

# Walkthrough: Creating a Measurement Studio Application with Windows Forms Controls and Analysis



**Note** To complete this walkthrough, you must have either the Measurement Studio Professional or Measurement Studio Enterprise package installed for Visual Studio 2005 or later. This walkthrough will not work with the Measurement Studio Standard package.

Measurement Studio includes user interface controls, such as a waveform graph control and a gauge control, and analysis functionality, such as signal generation and mathematical functions. This walkthrough is designed to help you learn how to add analysis and presentation functionality to a Windows Forms application by taking you through the following steps:

- **Setting up the project**—Using the Measurement Studio Application Wizard, you will create a new project that references the Measurement Studio Analysis class library and Windows Forms controls.
- **Adding user interface controls to the project**—Using the Toolbox, smart tags, and the Properties window, you will add and configure a button, waveform graph, legend, gauge, and numeric edit user interface control.
- **Generating, plotting, and analyzing the data**—Using `NationalInstruments.Analysis.SignalGeneration.WhiteNoiseSignal` and `NationalInstruments.Analysis.Math.Statistics.Mean`, you will generate data, plot the generated data on a waveform graph, and calculate the mean of the data.
- **Customizing the user interface**—Using smart tags and the Collection Editor and Auto Format dialog boxes, you will display the mean value on the gauge and the numeric edit, as well as customize your user interface.

# Before You Begin

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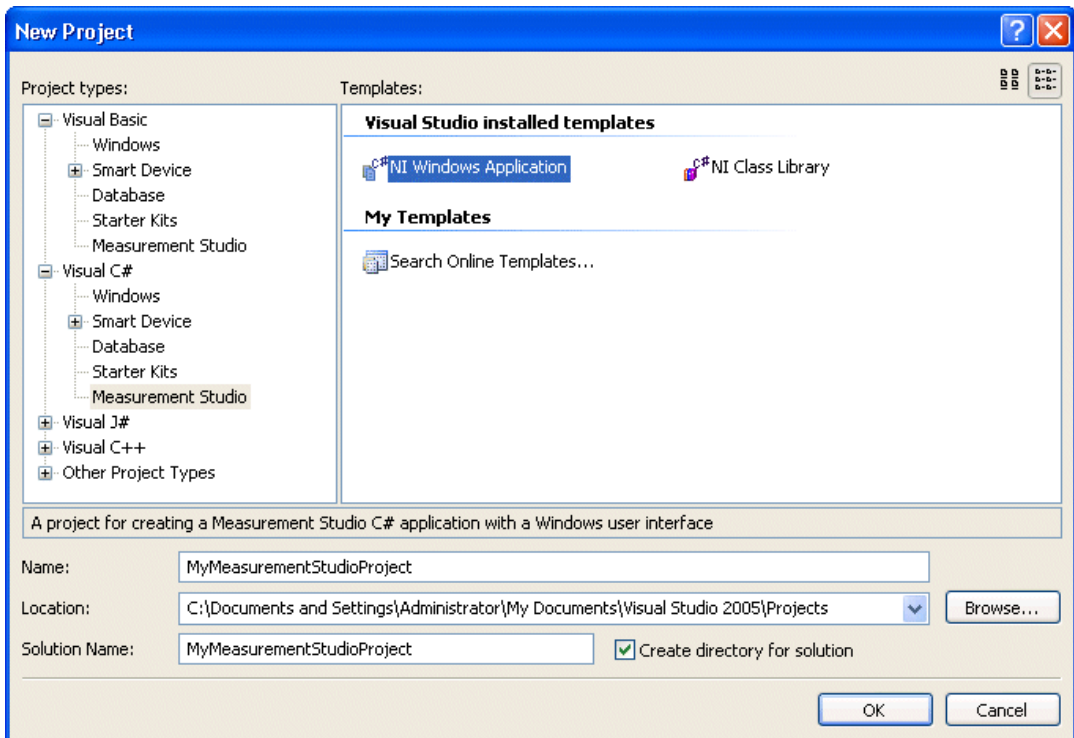
The following components are required to complete this walkthrough:

- Microsoft Visual Studio 2005 or Visual Studio 2008
- Measurement Studio 8.0.1 or later (Professional or Enterprise package) for Visual Studio 2005 or Measurement Studio 8.5 or later (Professional or Enterprise package) for Visual Studio 2008

