Exercise 4-1   Temperature Monitor VI
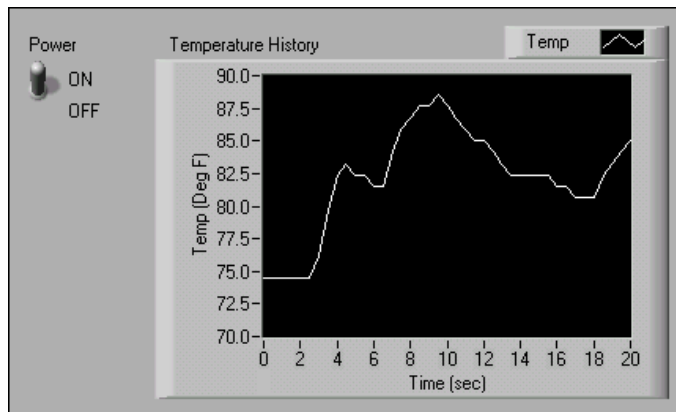
Objective: To use a While Loop and a waveform chart to acquire and display data.

Complete the following steps to build a VI that measures temperature and displays it on the waveform chart.

Front Panel

1. Open a new VI.

2. Build the following front panel.

   a. Select the vertical toggle switch on the **Controls»Boolean** palette and place it on the front panel. You will use the switch to stop the acquisition.

   b. Type Power inside the label and click outside the label or click the **Enter** button on the toolbar, shown at left.

   c. Select a waveform chart on the **Controls»Graph** palette and place it on the front panel. The waveform chart will display the temperature in real time.

   d. Type Temperature History inside the label and click outside the label or click the **Enter** button.

   e. The waveform chart legend labels the plot Plot 0. Use the Labeling tool to triple-click Plot 0 in the chart legend, type Temp, and click outside the label or click the **Enter** button to relabel the legend.

   f. The temperature sensor measures room temperature. Use the Labeling tool to double-click 10.0 in the y-axis, type 90, and click outside the label or click the **Enter** button to rescale the chart.

   g. Change –10.0 in the y-axis to 70.

   h. Label the y-axis Temp (Deg F) and the x-axis Time (sec).

Block Diagram

3. Select **Window»Show Diagram** to display the block diagram.

4. Enclose the two terminals in a While Loop, as shown in the following block diagram.
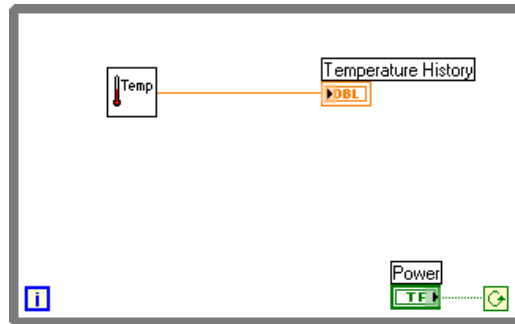
a. Select the While Loop on the **Functions»Structures** palette.

b. Click and drag a selection rectangle around the two terminals.

c. Use the Positioning tool to resize the loop, if necessary.

5. Select **Functions»Select a VI**, navigate to `c:\exercises\LV Basics I`, double-click the Thermometer VI, which you built in Exercise 3-2, and place the VI on the block diagram. This VI returns one temperature measurement from the temperature sensor.

6. Wire the block diagram objects as shown in the previous block diagram.

Note   To measure temperature in Celsius, wire a Boolean constant located on the **Functions»Boolean** palette to the **Temp Scale** input of the Thermometer VI. Change the scales on charts and graphs in subsequent exercises to a range of 20 and 32 instead of 70 and 90.

7. Save the VI as `Temperature Monitor.vi` because you will use this VI later in the course.

8. Display the front panel by clicking it or by selecting **Window»Show Panel**.

9. Use the Operating tool to click the vertical toggle switch and turn it to the ON position.

10. Run the VI.

The section of the block diagram within the While Loop border, or subdiagram, executes until the specified condition is TRUE. For example, while the switch is on (TRUE), the Thermometer VI takes and returns a new measurement and displays it on the waveform chart.

