

# MATLAB - Simulink

Simulink is a simulation and model-based design environment for dynamic and embedded systems, integrated with MATLAB. Simulink, also developed by MathWorks, is a data flow graphical programming language tool for modelling, simulating and analyzing multi-domain dynamic systems. It is basically a graphical block diagramming tool with customizable set of block libraries.

It allows you to incorporate MATLAB algorithms into models as well as export the simulation results into MATLAB for further analysis.

Simulink supports –

- system-level design
- simulation
- automatic code generation
- testing and verification of embedded systems

There are several other add-on products provided by MathWorks and third-party hardware and software products that are available for use with Simulink.

The following list gives brief description of some of them –

- **Stateflow** allows developing state machines and flow charts.
- **Simulink Coder** allows the generation of C source code for real-time implementation of systems automatically.
- **xPC Target** together with **x86-based real-time systems** provide an environment to simulate and test Simulink and Stateflow models in real-time on the physical system.
- **Embedded Coder** supports specific embedded targets.
- **HDL Coder** allows to automatically generate synthesizable VHDL and Verilog.
- **SimEvents** provides a library of graphical building blocks for modelling queuing systems.

Simulink is capable of systematic verification and validation of models through modelling style checking, requirements traceability and model coverage analysis.

Simulink Design Verifier allows you to identify design errors and to generate test case scenarios for model checking.

## Using Simulink

To open Simulink, type in the MATLAB work space –

```
simulink
```

Simulink opens with the **Library Browser**. The Library Browser is used for building simulation models.

# Simulink Library Browser

File Edit View Help

Enter search term

## Libraries


- Simulink
  - Commonly Used Blocks
  - Continuous
  - Discontinuities
  - Discrete
  - Logic and Bit Operations
  - Lookup Tables
  - Math Operations
  - Model Verification
  - Model-Wide Utilities
  - Ports & Subsystems
  - Signal Attributes
  - Signal Routing
  - Sinks
  - Sources
  - User-Defined Functions
  - Additional Math & Discr
- Aerospace Blockset
- Communications System
- Computer Vision System
- Control System Toolbox
- DSP System Toolbox
- Embedded Coder
- Fuzzy Logic Toolbox
- HDL Verifier
- Image Acquisition Toolb
- Instrument Control Tooll
- Model Predictive Contro
- Neural Network Toolbox
- OPC Toolbox
- Real-Time Windows Tarr

Library: Simulink

Search Results: (none)

