

# Simulink® 7

## Graphical User Interface



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*Simulink® Graphical User Interface*

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# Configuration Parameters Dialog Box

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## Configuration Parameters Dialog Box Overview

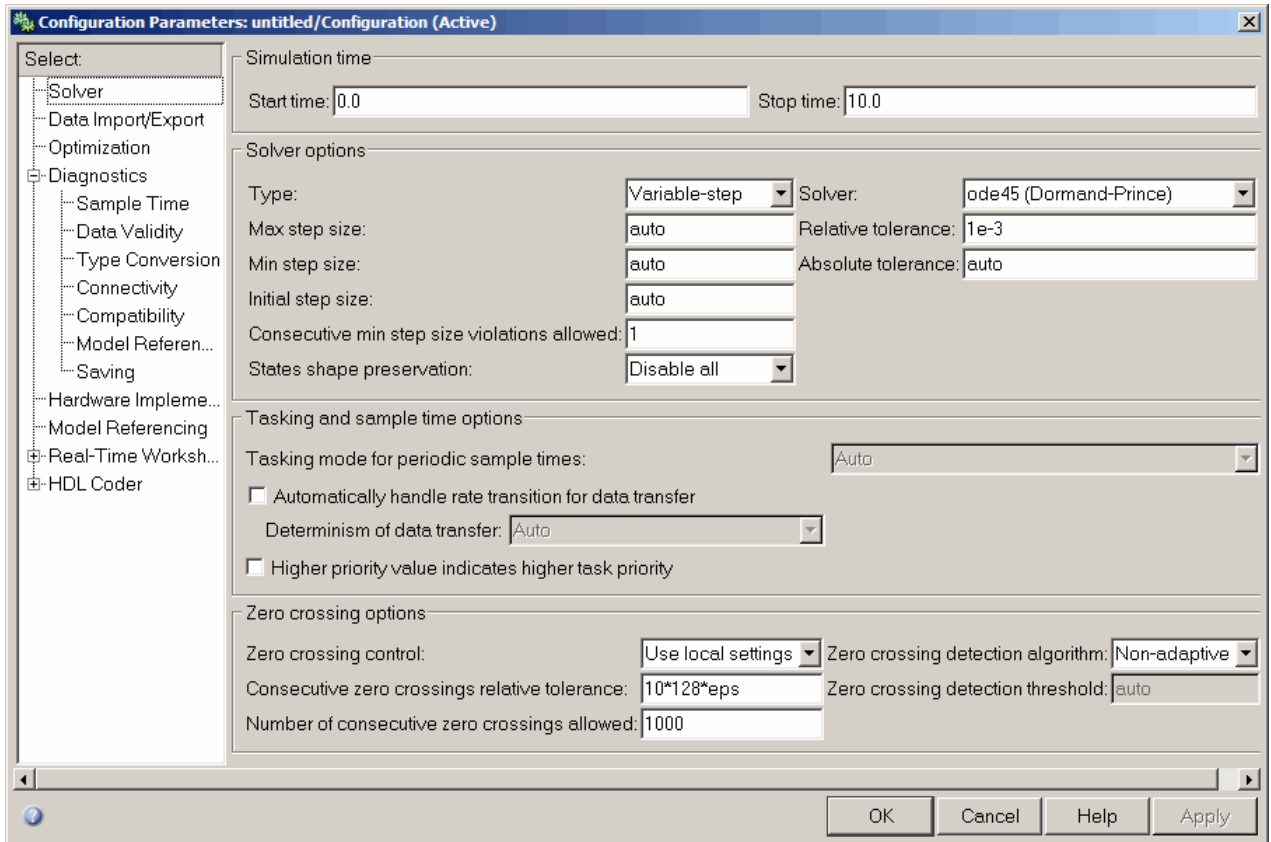
The **Configuration Parameters** dialog box specifies the settings for a model's active *configuration set*. These parameters determine the type of solver used, import and export settings, and other values that determine how the model runs. See Configuration Sets for more information.

---

**Note** You can also use the Model Explorer to modify settings for the active configuration set or any other configuration set. See “The Model Explorer: Overview” for more information.

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To display the dialog box, select **Simulation > Configuration Parameters** in the Model Editor, or press **Ctrl+E**. The dialog box appears.



The dialog box groups the configuration parameters into various categories. To display the parameters for a specific category, click the category in the **Select** tree on the left side of the dialog box.

In most cases, Simulink® software does not apply changes until you click **OK** or **Apply** at the bottom of the dialog box. The **OK** button applies your changes and dismisses the dialog box. The **Apply** button applies your changes but leaves the dialog box open.

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**Note** Each of the parameters in the **Configuration Parameters** dialog box can also be set via the `sim` command. Each parameter description includes the corresponding command line information.

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## Model Configuration Pane

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“Name” on page 1-6
“Description” on page 1-7

### Model Configuration Overview

View or edit the name and description of your configuration set.

In the Model Explorer you can edit the name and description of your configuration sets.

In the Model Explorer or Simulink Preferences window you can edit the description of your template configuration set, Model Configuration Preferences. Go to the Model Configuration Preferences to edit the template Configuration Parameters to be used as defaults for new models.

When editing the Model Configuration preferences, you can click **Restore to Default Preferences** to restore the default configuration settings for creating new models. These underlying defaults cannot be changed.

## **Name**

Specify the name of your configuration set.

## **Settings**

**Default:** Configuration (for Active configuration set) or Configuration Preferences (for default configuration set).

Edit the name of your configuration set.

In the Model Configuration Preferences, the name of the default configuration is always Configuration Preferences, and cannot be changed.

## **Description**

Specify a description of your configuration set.

## **Settings**

### **No Default**

Enter text to describe your configuration set.

## Solver Pane

Simulation time

Start time:  Stop time:

Solver options

Type:  Solver:

Max step size:  Relative tolerance:

Min step size:  Absolute tolerance:

Initial step size:

Consecutive min step size violations allowed:

States shape preservation:

Tasking and sample time options

Tasking mode for periodic sample times:

Automatically handle rate transition for data transfer

Higher priority value indicates higher task priority

Zero crossing options

Zero crossing control:  Zero crossing location algorithm:

Consecutive zero crossings relative tolerance:  Zero crossing location threshold:

Number of consecutive zero crossings allowed:

### In this section...

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- “Start time” on page 1-12
- “Stop time” on page 1-14
- “Type” on page 1-16
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“Extrapolation order” on page 1-73

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## Solver Overview

Specify the simulation start and stop time, and the solver configuration for the simulation. Use the Solver pane to set up a solver for a model's active configuration set.

A solver computes a dynamic system's states at successive time steps over a specified time span, using information provided by the model.

## Configuration

- 1 Select a solver type from the **Type** list.
- 2 Select a solver from the **Solver** list.
- 3 Set the parameters displayed for the selected type and solver combination.
- 4 Apply the changes.

## Tips

- Simulation time is not the same as clock time. For example, running a simulation for 10 seconds usually does not take 10 seconds. Total simulation time depends on factors such as model complexity, solver step sizes, and computer speed.
- Fixed-step solver type is required for code generation, unless you use an S-function or RSim target.
- Variable-step solver type can significantly shorten the time required to simulate models in which states change rapidly or which contain discontinuities.

## See Also

- Solvers
- Choosing a Solver
- Specifying a Simulation Start and Stop Time

- Configuration Parameters Dialog Box
- Solver Pane

## Start time

Specify the start time for the simulation or generated code as a double-precision value, scaled to seconds.

## Settings

**Default:** 0.0

- A start time other than 0.0 is an offset, and must be less than or equal to the stop time. An example of when you might use an offset is to set up a delay to accommodate some type of initialization.
- The values of block parameters with initial conditions must match the initial condition settings at the specified start time.
- Simulation time is not the same as clock time. For example, running a simulation for 10 seconds usually does not take 10 seconds. Total simulation time depends on factors such as model complexity, solver step sizes, and computer speed.

## Command-Line Information

**Parameter:** StartTime

**Type:** string

**Value:** any valid value

**Default:** '0.0'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	0.0



**See Also**

- [Specifying a Simulation Start and Stop Time](#)
- [Configuration Parameters Dialog Box](#)
- [Solver Pane](#)

## Stop time

Specify the stop time for the simulation or generated code as a double-precision value, scaled to seconds.

### Settings

**Default:** 10

- Stop time must be greater than or equal to the start time.
- Specify `inf` to run a simulation or generated program until you explicitly pause or stop it.
- If the stop time is the same as the start time, the simulation or generated program runs for one step.
- Simulation time is not the same as clock time. For example, running a simulation for 10 seconds usually does not take 10 seconds. Total simulation time depends on factors such as model complexity, solver step sizes, and computer speed.
- If your model includes blocks that depend on absolute time and you are creating a design that runs indefinitely, see [Blocks That Depend on Absolute Time](#).

### Command-Line Information

**Parameter:** StopTime

**Type:** string

**Value:** any valid value

**Default:** '10.0'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Any positive value

**See Also**

- [Blocks That Depend on Absolute Time](#)
- [Using Blocks to Stop or Pause a Simulation](#)
- [Specifying a Simulation Start and Stop Time](#)
- [Configuration Parameters Dialog Box](#)
- [Solver Pane](#)

## Type

Select the type of solver you want to use to simulate your model.

## Settings

**Default:** Variable-step

### Variable-step

Step size varies from step to step, depending on model dynamics. A variable-step solver:

- Reduces step size when model states change rapidly, to maintain accuracy.
- Increases step size when model states change slowly, to avoid unnecessary steps.

Variable-step is recommended for models in which states change rapidly or that contain discontinuities. In these cases, a variable-step solver requires fewer time steps than a fixed-step solver to achieve a comparable level of accuracy. This can significantly shorten simulation time.

### Fixed-step

Step size remains constant throughout the simulation.

Required for code generation, unless you use an S-function or RSim target.

---

**Note** The solver computes the next time as the sum of the current time and the step size.

---

## Dependencies

Selecting Variable-step enables the following parameters:

- Solver
- Max step size
- Min step size

- **Initial step size**
- **Relative tolerance**
- **Absolute tolerance**
- **Shape preservation**
- **Initial step size**
- **Number of consecutive min steps**
- **Zero-crossing control**
- **Time tolerance**
- **Number of consecutive zero crossings**
- **Algorithm**

Selecting Fixed-step enables the following parameters:

- **Solver**
- **Periodic sample time constraint**
- **Fixed-step size (fundamental sample time)**
- **Tasking mode for periodic sample times**
- **Higher priority value indicates higher task priority**
- **Automatically handle rate transitions for data transfers**

### **Command-Line Information**

**Parameter:** SolverType

**Type:** string

**Value:** 'Variable-step' | 'Fixed-step'

**Default:** 'Variable-step'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Fixed-step

## See Also

- Solvers
- Choosing a Solver
- “Purely Discrete Systems”
- Configuration Parameters Dialog Box
- Solver Pane

## Solver

Select the solver you want to use to compute the model's states during simulation or code generation.

## Settings

The available solvers change depending on which solver Type you selected:

- “Fixed-step Solvers” on page 1-19
- “Variable-step Solvers” on page 1-21

### Fixed-step Solvers. Default: ode3 (Bogacki-Shampine)

#### ode3 (Bogacki-Shampine)

Computes the model's state at the next time step as an explicit function of the current value of the state and the state derivatives, using the Bogacki-Shampine Formula integration technique to compute the state derivatives. In the following example, X is the state, DX is the state derivative, and h is the step size:

$$X(n+1) = X(n) + h * DX(n)$$

#### Discrete (no continuous states)

Computes the time of the next time step by adding a fixed step size to the current time.

Use this solver for models with no states or discrete states only, using a fixed step size. Relies on the model's blocks to update discrete states.

The accuracy and length of time of the resulting simulation depends on the size of the steps taken by the simulation: the smaller the step size, the more accurate the results but the longer the simulation takes.

---

**Note** The fixed-step discrete solver cannot be used to simulate models that have continuous states.

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**ode5 (Dormand-Prince)**

Computes the model's state at the next time step as an explicit function of the current value of the state and the state derivatives. Uses the Dormand-Prince Formula integration technique to compute the state derivatives. In the following example, X is the state, DX is the state derivative, and h is the step size:

$$X(n+1) = X(n) + h * DX(n)$$

**ode4 (Runge-Kutta)**

Uses the Fourth-Order Runge-Kutta (RK4) Formula integration technique to compute the model's state at the next time step as an explicit function of the current value of the state and the state derivatives. In the following example, X is the state, DX is the state derivative, and h is the step size:

$$X(n+1) = X(n) + h * DX(n)$$

**ode2 (Heun)**

Uses the Heun's Method integration technique to compute the model's state at the next time step as an explicit function of the current value of the state and the state derivatives. In the following example, X is the state, DX is the state derivative, and h is the step size:

$$X(n+1) = X(n) + h * DX(n)$$

**ode1 (Euler)**

Uses the Euler's Method integration technique to compute the model's state at the next time step as an explicit function of the current value of the state and the state derivatives. In the following example, X is the state, DX is the state derivative, and h is the step size:

$$X(n+1) = X(n) + h * DX(n)$$

**ode14x (extrapolation)**

Uses a combination of Newton's method and extrapolation from the current value to compute the model's state at the next time step, as an *implicit* function of the state and the state derivative at the next time step. In the following example, X is the state, DX is the state derivative, and h is the step size:

$$X(n+1) - X(n) - h * DX(n+1) = 0$$



This solver requires more computation per step than an explicit solver, but is more accurate for a given step size.

**Variable-step Solvers. Default:** ode45 (Dormand-Prince)

ode45 (Dormand-Prince)

Computes the model's state at the next time step using an explicit Runge-Kutta (4,5) formula (the Dormand-Prince pair) for numerical integration.

ode45 is a one-step solver, and therefore only needs the solution at the preceding time point.

Use ode45 as a first try for most problems.

Discrete (no continuous states)

Computes the time of the next step by adding a step size that varies depending on the rate of change of the model's states.

Use this solver for models with no states or discrete states only, using a variable step size.

ode23 (Bogacki-Shampine)

Computes the model's state at the next time step using an explicit Runge-Kutta (2,3) formula (the Bogacki-Shampine pair) for numerical integration.

ode23 is a one-step solver, and therefore only needs the solution at the preceding time point.

ode23 is more efficient than ode45 at crude tolerances and in the presence of mild stiffness.

ode113 (Adams)

Computes the model's state at the next time step using a variable-order Adams-Bashforth-Moulton PECE numerical integration technique.

ode113 is a multistep solver, and thus generally needs the solutions at several preceding time points to compute the current solution.

ode113 can be more efficient than ode45 at stringent tolerances.

`ode15s (stiff/NDF)`

Computes the model's state at the next time step using variable-order numerical differentiation formulas (NDFs). These are related to, but more efficient than the backward differentiation formulas (BDFs), also known as Gear's method.

`ode15s` is a multistep solver, and thus generally needs the solutions at several preceding time points to compute the current solution.

`ode15s` is efficient for stiff problems. Try this solver if `ode45` fails or is inefficient.

`ode23s (stiff/Mod. Rosenbrock)`

Computes the model's state at the next time step using a modified Rosenbrock formula of order 2.

`ode23s` is a one-step solver, and therefore only needs the solution at the preceding time point.

`ode23s` is more efficient than `ode15s` at crude tolerances, and can solve stiff problems for which `ode15s` is ineffective.

`ode23t (Mod. stiff/Trapezoidal)`

Computes the model's state at the next time step using an implementation of the trapezoidal rule with a "free" interpolant.

`ode23t` is a one-step solver, and therefore only needs the solution at the preceding time point.

Use `ode23t` if the problem is only moderately stiff and you need a solution with no numerical damping.

`ode23tb (stiff/TR-BDF2)`

Computes the model's state at the next time step using a multistep implementation of TR-BDF2, an implicit Runge-Kutta formula with a trapezoidal rule first stage, and a second stage consisting of a backward differentiation formula of order two. By construction, the same iteration matrix is used in evaluating both stages.

`ode23tb` is more efficient than `ode15s` at crude tolerances, and can solve stiff problems for which `ode15s` is ineffective.

## Tips

- Identifying the optimal solver for a model requires experimentation, for an in-depth discussion, see Choosing a Solver.
- The optimal solver balances acceptable accuracy with the shortest simulation time.
- Simulink software uses a discrete solver for any model with no states or discrete states only, even if you specify a continuous solver.
- A smaller step size increases accuracy, but also increases simulation time.
- The degree of computational complexity increases for  $ode_n$ , as  $n$  increases.
- As computational complexity increases, the accuracy of the results also increases.

## Dependencies

Selecting the `ode1` (Euler), `ode2` (Huen), `ode3` (Bogacki-Shampine), `ode4` (Runge-Kutta), `ode5` (Dormand-Prince), or `Discrete` (no continuous states) fixed-step solvers enables the following parameters:

- **Fixed-step size (fundamental sample time)**
- **Periodic sample time constraint**
- **Tasking mode for periodic sample times**
- **Automatically handle rate transition for data transfers**
- **Higher priority value indicates higher task priority**

Selecting `ode14x` (extrapolation) enables the following parameters:

- **Fixed-step size (fundamental sample time)**
- **Extrapolation order**
- **Number Newton's iterations**
- **Periodic sample time constraint**
- **Tasking mode for periodic sample times**
- **Automatically handle rate transition for data transfers**

- **Higher priority value indicates higher task priority**

Selecting the Discrete (no continuous states) variable-step solver enables the following parameters:

- **Max step size**
- **Automatically handle rate transition for data transfers**
- **Higher priority value indicates higher task priority**
- **Zero-crossing control**
- **Time tolerance**
- **Number of consecutive zero crossings**
- **Algorithm**

Selecting ode45 (Dormand-Prince), ode23 (Bogacki-Shampine), ode113 (Adams), or ode23s (stiff/Mod. Rosenbrock) enables the following parameters:

- **Max step size**
- **Min step size**
- **Initial step size**
- **Relative tolerance**
- **Absolute tolerance**
- **Shape preservation**
- **Number of consecutive min steps**
- **Automatically handle rate transition for data transfers**
- **Higher priority value indicates higher task priority**
- **Zero-crossing control**
- **Time tolerance**
- **Number of consecutive zero crossings**
- **Algorithm**

Selecting ode15s (stiff/NDF), ode23t (Mod. stiff/Trapezoidal), or ode23tb (stiff/TR-BDF2) enables the following parameters:

- **Max step size**
- **Min step size**
- **Initial step size**
- **Solver reset method**
- **Number of consecutive min steps**
- **Relative tolerance**
- **Absolute tolerance**
- **Shape preservation**
- **Maximum order**
- **Automatically handle rate transition for data transfers**
- **Higher priority value indicates higher task priority**
- **Zero-crossing control**
- **Time tolerance**
- **Number of consecutive zero crossings**
- **Algorithm**

### **Command-Line Information**

**Parameter:** Solver

**Type:** string

**Value:** 'VariableStepDiscrete' | 'ode45' | 'ode23' |  
'ode113' | 'ode15s' | 'ode23s' | 'ode23t' | 'ode23tb' |  
'FixedStepDiscrete' | 'ode5' | 'ode4' | 'ode3' | 'ode2' |  
'ode1' | 'ode14x'

**Default:** 'ode45'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Discrete (no continuous states)

## See Also

- Solvers
- Choosing a Solver
- “Purely Discrete Systems”
- Configuration Parameters Dialog Box
- Solver Pane

## Max Step Size

Specify the largest time step that the solver can take.

### Settings

**Default:** auto

- For the discrete solver, the default value (auto) is the model's shortest sample time.
- For continuous solvers, the default value (auto) is determined from the start and stop times. If the stop time equals the start time or is `inf`, Simulink software chooses 0.2 seconds as the maximum step size. Otherwise, it sets the maximum step size to

$$h_{max} = \frac{t_{stop} - t_{start}}{50}$$

### Tips

- Generally, the default maximum step size is sufficient. If you are concerned about the solver missing significant behavior, change the parameter to prevent the solver from taking too large a step.
- If the time span of the simulation is very long, the default step size might be too large for the solver to find the solution.
- If your model contains periodic or nearly periodic behavior and you know the period, set the maximum step size to some fraction (such as 1/4) of that period.
- In general, for more output points, change the refine factor, not the maximum step size. For more information, see [Specifying Output Options](#).

### Dependencies

This parameter is enabled only if the solver **Type** is set to `Variable-step`.

## Command-Line Information

**Parameter:** MaxStep  
**Type:** string  
**Value:** any valid value  
**Default:** 'auto'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- “Purely Discrete Systems”
- Specifying Output Options
- Configuration Parameters Dialog Box
- Solver Pane



## Initial Step Size

Specify the size of the first time step that the solver takes.

### Settings

**Default:** auto

By default, the solver selects an initial step size by examining the derivatives of the states at the start time.

### Tips

- Be careful when increasing the initial step size. If the first step size is too large, the solver might step over important behavior.
- The initial step size parameter is a *suggested* first step size. The solver tries this step size but reduces it if error criteria are not satisfied.

### Dependencies

This parameter is enabled only if the solver **Type** is set to Variable-step.

### Command-Line Information

**Parameter:** InitialStep

**Type:** string

**Value:** any valid value

**Default:** 'auto'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## **See Also**

- “Purely Discrete Systems”
- Improving Simulation Performance and Accuracy
- Configuration Parameters Dialog Box
- Solver Pane

## Min Step Size

Specify the smallest time step that the solver can take.

### Settings

**Default:** auto

- The default value (auto) sets an unlimited number of warnings and a minimum step size on the order of machine precision.
- You can specify either a real number greater than zero, or a two-element vector for which the first element is the minimum step size and the second element is the maximum number of minimum step size warnings before an error was issued.

### Tips

- If the solver takes a smaller step to meet error tolerances, it issues a warning indicating the current effective relative tolerance.
- Setting the second element to zero results in an error the first time the solver must take a step smaller than the specified minimum. This is equivalent to changing the **Min step size violation** diagnostic to error on the **Diagnostics** pane (see Min step size violation).
- Setting the second element to -1 results in an unlimited number of warnings. This is also the default if the input is a scalar.

### Dependencies

This parameter is enabled only if the solver **Type** is set to **Variable-step**.

### Command-Line Information

**Parameter:** MinStep  
**Type:** string  
**Value:** any valid value  
**Default:** 'auto'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- “Purely Discrete Systems”
- Min step size violation
- Configuration Parameters Dialog Box
- Solver Pane

## Relative tolerance

Specify the largest acceptable solver error, relative to the size of each state during each time step. If the relative error exceeds this tolerance, the solver reduces the time step size.

### Settings

**Default:** 1e-3

- The relative tolerance is a percentage of the state's value.
- The default value (1e-3) means that the computed state is accurate to within 0.1%.

### Tips

- The acceptable error at each time step is a function of both the **Relative tolerance** and the **Absolute tolerance**. For more information about how these settings work together, see [Specifying Variable-Step Solver Error Tolerances](#).
- During each time step, the solver computes the state values at the end of the step and also determines the local error – the estimated error of these state values. If the error is greater than the acceptable error for any state, the solver reduces the step size and tries again.
- The default relative tolerance value is sufficient for most applications. Decreasing the relative tolerance value can slow down the simulation.
- To check the accuracy of a simulation after you run it, you can reduce the relative tolerance to 1e-4 and run it again. If the results of the two simulations are not significantly different, you can feel confident that the solution has converged.

### Dependencies

This parameter is enabled only if you set:

- Solver **Type** to **Variable-step**.
- **Solver** to a continuous variable-step solver.

This parameter works along with **Absolute tolerance** to determine the acceptable error at each time step. For more information about how these settings work together, see [Specifying Variable-Step Solver Error Tolerances](#).

## Command-Line Information

**Parameter:** RelTol  
**Type:** string  
**Value:** any valid value  
**Default:** '1e-3'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- [Specifying Variable-Step Solver Error Tolerances](#)
- [Improving Simulation Performance and Accuracy](#)
- [Configuration Parameters Dialog Box](#)
- [Solver Pane](#)

## Absolute tolerance

Specify the largest acceptable solver error, as the value of the measured state approaches zero. If the absolute error exceeds this tolerance, the solver reduces the time step size.

### Settings

**Default:** auto

- The default value (auto) initially sets the absolute tolerance for each state to 1e-6. As the simulation progresses, the absolute tolerance for each state is reset to the maximum value that the state has thus far assumed times the relative tolerance for that state.

For example, if a state goes from 0 to 1 and the **Relative tolerance** is 1e-3, then by the end of the simulation the **Absolute tolerance** is set to 1e-3.

- If the computed setting is not suitable, you can determine an appropriate setting yourself.

### Tips

- The acceptable error at each time step is a function of both the **Relative tolerance** and the **Absolute tolerance**. For more information about how these settings work together, see [Specifying Variable-Step Solver Error Tolerances](#).
- The Integrator, Transfer Fcn, State-Space, and Zero-Pole blocks allow you to specify absolute tolerance values for solving the model states that they compute or that determine their output. The absolute tolerance values that you specify in these blocks override the global setting in the Configuration Parameters dialog box.
- You might want to override the **Absolute tolerance** setting using blocks if the global setting does not provide sufficient error control for all of your model's states, for example if they vary widely in magnitude.
- If you set the **Absolute tolerance** too low, the solver may take too many steps around near-zero state values, slowing down the simulation.
- To check the accuracy of a simulation after you run it, you can reduce the absolute tolerance and run it again. If the results of the two simulations

are not significantly different, you can feel confident that the solution has converged.

- If your simulation results do not seem accurate, and your model has states whose values approach zero, the **Absolute tolerance** may be too large. Reduce the **Absolute tolerance** to force the simulation to take more steps around areas of near-zero state values.

## Dependencies

This parameter is enabled only if you set:

- Solver **Type** to *Variable-step*.
- **Solver** to a continuous variable-step solver.

This parameter works along with **Relative tolerance** to determine the acceptable error at each time step. For more information about how these settings work together, see *Specifying Variable-Step Solver Error Tolerances*.

## Command-Line Information

**Parameter:** AbsTol

**Type:** string

**Value:** any valid value

**Default:** 'auto'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact



**See Also**

- [Specifying Variable-Step Solver Error Tolerances](#)
- [Improving Simulation Performance and Accuracy](#)
- [Configuration Parameters Dialog Box](#)
- [Solver Pane](#)

## Maximum order

Select the order of the numerical differentiation formulas (NDFs) used in the `ode15s` solver.

### Settings

**Default:** 5

- 5 Specifies that the solver uses fifth order NDFs.
- 1 Specifies that the solver uses first order NDFs.
- 2 Specifies that the solver uses second order NDFs.
- 3 Specifies that the solver uses third order NDFs.
- 4 Specifies that the solver uses fourth order NDFs.

### Tips

- Although the higher order formulas are more accurate, they are less stable.
- If your model is stiff and requires more stability, reduce the maximum order to 2 (the highest order for which the NDF formula is A-stable).
- As an alternative, you can try using the `ode23s` solver, which is a lower order (and A-stable) solver.

### Dependencies

This parameter is enabled only if **Solver** is set to `ode15s`.

## Command-Line Information

**Parameter:** MaxOrder

**Type:** integer

**Value:** 1 | 2 | 3 | 4 | 5

**Default:** 5

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- [Specifying Variable-Step Solver Error Tolerances](#)
- [Improving Simulation Performance and Accuracy](#)
- [Configuration Parameters Dialog Box](#)
- [Solver Pane](#)

## Solver reset method

Select how the solver behaves during a reset, such as when it detects a zero crossing.

### Settings

**Default:** Fast

Fast

Specifies that the solver will not recompute the Jacobian matrix at a solver reset.

Robust

Specifies that the solver will recompute the Jacobian matrix needed by the integration step at every solver reset.

### Tips

- Selecting **Fast** speeds up the simulation. However, it can result in incorrect solutions in some cases.
- If you suspect that the simulation is giving incorrect results, try the **Robust** setting. If there is no difference in simulation results between the fast and robust settings, revert to the fast setting.

### Dependencies

This parameter is enabled only if you select one of the following solvers:

- ode15s (Stiff/NDF)
- ode23t (Mod. Stiff/Trapezoidal)
- ode23tb (Stiff/TR-BDF2)

### Command-Line Information

**Parameter:** SolverResetMethod

**Type:** string

**Value:** 'Fast' | 'Robust'

**Default:** 'Fast'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Choosing a Solver
- Configuration Parameters Dialog Box
- Solver Pane

## Number of consecutive min steps

Specify the maximum number of consecutive minimum step size violations allowed during simulation.

### Settings

**Default:** 1

- A minimum step size violation occurs when a variable-step continuous solver takes a smaller step than that specified by the **Min step size** property (see Min step size).
- Simulink software counts the number of consecutive violations that it detects. If the count exceeds the value of **Number of consecutive min steps**, Simulink software displays either a warning or error message as specified by the **Min step size violation** diagnostic (see Min step size violation).

### Dependencies

This parameter is enabled only if you set:

- Solver **Type** to Variable-step.
- **Solver** to a continuous variable step solver.

### Command-Line Information

**Parameter:** MaxConsecutiveMinStep

**Type:** string

**Value:** any valid value

**Default:** '1'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

Application	Setting
Efficiency	No impact
Safety precaution	No impact

## See Also

- Choosing a Solver
- Min step size violation
- Min step size
- Configuration Parameters Dialog Box
- Solver Pane

## Number of consecutive min steps

Specify the maximum number of consecutive minimum step size violations allowed during simulation.

### Settings

**Default:** 1

- A minimum step size violation occurs when a variable-step continuous solver takes a smaller step than that specified by the **Min step size** property (see Min step size).
- Simulink software counts the number of consecutive violations that it detects. If the count exceeds the value of **Number of consecutive min steps**, Simulink software displays either a warning or error message as specified by the **Min step size violation** diagnostic (see Min step size violation).

### Dependencies

This parameter is enabled only if you set:

- Solver **Type** to Variable-step.
- **Solver** to a continuous variable step solver.

### Command-Line Information

**Parameter:** MaxConsecutiveMinStep

**Type:** string

**Value:** any valid value

**Default:** '1'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

### See Also

- Choosing a Solver
- Min step size violation
- Min step size
- Configuration Parameters Dialog Box
- Solver Pane



## Solver Jacobian Method

### Settings

Default: Auto

auto

Sparse perturbation

Full perturbation

Sparse analytical

Full analytical

### Tips

- The default setting (Auto) usually provides good accuracy for most models.

### Dependencies

This parameter is enabled only if an implicit solver is used.

### Command-Line Information

**Parameter:** SolverJacobianMethodControl

**Type:** string

**Value:** 'auto' | 'SparsePerturbation' | 'FullPerturbation' |  
'SparseAnalytical' | 'FullAnalytical'

**Default:** 'auto'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

**See Also**

- “Choosing a Solver”
- Solver Pane

## Tasking mode for periodic sample times

Select how blocks with periodic sample times execute.

### Settings

**Default:** Auto

#### Auto

Specifies that single-tasking execution is used if:

- Your model contains one sample time.
- Your model contains a continuous and a discrete sample time, and the fixed-step size is equal to the discrete sample time.

Selects multitasking execution for models operating at different sample rates.

#### SingleTasking

Specifies that all blocks are processed through each stage of simulation together (for example, calculating output and updating discrete states).

#### MultiTasking

Specifies that groups of blocks with the same execution priority are processed through each stage of simulation (for example, calculating output and updating discrete states) based on task priority. Multitasking mode helps to create valid models of real-world multitasking systems, where sections of your model represent concurrent tasks.

### Tip

The **Multitask rate transition** parameter on the **Diagnostics > Sample Time** pane allows you to adjust error checking for sample rate transitions between blocks that operate at different sample rates.

### Dependency

This parameter is enabled by selecting Fixed-step solver type.

