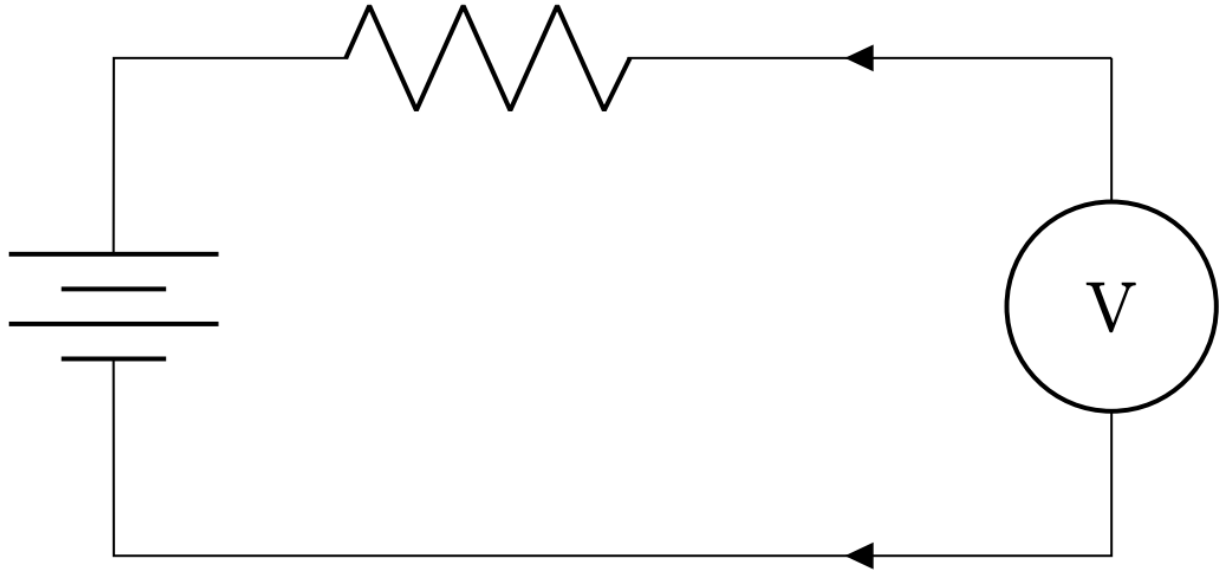
Internal Resistance of a Voltmeter

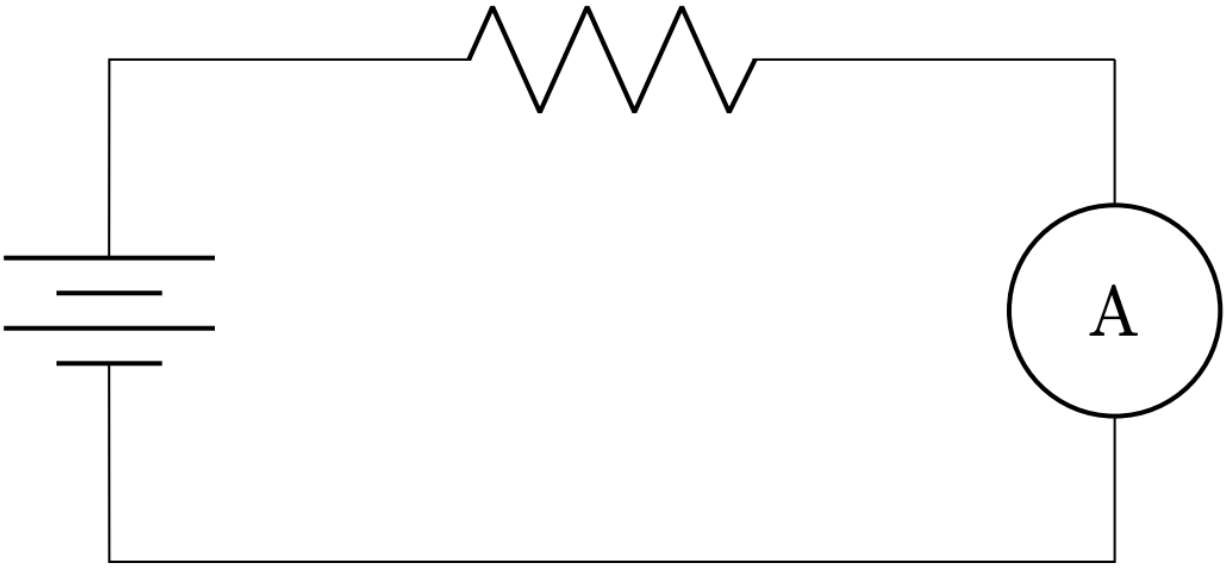


Vs = 9.999 V

Vm = 9.09 V

R = 1.004 MΩ

Rm = (Vm/(Vs - Vm))R = (9.09/(9.999 - 9.09) * 1.004*10^6 = 10.04 MΩ



Vs = 0.997 V

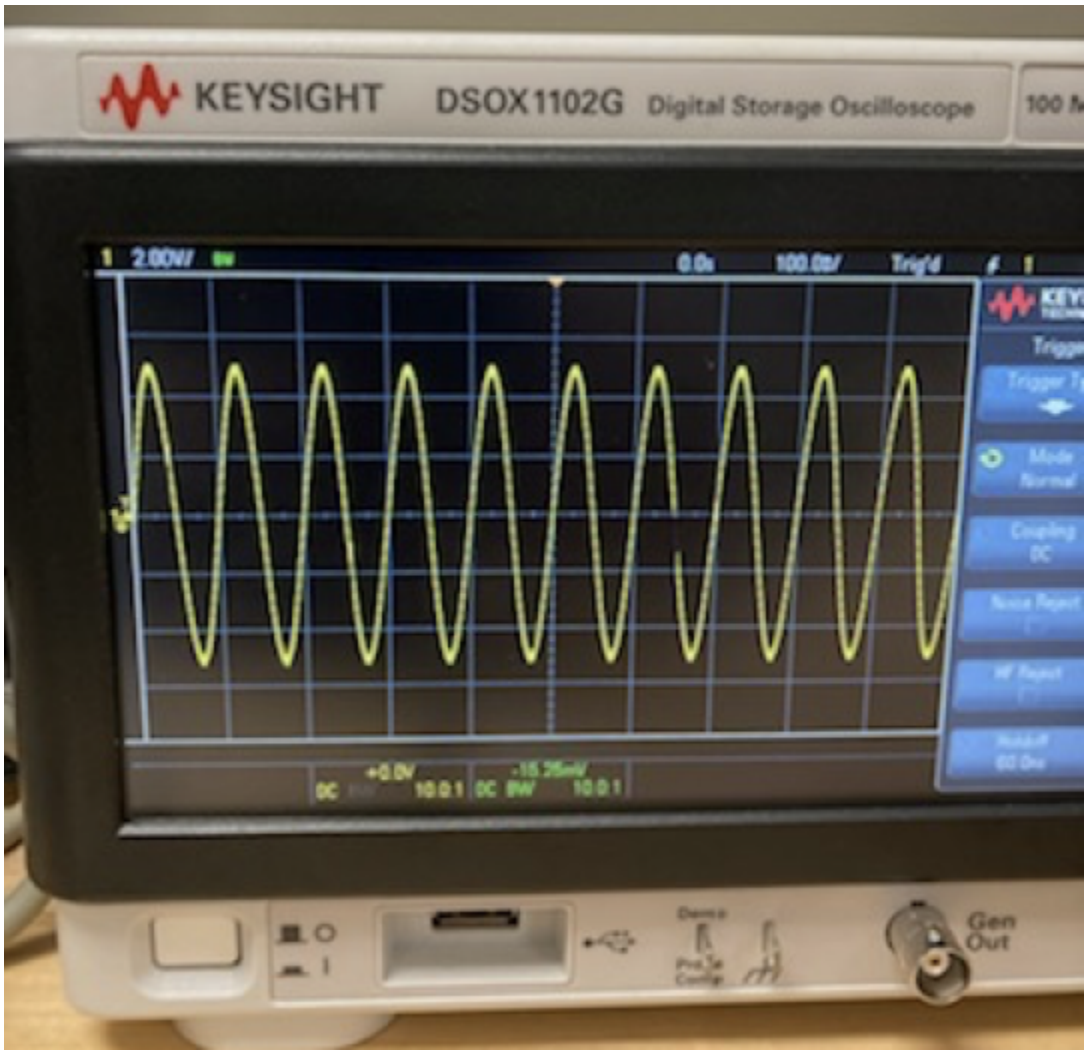
I = .0094 A

R = 97.88 Ohm

Rm = $(V_S/I) - R$= 0.9970/0.0094−97.88= 8.18Ω

Measurements of Time-Dependant Sources

Sinusoidal Wave Form



Square Wave Form

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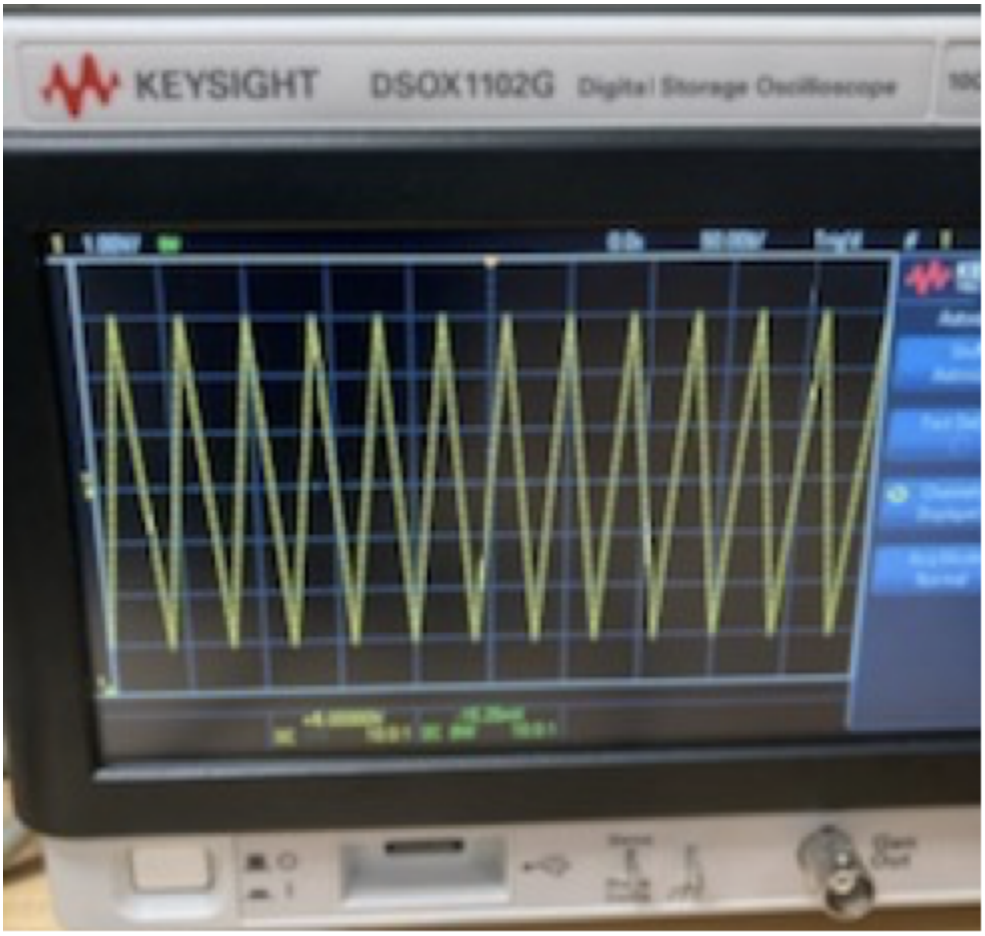
Triangle Wave Form



Question 1:

Precision is how frequently the given device or measure outputs the same value over and over. If the device does not vary (they are similar) then, it is precise. Accuracy measures how close the measurement that the device has is to the actual value. Lastly, resolution is the range of values the device can actually display (refers to the number of digits that can physically be displayed by