

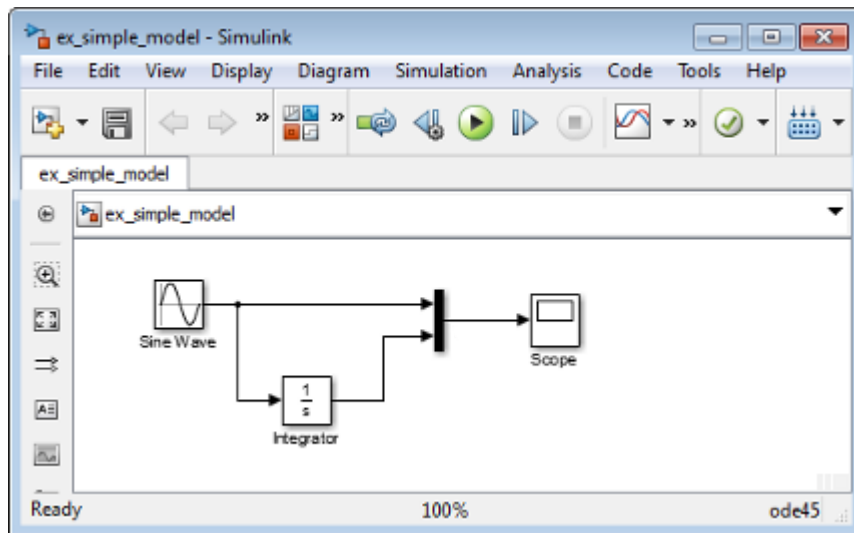
Create Simple Model

Model Overview for This Tutorial

You can use Simulink® to model a system and then simulate the dynamic behavior of that system. The basic techniques you use to create the simple model in this tutorial are the same techniques that you use for more complex models.

To create this simple model, you need four Simulink blocks. Blocks are the model elements that define the mathematics of a system and provide input signals:

- Sine Wave — Generate an input signal for the model.
- Integrator — Process the input signal.
- Bus Creator — Combine multiple signals into one signal.
- Scope — Visualize and compare the input signal with the output signal.



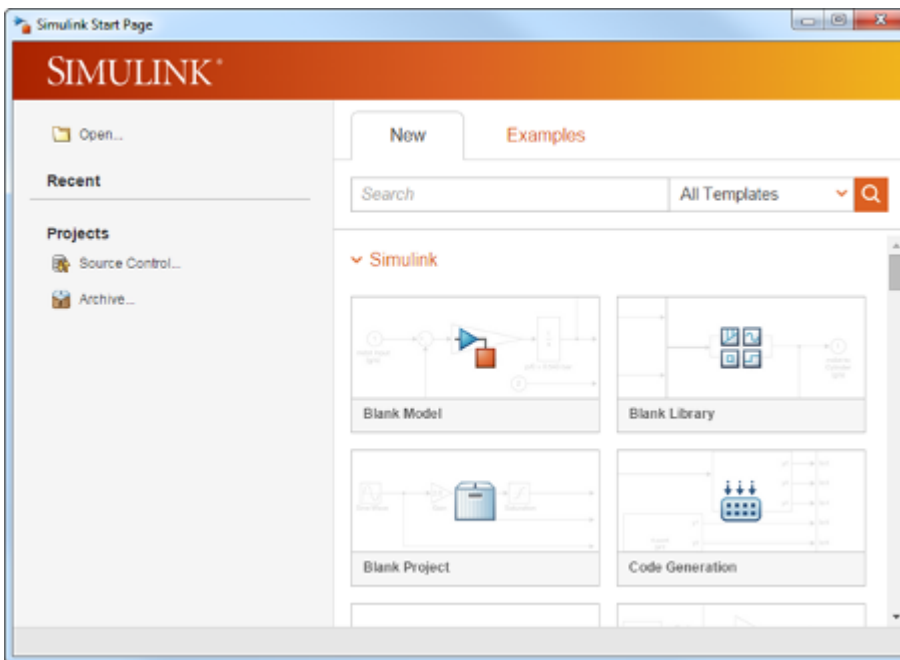
Simulating this model integrates a sine wave signal to a cosine signal and then displays the result, along with the original signal, in a Scope window.

Open New Model in Simulink Editor

Use the Simulink Editor to build your models.

