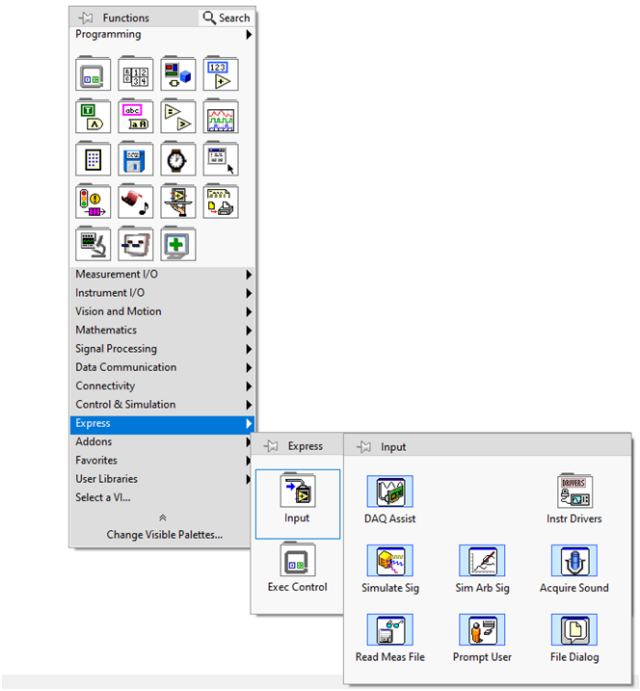
Lab 3.2 - Data Acquisition using LabVIEW

This experiment manual provides step-by-step instructions for using LabVIEW, DAQExpress, and Filter Express to acquire a signal from a data acquisition device and filter the acquired signal. The experiment aims to demonstrate the process of signal acquisition and filtering in LabVIEW using these software tools.

1. Open LabVIEW and select File > Create New .vi

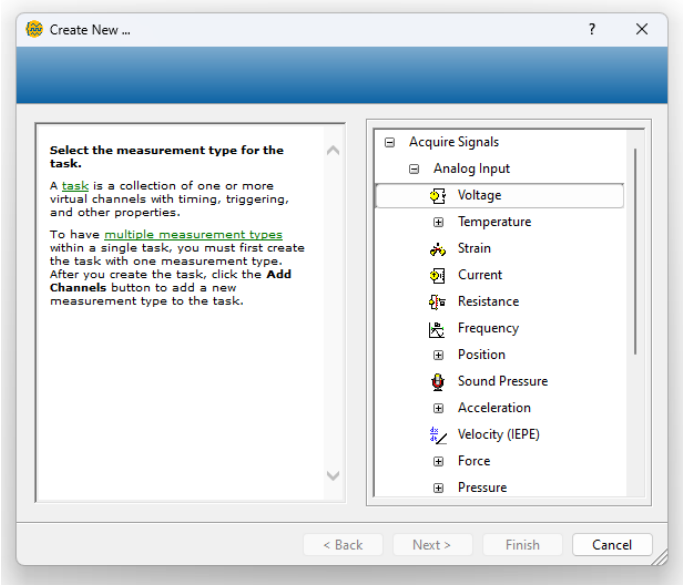
2. Set up the DAQ to read Data (an analog voltage) into LabBVIEW

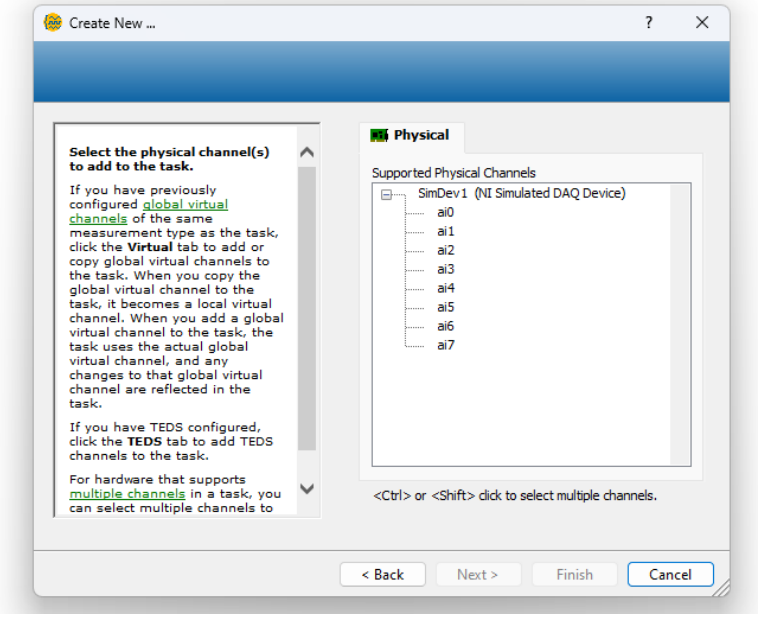
From the Functions pallette Express Input select Express > Input > DAQ Assist



