Appendix E

Digilent Analog Discovery 2 System

The Digilent Analog Discovery 2 is a LabVIEW based tool that allows students to emulate traditional laboratory bench equipment on their desktop or laptop computers. In this course, we will use the AD2 as a voltmeter, a function generator, and as an oscilloscope. At times, we will also use the AD2 power supplies as a voltage source.

Figure E.1: Digilent Analog Discovery 2.

Getting Your AD2 Running

Before you hook your AD2 up to your computer, you will need to download the relevant software. Go to https://analogdiscovery.com and click on the "Quick Start" tab at the top of the page. There are step by step instructions on how to set up your AD2 and download the WaveForms software. Follow the instructions carefully. Once you have downloaded the software you can connect your AD2 to your computer through a USB port using the USB B-micro to USB cable provided with your AD2. Continue to follow the steps outlined in the Quick Start Guide. Click on the WaveForms 2015 icon to launch the program. You should see a window something like the one shown in Figure E.2. You can see all of the functionality of the AD2 along the left side. In this course we will be using the first four items: Scope, Wavegen, Supplies, and Voltmeter.
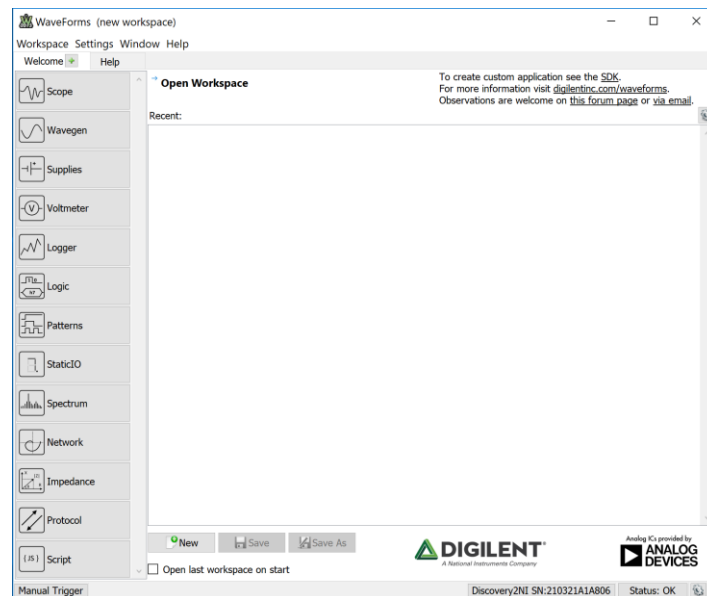
Figure E.2: AD 2 Main Window

Using the AD2 as a Voltmeter

To measure voltages using your AD2, click on the "Voltmeter" button along the left side of the main window. You should see a window similar to the one shown on the left in Figure E.3. Your voltmeter is now ready to measure voltages. Connect the "1+" and "1-" terminals of your AD2 across whatever points you want to measure the voltage on and then click on the run button. Your window should now look like the right one in Figure E.3. Voltage measurements should show up under Channel 1. Make sure to click on the stop button when you are done making your measurement. If you use the "2+" and "2-" terminals, your voltage reading will show up on Channel 2. You can use your AD2 voltmeter to measure two different voltages at the same time by using Channels 1 and 2 simultaneously.
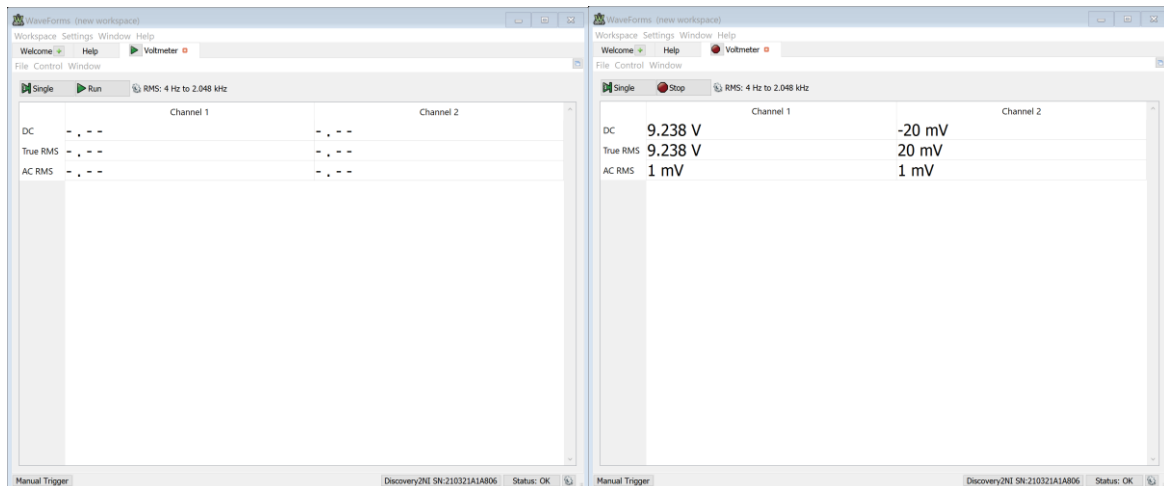
Figure E.3: Voltmeter Window