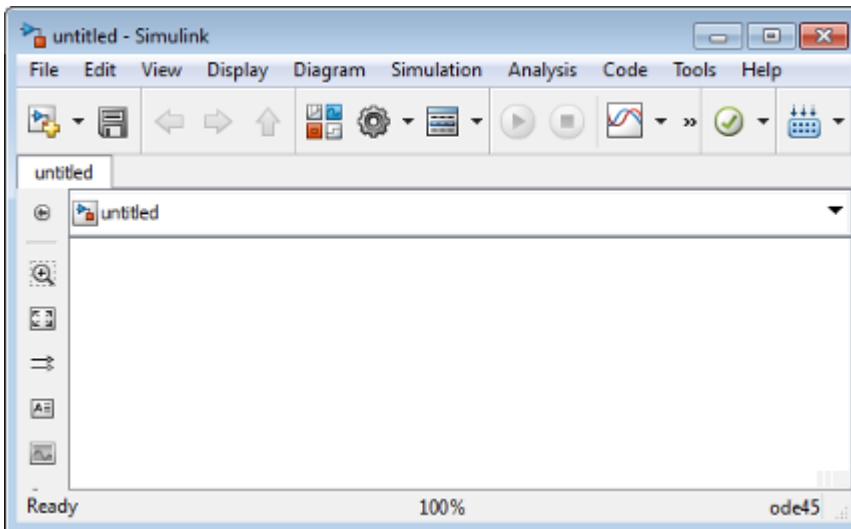
1. Start MATLAB®. From the MATLAB Toolstrip, click the **Simulink** button .

A short delay occurs the first time you open Simulink.



2. Click the **Blank Model** template, and then click the **Create Model** button.

The Simulink Editor opens with a new block diagram.

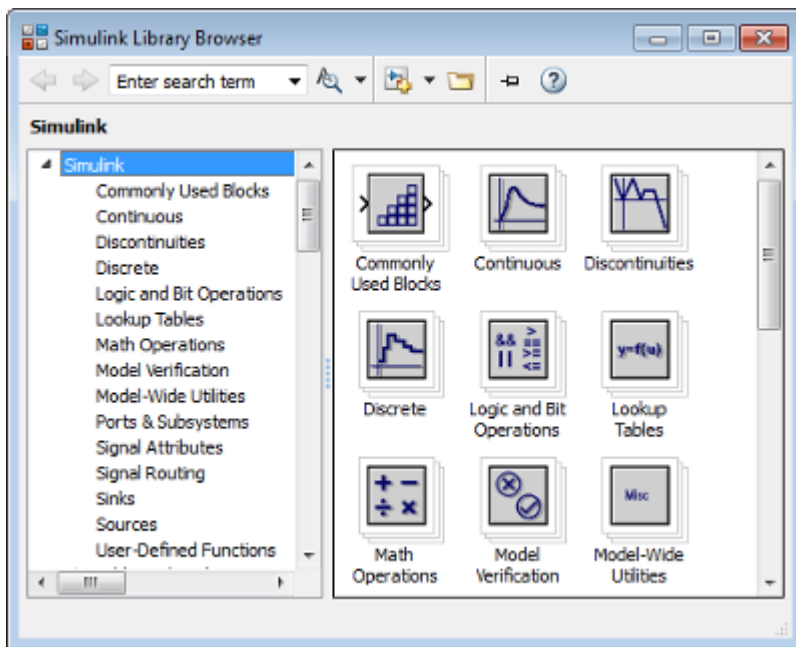



3. Select **File > Save as**. In the **File name** text box, enter a name for your model, For example, `simple_model`. Click **Save**. The model is saved with the file extension `.slx`.

Open Simulink Library Browser

From the Simulink Library Browser you can search for blocks to use in your model. Also, you can create a new Simulink model, project, or Stateflow[®] chart.

