

# Customizing a VI

---

## Approximate Time

You can complete this exercise in approximately 30 minutes.

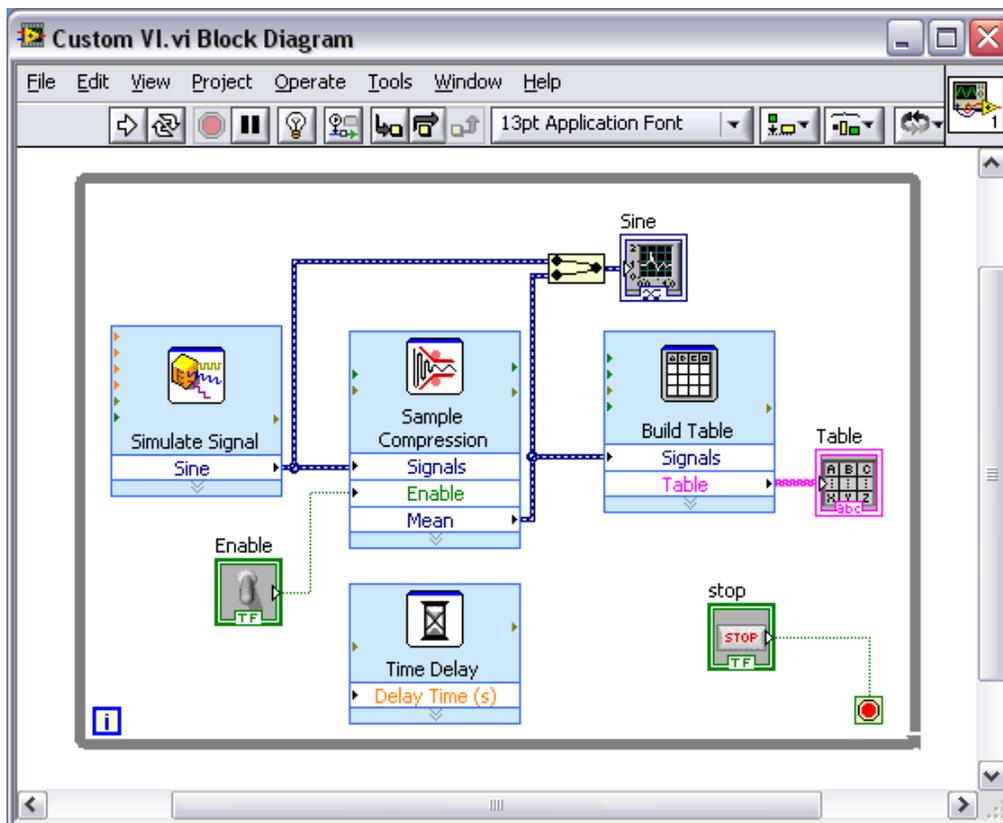
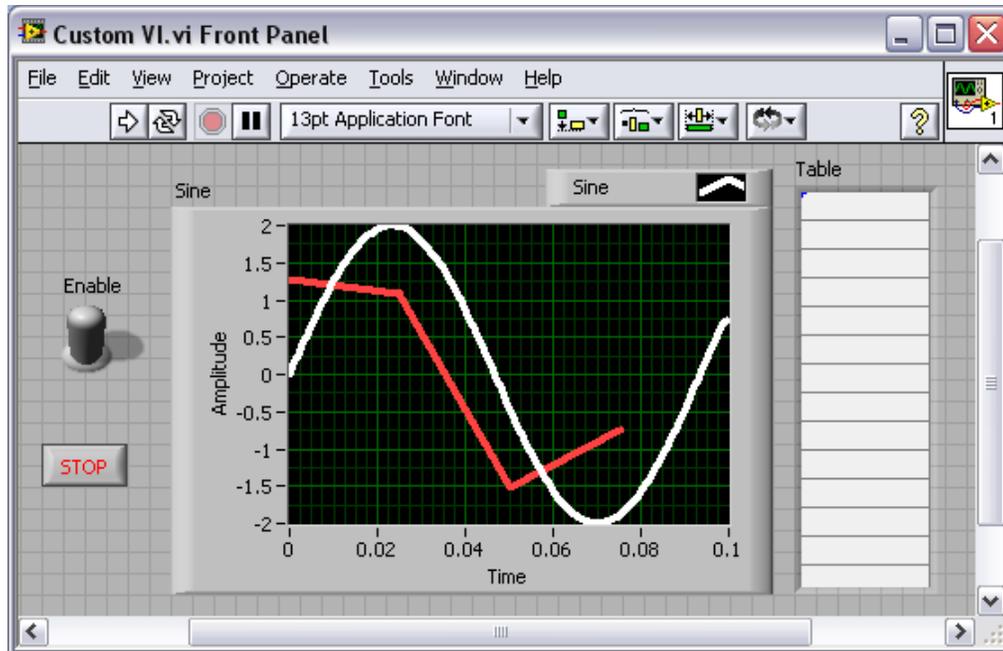
## Background