## Command-Line Information

**Parameter:** SolverMode

**Type:** string

**Value:** 'Auto' | 'SingleTasking' | 'MultiTasking'

**Default:** 'Auto'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Rate Transition block
- Model Execution and Rate Transitions
- Single-Tasking and Multitasking Execution Modes
- Sample Rate Transitions
- Single-Tasking and Multitasking Execution of a Model: an Example
- Configuration Parameters Dialog Box
- Solver Pane

## Automatically handle rate transition for data transfer

Specify whether Simulink software automatically inserts hidden Rate Transition blocks between blocks that have different sample rates to ensure: the integrity of data transfers between tasks; and optional determinism of data transfers for periodic tasks.

### Settings

**Default:** Off



On

Inserts hidden Rate Transition blocks between blocks when rate transitions are detected. Handles rate transitions for asynchronous and periodic tasks. Simulink software adds the hidden blocks configured to ensure data integrity for data transfers. Selecting this option also enables the parameter **Deterministic data transfer**, which allows you to control the level of data transfer determinism for periodic tasks.



Off

Does not insert hidden Rate Transition blocks when rate transitions are detected. If Simulink software detects invalid transitions, you must adjust the model such that the sample rates for the blocks in question match or manually add a Rate Transition block.

See Rate Transition Block Options in the Real-Time Workshop® documentation for further details.

### Tips

- Selecting this parameter allows you to handle rate transition issues automatically. This saves you from having to manually insert Rate Transition blocks to avoid invalid rate transitions, including invalid asynchronous-to-periodic and asynchronous-to-asynchronous rate transitions, in multirate models.
- For asynchronous tasks, Simulink software configures the inserted blocks to ensure data integrity but not determinism during data transfers.

### Command-Line Information

**Parameter:** AutoInsertRateTranBlk

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact (for simulation and during development) Off (for production code generation)
Efficiency	No impact
Safety precaution	Off

### See Also

- Rate Transition Block Options
- Configuration Parameters Dialog Box
- Solver Pane

## Deterministic data transfer

Control whether the Rate Transition block parameter **Ensure deterministic data transfer (maximum delay)** is set for auto-inserted Rate Transition blocks

**Default:** Whenever possible

Always

Specifies that the block parameter **Ensure deterministic data transfer (maximum delay)** is always set for auto-inserted Rate Transition blocks.

If Always is selected and if a model needs to auto-insert a Rate Transition block to handle a rate transition that is *not* between two periodic sample times related by an integer multiple, Simulink errors out.

Whenever possible

Specifies that the block parameter **Ensure deterministic data transfer (maximum delay)** is set for auto-inserted Rate Transition blocks whenever possible. If an auto-inserted Rate Transition block handles data transfer between two periodic sample times that are related by an integer multiple, **Ensure deterministic data transfer (maximum delay)** is set; otherwise, it is cleared.

Never (minimum delay)

Specifies that the block parameter **Ensure deterministic data transfer (maximum delay)** is never set for auto-inserted Rate Transition blocks.

---

**Note** Clearing the Rate Transition block parameter **Ensure deterministic data transfer (maximum delay)** can provide reduced latency for models that do not require determinism. See the description of **Ensure deterministic data transfer (maximum delay)** on the Rate Transition block reference page for more information.

---

### Dependencies

This parameter is enabled only if **Automatically handle rate transition for data transfer** is checked.

### Command-Line Information

**Parameter:** InsertRTBMode

**Type:** string

**Value:** 'Always' | 'Whenever possible' | 'Never (minimum delay)'

**Default:** 'Whenever possible'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	'Whenever possible'

### See Also

- Rate Transition Block Options
- Configuration Parameters Dialog Box
- Solver Pane



## Higher priority value indicates higher task priority

Specify whether the real-time system targeted by the model assigns higher or lower priority values to higher priority tasks when implementing asynchronous data transfers

### Settings

**Default:** Off



On

Real-time system assigns higher priority values to higher priority tasks, for example, 8 has a higher task priority than 4. Rate Transition blocks treat asynchronous transitions between rates with lower priority values and rates with higher priority values as low-to-high rate transitions.



Off

Real-time system assigns lower priority values to higher priority tasks, for example, 4 has a higher task priority than 8. Rate Transition blocks treat asynchronous transitions between rates with lower priority values and rates with higher priority values as high-to-low rate transitions.

### Command-Line Information

**Parameter:** PositivePriorityOrder

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## **See Also**

- Rate Transitions and Asynchronous Blocks
- Configuration Parameters Dialog Box
- Solver Pane

## Zero-crossing control

Enables zero-crossing detection during variable-step simulation of the model. For most models, this speeds up simulation by enabling the solver to take larger time steps.

### Settings

**Default:** Use local settings

Use local settings

Specifies that zero-crossing detection be enabled on a block-by-block basis. For a list of applicable blocks, see “Simulating Dynamic Systems”

To specify zero-crossing detection for one of these blocks, open the block’s parameter dialog box and select the **Enable zero-crossing detection** option.

Enable all

Enables zero-crossing detection for all blocks in the model.

Disable all

Disables zero-crossing detection for all blocks in the model.

### Tips

- For most models, enabling zero-crossing detection speeds up simulation by allowing the solver to take larger time steps.
- If a model has extreme dynamic changes, disabling this option can speed up the simulation but can also decrease the accuracy of simulation results. See Zero-crossing Detection for more information.
- Selecting **Enable all** or **Disable all** overrides the local zero-crossing detection setting for individual blocks.

### Dependencies

This parameter is enabled only if the solver **Type** is set to **Variable-step**.

Selecting either **Use local settings** or **Enable all** enables the following parameters:

- **Time tolerance**
- **Number of consecutive zero crossings**
- **Algorithm**

## Command-Line Information

**Parameter:** ZeroCrossControl

**Type:** string

**Value:** 'UseLocalSettings' | 'EnableAll' | 'DisableAll'

**Default:** 'UseLocalSettings'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Zero-Crossing Detection
- Number of consecutive zero crossings
- Consecutive zero-crossings violation
- Time tolerance
- Configuration Parameters Dialog Box
- Solver Pane

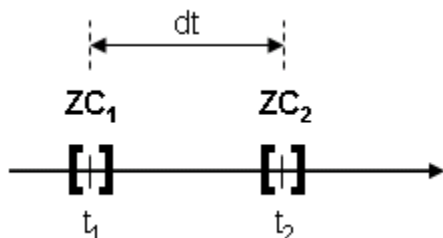
## Time tolerance

Specify a tolerance factor that controls how closely zero-crossing events must occur to be considered consecutive.

### Settings

**Default:**  $10 \cdot 128 \cdot \text{eps}$

- Simulink software defines zero crossings as consecutive if the time between events is less than a particular interval. The following figure depicts a simulation timeline during which Simulink software detects zero crossings  $ZC_1$  and  $ZC_2$ , bracketed at successive time steps  $t_1$  and  $t_2$ .



Simulink software determines that the zero crossings are consecutive if

$$dt < \text{RelTolZC} * t_2$$

where  $dt$  is the time between zero crossings and  $\text{RelTolZC}$  is the **Time tolerance**.

- Simulink software counts the number of consecutive zero crossings that it detects. If the count exceeds the value of **Number of consecutive zero crossings** allowed, Simulink software displays either a warning or error as specified by the **Consecutive zero-crossings violation** diagnostic (see Consecutive zero-crossings violation).

### Tips

- Simulink software resets the counter each time it detects nonconsecutive zero crossings (successive zero crossings that fail to meet the relative tolerance setting); therefore, decreasing the relative tolerance value may afford your model's behavior more time to recover.

- If your model experiences excessive zero crossings, you can also increase the **Number of consecutive zero crossings** to increase the threshold at which Simulink software triggers the **Consecutive zero-crossings violation** diagnostic.

## Dependencies

This parameter is enabled only if **Zero-crossing control** is set to either `Use local settings` or `Enable all`.

## Command-Line Information

**Parameter:** ConsecutiveZCsStepRelTol

**Type:** string

**Value:** any valid value

**Default:** '10\*128\*eps'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Zero-crossing Detection
- Zero-crossing Control
- Number of consecutive zero crossings
- Consecutive zero-crossings violation
- Configuration Parameters Dialog Box
- Solver Pane

## Number of consecutive zero crossings

Specify the number of consecutive zero crossings that can occur before Simulink software displays a warning or an error.

### Settings

**Default:** 1000

- Simulink software counts the number of consecutive zero crossings that it detects. If the count exceeds the specified value, Simulink software displays either a warning or an error as specified by the **Consecutive zero-crossings violation** diagnostic (see Consecutive zero-crossings violation).
- Simulink software defines zero crossings as consecutive if the time between events is less than a particular interval (see Time tolerance).

### Tips

- If your model experiences excessive zero crossings, you can increase this parameter to increase the threshold at which Simulink software triggers the **Consecutive zero-crossings violation** diagnostic. This may afford your model's behavior more time to recover.
- Simulink software resets the counter each time it detects nonconsecutive zero crossings; therefore, decreasing the relative tolerance value may also afford your model's behavior more time to recover.

### Dependencies

This parameter is enabled only if **Zero-crossing control** is set to either Use local settings or Enable all.

### Command-Line Information

**Parameter:** MaxConsecutiveZCs

**Type:** string

**Value:** any valid value

**Default:** '1000'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Zero-Crossing Detection
- Zero-Crossing Control
- Consecutive zero-crossings violation
- Time tolerance
- Configuration Parameters Dialog Box
- Solver Pane



## Algorithm

Specifies the algorithm to detect zero crossings when a variable-step solver is used.

## Settings

**Default:** Nonadaptive

### Adaptive

Use an improved zero-crossing algorithm which dynamically activates and deactivates zero-crossing bracketing. With this algorithm you can set a zero-crossing tolerance. See “Signal threshold” on page 1-63 to learn how to set the zero-crossing tolerance.

### Nonadaptive

Use the nonadaptive zero-crossing algorithm present in the Simulink software prior to Version 7.0 (R2008a). This option is provided for backward compatibility.

## Tips

- The adaptive zero-crossing algorithm is especially useful in systems having strong “chattering”, or Zeno behavior. In such systems, this algorithm yields shorter simulation run times compared to the nonadaptive algorithm. See Zero-Crossing Detection for more information.

## Dependencies

- This parameter is enabled only if the solver **Type** is set to **Variable-step**.
- Selecting **Adaptive** enables the **Signal threshold** parameter.

## Command-Line Information

**Parameter:** ZeroCrossAlgorithm

**Type:** string

**Value:** 'Nonadaptive' | 'Adaptive'

**Default:** 'Nonadaptive'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Zero-Crossing Detection
- Number of consecutive zero crossings
- Consecutive zero-crossings violation
- Time tolerance
- Configuration Parameters Dialog Box
- Solver Pane

## Signal threshold

Specifies the deadband region used during the detection of zero crossings. Signals falling within this region are defined as having crossed through zero.

The signal threshold is a real number, greater than or equal to zero.

### Settings

**Default:** Auto

Auto

The signal threshold is determined automatically by the adaptive algorithm.

String

Use the specified value for the signal threshold. The value must be a real number equal to or greater than zero.

### Tips

- Entering too small of a value for the **Signal Threshold** parameter will result in long simulation run times.
- Entering a large **Signal Threshold** value may improve the simulation speed (especially in systems having extensive chattering). However, making the value too large may reduce the simulation accuracy.

### Dependency

This parameter is enabled if the zero-crossing **Algorithm** is set to **Adaptive**.

### Command-Line Information

**Parameter:** ZCThreshold

**Type:** string

**Value:** 'auto' | any real number greater than or equal to zero

**Default:** 'auto'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Zero-Crossing Detection
- Number of consecutive zero crossings
- Consecutive zero-crossings violation
- Time tolerance
- Configuration Parameters Dialog Box
- Solver Pane

## Periodic sample time constraint

Select constraints on the sample times defined by this model. If the model does not satisfy the specified constraints during simulation, Simulink software displays an error message.

### Settings

**Default:** Unconstrained

#### Unconstrained

Specifies no constraints. Selecting this option causes Simulink software to display a field for entering the solver step size.

Use the **Fixed-step size (fundamental sample time)** option to specify solver step size.

#### Ensure sample time independent

Specifies that Model blocks inherit sample time from the context in which they are used. You cannot use a referenced model that has intrinsic sample times in a triggered subsystem or iterator subsystem. If you plan on referencing this model in a triggered or iterator subsystem, you should select **Ensure sample time independent** so that Simulink can detect sample time problems while unit testing this model.

- Model Block Sample Times
- Inherited Sample Time for Referenced Models
- Function Call Models

Simulink software checks to ensure that this model can inherit its sample times from a model that references it without altering its behavior. Models that specify a step size (i.e., a base sample time) cannot satisfy this constraint. For this reason, selecting this option causes Simulink software to hide the group's step size field (see **Fixed-step size (fundamental sample time)**).

#### Specified

Specifies that Simulink software check to ensure that this model operates at a specified set of prioritized periodic sample times. Use the **Sample time properties** option to specify and assign priorities to model sample times.

Executing Multitasking Models explains how to use this option for multitasking models.

## Tips

During simulation, Simulink software checks to ensure that the model satisfies the constraints. If the model does not satisfy the specified constraint, then Simulink software displays an error message.

## Dependencies

This parameter is enabled only if the solver **Type** is set to Fixed-step.

Selecting Unconstrained enables the following parameters:

- **Fixed-step size (fundamental sample time)**
- **Tasking mode for periodic sample times**
- **Higher priority value indicates higher task priority**
- **Automatically handle rate transitions for data transfers**

Selecting Specified enables the following parameters:

- **Sample time properties**
- **Tasking mode for periodic sample times**
- **Higher priority value indicates higher task priority**
- **Automatically handle rate transitions for data transfers**

## Command-Line Information

**Parameter:** SampleTimeConstraint

**Type:** string

**Value:** 'unconstrained' | 'STIndependent' | 'Specified'

**Default:** 'unconstrained'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Specified or Ensure sample time independent

## See Also

- Model Block Sample Times
- Inherited Sample Time for Referenced Models
- Function Call Models
- Fixed-step size (fundamental sample time)
- Executing Multitasking Models
- Configuration Parameters Dialog Box
- Solver Pane

## Fixed-step size (fundamental sample time)

Specify the step size used by the selected fixed-step solver.

### Settings

**Default:** auto

- Entering auto (the default) in this field causes Simulink software to choose the step size.
- If the model specifies one or more periodic sample times, Simulink software chooses a step size equal to the least common denominator of the specified sample times. This step size, known as the fundamental sample time of the model, ensures that the solver will take a step at every sample time defined by the model.
- If the model does not define any periodic sample times, Simulink software chooses a step size that divides the total simulation time into 50 equal steps.

### Dependencies

This parameter is enabled only if the **Periodic sample time constraint** is set to Unconstrained.

### Command-Line Information

**Parameter:** FixedStep

**Type:** string

**Value:** any valid value

**Default:** 'auto'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact



**See Also**

- [Modeling Dynamic Systems](#)
- [Configuration Parameters Dialog Box](#)
- [Solver Pane](#)

## Sample time properties

Specify and assign priorities to the sample times that this model implements.

### Settings

#### No Default

- Enter an Nx3 matrix with rows that specify the model's discrete sample time properties in order from fastest rate to slowest rate.
- Faster sample times must have higher priorities.

#### Format.

[period, offset, priority]

period	The time interval (sample rate) at which updates occur during the simulation.
offset	A time interval indicating an update delay. The block is updated later in the sample interval than other blocks operating at the same sample rate.
priority	Execution priority of the real-time task associated with the sample rate.

See Specifying Sample Time for more details and options for specifying sample time.

#### Example.

```
[[0.1, 0, 10]; [0.2, 0, 11]; [0.3, 0, 12]]
```

- Declares that the model should specify three sample times.
- Sets the fundamental sample time period to 0.1 second.
- Assigns priorities of 10, 11, and 12 to the sample times.
- Assumes higher priority values indicate lower priorities — the **Higher priority value indicates higher task priority** option is not selected.

## Tips

- If the model's fundamental rate differs from the fastest rate specified by the model, specify the fundamental rate as the first entry in the matrix followed by the specified rates, in order from fastest to slowest. See “Purely Discrete Systems”.
- If the model operates at one rate, enter the rate as a three-element vector in this field — for example, [0.1, 0, 10].
- When you update a model, Simulink software displays an error message if what you specify does not match the sample times defined by the model.
- If **Periodic sample time constraint** is set to Unconstrained, Simulink software assigns priority 40 to the model base sample rate. If **Higher priority value indicates higher task priority** is selected, Simulink software assigns priorities 39, 38, 37, and so on, to subrates of the base rate. Otherwise, it assigns priorities 41, 42, 43, and so on, to the subrates.
- Continuous rate is assigned a higher priority than is the discrete base rate regardless of whether **Periodic sample time constraint** is Specified or Unconstrained.

## Dependencies

This parameter is enabled by selecting Specified from the **Periodic sample time constraint** list.

## Command-Line Information

**Parameter:** SampleTimeProperty

**Type:** structure

**Value:** any valid matrix

**Default:** []

---

**Note** If you specify `SampleTimeProperty` at the command line, you must enter the sample time properties as a structure with the following fields:

- `SampleTime`
  - `Offset`
  - `Priority`
- 

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Period, offset, and priority of each sample time in the model; faster sample times must have higher priority than slower sample times

## See Also

- “Purely Discrete Systems”
- Specifying Sample Time
- Configuration Parameters Dialog Box
- Solver Pane

## Extrapolation order

Select the extrapolation order used by the `ode14x` solver to compute a model's states at the next time step from the states at the current time step.

### Settings

**Default:** 4

- 1      Specifies first order extrapolation.
- 2      Specifies second order extrapolation.
- 3      Specifies third order extrapolation.
- 4      Specifies fourth order extrapolation.

### Tip

Selecting a higher order produces a more accurate solution, but is more computationally intensive per step size.

### Dependencies

This parameter is enabled by selecting `ode14x (extrapolation)` from the **Solver** list.

### Command-Line Information

**Parameter:** `ExtrapolationOrder`

**Type:** integer

**Value:** 1 | 2 | 3 | 4

**Default:** 4

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Choosing a Fixed-Step Solver
- Configuration Parameters Dialog Box
- Solver Pane

## Number Newton's iterations

Specify the number of Newton's method iterations used by the `ode14x` solver to compute a model's states at the next time step from the states at the current time step.

### Settings

**Default:** 1

**Minimum:** 1

**Maximum:** 2147483647

More iterations produce a more accurate solution, but are more computationally intensive per step size.

### Dependencies

This parameter is enabled by selecting `ode14x` (extrapolation) from the Solver list.

### Command-Line Information

**Parameter:** `NumberNewtonIterations`

**Type:** integer

**Value:** any valid number

**Default:** 1

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## **See Also**

- Choosing a Fixed-Step Solver
- Configuration Parameters Dialog Box
- Solver Pane
- “Purely Discrete Systems”



## Data Import/Export Pane

The screenshot shows the Data Import/Export Pane interface, which is organized into three main sections:

- Load from workspace:** Contains two checkboxes, "Input:" and "Initial state:", each followed by an empty text input field.
- Save to workspace:** Contains several checkboxes and text input fields:
  - Time: tout
  - States: xout
  - Output: yout
  - Final states: xFinal
  - Signal logging: logcout
  - Data stores: dsmout
  - Save complete SimState in final state
  - Inspect signal logs when simulation is paused/stopped
- Save options:** Contains several input fields and dropdown menus:
  - Limit data points to last: 1000
  - Decimation: 1
  - Format: Array (dropdown menu)
  - Output options: Refine output (dropdown menu)
  - Refine factor: 1
  - Return as single object: out

### In this section...

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“Input” on page 1-80

“Initial state” on page 1-82

“Time” on page 1-84

“States” on page 1-86

“Output” on page 1-88

“Final states” on page 1-90

“Save complete SimState in final state” on page 1-92

“Signal logging” on page 1-95

**In this section...**

“Inspect signal logs when simulation is paused/stopped” on page 1-97

“Data stores” on page 1-99

“Limit data points to last” on page 1-100

“Decimation” on page 1-103

“Format” on page 1-105

“Output options” on page 1-107

“Refine factor” on page 1-109

“Output times” on page 1-111

“Return as Single Object” on page 1-112

## Data Import/Export Overview

The Data Import/Export pane allows you to import input signal and initial state data from a workspace and export output signal and state data to the MATLAB® workspace during simulation. This capability allows you to use standard or custom MATLAB functions to generate a simulated system's input signals and to graph, analyze, or otherwise postprocess the system's outputs.

### Configuration

- 1 Specify the data to load from a workspace before simulation begins.
- 2 Specify the data to save to the MATLAB workspace after simulation completes.

### Tips

- For more information on using this pane, see [Importing and Exporting Simulation Data](#).
- See the documentation of the `sim` command for some capabilities that are available only for programmatic simulation.

### See Also

- [Importing Data from a Workspace](#)
- [Exporting Data to the MATLAB Workspace](#)
- [Configuration Parameters Dialog Box](#)
- [Data Import/Export Pane](#)

## Input

Loads input data from a workspace before the simulation begins.

## Settings

**Default:** Off, [t,u]



On

Loads data from a workspace.

Specify a MATLAB expression for the data to be imported from a workspace. The Simulink software resolves symbols used in this specification as described in “Resolving Symbols”. The input data can take any of the following forms:

- Time series
- Data array
- Time expression
- Data structure

See Importing Data from a Workspace for information on how to use this field.



Off

Does not load data from a workspace.

## Tips

- You must select the **Input** check box before entering input data.
- Simulink software linearly interpolates or extrapolates input values as necessary if the Interpolate data option is selected for the corresponding Inport.
- The use of the **Input** box is independent of the setting of the **Format** list on the **Data Import/Export** pane.

## Command-Line Information

**Parameter:** LoadExternalInput

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

**Parameter:** ExternalInput

**Type:** scalar or vector

**Value:** any valid value

**Default:** [t,u]

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## See Also

- Importing Data from a Workspace
- Configuration Parameters Dialog Box
- Data Import/Export Pane

## Initial state

Loads the model's initial states from a workspace before simulation begins.

### Settings

**Default:** Off, `xInitial`



On

Simulink software loads initial states from a workspace.

Specify the name of a variable that contains the initial state values, for example, a variable containing states saved from a previous simulation.

Use the structure or structure-with-time option to specify initial states if you want to accomplish any of the following:

- Associate initial state values directly with the full path name to the states. This eliminates errors that could occur if Simulink software reorders the states, but the initial state array is not correspondingly reordered.
- Assign a different data type to each state's initial value.
- Initialize only a subset of the states.

See [Importing and Exporting States](#) for more information.



Off

Simulink software does not load initial states from a workspace.

### Tips

- You must select the **Initial State** check box before entering initial state data.
- The initial values specified by the workspace variable override the initial values specified by the model itself (the values specified by the initial condition parameters of those blocks in the model that have states).
- You must use the structure or structure-with-time format to initialize the states of a top model and the models that it references.

## Command-Line Information

**Parameter:** LoadInitialState

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

**Parameter:** InitialState

**Type:** variable (string) or vector

**Value:** any valid value

**Default:** 'xInitial'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## See Also

- Importing Data from a Workspace
- Importing and Exporting States
- Configuration Parameters Dialog Box
- Data Import/Export Pane

## Time

Saves simulation time data to the specified variable during simulation.

### Settings

**Default:** On, tout



On

Simulink software exports time data to the MATLAB workspace during simulation.

Specify the name of the MATLAB variable used to store time data. See [Exporting Data to the MATLAB Workspace](#) for more information.



Off

Simulink software does not export time data to the MATLAB workspace during simulation.

### Tips

- You must select the **Time** check box before entering the time variable.
- Simulink software saves the output to the MATLAB workspace at the base sample rate of the model. Use a To Workspace block if you want to save output at a different sample rate.
- The **Save options** area enables you to specify the format and restrict the amount of output saved.

### Command-Line Information

**Parameter:** SaveTime

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

**Parameter:** TimeSaveName

**Type:** string

**Value:** any valid value

**Default:** 'tout'



## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## See Also

- [Exporting Data to the MATLAB Workspace](#)
- [Configuration Parameters Dialog Box](#)
- [Data Import/Export Pane](#)

## States

Saves state data to the specified MATLAB variable during a simulation.

## Settings

**Default:** Off, xout



On

Simulink software exports state data to the MATLAB workspace during simulation.

Specify the name of the MATLAB variable used to store state data. See [Importing and Exporting States](#) for more information.



Off

Simulink does not export state data during simulation.

## Tips

- You must select the **States** check box before entering the states variable.
- Simulink saves the states in a MATLAB workspace variable having the specified name.
- The saved data has the format that you specify in the **Save options** area.
- Simulink creates empty variables for state logging (`xout`) if both of these conditions apply:
  - You enable **States**.
  - A model has no states.

## Command-Line Information

**Parameter:** SaveState

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

**Parameter:** StateSaveName

**Type:** string

**Value:** any valid value

**Default:** 'xout'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## See Also

- Importing and Exporting States
- Configuration Parameters Dialog Box
- Data Import/Export Pane

## Output

Saves signal data to the specified MATLAB variable during simulation.

## Settings

**Default:** On, you



On

Simulink software exports signal data to the MATLAB workspace during simulation.

Specify the name of the MATLAB variable used to store signal data. See Exporting Data to the MATLAB Workspace for more information.



Off

Simulink software does not export signal data during simulation.

## Tips

- You must select the **Output** check box before entering the output variable.
- Simulink software saves the output to the MATLAB workspace at the base sample rate of the model. Use a To Workspace block if you want to save output at a different sample rate.
- The **Save options** area enables you to specify the format and restrict the amount of output saved.

## Command-Line Information

**Parameter:** SaveOutput

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

**Parameter:** OutputSaveName

**Type:** string

**Value:** any valid value

**Default:** 'yout'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## See Also

- Exporting Data to the MATLAB Workspace
- Configuration Parameters Dialog Box
- Data Import/Export Pane

## Final states

Saves the logged states of the model at the end of a simulation to the specified MATLAB variable.

### Settings

**Default:** Off, xFinal



On

Simulink software exports final logged state data to the MATLAB workspace during simulation.

Specify the name of the MATLAB variable in which to store the values of these final states. See [Importing and Exporting States](#) for more information.



Off

Simulink software does not export the final state data during simulation.

### Tips

- You must select the **Final states** check box before entering the final states variable.
- Simulink software saves the final states in a MATLAB workspace variable having the specified name.
- The saved data has the format that you specify in the **Save options** area.
- Simulink creates empty variables for final state logging (xfinal) if both of these conditions apply:
  - You enable **Final states**.
  - A model has no states.

## Command-Line Information

**Parameter:** SaveFinalState

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

**Parameter:** FinalStateName

**Type:** string

**Value:** any valid value

**Default:** 'xFinal'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## See Also

- Importing and Exporting States
- Configuration Parameters Dialog Box
- Data Import/Export Pane

## Save complete SimState in final state

At the end of a simulation, Simulink saves the complete set of states of the model, including logged states, to the specified MATLAB variable.

### Settings

**Default:** Off, xFinal



On

Simulink software exports the complete set of final state data (i.e., the SimState) to the MATLAB workspace during simulation.

Specify the name of the MATLAB variable in which to store the values of the final states. See [Importing and Exporting States](#) for more information.



Off

Simulink software exports the final logged states during simulation.

### Tips

- You must select the **Final states** check box to enable the **Save complete SimState in final state** option.
- Simulink saves the final states in a MATLAB workspace variable having the specified name.
- The saved data has the format that you specify in the **Save options** area.

### Dependencies

This parameter is enabled by **Final states**.

### Command-Line Information

**Parameter:** SaveCompleteFinalSimState

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

**Parameter:** FinalStateName



**Type:** string  
**Value:** any valid value  
**Default:** 'xFinal'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

### See Also

- Importing and Exporting States
- Configuration Parameters Dialog Box
- Data Import/Export Pane



## Signal logging

Globally enable or disable signal logging for this model.

### Settings

**Default:** On, logout



On

Enables signal logging to the MATLAB workspace during simulation.

Specify the name of the signal logging object used to record logged signal data in the MATLAB workspace. See Logging Signals for more information.



Off

Disables signal logging to the MATLAB workspace during simulation.

### Tips

- You must select the **Signal logging** check box before entering the signal logging variable.
- Simulink software saves the signal data in a MATLAB workspace variable having the specified name.
- The saved data has the format that you specify in the **Save options** area.
- Simulink software does not support signal logging for the following types of signals:
  - Output of a Function-Call Generator block
  - Signal connected to the input of a Merge block
  - Outputs of Trigger and Enable blocks

### Dependencies

This parameter enables **Inspect signal logs when simulation is paused/stopped**.

## Command-Line Information

**Parameter:** SignalLogging

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

**Parameter:** SignalLoggingName

**Type:** string

**Value:** any valid value

**Default:** 'logout'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## See Also

- Logging Signals
- Configuration Parameters Dialog Box
- Data Import/Export Pane

## Inspect signal logs when simulation is paused/stopped

Specify whether Simulink software displays logged signals in the MATLAB **Time Series Tools** viewer at the end of a simulation or whenever you pause the simulation.

### Settings

**Default:** Off



On

Simulink displays logged signals in the MATLAB **Time Series Tools** viewer at the end of a simulation or whenever you pause the simulation.



Off

Simulink does not display logged signals at the end of a simulation.

### Tips

- If this option is off, you must select **Tools > Inspect logged signals** in the model editor to display logged signals in the **Time Series Tools** viewer.
- You must run the simulation before selecting **Tools > Inspect logged signals**. Otherwise, the command has no effect.

### Dependencies

This parameter is enabled by **Signal logging**.

### Command-Line Information

**Parameter:** InspectSignalLogs

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## See Also

- Logging Signals
- Configuration Parameters Dialog Box
- Data Import/Export Pane

## Data stores

Globally enable or disable logging of Data Store Memory block variables for this model.

### Settings

**Default:** On, dsmsout



On

Enables data store logging to the MATLAB workspace during simulation.

Specify the name of the data store logging object to use for recording logged data store data. The data store logging object must be in the MATLAB workspace.



Off

Disables data store logging to the MATLAB workspace during simulation.

### Tips

- Simulink saves the data in a MATLAB workspace variable having the specified name.
- The saved data has the format that you specify in the **Save options** area.
- See “Data Store Supported Data Types, Dimensions, and Complexity” and “Data Store Logging Limitations”.

**Dependencies.** Select the **Data stores** check box before entering the data store logging variable.

### Command-Line Information

**Parameter:** DSMLogging

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

**Parameter:** DSMLoggingName

**Type:** string  
**Value:** any valid value  
**Default:** 'dsmOut'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## See Also

- “Logging Data Stores”
- Logging Signals
- Configuration Parameters Dialog Box
- Data Import/Export Pane

## Limit data points to last

Limit the number of data points to export to the MATLAB workspace.

### Settings

**Default:** On, 1000

On

Limits the number of data points exported to the MATLAB workspace to the number that you specify.



Specify the maximum number of data points to export to the MATLAB workspace. At the end of the simulation, the MATLAB workspace contains the last N points generated by the simulation.



Off

Does not limit the number of data points.

## Tips

- You must select the **Limit data points to last** check box before specifying the number of data points.
- Saving data to the MATLAB workspace can slow down the simulation and consume memory. Use this parameter to limit the number of samples saved to help avoid this problem.
- You can also apply a **Decimation** factor to skip a selected number of samples.

## Command-Line Information

**Parameter:** LimitDataPoints

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

**Parameter:** MaxDataPoints

**Type:** string

**Value:** any valid value

**Default:** '1000'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## See Also

- Exporting Data to the MATLAB Workspace
- Configuration Parameters Dialog Box
- Data Import/Export Pane

## Decimation

Specify that Simulink software output only every N points, where N is the specified decimation factor.

### Settings

**Default:** 1

- The default value (1) specifies that all data points are saved.
- Simulink software outputs data only at the specified number of data points. For example, specifying 2 saves every other data point, while specifying 10 saves just one in ten data points.
- At the end of the simulation, the total number of data points is reduced by the factor specified.

### Tips

- Saving data to the MATLAB workspace can slow down the simulation and consume memory. Use this parameter to limit the number of samples saved to help avoid this problem.
- You can also use the **Limit data points to last** parameter to help resolve this problem.