1. From the Simulink Editor toolbar, click the **Simulink Library** button .

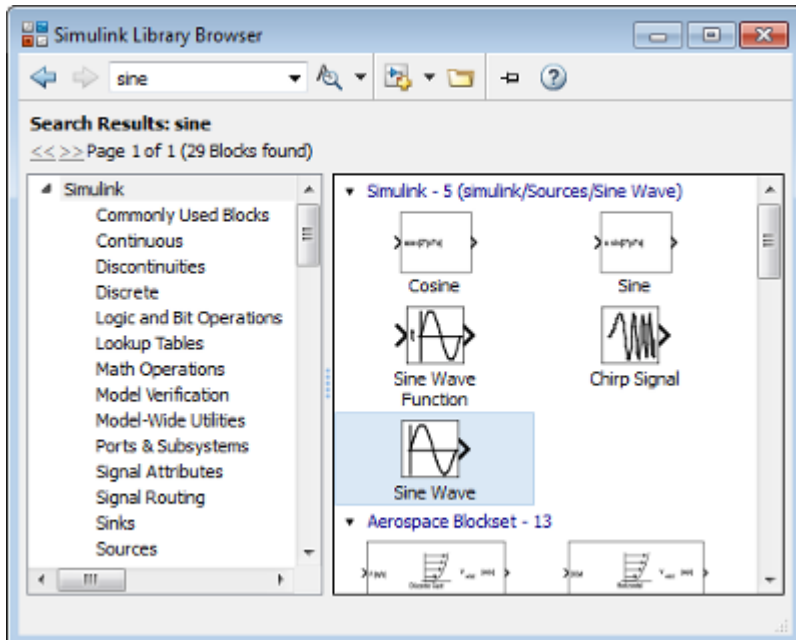


2. Set the Library Browser to stay on top of the other desktop windows. On the Library Browser toolbar, select the **Stay on top** button .

Browse or Search for Specific Blocks

To browse through the block libraries, select a MathWorks® product and then a functional area in the left pane. To search all of the available block libraries, enter a search term.

1. Search for a Sine Wave block. In the search box on the browser toolbar, enter `sine`, and then press the Enter key. Simulink searches the libraries for blocks with `sine` in their name or description, and then displays the blocks.



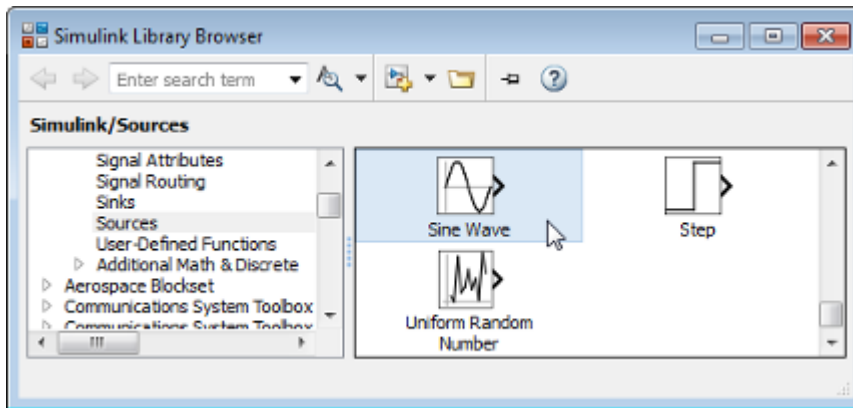
2. Get detailed information about a block. Right-click a block, and then select **Help for the <block name>**. The Help browser opens with the reference page for the block.
3. View block parameters. Right-click a block, and then select **Block Parameters**. The block parameters dialog box opens.

Add Blocks to Model

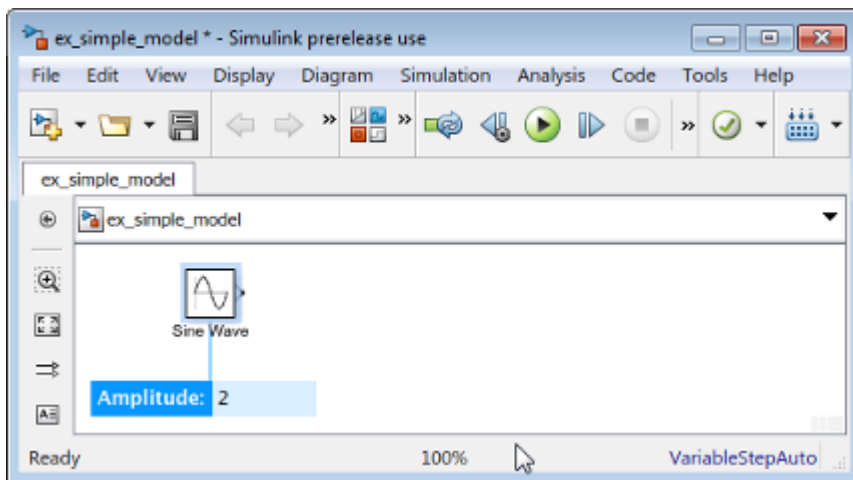
You build models by dragging blocks from the Simulink Library Browser window to the Simulink Editor or single-clicking your model and entering a search term.

To build the simple model, begin by copying blocks from the Simulink Library Browser to the Simulink Editor.

