Exercise 5-2: Creating an Acquire-Analyze-Visualize VI

Goal

Create a simple VI that acquires data, analyzes data, and displays the results.

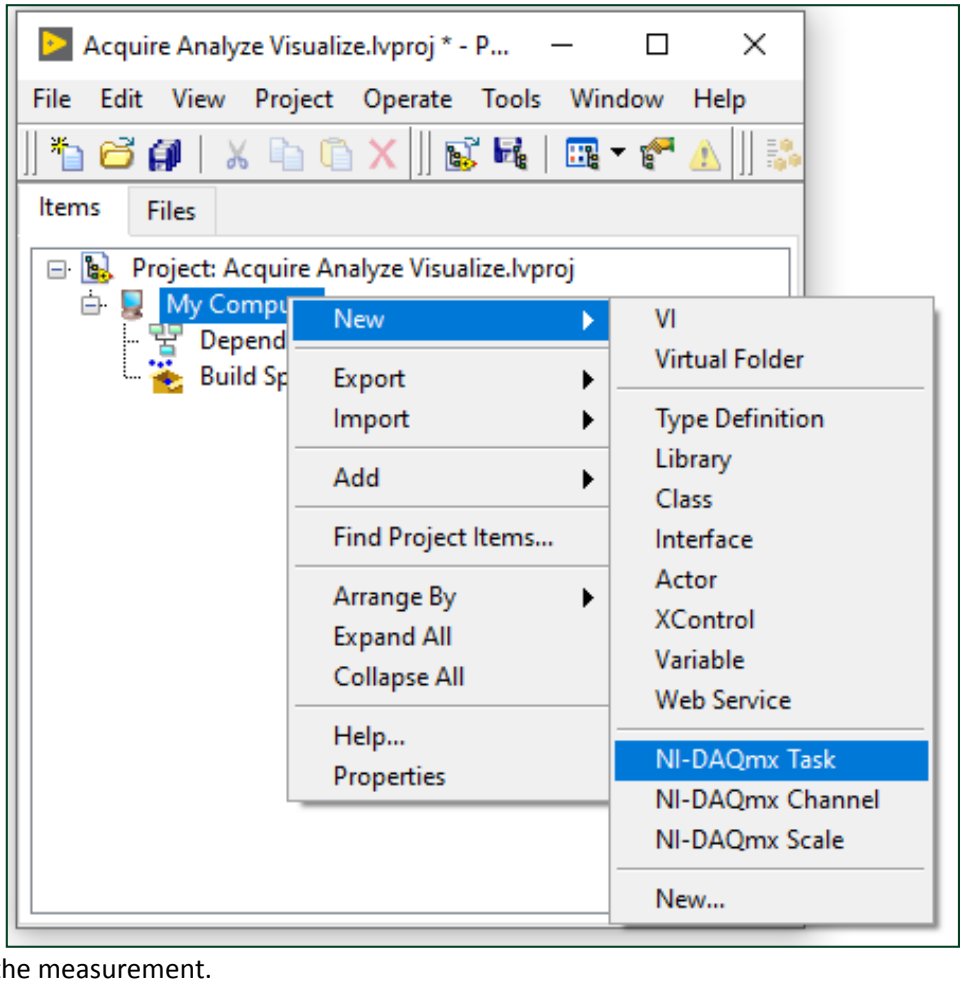
Instructions

Create the Project 1

1. Create a new project.
   - From the **Getting Started** window, select **Create Project» All» Blank Project** and click **Finish**.
   - Select **File» Save All** and enter `Acquire Analyze Visualize.lvproj` in the **File name** field.
   - Browse to the `C:\Exercises\LabVIEW Core 1\Acquire Analyze Visualize` directory and click **OK**.