## Setting Up the Project

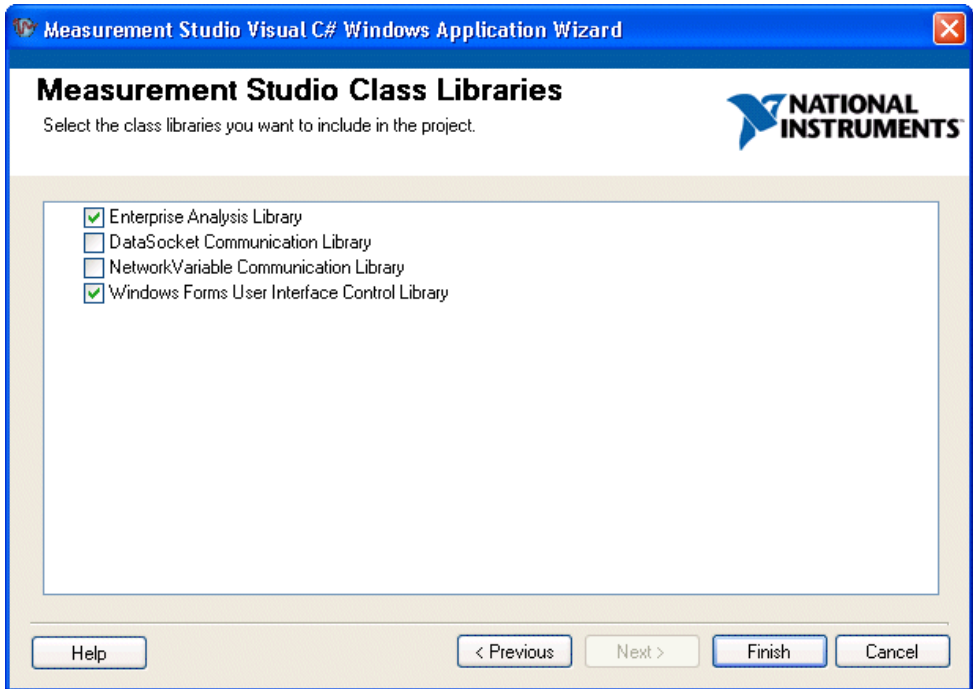
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1. Select **Start»All Programs»Microsoft Visual Studio 2005»Microsoft Visual Studio 2005** or **Start»All Programs»Microsoft Visual Studio 2008»Microsoft Visual Studio 2008**.
2. Select **File»New»Project**. The New Project dialog box launches.



3. In the Project Types pane, select **Measurement Studio** under Visual C# or Visual Basic, depending on which language you want to create the project in.

4. In the Templates pane, select **NI Windows Application**. Specify `MyMeasurementStudioProject` for **Name** and specify a **Location** of your choice.
5. Click **OK**. The Measurement Studio Application Wizard launches.
6. Select **Analysis Library** and **Windows Forms User Interface Control Library**.



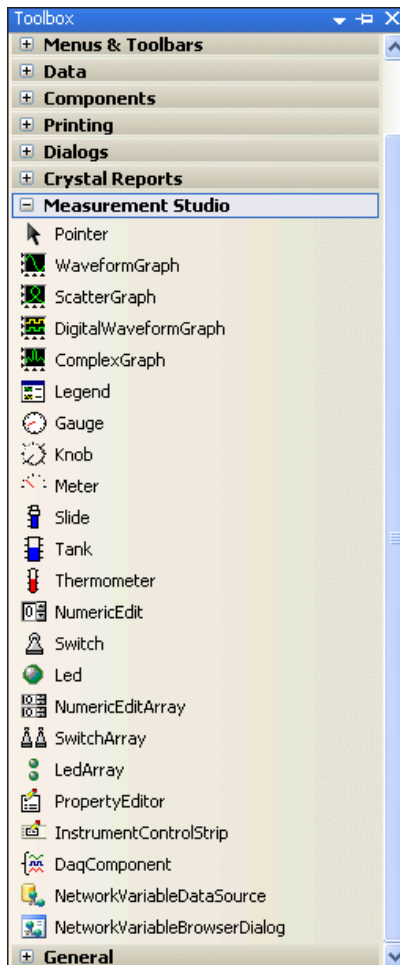
**Tip** If you are working with an existing project, you can access the Add/Remove Class Libraries dialog box by selecting **Measurement Studio»View .NET Class Library Wizard**.