### Command-Line Information

**Parameter:** Decimation

**Type:** string

**Value:** any valid value

**Default:** '1'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## See Also

- Exporting Data to the MATLAB Workspace
- Configuration Parameters Dialog Box
- Data Import/Export Pane

## Format

Select the format of state and output data saved to the MATLAB workspace.

## Settings

**Default:** Array

### Array

The format of the data is a matrix each row of which corresponds to a simulation time step.

### Structure

The format of the data is a structure that contains substructures for each port. Each port substructure contains signal data for the corresponding port.

### Structure with time

The format of the data is a structure that has two fields: a time field and a signals field. The time field contains a vector of simulation times. The signals field contains a substructure for each model input port (for imported data) or output port (for exported data). Each port substructure contains signal data for the corresponding port.

## Tips

- You can use array format to save your model's outputs and states only if the outputs are either all scalars or all vectors (or all matrices for states), are either all real or all complex, and are all of the same data type. Use the Structure or Structure with time output formats (see Structure with time) if your model's outputs and states do not meet these conditions.
- Simulink software can read back simulation data saved to the workspace in the Structure with time output format. See Importing Signal-and-Time Data Structures for more information.

## Command-Line Information

**Parameter:** SaveFormat

**Type:** string

**Value:** 'Array' | 'Structure' | 'StructureWithTime'

**Default:** 'Array'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## See Also

- Exporting Data to the MATLAB Workspace
- Configuration Parameters Dialog Box
- Data Import/Export Pane

## Output options

Select options for generating additional output signal data for variable-step solvers.

### Settings

**Default:** Refine output

#### Refine output

Generates data output between as well as at simulation times steps.

Use **Refine factor** to specify the number of points to generate between simulation time steps. For more information, see Refining Output.

#### Produce additional output

Generates additional output at specified times. Use **Output times** to specify the simulation times at which Simulink software should generate additional output.

#### Produce specified output only

Generates output only at specified times. Use **Output times** to specify the simulation times at which Simulink software should generate output.

### Tips

- These settings can force the solver to calculate output values for times that it would otherwise have omitted because the calculations were not needed to achieve accurate simulation results. These extra calculations can cause the solver to locate zero crossings that it would otherwise have missed.
- For additional information on how Simulink software calculates outputs for these three options, see Specifying Output Options.

### Dependencies

This parameter is enabled only if the model specifies a variable-step solver (see Solver Type).

Selecting Refine output enables the **Refine factor** parameter.

Selecting Produce additional output or Produce specified output only enables the **Output times** parameter.

## Command-Line Information

**Parameter:** OutputOption

**Type:** string

**Value:** 'RefineOutputTimes' | 'AdditionalOutputTimes' | 'SpecifiedOutputTimes'

**Default:** 'RefineOutputTimes'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## See Also

- Specifying Output Options
- Refine factor
- Refining Output
- Exporting Data to the MATLAB Workspace
- Configuration Parameters Dialog Box
- Data Import/Export Pane



## Refine factor

Specify how many points to generate between time steps to refine the output.

### Settings

**Default:** 1

- The default refine factor is 1, meaning that no extra data points are generated.
- A refine factor of 2 provides output midway between the time steps, as well as at the steps.

### Tip

Simulink software ignores this option for discrete models. This is because the value of data between time steps is undefined for discrete models.

### Dependency

This parameter is enabled only if you select **Refine** output as the value of **Output options**.

### Command-Line Information

**Parameter:** Refine  
**Type:** string  
**Value:** any valid value  
**Default:** '1'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## **See Also**

- Refining Output
- Configuration Parameters Dialog Box
- Data Import/Export Pane

## Output times

Specify times at which Simulink software should generate output in addition to, or instead of, the times of the simulation steps taken by the solver used to simulate the model.

### Settings

**Default:** []

- Enter a matrix containing the times at which Simulink software should generate output in addition to, or instead of, the simulation steps taken by the solver.
- If the value of **Output options** is `Produce additional output`, the default value [] specifies that no additional data points are generated.
- If the value of **Output options** is `Produce specified output only`, the default value [] specifies that no data points are generated.

### Tips

- The `Produce additional output` option generates output at the specified times as well as the regular simulation steps.
- The `Produce specified output only` option generates output only at the specified times.
- Discrete models define outputs only at major time steps. Therefore, Simulink software logs output for discrete models only at major time steps. If the **Output times** field specifies other times, Simulink software displays a warning at the MATLAB command line.

### Dependency

This parameter is enabled only if the value of **Output options** is `Produce additional output` or `Produce specified output only`.

## Command-Line Information

**Parameter:** OutputTimes

**Type:** string

**Value:** any valid value

**Default:** '[]'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact for simulation and during development Off for production code generation

## See Also

- Refining Output
- Configuration Parameters Dialog Box
- Data Import/Export Pane

## Return as Single Object

Enable the single-output format of the sim command.

## Settings

**Default:** off

- Turning this option 'on' directs Simulink to return all simulation outputs within a single Simulink.SimulationOutput object.
- Enabling this option makes the sim command compatible with the parfor command, in terms of transparency issues.

## Tips

- The method `who` of the `Simulink.SimulationOutput` object returns the list of variables that the object contains.
- Use the `find` method of the `Simulink.SimulationOutput` object to access the variables that the object contains.

## Command-Line Information

**Parameter:** `ReturnWorkspaceOutputs`

**Type:** `string`

**Value:** `'on' | 'off' |`

**Default:** `'off'`

## Recommended Settings

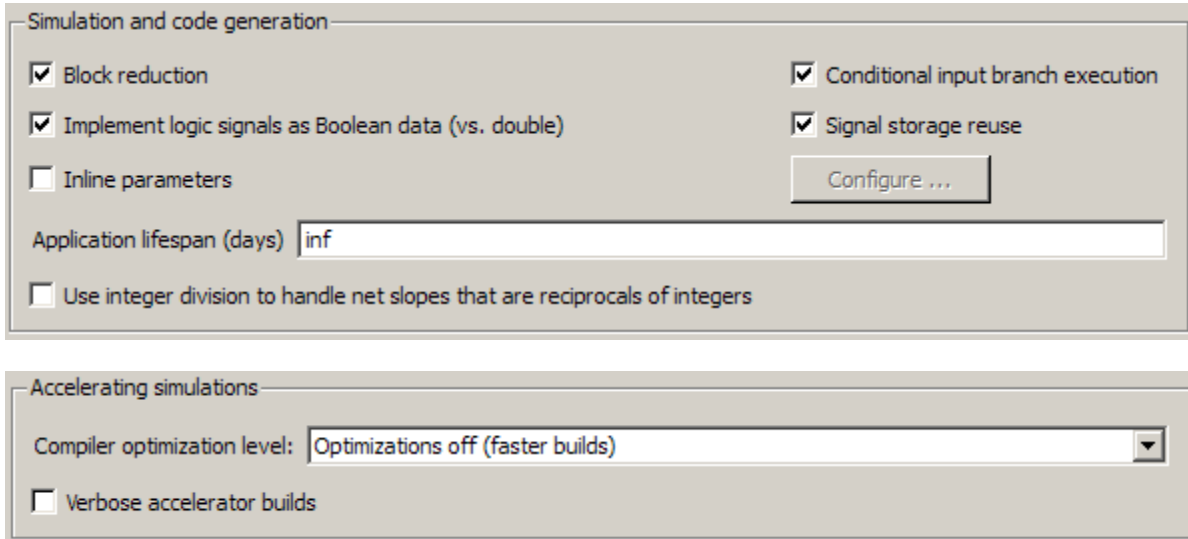
Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- “Configuration Parameters Dialog Box Overview” on page 1-2
- “Data Import/Export Pane” on page 1-77
- “Using the `sim` Command”
- “Running Parallel Simulations”

## Optimization Pane

The Optimization pane includes the following parameters:



Simulation and code generation

- Block reduction
- Implement logic signals as Boolean data (vs. double)
- Inline parameters
- Conditional input branch execution
- Signal storage reuse

Application lifespan (days)

Use integer division to handle net slopes that are reciprocals of integers

Configure ...

Accelerating simulations

Compiler optimization level:

Verbose accelerator builds

The Optimization pane includes the following parameters when the Real-Time Workshop product is installed on your system and you select a GRT-based target.

Code generation

Signals

- Enable local block outputs
- Reuse block outputs
- Inline invariant signals
- Eliminate superfluous local variables (Expression folding)
- Minimize data copies between local and global variables

Loop unrolling threshold:  Maximum stack size (bytes):

Use memcpy for vector assignment Memcpy threshold (bytes):

Data initialization

- Use memset to initialize floats and doubles to 0.0

Integer and fixed-point

- Remove code from floating-point to integer conversions that wraps out-of-range values
- Remove code from floating-point to integer conversions with saturation that maps NaN to zero

The Optimization pane includes the following parameters when the Real-Time Workshop product is installed on your system and you select an ERT-based target. ERT-based target optimizations require a Real-Time Workshop® Embedded Coder™ license when generating code.

Code generation

Parameter structure:

Signals

Enable local block outputs                       Reuse block outputs

Inline invariant signals

Eliminate superfluous local variables (Expression folding)    Simplify array indexing

Minimize data copies between local and global variables

Pack Boolean data into bitfields                      Bitfield declarator type specifier:

Loop unrolling threshold:                       Maximum stack size (bytes):

Use memcpy for vector assignment                      Memcpy threshold (bytes):

Pass reusable subsystem outputs as:

Data initialization

Remove root level I/O zero initialization                       Use memset to initialize floats and doubles to 0.0

Remove internal data zero initialization                       Optimize initialization code for model reference

Integer and fixed-point

Remove code from floating-point to integer conversions that wraps out-of-range values

Remove code from floating-point to integer conversions with saturation that maps NaN to zero

Remove code that protects against division arithmetic exceptions

The Optimization pane includes the following parameters when Real-Time Workshop and Stateflow® products are both installed on your system. Your model need not include Stateflow charts or Truth Table blocks.

Stateflow

Use bitsets for storing state configuration                       Use bitsets for storing Boolean data



**In this section...**

- “Optimization Overview” on page 1-119
- “Block reduction” on page 1-120
- “Conditional input branch execution” on page 1-124
- “Inline parameters” on page 1-126
- “Implement logic signals as Boolean data (vs. double)” on page 1-129
- “Signal storage reuse” on page 1-131
- “Application lifespan (days)” on page 1-133
- “Use integer division to handle net slopes that are reciprocals of integers” on page 1-136
- “Parameter structure” on page 1-138
- “Enable local block outputs” on page 1-140
- “Eliminate superfluous local variables (Expression folding)” on page 1-143
- “Minimize data copies between local and global variables” on page 1-145
- “Simplify array indexing” on page 1-147
- “Reuse block outputs” on page 1-149
- “Inline invariant signals” on page 1-152
- “Pack Boolean data into bitfields” on page 1-154
- “Bitfield declarator type specifier” on page 1-156
- “Loop unrolling threshold” on page 1-158
- “Maximum stack size (bytes)” on page 1-160
- “Use memcpy for vector assignment” on page 1-161
- “Memcpy threshold (bytes)” on page 1-163
- “Pass reusable subsystem outputs as” on page 1-165
- “Remove root level I/O zero initialization” on page 1-167
- “Use memset to initialize floats and doubles to 0.0” on page 1-169
- “Remove internal data zero initialization” on page 1-171

**In this section...**

- “Optimize initialization code for model reference” on page 1-173
- “Remove code from floating-point to integer conversions that wraps out-of-range values” on page 1-175
- “Remove code from floating-point to integer conversions with saturation that maps NaN to zero” on page 1-177
- “Remove code that protects against division arithmetic exceptions” on page 1-179
- “Use bitsets for storing state configuration” on page 1-181
- “Use bitsets for storing Boolean data” on page 1-183
- “Model Parameter Configuration Dialog Box” on page 1-185
- “Compiler optimization level” on page 1-187
- “Verbose accelerator builds” on page 1-189

## Optimization Overview

Set up optimizations for a model's active configuration set. Optimizations are set for both simulation and code generation.

### Configuration

Set the parameters displayed.

### Tips

- Real-Time Workshop optimizations appear only when the Real-Time Workshop product is installed on your system. Selecting a GRT-based or ERT-based system target file changes the available options. ERT-based target optimizations require a Real-Time Workshop Embedded Coder license when generating code.
- Stateflow software optimizations appear only when Real-Time Workshop and Stateflow products are both installed on your system and the model includes Stateflow charts or Embedded MATLAB<sup>®</sup> Function blocks. The settings you make for the Stateflow software options also apply to all Embedded MATLAB Function blocks in the model. You do not need a Stateflow license to use Embedded MATLAB Function blocks.

### See Also

- [Optimizing a Model for Code Generation](#)
- [Configuration Parameters Dialog Box](#)
- [Optimization Pane](#)
- [“Performing Acceleration”](#)

## Block reduction

Reduce execution time by collapsing or removing groups of blocks.

### Settings

Default: On



Simulink software searches for and reduces the following block patterns:

- **Accumulators** — A group consisting of a Constant block, a Sum block, and feedback through a Unit Delay block.
- **Redundant type conversions** — Unnecessary type conversion blocks, such as an int type conversion block with an input and output of type int.
- **Dead code** — Blocks or signals in an unused code path.
- **Fast-to-slow Rate Transition block in a single-tasking system** — Rate Transition blocks with an input frequency faster than its output frequency.



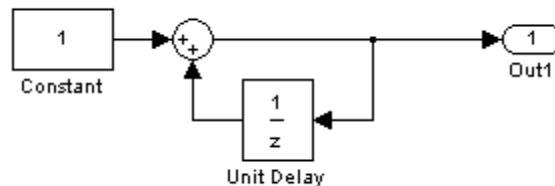
Simulink software does not search for block patterns that can be optimized. Simulation and generated code are not optimized.

### Tips

- When you select **Block reduction**, Simulink software collapses certain groups of blocks into a single, more efficient block, or removes them entirely. This results in faster execution during model simulation and in generated code.
- Block reduction does not change the appearance of the source model.
- Tunable parameters do not prevent a block from being reduced by dead code elimination.
- Once block reduction takes place, Simulink software does not display the sorted order for blocks that have been removed.

- Block reduction is intended to remove only the generated code that represents execution of a block. Other supporting data, such as definitions for sample time and data types might remain in the generated code.

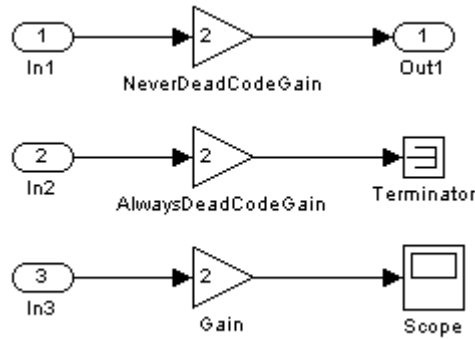
**Accumulators.** Simulink software recognizes the block diagram shown in the following figure as an accumulator:



- An accumulator construct is recognized anywhere across a block diagram, or within subsystems at lower levels.
- With the **Block reduction** option enabled, Simulink software creates a synthesized block, `Sum_synth_accum`. The synthesized block replaces the previous block diagram, resulting in a simple increment calculation.

**Dead Code Elimination.** Any blocks or signals in an *unused code path* are eliminated from generated code.

- The following conditions need to be met for a block to be considered part of an unused code path:
  - All signal paths for the block end with a block that does not execute. Examples of blocks that do not execute include Terminator blocks, disabled Assertion blocks, S-Function blocks configured for block reduction, and To Workspace blocks when MAT-file logging is disabled for code generation.
  - No signal paths for the block include global signal storage downstream from the block.
- Tunable parameters do not prevent a block from being reduced by dead code elimination.
- Consider the signal paths in the following block diagram.



If you check **Block reduction**, Real-Time Workshop software responds to each signal path as follows:

For Signal Path...	Real-Time Workshop Software...
In1 to Out1	Always generates code because dead code elimination conditions are not met.
In2 to Terminator	Never generates code because dead code elimination conditions are met.
In3 to Scope	Generates code if MAT-file logging is enabled and eliminates code if MAT-file logging is disabled.

### Command-Line Information

**Parameter:** BlockReduction

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

## Recommended Settings

Application	Setting
Debugging	Off (for simulation and during development) No impact (for production code generation)
Traceability	Off
Efficiency	On
Safety precaution	Off

## See Also

- Block Reduction
- Single-Tasking Execution
- Optimizing a Model for Code Generation
- Configuration Parameters Dialog Box
- Optimization Pane

## Conditional input branch execution

Improve model execution when the model contains Switch and Multiport Switch blocks.

### Settings

Default: On



On

Executes only the blocks required to compute the control input and the data input selected by the control input. This optimization speeds execution of code generated from the model. Limits to Switch block optimization:

- Only blocks with -1 (inherited) or `inf` (Constant) sample time can participate.
- Blocks with outputs flagged as test points cannot participate.
- No multirate block can participate.
- Blocks with states cannot participate.
- Only S-functions with option `SS_OPTION_CAN_BE_CALLED_CONDITIONALLY` set can participate.



Off

Executes all blocks driving the Switch block input ports at each time step.

### Command-Line Information

**Parameter:** `ConditionallyExecuteInputs`

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'



## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	On
Efficiency	On (execution), No impact (ROM, RAM)
Safety precaution	Off

## See Also

- Expression Folding
- Conditional Input Execution
- Optimizing a Model for Code Generation
- Configuration Parameters Dialog Box
- Optimization Pane

## Inline parameters

Transform tunable parameters into constant values.

### Settings

**Default:** Off



Selecting **Inline parameters** has the following effects:

- Real-Time Workshop software uses the numerical values of model parameters, instead of their symbolic names, in generated code.
- Reduces global RAM usage, because parameters are not declared in the global parameters structure.
- Enables the **Configure** button. Clicking the **Configure** button opens the Model Parameter Configuration dialog box.



Uses symbolic names for model parameters in generated code.

### Tips

- Simulink software allows you to override the **Inline parameters** option for parameters whose values are defined by variables in the MATLAB workspace. To specify that such a parameter remain tunable, specify the parameter as global in the Model Configuration Parameters dialog box (see Model Parameter Configuration Dialog Box). To display the dialog box, click the adjacent **Configure** button.
- To tune a global parameter, change the value of the corresponding workspace variable and select **Update Diagram (Ctrl+D)** from the Simulink **Edit** menu.
- You cannot tune inlined parameters in code generated from a model. However, when simulating a model, you can tune an inlined parameter if its value derives from a workspace variable. For example, suppose that a model has a Gain block whose **Gain** parameter is inlined and equals  $a$ , where  $a$  is a variable defined in the model's workspace. When simulating the model, Simulink software disables the **Gain** parameter field, preventing you from using the block's dialog box to change the gain.

However, you can still tune the gain by changing the value of  $a$  at the MATLAB command line and updating the diagram.

- When a top model uses referenced models:
  - All referenced models must specify **Inline parameters** to be on.
  - The top model can specify **Inline parameters** to be on or off.

See Inline Parameter Requirements for more information.

- If your model contains an Environment Controller block, you can suppress code generation for the branch connected to the Sim port if you select **Inline parameters** and the branch does not contain external signals.
- Simulink Scope and Signal Viewer blocks with Constant and Ground blocks — If you turn on inline parameters, the value of a Constant or Ground block does not change during the simulation. The constant value is determined before a simulation and plotted on a scope graph as a single point. To see a scope trace, change the sample time for a Constant or Ground block from `inf` to a value.

## Dependencies

This parameter enables:

- **Configure** button
- “**Parameter structure**” on page 1-138
- “**Inline invariant signals**” on page 1-152

## Command-Line Information

**Parameter:** `InlineParams`

**Type:** `string`

**Value:** `'on' | 'off'`

**Default:** `'off'`

### **Recommended Settings**

<b>Application</b>	<b>Setting</b>
Debugging	Off (for simulation and during development) On (for production code generation)
Traceability	On
Efficiency	On
Safety precaution	No impact

### **See Also**

- Model Parameter Configuration Dialog Box
- Parameter Storage, Interfacing, and Tuning
- Model Referencing Inline Parameters
- Optimizing a Model for Code Generation
- Configuration Parameters Dialog Box
- Optimization Pane

## Implement logic signals as Boolean data (vs. double)

Controls the output data type of blocks that generate logic signals.

### Settings

Default: On



**On**

Blocks that generate logic signals output a signal of `boolean` data type. This reduces the memory requirements of generated code.



**Off**

Blocks that generate logic signals output a signal of `double` data type. This ensures compatibility with models created by earlier versions of Simulink software.

### Tips

- Setting this option **on** reduces the memory requirements of generated code, because a Boolean signal typically requires one byte of storage compared to eight bytes for a `double` signal.
- Setting this option **off** allows the current version of Simulink software to run models that were created by earlier versions of Simulink software that supported only signals of type `double`.
- This optimization affects the following blocks:
  - **Logical Operator block** – This parameter affects only those Logical Operator blocks whose **Output data type** parameter specifies `Logical`. If this parameter is selected, such blocks output a signal of `boolean` data type; otherwise, such blocks output a signal of `double` data type.
  - **Relational Operator block** – This parameter affects only those Relational Operator blocks whose **Output data type** parameter specifies `Logical`. If this parameter is selected, such blocks output a signal of `boolean` data type; otherwise, such blocks output a signal of `double` data type.
  - **Combinatorial Logic block** – If this parameter is selected, Combinatorial Logic blocks output a signal of `boolean` data type;

otherwise, they output a signal of `double` data type. See Combinatorial Logic in the *Simulink Reference* for an exception to this rule.

- **Hit Crossing block** – If this parameter is selected, Hit Crossing blocks output a signal of `boolean` data type; otherwise, they output a signal of `double` data type.

## Dependencies

- This parameter is disabled for models created with a version of Simulink software that supports only signals of type `double`.

## Command-Line Information

**Parameter:** `BooleanDataType`  
**Type:** `string`  
**Value:** `'on' | 'off'`  
**Default:** `'on'`

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	On
Safety precaution	On

## See Also

- Optimizing a Model for Code Generation
- Configuration Parameters Dialog Box
- Optimization Pane

## Signal storage reuse

Reuse signal memory.

### Settings

Default: On



**On**

Simulink software reuses memory buffers allocated to store block input and output signals, reducing the memory requirement of your real-time program.



**Off**

Simulink software allocates a separate memory buffer for each block's outputs. This makes all block outputs global and unique, which in many cases significantly increases RAM and ROM usage.

### Tips

- This option applies only to signals with storage class **Auto**.
- Signal storage reuse can occur only among signals that have the same data type.
- Clearing this option can substantially increase the amount of memory required to simulate large models.
- Clear this option if you need to:
  - Debug a C-MEX S-function
  - Use a Floating Scope or a Display block with the **Floating display** option selected to inspect signals in a model that you are debugging
- Simulink software opens an error dialog if **Signal storage reuse** is enabled and you attempt to use a Floating Scope or floating Display block to display a signal whose buffer has been reused.

### Dependencies

This parameter enables:

- “**Enable local block outputs**” on page 1-140

- “Reuse block outputs” on page 1-149
- “Eliminate superfluous local variables (Expression folding)” on page 1-143
- “Minimize data copies between local and global variables” on page 1-145

## Command-Line Information

Parameter:OptimizeBlockIOStorage

Type: string

Value: 'on' | 'off'

Default: 'on'

## Recommended Settings

Application	Setting
Debugging	Off
Traceability	Off
Efficiency	On
Safety precaution	No impact

## See Also

- Signal Storage, Optimization, and Interfacing
- Optimizing a Model for Code Generation
- Configuration Parameters Dialog Box
- Optimization Pane



## Application lifespan (days)

Specify how long (in days) an application that contains blocks depending on elapsed or absolute time should be able to execute before timer overflow.

### Settings

**Default:** `inf`

**Min:** Must be greater than zero

**Max:** `inf`

Enter a positive (nonzero) scalar value (for example, `0.5`) or `inf`.

If you are licensed for the Real-Time Workshop Embedded Coder product and select an ERT target for your model, the default value for **Application lifespan (days)** is 1.

This parameter is ignored when you are operating your model in external mode, have **Mat-file logging** enabled, or have a continuous sample time because a 64 bit timer is required in these cases.

### Tips

- Specifying a lifespan, along with the simulation step size, determines the data type used by blocks to store absolute time values.
- For simulation, setting this parameter to a value greater than the simulation time will ensure time does not overflow.
- Simulink software evaluates this parameter first against the model workspace. If this does not resolve the parameter, Simulink software then evaluates it against the base workspace.
- The Application lifespan also determines the word size used by timers in the generated code, which can lower RAM usage. For more information, see *Timing Services* in the Real-Time Workshop documentation.
- Application lifespan, when combined with the step size of each task, determines the data type used for integer absolute time for each task, as follows:
  - If your model does not require absolute time, this option affects neither simulation nor the generated code.

- If your model requires absolute time, this option optimizes the word size used for storing integer absolute time in generated code. This ensures that timers do not overflow within the lifespan you specify. If you set **Application lifespan** to `inf`, two `uint32` words are used.
- If your model contains fixed-point blocks that require absolute time, this option affects both simulation and generated code.

For example, using 64 bits to store timing data enables models with a step size of 0.001 microsecond (10E-09 seconds) to run for more than 500 years, which would rarely be required. To run a model with a step size of one millisecond (0.001 seconds) for one day would require a 32-bit timer (but it could continue running for 49 days).

- A timer will allocate 64 bits of memory if you specify a value of `inf`.
- To minimize the amount of RAM used by time counters, specify a lifespan no longer than necessary.
- Must be the same for top and referenced models.
- Optimize the size of counters used to compute absolute and elapsed time.

## Command-Line Information

**Parameter:** LifeSpan

**Type:** string

**Value:** positive (nonzero) scalar value or `inf`

**Default:** 'inf'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	Finite value
Safety precaution	<code>inf</code>

**See Also**

- [Timing Services](#)
- [Using Timers in Asynchronous Tasks](#)
- [Optimizing a Model for Code Generation](#)
- [Configuration Parameters Dialog Box](#)
- [Optimization Pane](#)

## Use integer division to handle net slopes that are reciprocals of integers

The Simulink® Fixed Point™ software performs net slope correction using integer division to handle net slopes that are reciprocals of integers when simplicity and accuracy conditions are met.

### Settings

**Default:** Off



On

Perform net slope correction using integer division when simplicity and accuracy conditions are met.



Off

Perform net slope correction using integer multiplication followed by shifts.

### Tips

- This optimization affects both simulation and code generation.
- When a change of fixed-point slope is not a power of two, net slope correction is necessary. Normally, net slope correction uses an integer multiplication followed by shifts. Enabling this new optimization replaces the multiplication and shifts with an integer division under certain simplicity and accuracy conditions.
- Performing net slope correction using integer division is not always more efficient than using multiplication followed by shifts. Ensure that the target hardware supports efficient division.
- To ensure that this optimization occurs, you must:
  - Set the word length of the block to ensure that the software can perform division using the production target long data type. This avoids using multiword operations.
  - Set the **Signed integer division rounds to** configuration parameter setting on the **Hardware Implementation > Embedded Hardware** subpane to **Zero** or **Floor**. The optimization does not occur if this parameter is set to **Undefined**.

- Set the **Integer rounding mode** parameter of the block to **Simplest** or to the value of the **Signed integer division rounds to** configuration parameter setting on the **Hardware Implementation > Embedded Hardware** subpane.

## Dependency

This parameter requires a Simulink Fixed Point license.

## Command-Line Information

**Parameter:** UseIntDivNetSlope

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	On (when target hardware supports efficient division) Off (otherwise)
Safety precaution	No impact

## See Also

- Use Integer Division for Net Slope Correction
- Configuration Parameters Dialog Box
- Optimization Pane

## Parameter structure

Control how parameter data is generated for reusable subsystems.

### Settings

**Default:** Hierarchical

#### Hierarchical

Generates a separate header file, defining an independent parameter structure, for each subsystem that meets the following conditions:

- The subsystem's **Real-Time Workshop system code** parameter is set to `Reusable` function.
- The subsystem does not violate any code reuse limitations.
- The subsystem does not access parameters other than its own (such as parameters of the root-level model).

Each subsystem parameter structure is referenced as a substructure of the root-level parameter data structure, creating a structure hierarchy.

#### NonHierarchical

Generates a single, flat parameter data structure. Subsystem parameters are defined as fields within the structure. A nonhierarchical data structure can reduce compiler padding between word boundaries, producing more efficient compiled code.

### Dependencies

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is enabled by “**Inline parameters**” on page 1-126.

### Command-Line Information

**Parameter:** `InlinedParameterPlacement`

**Type:** `string`

**Value:** `'Hierarchical' | 'NonHierarchical'`

**Default:** 'Hierarchical'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	Hierarchical
Efficiency	NonHierarchical
Safety precaution	No impact

### See Also

- Nonvirtual Subsystem Code Generation
- Optimizing a Model for Code Generation
- Configuration Parameters Dialog Box
- Optimization Pane

## Enable local block outputs

Specify whether block signals are declared locally or globally.

### Settings

Default: On



On

Block signals are declared locally in functions.



Off

Block signals are declared globally.

### Tips

- If it is not possible to declare an output as a local variable, the generated code declares the output as a global variable.
- If you are constrained by limited stack space, you can turn **Enable local block outputs** off and still benefit from memory reuse.

### Dependencies

- This parameter requires a Real-Time Workshop license.
- This parameter is enabled by **Signal storage reuse**.

### Command-Line Information

**Parameter:** LocalBlockOutputs

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'



## Recommended Settings

Application	Setting
Debugging	Off
Traceability	No impact
Efficiency	On
Safety precaution	No impact

## See Also

- Signal Storage, Optimization, and Interfacing
- Signals with Auto Storage Class
- Optimizing a Model for Code Generation
- Configuration Parameters Dialog Box
- Optimization Pane



## Eliminate superfluous local variables (Expression folding)

Collapse block computations into single expressions.

### Settings

Default: On

On

- Enables expression folding.
- Eliminates local variables, incorporating the information into the main code statement.
- Improves code readability and efficiency.

Off

Disables expression folding.

### Dependencies

- This parameter requires a Real-Time Workshop license.
- This parameter is enabled by **Signal storage reuse**.

### Command-Line Information

**Parameter:** ExpressionFolding

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

## Recommended Settings

Application	Setting
Debugging	Off
Traceability	No impact (for simulation and during development) Off (for production code generation)
Efficiency	On
Safety precaution	No impact

## See Also

- Expression Folding
- Optimizing a Model for Code Generation
- Configuration Parameters Dialog Box
- Optimization Pane

## Minimize data copies between local and global variables

Reuse existing global variables to store temporary results.

### Settings

Default: Off



On

Writes data for block outputs to global variables, reducing RAM consumption and execution time.



Off

Writes data for block outputs to local variables.

### Dependencies

- This parameter requires a Real-Time Workshop license.
- This parameter is enabled by “**Signal storage reuse**” on page 1-131.

### Command-Line Information

**Parameter:** EnhancedBackFolding

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

### Recommended Settings

Application	Setting
Debugging	Off
Traceability	Off
Efficiency	No impact (execution), On (ROM, RAM)
Safety precaution	No impact

## **See Also**

- “Signal Considerations”
- “Optimizing Generated Code”
- Configuration Parameters Dialog Box
- Optimization Pane

## Simplify array indexing

Replace multiply operations in array indices when accessing arrays in a loop.

### Settings

**Default:** Off



On

In array indices, replace multiply operations with add operations when accessing arrays in a loop in the generated code. When the original signal is multidimensional, the Real-Time Workshop Embedded Coder generates one-dimensional arrays, resulting in multiply operations in the array indices. Using this setting eliminates costly multiply operations when accessing arrays in a loop in the C/C++ program. This optimization (commonly referred to as strength reduction) is particularly useful if the C/C++ compiler on the target platform does not have similar functionality. No appearance of multiply operations in the C/C++ program does not imply that the C/C++ compiler does not generate multiply instructions.