3. Set up the DAQ.

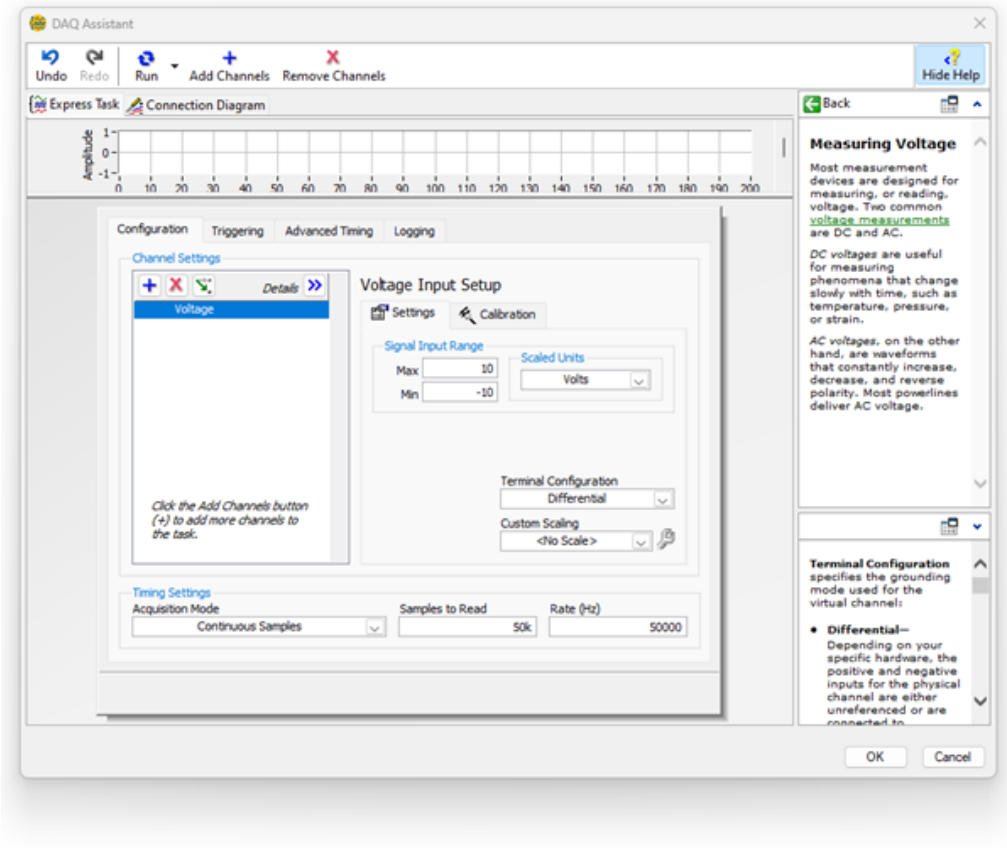
Double-click on the DAQ Assistant on the Block Diagram and choose Acquire > Voltage and then the appropriate analog input (ai) as you have wired in your circuit.





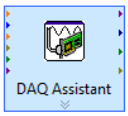
4. Configure the acquisition parameters.

