ECE210 Laboratory
Lab Report #0

Spring 2021

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Net ID: _____ ,
Student Name:

_____

Lab section:

_____

1 Laboratory exercise

1.1 Objective

- Installing Scopy on your computer (laptop or desktop) and getting familiar with ADALM2000 or "M2K"
- Connecting input and output ports of M2K to a simple circuit built on a breadboard
- Using the Power Supply and Voltmeter modules of Scopy
- Using the Signal Generator module of Scopy to generate simple sinusoidal signal
- Using the Oscilloscope module of Scopy to examine sinusoidal and rectified signals

1.2 Getting ready for experiments at home

First install the Scopy software suite on your computer following the instructions given at
`https://wiki.analog.com/university/tools/m2k/scopy`.

- If you have any difficulties or questions about the installation process, including drivers that may need to be installed in your computer, come to open lab and ask for help.
- Once the installation is complete, double click the Scopy app icon to see whether the M2K unit connected to a USB port of your computer is detected by Scopy. If everything works well you should see Figure 1 on your computer screen:

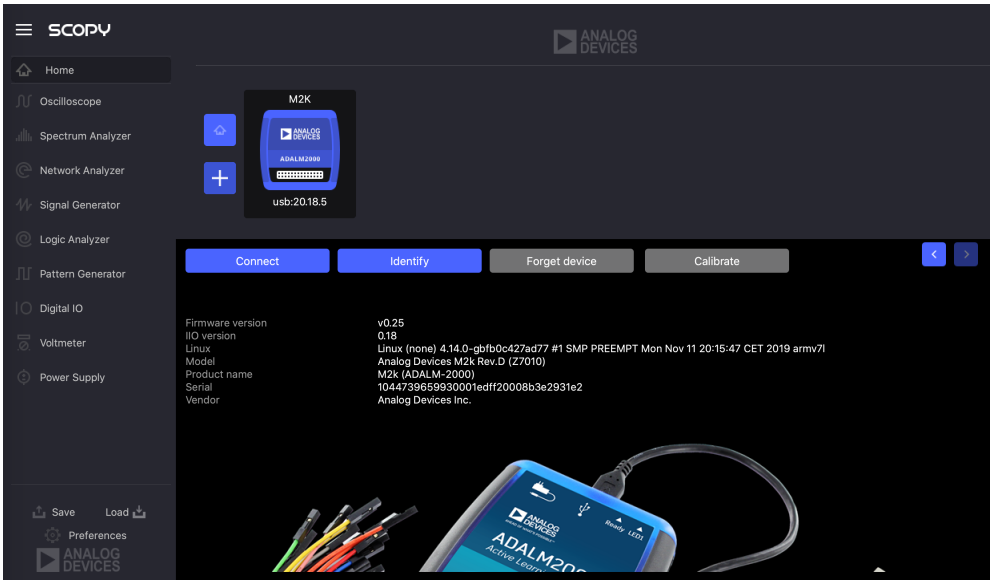


Figure 1: Scopy interface

- While M2K unit is USB connected to your computer it will connect to external circuits you will build on your breadboard with 10 wires extending from 10 nodes labeled by 1+/-, 2+/-, ground symbols, V+/-, and W1/2 on the left side of the unit as Figure 2 :
  - 1+/- and 2+/- function as input nodes (hi/lo) for Channels 1 and 2 of the Scopy Oscilloscope and Voltmeter units
  - V+/- are positive and negative voltage output nodes for the Power Supply module of Scopy with respect to ground
  - W1/W2 are output nodes of Channels 1 and 2 of the Signal Generator module of Scopy with respect to ground

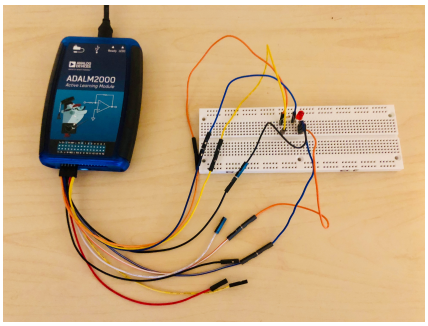


Figure 2: M2K with circuit

1.3 A diode circuit and Ohm's law

We will familiarize ourselves with M2K and Scopy software starting with a simple circuit consisting of a diode and a resistor described in the M2K Ohm's law tutorial given at