Off

Leave multiply operations in array indices when accessing arrays in a loop.

### Dependencies

This parameter:

- Requires a Real-Time Workshop Embedded Coder license to generate code.
- Appears only for ERT-based targets.

### Command-Line Information

**Parameter:** StrengthReduction

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- “Optimizing Generated Code”
- “Preparing Models for Code Generation”



## Reuse block outputs

Specify whether Real-Time Workshop software reuses signal memory.

### Settings

Default: On



On

- Real-Time Workshop software reuses signal memory whenever possible, reducing stack size where signals are being buffered in local variables.
- Selecting this parameter trades code traceability for code efficiency.



Off

Signals are stored in unique locations.

### Dependencies

- This parameter requires a Real-Time Workshop license.
- This parameter is enabled by **Signal storage reuse**.

### Command-Line Information

Parameter: BufferReuse

Type: string

Value: 'on' | 'off'

Default: 'on'

### Recommended Settings

Application	Setting
Debugging	Off
Traceability	Off
Efficiency	On
Safety precaution	No impact

## **See Also**

- [Signal Storage, Optimization, and Interfacing](#)
- [Signals with Auto Storage Class](#)
- [Optimizing a Model for Code Generation](#)
- [Configuration Parameters Dialog Box](#)
- [Optimization Pane](#)



## Inline invariant signals

Transform symbolic names of invariant signals into constant values.

### Settings

Default: Off

On

Real-Time Workshop software uses the numerical values of model parameters, instead of their symbolic names, in generated code. An invariant signal is not inlined if it is nonscalar, complex, or the block inport the signal is attached to takes the address of the signal.

Off

Uses symbolic names of model parameters in generated code.

### Dependencies

- This parameter requires a Real-Time Workshop license.
- This parameter is enabled by **Inline parameters**.

### Command-Line Information

Parameter: InlineInvariantSignals

Type: string

Value: 'on' | 'off'

Default: 'off'

### Recommended Settings

Application	Setting
Debugging	Off
Traceability	Off
Efficiency	On
Safety precaution	No impact

**See Also**

Inlining Invariant Signals

## Pack Boolean data into bitfields

Specify whether Boolean signals are stored as one-bit bitfields or as a Boolean data type.

---

**Note** You cannot use this optimization when you generate code for a target that specifies an explicit structure alignment.

---

### Settings

**Default:** Off



On

Stores Boolean signals into one-bit bitfields in global block I/O structures or DWork vectors. This will reduce RAM, but might cause more executable code.



Off

Stores Boolean signals as a Boolean data type in global block I/O structures or DWork vectors.

### Dependencies

This parameter:

- Requires a Real-Time Workshop Embedded Coder license.
- Appears only for ERT-based targets.

### Command-Line Information

**Parameter:** BooleansAsBitfields

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	Off (execution, ROM), On (RAM)
Safety precaution	No impact

## See Also

- “Optimization Pane” on page 1-114
- “Bitfield declarator type specifier” on page 1-156

## Bitfield declarator type specifier

Specify the bitfield type when selecting configuration parameter “Pack Boolean data into bitfields” on page 1-154.

---

**Note** The optimization benefit is dependent upon your choice of target.

---

### Settings

Default: `uint_T`

`uint_T`

The type specified for a bitfield declaration is an unsigned `int`.

`uchar_T`

The type specified for a bitfield declaration is an unsigned `char`.

### Tip

The “Pack Boolean data into bitfields” on page 1-154 configuration parameter default setting uses unsigned integers. This might cause an increase in RAM if the bitfields are small and distributed. In this case, `uchar_T` might use less RAM depending on your target.

### Dependency

**Pack Boolean data into bitfields** enables this parameter.

### Command-Line Information

Parameter: `BitfieldContainerType`

Type: `string`

Value: `uint_T | uchar_T`

Default: `uint_T`



## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	Target dependent
Safety precaution	No impact

## See Also

“Pack Boolean data into bitfields” on page 1-154

## Loop unrolling threshold

Specify the minimum signal or parameter width for which a for loop is generated.

### Settings

**Default:** 5

Specify the array size at which the code generator begins to use a for loop instead of separate assignment statements to assign values to the elements of a signal or parameter array.

When there are perfectly nested loops, the code generator uses a for loop if the product of the loop counts for all loops in the perfect loop nest is greater than or equal to the threshold.

### Dependency

This parameter requires a Real-Time Workshop license.

### Command-Line Information

**Parameter:** RollThreshold

**Type:** string

**Value:** any valid value

**Default:** '5'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	>0
Safety precaution	>1

**See Also**

- [Configuring a Loop Unrolling Threshold](#)
- [Real-Time Workshop Target Language Compiler](#)

## Maximum stack size (bytes)

Specify the maximum stack size in bytes for your model.

### Settings

**Default:**Inherit from target

Inherit from target

The Real-Time Workshop software assigns the maximum stack size to the smaller value of the following:

- The default value (200,000 bytes) set by the Real-Time Workshop software
- Value of the TLC variable `MaxStackSize` in the system target file

<Specify a value>

Specify a positive integer value. Real-Time Workshop software assigns the maximum stack size to the specified value.

---

**Note** If you specify a maximum stack size for a model, the estimated required stack size of a referenced model must be less than the specified maximum stack size of the parent model.

---

### Tips

- If you specify the maximum stack size to be zero, then the generated code implements all variables as global data.
- If you specify the maximum stack to be `inf`, then the generated code contains the least number of global variables.

### Command-Line Information

**Parameter:** `MaxStackSize`

**Type:** `int`

**Value:** Any valid value

**Default:** Inherit from target

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

“Using Stack Space Allocation” in the Real-Time Workshop documentation

## Use memcpy for vector assignment

Optimize code generated for vector assignment by replacing for loops with memcpy.

## Settings

Default: On



**On**

Enables use of memcpy for vector assignment based on the associated threshold parameter **Memcpy threshold (bytes)**. memcpy is used in the generated code if the number of array elements times the number of bytes per element is greater than or equal to the specified value for **Memcpy threshold (bytes)**. One byte equals the width of a character in this context.



**Off**

Disables use of memcpy for vector assignment.

## Dependencies

- This parameter requires a Real-Time Workshop license.
- When selected, this parameter enables the associated parameter **Memcpy threshold (bytes)**.

## Command-Line Information

**Parameter:** EnableMemcpy

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	On
Safety precaution	No impact

## See Also

- “Optimizing Code Generated for Vector Assignments”
- Optimizing a Model for Code Generation
- Configuration Parameters Dialog Box
- Optimization Pane

## Memcpy threshold (bytes)

Specify the minimum array size in bytes for which memcpy function calls should replace for loops in the generated code for vector assignments.

### Settings

**Default:** 64

Specify the array size, in bytes, at which the code generator begins to use memcpy instead of for loops for vector assignments.

### Dependencies

- This parameter requires a Real-Time Workshop license.
- This parameter is enabled when you select **Use memcpy for vector assignment**.

### Command-Line Information

**Parameter:** MemcpyThreshold

**Type:** integer

**Value:** any valid quantity of bytes

**Default:** 64

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	Accept default or determine target-specific optimal value
Safety precaution	No impact

## **See Also**

- “Optimizing Code Generated for Vector Assignments”
- Optimizing a Model for Code Generation
- Configuration Parameters Dialog Box
- Optimization Pane



## Pass reusable subsystem outputs as

Specify how a reusable subsystem passes outputs.

### Settings

**Default:** Structure reference

#### Structure reference

Passes reusable subsystem outputs as a pointer to a structure stored in global memory.

#### Individual arguments

Passes each reusable subsystem output argument as an address of a local, instead of as a pointer to an area of global memory containing all output arguments. This option reduces global memory usage and eliminates copying local variables back to global block I/O structures. When the signals are allocated as local variables, there may be an increase in stack size. If the stack size increases beyond a level that you want, use the default setting. The maximum number of output arguments passed individually is 12.

---

**Note** The default option is used for reusable subsystems that have signals with variable dimensions.

---

### Dependencies

This parameter:

- Requires a Real-Time Workshop Embedded Coder license.
- Appears only for ERT-based targets.

### Command-Line Information

**Parameter:** PassReuseOutputArgsAs

**Type:** string

**Value:** 'Structure reference' | 'Individual arguments'

**Default:** 'Structure reference'

### **Recommended Settings**

<b>Application</b>	<b>Setting</b>
Debugging	No impact
Traceability	No impact
Efficiency	No impact (execution), Structure reference (ROM), Individual arguments (RAM)
Safety precaution	No impact

### **See Also**

- “Optimizing Generated Code”
- “Preparing Models for Code Generation”

## Remove root level I/O zero initialization

Specify whether to generate initialization code for root-level inports and outports set to zero.

### Settings

**Default:** Off (GUI), 'on' (command-line)



On

Does not generate initialization code for root-level inports and outports set to zero.



Off

Generates initialization code for all root-level inports and outports. You should use the default:

- To ensure that memory allocated for C MEX S-function wrappers is initialized to zero
- For safety-critical applications that require that all internal and external data be initialized to zero

### Dependencies

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

### Command-Line Information

**Parameter:** ZeroExternalMemoryAtStartup

**Type:** string

**Value:** 'off' | 'on'

**Default:** 'on'

---

**Note** The command-line values are reverse of the settings values. Therefore, 'on' in the command line corresponds to the description of “Off” in the settings section, and 'off' in the command line corresponds to the description of “On” in the settings section.

---

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	On (GUI), off (command line) (execution, ROM), No impact (RAM)
Safety precaution	Off (GUI), on (command line)

## See Also

- Optimizing a Model for Code Generation
- Configuration Parameters Dialog Box
- Optimization Pane

## Use memset to initialize floats and doubles to 0.0

Specify whether to generate code that explicitly initializes floating-point data to 0.0.

### Settings

**Default:** On (GUI), 'off' (command-line)



On

Uses `memset` to clear internal storage for floating-point data to integer bit pattern 0 (all bits 0), regardless of type. An example of a case for selecting this option is to gain compiler efficiency when the compiler and target CPU both represent floating-point zero with the integer bit pattern 0.



Off

Generates code to explicitly initialize storage for data of types `float` and `double` to 0.0. The resulting code is slightly less efficient than code generated when you select the option.

You should not select this option if you need to ensure that memory allocated for C MEX S-function wrappers is initialized to zero.

### Dependency

This parameter requires a Real-Time Workshop license.

### Command-Line Information

**Parameter:** `InitFltsAndDblsToZero`

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

---

**Note** The command-line values are reverse of the settings values. Therefore, 'on' in the command line corresponds to the description of "Off" in the settings section, and 'off' in the command line corresponds to the description of "On" in the settings section.

---

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	On (GUI), 'off' (command-line) (execution, ROM), No impact (RAM)
Safety precaution	No impact

## See Also

- [Optimizing a Model for Code Generation](#)
- [Configuration Parameters Dialog Box](#)
- [Optimization Pane](#)

## Remove internal data zero initialization

Specify whether to generate initialization code for internal work structures, such as block states and block outputs, to zero.

### Settings

**Default:** Off (GUI), 'on' (command-line)



On

Does not generate code that initializes internal work structures to zero. An example of when you might select this parameter is to test the behavior of a design during warm boot—a restart without full system reinitialization.

Selecting this parameter does not guarantee that memory is in a known state each time the generated code begins execution. When you run a model or generated S-function multiple times, each run can produce a different answer, even when calling the model initialization function in an attempt to reset memory.

If want to get the same answer on every run from a generated S-function, enter the command `clear SFcnNam` or `clear mex` in the MATLAB Command Window before each run.



Off

Generates code that initializes internal work structures to zero. You should use the default:

- To ensure that memory allocated for C MEX S-function wrappers is initialized to zero
- For safety critical applications that require that all internal and external data be initialized to zero

### Dependencies

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

## Command-Line Information

**Parameter:** ZeroInternalMemoryAtStartup

**Type:** string

**Value:** 'off' | 'on'

**Default:** 'on'

---

**Note** The command-line values are reverse of the settings values. Therefore, 'on' in the command line corresponds to the description of “Off” in the settings section, and 'off' in the command line corresponds to the description of “On” in the settings section.

---

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	On (GUI), off (command line), (execution, ROM), No impact (RAM)
Safety precaution	Off (GUI), on (command line)

## See Also

- Optimizing a Model for Code Generation
- Configuration Parameters Dialog Box
- Optimization Pane



## Optimize initialization code for model reference

Specify whether to generate initialization code for blocks that have states.

### Settings

**Default:** on



On

Suppresses generation of initialization code for blocks that have states unless the blocks are in a system that can reset its states, such as an enabled subsystem. This results in more efficient code, but requires that you not refer to the model from a Model block that resides in a system that resets states. If you violate this constraint, Simulink software reports an error, in which case you can disable this optimization.



Off

Generates initialization code for all blocks that have states. Disable this option if the current model includes a subsystem that resets states, such as an enabled subsystem, and the model is referred to from another model with a Model block.

### Dependencies

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- You must disable this option if your model includes enabled subsystem and model is referred to from another model with Model block.

### Command-Line Information

**Parameter:** OptimizeModelRefInitCode

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	On (execution, ROM), No impact (RAM)
Safety precaution	No impact

## See Also

- [Optimizing a Model for Code Generation](#)
- [Configuration Parameters Dialog Box](#)
- [Optimization Pane](#)

## Remove code from floating-point to integer conversions that wraps out-of-range values

Remove wrapping code that handles out-of-range floating-point to integer conversion results.

### Settings

Default: Off



On

Removes code when out-of-range conversions occur. Select this check box if code efficiency is critical to your application and the following conditions are true for at least one block in the model:

- Computing the outputs or parameters of a block involves converting floating-point data to integer or fixed-point data.
- The **Saturate on integer overflow** check box is cleared in the Block Parameters dialog box.

---

**Caution** Execution of generated code might not produce the same results as simulation.

---



Off

Results for simulation and execution of generated code match when out-of-range conversions occur. The generated code is larger than when you select this check box.

### Tips

- Selecting this check box reduces the size and increases the speed of the generated code at the cost of potentially producing results that do not match simulation in the case of out-of-range values.
- Selecting this check box affects code generation results only for out-of-range values and cannot cause code generation results to differ from simulation results for in-range values.

## Dependency

This parameter requires a Real-Time Workshop license.

## Command-Line Information

**Parameter:** EfficientFloat2IntCast

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

## Recommended Settings

Application	Setting
Debugging	Off
Traceability	Off
Efficiency	On (execution, ROM), No impact (RAM)
Safety precaution	Off (for simulation and during development) On (for production code generation)

## See Also

- Removing Code That Wraps Out-of-Range Values
- Configuration Parameters Dialog Box
- Optimization Pane

## Remove code from floating-point to integer conversions with saturation that maps NaN to zero

Remove code that handles floating-point to integer conversion results for NaN values.

### Settings

Default: On



On

Removes code when mapping from NaN to integer zero occurs. Select this check box if code efficiency is critical to your application and the following conditions are true for at least one block in the model:

- Computing outputs or parameters of a block involves converting floating-point data to integer or fixed-point data.
- The **Saturate on integer overflow** check box is selected in the Block Parameters dialog box.

---

**Caution** Execution of generated code might not produce the same results as simulation.

---



Off

Results for simulation and execution of generated code match when mapping from NaN to integer zero occurs. The generated code is larger than when you select this check box.

### Tips

- Selecting this check box reduces the size and increases the speed of the generated code at the cost of producing results that do not match simulation in the case of NaN values.
- Selecting this check box affects code generation results only for NaN values and cannot cause code generation results to differ from simulation results for any other values.

## Dependencies

- This parameter requires a Real-Time Workshop license.
- For ERT-based targets, this parameter is enabled when you select the **floating-point numbers** and **non-finite numbers** check boxes in the **Real-Time Workshop > Interface** pane.

## Command-Line Information

**Parameter:** EfficientMapNaN2IntZero

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

## Recommended Settings

Application	Setting
Debugging	Off
Traceability	Off
Efficiency	On
Safety precaution	Off (for simulation and during development) On (for production code generation)

## See Also

- Removing Code That Maps NaN Values to Integer Zero
- Configuration Parameters Dialog Box
- Optimization Pane

## Remove code that protects against division arithmetic exceptions

Specify whether to generate code that guards against division by zero for fixed-point data.

### Settings

Default: On



On

Does not generate code that guards against division by zero for fixed-point data. When you select this option, simulation results and results from generated code might not be in bit-for-bit agreement.



Off

Generates code that guards against division by zero for fixed-point data.

### Dependencies

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

### Command-Line Information

**Parameter:** NoFixptDivByZeroProtection

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	On
Safety precaution	Off

## **See Also**

- [Optimizing a Model for Code Generation](#)
- [Configuration Parameters Dialog Box](#)
- [Optimization Pane](#)



## Use bitsets for storing state configuration

Use bitsets to reduce the amount of memory required to store state configuration variables.

### Settings

**Default:** Off



On

Stores state configuration variables in bitsets. Potentially reduces the amount of memory required to store the variables. Potentially requires more instructions to access state configuration, which can result in less optimal code.



Off

Stores state configuration variables in unsigned bytes. Potentially increases the amount of memory required to store the variables. Potentially requires fewer instructions to access state configuration, which can result in more optimal code.

### Tips

- Selecting this check box can significantly reduce the amount of memory required to store the variables. However, it can increase the amount of memory required to store target code if the target processor does not include instructions for manipulating bitsets.
- Select this check box for Stateflow charts that have a large number of sibling states at a given level of the hierarchy.
- Clear this check box for Stateflow charts with a small number of sibling states at a given level of the hierarchy.

### Dependency

This parameter requires a Stateflow license.

### Command-Line Information

**Parameter:** StateBitsets

**Type:** string  
**Value:** 'on' | 'off'  
**Default:** 'off'

## Recommended Settings

Application	Setting
Debugging	Off
Traceability	Off
Efficiency	Off (execution, ROM), On (RAM)
Safety precaution	No impact

## See Also

- Optimizing Generated Code
- Configuration Parameters Dialog Box
- Optimization Pane

## Use bitsets for storing Boolean data

Use bitsets to reduce the amount of memory required to store Boolean data.

### Settings

**Default:** Off



On

Stores Boolean data in bitsets. Potentially reduces the amount of memory required to store the data. Potentially requires more instructions to access the data, which can result in less optimal code.



Off

Stores Boolean data in unsigned bytes. Potentially increases the amount of memory required to store the data. Potentially requires fewer instructions to access the data, which can result in more optimal code.

### Tips

- Select this check box for Stateflow charts that reference Boolean data infrequently.
- Clear this check box for Stateflow charts that reference Boolean data frequently.

### Dependency

This parameter requires a Stateflow license.

### Command-Line Information

**Parameter:** DataBitsets

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

## Recommended Settings

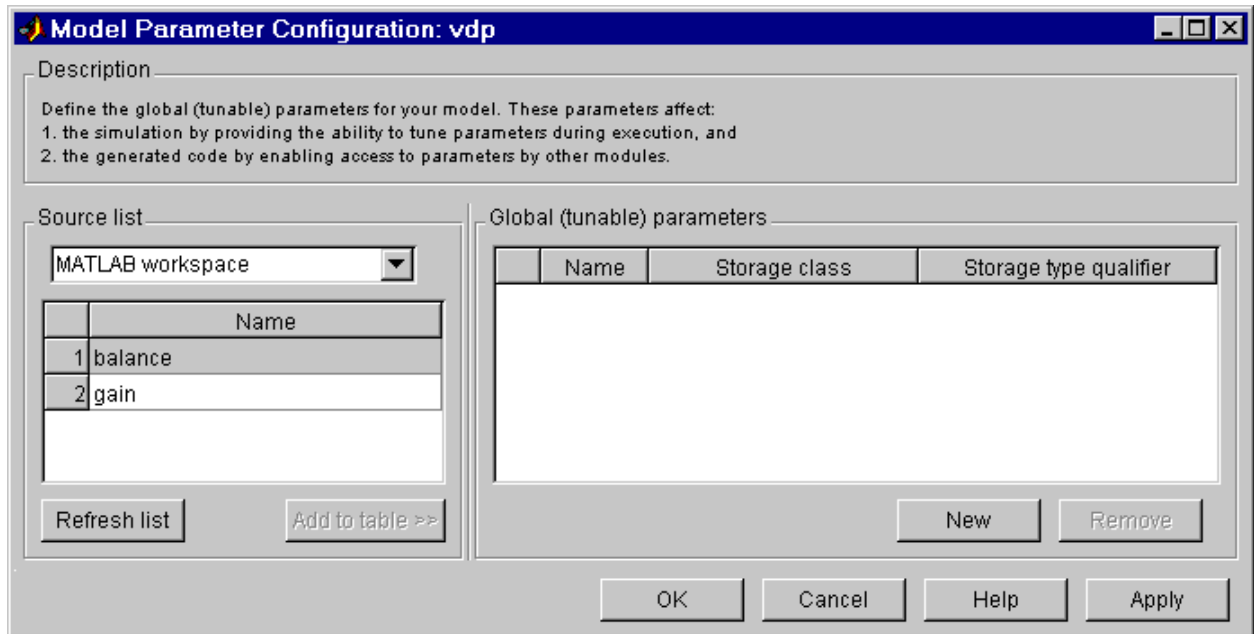
Application	Setting
Debugging	Off
Traceability	Off
Efficiency	Off (execution, ROM), On (RAM)
Safety precaution	No impact

## See Also

- [Optimizing Generated Code](#)
- [Configuration Parameters Dialog Box](#)
- [Optimization Pane](#)

## Model Parameter Configuration Dialog Box

The **Model Parameter Configuration** dialog box allows you to override the **Inline parameters** option (see Inline parameters) for selected parameters.




---

**Note** Simulink software ignores the settings of this dialog box if a model contains references to other models. However, you can still tune parameters of such models, using `Simulink.Parameter` objects (see “Inline Parameter Requirements” for more information).

---

The dialog box has the following controls.

### Source list

Displays a list of workspace variables. The options are:

- MATLAB workspace

Lists all variables in the MATLAB workspace that have numeric values.

- **Referenced workspace variables**

Lists only those variables referenced by the model.

### **Refresh list**

Updates the source list. Click this button if you have added a variable to the workspace since the last time the list was displayed.

### **Add to table**

Adds the variables selected in the source list to the adjacent table of tunable parameters.

### **New**

Defines a new parameter and adds it to the list of tunable parameters. Use this button to create tunable parameters that are not yet defined in the MATLAB workspace.

---

**Note** This option does not create the corresponding variable in the MATLAB workspace. You must create the variable yourself.

---

### **Storage class**

Used for code generation. See the *Real-Time Workshop User's Guide* for more information.

### **Storage type qualifier**

Used for code generation. See the *Real-Time Workshop User's Guide* for more information.

## Compiler optimization level

Sets the degree of optimization used by the compiler when generating code for acceleration.

### Settings

**Default:** Optimizations off (faster builds)

Optimizations off (faster builds)

Specifies the compiler not to optimize code. This results in faster build times.

Optimizations on (faster runs)

Specifies the compiler to generate optimized code. The generated code will run faster, but the model build will take longer than if optimizations are off.

### Tips

- The default `Optimizations off` is a good choice for most models. This quickly produces code that can be used with acceleration.
- Set `Optimizations on` to optimize your code. The fast running code produced by optimization can be advantageous if you will repeatedly run your model with the accelerator.

### Command-Line Information

**Parameter:** `SimCompilerOptimization`

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	No impact

## **See Also**

- “Accelerating Models”
- “Interacting with the Acceleration Modes Programmatically”
- “Customizing the Acceleration Build Process”



## Verbose accelerator builds

Select the amount of information displayed during code generation for Simulink Accelerator mode, referenced model Accelerator mode, and Rapid Accelerator mode.

### Settings

**Default:** Off

**Off**  
Display limited amount of information during the code generation process.

**On**  
Display progress information during code generation, and show the compiler options in use.

### Command-Line Information

**Parameter:** AccelVerboseBuild

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

### See Also

For more information about AccelVerboseBuild, see “Controlling Verbosity During Code Generation”.

## Diagnostics Pane: Solver

Solver	
Algebraic loop:	warning
Minimize algebraic loop:	warning
Block priority violation:	warning
Min step size violation:	warning
Sample hit time adjusting:	none
Consecutive zero crossings violation:	error
Unspecified inheritability of sample time:	warning
Solver data inconsistency:	none
Automatic solver parameter selection:	warning
Extraneous discrete derivative signals:	error
State name clash:	warning

### In this section...

“Solver Diagnostics Overview” on page 1-192

“Algebraic loop” on page 1-193

“Minimize algebraic loop” on page 1-195

“Block priority violation” on page 1-197

“Min step size violation” on page 1-199

“Sample hit time adjusting” on page 1-201

“Consecutive zero-crossings violation” on page 1-203

“Unspecified inheritability of sample time” on page 1-205

“Solver data inconsistency” on page 1-207

“Automatic solver parameter selection” on page 1-209

“Extraneous discrete derivative signals” on page 1-211

**In this section...**

“State name clash” on page 1-213

“SimState interface checksum mismatch:” on page 1-214

## **Solver Diagnostics Overview**

Specify what diagnostic actions Simulink software should take, if any, when it detects an abnormal condition with the solver.

### **Configuration**

Set the parameters displayed.

### **Tips**

- The options are typically to do nothing or to display a warning or an error message.
- A warning does not terminate a simulation, but an error does.

### **See Also**

- Diagnosing Simulation Errors
- Sample Time Diagnostics
- Data Validity Diagnostics
- Type Conversion Diagnostics
- Connectivity Diagnostics
- Compatibility Diagnostics
- Model Referencing Diagnostics
- Saving Diagnostics
- Configuration Parameters Dialog Box
- Diagnostics Pane: Solver

## Algebraic loop

Select the diagnostic action to take if Simulink software detects an algebraic loop while compiling the model.

### Settings

**Default:** warning

none

Simulink software does not check for algebraic loops.

warning

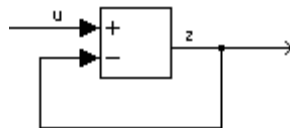
When Simulink software detects an algebraic loop, it displays a warning.

error

When Simulink software detects an algebraic loop, it terminates the simulation, displays an error message, and highlights the portion of the block diagram that comprises the loop.

### Tips

- An *algebraic loop* generally occurs when an input port with direct feedthrough is driven by the output of the same block, either directly, or by a feedback path through other blocks with direct feedthrough. An example of an algebraic loop is this simple scalar loop.



- When a model contains an algebraic loop, Simulink software calls a loop solving routine at each time step. The loop solver performs iterations to determine the solution to the problem (if it can). As a result, models with algebraic loops run slower than models without them.
- Use the **error** option to highlight algebraic loops when you simulate a model. This causes Simulink software to display an error dialog (the Diagnostics Viewer) and recolor portions of the diagram that represent the algebraic loops that it detects. Simulink software uses red to color the

blocks and lines that constitute the loops. Closing the error dialog restores the diagram to its original colors.

- See Algebraic Loops for more information.

## Command-Line Information

**Parameter:** AlgebraicLoopMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

## Recommended Settings

Application	Setting
Debugging	error
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Algebraic Loops
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Solver

## Minimize algebraic loop

Select the diagnostic action to take if algebraic loop minimization cannot be performed for a subsystem because an input port of that subsystem has direct feedthrough.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- If the port is involved in an algebraic loop, Simulink software can remove the loop only if at least one other input port in the loop lacks direct feedthrough.
- Simulink software cannot minimize algebraic loops containing signals designated as test points (see Working with Test Points).

### Command-Line Information

**Parameter:** ArtificialAlgebraicLoopMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Algebraic Loops
- Diagnosing Simulation Errors
- Working with Test Points
- Configuration Parameters Dialog Box
- Diagnostics Pane: Solver



## Block priority violation

Select the diagnostic action to take if Simulink software detects a block priority specification error.

### Settings

**Default:** warning

warning

When Simulink software detects a block priority specification error, it displays a warning.

error

When Simulink software detects a block priority specification error, it terminates the simulation and displays an error message.

### Tips

- Simulink software allows you to assign update priorities to blocks. Simulink software executes the output methods of higher priority blocks before those of lower priority blocks.
- Simulink software honors the block priorities that you specify only if they are consistent with the Simulink block sorting algorithm. If Simulink software is unable to honor a user specified block priority, it generates a block priority specification error.

### Command-Line Information

**Parameter:** BlockPriorityViolationMsg

**Type:** string

**Value:** 'warning' | 'error'

**Default:** 'warning'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Controlling and Displaying the Sorted Order
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Solver

## Min step size violation

Select the diagnostic action to take if Simulink software detects that the next simulation step is smaller than the minimum step size specified for the model.

### Settings

**Default:** warning

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- A minimum step size violation can occur if the specified error tolerance for the model requires a step size smaller than the specified minimum step size. See [Min step size](#) and [Maximum order](#) for more information.
- Simulink software allows you to specify the maximum number of consecutive minimum step size violations permitted (see [Number of consecutive min steps](#)).

### Command-Line Information

**Parameter:** MinStepSizeMsg

**Type:** string

**Value:** 'warning' | 'error'

**Default:** 'warning'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	No impact

## **See Also**

- Min step size
- Maximum order
- Number of consecutive min steps
- “Purely Discrete Systems”
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Solver

## Sample hit time adjusting

Select the diagnostic action to take if Simulink software makes a minor adjustment to a sample hit time while running the model.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

### Tips

- Simulink software might change a sample hit time if that hit time is close to the hit time for another task. If Simulink software considers the difference to be due only to numerical errors (for example, precision issues or roundoff errors), it changes the sample hits of the faster task or tasks to exactly match the time of the slowest task that has that hit.
- Over time, these sample hit changes might cause a discrepancy between the numerical simulation results and the actual theoretical results.
- When this option is set to warning, the MATLAB Command Window displays a warning like the following when Simulink software detects a change in the sample hit time:

```
Warning: Timing engine warning: Changing the hit time for ...
```

### Command-Line Information

**Parameter:** TimeAdjustmentMsg

**Type:** string

**Value:** 'none' | 'warning'

**Default:** 'none'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Solver

## Consecutive zero-crossings violation

Select the diagnostic action to take when Simulink software detects that the number of consecutive zero crossings exceeds the specified maximum.

### Settings

**Default:** error

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- If you select warning or error, Simulink software reports the current simulation time, the number of consecutive zero crossings counted, and the type and name of the block in which Simulink software detected the zero crossings.
- For more information, see Preventing Excessive Zero Crossings.

### Dependency

This diagnostic applies only when you are using a variable-step solver and the zero-crossing control is set to either `Enable all` or `Use local settings`.

### Command-Line Information

**Parameter:** MaxConsecutiveZCsMsg

**Type:** string

**Value:** 'none' | 'warning'

**Default:** 'error'

### **Recommended Settings**

<b>Application</b>	<b>Setting</b>
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	warning or error

### **See Also**

- Zero-Crossing Detection
- Zero-Crossing Control
- Number of consecutive zero crossings
- Time tolerance
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Solver



## Unspecified inheritability of sample time

Select the diagnostic action to take if this model contains S-functions that do not specify whether they preclude this model from inheriting their sample times from a parent model.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- Not specifying an inheritance rule may lead to incorrect simulation results.
- Simulink software checks for this condition only if the solver used to simulate this model is a fixed-step discrete solver and the periodic sample time constraint for the solver is set to ensure sample time independence
- For more information, see Periodic sample time constraint.

### Command-Line Information

**Parameter:** UnknownTsInhSupMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Periodic sample time constraint
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Solver

## Solver data inconsistency

Select the diagnostic action to take if Simulink software detects S-functions that have continuous sample times, but do not produce consistent results when executed multiple times.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- Consistency checking can cause a significant decrease in performance (up to 40%).
- Consistency checking is a debugging tool that validates certain assumptions made by Simulink ODE solvers. Use this option to:
  - Validate your S-functions and ensure that they adhere to the same rules as Simulink built-in blocks.
  - Determine the cause of unexpected simulation results.
  - Ensure that blocks produce constant output when called with a given value of  $t$  (time).
- Simulink software saves (caches) output, the zero-crossing, the derivative, and state values from one time step for use in the next time step. The value at the end of a time step can generally be reused at the start of the next time step. Solvers, particularly stiff solvers such as `ode23s` and `ode15s`, take advantage of this to avoid redundant calculations. While calculating the Jacobian matrix, a stiff solver can call a block's output functions many times at the same value of  $t$ .