11. Click the vertical toggle switch to stop the acquisition. The condition is FALSE, and the loop stops executing.

12. Format and customize the X and Y scales of the waveform chart.

    a. Right-click the chart and select **Y Scale»Formatting** from the shortcut menu. The following dialog box appears.
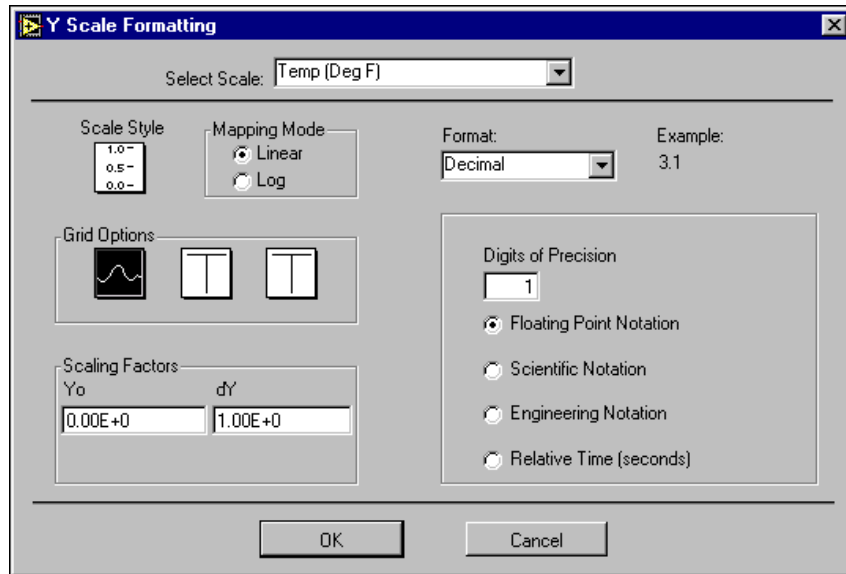
    b. Click the **Scale Style** icon and select different styles for the y-axis. You also can select different mapping modes, grid options, scaling factors, and formats and precisions.

    c. Select the options shown in the previous dialog box and click the **OK** button.

13. Right-click the waveform chart and select **Data Operations»Clear Chart** from the shortcut menu to clear the display buffer and reset the waveform chart. If the VI is running, you can select **Clear Chart** from the shortcut menu.

Changing the Mechanical Action of Boolean Switches

Each time you run the VI, you first must turn on the vertical toggle switch and then click the **Run** button. You can modify the mechanical action of Boolean controls by selecting one of the following options.

- **Switch When Pressed**—Changes the control value each time you click the control with the Operating tool. How often the VI reads the control does not affect this action.

- **Switch When Released**—Changes the control value only after you release the mouse button during a click within the graphical boundary of the control. How often the VI reads the control does not affect this action.

- **Switch Until Released**—Changes the control value when you click the control and retains the new value until you release the mouse button, at which time the control reverts to its original value. How often the VI reads the control does not affect this action.

- **Latch When Pressed**—Changes the control value when you click the control and retains the new value until the VI reads it once, at which time the control reverts to its default value. This action happens whether you continue to hold down the mouse button. This action is useful for stopping While Loops or having the VI perform an action only once each time you set the control.

- **Latch When Released**—Changes the control value only after you release the mouse button. When the VI reads the value once, the control reverts to the old value. This action guarantees at least one new value.

- **Latch Until Released**—Changes the control value when you click the control and retains the value until the VI reads the value once or until you release the mouse button, whichever occurs last.

14. Modify the vertical toggle switch so temperature is plotted on the graph each time you run the VI.

    a. Stop the VI if it is running.

    b. Use the Operating tool to click the vertical toggle switch and turn it to the ON position.

    c. Right-click the switch and select **Data Operations»Make Current Value Default** from the shortcut menu. This sets the ON position as the default value.

    d. Right-click the switch and select **Mechanical Action»Latch When Pressed** from the shortcut menu.

15. Run the VI.

16. Use the Operating tool to click the vertical switch to stop the acquisition. The switch changes to the OFF position and changes back to ON after the conditional terminal reads the value.

Adding Timing

When this VI runs, the While Loop executes as quickly as possible. Complete the following steps to take data at certain intervals, such as once every half-second, as shown in the following block diagram.
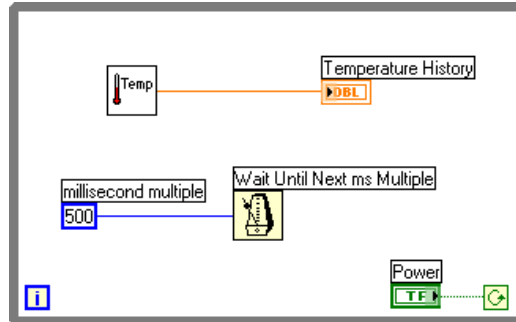
a. Place the Wait Until Next ms Multiple function located on the **Functions»Time & Dialog** palette. This function makes sure that each iteration occurs every half-second (500 ms).

b. Right-click the **millisecond multiple** input of the Wait Until Next ms Multiple function, select **Create»Constant** from the shortcut menu, type 500, and press the <Enter> key. The numeric constant specifies a wait of 500 ms so the loop executes once every half-second.

c. On the front panel, right-click the chart and select **X Scale» Formatting** from the shortcut menu. Change the Δ**X** value to 0.5 because you added a 500 ms wait between loop iterations.

17. Save the VI, because you will use this VI later in the course.

18. Run the VI.

19. Try different values for the numeric constant and run the VI again.

20. Close the VI.

End of Exercise 4-1