 Commonly Used Blocks

 Continuous

 Discontinuities


 Discrete

 Logic and Bit Operations

 Lookup Tables

 Math Operations

 Model Verification

 Model-Wide Utilities

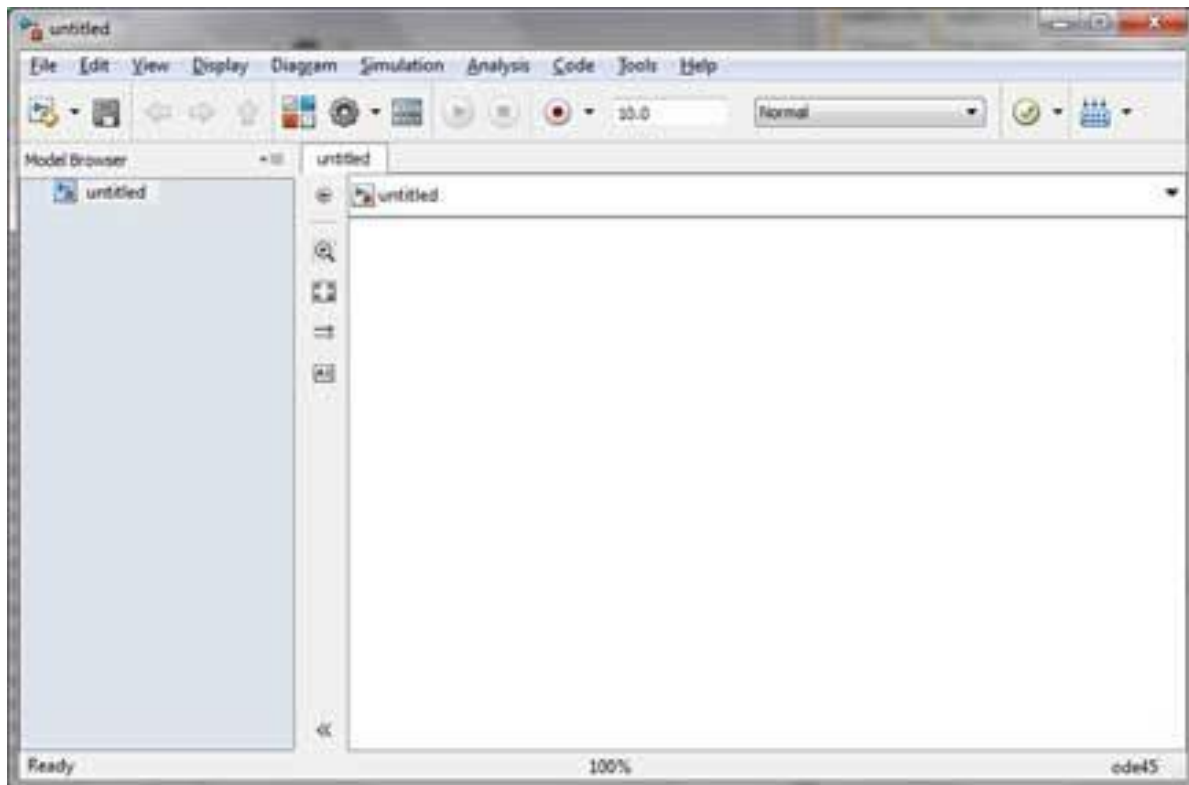
 Ports & Subsystems

 Signal Attributes

On the left side window pane, you will find several libraries categorized on the basis of various systems, clicking on each one will display the design blocks on the right window pane.

## Building Models

To create a new model, click the **New** button on the Library Browser's toolbar. This opens a new untitled model window.



A Simulink model is a block diagram.

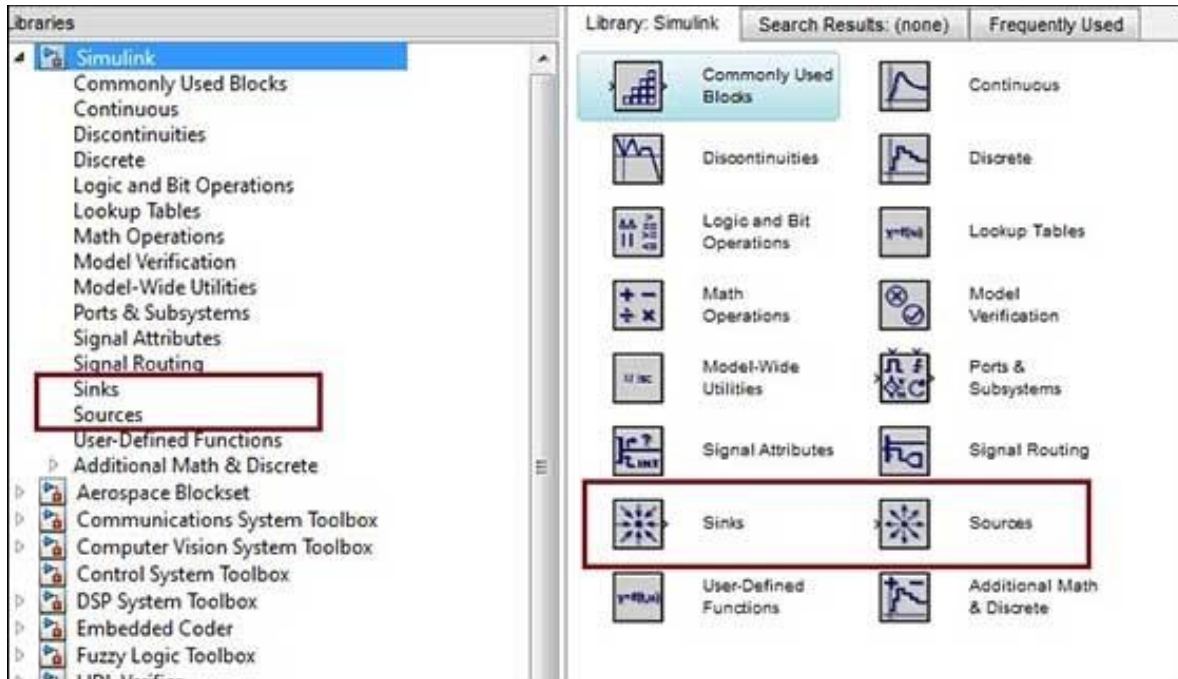
Model elements are added by selecting the appropriate elements from the Library Browser and dragging them into the Model window.