You can choose one of many LabVIEW template VIs to use as a starting point when building VIs. However, sometimes you need to build a VI for which a template is not available. This tutorial teaches you how to build and customize a VI without using a template.

## Overview

In the following exercises, you will open a blank VI and add structures and Express VIs to the block diagram to build a new VI. You will build a VI that generates a signal, reduces the number of samples in the signal, and displays the resulting data in a table on the front panel.

# Completed Exercise



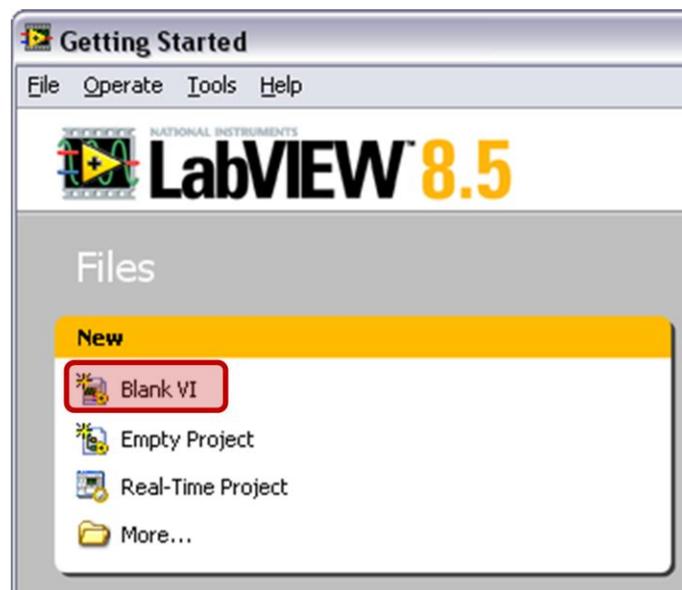
# Step-by-Step Instructions

---

## 1. Opening a Blank VI

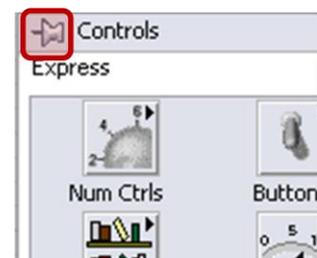
If no template is available for the VI you want to build, you can start with a blank VI and add Express VIs to accomplish a specific task. Complete the following steps to open a blank VI:

- a. In the **Getting Started** window, click the **Blank VI** link in the **New** section or press the <Ctrl-N> keys to open a blank VI. A blank front panel and block diagram appear.



You also can open a blank VI by selecting **File » New VI** or by selecting **File » New** and selecting **Blank VI** from the **Create New** list.

- b. You can right-click any blank space on the front panel to display a temporary version of the **Controls** palette. The **Controls** palette appears with a thumbtack icon in the upper left corner. Click the thumbtack to pin the palette so it is not temporary.