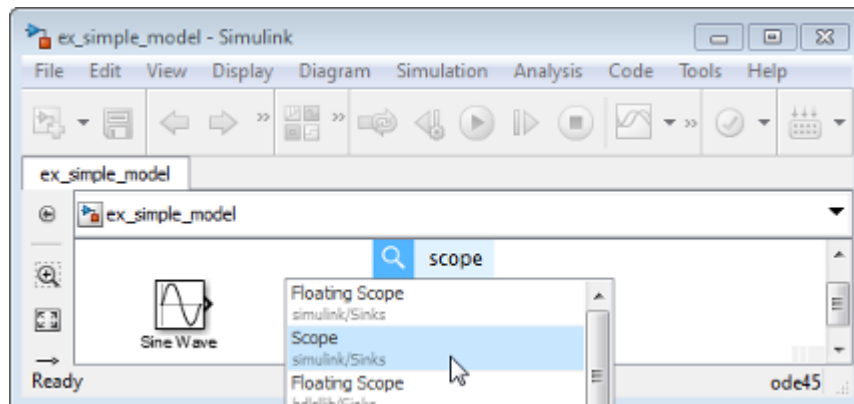
1. In the left pane of Simulink Library Browser, select the Sources library.
2. From the right pane, select the Sine Wave block.



3. Drag the Sine Wave block to the Simulink Editor. A copy of the Sine Wave block appears in your model with a text box for entering the value of the **Amplitude** parameter. In the text box enter 2.



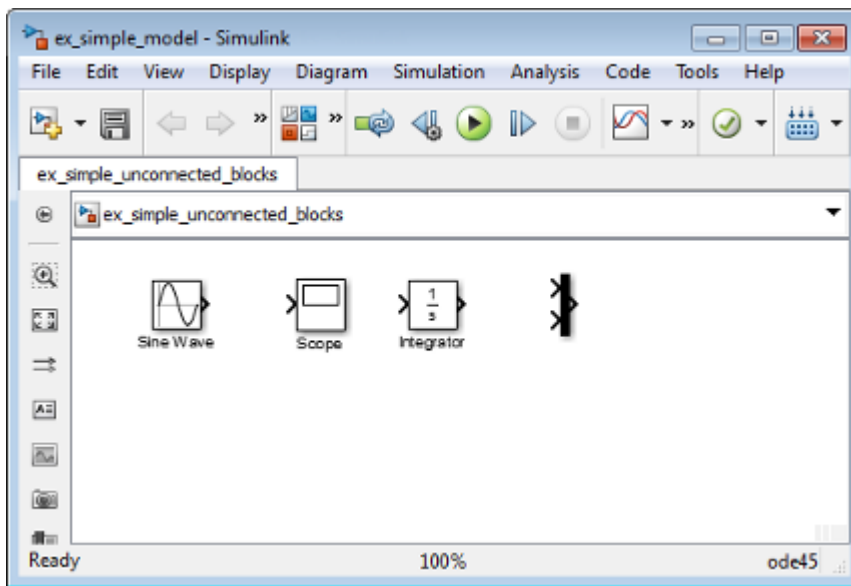
4. Add a Scope block using this alternative procedure:
 - a. Click within the block diagram.
 - b. After the search icon appears, type scope, and then from the list, select Scope from the Simulink/Sinks library.



5. Add the following blocks to your model using one of the approaches you used to add the Sine Wave and Scope blocks.

Library	Block
Simulink/Continuous	Integrator
Simulink/Signal Routing	Bus Creator

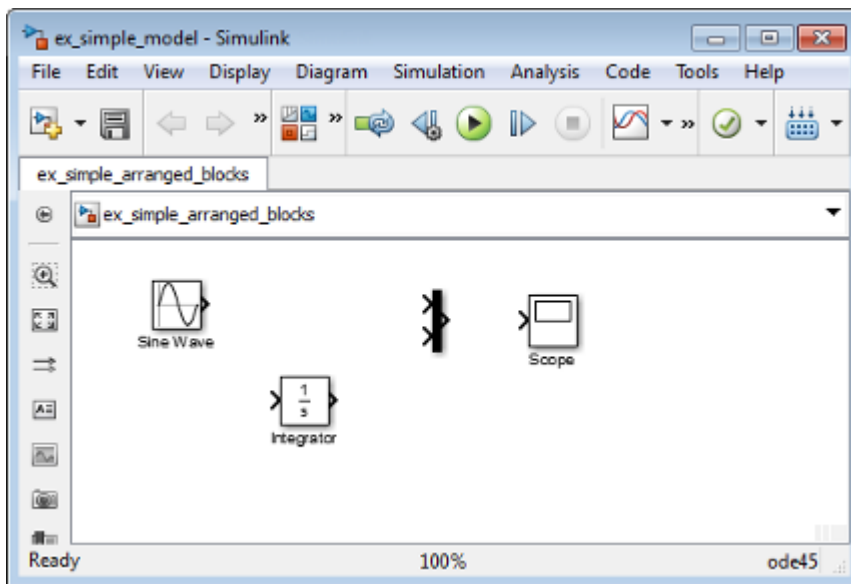
Your model should now have the blocks you need for the simple model.