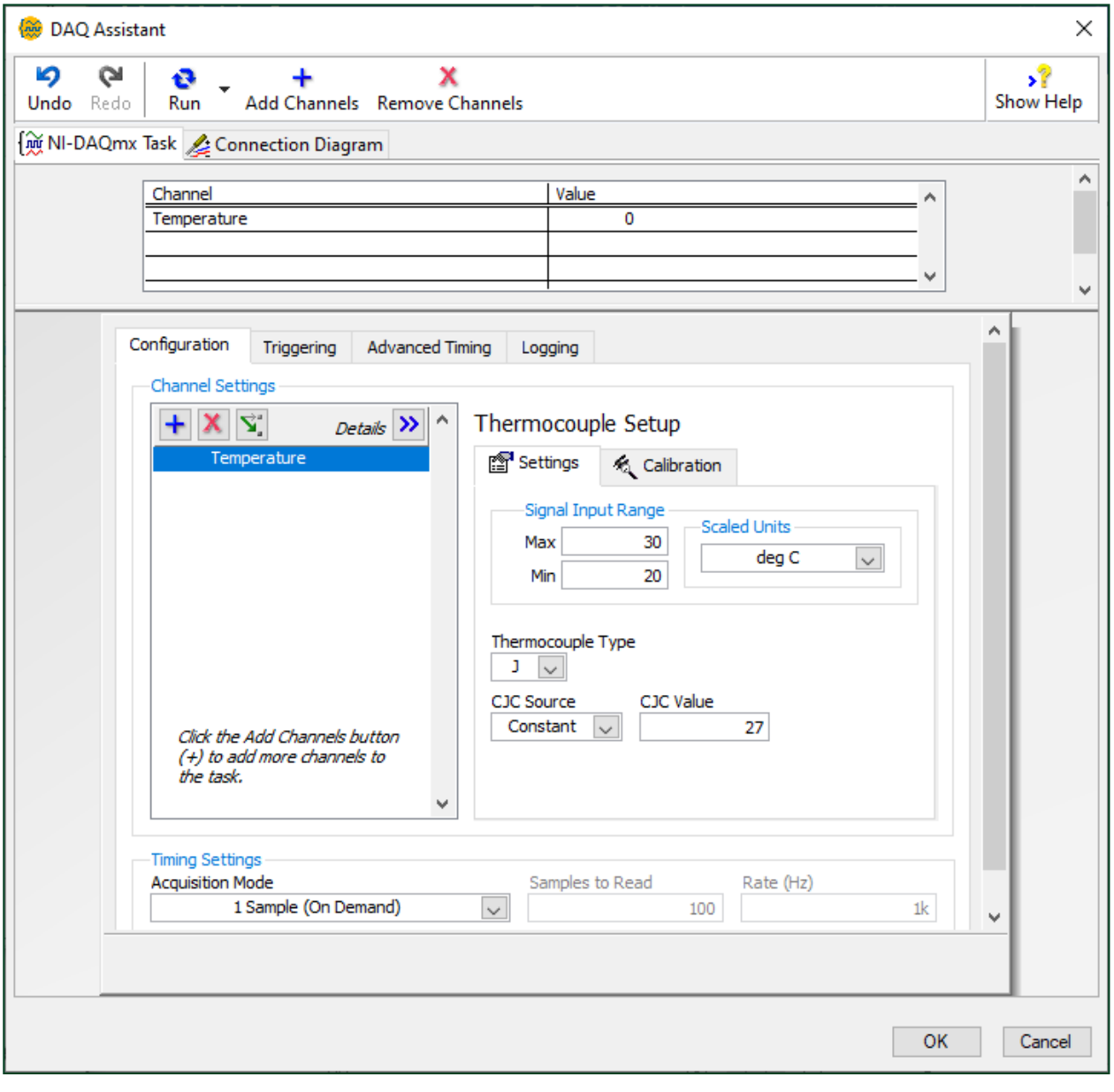
Create an NI-DAQmx Task

1. Create a DAQmx task.
   - In the **Project Explorer** window right-click **My Computer** and select **New» NI-DAQmx Task**.



2. Configure the measurement.
   - In the Create New dialog box that appears, select **Acquire Signals» Analog Input» Temperature» Thermocouple**.

- Name the task `Thermocouple`, and **Finish**.
- The next dialog box that appears prompts you to select the physical channel to use with your new task. Under **PCI-6221**, select **ai1** and click **Next**.
- Name the task `Thermocouple`, and click **Finish**.
- In the **DAQ Assistant** dialog box, configure the task as shown in the following figure.