## 2. Adding an Express VI that Simulates a Signal

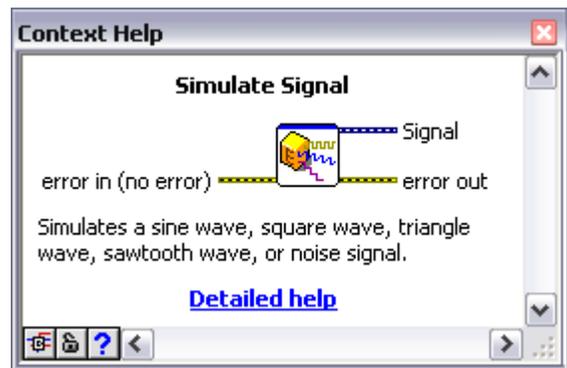
Complete the following steps to find the Express VI you will use and add it to the block diagram:

- a. Click the Show Context Help Window button on the front panel or block diagram toolbar to display the Context Help window. You also can select **Help » Show Context Help** from either window to display the Context Help window.

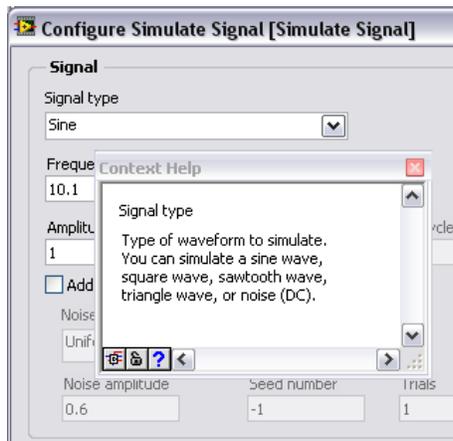


You also can press the <Ctrl-H> keys to display the **Context Help** window.

- b. Display the block diagram. On the **Functions** palette, select the **Express » Input** subpalette and move the cursor over one of the Express VIs. When you move the cursor over a VI, the **Context Help** window displays information about that VI.

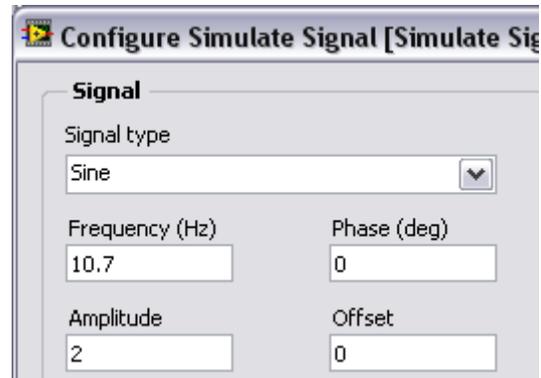


- c. Use the information that appears in the **Context Help** window to find the Express VI that can simulate a sine wave signal. Keep the **Context Help** window open.

