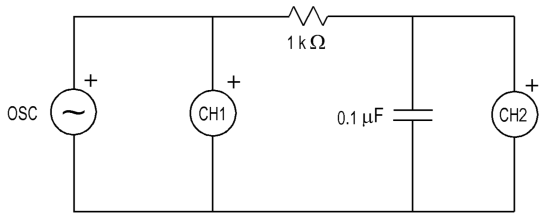
Tutorial No.1 – Measure an RC Low-Pass Filter Transfer Function

If the “Sanity check” worked out but you still are not convinced, try this as a real-life application of a frequency response analyzer:

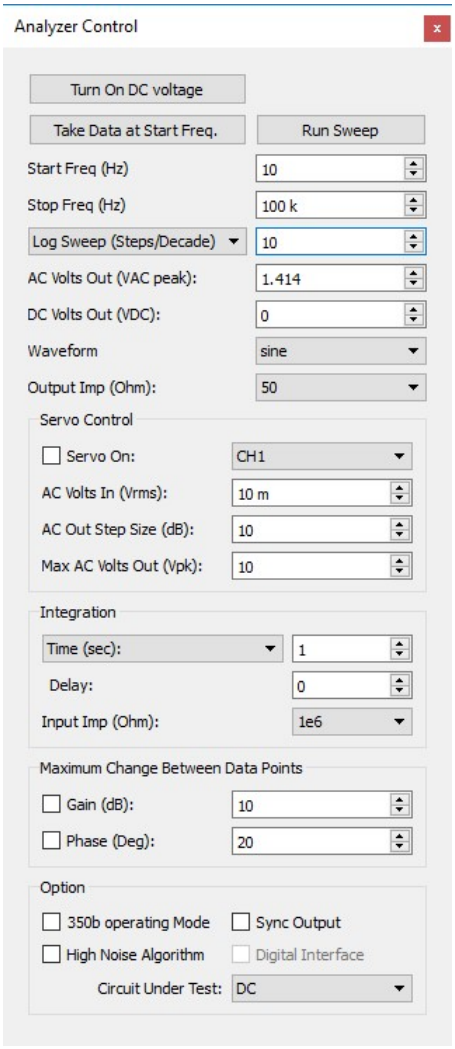


1. Take a resistor and capacitor you know the value of and solder them in series. Using the same BNC-Mini-grabber cables as before, connect both the oscillator output and the main input of channel 1 across both parts with the black (return) lead connected to the capacitor. Connect channel 2 across the capacitor with the black (return) lead connected the same place as the other two black leads. Calculate the corner frequency of the filter from the formula $f=1/2\pi RC$. Or just use a 1k resistor and a 0.1 μF capacitor and the corner frequency will be 1.6 kHz.

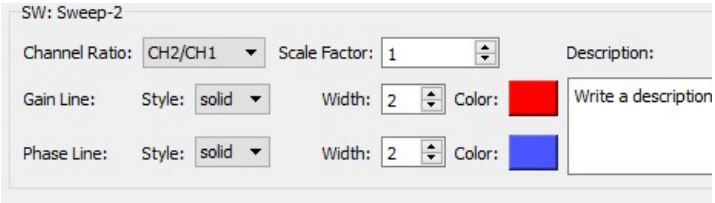
2. Set the sweep from approximately 2 decades below the corner frequency to approximately 2 decades above the corner frequency (10 Hz to 100 kHz if you use 1k and 0.1 μF).

   Select Log Sweep, 10 Steps per Decade, 1.414 volts peak AC, 0 volts DC, sine wave, 50 Ohm output impedance, 1-second integration, 0 delay time and 1 MOhm input impedance.

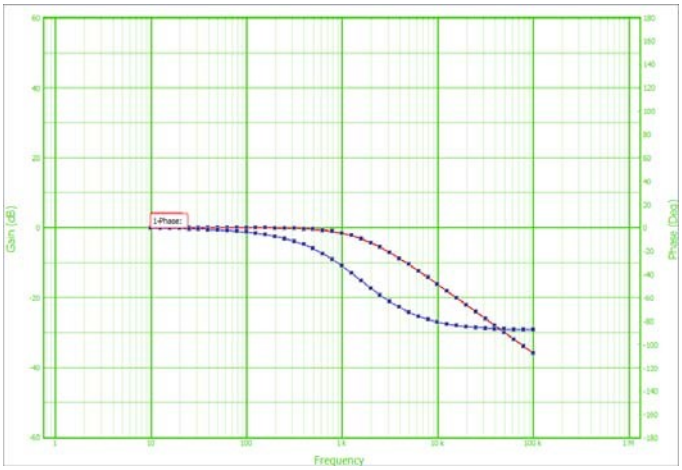
   Click on Run Sweep.



3. The Data Set Properties sub window gives you the choice of channel ratios to plot to the graph. You can also set the scale factor of the plot. The default settings CH2/CH1 and Scale Factor=1 are correct for this measurement.



4. The sweep will start. You can see the plot of the data being taken in real time. The resulting gain plot should be flat at 0 dB out to the corner frequency, then fall at a -20 dB per decade slope thereafter. The phase should be 0 degrees at low frequency, -45 degrees at the corner, and asymptotically approach -90 degrees at high frequency. If this works, you can be certain that the equipment is connected and functioning properly.



Measured transfer function of low pass R-C filter