- When consistency checking is enabled, Simulink software recomputes the appropriate values and compares them to the cached values. If the values are not the same, a consistency error occurs. Simulink software compares computed values for these quantities:
  - Outputs
  - Zero crossings
  - Derivatives
  - States

## Command-Line Information

**Parameter:** ConsistencyChecking  
**Type:** string  
**Value:** 'none' | 'warning' | 'error'  
**Default:** 'warning'

## Recommended Settings

Application	Setting
Debugging	warning
Traceability	No impact
Efficiency	none
Safety precaution	No impact

## See Also

- Diagnosing Simulation Errors
- Choosing a Solver
- Configuration Parameters Dialog Box
- Diagnostics Pane: Solver

## Automatic solver parameter selection

Select the diagnostic action to take if Simulink software changes a solver parameter setting.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

When enabled, this option notifies you if:

- Simulink software changes a user-modified parameter to make it consistent with other model settings.
- Simulink software automatically selects solver parameters for the model, such as `FixedStepSize`.

For example, if you simulate a discrete model that specifies a continuous solver, Simulink software changes the solver type to discrete and displays a warning about this change at the MATLAB command line.

### Command-Line Information

**Parameter:** `SolverPrmCheckMsg`

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

### **Recommended Settings**

<b>Application</b>	<b>Setting</b>
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

### **See Also**

- Diagnosing Simulation Errors
- Choosing a Solver
- Configuration Parameters Dialog Box
- Diagnostics Pane: Solver

## Extraneous discrete derivative signals

Select the diagnostic action to take when a discrete signal appears to pass through a Model block to the input of a block with continuous states.

### Settings

**Default:** error

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- This error can occur if a discrete signal passes through a Model block to the input of a block with continuous states, such as an Integrator block. In this case, Simulink software cannot determine with certainty the minimum rate at which it needs to reset the solver to solve this model accurately.
- If this diagnostic is set to `none` or `warning`, Simulink software resets the solver whenever the value of the discrete signal changes. This ensures accurate simulation of the model if the discrete signal is the source of the signal entering the block with continuous states. However, if the discrete signal is not the source of the signal entering the block with continuous states, resetting the solver at the rate the discrete signal changes can lead to the solver being reset more frequently than necessary, slowing down the simulation.
- If this diagnostic is set to `error`, Simulink software halts when compiling this model and displays an error.

### Dependency

This diagnostic applies only when you are using a variable-step ode solver and the block diagram contains Model blocks.

### Command-Line Information

**Parameter:** ModelReferenceExtraNoncontSigs

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'error'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

### See Also

- Diagnosing Simulation Errors
- Choosing a Solver
- Configuration Parameters Dialog Box
- Diagnostics Pane: Solver



## State name clash

Select the diagnostic action to take when a name is used for more than one state in the model.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

### Tips

- This diagnostic applies for continuous and discrete states during simulation.
- This diagnostic applies only if you save states to the MATLAB workspace using the format **Structure** or **Structure with time**. If you do not save states in structure format, the state names are not used, and therefore the diagnostic will not warn you about a naming conflict.

### Command-Line Information

**Parameter:** StateNameClashWarn

**Type:** string

**Value:** 'none' | 'warning'

**Default:** 'warning'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	No impact

## See Also

- Diagnosing Simulation Errors
- Data Import/Export Pane
- Save to workspace: States
- Save options: Format
- Exporting Data to the MATLAB Workspace
- Configuration Parameters Dialog Box
- Diagnostics Pane: Solver

## SimState interface checksum mismatch:

Use this check to ensure that the interface checksum is identical to the model checksum before loading the SimState.

## Settings

**Default:** warning

none

Simulink software does not compare the interface checksum to the model checksum.

warning

The interface checksum in the SimState is different than the model checksum.

error

When Simulink detects that a change in the configuration settings occurred after saving the SimState, it does not load the SimState and reports an error.

## Command-Line Information

**Parameter:** SimStateInterfaceChecksum

**Type:** string

**Value:** 'warning' | 'error' | 'none'

**Default:** 'warning'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- “Saving and Restoring the Simulation State as the SimState”
-

## Diagnostics Pane: Sample Time

Sample Time	
Source block specifies -1 sample time:	warning
Discrete used as continuous:	warning
Multitask rate transition:	error
Single task rate transition:	none
Multitask conditionally executed subsystem:	error
Tasks with equal priority:	warning
Enforce sample times specified by Signal Specification blocks:	warning

### In this section...

- “Sample Time Diagnostics Overview” on page 1-217
- “Source block specifies -1 sample time” on page 1-218
- “Discrete used as continuous” on page 1-220
- “Multitask rate transition” on page 1-222
- “Single task rate transition” on page 1-224
- “Multitask conditionally executed subsystem” on page 1-226
- “Tasks with equal priority” on page 1-228
- “Enforce sample times specified by Signal Specification blocks” on page 1-230

## Sample Time Diagnostics Overview

Specify what diagnostic actions Simulink software should take, if any, when it detects a compilation error related to model sample times.

### Configuration

Set the parameters displayed.

### Tips

- The options are typically to do nothing or to display a warning or an error message.
- A warning does not terminate a simulation, but an error does.

### See Also

- Diagnosing Simulation Errors
- Solver Diagnostics
- Data Validity Diagnostics
- Type Conversion Diagnostics
- Connectivity Diagnostics
- Compatibility Diagnostics
- Model Referencing Diagnostics
- Saving Diagnostics
- Configuration Parameters Dialog Box
- Diagnostics Pane: Sample Time

## Source block specifies -1 sample time

Select the diagnostic action to take if a source block (such as a Sine Wave block) specifies a sample time of -1.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- The Random Source block does not obey this parameter. If its **Sample time** parameter is set to -1, the Random Source block inherits its sample time from its output port and never produces warnings or errors.
- Some Communications Blockset™ blocks internally inherit sample times, which can be a useful and valid modeling technique. Set this parameter to none for these types of models.

### Command-Line Information

**Parameter:** InheritedTsInSrcMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Sample Time

## Discrete used as continuous

Select the diagnostic action to take if a discrete block (such as the Unit Delay block), inherits a continuous sample time from the block connected to its input.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Command-Line Information

**Parameter:** DiscreteInheritContinuousMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

### See Also

- Diagnosing Simulation Errors



- Configuration Parameters Dialog Box
- Diagnostics Pane: Sample Time

## Multitask rate transition

Select the diagnostic action to take if an invalid rate transition occurred between two blocks operating in multitasking mode.

### Settings

**Default:** error

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- This parameter allows you to adjust error checking for sample rate transitions between blocks that operate at different sample rates.
- Use this option for models of real-time multitasking systems to ensure detection of illegal rate transitions between tasks that can result in a task's output being unavailable when needed by another task. You can then use Rate Transition blocks to eliminate such illegal rate transitions from the model.

### Command-Line Information

**Parameter:** MultiTaskRateTransMsg

**Type:** string

**Value:** 'warning' | 'error'

**Default:** 'error'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	error

### **See Also**

- Rate Transition block
- Model Execution and Rate Transitions
- Single-Tasking and Multitasking Execution Modes
- Sample Rate Transitions
- Tasking mode for periodic sample times
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Sample Time

## Single task rate transition

Select the diagnostic action to take if a rate transition occurred between two blocks operating in single-tasking mode.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- This parameter allows you to adjust error checking for sample rate transitions between blocks that operate at different sample rates.
- Use this parameter when you are modeling a single-tasking system. In such systems, task synchronization is not an issue.

### Command-Line Information

**Parameter:** SingleTaskRateTransMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	none or error

### **See Also**

- Rate Transition block
- Model Execution and Rate Transitions
- Single-Tasking and Multitasking Execution Modes
- Sample Rate Transitions
- Tasking mode for periodic sample times
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Sample Time

## Multitask conditionally executed subsystem

Select the diagnostic action to take if Simulink software detects a subsystem that may cause data corruption or non-deterministic behavior.

### Settings

**Default:** error

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- These types of subsystems can be caused by either of the following conditions:
  - Your model uses multitasking solver mode and it contains an enabled subsystem that operates at multiple rates.
  - Your model contains a conditionally executed subsystem that can reset its states and that contains an asynchronous subsystem.These types of subsystems can cause corrupted data or nondeterministic behavior in a real-time system that uses code generated from the model.
- For models that use multitasking solver mode and contain an enabled subsystem that operates at multiple rates, consider using single-tasking solver mode or using a single-rate enabled subsystem instead.
- For models that contain a conditionally executed subsystem that can reset its states and that contains an asynchronous subsystem, consider moving the asynchronous subsystem outside the conditionally executed subsystem.

## Command-Line Information

**Parameter:** MultiTaskCondExecSysMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'error'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Tasking mode for periodic sample times
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Sample Time

## Tasks with equal priority

Select the diagnostic action to take if Simulink software detects two tasks with equal priority that can preempt each other in the target system.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- This condition can occur when one asynchronous task of the target represented by this model has the same priority as one of the target's asynchronous tasks.
- This option must be set to Error if the target allows tasks having the same priority to preempt each other.

### Command-Line Information

**Parameter:** TasksWithSamePriorityMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact



<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	none or error

### **See Also**

- Diagnosing Simulation Errors
- Rate Transitions and Asynchronous Blocks
- Configuration Parameters Dialog Box
- Diagnostics Pane: Sample Time

## Enforce sample times specified by Signal Specification blocks

Select the diagnostic action to take if the sample time of the source port of a signal specified by a Signal Specification block differs from the signal's destination port.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- The Signal Specification block allows you to specify the attributes of the signal connected to its input and output ports. If the specified attributes conflict with the attributes specified by the blocks connected to its ports, Simulink software displays an error when it compiles the model, for example, at the beginning of a simulation. If no conflict exists, Simulink software eliminates the Signal Specification block from the compiled model.
- You can use the Signal Specification block to ensure that the actual attributes of a signal meet desired attributes, or to ensure correct propagation of signal attributes throughout a model.

### Command-Line Information

**Parameter:** SigSpecEnsureSampleTimeMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Diagnosing Simulation Errors
- Signal Specification block
- Configuration Parameters Dialog Box
- Diagnostics Pane: Sample Time

## Diagnostics Pane: Data Validity

Data Validity

Signals

Signal resolution:  Detect overflow:

Division by singular matrix:  Inf or NaN block output:

Underspecified data types:  "rt" prefix for identifiers:

Simulation range checking:

Parameters

Detect downcast:  Detect overflow:

Detect underflow:  Detect precision loss:

Detect loss of tunability:

Data Store Memory Block

Detect read before write:  Multitask data store:

Detect write after read:  Duplicate data store names:

Detect write after write:

Merge Block

Detect multiple driving blocks executing at the same time step:

Model Initialization

Underspecified initialization detection:

Check undefined subsystem initial output

Check preactivation output of execution context

Check runtime output of execution context

Debugging

Array bounds exceeded:

Model Verification block enabling:

**In this section...**

- “Data Validity Diagnostics Overview” on page 1-234
- “Signal resolution” on page 1-235
- “Division by singular matrix” on page 1-237
- “Underspecified data types” on page 1-239
- “Simulation range checking” on page 1-241
- “Detect overflow” on page 1-243
- “Inf or NaN block output” on page 1-245
- “rt” prefix for identifiers” on page 1-247
- “Detect downcast” on page 1-249
- “Detect overflow” on page 1-251
- “Detect underflow” on page 1-253
- “Detect precision loss” on page 1-255
- “Detect loss of tunability” on page 1-257
- “Detect read before write” on page 1-259
- “Detect write after read” on page 1-261
- “Detect write after write” on page 1-263
- “Multitask data store” on page 1-265
- “Duplicate data store names” on page 1-267
- “Detect multiple driving blocks executing at the same time step” on page 1-269
- “Underspecified initialization detection” on page 1-271
- “Check undefined subsystem initial output” on page 1-274
- “Check preactivation output of execution context” on page 1-277
- “Check runtime output of execution context” on page 1-280
- “Array bounds exceeded” on page 1-283
- “Model Verification block enabling” on page 1-285

## Data Validity Diagnostics Overview

Specify what diagnostic action Simulink software should take, if any, when it detects a condition that could compromise the integrity of data defined by the model, as well as the Data Validity parameters that pertain to code generation, and are used to debug a model.

### Configuration

Set the parameters displayed.

### Tips

- The options are typically to do nothing or to display a warning or an error message.
- A warning does not terminate a simulation, but an error does.

### See Also

- Diagnosing Simulation Errors
- Solver Diagnostics
- Sample Time Diagnostics
- Type Conversion Diagnostics
- Connectivity Diagnostics
- Compatibility Diagnostics
- Model Referencing Diagnostics
- Saving Diagnostics
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Signal resolution

Select how Simulink software resolves signals to `Simulink.Signal` objects. See “Explicit and Implicit Symbol Resolution” for more information.

### Settings

**Default:** Explicit only

#### Explicit only

Do not perform implicit signal resolution. Only explicitly specified signal resolution occurs. This is the recommended setting.

#### Explicit and implicit

Perform implicit signal resolution wherever possible, without posting any warnings about the implicit resolutions.

#### Explicit and warn implicit

Perform implicit signal resolution wherever possible, posting a warning of each implicit resolution that occurs.

### Tips

- Use the Signal Properties dialog box (see Signal Properties Dialog Box) to specify explicit resolution for signals.
- Use the **State Attributes** pane on dialog boxes of blocks that have discrete states, e.g., the Discrete-Time Integrator block, to specify explicit resolution for discrete states.
- Multiple signals can resolve to the same signal object and have the properties that the object specifies.
- The MathWorks discourages using implicit signal resolution except for fast prototyping, because implicit resolution slows performance, complicates model validation, and can have nondeterministic effects.
- Simulink software provides the `disableimplicitsignalresolution` function, which you can use to change settings throughout a model so that it does not use implicit signal resolution.

### Command-Line Information

**Parameter:** SignalResolutionControl

**Type:** string

**Value:** 'UseLocalSettings' | 'TryResolveAll' |  
'TryResolveAllWithWarning'

**Default:** 'UseLocalSettings'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Explicit only

### See Also

- Diagnosing Simulation Errors
- Simulink.Signal
- Signal Properties Dialog Box
- Discrete-Time Integrator block
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity



## Division by singular matrix

Select the diagnostic action to take if the Product block detects a singular matrix while inverting one of its inputs in matrix multiplication mode.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Command-Line Information

**Parameter:** CheckMatrixSingularityMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

### See Also

- Diagnosing Simulation Errors

- Product block
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Underspecified data types

Select the diagnostic action to take if Simulink software could not infer the data type of a signal during data type propagation.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Command-Line Information

**Parameter:** UnderSpecifiedDataTypeMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

### See Also

- Diagnosing Simulation Errors

- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Simulation range checking

Select the diagnostic action to take when signals exceed specified minimum or maximum values.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- Use a block's **Output minimum** or **Minimum** parameter to specify the minimum value that the block should output.
- Use a block's **Output maximum** or **Maximum** parameter to specify the maximum value that the block should output.
- Enable this diagnostic to check whether block outputs exceed the minimum or maximum values that you specified.
- When **Simulation range checking** is enabled, Simulink software performs signal range checking at every time step during a simulation. Setting this diagnostic to warning or error can cause a decrease in simulation performance.

### Command-Line Information

**Parameter:** SignalRangeChecking

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

## Recommended Settings

Application	Setting
Debugging	warning or error
Traceability	warning or error
Efficiency	none
Safety precaution	error

## See Also

- Checking Signal Ranges
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Detect overflow

Select the diagnostic action to take if the value of a signal or parameter is too large to be represented by the signal or parameter's data type.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- This diagnostic applies only to overflows for integer and fixed-point data types.
- To check for floating-point overflows (e.g., Inf or NaN) for double or single data types, select the **Inf or NaN block output** diagnostic. (See “Inf or NaN block output” on page 1-245 for more information.)

### Command-Line Information

**Parameter:** IntegerOverflowMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	error

## **See Also**

- Diagnosing Simulation Errors
- Working with Data Types
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity



## Inf or NaN block output

Select the diagnostic action to take if the value of a block output is Inf or NaN at the current time step.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- This diagnostic applies only to floating-point overflows for double or single data types.
- To check for integer and fixed-point overflows, select the **Detect overflow** diagnostic. (See “Detect overflow” on page 1-243 for more information.)

### Command-Line Information

**Parameter:** SignalInfNanChecking

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	error

## **See Also**

- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## "rt" prefix for identifiers

Select the diagnostic action to take during code generation if a Simulink object name (the name of a parameter, block, or signal) begins with `rt`.

### Settings

**Default:** error

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- The default setting (error) causes code generation to terminate with an error if it encounters a Simulink object name (parameter, block, or signal), that begins with `rt`.
- This is intended to prevent inadvertent clashes with generated identifiers whose names begins with `rt`.

### Command-Line Information

**Parameter:** RTPrefix

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'error'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	error

## **See Also**

- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Detect downcast

Select the diagnostic action to take when a parameter downcast occurs during simulation.

### Settings

**Default:** error

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- A parameter downcast occurs if the computation of block output required converting the parameter's specified type to a type having a smaller range of values (for example, from `uint32` to `uint8`).
- This diagnostic applies only to named tunable parameters.

### Command-Line Information

**Parameter:** `ParameterDowncastMsg`

**Type:** `string`

**Value:** `'none' | 'warning' | 'error'`

**Default:** `'error'`

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	error

## **See Also**

- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Detect overflow

Select the diagnostic action to take if a parameter overflow occurs during simulation.

### Settings

**Default:** error

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- A parameter overflow occurs if Simulink software encounters a parameter whose data type's range is not large enough to accommodate the parameter's ideal value (the ideal value is either too large or too small to be represented by the data type). For example, suppose that the parameter's ideal value is 200 and its data type is `int8`. Overflow occurs in this case because the maximum value that `int8` can represent is 127.
- Parameter overflow differs from parameter precision loss, which occurs when the ideal parameter value is within the range of the data type and scaling being used, but cannot be represented exactly.
- Both parameter overflow and precision loss are quantization errors, and the distinction between them can be a fine one. The **Detect overflow** diagnostic reports all quantization errors greater than one bit. For very small parameter quantization errors, precision loss will be reported rather than an overflow when

$$(Max + Slope) \geq V_{ideal} > (Min - Slope)$$

where

- *Max* is the maximum value representable by the parameter data type

- *Min* is the minimum value representable by the parameter data type
- *Slope* is the slope of the parameter data type (slope = 1 for integers)
- $V_{ideal}$  is the ideal value of the parameter

## Command-Line Information

**Parameter:** ParameterOverflowMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'error'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity



## Detect underflow

Select the diagnostic action to take when a parameter underflow occurs during simulation.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- Parameter underflow occurs when Simulink software encounters a parameter whose data type does not have enough precision to represent the parameter's ideal value because the ideal value is too small.
- When parameter underflow occurs, casting the ideal value to the data type causes the parameter's modeled value to become zero, and therefore to differ from its ideal value.

### Command-Line Information

**Parameter:** ParameterUnderflowMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Detect precision loss

Select the diagnostic action to take when parameter precision loss occurs during simulation.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- Precision loss occurs when Simulink software encounters a parameter whose data type does not have enough precision to represent the parameter's value exactly. As a result, the modeled value differs from the ideal value.
- Parameter precision loss differs from parameter overflow, which occurs when the range of the parameter's data type, i.e., that maximum value that it can represent, is smaller than the ideal value of the parameter.
- Both parameter overflow and precision loss are quantization errors, and the distinction between them can be a fine one. The **Detect Parameter overflow** diagnostic reports all parameter quantization errors greater than one bit. For very small parameter quantization errors, precision loss will be reported rather than an overflow when

$$(Max + Slope) \geq V_{ideal} > (Min - Slope)$$

where

- *Max* is the maximum value representable by the parameter data type.
- *Min* is the minimum value representable by the parameter data type.

- *Slope* is the slope of the parameter data type (slope = 1 for integers).
- $V_{ideal}$  is the full-precision, ideal value of the parameter.

## Command-Line Information

**Parameter:** ParameterPrecisionLossMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Detect loss of tunability

Select the diagnostic action to take when an expression with tunable variables is reduced to its numerical equivalent.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tip

If a tunable workspace variable is modified by Mask Initialization code, or is used in an arithmetic expression with unsupported operators or functions, the expression is reduced to a numeric expression and therefore cannot be tuned.

### Command-Line Information

**Parameter:** ParameterTunabilityLossMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## **See Also**

- Diagnosing Simulation Errors
- Tunable Expressions
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Detect read before write

Select the diagnostic action to take if the model attempts to read data from a data store to which it has not written data in this time step.

### Settings

**Default:** Use local settings

Use local settings

For each local data store (defined by a Data Store Memory block or Simulink.Signal object in a model workspace) use the setting specified by the block. For each global data store (defined by a Simulink.Signal object in the base workspace) disable the diagnostic.

Disable All

Disables this diagnostic for all data stores accessed by the model.

Enable All As Warnings

Displays diagnostic as a warning at the MATLAB command line.

Enable All As Errors

Halts the simulation and displays the diagnostic in an error dialog box.

### Command-Line Information

**Parameter:** ReadBeforeWriteMsg

**Type:** string

**Value:** 'UseLocalSettings' | 'DisableAll' | 'EnableAllAsWarning' | 'EnableAllAsError'

**Default:** 'UseLocalSettings'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Enable all as errors

## **See Also**

- Diagnosing Simulation Errors
- Working with Data Stores
- Data Store Memory block
- Simulink.Signal object
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity



## Detect write after read

Select the diagnostic action to take if the model attempts to write data to a data store after previously reading data from it in the current time step.

### Settings

**Default:** Use local settings

Use local settings

For each local data store (defined by a Data Store Memory block or Simulink.Signal object in a model workspace) use the setting specified by the block. For each global data store (defined by a Simulink.Signal object in the base workspace) disable the diagnostic.

Disable All

Disables this diagnostic for all data stores accessed by the model.

Enable All As Warnings

Displays diagnostic as a warning at the MATLAB command line.

Enable All As Errors

Halts the simulation and displays the diagnostic in an error dialog box.

### Command-Line Information

**Parameter:** WriteAfterReadMsg

**Type:** string

**Value:** 'UseLocalSettings' | 'DisableAll' | 'EnableAllAsWarning' | 'EnableAllAsError'

**Default:** 'UseLocalSettings'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Enable all as errors

## **See Also**

- Diagnosing Simulation Errors
- Working with Data Stores
- Data Store Memory block
- Simulink.Signal object
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Detect write after write

Select the diagnostic action to take if the model attempts to write data to a data store twice in succession in the current time step.

### Settings

**Default:** Use local settings

Use local settings

For each local data store (defined by a Data Store Memory block or Simulink.Signal object in a model workspace) use the setting specified by the block. For each global data store (defined by a Simulink.Signal object in the base workspace) disable the diagnostic.

Disable All

Disables this diagnostic for all data stores accessed by the model.

Enable All As Warnings

Displays diagnostic as a warning at the MATLAB command line.

Enable All As Errors

Halts the simulation and displays the diagnostic in an error dialog box.

### Command-Line Information

**Parameter:** WriteAfterWriteMsg

**Type:** string

**Value:** 'UseLocalSettings' | 'DisableAll' | 'EnableAllAsWarning' | 'EnableAllAsError'

**Default:** 'UseLocalSettings'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Enable all as errors

## **See Also**

- Diagnosing Simulation Errors
- Working with Data Stores
- Data Store Memory block
- Simulink.Signal object
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Multitask data store

Select the diagnostic action to take when one task reads data from a Data Store Memory block to which another task writes data.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- Such a situation is safe only if one of the tasks cannot interrupt the other, such as when the data store is a scalar and the writing task uses an atomic copy operation to update the store or the target does not allow the tasks to preempt each other.
- You should disable this diagnostic (set it to none) only if the application warrants it, such as if the application uses a cyclic scheduler that prevents tasks from preempting each other.

### Command-Line Information

**Parameter:** MultiTaskDSMMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Diagnosing Simulation Errors
- Working with Data Stores
- Data Store Memory block
- Simulink.Signal object
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Duplicate data store names

Select the diagnostic action to take when the model contains multiple data stores that have the same name. The data stores can be defined with Data Store Memory blocks or `Simulink.Signal` objects.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tip

This diagnostic is useful for detecting errors that can occur when a lower-level data store unexpectedly shadows a higher-level data store that has the same name.

### Command-Line Information

**Parameter:** UniqueDataStoreMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	No impact

## See Also

- Diagnosing Simulation Errors
- Working with Data Stores
- Data Store Memory block
- `Simulink.Signal` object
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity



## Detect multiple driving blocks executing at the same time step

Select the diagnostic action to take when the software detects a Merge block with more than one driving block executing at the same time step.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- Connecting the inputs of a Merge block to multiple driving blocks that execute at the same time step can lead to inconsistent results for both simulation and generated code. Set **Detect multiple driving blocks executing at the same time step** to error to avoid such situations.
- If **Underspecified initialization detection** is set to Simplified, this parameter is disabled, and Simulink software automatically uses the strictest setting (error) for this diagnostic. Multiple driving blocks executing at the same time step always result in an error.

### Dependency

This parameter is enabled only if **Underspecified initialization detection** is set to Classic.

### Command-Line Information

**Parameter:** MergeDetectMultiDrivingBlocksExec

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

### Recommended Settings

Application	Setting
Debugging	error
Traceability	error
Efficiency	No impact
Safety precaution	error

### See Also

- Diagnosing Simulation Errors
- Merge block
- “Check consistency of initialization parameters for Outport and Merge blocks”
- “Underspecified initialization detection” on page 1-271
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Underspecified initialization detection

Select how Simulink software handles initialization of initial conditions for conditionally executed subsystems, Merge blocks, subsystem elapsed time, and Discrete-Time Integrator blocks.

### Settings

**Default:** Classic

#### Classic

Initial conditions are initialized the same way they were prior to R2008b.

#### Simplified

Initial conditions are initialized using the enhanced behavior, which can improve the consistency of simulation results.

### Tips

- Use **Classic** to ensure compatibility with previous releases of Simulink.
- Use **Simplified** to improve the consistency of simulation results, especially for models that do not specify initial conditions for conditional subsystem output ports, and for models that have conditionally executed subsystem output ports connected to S-functions.
- When using **Simplified** initialization mode, you must set both **Mux blocks used to create bus signals**, and **Bus signal treated as vector** to error on the Connectivity Diagnostics pane.
- For existing models, The MathWorks recommends using the Model Advisor to migrate your model to the new settings. To migrate your model, run the following Model Advisor checks:
  - **Check for proper bus usage**
  - **Check consistency of initialization parameters for Outport and Merge blocks**

For more information, see “Check consistency of initialization parameters for Outport and Merge blocks” in the *Simulink Reference*.

## Dependencies

Selecting **Classic** enables the following parameters:

- **Detect multiple driving blocks executing at the same time step**
- **Check undefined subsystem initial output**
- **Check preactivation output of execution context**
- **Check runtime output of execution context**

Selecting **Simplified** disables these parameters, and automatically sets **Detect multiple driving blocks executing at the same time step** to error.

## Command-Line Information

**Parameter:** UnderspecifiedInitializationDetection

**Type:** string

**Value:** 'classic' | 'simplified'

**Default:** 'classic'

## Recommended Settings

Application	Setting
Debugging	Simplified
Traceability	Simplified
Efficiency	Simplified
Safety precaution	Simplified

## See Also

- “Check consistency of initialization parameters for Outport and Merge blocks”
- Merge block
- Discrete-Time Integrator block

- “Creating Conditional Subsystems”
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Check undefined subsystem initial output

Specify whether to display a warning if the model contains a conditionally executed subsystem in which a block with a specified initial condition drives an Output block with an undefined initial condition

### Settings

**Default:** On

On

Displays a warning if the model contains a conditionally executed subsystem in which a block with a specified initial condition drives an Output block with an undefined initial condition.

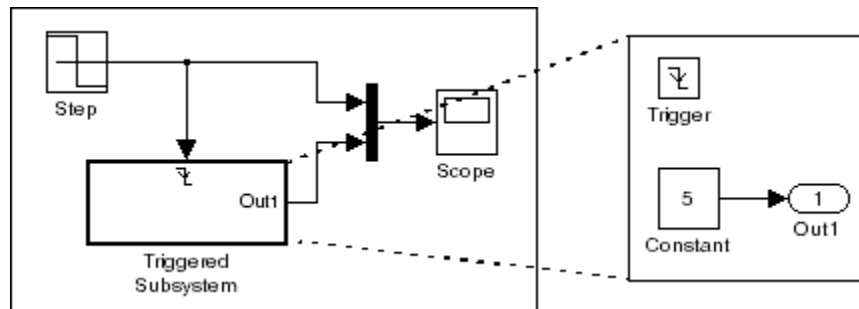
Off

Does not display a warning.

### Tips

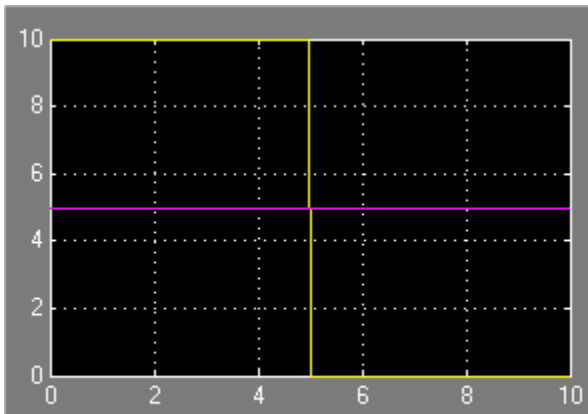
- This situation occurs when a block with a specified initial condition, such as a Constant, Initial Condition, or Delay block, drives an Output block with an undefined initial condition (**Initial output** parameter is set to []).
- Models with such subsystems can produce initial results (i.e., before initial activation of the conditionally executed subsystem) in the current release that differ from initial results produced in Release 13 or earlier releases.

Consider for example the following model.

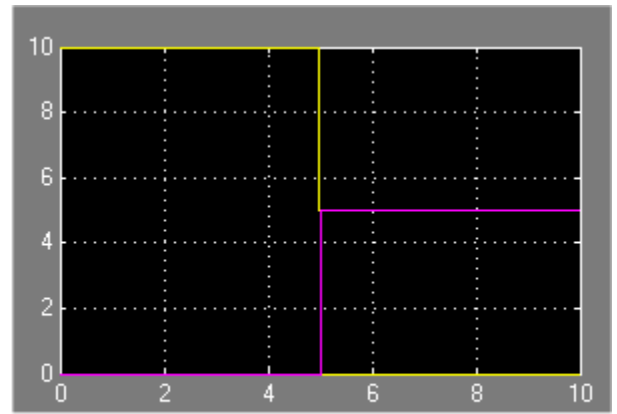


This model does not define the initial condition of the triggered subsystem's output port.

The following figure compares the superimposed output of this model's Step block and the triggered subsystem in Release 13 and the current release.



**Release 13**



**Current Release**

Notice that the initial output of the triggered subsystem differs between the two releases. This is because Release 13 and earlier releases use the initial output of the block connected to the output port (i.e., the Constant block) as the triggered subsystem's initial output. By contrast, this release outputs 0 as the initial output of the triggered subsystem because the model does not specify the port's initial output.

## Dependency

This parameter is enabled only if **Underspecified initialization detection** is set to **Classic**.

## Command-Line Information

**Parameter:** CheckSSInitialOutputMsg

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	On

## See Also

- Diagnosing Simulation Errors
- “Creating Conditional Subsystems”
- “Underspecified initialization detection” on page 1-271
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity



## Check preactivation output of execution context

Specify whether to display a warning if Simulink software detects potential initial output differences from previous releases.

### Settings

**Default:** Off



On

Displays a warning if Simulink software detects potential initial output differences from previous releases.



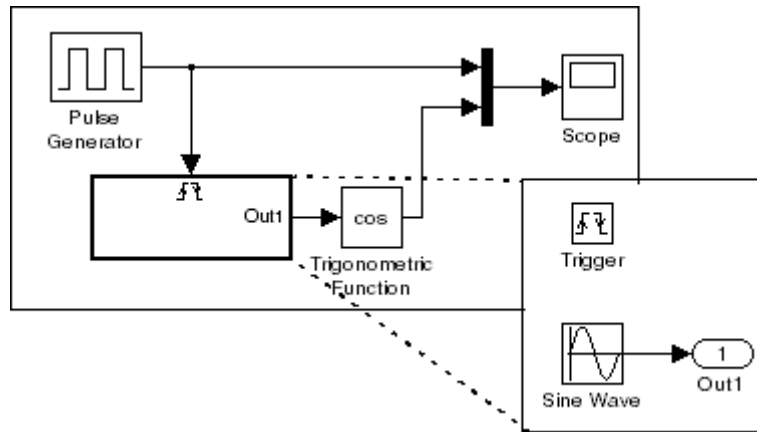
Off

Does not display a warning.

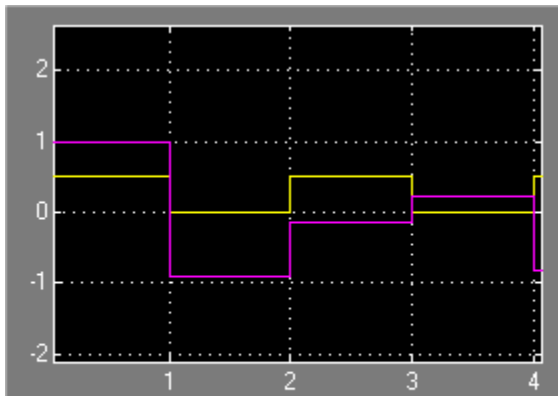
### Tips

- This diagnostic is triggered if the model contains a block that meets the following conditions:
  - The block produces nonzero output for zero input (e.g., a Cosine block).
  - The block is connected to an output of a conditionally executed subsystem.
  - The block inherits its execution context from that subsystem.
  - The Output to which it is connected has an undefined initial condition, i.e., the Output block's **Initial output** parameter is set to [].
- Models with blocks that meet these criteria can produce initial results (i.e., before the conditionally executed subsystem is first activated in the current release that differ from initial results produced in Release 13 or earlier releases.

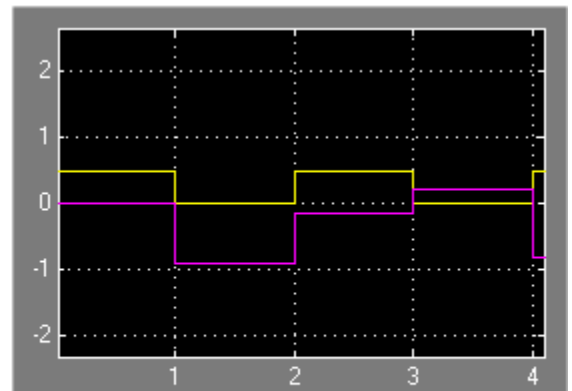
Consider for example the following model.



The following figure compares the superimposed output of the Pulse Generator and cos block in Release 13 and the current release.



**Release 13**



**Current Release**

Note that the initial output of the cos block differs between the two releases. This is because in Release 13, the cos block belongs to the execution context of the root system and hence executes at every time step whereas in the current release, the cos block belongs to the execution context of the triggered subsystem and hence executes only when the triggered subsystem executes.

## Dependency

This parameter is enabled only if **Underspecified initialization detection** is set to **Classic**.

## Command-Line Information

**Parameter:** CheckExecutionContextPreStartOutputMsg

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	On

## See Also

- Diagnosing Simulation Errors
- “Underspecified initialization detection” on page 1-271
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Check runtime output of execution context

Specify whether to display a warning if Simulink software detects potential output differences from previous releases.

### Settings

**Default:** Off



On

Displays a warning if Simulink software detects potential output differences from previous releases.



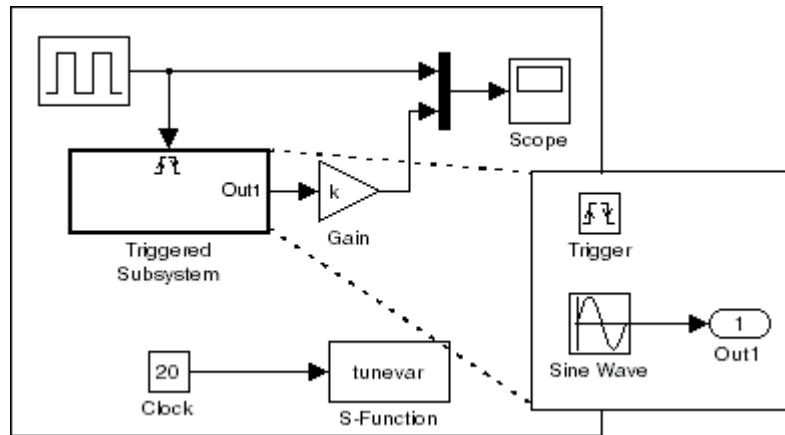
Off

Does not display a warning.

### Tips

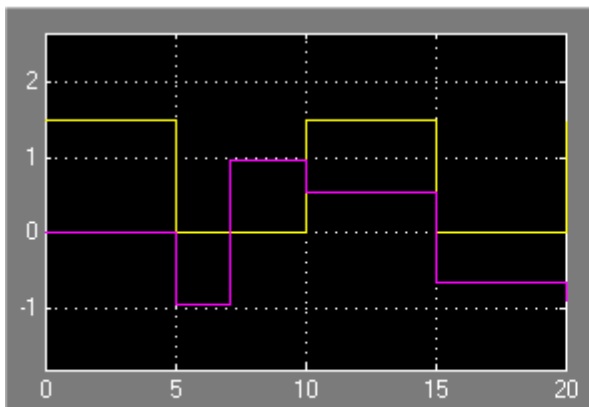
- This diagnostic is triggered if the model contains a block that meets the following conditions:
  - The block has a tunable parameter.
  - The block is connected to an output of a conditionally executed subsystem.
  - The block inherits its execution context from that subsystem.
  - The Output to which it is connected has an undefined initial condition, i.e., the Output block's **Initial output** parameter is set to [].
- Models with blocks that meet these criteria can produce results when the parameter is tuned in the current release that differ from results produced in Release 13 or earlier releases.

Consider for example the following model.

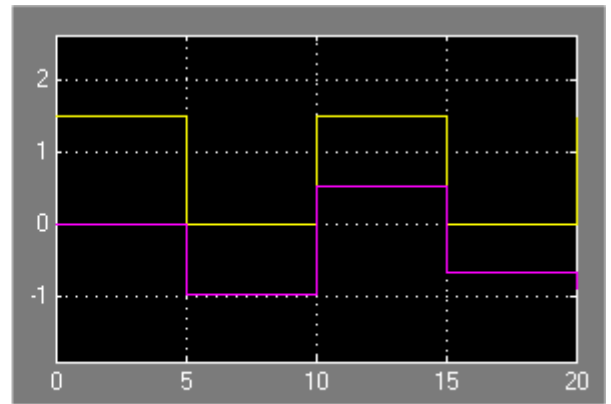


In this model, the tunevar S-function changes the value of the Gain block's k parameter and updates the diagram at simulation time 7 (i.e., it simulates tuning the parameter).

The following figure compares the superimposed output of the model's Pulse Generator block and its Gain block in Release 13 and the current release.



**Release 13**



**Current Release**

Note that the output of the Gain block changes at time 7 in Release 13 but does not change in the current release. This is because in Release 13, the Gain block belongs to the execution context of the root system and hence executes at every time step whereas in the current release, the Gain

block belongs to the execution context of the triggered subsystem and hence executes only when the triggered subsystem executes, i.e., at times 5, 10, 15, and 20.

## Dependency

This parameter is enabled only if **Underspecified initialization detection** is set to **Classic**.

## Command-Line Information

**Parameter:** CheckExecutionContextRuntimeOutputMsg

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	On

## See Also

- Diagnosing Simulation Errors
- “Underspecified initialization detection” on page 1-271
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Array bounds exceeded

Select the diagnostic action to take when blocks write data to locations outside the memory allocated to them.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- Use this option to check whether execution of each instance of a block during model simulation writes data to memory locations not allocated to the block. This can happen only if your model includes a user-written S-function that has a bug.
- Enabling this option slows down model execution considerably. Thus, you should enable it only if you suspect that your model contains a user-written S-function that has a bug.
- This option causes Simulink software to check whether a block writes outside the memory allocated to it during simulation. Typically this can happen only if your model includes a user-written S-function that has a bug.
- See Writing S-Functions for more information on using this option.

### Command-Line Information

**Parameter:** ArrayBoundsChecking

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

## Recommended Settings

Application	Setting
Debugging	warning
Traceability	No impact
Efficiency	none
Safety precaution	No impact

## See Also

- Diagnosing Simulation Errors
- Writing S-Functions
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity



## Model Verification block enabling

Enable model verification blocks in the current model either globally or locally.

### Settings

**Default:** Use local settings

Use local settings

Enables or disables blocks based on the value of the `Enable assertion` parameter of each block. If a block's `Enable assertion` parameter is on, the block is enabled; otherwise, the block is disabled.

Enable All

Enables all model verification blocks in the model regardless of the settings of their `Enable assertion` parameters.

Disable All

Disables all model verification blocks in the model regardless of the settings of their `Enable assertion` parameters.

### Dependency

Simulation and code generation ignore the **Model Verification block enabling** parameter when model verification blocks are inside a S-function.

### Command-Line Information

**Parameter:** AssertControl

**Type:** string

**Value:** 'UseLocalSettings' | 'EnableAll' | 'DisableAll'

**Default:** 'UseLocalSettings'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	Disable all

## **See Also**

- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Data Validity

## Diagnostics Pane: Type Conversion

Type Conversion

Unnecessary type conversions:

Vector/matrix block input conversion:

32-bit integer to single precision float conversion:

Fixed-point Constants

Detect underflow:  Detect overflow:

Detect precision loss:

### In this section...

“Type Conversion Diagnostics Overview” on page 1-288

“Unnecessary type conversions” on page 1-289

“Vector/matrix block input conversion” on page 1-290

“32-bit integer to single precision float conversion” on page 1-292

“Detect underflow” on page 1-294

“Detect precision loss” on page 1-296

“Detect overflow” on page 1-298

## **Type Conversion Diagnostics Overview**

Specify the diagnostic actions that Simulink software should take when it detects a data type conversion problem while compiling the model.

### **Configuration**

Set the parameters displayed.

### **Tips**

- The options are typically to do nothing or to display a warning or an error message.
- A warning does not terminate a simulation, but an error does.

### **See Also**

- Diagnosing Simulation Errors
- Solver Diagnostics
- Sample Time Diagnostics
- Data Validity Diagnostics
- Connectivity Diagnostics
- Compatibility Diagnostics
- Model Referencing Diagnostics
- Saving Diagnostics
- Configuration Parameters Dialog Box
- Diagnostics Pane: Type Conversion

## Unnecessary type conversions

Select the diagnostic action to take when Simulink software detects a Data Type Conversion block used where no type conversion is necessary.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

### Command-Line Information

**Parameter:** UnnecessaryDatatypeConvMsg

**Type:** string

**Value:** 'none' | 'warning'

**Default:** 'none'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	warning

### See Also

- Diagnosing Simulation Errors
- Data Type Conversion block
- Configuration Parameters Dialog Box
- Diagnostics Pane: Type Conversion

## Vector/matrix block input conversion

Select the diagnostic action to take when Simulink software detects a vector-to-matrix or matrix-to-vector conversion at a block input.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

Simulink software converts vectors to row or column matrices and row or column matrices to vectors under the following circumstances:

- If a vector signal is connected to an input that requires a matrix, Simulink software converts the vector to a one-row or one-column matrix.
- If a one-column or one-row matrix is connected to an input that requires a vector, Simulink software converts the matrix to a vector.
- If the inputs to a block consist of a mixture of vectors and matrices and the matrix inputs all have one column or one row, Simulink software converts the vectors to matrices having one column or one row, respectively.

### Command-Line Information

**Parameter:** VectorMatrixConversionMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Diagnosing Simulation Errors
- Determining Output Signal Dimensions
- Configuration Parameters Dialog Box
- Diagnostics Pane: Type Conversion

## 32-bit integer to single precision float conversion

Select the diagnostic action to take if Simulink software detects a 32-bit integer value was converted to a floating-point value.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

### Tip

Converting a 32-bit integer value to a floating-point value can result in a loss of precision. See *Working with Data Types* for more information.

### Command-Line Information

**Parameter:** Int32ToFloatConvMsg

**Type:** string

**Value:** 'none' | 'warning'

**Default:** 'warning'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	warning

### See Also

- Diagnosing Simulation Errors



- Working with Data Types
- Configuration Parameters Dialog Box
- Diagnostics Pane: Type Conversion

## Detect underflow

Specifies diagnostic action to take when a fixed-point constant underflow occurs during simulation.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- This diagnostic applies only to fixed-point constants (net slope and net bias).
- Fixed-point constant underflow occurs when Simulink software encounters a fixed-point constant whose data type does not have enough precision to represent the ideal value of the constant because the ideal value is too small.
- When fixed-point constant underflow occurs, casting the ideal value to the data type causes the value of the fixed-point constant to become zero, and therefore to differ from its ideal value.

### Dependency

This parameter requires a Simulink Fixed Point license.

### Command-Line Information

**Parameter:** FixptConstUnderflowMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Net Slope and Net Bias Precision Issues
- Configuration Parameters Dialog Box
- Diagnostics Pane: Type Conversion

## Detect precision loss

Specifies diagnostic action to take when a fixed-point constant precision loss occurs during simulation.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- This diagnostic applies only to fixed-point constants (net slope and net bias).
- Precision loss occurs when Simulink software converts a fixed-point constant to a data type which does not have enough precision to represent the exact value of the constant. As a result, the quantized value differs from the ideal value.
- Fixed-point constant precision loss differs from fixed-point constant overflow. Overflow occurs when the range of the parameter's data type, that is, the maximum value that it can represent, is smaller than the ideal value of the parameter.

### Dependency

This parameter requires a Simulink Fixed Point license.

### Command-Line Information

**Parameter:** FixptConstPrecisionLossMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

### **Recommended Settings**

<b>Application</b>	<b>Setting</b>
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

### **See Also**

- Net Slope and Net Bias Precision Issues
- Configuration Parameters Dialog Box
- Diagnostics Pane: Type Conversion

## Detect overflow

Specifies diagnostic action to take when a fixed-point constant overflow occurs during simulation.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- This diagnostic applies only to fixed-point constants (net slope and net bias).
- Overflow occurs when the Simulink software converts a fixed-point constant to a data type whose range is not large enough to accommodate the ideal value of the constant. The ideal value is either too large or too small to be represented by the data type. For example, suppose that the ideal value is 200 and the converted data type is `int8`. Overflow occurs in this case because the maximum value that `int8` can represent is 127.
- Fixed-point constant overflow differs from fixed-point constant precision loss. Precision loss occurs when the ideal fixed-point constant value is within the range of the data type and scaling being used, but cannot be represented exactly.

### Dependency

This parameter requires a Simulink Fixed Point license.

### Command-Line Information

Parameter:`FixptConstOverflowMsg`

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

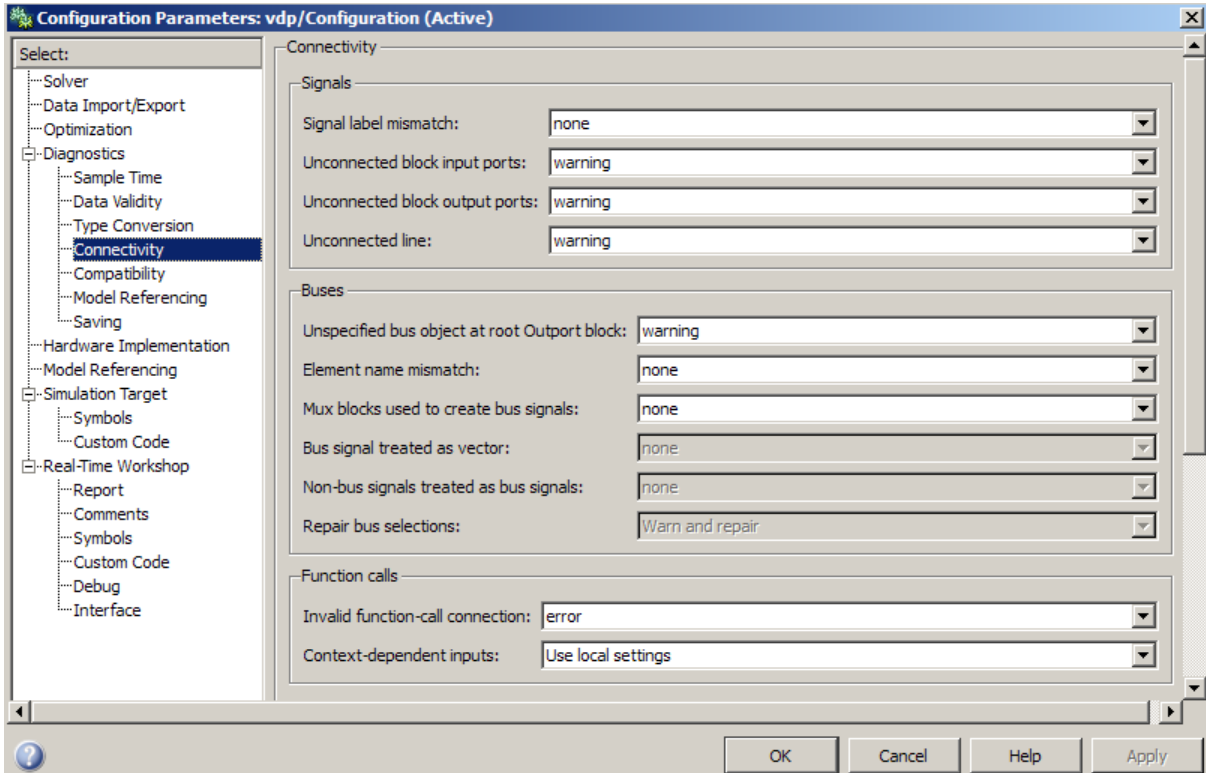
### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

### See Also

- Net Slope and Net Bias Precision Issues
- Configuration Parameters Dialog Box
- Diagnostics Pane: Type Conversion

## Diagnostics Pane: Connectivity



### In this section...

- “Connectivity Diagnostics Overview” on page 1-302
- “Signal label mismatch” on page 1-303
- “Unconnected block input ports” on page 1-305
- “Unconnected block output ports” on page 1-307
- “Unconnected line” on page 1-309
- “Unspecified bus object at root Output block” on page 1-311
- “Element name mismatch” on page 1-313



**In this section...**

“Mux blocks used to create bus signals” on page 1-315

“Bus signal treated as vector” on page 1-318

“Non-bus signals treated as bus signals” on page 1-321

“Repair bus selections” on page 1-323

“Invalid function-call connection” on page 1-325

“Context-dependent inputs” on page 1-327

## Connectivity Diagnostics Overview

Specify the diagnostic actions that Simulink software should take when it detects a problem with block connections while compiling the model.

### Configuration

Set the parameters displayed.

### Tips

- The options are typically to do nothing or to display a warning or an error message.
- A warning does not terminate a simulation, but an error does.

### See Also

- Diagnosing Simulation Errors
- Solver Diagnostics
- Sample Time Diagnostics
- Data Validity Diagnostics
- Type Conversion Diagnostics
- Compatibility Diagnostics
- Model Referencing Diagnostics
- Saving Diagnostics
- Configuration Parameters Dialog Box
- Diagnostics Pane: Connectivity

## Signal label mismatch

Select the diagnostic action to take when Simulink software detects virtual signals that have a common source signal but different labels.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Command-Line Information

**Parameter:** SignalLabelMismatchMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

### See Also

- Diagnosing Simulation Errors

- Virtual Signals
- Configuration Parameters Dialog Box
- Diagnostics Pane: Connectivity

## Unconnected block input ports

Select the diagnostic action to take when the model contains a block with an unconnected input.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Command-Line Information

**Parameter:** UnconnectedInputMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

### See Also

- Diagnosing Simulation Errors

- Configuration Parameters Dialog Box
- Diagnostics Pane: Connectivity

## Unconnected block output ports

Select the diagnostic action to take when the model contains a block with an unconnected output.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Command-Line Information

**Parameter:** UnconnectedOutputMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

### See Also

- Diagnosing Simulation Errors

- Configuration Parameters Dialog Box
- Diagnostics Pane: Connectivity



## Unconnected line

Select the diagnostic action to take when the Model contains an unconnected line or an unmatched Goto or From block.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Command-Line Information

**Parameter:** UnconnectedLineMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

### See Also

- Diagnosing Simulation Errors

- Goto block
- From block
- Configuration Parameters Dialog Box
- Diagnostics Pane: Connectivity

## Unspecified bus object at root Output block

Select the diagnostic action to take while generating a simulation target for a referenced model if any of the model's root Output blocks is connected to a bus but does not specify a bus object (see `Simulink.Bus`).

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Command-Line Information

**Parameter:** `RootOutputRequireBusObject`

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

### See Also

- Diagnosing Simulation Errors

- Outport block
- Simulink.Bus
- Configuration Parameters Dialog Box
- Diagnostics Pane: Connectivity

## Element name mismatch

Select the diagnostic action to take if the name of a bus element does not match the name specified by the corresponding bus object.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tip

You can use this diagnostic along with bus objects to ensure that your model meets bus element naming requirements imposed by some blocks, such as the Switch block.

### Command-Line Information

**Parameter:** BusObjectLabelMismatch

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## **See Also**

- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Connectivity

## Mux blocks used to create bus signals

Select the diagnostic action to take if Simulink detects a Mux block that creates a virtual bus.

### Settings

**Default:** warning

none

Simulink software takes no action.

This option disables checking for Mux blocks used to create virtual bus signals.

warning

Simulink software displays a warning.

This option does not enforce strict bus behavior. However, if it detects a Mux block that creates a virtual bus during model update or simulation, it displays a message in the MATLAB Command Window that identifies the offending block. It does this for the first ten Mux blocks that it encounters that violate strict bus behavior.

error

Simulink terminates the simulation and displays an error message identifying the first Mux block it encounters that is used to create a virtual bus. If this option is selected, a Mux block with more than one input is allowed to output only a vector signal, and a Mux block with only one input is allowed to output only a scalar, vector, or matrix signal.

### Tips

- This diagnostic detects use of Mux blocks to create virtual buses. The diagnostic considers a signal created by a Mux block to be a virtual bus if the signal meets either or both of the following conditions:
  - A Bus Selector block individually selects one or more of the signal elements (as opposed to the entire signal).
  - The signal components have differing data types, numeric types (complex or real), dimensionality, storage classes (see the *Real-Time Workshop*

*User's Guide* for information on storage classes), or sampling modes (see the Signal Processing Blockset™ documentation for information on frame-based sampling).

- Using a Mux block to create a virtual bus does not support strong type checking and increases the likelihood of run-time errors. In new applications, do not use Mux blocks to create bus signals. Consider upgrading existing applications to that use of Mux blocks.
  - Simulink generates a warning when you load a model created in a release prior to R2010a, if that model contains a Mux block to create a bus signal. For new models, Simulink generates an error.
- If you are using simplified initialization mode, you must set this diagnostic to error. For more information, see Underspecified initialization detection.
- You can identify Mux blocks used to create virtual buses using the Model Advisor check **Check for proper bus usage**. For more information, see “Check for proper bus usage”.
- You can avoid strict bus behavior errors and warnings by using `slreplace_mux` to remove Mux blocks that violate strict bus behavior from your model. Before executing the command, you should set this diagnostic to warning or none.
- See Avoiding Mux/Bus Mixtures for more information.

## Dependency

Selecting error enables the following parameter:

- **Bus signal treated as vector**

## Command-Line Information

**Parameter:** StrictBusMsg

**Type:** string

**Value:** 'none' | 'warning' | 'ErrorLevel1' |

'WarnOnBusInputToNonBusBlock' | 'ErrorOnBusInputToNonBusBlock'

**Default:** 'warning'



## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Avoiding Mux/Bus Mixtures
- Diagnosing Simulation Errors
- Mux block
- Bus Creator block
- Bus Selector block
- Underspecified initialization detection
- “Check for proper bus usage”
- Configuration Parameters Dialog Box
- Diagnostics Pane: Connectivity

## Bus signal treated as vector

Select the diagnostic action to take when Simulink software detects a virtual bus signal that is used as a mux signal.

### Settings

**Default:** warning

none

Disables checking for virtual buses used as muxes.

warning

Simulink software displays a warning if it detects a virtual bus used as a mux. This option does not enforce strict bus behavior.

error

Simulink software terminates the simulation and displays an error message when it builds a model that uses any virtual bus as a mux.

### Tips

- This diagnostic detects the use of virtual bus signals used to specify muxes. The diagnostic considers a virtual bus signal to be used as a mux if it is input to a Demux block or to any block that can input a mux or a vector but is not formally defined as bus-capable. See Bus-Capable Blocks for details.
- Virtual buses can be used as muxes only when they contain no nested buses and all constituent signals have the same attributes. This practice is deprecated as of R2007a (V6.6) and may cease to be supported at some future time. The MathWorks therefore discourages mixing virtual buses with muxes in new applications, and encourages upgrading existing applications to avoid such mixtures.
- If you are using simplified initialization mode, you must set this diagnostic to error. For more information, see Underspecified initialization detection.
- You can identify bus signals that are treated as a vectors using the Model Advisor check **Check for proper bus usage**. For more information, see “Check for proper bus usage”.
- You can eliminate warnings and errors about virtual buses used as muxes by using `Simulink.BlockDiagram.addBusToVector` to insert a Bus to

Vector block into any virtual bus signal that is used as a mux. Before executing the command, you should set this diagnostic to warning or none.

- See Avoiding Mux/Bus Mixtures for more information.

## Dependency

This parameter is enabled only when **Mux blocks used to create bus signals** is set to error.

## Command-Line Information

**Parameter:** StrictBusMsg

**Type:** string

**Value:** 'none' | 'warning' | 'ErrorLevel1' | 'WarnOnBusTreatedAsVector' | 'ErrorOnBusTreatedAsVector'

**Default:** 'warning'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Avoiding Mux/Bus Mixtures
- Diagnosing Simulation Errors
- Bus-Capable Blocks
- Demux block
- Bus to Vector block
- Underspecified initialization detection

- “Check for proper bus usage”
- `Simulink.BlockDiagram.addBusToVector`
- Configuration Parameters Dialog Box
- Diagnostics Pane: Connectivity

## Non-bus signals treated as bus signals

Detect when Simulink implicitly converts a non-bus signal to a bus signal to support connecting the signal to a Bus Assignment or Bus Selector block.

### Settings

**Default:** none

none

Implicitly converts non-bus signals to bus signals to support connecting the signal to a Bus Assignment or Bus Selector block.

warning

Simulink displays a warning, indicating that it has converted a non-bus signal to a bus signal. The warning lists the non-bus signals that Simulink converts.

error

Simulink terminates the simulation without performing converting non-bus signals to bus signals. The error message lists the non-bus signal that is being treated as a bus signal.

### Tips

- Using a Mux block to create a virtual bus does not support strong type checking and increases the likelihood of run-time errors. In new applications, do not use Mux blocks to create bus signals. Consider upgrading existing applications to that use of Mux blocks.
  - Simulink generates a warning when you load a model created in a release prior to R2010a, if that model contains a Mux block to create a bus signal. For new models, Simulink generates an error.
- See Avoiding Mux/Bus Mixtures for more information.

### Dependency

This parameter is enabled only when **Mux blocks used to create bus signals** is set to error.

## Command-Line Information

**Parameter:** NonbusSignalTreatedAsBus

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- [Avoiding Mux/Bus Mixtures](#)
- [Diagnosing Simulation Errors](#)
- [Bus-Capable Blocks](#)
- [Demux block](#)
- [Bus to Vector block](#)
- [Simulink.BlockDiagram.addBusToVector](#)
- [Configuration Parameters Dialog Box](#)
- [Diagnostics Pane: Connectivity](#)

## Repair bus selections

Repair broken selections in the Bus Selector and Bus Assignment block parameter dialogs due to upstream bus hierarchy changes.

### Settings

**Default:** Warn and repair

Warn and repair

Simulink displays a warning, indicating the block parameters for Bus Selector and Bus Assignment blocks that Simulink repaired to reflect upstream bus hierarchy changes.

Error without repair

Simulink terminates the simulation and displays an error message indicating the block parameters that you need to repair for Bus Selector and Bus Assignment blocks to reflect upstream bus hierarchy changes.

### Tips

- See Avoiding Mux/Bus Mixtures for more information.

### Dependency

This parameter is enabled only when **Mux blocks used to create bus signals** is set to error.

### Command-Line Information

**Parameter:** BusNameAdapt

**Type:** string

**Values:** 'WarnAndRepair' | 'ErrorWithoutRepair'

**Default:** 'WarnAndRepair'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Warn and repair

## See Also

- Avoiding Mux/Bus Mixtures
- “Nesting Buses”
- Diagnosing Simulation Errors
- Bus-Capable Blocks
- Configuration Parameters Dialog Box
- Diagnostics Pane: Connectivity



## Invalid function-call connection

Select the diagnostic action to take if Simulink software detects incorrect use of a function-call subsystem.

### Settings

**Default:** error

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- See the "Function-call systems" examples in the Simulink "Subsystem Semantics" library for examples of invalid uses of function-call subsystems.
- Setting this parameter to none or warning can lead to invalid simulation results.
- Setting this parameter to none or warning may cause Simulink software to insert extra delay operations.

### Command-Line Information

**Parameter:** InvalidFcnCallConnMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'error'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Diagnosing Simulation Errors
- Subsystem Semantics library
- Configuration Parameters Dialog Box
- Diagnostics Pane: Connectivity

## Context-dependent inputs

Select the diagnostic action to take when Simulink software has to compute any of a function-call subsystem's inputs directly or indirectly during execution of a call to a function-call subsystem.

### Settings

**Default:** Use local settings

Use local settings

Issues a warning only if the corresponding diagnostic is selected on the function-call subsystem's parameters dialog box (see the documentation for the Subsystem block's parameter dialog box for more information).

Enable all

Enables this diagnostic for all function-call subsystems in this model.

Disable all

Disables this diagnostic for all function-call subsystems in this model.

### Tips

- This situation occurs when executing a function-call subsystem can change its inputs.
- See the "Function-call systems" examples in the Simulink "Subsystem Semantics" library for examples of such function-call subsystems).

### Command-Line Information

**Parameter:** FcnCallInpInsideContextMsg

**Type:** string

**Value:** 'Use local settings' | 'Enable All' | 'Disable All'

**Default:** 'Use local settings'

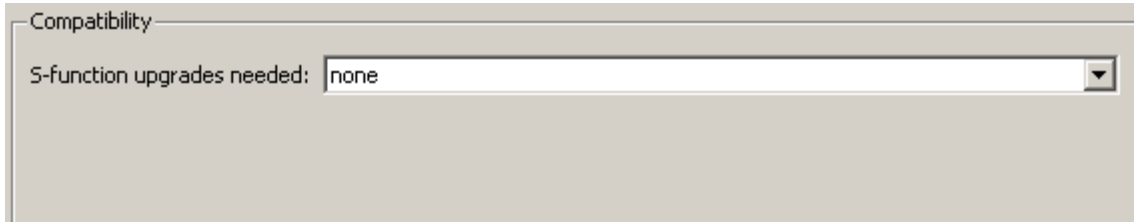
## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Enable all

## See Also

- Subsystem Semantics library
- Subsystem block
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Connectivity

## Diagnostics Pane: Compatibility



### In this section...

“Compatibility Diagnostics Overview” on page 1-330

“S-function upgrades needed” on page 1-331

## Compatibility Diagnostics Overview

Specify the diagnostic actions that Simulink software should take when it detects an incompatibility between the current version of Simulink software and the model.