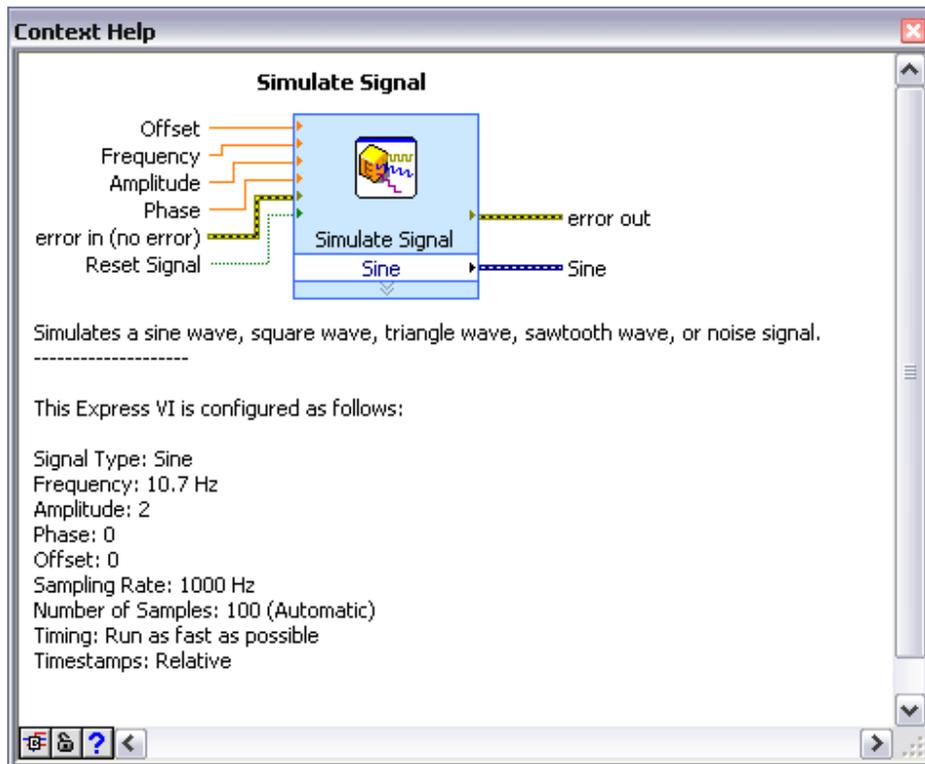


- d. Select the Simulate Signal Express VI and place it on the block diagram. The **Configure Simulate Signal** dialog box appears.
- e. Move the cursor over the various options in the **Configure Simulate Signal** dialog box, such as **Frequency (Hz)**, and **Amplitude**. Read the information that appears in the **Context Help** window.

- f. Configure the Simulate Signal Express VI to generate a sine wave with a frequency of 10.7 and amplitude of 2. The signal in the **Result Preview** window changes to reflect the configured sine wave.



- g. Click the **OK** button to save the current configuration and close the **Configure Simulate Signal** dialog box.
- h. Move the cursor over the Simulate Signal Express VI and read the information that appears in the **Context Help** window. The **Context Help** window displays configuration information about the Simulate Signal Express VI.



- i. Save the VI as Custom VI.vi in an easily accessible location.

### 3. Searching the Help and Modifying a Signal

Complete the following steps to use the *LabVIEW Help* to search for the Express VI that reduces the number of samples in a signal:

- a. Move the cursor over the Simulate Signal Express VI and click the **Detailed help** link in the **Context Help** window to display the *Simulate Signal* topic in the *LabVIEW Help*. You may have to scroll down in the **Context Help** window to see the **Detailed help** link.



You also can access the *LabVIEW Help* by right-clicking a VI or function on the block diagram or on a pinned palette and selecting **Help** from the shortcut menu or by selecting **Help » Search the LabVIEW Help**.

- b. Click the **Search** tab, enter *sample compression* in the **Type in the word(s) to search for** search for combo box, and press the <Enter> key. This word choice reflects what you want this Express VI to do—compress, or reduce, the number of samples in a signal.



Title	Location	Rank
Interactive Alignment	SignalExpress ...	1
Sample Compression	Reference	2
Front Panel Controls and...	Concept	3
NI PCI-6221 Supported ...	LabVIEW Help	4
DAQmx Channel Properti...	NI-DAQmx Pro...	5
Get XY Value	Reference	6
NI PCI-6221 Supported ...	LabVIEW Help	7

- c. Double-click the **Sample Compression** topic in the search results to display the topic that describes the Sample Compression Express VI.

- d. After you read the description of the Express VI, click the **Place on the block diagram** button to place the Express VI on the cursor.

**Sample Compression**

Acquires a large number of data points and **compresses** the data points into a smaller number of points.

Example

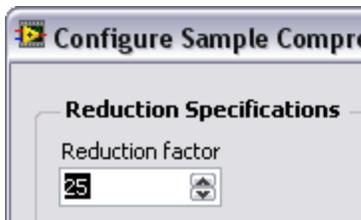
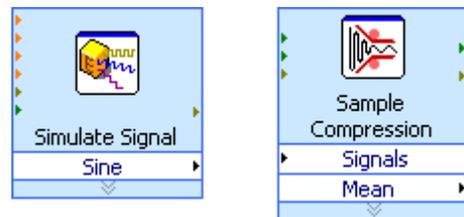
Dialog Box Options

Block Diagram Inputs

Block Diagram Outputs

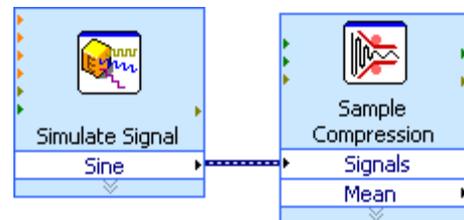
Place on the block diagram  Find on the **Functions** palette

- e. Move the cursor to the block diagram.
- f. Place the Sample Compression Express VI on the block diagram to the right of the Simulate Signal Express VI.