Function Generator

To create a signal using the AD2 function generator, click on the Wavegen button on the left side of the main window. You should see a window similar to the one shown in Figure E.4. As shown, the function generator is currently generating a sine wave of amplitude 1V, frequency of 1kHz, and phase of 0 degrees. Any of the parameters (and more) can be adjusted. Try playing with the various parameters to see how the signal changes. Also, note there is a drop down menu under the "type" tab that will allow you to select from a host of other waveforms (e.g., DC, square wave, triangle wave, etc.). Finally, you can select which terminal this waveform will be output to using the drop down menu on the "Channels" tab. It will allow you to select from Channel 1 or Channel 2. If you select Channel 1, the signal will be output on the "W1" output of your AD2. That means that the voltage on your W1 terminal will follow the form you specified with Wavegen relative to the ground terminal. Remember, voltage is a relative thing. We are specifying the voltage on the output W1 relative to something. In this case, it is relative to the ground output. So when you hook the voltage W1 to your circuit, you must also connect the ground output of your AD2 to the ground of your circuit. The waveform generator will allow you to select both Channels 1 and 2 in which case you can output two different waveforms to the two different outputs.
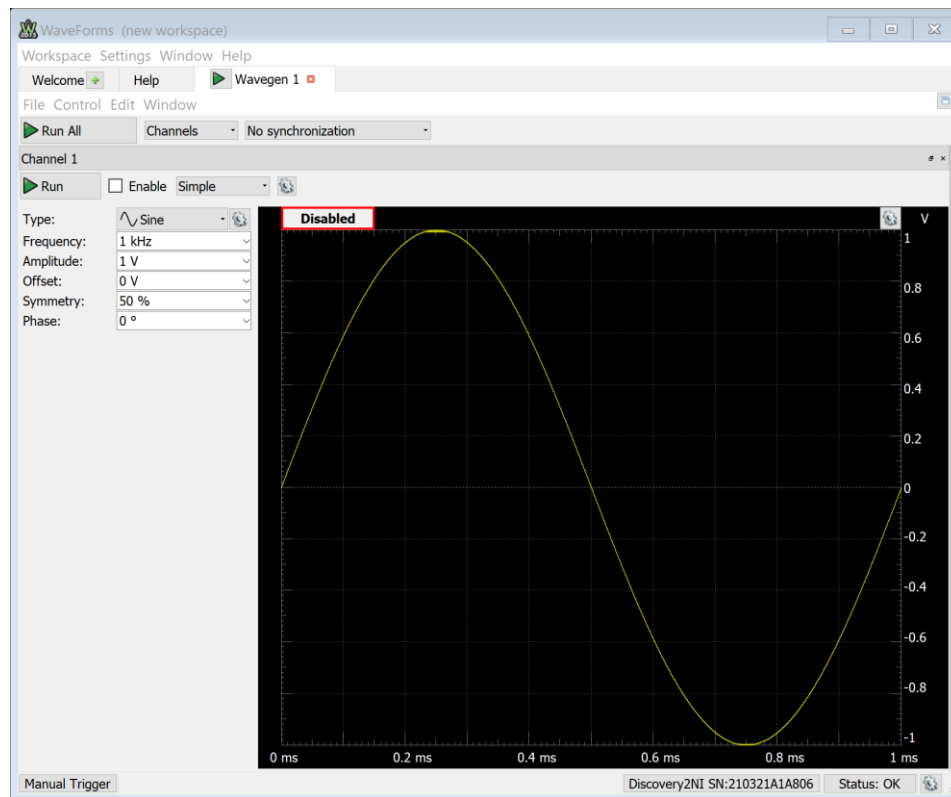
Figure E.4: AD2 Wavegen Window

Oscilloscope

Use the "scope" button from the main window to launch the AD2's oscilloscope. An oscilloscope measures time varying voltages and displays them on a screen. A typical scope output looks like the one shown in Figure E.5. There are several parameters you will need to select including:

- Source: Where do you want to measure the voltage from? In the case shown in Figure E.5, Channel 1 is selected as the source and so the scope is measuring the voltage between the terminals 1+ and 1-.