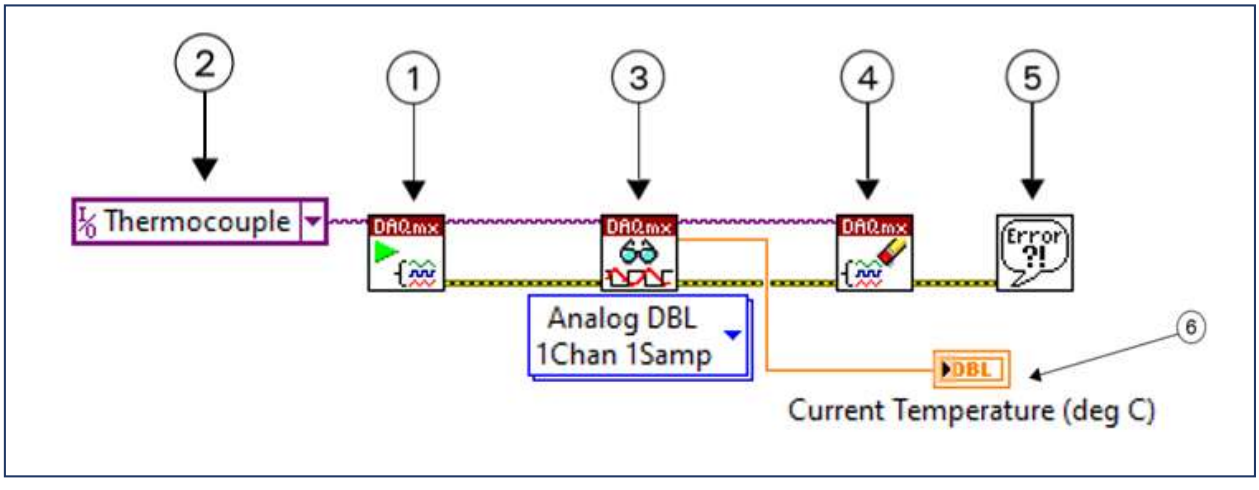


Note: You should configure the task according to your specific hardware configuration, e.g. if you have a thermocouple connected of a different type and with different signal input range connected, then you should configure the parameters accordingly to that thermocouple characteristics.

3. Validate the signal is correct using the **DAQ Assistant** dialog box.
   - On the top pane of the dialog box, switch the **Display Type** to **Chart** and run the task to verify that the chart displays the expected temperature.
   - Click **Stop** to stop the acquisition.
   - Click **<Ctrl-S>** to save the VI and name it Acquire Analyze Visualize.

Acquire Data

1. Create a new VI in your project.
   - In the **Project Explorer** window, add a **VI**.
   - Click **<Ctrl-S>** to save the VI and name it `Acquire Analyze Visualize`.
2. Modify the block diagram, as shown in the following figure, to acquire data.



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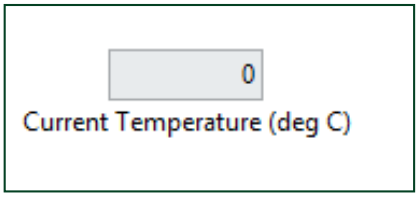
1. **DAQmx Start Task VI-** Transitions the task to the running state to begin the measurement or generation.
2. **Task constant-** Right-click the **task in** input of the DAQmx Start Task VI and select **Create Constant**. Set the constant to **Thermocouple**.
3. **DAQmx Read VI-** In the Polymorphic VI selector, set the values shown in the table below.
4. **DAQmx Clear Task VI-** Clears the task. Before clearing, this VI aborts the task, if necessary, and releases any resources the task reserved.
5. **Simple Error Handler VI-** Indicates whether an error occurred. If an error occurred, this VI returns a description of the error and optionally displays a dialog box.
6. **Current Temperature (deg C) indicator-** Right-click the **data output** of the **DAQmx Read VI** and select Create Indicator. Rename the indicator `Current Temperature (deg C)`.

Note: Task constant populates with any DAQmx tasks that you have created in this project.