### Configuration

Set the parameters displayed.

### Tips

- The options are typically to do nothing or to display a warning or an error message.
- A warning does not terminate a simulation, but an error does.

### See Also

- Diagnosing Simulation Errors
- Solver Diagnostics
- Sample Time Diagnostics
- Data Validity Diagnostics
- Type Conversion Diagnostics
- Connectivity Diagnostics
- Compatibility Diagnostics
- Model Referencing Diagnostics
- Saving Diagnostics
- Configuration Parameters Dialog Box
- Diagnostics Pane: Compatibility

## S-function upgrades needed

Select the diagnostic action to take if Simulink software encounters a block that has not been upgraded to use features of the current release.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Command-Line Information

**Parameter:** SfunCompatibilityCheckMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

### See Also

- Diagnosing Simulation Errors

- Configuration Parameters Dialog Box
- Diagnostics Pane: Compatibility



## Diagnostics Pane: Model Referencing

Model Referencing	
Model block version mismatch:	none ▼
Port and parameter mismatch:	none ▼
Model configuration mismatch:	none ▼
Invalid root Inport/Outport block connection:	none ▼
Unsupported data logging:	warning ▼

### In this section...

“Model Referencing Diagnostics Overview” on page 1-334

“Model block version mismatch” on page 1-335

“Port and parameter mismatch” on page 1-337

“Model configuration mismatch” on page 1-339

“Invalid root Inport/Outport block connection” on page 1-341

“Unsupported data logging” on page 1-345

## **Model Referencing Diagnostics Overview**

Specify the diagnostic actions that Simulink software should take when it detects an incompatibility relating to a model reference hierarchy.

### **Configuration**

Set the parameters displayed.

### **Tips**

- The options are typically to do nothing or to display a warning or an error message.
- A warning does not terminate a simulation, but an error does.

### **See Also**

- Referencing Models
- Diagnosing Simulation Errors
- Solver Diagnostics
- Sample Time Diagnostics
- Data Validity Diagnostics
- Type Conversion Diagnostics
- Connectivity Diagnostics
- Compatibility Diagnostics
- Saving Diagnostics
- Configuration Parameters Dialog Box
- Diagnostics Pane: Model Referencing

## Model block version mismatch

Select the diagnostic action to take when loading or updating this model if Simulink software detects a mismatch between the version of the model used to create or refresh a Model block in this model and the referenced model's current version.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning and refreshes the Model block.

error

Simulink software displays an error message and does not refresh Model block.

### Tip

If you have enabled display of referenced model version numbers on Model blocks for this model (see [Displaying Referenced Model Version Numbers](#)), Simulink software displays a version mismatch on the Model block icon, for example: Rev:1.0 != 1.2.

### Command-Line Information

**Parameter:** ModelReferenceVersionMismatchMessage

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	none

## **See Also**

- Referencing Models
- Diagnosing Simulation Errors
- Displaying Referenced Model Version Numbers
- Configuration Parameters Dialog Box
- Diagnostics Pane: Model Referencing

## Port and parameter mismatch

Select the diagnostic action to take if Simulink software detects a port or parameter mismatch during model loading or updating.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning and refreshes the Model block.

error

Simulink software displays an error message and does not refresh the Model block.

### Tips

- Port mismatches occur when there is a mismatch between the I/O ports of a Model block and the root-level I/O ports of the model it references.
- Parameter mismatches occur when there is a mismatch between the parameter arguments recognized by the Model block and the parameter arguments declared by the referenced model.
- Model block icons can display a message indicating port or parameter mismatches. To enable this feature, select **Block displays > Model Block I/O Mismatch** from the parent model's **Format** menu.

### Command-Line Information

**Parameter:** ModelReferenceIOMismatchMessage

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

## See Also

- Referencing Models
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Model Referencing

## Model configuration mismatch

Select the diagnostic action to take if the configuration parameters of a model referenced by this model do not match this model's configuration parameters or are inappropriate for a referenced model.

### Settings

**Default:** none

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tip

Set this diagnostic to warning or error if you suspect that an inappropriate or mismatched configuration parameter may be causing your model to give the wrong result.

### Command-Line Information

**Parameter:** ModelReferenceCSMismatchMessage

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	warning

## **See Also**

- Referencing Models
- Configuration Parameter Requirements
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Model Referencing



## Invalid root Inport/Output block connection

Select the diagnostic action to take if Simulink software detects invalid internal connections to this model's root-level Output port blocks.

### Settings

**Default:** none

none

Simulink software silently inserts hidden blocks to satisfy the constraints wherever possible.

warning

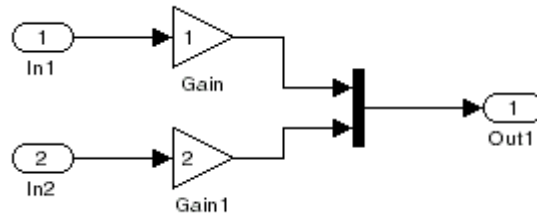
Simulink software warns you that a connection constraint has been violated and attempts to satisfy the constraint by inserting hidden blocks.

error

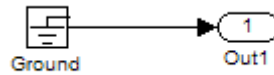
Simulink software terminates the simulation or code generation and displays an error message.

### Tips

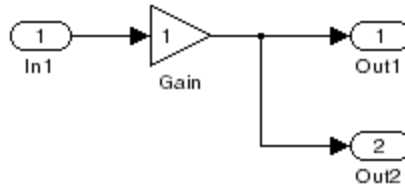
- In some cases (such as function-call feedback loops), automatically inserted hidden blocks may introduce delays and thus may change simulation results.
- Auto-inserting hidden blocks to eliminate root I/O problems stops at subsystem boundaries. Therefore, you may need to manually modify models with subsystems that violate any of the constraints below.
- The types of invalid internal connections are:
  - A root Output port is connected directly or indirectly to more than one nonvirtual block port:



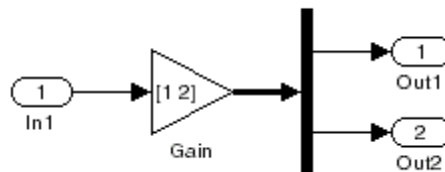
- A root Output port is connected to a Ground block:



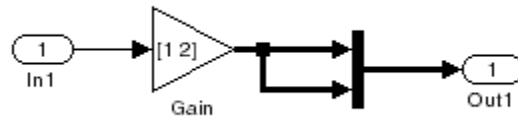
- Two root Output blocks are connected to the same block port:



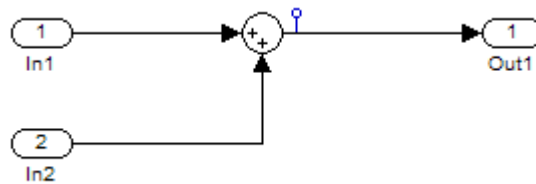
- An Output port block is connected to some elements of a block output and not others:



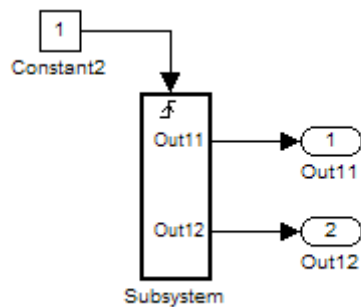
- An Output block is connected more than once to the same element:



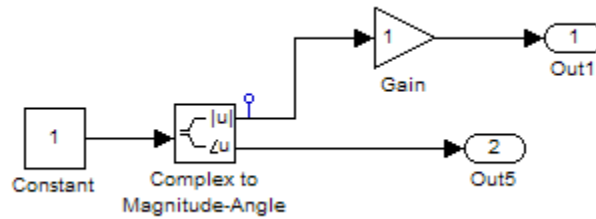
- The signal driving the root outputport is a test point:



- The output port has a constant sample time, but the driving block has a non-constant sample time:



- The driving block has a constant sample time and multiple output ports, and one of the other output ports of the block is a test point.



### Command-Line Information

**Parameter:** ModelReferenceIOMsg  
**Type:** string  
**Value:** 'none' | 'warning' | 'error'  
**Default:** 'none'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error

### See Also

- Referencing Models
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Diagnostics Pane: Model Referencing

## Unsupported data logging

Select the diagnostic action to take if this model contains To Workspace blocks or Scope blocks with data logging enabled.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning.

error

Simulink software terminates the simulation and displays an error message.

### Tips

- The default action warns you that Simulink software does not support use of these blocks to log data from referenced models.
- See Logging Referenced Model Signals for information on how to log signals from a reference to this model.

### Command-Line Information

**Parameter:** ModelReferenceDataLoggingMessage

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

### Recommended Settings

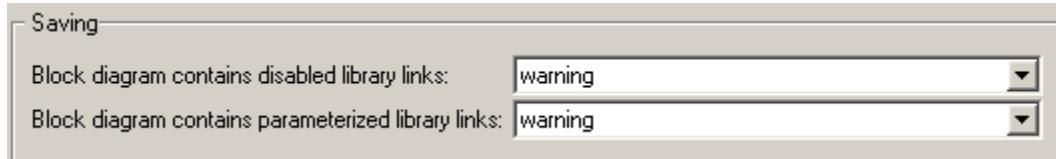
Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	error

## **See Also**

- Referencing Models
- Diagnosing Simulation Errors
- Logging Referenced Model Signals
- To Workspace block
- Scope block
- Configuration Parameters Dialog Box
- Diagnostics Pane: Model Referencing

## Diagnostics Pane: Saving



Saving

Block diagram contains disabled library links: warning

Block diagram contains parameterized library links: warning

### In this section...

“Saving Tab Overview” on page 1-348

“Block diagram contains disabled library links” on page 1-349

“Block diagram contains parameterized library links” on page 1-351

## **Saving Tab Overview**

Specify the diagnostic actions that Simulink software takes when saving a block diagram containing disabled library links or parameterized library links.

### **Configuration**

Set the parameters displayed.

### **Tips**

- The options are typically to do nothing or to display a warning or an error message.
- A warning does not terminate a simulation, but an error does.

### **See Also**

- Saving a Model
- Model Parameters
- Diagnosing Simulation Errors
- Solver Diagnostics
- Sample Time Diagnostics
- Data Validity Diagnostics
- Type Conversion Diagnostics
- Connectivity Diagnostics
- Compatibility Diagnostics
- Model Referencing Diagnostics
- Configuration Parameters Dialog Box
- Diagnostics Pane: Saving



## Block diagram contains disabled library links

Select the diagnostic action to take when saving a model containing disabled library links.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning and saves the block diagram. The diagram may not contain the information you had intended.

error

Simulink software displays an error message. The model is not saved.

### Tip

Use the Model Advisor Identify disabled library links check to find disabled library links.

### Command-Line Information

**Parameter:** SaveWithDisabledLinksMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'warning'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## **See Also**

- [Disabling Library Links](#)
- [Identify disabled library links](#)
- [Saving a Model](#)
- [Model Parameters](#)
- [Configuration Parameters Dialog Box](#)
- [Diagnostics Pane: Saving](#)

## Block diagram contains parameterized library links

Select the diagnostic action to take when saving a model containing parameterized library links.

### Settings

**Default:** warning

none

Simulink software takes no action.

warning

Simulink software displays a warning and saves the block diagram. The diagram may not contain the information you had intended.

error

Simulink software displays an error message. The model is not saved.

### Tips

- Use the Model Advisor Identify parameterized library links check to find parameterized library links.

### Command-Line Information

**Parameter:** SaveWithParameterizedLinksMsg

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'none'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## **See Also**

- Identify parameterized library links
- Configuration Parameters Dialog Box
- Diagnostics Pane: Saving

## Hardware Implementation Pane

The screenshot shows a software configuration window titled "Hardware Implementation Pane". It is divided into two main sections: "Embedded hardware (simulation and code generation)" and "Emulation hardware (code generation only)".

**Embedded hardware (simulation and code generation)**

- Device vendor: Generic (dropdown menu)
- Device type: Unspecified (assume 32-bit Generic) (dropdown menu)
- Number of bits:
  - char: 8 (text input)
  - short: 16 (text input)
  - int: 32 (text input)
  - long: 32 (text input)
  - native word size: 32 (text input)
- Byte ordering: Unspecified (dropdown menu)
- Signed integer division rounds to: Undefined (dropdown menu)
- Shift right on a signed integer as arithmetic shift

**Emulation hardware (code generation only)**

- None

### In this section...

- “Hardware Implementation Overview” on page 1-355
- “Device vendor” on page 1-356
- “Device type” on page 1-359
- “Number of bits: char” on page 1-369
- “Number of bits: short” on page 1-371
- “Number of bits: int” on page 1-373
- “Number of bits: long” on page 1-375
- “Number of bits: native word size” on page 1-377
- “Byte ordering” on page 1-379
- “Signed integer division rounds to” on page 1-381
- “Shift right on a signed integer as arithmetic shift” on page 1-384
- “None” on page 1-386
- “Device vendor” on page 1-388

**In this section...**

“Device type” on page 1-391

“Number of bits: char” on page 1-401

“Number of bits: short” on page 1-403

“Number of bits: int” on page 1-405

“Number of bits: long” on page 1-407

“Number of bits: native word size” on page 1-409

“Byte ordering” on page 1-411

“Signed integer division rounds to” on page 1-413

“Shift right on a signed integer as arithmetic shift” on page 1-416

## Hardware Implementation Overview

Describe the hardware characteristics for the modelled system, including how to set up embedded and emulation hardware settings for both simulation and code generation.

---

**Note Hardware Implementation** pane options do not control hardware or compiler behavior: their purpose is to solely describe hardware and compiler properties to MATLAB software, which uses the information to generate code that is correct for the platform, runs as efficiently as possible, and gives bit-true agreement for the results of integer and fixed-point operations in simulation, production code, and test code.

---

### Configuration

- 1 Choose the **Device type** in the Embedded hardware subpane.
- 2 Set the parameters displayed for the selected device type.
- 3 Apply the changes.
- 4 Repeat as needed for Emulation hardware.

### Tips

- This pane applies to models of computer-based systems, such as embedded controllers.
- Specifying hardware characteristics enables simulation of the model to detect error conditions that could arise when executing code, such as hardware overflow.

### See Also

- [Configuring Hardware Properties](#)
- [Configuration Parameters Dialog Box](#)
- [Hardware Implementation Pane](#)

## Device vendor

Select the manufacturer of the hardware you will use to implement the production version of the system represented by this model.

### Settings

**Default:** Generic

- AMD
- ARM Compatible
- ASIC/FPGA (**Embedded hardware** subpane only)
- Analog Devices
- Atmel
- Freescale
- Infineon
- Intel
- Microchip
- NEC
- Renesas
- SGI
- STMicroelectronics
- Texas Instruments
- Generic

### Tips

- Select the device vendor before you specify the hardware device used to define your system's constraints.
- If your production hardware does not match any of the listed vendors, select **Generic**.



- The **Device vendor** and **Device type** fields both share the same command line parameter: `ProdHWDeviceType`. When specifying this parameter from the command line, separate the device vendor and device type values using the characters `>`. For example: `'Intel->8051 Compatible'`.
- To add **Device vendor** and **Device type** values to the default set that is displayed on the **Hardware Implementation** pane, see “Registering Additional Device Vendor and Device Type Values” in the Real-Time Workshop documentation.

## Dependencies

This parameter determines the options available in the **Device type** drop-down menu.

## Command-Line Information

**Parameter:** `ProdHWDeviceType`

**Type:** `string`

**Value:** any valid value (see tips)

**Default:** `'Generic->Unspecified (assume 32-bit Generic)'`

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Device type (production hardware)
- Device vendor (test hardware)
- Hardware Implementation Options

- Specifying Embedded Hardware Characteristics
- Configuration Parameters Dialog Box
- Hardware Implementation Pane

## Device type

Select the type of hardware you will use to implement the production version of the system represented by this model.

### Settings

**Default:** Unspecified (assume 32 bit Generic)

Generic options:

- 16-bit Embedded Processor
- 32-bit Embedded Processor
- 32-bit Real-Time Simulator
- 32-bit x86 compatible
- 8-bit Embedded Processor
- Custom
- MATLAB Host Computer (available as an **Emulation hardware** device and, for Embedded MATLAB Coder configuration, as an **Embedded hardware** device)
- Unspecified (assume 32-bit Generic)

AMD® options:

- K5/K6/Athlon

ARM® Compatible options:

- ARM 10
- ARM 11
- ARM 7
- ARM 8
- ARM 9

ASIC/FPGA options: (**Embedded hardware** subpane only)

- ASIC/FPGA

Analog Devices™ options:

- Blackfin
- SHARC
- TigerSHARC

Atmel® options:

- AVR

Freescale™ options:

- 32-bit PowerPC
- 68332
- 68HC08
- 68HC11
- ColdFire
- DSP563xx (16-bit mode)
- HC(S)12
- MPC52xx
- MPC5500
- MPC55xx
- MPC5xx
- MPC7400
- MPC7xxx
- MPC82xx
- MPC83xx
- MPC85xx
- MPC86xx

- MPC8xx
- S12x

Infineon® options:

- C16x, XC16x
- TriCore

Intel® options:

- 8051 Compatible
- x86/Pentium

Microchip:

- PIC18
- dsPIC

NEC® options:

- V850

Renesas® options:

- M16C
- M32C
- R8C/Tiny
- SH-2/3/4

SGI:

- UltraSPARC IIi

STMicroelectronics:

- ST10/Super10

Texas Instruments™ options:

- C2000
- C5000
- C6000
- MSP430
- TMS470

### Tips

- Select the device vendor before you specify the hardware device type.
- Selecting a device type specifies the hardware device to define your system's constraints:
  - Default hardware properties appear as the initial values.
  - Parameters with only one possible value cannot be changed.
  - Parameters with more than one possible value provide a list of legal values.
  - Static values for each device type are displayed in the following table.
  - Parameters that you can modify are identified with an **x**.

Key:	Word size = native word size							
	Rounds to = Signed integer division rounds to							
	Shift right = Shift right on a signed integer as arithmetic shift							
Device vendor / Device type	Number of bits					Byte ordering	Rounds to	Shift right
	char	short	int	long	Word size			
Generic								
Unspecified (assume 32-bit Generic) (default)	8	16	32	32	32	Unspecified	x	Set

Key:	Word size = native word size							
	Rounds to = Signed integer division rounds to							
	Shift right = Shift right on a signed integer as arithmetic shift							
Device vendor / Device type	Number of bits					Byte ordering	Rounds to	Shift right
	char	short	int	long	Word size			
Custom	x	x	x	x	x	x	x	x
16-bit Embedded Processor	8	16	16	32	16	x	x	Set
32-bit Embedded Processor	8	16	32	32	32	x	x	Set
32-bit Real Time Simulator	8	16	32	32	32	x	x	Set
32-bit x86 compatible	8	16	32	32	32	Little Endian	Zero	Set
8-bit Embedded Processor	8	16	16	32	8	x	x	Set
MATLAB Host Computer	8	16	32	Host specific value (32 or 64)	Host specific value (32 or 64)	Little Endian	x	Set
AMD								
K5/K6/Athlon	8	16	32	32	32	Little Endian	x	Set
ARM Compatible								
ARM 7/8/9/10/11	8	16	32	32	x	x	x	x
ASIC/FPGA								
ASIC/FPGA	NA	NA	NA	NA	NA	NA	NA	NA
Analog Devices								

Key:	Word size = native word size							
	Rounds to = Signed integer division rounds to							
	Shift right = Shift right on a signed integer as arithmetic shift							
Device vendor / Device type	Number of bits					Byte ordering	Rounds to	Shift right
	char	short	int	long	Word size			
Blackfin	8	16	32	32	32	Little Endian	Zero	Set
SHARC	32	32	32	32	32	Big Endian	Zero	Set
TigerSHARC	32	32	32	32	32	Little Endian	Zero	Set
Atmel								
AVR	8	16	16	32	8	Little Endian	Zero	Set
Freescale								
32-bit PowerPC	8	16	32	32	32	Big Endian	Zero	Set
68332	8	16	32	32	32	Big Endian	x	Set
68HC08	8	16	16	32	8	Big Endian	x	Set
68HC11	8	16	16	32	8	Big Endian	x	Set
ColdFire	8	16	32	32	32	Big Endian	Zero	Set
DSP563xx (16-bit mode)	8	16	16	32	16	x	x	Set
HC(S)12	8	16	16	32	16	Big Endian	x	Set



Key:	Word size = native word size								
	Rounds to = Signed integer division rounds to								
	Shift right = Shift right on a signed integer as arithmetic shift								
Device vendor / Device type	Number of bits					Byte ordering	Rounds to	Shift right	
	char	short	int	long	Word size				
MPC52xx, MPC5500, MPC55xx, MPC5xx, MPC7400, MPC7xxx, MPC82xx, MPC83xx, MPC85xx, MPC86xx, MPC8xx	8	16	32	32	32	x	Zero	Set	
S12x	8	16	16	32	16	Big Endian	x	Set	
Infineon									
C16x, XC16x	8	16	16	32	16	Little Endian	Zero	Set	
TriCore	8	16	32	32	32	Little Endian	x	Set	
Intel									
8051 Compatible	8	16	16	32	8	x	x	Clear	
x86/Pentium	8	16	32	32	32	Little Endian	x	Set	
Microchip									
PIC18	8	16	16	32	8	Little Endian	Zero	Set	
dsPIC	8	16	16	32	16	Little Endian	Zero	Set	
NEC									
V850	8	16	32	32	32	x	x	x	
Renesas									

Key:	Word size = native word size							
	Rounds to = Signed integer division rounds to							
	Shift right = Shift right on a signed integer as arithmetic shift							
Device vendor / Device type	Number of bits					Byte ordering	Rounds to	Shift right
	char	short	int	long	Word size			
M16C	8	16	16	32	16	Little Endian	x	x
M32C	8	16	x	32	x	Little Endian	x	x
R8C/Tiny	8	16	16	32	16	Little Endian	x	x
SH-2/3/4	8	16	32	32	32	x	x	x
SGI								
UltraSPARC Iii	8	16	32	32	32	Big Endian	x	Set
STMicroelectronics								
ST10/Super10	8	16	16	32	16	Little Endian	Zero	Set
Texas Instruments								
C2000	16	16	16	32	16	x	Zero	Set
C5000	16	16	16	32	16	Big Endian	Zero	Set
C6000	8	16	32	40	32	x	Zero	Set
MSP430	8	16	16	32	16	Little Endian	Zero	Set
TMS470	8	16	32	32	x	x	x	x

- If your production hardware does not match any of the listed types, select Unspecified (assume 32-bit Generic) if it has the characteristics of a generic 32-bit microprocessor; otherwise select Custom.

- The **Device vendor** and **Device type** fields both share the same command line parameter: `ProdHWDeviceType`. When specifying this parameter from the command line, separate the device vendor and device type values using the characters `>`. For example: `'Intel->8051 Compatible'`.
- To add **Device vendor** and **Device type** values to the default set that is displayed on the **Hardware Implementation** pane, see “Registering Additional Device Vendor and Device Type Values” in the Real-Time Workshop documentation.

## Dependencies

The options available in the drop-down menu are determined by the **Device vendor** parameter.

Selecting **ASIC/FPGA** enables the **Emulation hardware (code generation only)** subpane.

For all other device types, this parameter sets:

- **char**
- **short**
- **int**
- **long**
- **native word size**
- **Byte ordering**
- **Signed integer division rounds to**
- **Shift right on a signed integer as arithmetic shift**

## Command-Line Information

**Parameter:** `ProdHWDeviceType`

**Type:** `string`

**Value:** any valid value (see tips)

**Default:** `'Generic->Unspecified (assume 32-bit Generic)'`

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Device vendor (production hardware)
- Device type (test hardware)
- Hardware Implementation Options
- Specifying Embedded Hardware Characteristics
- Configuration Parameters Dialog Box
- Hardware Implementation Pane

## Number of bits: char

Describe the character bit length for the production hardware.

### Settings

**Default:** 8

**Minimum:** 8

**Maximum:** 32

Enter a value between 8 and 32.

### Tip

All values must be a multiple of 8.

### Dependencies

- This parameter is enabled by **Device type**.
- Simulink software disables this control if it knows the data type lengths for the selected device type.

### Command-Line Information

**Parameter:** ProdBitPerChar

**Type:** integer

**Value:** any valid value

**Default:** 8

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	Target specific
Safety precaution	No impact for simulation and during development. Match operation of compiler and hardware for code generation.

## **See Also**

- Hardware Implementation Options
- Specifying Embedded Hardware Characteristics
- Configuration Parameters Dialog Box
- Hardware Implementation Pane

## Number of bits: short

Describe the data bit length for the production hardware.

### Settings

**Default:** 16

**Minimum:** 8

**Maximum:** 32

Enter a value between 8 and 32.

### Tip

All values must be a multiple of 8.

### Dependencies

- This parameter is enabled by **Device type**.
- Simulink software disables this control if it knows the data type lengths for the selected device type.

### Command-Line Information

**Parameter:** ProdBitPerShort

**Type:** integer

**Value:** any valid value

**Default:** 16

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	Target specific
Safety precaution	No impact for simulation and during development. Match operation of compiler and hardware for code generation.

## See Also

- Hardware Implementation Options
- Specifying Embedded Hardware Characteristics
- Configuration Parameters Dialog Box
- Hardware Implementation Pane



## Number of bits: int

Describe the data integer bit length for the production hardware.

### Settings

**Default:** 32

**Minimum:** 8

**Maximum:** 32

Enter a number between 8 and 32.

### Tip

All values must be a multiple of 8.

### Dependencies

- This parameter is enabled by **Device type**.
- Simulink software disables this control if it knows the data type lengths for the selected device type.

### Command-Line Information

**Parameter:** ProdBitPerInt

**Type:** integer

**Value:** any valid value

**Default:** 32

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	Target specific
Safety precaution	No impact for simulation and during development. Match operation of compiler and hardware for code generation.

## **See Also**

- Hardware Implementation Options
- Specifying Embedded Hardware Characteristics
- Configuration Parameters Dialog Box
- Hardware Implementation Pane

## Number of bits: long

Describe the data bit lengths for the production hardware.

### Settings

**Default:** 32

**Minimum:** 32

**Maximum:** 64

Enter a value between 32 and 64.

### Tip

All values must be a multiple of 8 and between 32 and 64.

### Dependencies

- This parameter is enabled by **Device type**.
- Simulink software disables this control if it knows the data type lengths for the selected device type.

### Command-Line Information

**Parameter:** ProdBitPerLong

**Type:** integer

**Value:** any valid value

**Default:** 32

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	Target specific
Safety precaution	No impact for simulation and during development. Match operation of compiler and hardware for code generation.

## See Also

- Hardware Implementation Options
- Specifying Embedded Hardware Characteristics
- Configuration Parameters Dialog Box
- Hardware Implementation Pane

## Number of bits: native word size

Describe the microprocessor native word size for the production hardware.

### Settings

**Default:** 32

**Minimum:** 8

**Maximum:** 64

Enter a value between 8 and 64.

### Tip

All values must be a multiple of 8.

### Dependencies

- This parameter is enabled by **Device type**.
- Simulink software disables this control if it knows the data type lengths for the selected device type.

### Command-Line Information

**Parameter:** ProdWordSize

**Type:** integer

**Value:** any valid value

**Default:** 32

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	Target specific
Safety precaution	No impact for simulation and during development. Match operation of compiler and hardware for code generation.

## **See Also**

- Hardware Implementation Options
- Specifying Embedded Hardware Characteristics
- Configuration Parameters Dialog Box
- Hardware Implementation Pane

## Byte ordering

Describe the byte ordering for the production hardware.

### Settings

**Default:** Unspecified

Unspecified

Specifies that the code determines the endianness of the hardware.  
This is the least efficient choice.

Big Endian

The most significant byte appears first.

Little Endian

The least significant byte appears first.

### Dependencies

- This parameter is enabled by **Device type**.
- Simulink software disables this control if it knows the data type lengths for the selected device type.

### Command-Line Information

**Parameter:** ProdEndianness

**Type:** string

**Value:** 'Unspecified' | 'LittleEndian' | 'BigEndian'

**Default:** 'Unspecified'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	No impact

## **See Also**

- Hardware Implementation Options
- Specifying Embedded Hardware Characteristics
- Configuration Parameters Dialog Box
- Hardware Implementation Pane



## Signed integer division rounds to

Describe how to produce a signed integer quotient for the production hardware.

### Settings

**Default:** Undefined

#### Undefined

Choose this option if neither Zero nor Floor describes the compiler's behavior, or if that behavior is unknown.

#### Zero

If the quotient is between two integers, the compiler chooses the integer that is closer to zero as the result.

#### Floor

If the quotient is between two integers, the compiler chooses the integer that is closer to negative infinity.

### Tips

- Use the **Integer rounding mode** parameter on your model's blocks to simulate the rounding behavior of the C compiler that you use to compile code generated from the model. This setting appears on the **Signal Attributes** pane of the parameter dialog boxes of blocks that can perform signed integer arithmetic, such as the Product block.
- For most blocks, the value of **Integer rounding mode** completely defines rounding behavior. For blocks that support fixed-point data and the Simplest rounding mode, the value of **Signed integer division rounds to** also affects rounding. For details, see "Rounding" in the *Simulink Fixed Point User's Guide*.
- See Hardware Implementation Options in the Real-Time Workshop documentation for information on how this option affects code generation.
- The following table illustrates the compiler behavior described by the options for this parameter.

<b>N</b>	<b>D</b>	<b>Ideal N/D</b>	<b>Zero</b>	<b>Floor</b>	<b>Undefined</b>
33	4	8.25	8	8	8
-33	4	-8.25	-8	-9	-8 or -9
33	-4	-8.25	-8	-9	-8 or -9
-33	-4	8.25	8	8	8 or 9

### Dependency

This parameter is enabled by **Device type**.

### Command-Line Information

**Parameter:** ProdIntDivRoundTo

**Type:** string

**Value:** 'Floor' | 'Zero' | 'Undefined'

**Default:** 'Undefined'

### Recommended settings

<b>Application</b>	<b>Setting</b>
Debugging	No impact for simulation and during development. Undefined for production code generation.
Traceability	No impact for simulation and during development. Zero or Floor for production code generation.
Efficiency	No impact for simulation and during development. Zero for production code generation.
Safety precaution	No impact for simulation and during development. Floor for production code generation.

**See Also**

- [Hardware Implementation Options](#)
- [Specifying Embedded Hardware Characteristics](#)
- [Configuration Parameters Dialog Box](#)
- [Hardware Implementation Pane](#)

## Shift right on a signed integer as arithmetic shift

Describe how your compiler rounds the result of two signed integers for the production hardware.

### Settings

**Default:** On



On

Generates simple efficient code whenever the Simulink model performs arithmetic shifts on signed integers.



Off

Generates fully portable but less efficient code to implement right arithmetic shifts.

### Tips

- Select this parameter if the C compiler implements a signed integer right shift as an arithmetic right shift.
- An arithmetic right shift fills bits vacated by the right shift with the value of the most significant bit, which indicates the sign of the number in twos complement notation.

### Dependency

This parameter is enabled by **Device type**.

### Command-Line Information

**Parameter:** ProdShiftRightIntArith

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

## Recommended settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	On
Safety precaution	No impact

## See Also

- Hardware Implementation Options
- Specifying Embedded Hardware Characteristics
- Configuration Parameters Dialog Box
- Hardware Implementation Pane

## None

Specify whether the test hardware differs from the deployment hardware.

