



## Electronic Test and Measuring Equipment

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### Purpose:

The objective of this lab is to experience some of the problems associated with using electronic test and measuring equipment, and to gain experience using the oscilloscope and function generator.

### Equipment Required:

- DMM
- oscilloscope
- two 10 M $\Omega$  (ohm) resistors.
- function generator
- DC power supply

### Procedures:

1. Measure the actual value of the two 10 M ohm resistors using the DMM. Record the two values.
2. Set the DC supply to +10 Volts, and apply to the two 10 M ohm resistors connected in series. Calculate the voltage you would expect to measure across each resistor, respectively. After calculating the expected voltage measurements, measure each, determine the % difference from the expected values, and explain the difference.
3. Set the function generator to 10 kHz, 10 V<sub>p-p</sub>, sine wave, using the DMM to set the frequency and the amplitude. Remember to convert V<sub>p-p</sub> to V<sub>rms</sub>, since the DMM only measures in V<sub>rms</sub>. Also, be sure to turn the offset of the function generator to OFF.
4. Measure the amplitude and frequency of the 10 kHz sine wave using the oscilloscope. Compare these measurements to those obtained from the DMM. If the amplitude differs greatly from the expected value, check the output impedance setting on the function generator.
5. Calculate the voltage you would expect to measure across each resistor and across both resistors, with the 10 kHz, 10 V<sub>p-p</sub> signal applied, both for the DMM and for the oscilloscope.
6. Apply the above output of the function generator to the 10 M ohm resistors (remove the DC voltage). Using the DMM (on AC Voltage), measure the voltage across each resistor and across both resistors. Compare these to the expected values.
7. Disconnect the DMM; now using the oscilloscope, observe the voltage across both resistors, and the voltage across the resistor closer to ground. Do not try to measure the voltage across the other resistor. Compare the measured values to the expected values.

### Report and Conclusion:

This lab was intended to show that errors in measurements can be due to the measuring equipment being used. Discuss the sources of error in your measurements. Also discuss the difference in resolution between the DMM and the oscilloscope, and the advantage(s) and disadvantage(s) of both the DMM and the oscilloscope.