7. Click **Finish** to display `Form1` in the Windows Forms Designer.

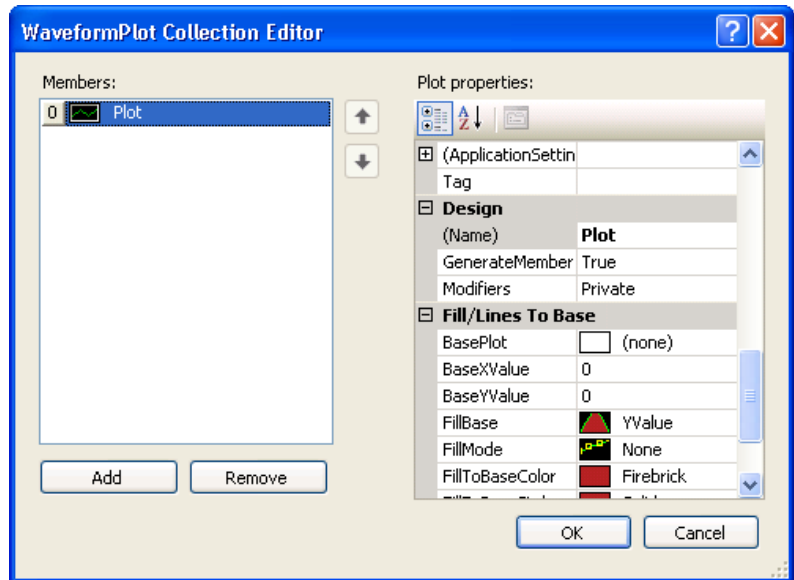
# Adding User Interface Controls to the Project

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1. Select **View»Toolbox** to display the Toolbox. The Toolbox contains components and controls that you can add to your project.
2. Expand the **All Windows Forms** group. The All Windows Forms group contains controls and components included in the `System.Windows.Forms` namespace.
3. Select the **Button** control and drag and drop it onto the form.
4. Right-click the button and select **Properties** to display the Properties window. You configure the properties of the control in the Properties window.
5. The Text property will be highlighted. Type `Start` for the button text.
6. Expand the **Measurement Studio** group in the Toolbox.



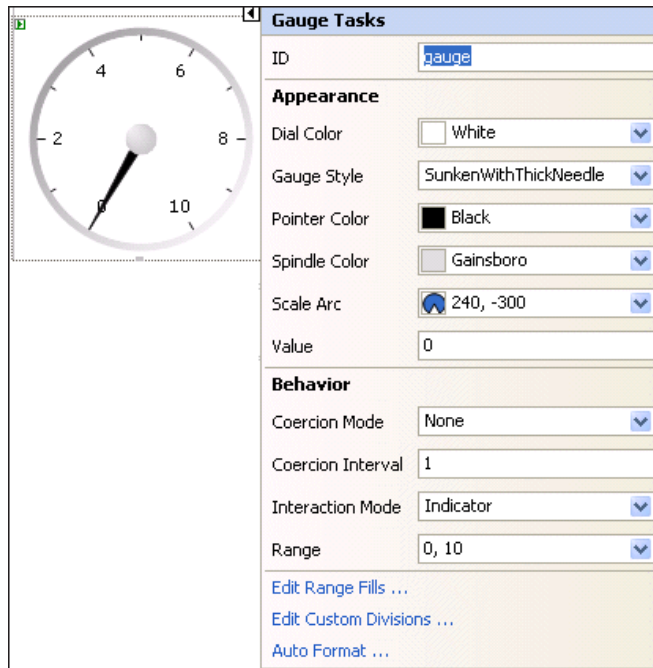
7. Select the **WaveformGraph** control and drag and drop it onto the form.
8. Right-click the waveform graph and select **Edit Plots** to display the WaveformPlot Collection Editor dialog box. You use the WaveformPlotCollection Editor dialog box to add or remove plots and to configure plot properties.



**Note** You can also access the WaveformPlot Collection Editor dialog box by clicking the waveform graph smart tag. To access the smart tag, left click on the control to select it and then left click on the arrow button in the upper right corner of the control.