- g. Configure the Sample Compression Express VI to reduce the signal by a factor of 25 using the mean of these values.
- h. Click the **OK** button to save the current configuration and close the **Configure Sample Compression** dialog box.

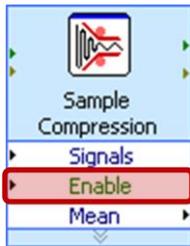
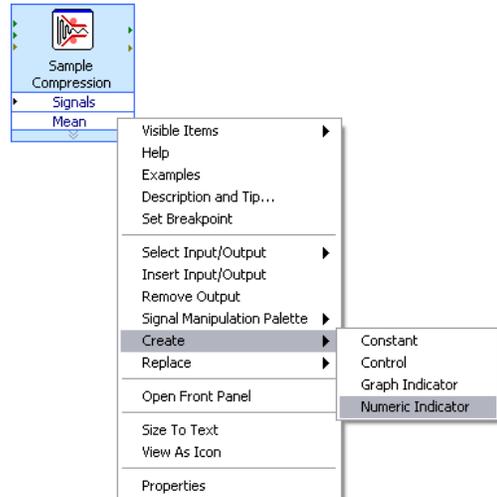
- i. Use the Wiring tool to wire the **Sine** output of the Simulate Signal Express VI to the **Signals** input of the Sample Compression Express VI.



## 4. Customizing a User Interface from the Block Diagram

In the previous exercises, you added controls and indicators to the front panel using the **Controls** palette. You also can create controls and indicators from the block diagram. Complete the following steps to create controls and indicators from the block diagram:

- a. On the block diagram, right-click the **Mean** output of the Sample Compression Express VI and select **Create » Numeric Indicator** from the shortcut menu to create a numeric indicator. A **Mean** indicator appears on the block diagram.



- b. Right-click the **Enable** input of the Sample Compression Express VI and select **Insert Input/Output** from the shortcut menu to insert the **Enable** input.



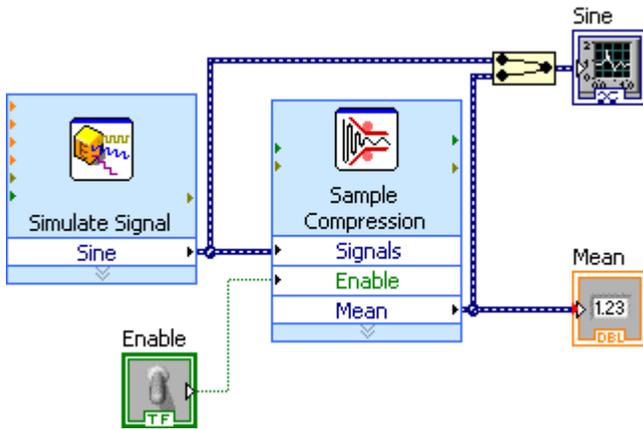
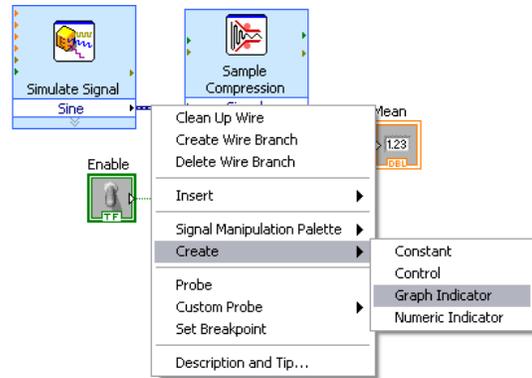
In a previous exercise you learned to add inputs and outputs by expanding the Express VI using the down arrows. Using the shortcut menu is a different way of displaying and selecting the inputs and outputs of an Express VI.

- c. Right-click the **Enable** input and select **Create » Control** from the shortcut menu to create a switch. A Boolean control appears on the block diagram.



Control terminals have a thicker border than indicator terminals. Also, an arrow appears on the right of the terminal if the terminal is a control, and an arrow appears on the left of the terminal if the terminal is an indicator.

