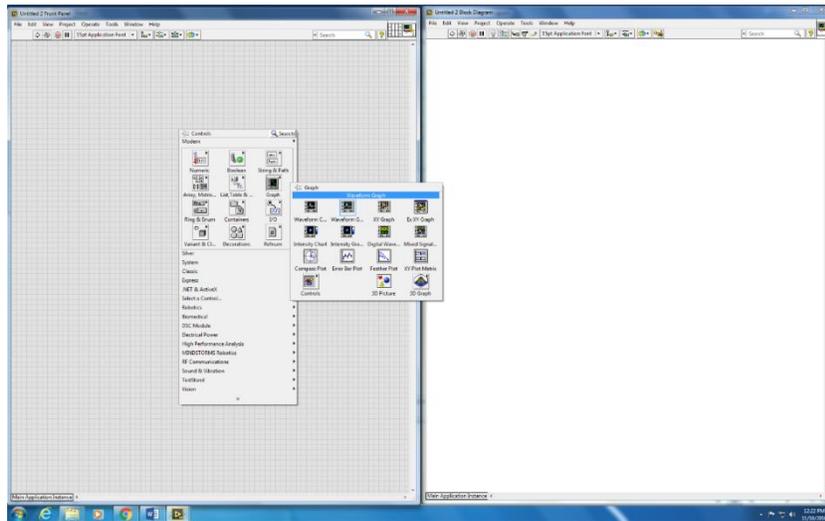


Objective:

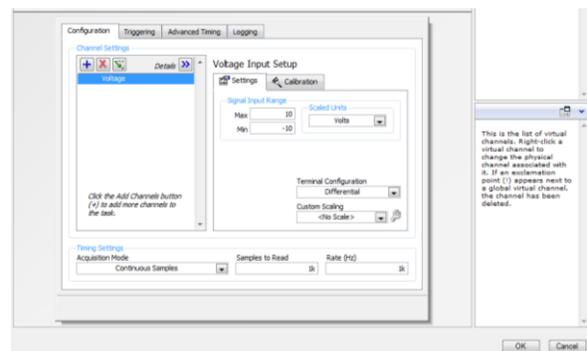
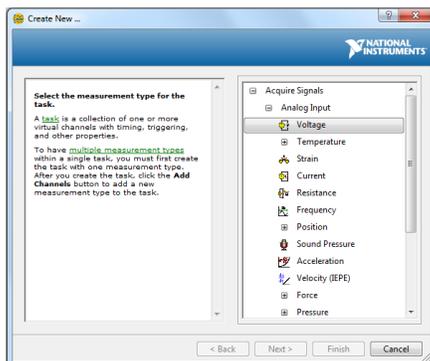
In this exercise we will be creating a virtual instrument (VI) in LabVIEW that will input an external voltage signal and display a waveform graph of the signal, and also record and save the voltages as data files for further analysis.

Instructions:

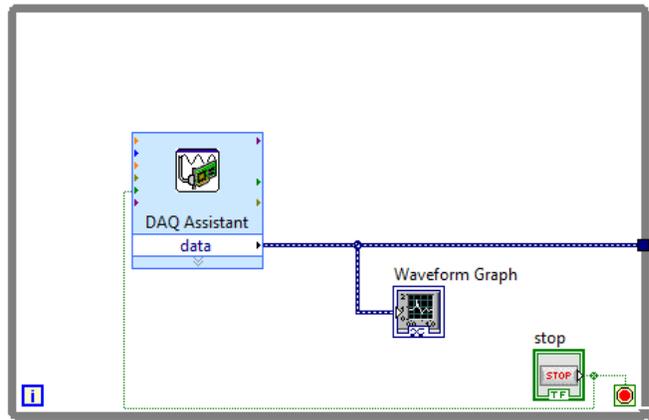
1. Open LabVIEW: Go to the Start menu. Open "NI LabVIEW 2014 (32bit)". Click Create Project. Select Blank VI and click Finish.
2. You should now have two windows open, the "Front Panel" which acts as the user interface, and the "Block Diagram" in which you will build and wire your VI. Right click on the Front Panel to display the Controls Palette. Hover your mouse over Graph, then select Waveform Graph. Notice as you place your graph on the Front Panel a corresponding icon is displayed on the Block Diagram.



3. It will be helpful to change a couple settings of the Waveform graph that will be displayed. Right click on the Waveform Graph icon, then open "properties" and "scales". For the "Time (x-axis)" scale, uncheck "auto-scale" and make the x-axis range 0 (min) to 3 (max); this will display 3 seconds of data. Pull down to "Amplitude (y-axis)" and also turn off auto-scale, setting the amplitude scale from -5 to 5 (Volts). Click OK when finished.
4. Right click in the Block Diagram Window to open the Functions Palette. Hover over Structures and select While Loop. Click and drag your while loop around the Waveform graph icon. Next insert your data acquisition assistant into your while loop by opening the Functions Palette, clicking on Measurement I/O, hovering over NI-DAQmx, and selecting DAQ Assist. A window will pop up when you place the DAQ assistant. Open Acquire Signals then Analog Input, and select Voltage. Select ai0 and click Finish. In the Configuration box, change "Timing Settings" (near the bottom), Acquisition Mode to "Continuous Samples" and the "Samples to Read" to 3k. Rate should be 1k Hz. Click OK. You can also right click and edit properties after the VI is done, and move and arrange your Block Diagram icons.

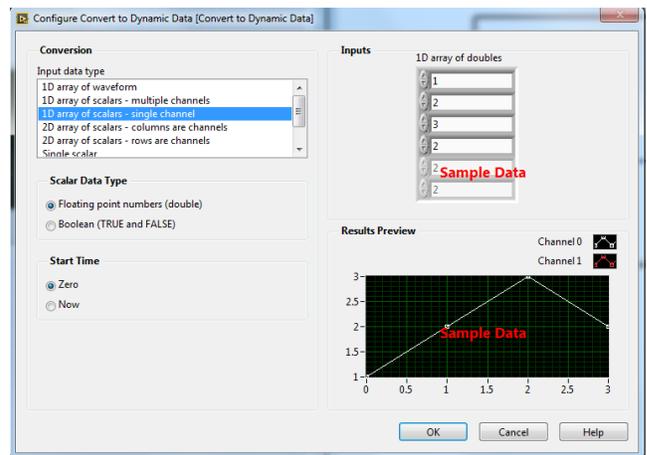


- In order to stop your while loop you will need to create a control. Right click on the red circle on the bottom right-hand corner of the while loop box. Choose Create Control. Notice a Stop button appears on the Front Panel.
- Now let's start wiring the VI. When you hover over the small arrows on the DAQ Assist icon notice how the cursor changes to a wire spool. Click the second to the bottom left-side arrow on the DAQ Assist icon (Stop (F)). Then click on the stop icon. There should now be a wire connecting the DAQ Assist and the Stop icon. This tells the VI to send data along this "wire". Next wire the data arrow on the DAQ Assist icon to the Waveform Graph icon, and also to the while loop box (see image to the right for wiring up to this point).



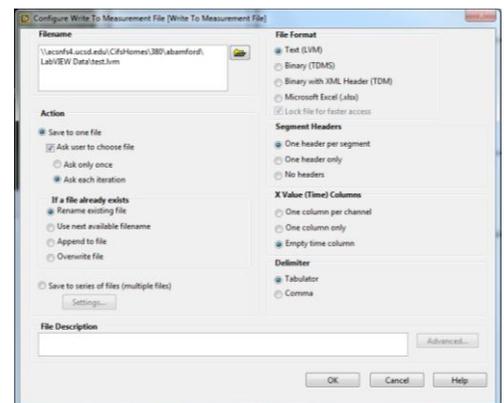
- Right click on the small blue box at the junction of the while loop box and the DAQ wire. Select Signal Manipulation Palette and choose To DDT. The DDT tool converts dynamic data to digital values that can be stored. Place the To DDT icon outside the loop. A dialog box will open; change the Start Time to Zero and click OK.