the device). Multimeter resolution is 6 digits whereas DC supply resolution is 4 digits. Because the multimeter has more digits, it is more accurate. Because it is more accurate, we need to make sure that the power supply outputs as close to .75V as we can possibly make it to be.

Question 2:

Since the internal resistance should be 50Ω, the function generator will display 4V instead of 5V because the internal resistance is 25Ω. This is because the function generator will need to output less current to get to 5V because there is less resistance. Based on Ohm's Law, it would display 4V.

Question 3:

When looking at the datasheet, the internal resistance of the multimeter is 10MΩ which is a little lower than the measured value that I got. The percent error is about 0.4%. The internal resistance of the multimeter when actually measuring the 10-100mA is 2Ω according to what it says on the datasheet. However, my experiment gave me 8.18Ω which has a percent error of 309%. What we can see from this is that because the resistance values are so low, if there is a little bit of a change between the values, it yields a high percent error.

Extension: How do you make them better?

There are several ways we can make an oscilloscope better. The first way is to increase the bandwidth. The reason why is because oscilloscopes that have a big enough band width are able to capture the highest frequencies of a particular signal. The second way to make an oscilloscope better is to increase the speed of the oscilloscope rise time. This is important to do because faster rise times make oscilloscopes more accurate. Another way to increase the quality of your oscilloscope would be to increase the sampling rate. Having a faster sample rate means that you will be able to more accurately capture the graph. Lastly, you would also want to increase the number of channel to perform time correlated measurements for various waves.