voltage source being set to 5 volts as can be seen in **Figure 5**.



One thing that can be noted in **Figure 5** above is that there is a very distinct rise/fall time associated with the Function Generator's waveform on the Oscilloscope. This can be adjusted by selecting the "Set Rise/Fall Time" button, at which point you will see the window in **Figure 6** appear.

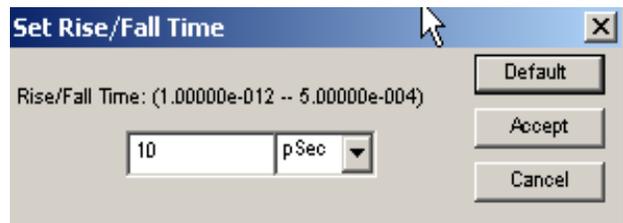


Figure 6

Lets see what happens if we set it at a smaller value then the default.

Figure 7

