January 21, 2024

# Frank Martino - Proof of Skills Day 2

## **Q2** Experimental Measurements and Personal Instrumentation

**Prove your skill set using ONE of the following: M1K board, Analog Discovery Board, or M2K board.**

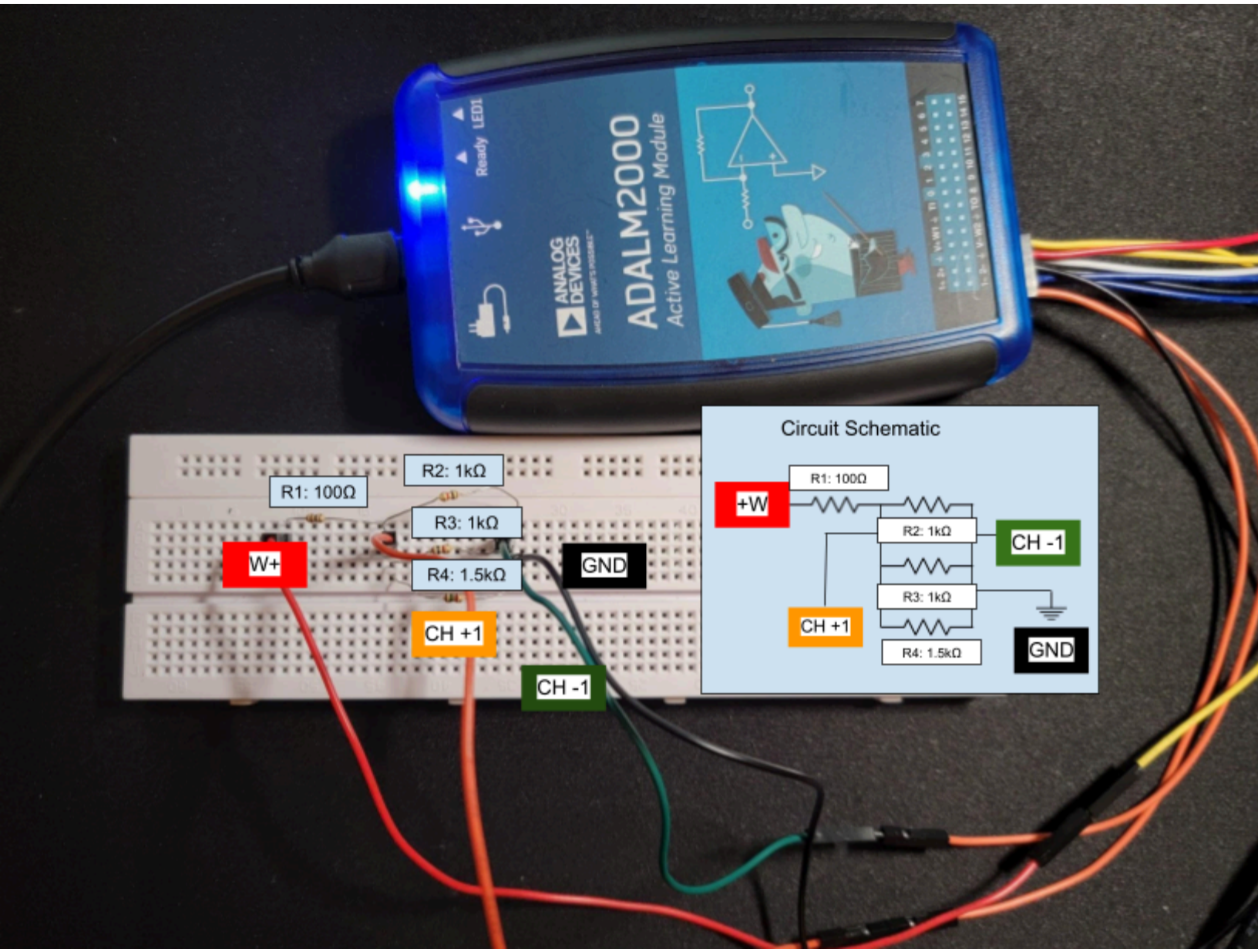
Each of the **Experimental Measurements and Personal Instrumentation** Objectives above should reflect the following goals:

- [x] ~~1. I can use consistent **color coding of wires when I build circuits on my breadboard** to aid in troubleshooting.~~
- [x] ~~2. I can "zoom in" to an oscilloscope output by **changing the time scale (x-axis)** to show important parameters (for example, a sinusoid with 25 cycles would be easier to see if only 3-5 cycles were shown instead!) when needed~~
- [x] ~~3. I can "zoom in" to an oscilloscope output by **changing the voltage scale (y-axis)** to show important parameters (for example, a sinusoid with 500mV amplitude would be difficult to see with 5V/div…) when needed~~
- [x] ~~4. I can **change the THICKNESS** of my trace lines for easy viewing.~~
- [x] ~~5. I **can change the background color of my oscilloscope output to white** and paste in an external document for easy viewing.~~
- [x] ~~6. I **can label the measurement output clearly** with the circuit schematic component names~~

## **Q2.3** Build a Resistive Circuit and Measure the Current

**I can build a resistive circuit and measure the dc current through ONE resistor using a dc source (OR find another way if needed depending on board!) (Must be two or more resistors, hint: to do something useful to you, try to simulate a homework or class problem!)**

To prove my skills in building a resistive circuit and measuring the current, I made a circuit (the same as day 2.2) with a 100Ω resistor (R1) in parallel with 3 resistors 1kΩ, 1kΩ, and 1.5kΩ respectively (shown in the diagram below). I then supplied a 3 volt, using channel +W from the ADALM2000 measured by channels +1 and -1. Using the oscilloscope and channels +1 and -1, I was able to measure the current across the R2 as 2.930mA.


Ready LED1
ANALOG DEVICES
ADALM2000
Active Learning Module
R1: 100Ω
R2: 1kΩ
R3: 1kΩ
R4: 1.5kΩ
W+
GND
CH +1
CH -1
Circuit Schematic
+W
R1: 100Ω
R2: 1kΩ
CH -1
R3: 1kΩ
CH +1
R4: 1.5kΩ
GND

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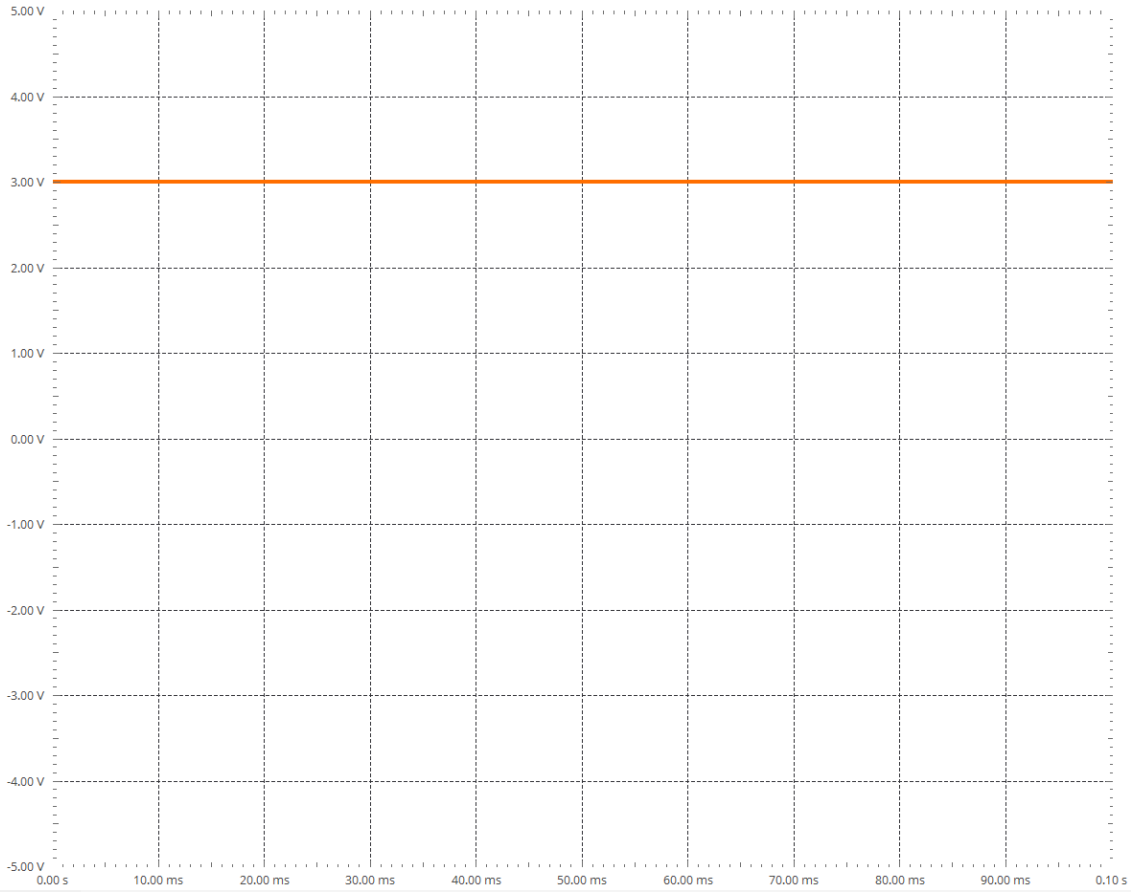
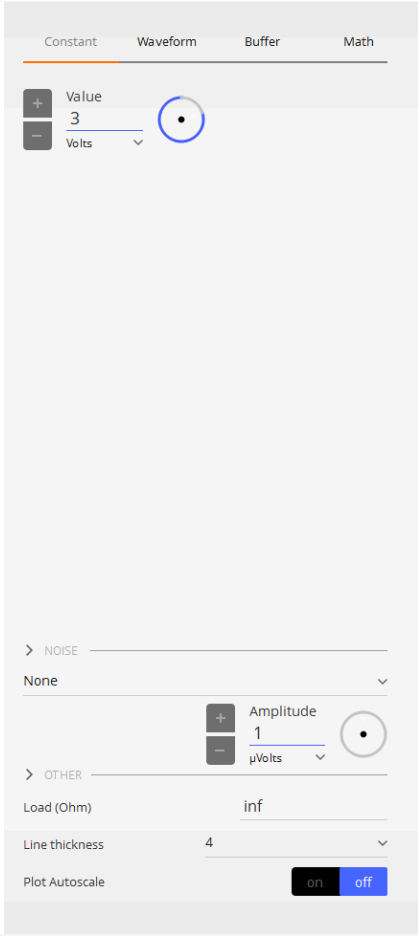
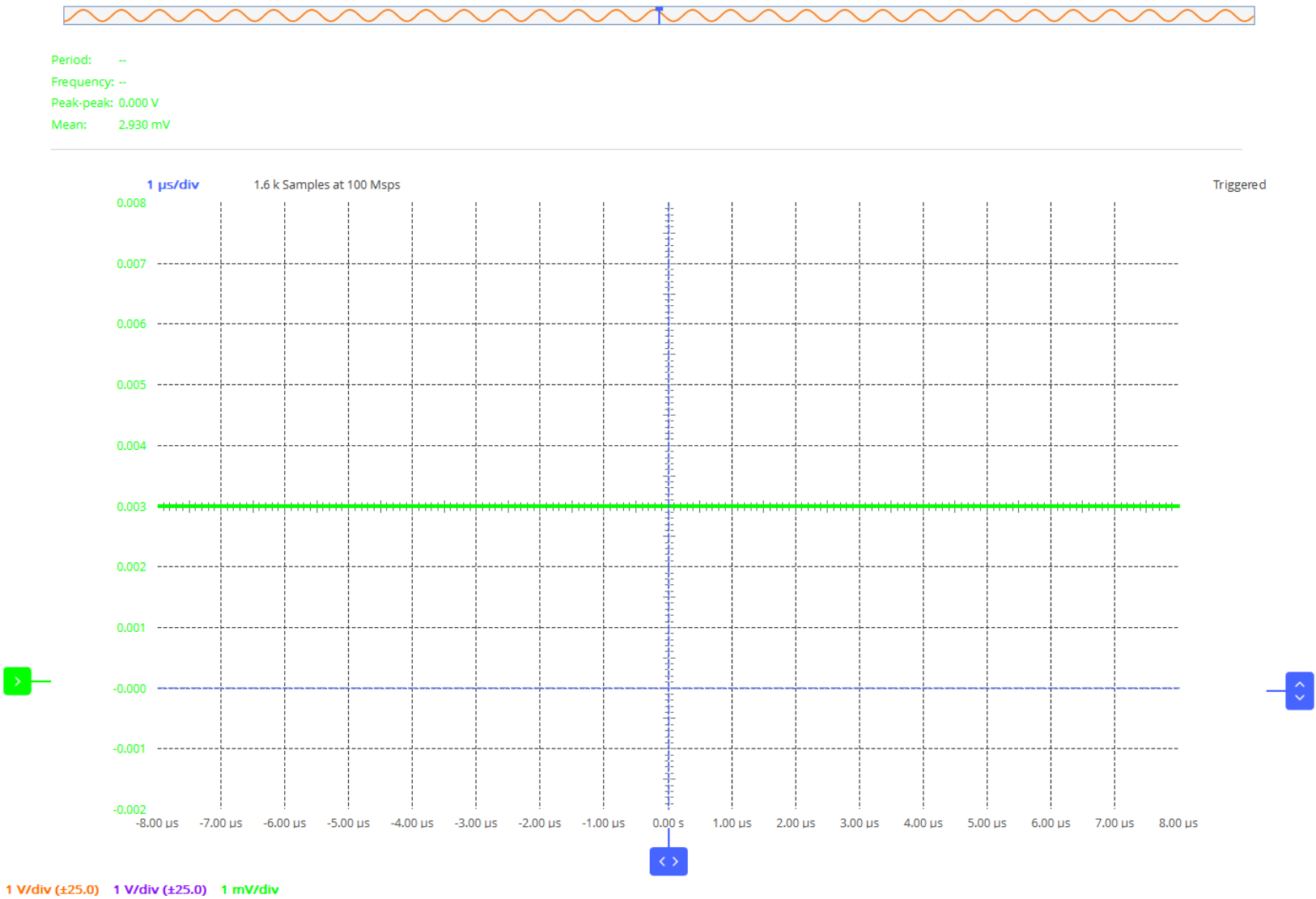
# Generated Signal by the ADALM2000:
# Constant DC 3 volts



Unfortunately, unlike the ADALM1000, the ADALM2000 does not have the ability to measure current, so the user must use the math function in the oscilloscope.Scopy also does not allow the user to change the units, so the graph below still reads voltages, but it is truly measuring current in amps. Using the math function we can not get a perfectly accurate current reading, so the only way to get a constantly updating current reading on resistor 2 is to measure the voltage across resistor 2 and divide the known resistance. This use of Ohm's law as rearranging V=IR to solve for current gets us I=V/R. R2 is labeled as 1000Ω, but we know no resistor is perfect and the manufactured label is not seen in the real world, as there are tolerances. To compensate for this, I measured the resistance with a multimeter and got 980Ω, which was ultimately used in the equation, t0/980 where t0 is the voltage measured.




The graph above is zoomed and stretched to the maximum ability of the oscilloscope.