Move and Resize Blocks

Before you connect the blocks in your model, arrange the block inputs and outputs to make signal connections as straightforward as possible.

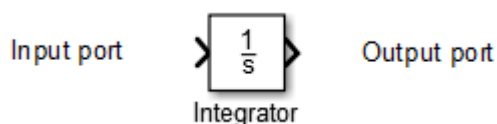
1. Move the Scope block after the Bus Creator block output. You can either:
 - Click and drag the block.
 - Select the block, and then press the arrow keys on your keyboard.
2. Move the blocks until your model looks similar to the following figure.



Block Connections

Most blocks have angle brackets on one or both sides. These angle brackets represent input and output ports:

- The > symbol pointing into a block is an *input port*.
- The > symbol pointing out of a block is an *output port*.



You connect block output ports to input ports with lines. The lines represent signals with time-varying values.

Draw Signal Lines Between Blocks

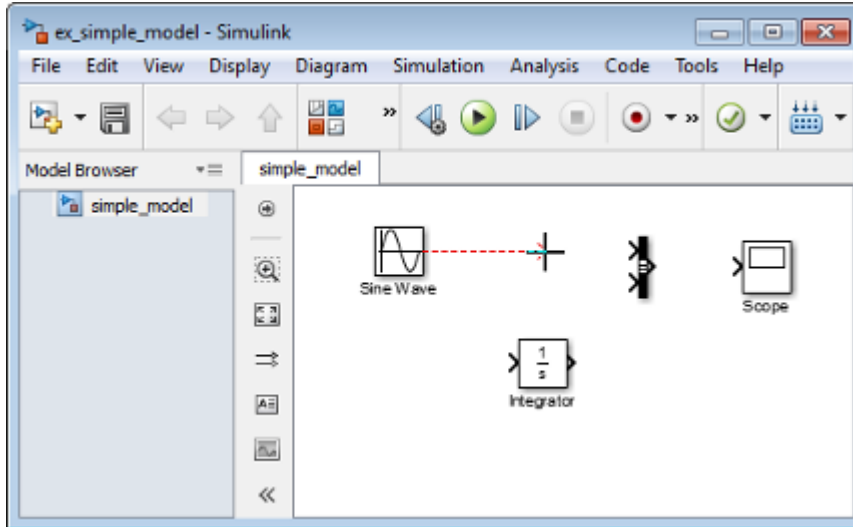
Connect the blocks by drawing lines between output ports and input ports.

1. Position the cursor over the output port on the right side of the Sine Wave block.

The pointer changes to a cross hair (+).

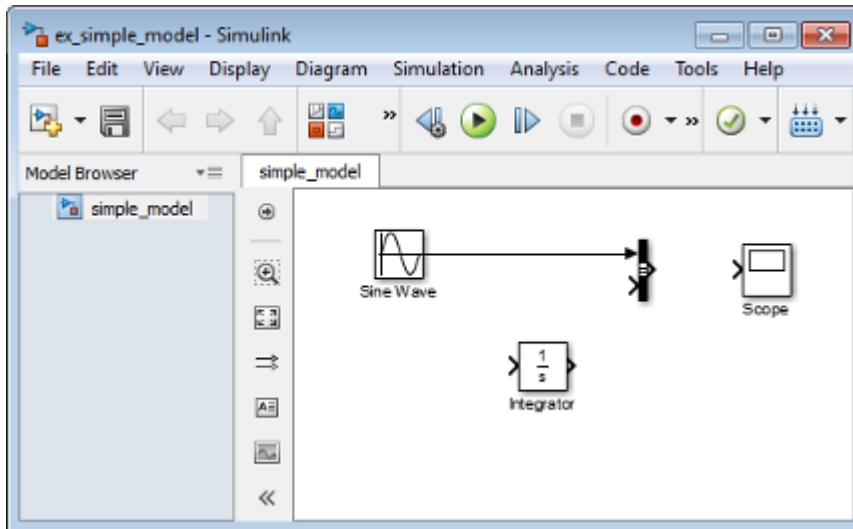
2. Click, and then drag a line from the output port to the top input port of the Bus Creator block.