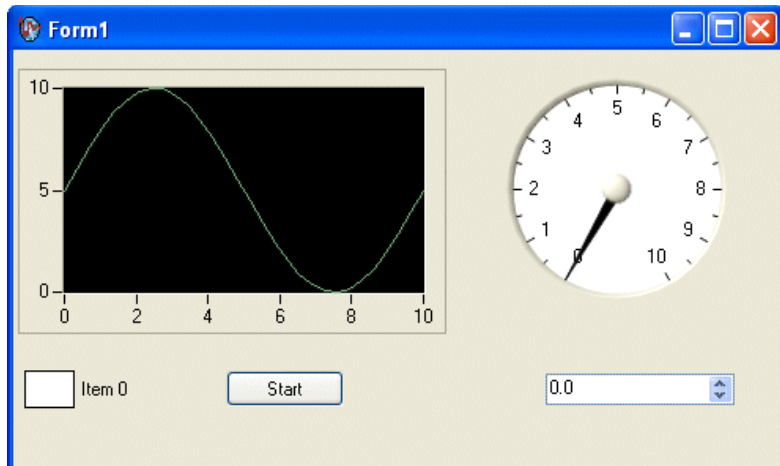
9. Type `Plot` for the Name. Click **OK**.
10. Before you add the Measurement Studio legend, numeric edit, and gauge controls, you need to resize the form to accommodate them. Select the form and use the double-sided arrow to resize it.
11. Select the **Legend** control and drag and drop it onto the form.
12. Select the **NumericEdit** control and drag and drop it onto the form.
13. Select the **Gauge** control and drag and drop it onto the form.

14. Click the gauge smart tag to display the Gauge Tasks.



15. Type gauge for the name of the gauge.

The following screenshot shows Form1 with the user controls.



# Generating, Plotting, and Analyzing the Data

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1. Double-click the button control to display the `Form1` code, with the cursor inside the click event handler of the button control.
2. Add the following code to generate random data, plot the data, calculate the mean of the data, and display the mean on the gauge.

[VB.NET]

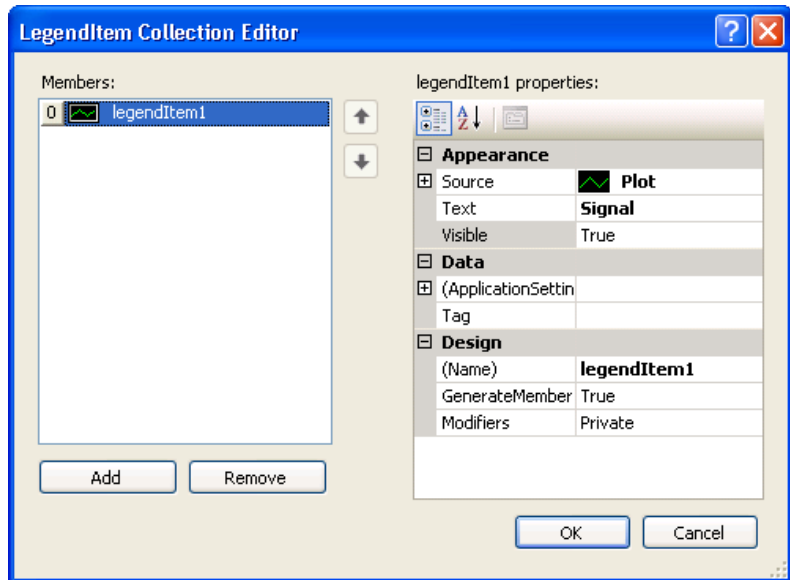
```
' Declare and initialize an instance of WhiteNoiseSignal.
Dim whiteNoise As New WhiteNoiseSignal()
' Store the generated data in a double array named data.
Dim data As Double() = whiteNoise.Generate(1000.0, 256)
' Use the PlotY method to plot the data.
Plot.PlotY(data)
' Use the Mean method to calculate the mean of the data.
Dim mean As Double = Statistics.Mean(data)
' Display the mean on the gauge.
gauge.Value = mean
```

[C#]

```
// Declare and initialize an instance of WhiteNoiseSignal.
WhiteNoiseSignal whiteNoise = new WhiteNoiseSignal();
// Store the generated data in a double array named data.
double[] data = whiteNoise.Generate(1000.0, 256);
// Use the PlotY method to plot the data.
Plot.PlotY(data);
// Use the Mean method to calculate the mean of the data.
double mean = Statistics.Mean(data);
// Display the mean on the gauge.
gauge.Value = mean;
```