Alternately, you can copy the model elements and paste them into the model window.

## Examples

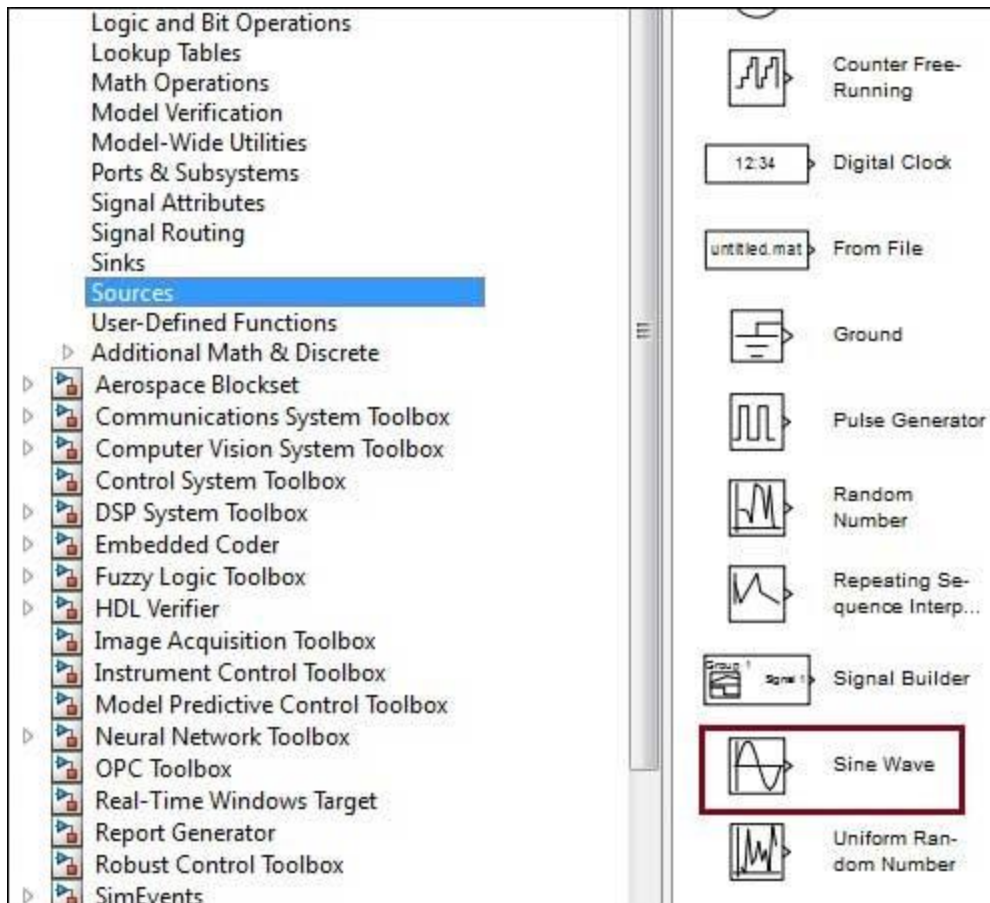
Drag and drop items from the Simulink library to make your project.

For the purpose of this example, two blocks will be used for the simulation - A **Source** (a signal) and a **Sink** (a scope). A signal generator (the source) generates an analog signal, which will then be graphically visualized by the scope(the sink).