While holding down the mouse button, the connecting line appears as a red dotted arrow.



3. Release the mouse button when the pointer is over the output port.

Simulink connects the blocks with a line and an arrow indicating the direction of signal flow.

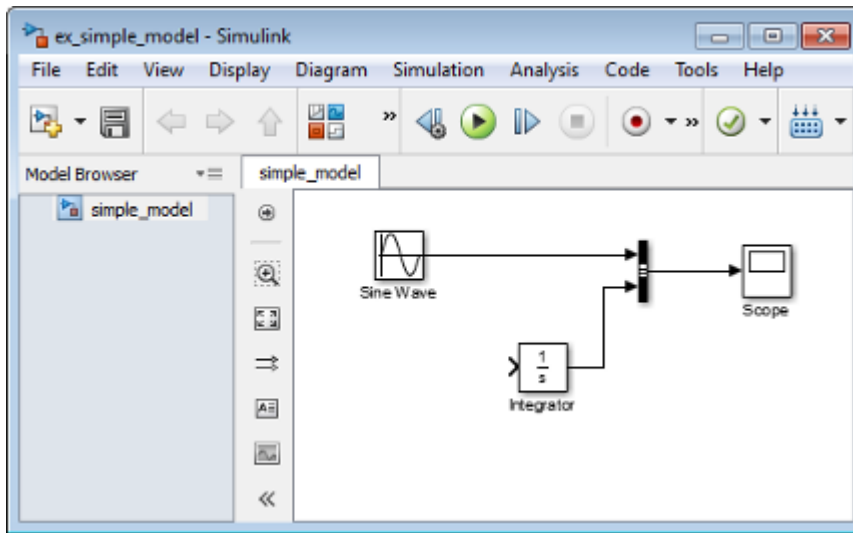


4. Connect the output port of the Integrator block to the bottom input port on the Bus Creator block using a **Ctrl** key shortcut:

- a. Select the Integrator block.
- b. Press and hold the **Ctrl** key.
- c. Click the Bus Creator block.

The Integrator block connects to the Bus Creator block with a signal line.

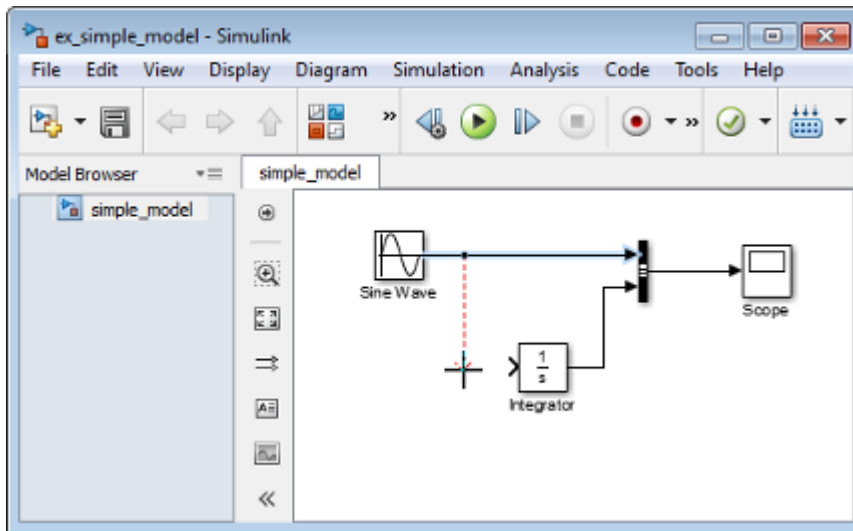
5. Click and drag the output port from the Bus Creator block to the Scope block.



Draw Branched Signal Lines

Your simple model is almost complete. To finish the model, connect the Sine Wave block to the Integrator block. This connection is different from the other connections, which all connect output ports to input ports.