- d. Right-click the wire that connects the **Sine** output of the Simulate Signal Express VI to the **Signals** input of the Sample Compression Express VI and select **Create » Graph** **Indicator** from the shortcut menu.



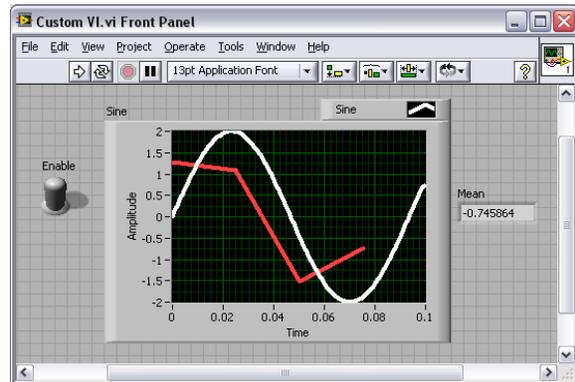
- e. Use the Wiring tool to wire the **Mean** output of the Sample Compression Express VI to the **Sine** graph indicator. The Merge Signals function automatically appears.
- f. Arrange the objects on the block diagram as shown.

- g. Display the front panel. The controls and indicators you added appear on the front panel with labels that correspond to the inputs and outputs from which you created.



You might need to scroll or resize the front panel to see all controls and indicators.

- h. Arrange the objects on the front panel as shown and run the VI.
- i. Toggle the **Enable** control and run the VI again. Notice the **Mean** indicator and **Sine** graph update.
- j. Save the VI.



## 5. Configuring a VI to Run Continuously until the User Stops It

In the current state, the VI runs once, generates one signal, then stops running. To run the VI until a condition occurs, you can use a While Loop. Complete the following steps to add a While Loop to the block diagram:

a. Display the front panel and run the VI. The VI runs once and then stops.



b. Display the block diagram.

c. Click the **Search** button on the **Functions** palette



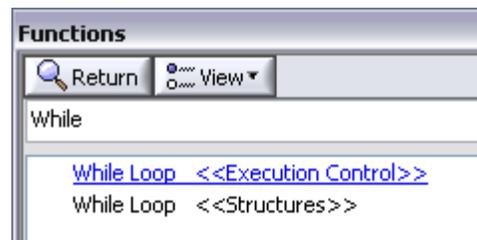
d. Enter *While* in the text box.



LabVIEW searches as you type and displays any matches in the search results text box. LabVIEW displays a folder glyph to the left of subpalettes in the search results and displays a light blue glyph to the left of Express VIs in the search results.

e. Double-click **While Loop <<Execution**

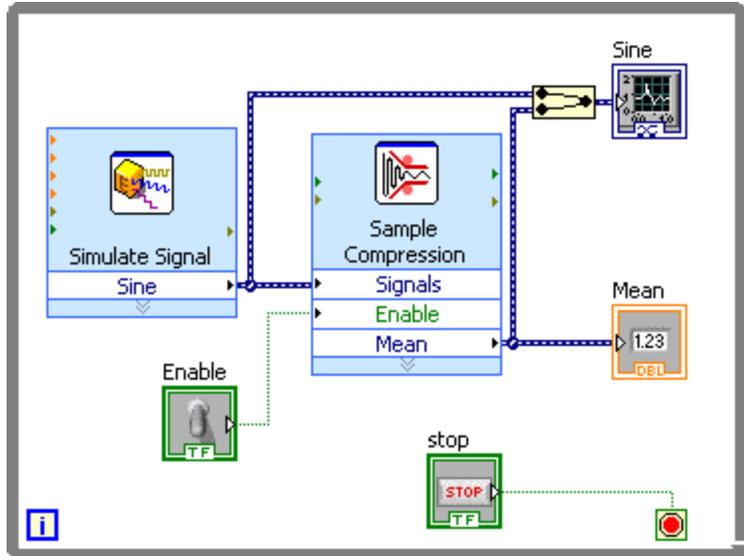
**Control>>** to display the **Execution Control** subpalette and temporarily highlight the While Loop on the subpalette.



f. Select the While Loop on the **Execution Control** palette.

g. Move the cursor to the upper left corner of the block diagram. Click to place the top left corner of the While Loop. Drag the cursor diagonally to enclose all the Express VIs and wires.