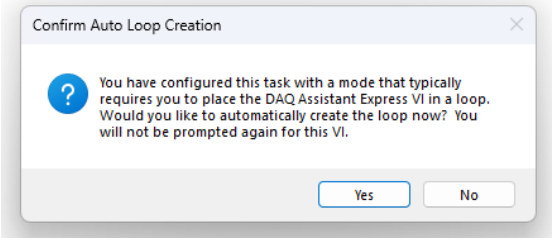
Set the terminal configuration to RSE (make sure that all grounds are connected together). Set the Acquisition Mode to Continuous Samples (so that data is taken continuously). Set the samples to read to 50k and the rate to 50k

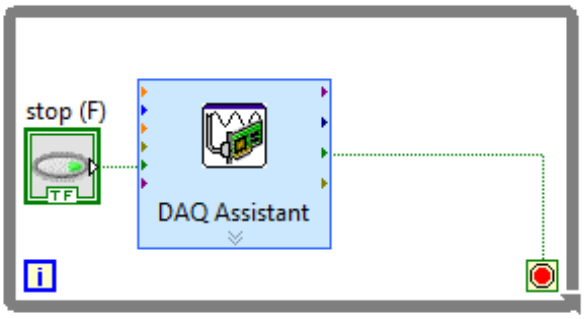


5. Set up a While Loop

The DAQ Assistant will now generated code. If you are prompted to automatically created a While Loop for the DAQ Assistant code to execute continuously, select yes. Otherwise place the loop manually on the Block Diagram.

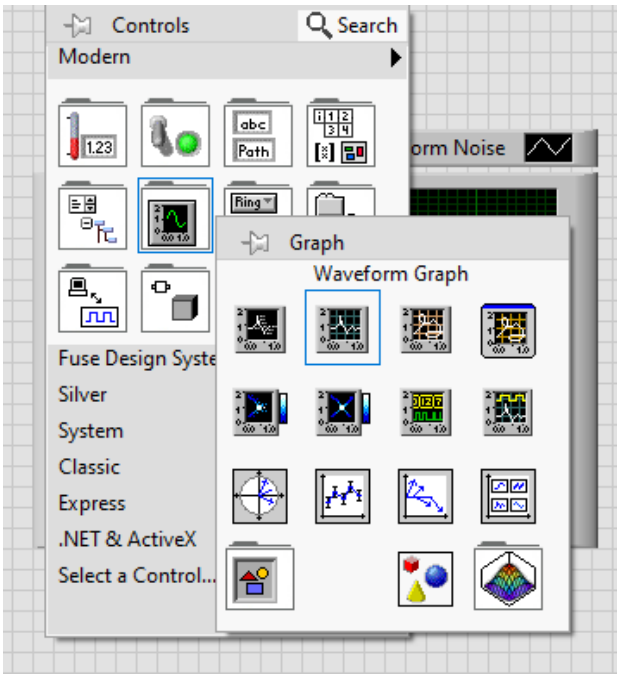


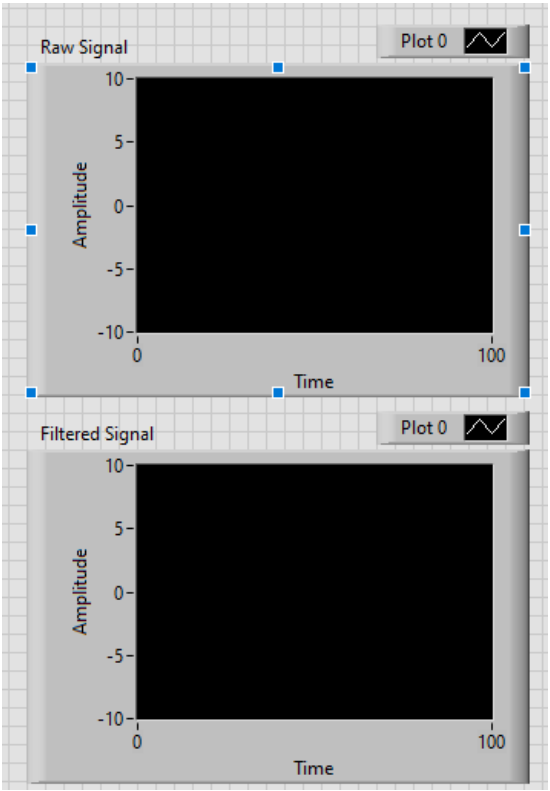




6. Create the Front Panel

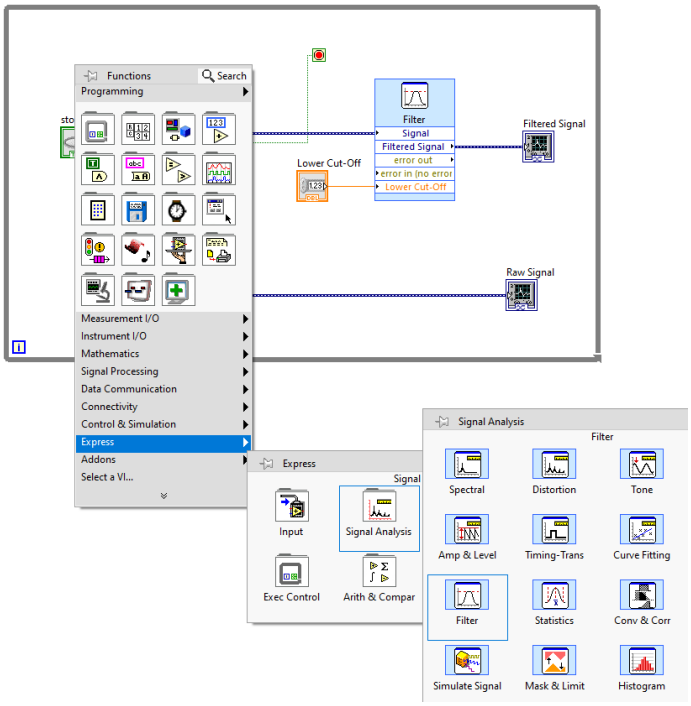
On the Front Panel, place two Waveform Graphs. Label one for the Raw (Unfiltered) Signal, and the other as the Filtered Signal.

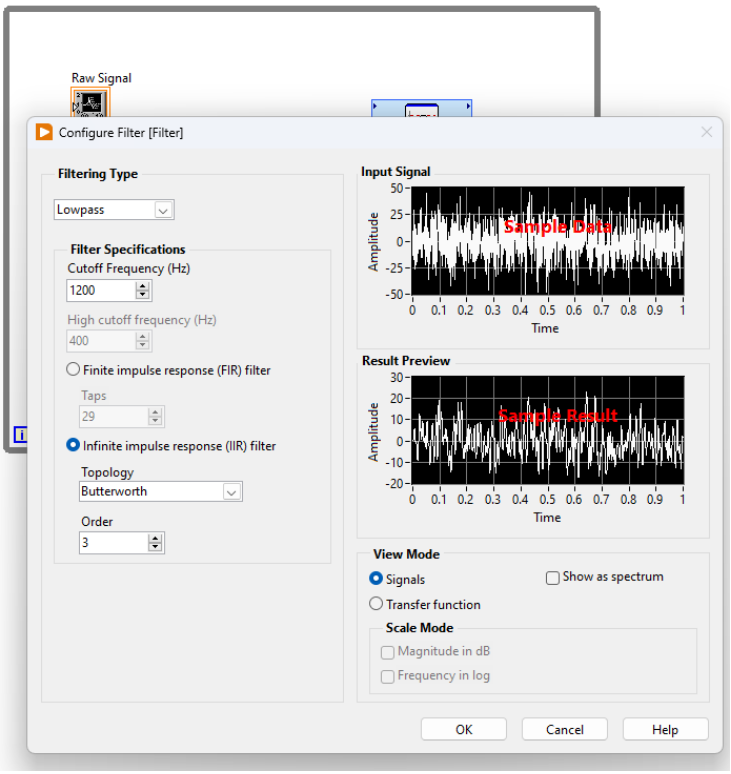




7. Configure the software filter

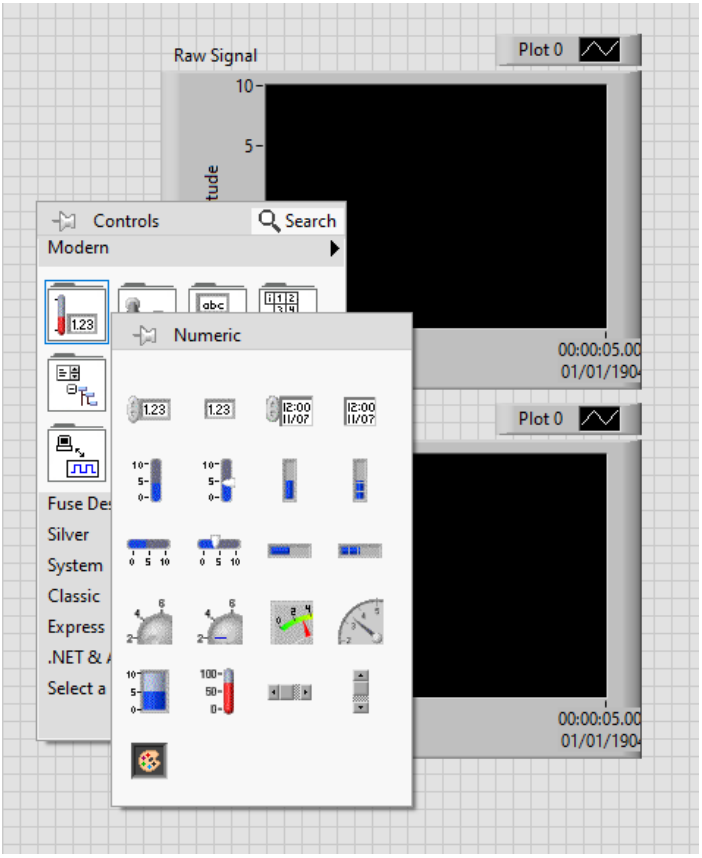
On the block diagram, right click and place a signal filter from Express > Signal Analysis > Filter. Configure a lowpass Buttersworth second-order filter with a cut-off frequency of 1200 Hz.

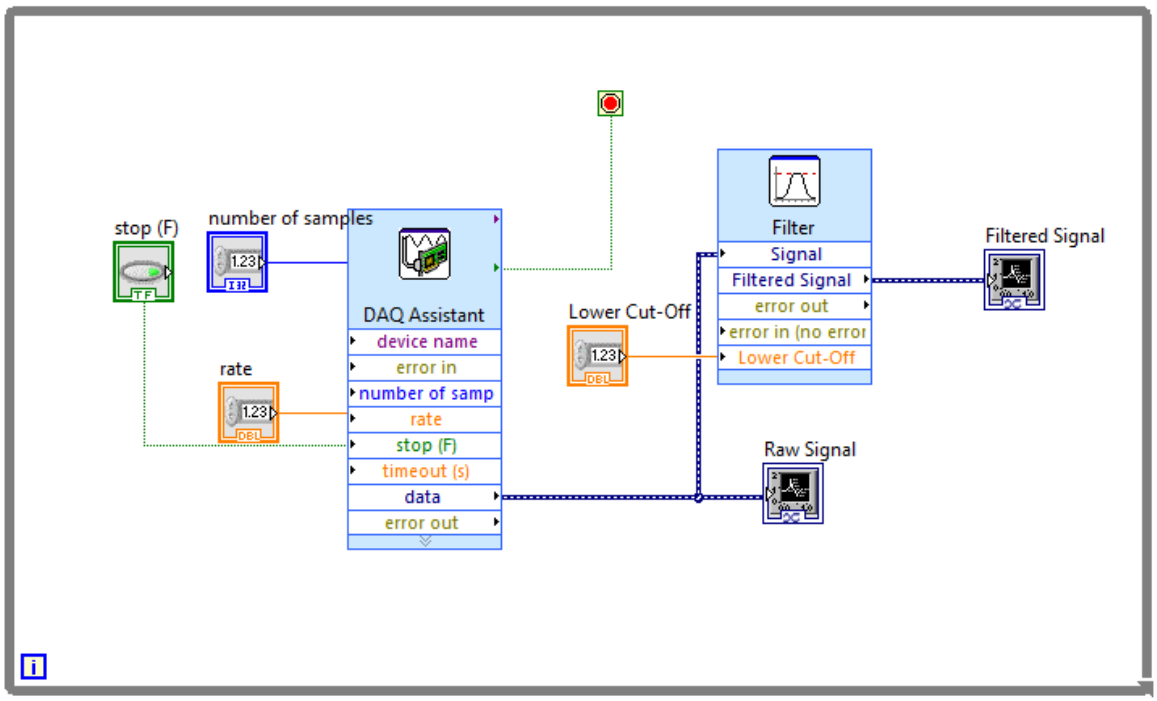




8. Configure the user interface

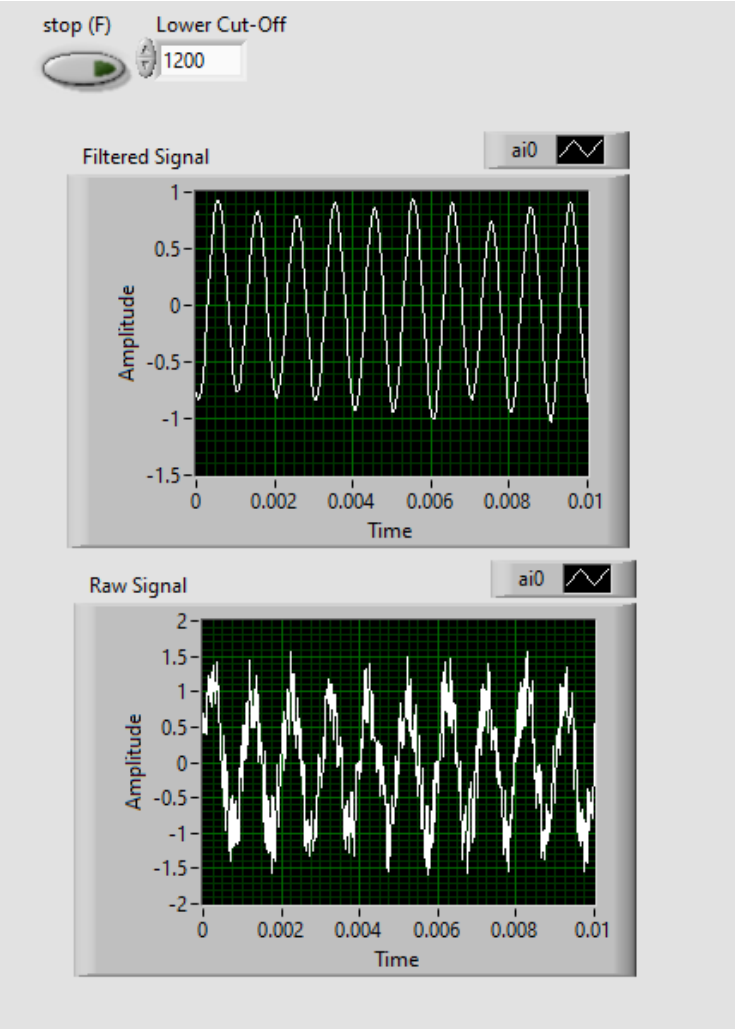
On the front panel, place a number of numeric controls to allow control of the sample rate, number of samples and filter cut-off. Wire the controls into the appropriate variables, and label the controls as shown below.



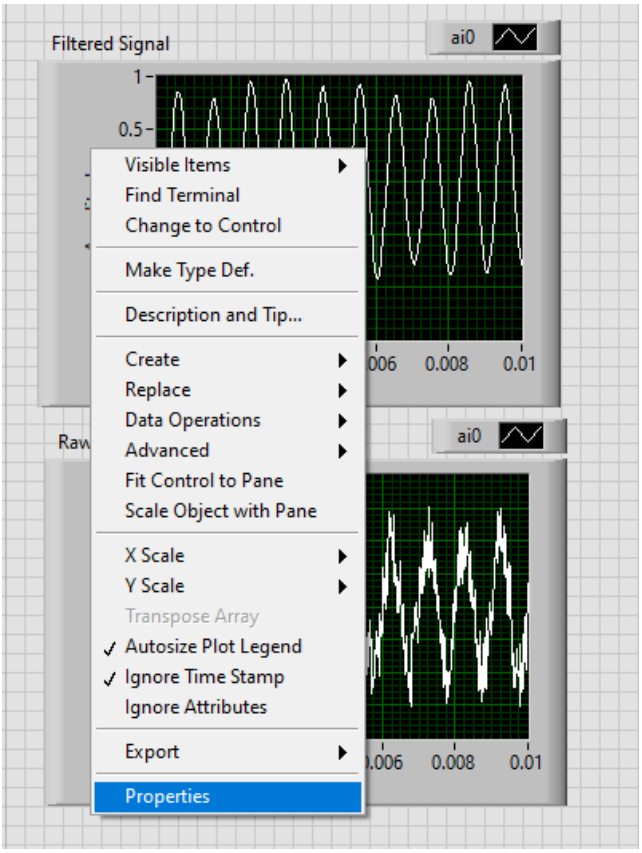


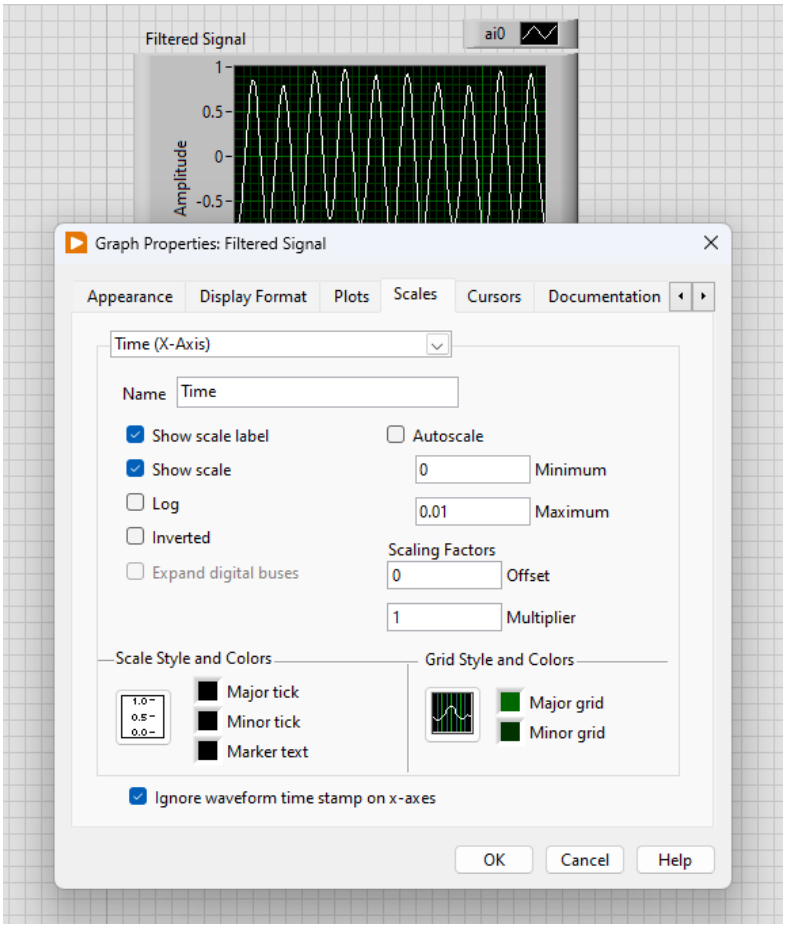
9. Test the VI

Run the vi and test the program. Adjust the sample rate for good sample acquisition (i.e. at least full wave), and cut-off to remove the noise from the signal.



You may need to adjust the x- and y-axis scales. To do so, right click on the chart on the Front Panel, and select Properties > Scales and disable Autoscale for each axis and select an appropriate range.


Filtered Signal
ai0
1
0.5
Visible Items
Find Terminal
Change to Control
Make Type Def.
Description and Tip...
Create
Replace
Data Operations
Advanced
Fit Control to Pane
Scale Object with Pane
X Scale
Y Scale
Transpose Array
Autosize Plot Legend
Ignore Time Stamp
Ignore Attributes
Export
Properties
0.006
0.008
0.01


Filtered Signal
ai0
Amplitude
1
0.5
0
-0.5
Graph Properties: Filtered Signal
Appearance
Display Format
Plots
Scales
Cursors
Documentation
Time (X-Axis)
Name
Time
Show scale label
Show scale
Log
Inverted
Expand digital buses
Autoscale
0
Minimum
0.01
Maximum
Scaling Factors
0
Offset
1
Multiplier
Scale Style and Colors
Major tick
Minor tick
Marker text
Grid Style and Colors
Major grid
Minor grid
Ignore waveform time stamp on x-axes
OK
Cancel
Help