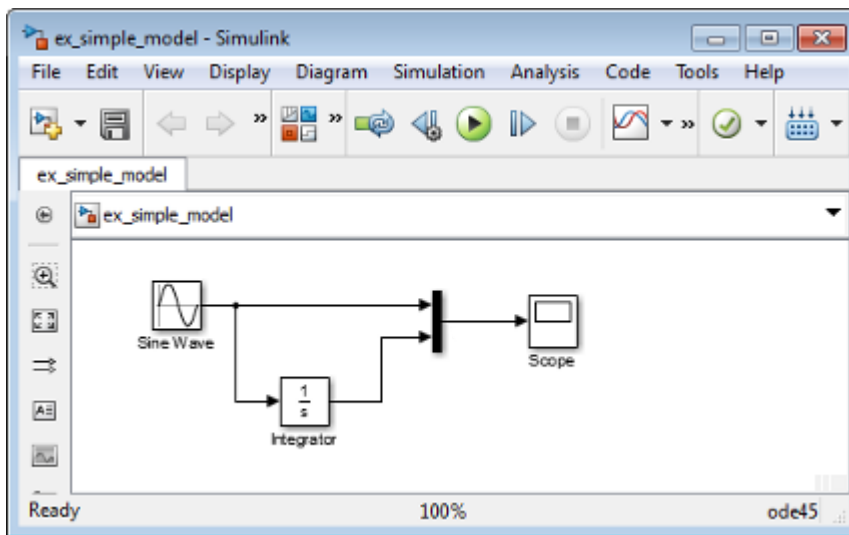
1. Position the cursor where you want to start a branch line. In this example, position the cursor over the signal line between the Sine Wave and Bus Creator blocks.
2. Right-click and drag the cursor away from the line to form a dotted line segment.



3. Continue to drag the cursor to the Integrator input port, and then release the mouse button.

The new line, called a *branch line*, carries the same signal that passes from the Sine Wave block to the Bus Creator block.

4. Drag line segments to straighten and align with blocks. Your model is now complete.



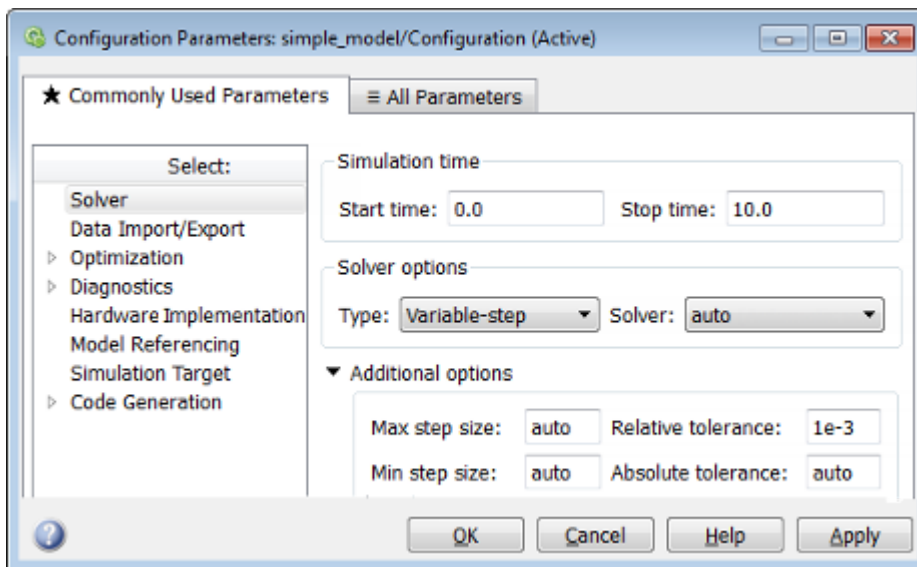
Define Configuration Parameters

Before you simulate the behavior of your model, you can modify the default values for the configuration parameters. The configuration parameters include the type of numerical solver, start time, stop time, and maximum step size.

1. From the Simulink Editor menu, select **Simulation > Model Configuration Parameters**. The Configuration Parameters dialog box opens to the **Solver** pane.

Tip: Alternatively, you can open the Model Configuration Parameters dialog box by clicking the parameters button  on the Simulink Editor toolbar.

2. In the **Stop time** field, enter 20. With the **Solver** parameter set to auto, Simulink determines the best numerical solver for simulating your model.
3. Select **Additional options**. In the **Max step size** field, enter 0.2.



4. Click **Apply** or **OK**.

Run Simulation

After you define the configuration parameters, you are ready to simulate your model.

1. From the Simulink Editor menu bar, select **Simulation > Run**.

The simulation runs, and then stops when it reaches the stop time specified in the Model Configuration Parameters dialog box.