DAQmx Read Configuration Settings

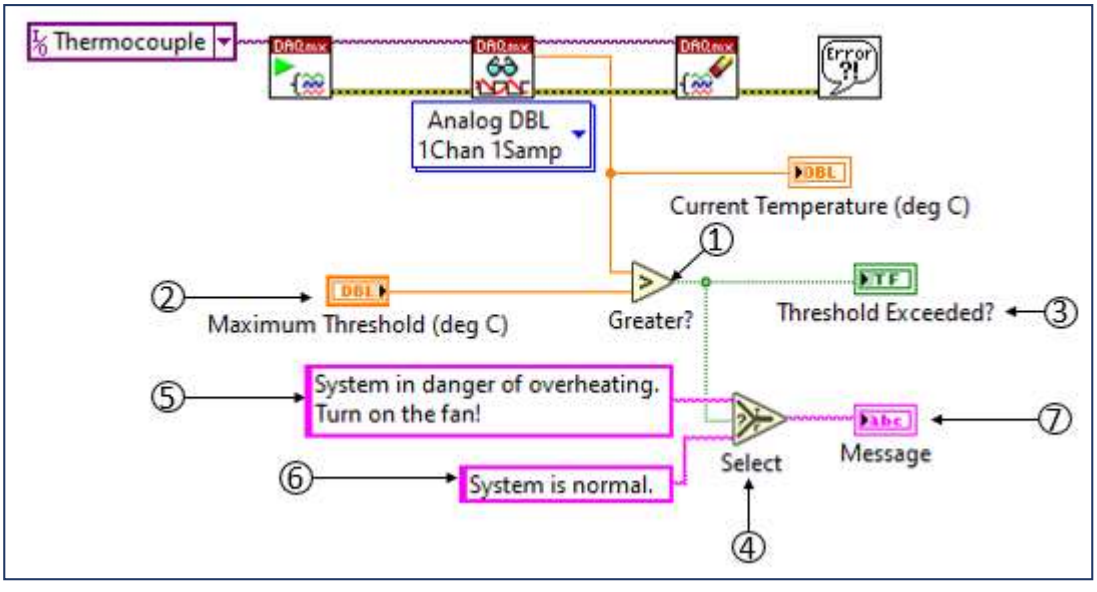
Channel Type	Analog Input
Channel Count	Single Channel
Sample Count	Single Sample
Data Format	DBL (Floating Point)

3. Switch to Front Panel.
4. Run the VI. Your VI returns a single temperature acquired from the DAQ device.



Analyze and Visualize Data

1. Modify the block diagram, as shown in the following figure, to analyze the acquired data.



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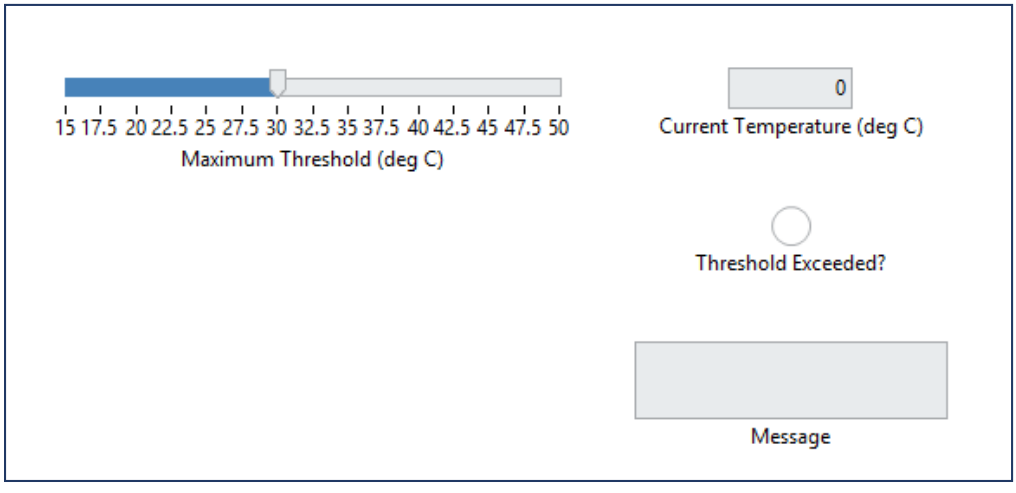
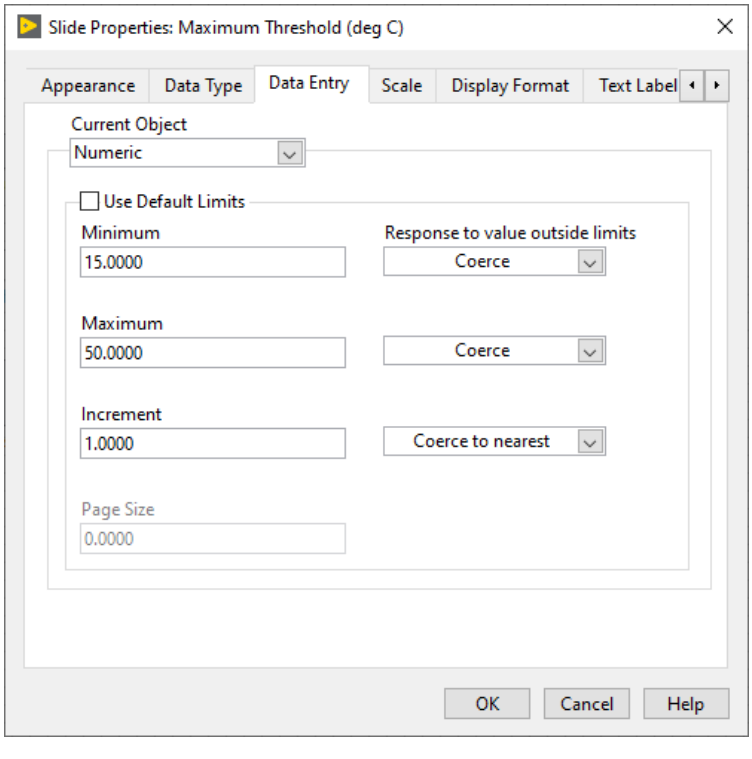
1. **Greater Function** – Add a Greater function to the block diagram.
2. **Input terminal** – Right-click the **y input of the Greater function**, select **Create Control** and rename the terminal `Maximum Threshold (deg C)`.
3. **Boolean indicator** – Right-click the **output of the Greater function** and select **Create Indicator**. Rename the indicator `Threshold Exceeded`
4. **Select function** – Add a Select function to the block diagram.
5. **String constant** – Add a string constant to the block diagram and wire it to the t input of the Select function. Set the value of the constant to `System in danger of overheating. Turn on the fan!`
6. **String constant** – Right-click the **f input of the Select function** and select **Create Constant**. Set the value of the constant to `System is normal.`
7. **String indicator** – Right-click the **output of the Select function**, select **Create Indicator**, rename it Message.