Note: You can move the controls and icons within both the Block Diagram and the Front Panel to clean up your design!



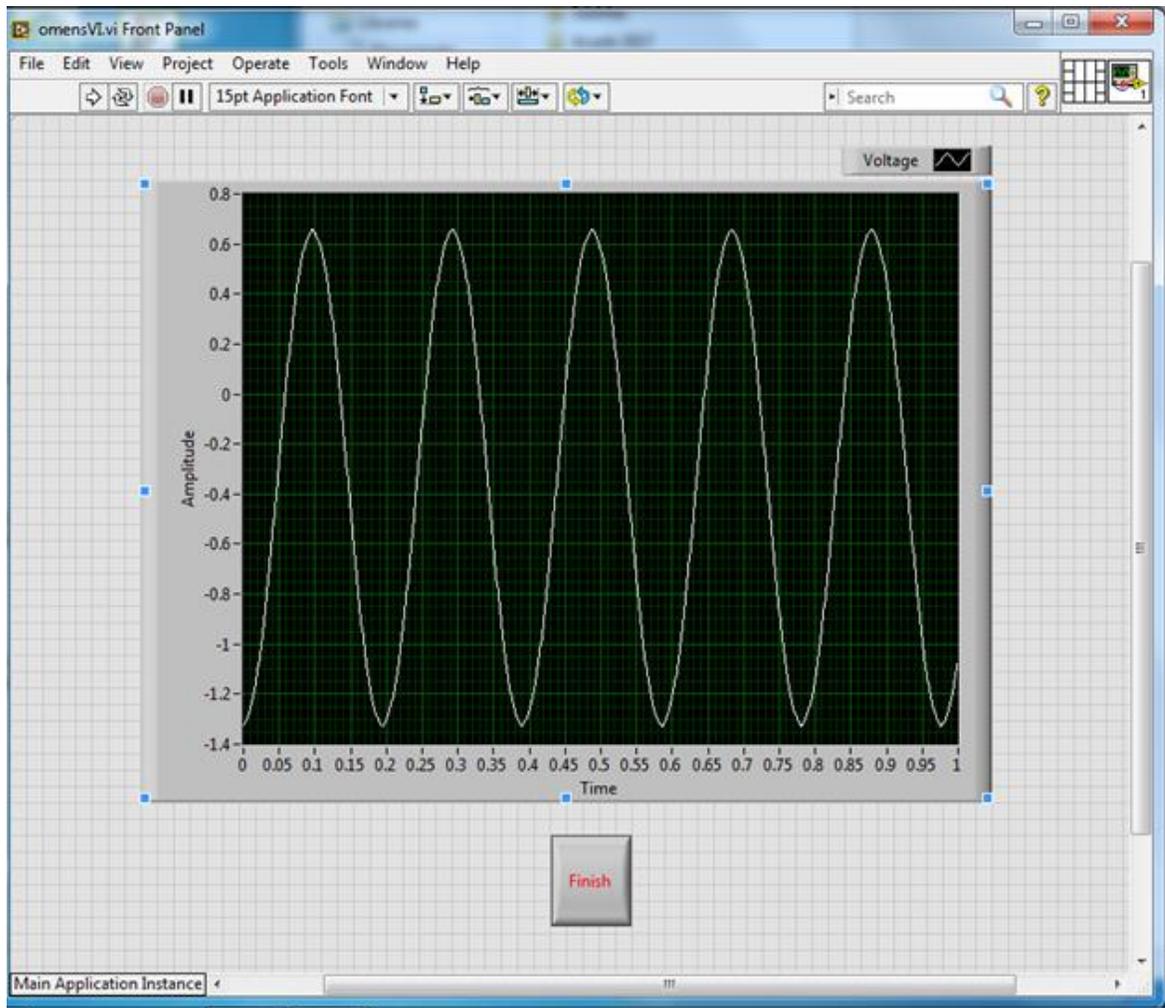
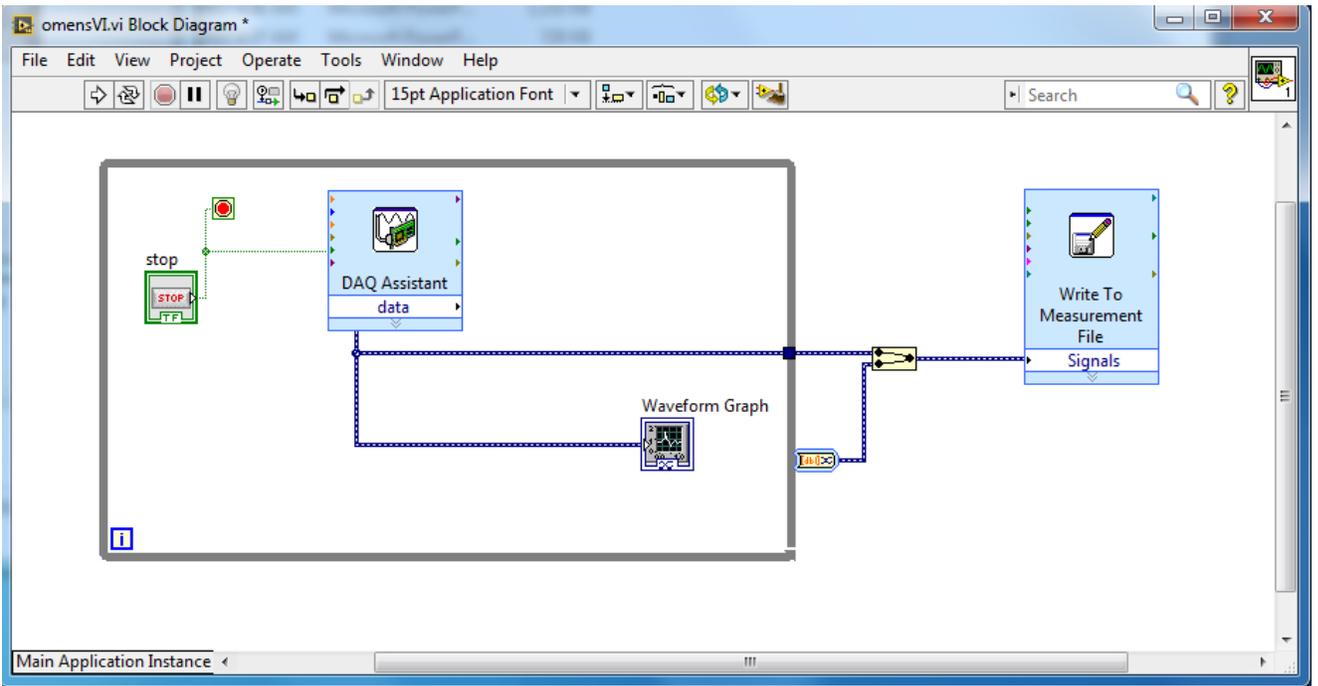
- Go back to the Signal Manipulation Palette, and place a Merge Signals icon outside the loop box. Wire the To DDC output and the while loop blue box to its inputs.

- In order to save the voltages as a file, open the Functions Palette, select Express, hover over Output, and click on Write to Measurement File. Place this function outside the while loop. In the dialog box check "Ask user to choose file" and select "Ask each iteration". Click OK. Wire the combined signals output from the Merge Signals icon to the arrow next to signals on the Write to Measurement File icon. Change the properties of the Write to Measurements so that "X Value (Time) columns" is "One column per channel". This will write both X and Y data to the file.



- You should now have a working VI. To run your VI click the white arrow on the top left corner of the Front Panel. Your input voltage will be displayed on the waveform graph. To stop data acquisition click your stop button in the VI. A dialog box will appear prompting you to save your data. Name and save your data (data is stored in text format in a *.lvm file; 3 seconds worth of data). A sample final Block diagram is shown below.

- Save your VI as a LabView file in your own account directory (it will be saved as a *.vi file). You should be able to click on the VI file at a later time, which runs LabView and your VI. Make sure you are using LabVIEW 2014.



Sine wave input using acquisition VI shown at top