Tip: Alternatively, you can control a simulation by clicking the **Run** simulation button



and **Pause** simulation button

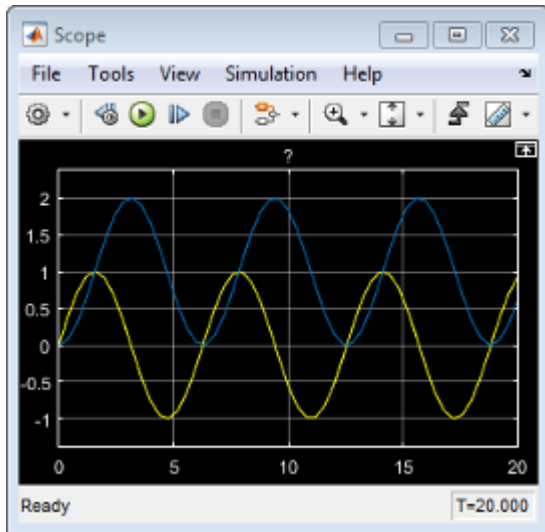


Observe Simulation Results

After simulating a model, you can view the simulation results in a Scope window.

1. Double-click the Scope block.

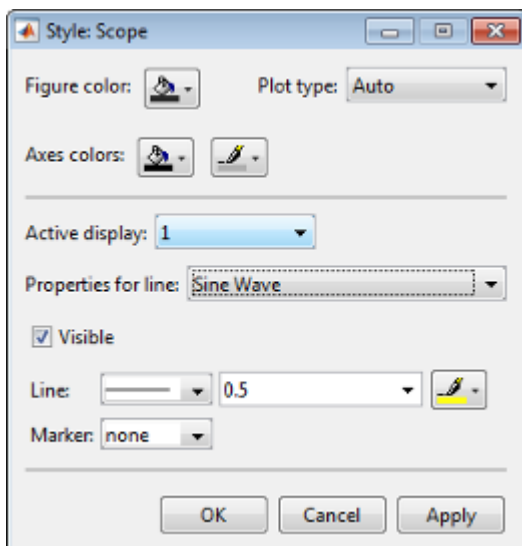
The Scope window opens and displays the simulation results. The plot shows a sine wave signal with the resulting cosine wave signal.



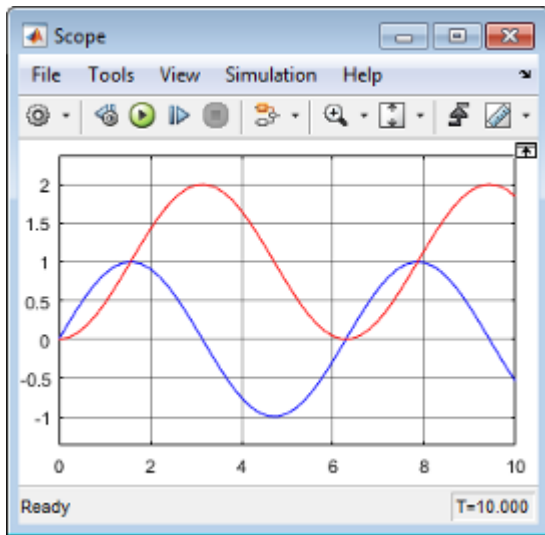
2. On the Scope window toolbar, click the **Style** button.



A Style dialog box opens with display options.



3. Change the appearance of the display. For example, select white for the **Figure color** and **Axes color** background (icons with a pitcher).
4. Select black for the **Axes color** ticks, labels, and grid colors (icon with a paintbrush).
5. Change signal line colors for the Sine Wave to blue and the Integrator to red. To see your changes, click **OK** or **Apply**.



See Also

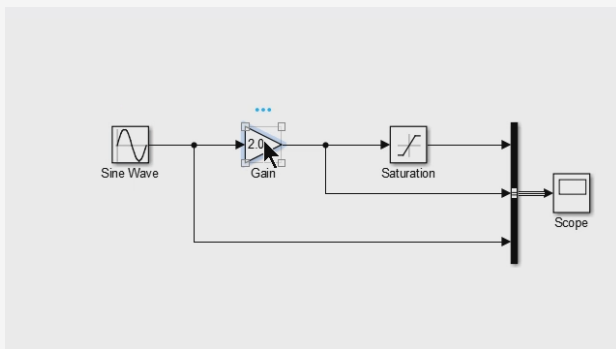
Blocks

[Bus Creator](#) | [Integrator](#) | [Scope](#) | [Sine Wave](#)

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