2. Create the front panel, as shown in the following figure, to visualize your results.
   - Right-click the **Maximum Threshold (deg C)** control and select **Replace» Numeric» Horizontal Pointer Slide (NXG Style)**. Resize the control as desired.
   - Double-click the **minimum** and **maximum values** on the **Horizontal Pointer Slide** control and set them according to the table below.

Minimum	15
Maximum	50

   - Right-click the **Horizontal Pointer Slide** control and select **Data Entry** from the shortcut menu. Set the properties on the **Data Entry** tab as shown in the following figure.



- Set the current value of the **Horizontal Pointer Slide** control to 30. After that, right-click the control and select **Data Operations» Make Current Value Default** from the shortcut menu.
- Right-click the **Threshold Exceeded** indicator and select **Replace» Boolean» LED (NXG Style)**. Resize the indicator as desired.
- Resize the **Message** indicator to be larger.

3. Run the VI. Adjust the **Maximum Threshold** control to be above and below the **Current Temperature (deg C)**, and compare the indicator results.

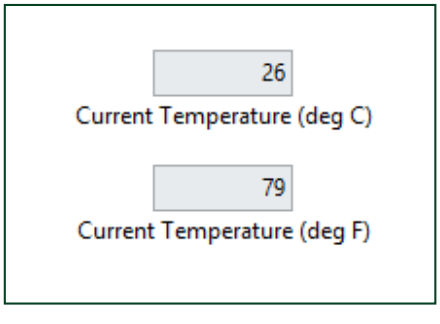
Your Turn

1. Add a new VI named `Celsius and Fahrenheit.vi` to the project.
2. Modify the VI to acquire a temperature, display the temperature in degrees Celsius, and convert the temperature to display the temperature in degrees Fahrenheit. The VI should have the following indicators.
   - Current Temperature (deg C)
   - Current Temperature (deg F)

(Hint) Formula for converting deg Celsius to deg Fahrenheit. Delete the task in constant from the block diagram.

$$Degrees\ Fahrenheit = Degrees\ Celsius\ x\ \frac{9}{5} + 32$$

3. Run the VI. Use a calculator to verify that the conversion between Celsius and Fahrenheit is correct.



End of Exercise 5-2