- Time: These parameters select the scale of the horizontal (time) axis. In the example in Figure E.5, the time based is set to 500µsec per division.

- Channel 1: Right below the settings for the time axis are the settings for the vertical (voltage) axis. In the case of Figure E.5, the voltage scale is set to ½ volt per division. If Channel 2 were selected, there would be a different axis scale setting for the Channel 2 voltage. They don't need to be on the same scale.

- Condition: This sets the triggering mechanism for the scope which determines how the waveform is centered on the scope display. In the case of Figure E.5, the triggering is set so that the center of the waveform occurs when the rising edge crosses the 0V level.

Feel free to play around with the various setting to get a better feel for what they do.
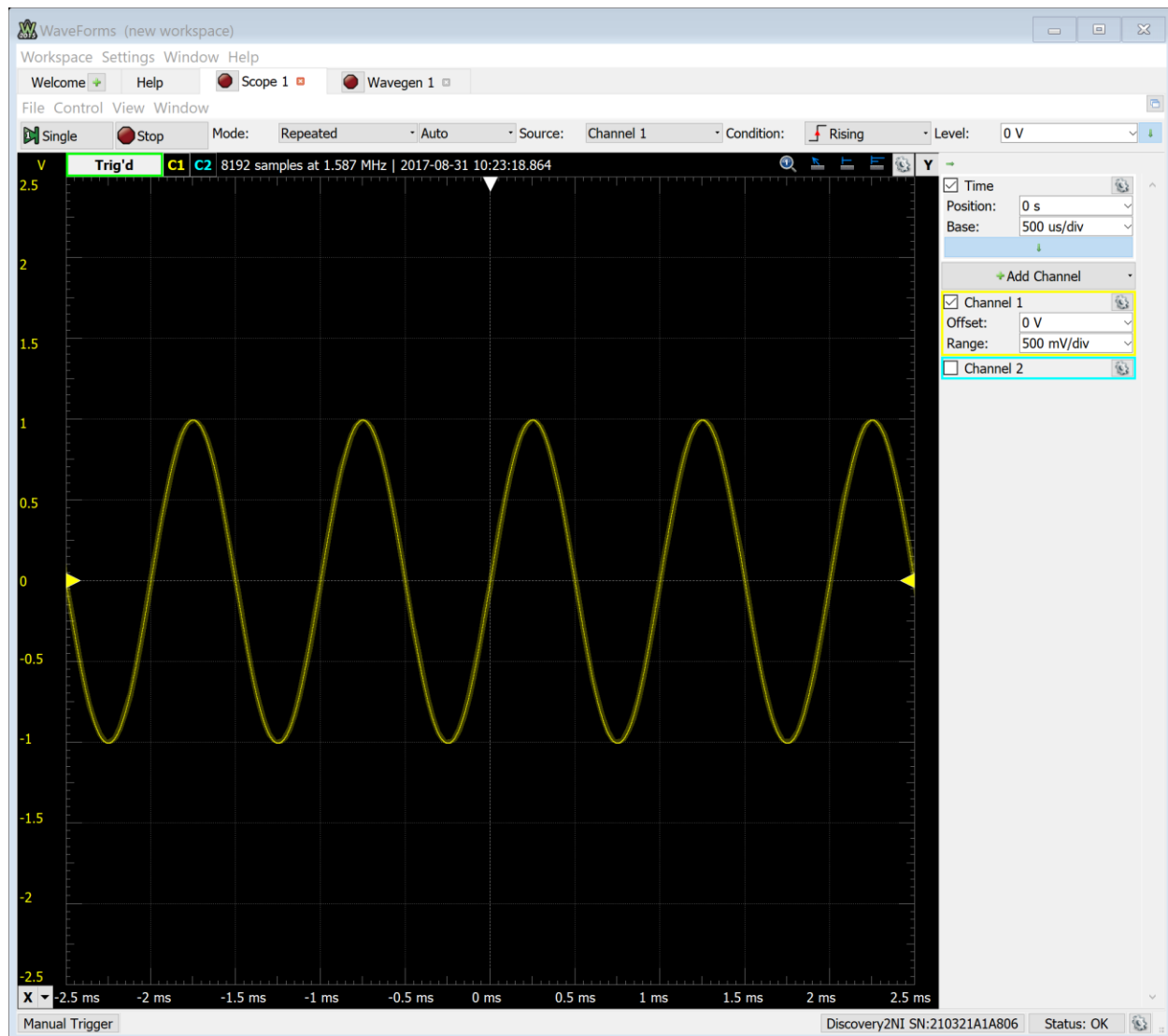

Figure E.5: AD2 Oscilloscope Window