`https://wiki.analog.com/university/courses/electronics/ohm_law`

We will implement the circuit shown in that link on our own breadboard but using a 1kΩ resistor instead of the 470Ω. The circuit will be sourced by using the MK2 Power Supply unit with V+/- nodes and controlled by the Power Supply module of Scopy --- see

`https://wiki.analog.com/university/tools/m2k/scopy/power-supply`

The circuit will be probed by using the M2K Voltmeter unit described in

`https://wiki.analog.com/university/tools/m2k/scopy/voltmeter`

Using the Scopy Voltmeter module

Measure the voltage across the LED diode : $V_{\text{LED}} =$ (____/3)

Determine the current going through the LED diode using Ohm's law : $I_{\text{LED}} =$ (____/3)

Determine the resistance of the LED diode : $R_{\text{LED}} =$ (____/3)

1.4 AC signal and rectification

Replace the Power Supply input of the circuit with a Signal Generator input producing a sinusoidal input voltage and replace the Voltmeter module by the Oscilloscope module of Scopy for probing purposes.
For Signal Generator description see

`https://wiki.analog.com/university/tools/m2k/scopy/siggen`

For Oscilloscope description see

`https://wiki.analog.com/university/tools/m2k/scopy/oscilloscope#working_with_math_channels`.

Circuit of Part 3 can be modified for Part 4 as follows:

- Click "Stop" in the Power Supply and Voltmeter
- Disconnect the V+ in the circuit and connect W1
- The circuit should look like Figure 3:

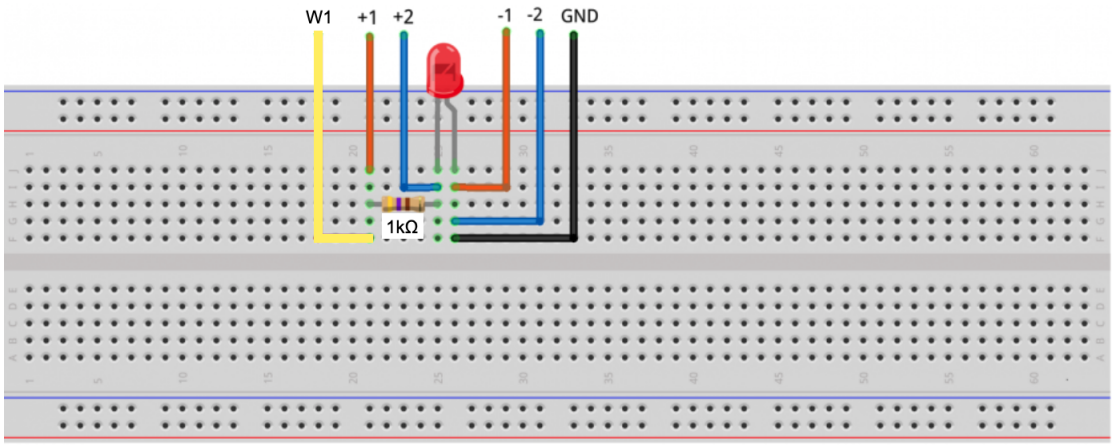
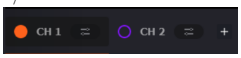


Figure 3: circuit on breadboard

- On Signal Generator module in Scopy select "Waveform" and then choose "Sine" under the tap. Input the "Amplitude" for 5 volts and "Frequency" for 50 Hz. Then click "Run"

- On Oscilloscope module in Scopy click "Run".
  - The Oscilloscope module supports up to two channels. To enable/disable the channel, click the circle 

in the bottom of the UI , and the setting for each channel can be adjusted by clicking  next to the circle for each channel. You might have to adjust the "Time Base"

- Go to Signal Generator and slowly increase the Frequency from 1 Hz to 10 Hz while keeping the Signal Generator running.

Sketch both channels (display at least one cycle and full amplitude) (____/3)

V/div : _____ t/div : _____

What do you see from the LED diode ? (____/4)

Explain why this is happening (____/4)

Explain your reasoning: