Exercise 5-3: DAQmx Task vs. Full DAQmx API

Goal

Use and compare the DAQmx task with full DAQmx API approaches of acquiring data from a DAQmx device.

Instructions

**Approach 1: Using the DAQmx Task**

This approach helps you get started quickly if you have already created a DAQmx task.

1. Open `C:\Exercises\LabVIEW Core 1\DAQmx Task vs Full DAQmx API\DAQmx Task vs Full DAQmx API.lvproj`.
2. Examine the task presented in the project.
   - Open the My Analog Input Voltage task from the **Project Explorer** window.
   - Examine the settings in the **DAQ Assistant** dialog box. Notice **Rate (Hz)** is set to 2.56 kHz.
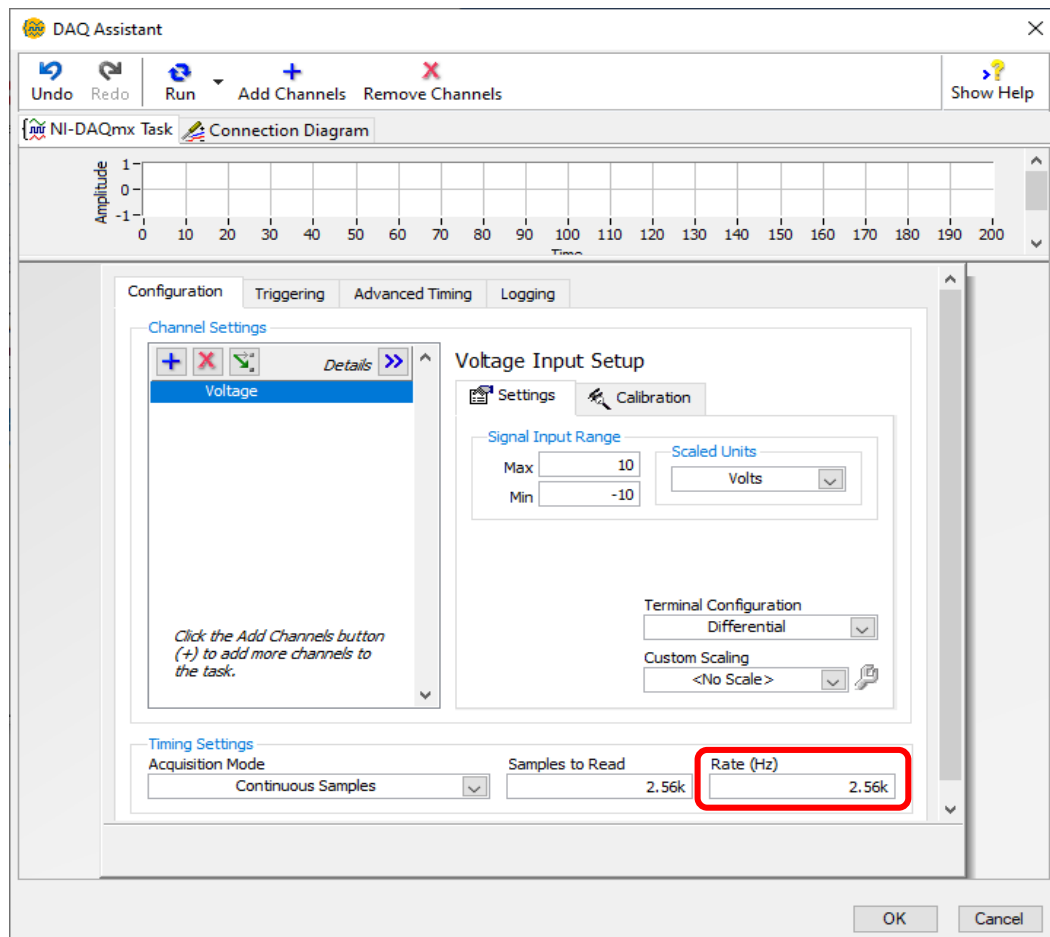

Note: Adjust **Rate (Hz)** to a rate that is supported by your DAQ device, if necessary.

- Click the Details button, and note that **Physical Channel** is set to **PCI-6221/ai0**.
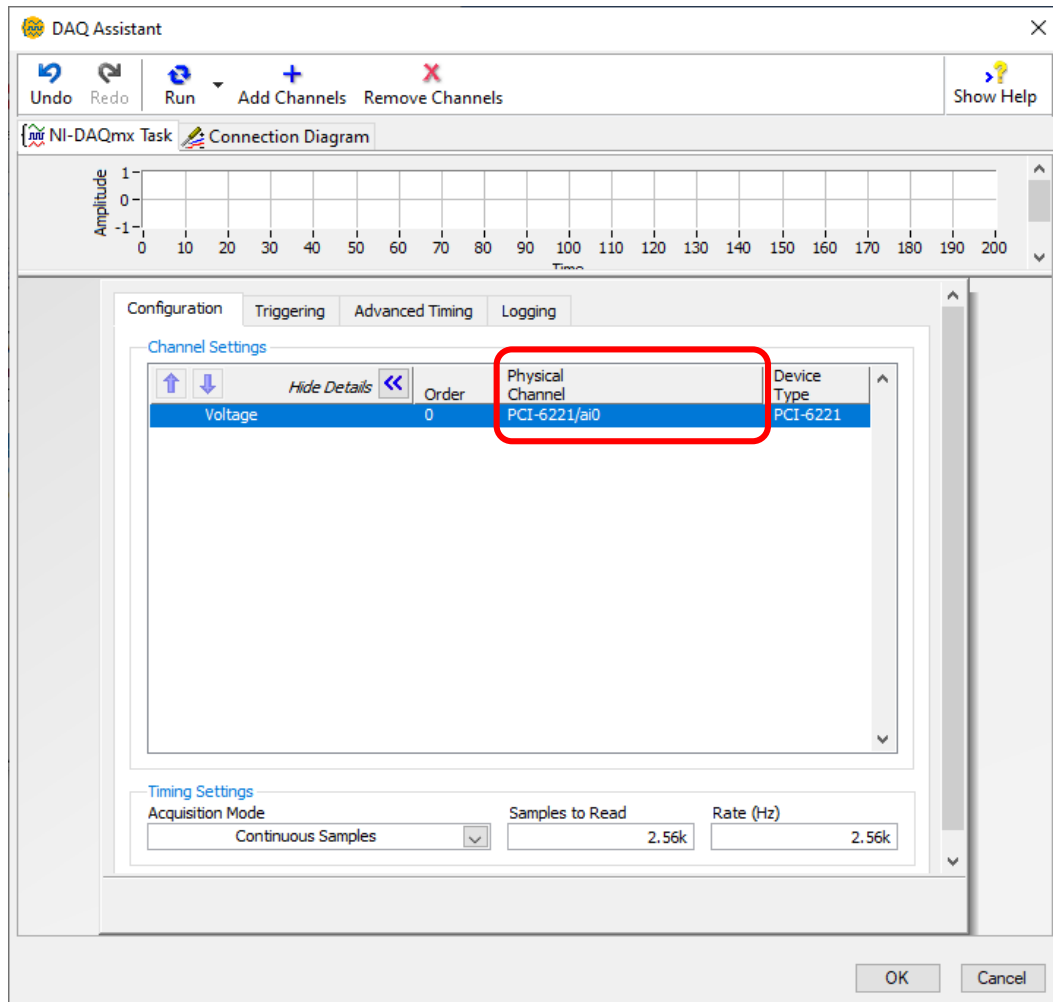
- Close the **DAQ Assistant** dialog box.
3. Open DAQmx Task Method VI from the **Project Explorer** window.
4. Tile the front panel and block diagram to see both at the same time by pressing <Ctrl-T>.
5. Examine the block diagram.
   - Notice the task constant, which references the My Analog Input Voltage task in the project. This task defines the channel and timing settings.
   - Pay attention to the configuration of the DAQmx Read VI shown under the Polymorphic VI selector.
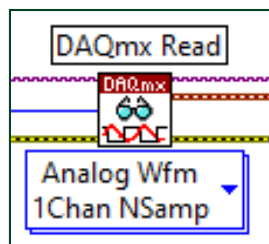
6. Examine the behavior of this VI.
   - On the front panel, set the value of the **Number of Samples** control to 5120.

Note: Because the sample rate defined in the **My Analog Input Voltage** task is 2.56 kHz (samples per second) and **Number of Samples** is set to 5,120, the DAQmx Read VI will read 5,120 samples representing 2 seconds of data.

   - Run the VI.
   - Notice that this VI makes a single acquisition and stops. The data graph indicator now shows 5,120 samples. Notice that the **Time (s)** x-axis shows that graph contains 2 seconds of data.
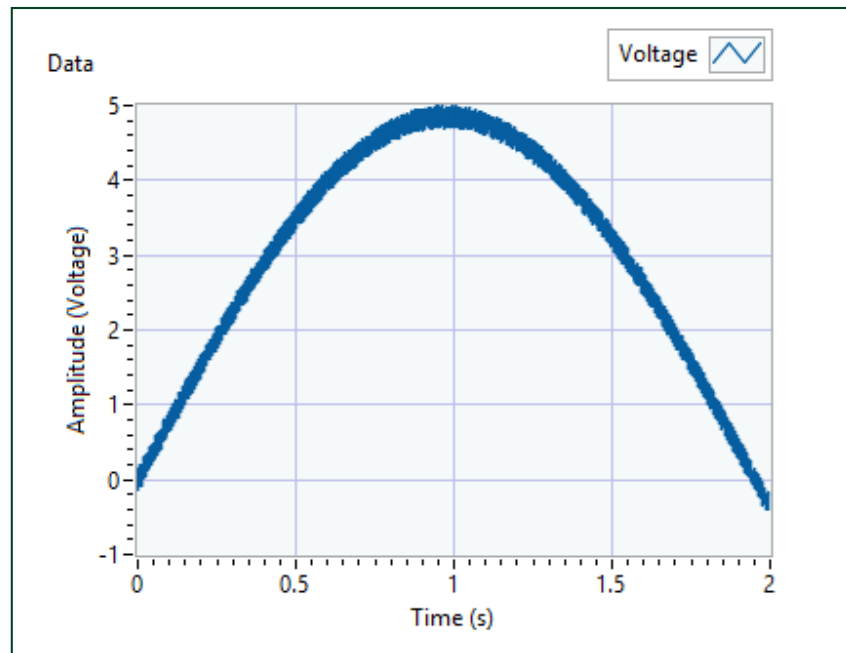
Approach 2: Using the Full DAQmx API

This approach allows all the configuration settings to be contained in the VI and provides more flexibility. This is the recommended approach for the remainder of this course.

1. Create a copy of the DAQmx Task Method VI.
   - In the **Project Explorer** window, right-click the **DAQmx Task Method VI** and select **Save As**.
   - In the appeared dialog box, select **Open additional copy**, check the **Add copy to DAQmx Task vs Full DAQmx API.lvproj** box, and press **Continue**.
   - Name the VI as Full DAQmx API Method.vi, then click **OK**.
   - Close the DAQmx Task Method VI.
2. Delete the **task in** constant from the block diagram.
3. Programmatically create and configure the DAQmx task, as shown in the figure below by following the instructions in the next steps.
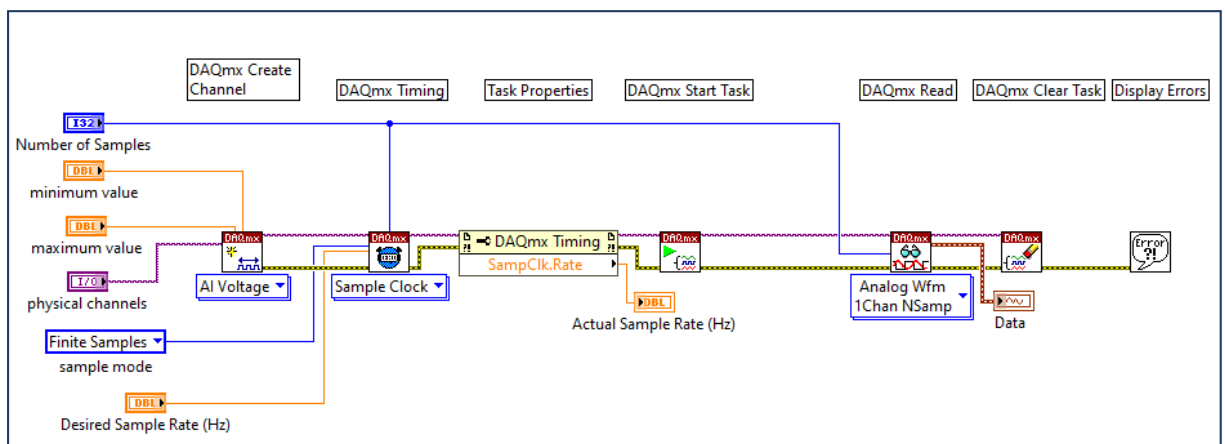

4. Add a DAQmx Create Channel VI to the block diagram.
   - When you add the DAQmx Create Channel VI, select the **configuration settings** as shown in the following figure.
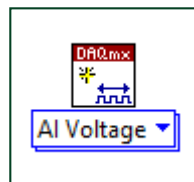

   - On the block diagram, hover your cursor over the **physical channels** input. Right-click and select **Create Control**.
   - Right-click both the **minimum** and **maximum value** inputs, and select **Create Control**.

5. Add a DAQmx Timing VI to set the sample rate and sample mode.
   - When you add the DAQmx Timing VI, select the **configuration settings** as shown in the following figure.
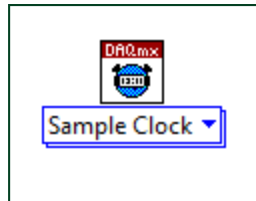

   - Right-click the **rate** input and select **Create Control**. Rename it Desired Sample Rate (Hz).
   - Right-click the **sample mode** input and select **Create Constant**. Set the value of the constant to **Finite Samples** because this VI will only read a finite number of samples.
   - Wire the **Number of Samples** control to the **samples per channel** input of the DAQmx Timing VI.
   - In finite acquisition mode, the **samples per channel** input tells the DAQmx task how many finite samples the DAQmx task should acquire.
6. Add a DAQmx Timing Property Node to get the actual sample rate.
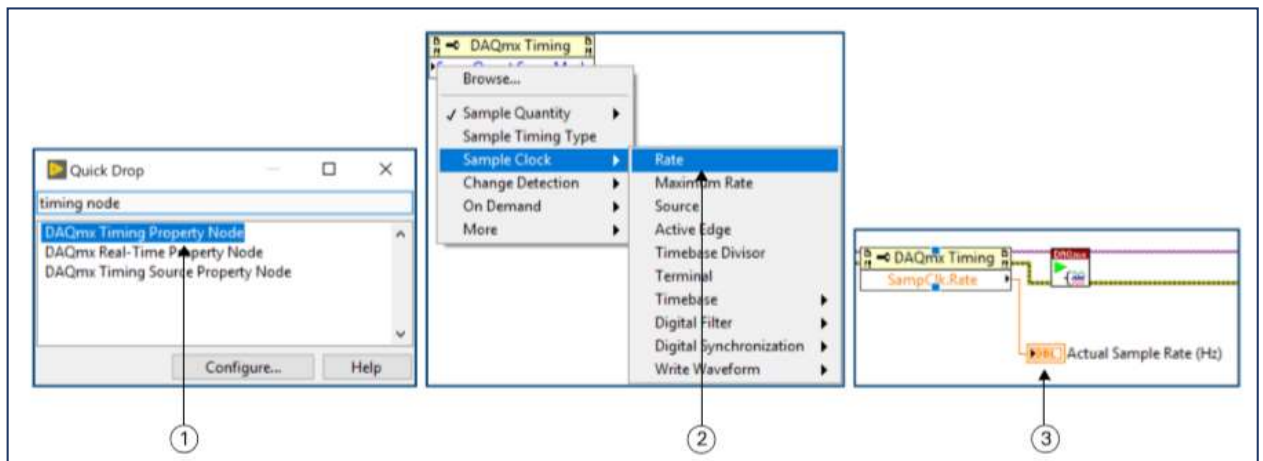
   1. **Timing** – Select and place the **DAQmx Timing Property Node** from the **Quick Drop** menu.
   2. **Sample Clock Rate** – In the pull-down menu, select **Sample Clock»Rate**.
   3. **Actual Sample Rate (Hz)** – Right-click the **DAQmx Timing Property Node** and select **Change All To Read**. Then right-click the **SampleClock:Rate** output and select **Create Indicator**. Rename the indicator as `Actual Sample Rate (Hz)`.

   Note: If you can't locate the appropriate Property Node setting follow the instructions below.
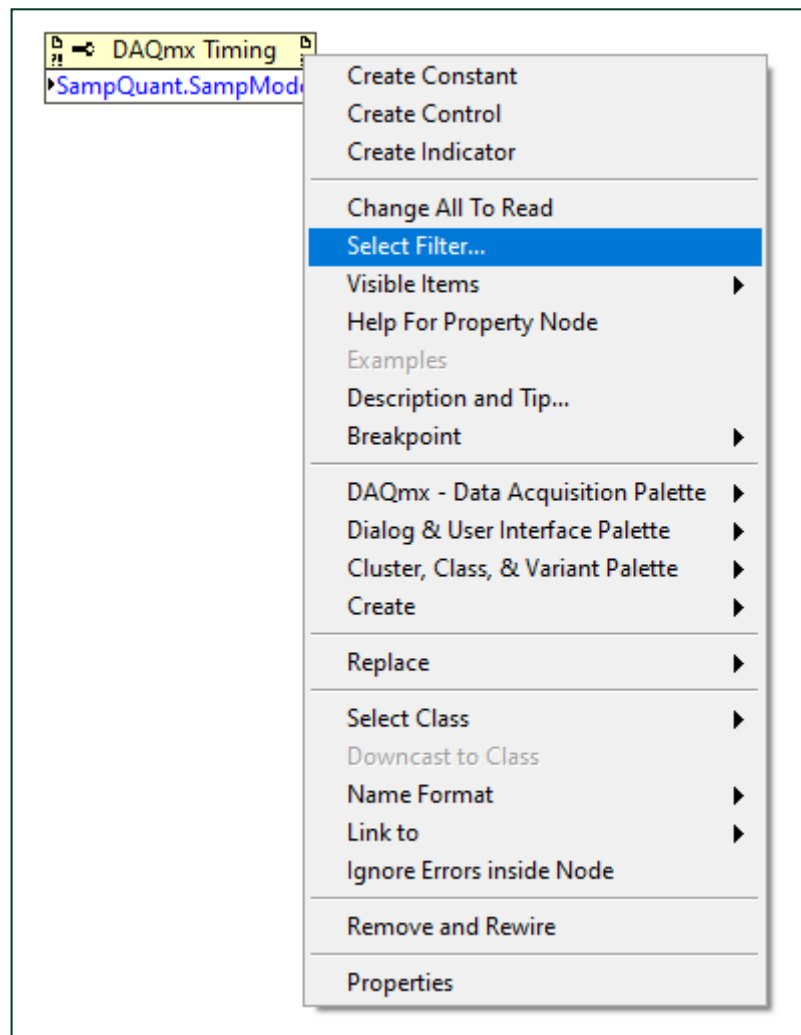
- Right-click on the **property node** and click **Select Filter**.

- The **Configure Filter Settings** dialog box should appear similar to the following picture. Selecting **Show All Attributes** will cause LabVIEW to display all properties regardless of which devices are configured on that computer.
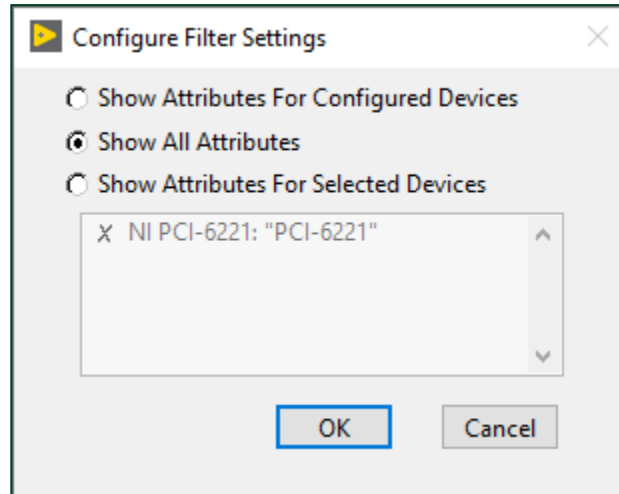
7. Complete the wiring as shown in the figure under step 3.
8. Switch to the front panel and arrange the controls as shown in the following figure.
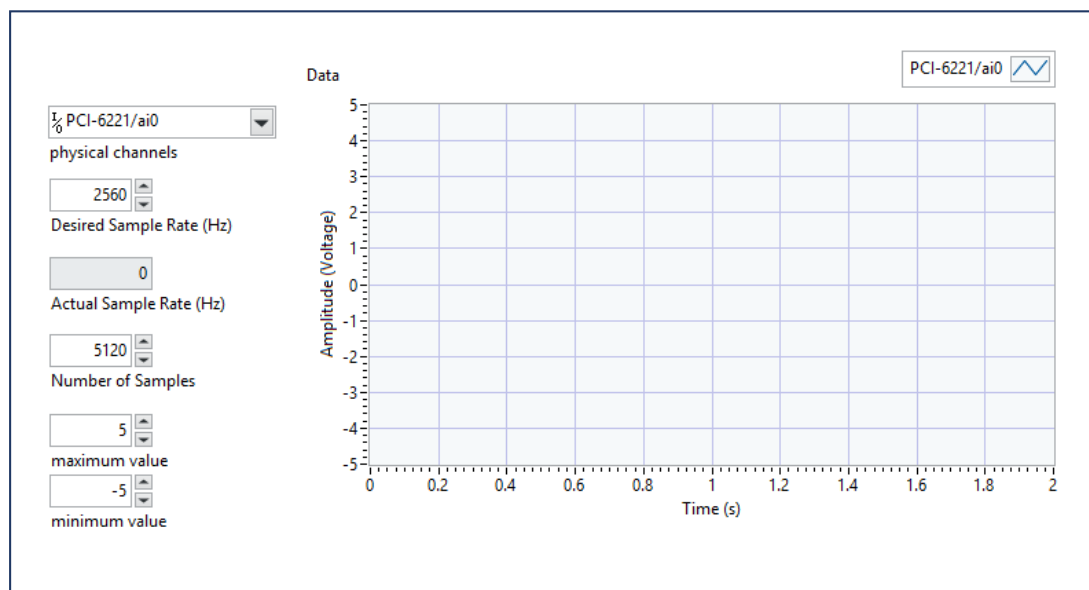
9. Set the **Number of Samples** control to 5,120.
10. Set the values of the added controls to match the values in the **DAQ Assistant** window.
11. You can find the values for **DAQ Assistant** in the locations shown in the following.

Control Name	DAQ Assistant Value Location
physical channels	Configuration» Details» Physical Channel
Desired Sample Rate (Hz)	Configuration» Timing Settings» Rate (Hz) **Note**: Enter this value into the control in units of Hz, not kHz.
maximum value	Configuration» Signal Input Range» Max
minimum value	Configuration» Signal Input Range» Min

12. Run the VI.
13. Because you are using the DAQmx Create Channel and DAQmx Timing VIs, you can modify the physical channel and sample rate directly from your VI. This VI is no longer directly connected to the **My Analog Input Voltage** task. All the configuration for this DAQmx task is contained in this VI.
    - Change the **Desired Sample Rate (Hz)** control value from 2,560 to 5,120 to update the sample rate.
    - Run the VI, and notice that the **Time (s)** x-axis now shows that only 1 second of data was acquired.
    - Change the **Desired Sample Rate (Hz)** control value to 3,333. Run the VI, and notice that the **Actual Sample Rate** indicator value is different from **Desired Sample Rate**.

    Note: It is important for you to check the actual sample rate that the DAQ device used to acquire your data. Do not assume that the actual sample rate is the same as the desired sample rate you entered. The supported sample rates vary depending on your DAQ device or module.

    - Change the **physical channels** control to a different channel, such as PCI-6221/ai3.
    - Run the VI, and notice that you are now acquiring data from a different channel.
14. Select **File» Save**.
15. Close the project when finished.

On the Job

If your application will use NI-DAQmx, which approach will you use? Circle the correct answer.

a. DAQmx Task Approach OR
b. Full DAQmx API Approach

End of Exercise 5-3