- h. Click to create the While Loop around the Express VIs and wires. The While Loop appears with a **STOP** button wired to the conditional terminal. This While Loop is configured to stop when the user clicks the **STOP** button.



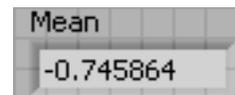
If all of the block diagram objects are not enclosed in the while loop, you can select the objects and move them into the while loop.

- i. Display the front panel and run the VI. The VI now runs until you click the **STOP** button. A While Loop executes the VIs and functions inside the loop until the user clicks the **STOP** button.
- j. Click the **STOP** button and save the VI.

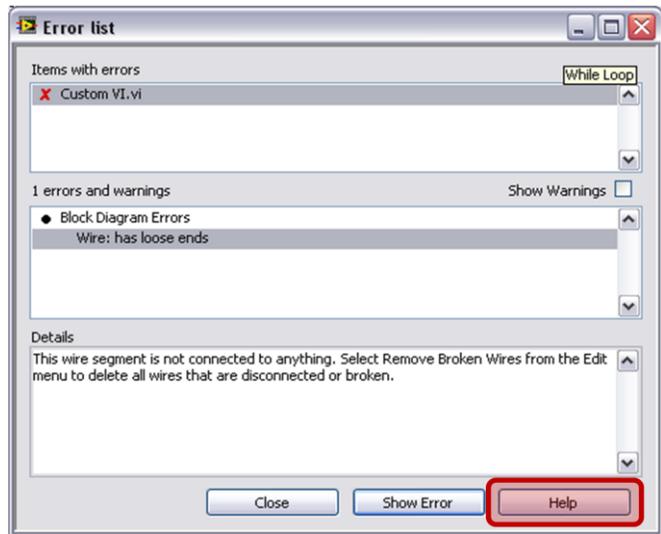
## 6. Using the Error List Window

If a VI contains an indicator you do not want to use, you can delete it. Complete the following steps to remove the **Mean** indicator from the front panel:

- a. On the front panel, move the cursor over the **Mean** indicator until the Positioning tool appears.
- b. Click the **Mean** indicator to select it and press the <Delete> key.
- c. Display the block diagram.
- d. A wire appears as a dashed black line with a red **X** in the middle. The dashed black line is a broken wire. The **Run** button appears broken to indicate the VI cannot run.



- e. Click the broken **Run** button to display the **Error list** window. The **Error list** window lists all errors in the VI and provides details about each error.
- f. In the **errors and warnings** list, select the **Wire: has loose ends** error and click the **Help** button to display more information.



You also can move the Wiring tool over a broken wire to display a tip strip that describes why the wire is broken. This information also appears in the Context Help window when you move the Wiring tool over a broken wire.

- g. In the **errors and warnings** list, double-click the **Wire: has loose ends** error to highlight the broken wire.
- h. Press the <Ctrl-B> keys to delete the broken wire. Pressing the <CTRL-B> keys deletes all broken wires on the block diagram.



You can press the <Delete> key to delete only the selected wire.

- i. Select **View » Error List** to display the **Error list** window. No errors appear in the **errors and warnings** field.



You also can press the <Ctrl-L> keys to display the **Error list** window.

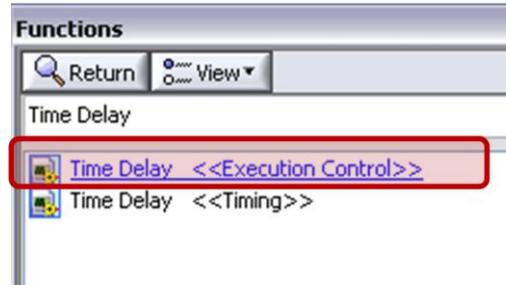
- j. Click the **Close** button to close the **Error list** window. The **Run** button no longer appears broken.