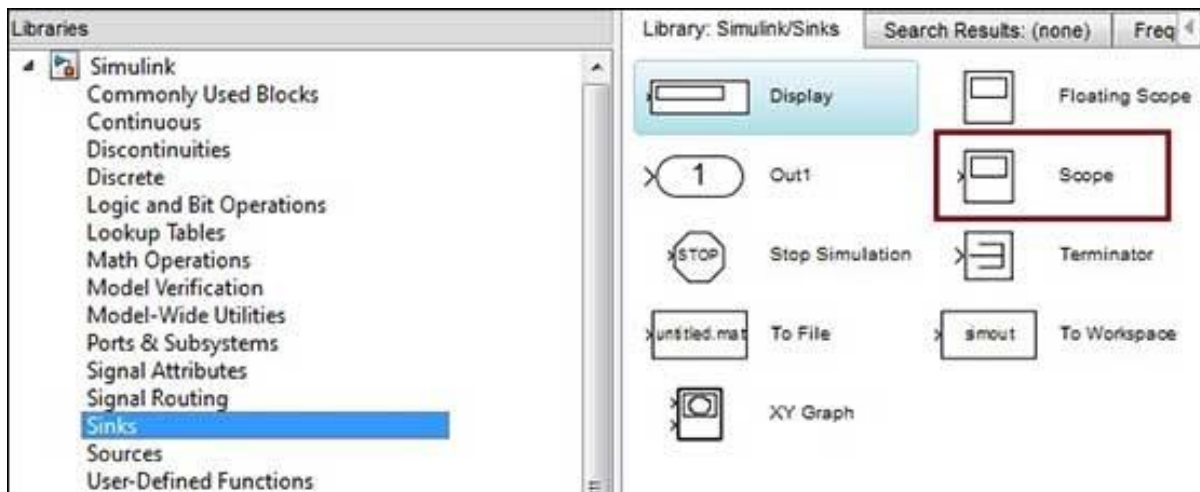


Begin by dragging the required blocks from the library to the project window. Then, connect the blocks together which can be done by dragging connectors from connection points on one block to those of another.

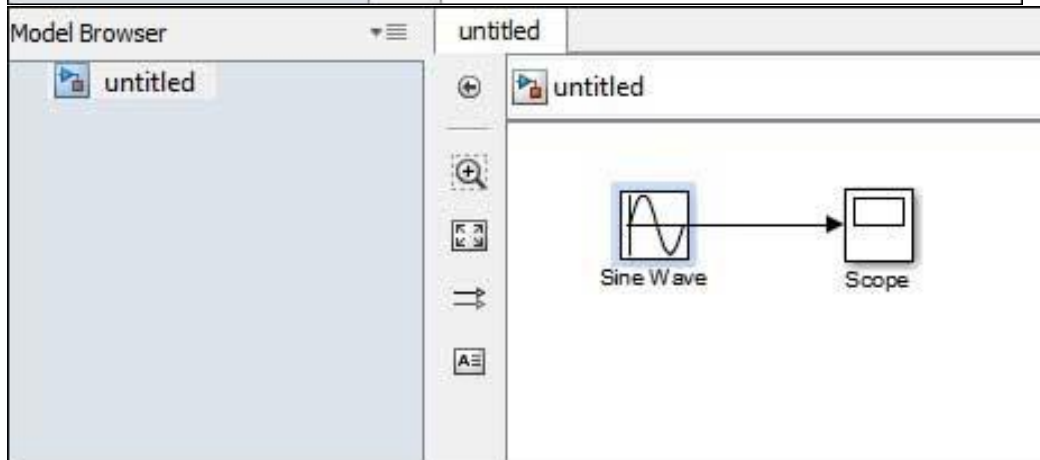
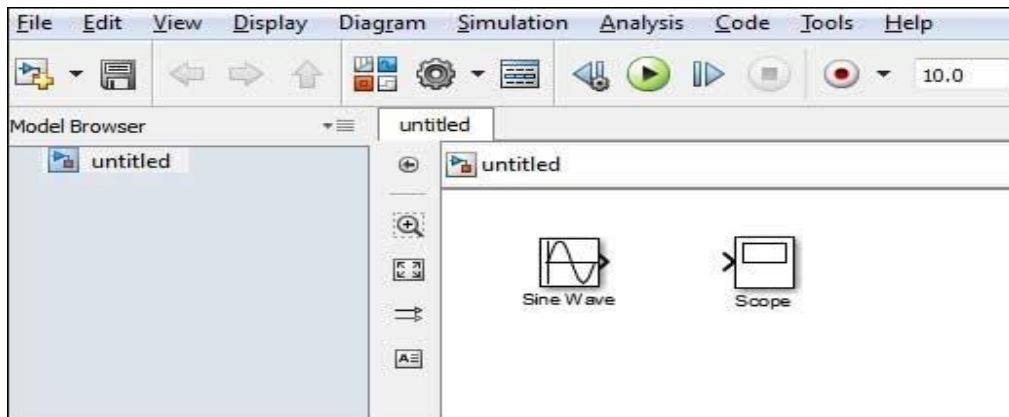
Let us drag a 'Sine Wave' block into the model.



Select 'Sinks' from the library and drag a 'Scope' block into the model.



Drag a signal line from the output of the Sine Wave block to the input of the Scope block.



Run the simulation by pressing the 'Run' button, keeping all parameters default (you can change them from the Simulation menu)

You should get the below graph from the scope.