# Customizing Your User Interface

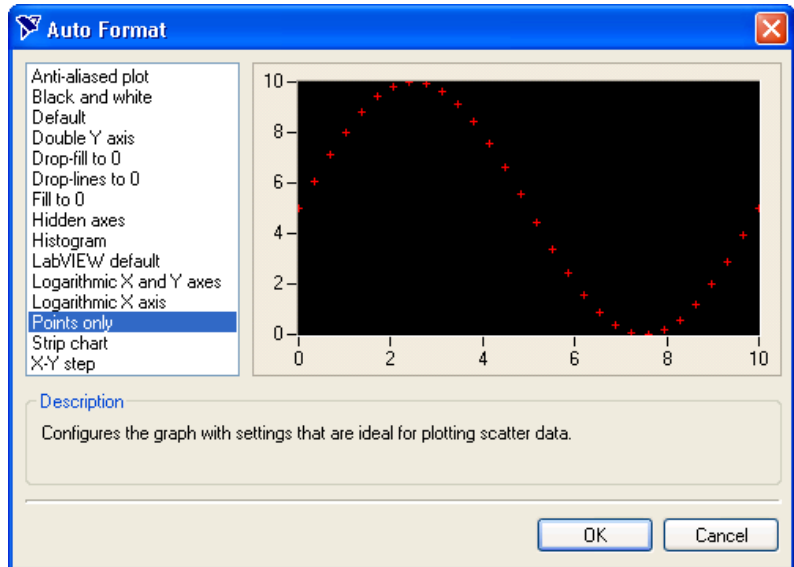
1. Right-click the legend and select **Edit Items** to display the LegendItem Collection Editor dialog box. You use the LegendItem Collection Editor dialog box to add or remove legend items and to configure legend item properties.



2. Select **Plot** in the **Source** drop-down list and enter `Signal` in the **Text** box. Click **OK**. Now that you have specified a legend item for the plot, changes you make to the plot will be reflected on the legend.
3. Right-click the graph and select **Auto Format** to display the Auto Format dialog box. The Auto Format dialog box provides a set of pre-configured control styles. When you select a style and click **OK**, the Auto Format feature configures the appropriate control properties to reflect the style you chose.

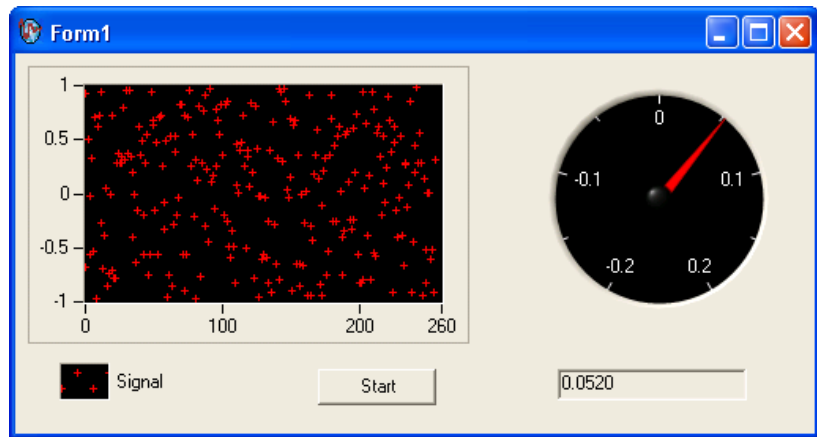


4. Select **Points Only**. Click **OK**. Notice that the legend changed automatically to match the formatting of the graph.



5. Click the gauge smart tag to display the Gauge Tasks.
6. Select **Auto Format** to display the Auto Format dialog box.
7. Select **Dark** and click **OK**.
8. Right-click the gauge and select **Properties** to display the Properties window.
9. Set the Range property for the gauge with the drop-down Range type editor. Type  $-0.2$  for the minimum value and type  $0.2$  for the maximum value.
10. Click the numeric edit smart tag to display the Numeric Edit Tasks.
11. Select **Gauge** in the **Source** drop-down list. Setting the Source property to the gauge allows two-way binding between the controls.
12. Deselect **ArrowKeys**, **Buttons**, and **Text** for the **InteractionMode** property of the numeric edit control. Deselecting these interaction modes makes the numeric edit an indicator. The numeric edit control only displays the calculated mean.
13. Select the Format Mode property and in the Numeric Edit Format Mode Editor dialog box, change the Precision to 4 to show four decimal places of precision.
14. Select **File»Save Form1.cs** to save your application.
15. Select **Debug»Start Without Debugging** to run the application.

16. After your program builds, click **Start**. Notice the graph shows the data plot, and the gauge and the numeric edit display the mean of the data.



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