## 7. Controlling the Speed of Execution

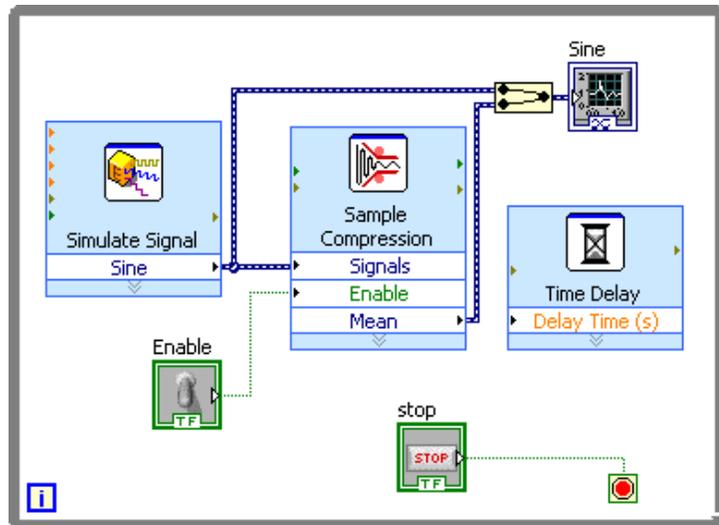
To plot the points on the waveform graph more slowly, you can add a time delay to the block diagram. Complete the following steps to control the speed at which the VI runs:

- a. On the block diagram, search for the Time Delay Express VI on the **Functions** palette and place it inside the While Loop. You can use the Time Delay Express VI to control the execution rate of the VI.



- b. Enter 0.25 in the **Time delay (seconds)** text box. This time delay specifies how fast the loop runs. With a 0.25 second time delay, the loop iterates once every quarter of a second.

- c. Click the **OK** button to save the configuration and close the **Configure Time Delay** dialog box.
- d. Display the front panel and run the VI.
- e. Click the **Enable** switch and examine the change on the graph.



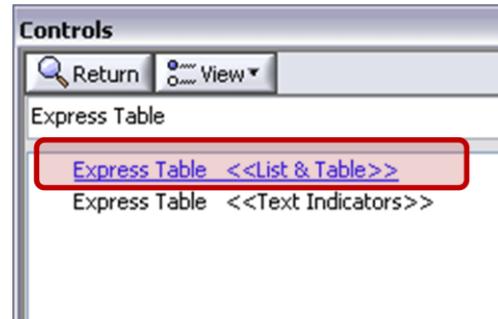
If the Enable switch is on, the graph displays the reduced signal. If the Enable switch is off, the graph does not display the reduced signal.

- f. Click the **STOP** button to stop the VI.

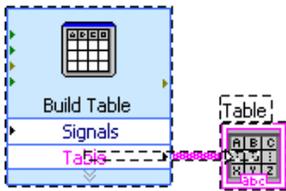
## 8. Using a Table to Display Data

Complete the following steps to display a collection of mean values in front panel table:

- a. On the front panel, search for the **Express Table** indicator on the **Controls** palette and place it on the front panel.
- b. Display the block diagram. LabVIEW wired the **Table** terminal to the Build Table Express VI.



- c. If the Build Table Express VI and the **Table** terminal are not selected already, click an open area on the block diagram to the left of the Build Table Express VI.
  - d. Drag the cursor diagonally until the selection rectangle encloses the Build Table Express VI and the **Table** terminal. A moving dashed outline highlights the Build Table Express VI, the **Table** terminal, and the wire joining the two.
  - e. Drag the objects into the While Loop to the right of the Sample Compression Express VI.



When you place an object in a While Loop near the border, the loop resizes to add space for that object.

- f. Wire the **Mean** output of the Sample Compression Express VI to the **Signals** input of the Build Table Express VI.
- g. Display the front panel and run the VI.
- h. If the **Enable** switch is on, the table displays the mean values of every 25 samples of the sine wave. If the **Enable** switch is off, the table does not record the mean values.
- i. Stop the VI.
- j. Experiment with properties of the table by using the **Table Properties** dialog box.



The **Table Properties** dialog box can be accessed if you right-click the table and select **Properties** from the drop-down menu.

- k. Save and close the VI.