## Settings

**Default:** On

On

Specifies that the hardware used to test the code generated from the model is the same as the production hardware, or has the same characteristics.

Off

Specifies that the hardware used to test the code generated from the model has different characteristics than the production hardware.

## Tips

- You can generate code that runs on the test hardware but behaves as if it had been generated for and executed on the deployment hardware.
- The **Embedded hardware (simulation and code generation)** subpane specifies the deployment hardware properties. The **Emulation hardware (code generation only)** subpane is used to specify the test hardware properties.

## Dependency

Enables the Emulation hardware subpane.

## Command-Line Information

**Parameter:** ProdEqTarget

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

## Recommended settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## More information

- [Specifying Emulation Hardware Characteristics](#)
- [Hardware Implementation Options](#)
- [Configuration Parameters Dialog Box](#)
- [Hardware Implementation Pane](#)

## Device vendor

Select the manufacturer of the hardware that will be used to test the code generated from the model.

### Settings

**Default:** Generic

- AMD
- ARM Compatible
- ASIC/FPGA (**Embedded hardware** subpane only)
- Analog Devices
- Atmel
- Freescale
- Infineon
- Intel
- Microchip
- NEC
- Renesas
- SGI
- STMicroelectronics
- Texas Instruments
- Generic

### Tips

- Select the device vendor before you specify the hardware device used to define your system's constraints.
- If your test hardware does not match any of the listed vendors, select Generic.



- The **Device vendor** and **Device type** fields both share the same command line parameter: `TargetHWDeviceType`. When specifying this parameter from the command line, separate the device vendor and device type values using the characters `>`. For example: `'Intel->8051 Compatible'`.
- To add **Device vendor** and **Device type** values to the default set that is displayed on the **Hardware Implementation** pane, see “Registering Additional Device Vendor and Device Type Values” in the Real-Time Workshop documentation.

## Dependencies

This parameter determines the options available in the **Device type** drop-down menu.

## Command-Line Information

**Parameter:** `TargetHWDeviceType`

**Type:** string

**Value:** any valid value (see tips)

**Default:** `'Generic->Unspecified (assume 32-bit Generic)'`

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Device type (test hardware)
- Specifying Emulation Hardware Characteristics
- Hardware Implementation Options

- Configuration Parameters Dialog Box
- Hardware Implementation Pane

## Device type

Select the type of hardware that will be used to test the code generated from the model.

### Settings

**Default:** Unspecified (assume 32 bit Generic)

Generic options:

- 16-bit Embedded Processor
- 32-bit Embedded Processor
- 32-bit Real-Time Simulator
- 32-bit x86 compatible
- 8-bit Embedded Processor
- Custom
- MATLAB Host Computer (available as an **Emulation hardware** device and, for Embedded MATLAB Coder configuration, as an **Embedded hardware** device)
- Unspecified (assume 32-bit Generic)

AMD options:

- K5/K6/Athlon

ARM Compatible options:

- ARM 10
- ARM 11
- ARM 7
- ARM 8
- ARM 9

ASIC/FPGA options: (**Embedded hardware** subpane only)

- ASIC/FPGA

Analog Devices options:

- Blackfin
- SHARC
- TigerSHARC

Atmel options:

- AVR

Freescale options:

- 32-bit PowerPC
- 68332
- 68HC08
- 68HC11
- ColdFire
- DSP563xx (16-bit mode)
- HC(S)12
- MPC52xx
- MPC5500
- MPC55xx
- MPC5xx
- MPC7400
- MPC7xxx
- MPC82xx
- MPC83xx
- MPC85xx
- MPC86xx

- MPC8xx
- S12x

Infineon options:

- C16x, XC16x
- TriCore

Intel options:

- 8051 Compatible
- x86/Pentium

Microchip:

- PIC18
- dsPIC

NEC options:

- V850

Renesas options:

- M16C
- M32C
- R8C/Tiny
- SH-2/3/4

SGI:

- UltraSPARC IIi

STMicroelectronics:

- ST10/Super10

Texas Instruments options:

- C2000
- C5000
- C6000
- MSP430
- TMS470

### Tips

- Select the device vendor before you specify the hardware device type.
- Selecting a device type specifies the hardware device to define your system's constraints:
  - Default hardware properties appear as the initial values.
  - Parameters with only one possible value cannot be changed.
  - Parameters with more than one possible value provide a list of legal values.
  - Static values for each device type are displayed in the following table.
  - Parameters that you can modify are identified with an x.

Key:	Word size = native word size							
	Rounds to = Signed integer division rounds to							
	Shift right = Shift right on a signed integer as arithmetic shift							
Device vendor / Device type	Number of bits					Byte ordering	Rounds to	Shift right
	char	short	int	long	Word size			
Generic								
Unspecified (assume 32-bit Generic) (default)	8	16	32	32	32	Unspecified	x	Set

Key:	Word size = native word size							
	Rounds to = Signed integer division rounds to							
	Shift right = Shift right on a signed integer as arithmetic shift							
Device vendor / Device type	Number of bits					Byte ordering	Rounds to	Shift right
	char	short	int	long	Word size			
Custom	x	x	x	x	x	x	x	x
16-bit Embedded Processor	8	16	16	32	16	x	x	Set
32-bit Embedded Processor	8	16	32	32	32	x	x	Set
32-bit Real Time Simulator	8	16	32	32	32	x	x	Set
32-bit x86 compatible	8	16	32	32	32	Little Endian	Zero	Set
8-bit Embedded Processor	8	16	16	32	8	x	x	Set
MATLAB Host Computer	8	16	32	Host specific value (32 or 64)	Host specific value (32 or 64)	Little Endian	x	Set
AMD								
K5/K6/Athlon	8	16	32	32	32	Little Endian	x	Set
ARM Compatible								
ARM 7/8/9/10/11	8	16	32	32	x	x	x	x
ASIC/FPGA								
ASIC/FPGA	NA	NA	NA	NA	NA	NA	NA	NA
Analog Devices								

Key:	Word size = native word size							
	Rounds to = Signed integer division rounds to							
	Shift right = Shift right on a signed integer as arithmetic shift							
Device vendor / Device type	Number of bits					Byte ordering	Rounds to	Shift right
	char	short	int	long	Word size			
Blackfin	8	16	32	32	32	Little Endian	Zero	Set
SHARC	32	32	32	32	32	Big Endian	Zero	Set
TigerSHARC	32	32	32	32	32	Little Endian	Zero	Set
Atmel								
AVR	8	16	16	32	8	Little Endian	Zero	Set
Freescale								
32-bit PowerPC	8	16	32	32	32	Big Endian	Zero	Set
68332	8	16	32	32	32	Big Endian	x	Set
68HC08	8	16	16	32	8	Big Endian	x	Set
68HC11	8	16	16	32	8	Big Endian	x	Set
ColdFire	8	16	32	32	32	Big Endian	Zero	Set
DSP563xx (16-bit mode)	8	16	16	32	16	x	x	Set
HC(S)12	8	16	16	32	16	Big Endian	x	Set



Key:	Word size = native word size								
	Rounds to = Signed integer division rounds to								
	Shift right = Shift right on a signed integer as arithmetic shift								
Device vendor / Device type	Number of bits					Byte ordering	Rounds to	Shift right	
	char	short	int	long	Word size				
MPC52xx, MPC5500, MPC55xx, MPC5xx, MPC7400, MPC7xxx, MPC82xx, MPC83xx, MPC85xx, MPC86xx, MPC8xx	8	16	32	32	32	x	Zero	Set	
S12x	8	16	16	32	16	Big Endian	x	Set	
Infineon									
C16x, XC16x	8	16	16	32	16	Little Endian	Zero	Set	
TriCore	8	16	32	32	32	Little Endian	x	Set	
Intel									
8051 Compatible	8	16	16	32	8	x	x	Clear	
x86/Pentium	8	16	32	32	32	Little Endian	x	Set	
Microchip									
PIC18	8	16	16	32	8	Little Endian	Zero	Set	
dsPIC	8	16	16	32	16	Little Endian	Zero	Set	
NEC									
V850	8	16	32	32	32	x	x	x	
Renesas									

Key:	Word size = native word size							
	Rounds to = Signed integer division rounds to							
	Shift right = Shift right on a signed integer as arithmetic shift							
Device vendor / Device type	Number of bits					Byte ordering	Rounds to	Shift right
	char	short	int	long	Word size			
M16C	8	16	16	32	16	Little Endian	x	x
M32C	8	16	x	32	x	Little Endian	x	x
R8C/Tiny	8	16	16	32	16	Little Endian	x	x
SH-2/3/4	8	16	32	32	32	x	x	x
SGI								
UltraSPARC Iii	8	16	32	32	32	Big Endian	x	Set
STMicroelectronics								
ST10/Super10	8	16	16	32	16	Little Endian	Zero	Set
Texas Instruments								
C2000	16	16	16	32	16	x	Zero	Set
C5000	16	16	16	32	16	Big Endian	Zero	Set
C6000	8	16	32	40	32	x	Zero	Set
MSP430	8	16	16	32	16	Little Endian	Zero	Set
TMS470	8	16	32	32	x	x	x	x

- If your test hardware does not match any of the listed types, select Unspecified (assume 32-bit Generic) if it has the characteristics of a generic 32-bit microprocessor; otherwise select Custom.

- The **Device vendor** and **Device type** fields both share the same command line parameter: `TargetHWDeviceType`. When specifying this parameter from the command line, separate the device vendor and device type values using the characters `>`. For example: `'Intel->8051 Compatible'`.
- To add **Device vendor** and **Device type** values to the default set that is displayed on the **Hardware Implementation** pane, see “Registering Additional Device Vendor and Device Type Values” in the Real-Time Workshop documentation.

## Dependencies

The options available in the drop-down menu are determined by the **Device vendor** parameter.

This parameter sets:

- **char**
- **short**
- **int**
- **long**
- **native word size**
- **Byte ordering**
- **Signed integer division rounds to**
- **Shift right on a signed integer as arithmetic shift**

## Command-Line Information

**Parameter:** `TargetHWDeviceType`

**Type:** `string`

**Value:** any valid value (see tips)

**Default:** `'Generic->Unspecified (assume 32-bit Generic)'`

### **Recommended Settings**

<b>Application</b>	<b>Setting</b>
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

### **See Also**

- Device vendor (test hardware)
- Specifying Emulation Hardware Characteristics
- Hardware Implementation Options
- Configuration Parameters Dialog Box
- Hardware Implementation Pane

## Number of bits: char

Describe the character bit length for the hardware used to test code.

### Settings

**Default:** 8

**Minimum:** 8

**Maximum:** 32

Enter a value between 8 and 32.

### Tip

All values must be a multiple of 8.

### Dependencies

- This parameter is enabled by **Device type**.
- Simulink software disables this control if it knows the data type lengths for the selected device type.

### Command-Line Information

**Parameter:** TargetBitPerChar

**Type:** integer

**Value:** any valid value

**Default:** 8

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	Target specific
Safety precaution	No impact for simulation and during development. Match operation of compiler and hardware for code generation.

## See Also

- Specifying Emulation Hardware Characteristics
- Hardware Implementation Options
- Configuration Parameters Dialog Box
- Hardware Implementation Pane

## Number of bits: short

Describe the data bit length for the hardware used to test code.

### Settings

**Default:** 16

**Minimum:** 8

**Maximum:** 32

Enter a value between 8 and 32.

### Tip

All values must be a multiple of 8.

### Dependencies

- This parameter is enabled by **Device type**.
- Simulink software disables this control if it knows the data type lengths for the selected device type.

### Command-Line Information

**Parameter:** TargetBitPerShort

**Type:** integer

**Value:** any valid value

**Default:** 16

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	Target specific
Safety precaution	No impact for simulation and during development. Match operation of compiler and hardware for code generation.

## **See Also**

- Specifying Emulation Hardware Characteristics
- Hardware Implementation Options
- Configuration Parameters Dialog Box
- Hardware Implementation Pane



## Number of bits: int

Describe the data integer bit length of the hardware used to test code.

### Settings

**Default:** 32

**Minimum:** 8

**Maximum:** 32

Enter a number between 8 and 32.

### Tip

All values must be a multiple of 8.

### Dependencies

- This parameter is enabled by **Device type**.
- Simulink software disables this control if it knows the data type lengths for the selected device type.

### Command-Line Information

**Parameter:** TargetBitPerInt

**Type:** integer

**Value:** any valid value

**Default:** 32

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	Target specific
Safety precaution	No impact for simulation and during development. Match operation of compiler and hardware for code generation.

## **See Also**

- Specifying Emulation Hardware Characteristics
- Hardware Implementation Options
- Configuration Parameters Dialog Box
- Hardware Implementation Pane

## Number of bits: long

Describe the data bit lengths for the hardware used to test code.

### Settings

**Default:** 32

**Minimum:** 32

**Maximum:** 64

Enter a value between 32 and 64. (The value 64 is selected by default if you run MATLAB software on a 64-bit host computer and select the MATLAB host as the test hardware — that is, `TargetHWDeviceType` equals `'Generic->MATLAB Host Computer'`.)

### Tip

All values must be a multiple of 8 and between 32 and 64.

### Dependencies

- This parameter is enabled by **Device type**.
- Simulink software disables this control if it knows the data type lengths for the selected device type.

### Command-Line Information

**Parameter:** `TargetBitPerLong`

**Type:** integer

**Value:** any valid value

**Default:** 32

### **Recommended Settings**

<b>Application</b>	<b>Setting</b>
Debugging	No impact
Traceability	No impact
Efficiency	Target specific
Safety precaution	No impact for simulation and during development. Match operation of compiler and hardware for code generation.

### **See Also**

- Specifying Emulation Hardware Characteristics
- Hardware Implementation Options
- Configuration Parameters Dialog Box
- Hardware Implementation Pane

## Number of bits: native word size

Describe the microprocessor native word size for the hardware used to test code.

### Settings

**Default:** 32

**Minimum:** 8

**Maximum:** 64

Enter a value between 8 and 64. (The value 64 is selected by default if you run MATLAB software on a 64-bit host computer and select the MATLAB host as the test hardware — that is, TargetHWDeviceType equals 'Generic->MATLAB Host Computer'.)

### Tip

All values must be a multiple of 8.

### Dependencies

- This parameter is enabled by **Device type**.
- Simulink software disables this control if it knows the data type lengths for the selected device type.

### Command-Line Information

**Parameter:** TargetWordSize

**Type:** integer

**Value:** any valid value

**Default:** 32

### **Recommended Settings**

<b>Application</b>	<b>Setting</b>
Debugging	No impact
Traceability	No impact
Efficiency	Target specific
Safety precaution	No impact for simulation and during development. Match operation of compiler and hardware for code generation.

### **See Also**

- Specifying Emulation Hardware Characteristics
- Hardware Implementation Options
- Configuration Parameters Dialog Box
- Hardware Implementation Pane

## Byte ordering

Describe the byte ordering for the hardware used to test code.

### Settings

**Default:** Unspecified

Unspecified

Specifies that the code determines the endianness of the hardware.  
This is the least efficient choice.

Big Endian

The most significant byte comes first.

Little Endian

The least significant byte comes first.

---

**Note** For guidelines to observe when configuring **Embedded hardware** controls for code generation, see Hardware Implementation Options in the Real-Time Workshop documentation.

---

## Dependencies

- This parameter is enabled by **Device type**.
- Simulink software disables this control if it knows the data type lengths for the selected device type.

## Command-Line Information

**Parameter:** TargetEndianness

**Type:** string

**Value:** 'Unspecified' | 'LittleEndian' | 'BigEndian'

**Default:** 'Unspecified'

### **Recommended Settings**

<b>Application</b>	<b>Setting</b>
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact for simulation and during development. Match operation of compiler and hardware for code generation.

### **See Also**

- Specifying Emulation Hardware Characteristics
- Hardware Implementation Options
- Configuration Parameters Dialog Box
- Hardware Implementation Pane



## Signed integer division rounds to

Describe how to produce a signed integer quotient for the hardware used to test code.

### Settings

**Default:** Undefined

#### Undefined

Choose this option if neither Zero nor Floor describes the compiler's behavior, or if that behavior is unknown.

#### Zero

If the quotient is between two integers, the compiler chooses the integer that is closer to zero as the result.

#### Floor

If the quotient is between two integers, the compiler chooses the integer that is closer to negative infinity.

### Tips

- Use the **Integer rounding mode** parameter on your model's blocks to simulate the rounding behavior of the C compiler that you use to compile code generated from the model. This setting appears on the **Signal Attributes** pane of the parameter dialog boxes of blocks that can perform signed integer arithmetic, such as the Product block.
- For most blocks, the value of **Integer rounding mode** completely defines rounding behavior. For blocks that support fixed-point data and the Simplest rounding mode, the value of **Signed integer division rounds to** also affects rounding. For details, see "Rounding" in the *Simulink Fixed Point User's Guide*.
- See Hardware Implementation Options in the Real-Time Workshop documentation for information on how this option affects code generation.
- The following table illustrates the compiler behavior described by the options for this parameter.

<b>N</b>	<b>D</b>	<b>Ideal N/D</b>	<b>Zero</b>	<b>Floor</b>	<b>Undefined</b>
33	4	8.25	8	8	8
-33	4	-8.25	-8	-9	-8 or -9
33	-4	-8.25	-8	-9	-8 or -9
-33	-4	8.25	8	8	8 or 9

### Dependency

This parameter is enabled by **Device type**.

### Command-Line Information

**Parameter:** TargetIntDivRoundTo

**Type:** string

**Value:** 'Floor' | 'Zero' | 'Undefined'

**Default:** 'Undefined'

### Recommended settings

<b>Application</b>	<b>Setting</b>
Debugging	No impact for simulation and during development. Undefined for production code generation.
Traceability	No impact for simulation and during development. Zero or Floor for production code generation.
Efficiency	No impact for simulation and during development. Zero for production code generation.
Safety precaution	No impact for simulation and during development. Floor for production code generation.

**See Also**

- [Specifying Emulation Hardware Characteristics](#)
- [Hardware Implementation Options](#)
- [Configuration Parameters Dialog Box](#)
- [Hardware Implementation Pane](#)

## Shift right on a signed integer as arithmetic shift

Describe how your compiler rounds the result of two signed integers for the hardware used to test code.

### Settings

**Default:** On



On

Generates simple efficient code whenever the Simulink model performs arithmetic shifts on signed integers.



Off

Generates fully portable but less efficient code to implement right arithmetic shifts.

### Tips

- Select this parameter if your C compiler implements a signed integer right shift as an arithmetic right shift.
- An arithmetic right shift fills bits vacated by the right shift with the value of the most significant bit, which indicates the sign of the number in twos complement notation. It is equivalent to dividing the number by 2.
- This setting affects only code generation

### Dependency

This parameter is enabled by **Device type**.

### Command-Line Information

**Parameter:** TargetShiftRightIntArith

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

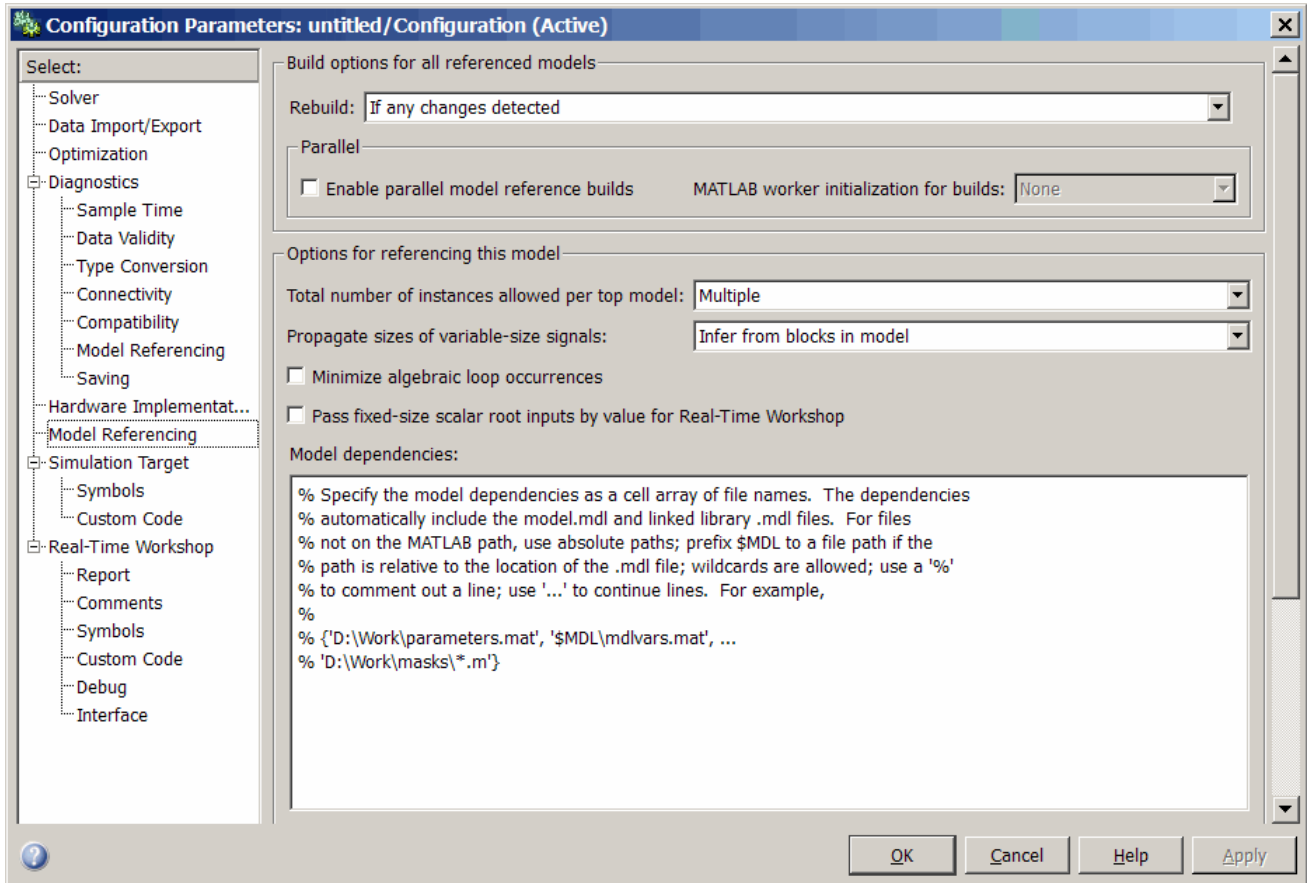
## Recommended settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	On
Safety precaution	No impact

## See Also

- [Specifying Emulation Hardware Characteristics](#)
- [Hardware Implementation Options](#)
- [Configuration Parameters Dialog Box](#)
- [Hardware Implementation Pane](#)

## Model Referencing Pane



### In this section...

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“Rebuild options” on page 1-421

“Never rebuild targets diagnostic” on page 1-424

“Enable parallel model reference builds” on page 1-426

“MATLAB worker initialization for builds” on page 1-428

**In this section...**

“Total number of instances allowed per top model” on page 1-430

“Pass fixed-size scalar root inputs by value for Real-Time Workshop” on page 1-432

“Minimize algebraic loop occurrences” on page 1-434

“Propagate sizes of variable-size signals” on page 1-437

“Model dependencies” on page 1-440

## Model Referencing Pane Overview

Specify the options for including other models in this model, this model in other models, and for building simulation and code generation targets.

### Configuration

Set the parameters displayed.

### Tips

- The Model Referencing pane allows you to specify options for:
  - Including other models in this model.
  - Including the current model in other models.
- The option descriptions use the term *this model* to refer to the model that you are configuring and the term *referenced model* to designate models referenced by *this model*.

### See Also

- Model Dependencies
- Configuration Parameters Dialog Box
- Model Referencing Pane



## Rebuild options

Select whether to rebuild simulation and Real-Time Workshop targets for referenced models before updating, simulating, or generating code from this model.

### Settings

**Default:** If any changes detected

If any changes detected

Rebuilds the target for a referenced model if Simulink software detects any changes of any kind in the target's dependencies. This option also checks for changes in the compiled form of the referenced model. Checking the compiled model can detect some changes that occur even in dependencies that you do not specify.

Always

Rebuilds all targets referenced by this model before simulating, updating, or generating code from it.

If any changes in known dependencies detected

Rebuilds a target if Simulink software detects any changes in known target dependencies (see below) since the target was last built. This option ignores cosmetic changes, such as annotation changes, in the referenced model and in any block library dependencies, thus preventing unnecessary rebuilds.

Never

Never rebuild targets before simulating or generating code from this model. If you are certain that your targets are up-to-date, you can use this option to avoid time-consuming target dependency checking when simulating, updating, or generating code from a model.

### Tips

- Simulink software detects target dependencies in:
  - The referenced model's model file
  - Block library files used by the referenced model
  - Targets of models referenced by the referenced model

- S-functions and associated TLC files used by the referenced model
- User-specified dependencies (see Model Dependencies)
- Workspace variables used by the referenced model
- It is a good idea to use the **Always** option before deployment of a model to assure that all the model reference targets are up-to-date.
- Before selecting **If any changes in known dependencies detected**, you should be certain that you have specified every user-created dependency (for example, MATLAB files or MAT-files) for this model to ensure that all targets that need to be rebuilt are rebuilt. Otherwise, invalid simulation results may occur.
- The **If any changes in known dependencies detected** option cannot detect changes in unspecified dependencies, such as MATLAB files used to initialize block masks. If you suspect that a model has such unknown dependencies, you can still guarantee valid simulation by selecting the **Always** or the **If any changes detected** option.
- Use the **Never** option with caution because it may lead to invalid results if referenced model targets are not in fact up-to-date.

## Dependency

Selecting **Never** enables the **Never rebuild targets diagnostic** parameter.

## Command-Line Information

**Parameter:** UpdateModelReferenceTargets

**Type:** string

**Value:** 'IfOutOfDate' | 'Force' | 'AssumeUpToDate' | 'IfOutOfDateOrStructuralChange'

**Default:** 'IfOutOfDateOrStructuralChange'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	Never or If any changes detected

### **See Also**

- Model Dependencies
- Configuration Parameters Dialog Box
- Model Referencing Pane

## Never rebuild targets diagnostic

Select the diagnostic action that Simulink software should take if it detects a target that needs to be rebuilt.

### Settings

**Default:** Error if targets require rebuild

none

Simulink software takes no action.

Warn if targets require rebuild

Simulink software displays a warning.

Error if targets require rebuild

Simulink software terminates the simulation and displays an error message.

### Tip

Selecting None bypasses dependency checking, and thus enables faster updating, simulation, and code generation, but can cause models that are not up-to-date to malfunction or generate incorrect results.

### Dependency

This parameter is enabled only if you select Never in the **Rebuild options** field.

### Command-Line Information

**Parameter:** CheckModelReferenceTargetMessage

**Type:** string

**Value:** 'none' | 'warning' | 'error'

**Default:** 'error'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	error if targets require rebuild

## See Also

- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Model Referencing Pane

## Enable parallel model reference builds

Specify whether to use automatic parallel building of the model reference hierarchy whenever possible.

### Settings

**Default:** Off

On  
Simulink software builds the model reference hierarchy in parallel whenever possible (based on computing resources and the structure of the model reference hierarchy).

Off  
Simulink never builds the model reference hierarchy in parallel.

### Dependency

Selecting this option enables the **MATLAB worker initialization for builds** parameter.

### Tip

For distributed pools, only simulation targets build in parallel (not code generation targets).

### Command-Line Information

**Parameter:** EnableParallelModelReferenceBuilds

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	No impact

### **See Also**

- “Parallel Building for Large Model Reference Hierarchies”
- Configuration Parameters Dialog Box
- Model Referencing Pane

## MATLAB worker initialization for builds

Specify how to initialize MATLAB workers for parallel builds.

### Settings

**Default:** None

None

Simulink software takes no action. Specify this value if the child models in the model reference hierarchy do not rely on anything in the base workspace beyond what they explicitly set up (for example, with a model load function).

Copy base workspace

Simulink attempts to copy the base workspace to each MATLAB worker. Specify this value if you use a setup script to prepare the base workspace for all models to use.

Load top model

Simulink loads the top model on each MATLAB worker. Specify this value if the top model in the model reference hierarchy handles all of the base workspace setup (for example, with a model load function).

### Limitation

For values other than None, limitations apply to global variables in the base workspace. Global variables are not propagated across parallel workers and do not reflect changes made by top and child model scripts.

### Dependency

Selecting the option **Enable parallel model reference builds** enables this parameter.

### Command-Line Information

**Parameter:** ParallelModelReferenceMATLABWorkerInit

**Type:** string

**Value:** 'None' | 'Copy Base Workspace' | 'Load Top Model'

**Default:** 'None'



## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- “Parallel Building for Large Model Reference Hierarchies”
- Configuration Parameters Dialog Box
- Model Referencing Pane

## Total number of instances allowed per top model

Specify how many references to this model can occur in another model.

### Settings

**Default:** Multiple

#### Zero

The model cannot be referenced. An error occurs if a reference to the model occurs in another model.

#### One

The model can be referenced at most once in a model reference hierarchy. An error occurs if more than one reference exists.

#### Multiple

The model can be referenced more than once in a hierarchy, provided that it contains no constructs that preclude multiple reference. An error occurs if the model cannot be multiply referenced, even if only one reference exists.

### Command-Line Information

**Parameter:** ModelReferenceNumInstancesAllowed

**Type:** string

**Value:** 'Zero' | 'Single' | 'Multi'

**Default:** 'Multi'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

**See Also**

- [Diagnosing Simulation Errors](#)
- [Configuration Parameters Dialog Box](#)
- [Model Referencing Pane](#)

## Pass fixed-size scalar root inputs by value for Real-Time Workshop

Specify whether a model that calls (references) this model passes this scalar inputs of this model by value.

### Settings

**Default:** Off (GUI), 'on' (command-line)



On

A model that calls (references) this model passes scalar inputs of this model by value.



Off

The calling model passes the inputs by reference (it passes the addresses of the inputs rather than the input values).

### Tips

- Passing roots by value allows this model to read its scalar inputs from register or local memory which is faster than reading the inputs from their original locations.
- However, passing roots by value can lead to incorrect results if the model's root scalar inputs can change within a time step. This can happen, for instance, if this model's inputs and outputs share memory locations (as a result of a feedback loop) and the model is invoked multiple times in a time step; for example, by an Inport or Trigger block (see "Function-Call Subsystems"). In such cases, this model sees scalar input changes that occur in the same time step only if the inputs are passed by reference. That is why this option is off by default.
- If you are certain that this model is not referenced in contexts where its inputs can change within a time step, select this option to generate more efficient code for this model.
- Selecting this option can affect reuse of code generated for subsystems. See Reusable Code and Referenced Models for more information.

- For SIM targets, a model that references this model passes inputs by reference, regardless of how you set the **Pass fixed-size scalar root inputs by value for Real-Time Workshop** parameter.

## Command-Line Information

**Parameter:** ModelReferencePassRootInputsByReference

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

---

**Note** The command-line values are reverse of the settings values. Therefore, 'on' in the command line corresponds to the description of “Off” in the settings section, and 'off' in the command line corresponds to the description of “On” in the settings section.

---

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Off

## See Also

- “Function-Call Subsystems”
- Reusable Code and Referenced Models
- Configuration Parameters Dialog Box
- Model Referencing Pane

## Minimize algebraic loop occurrences

Specify whether Simulink software tries to eliminate algebraic loops involving this model from models that reference it.

### Settings

**Default:** Off



On

Simulink software tries to eliminate algebraic loops involving this model from models that reference it.



Off

Simulink software does not try to eliminate algebraic loops from the models that reference this model.

### Tips

- Enabling this option disables:
  - Conditional input branch optimization for simulation
  - The Real-Time Workshop **Single output/update function** parameter (disabling this parameter generates separate *model\_output* and *model\_update* functions)
- See Algebraic Loops for more information.

### Command-Line Information

**Parameter:** ModelReferenceMinAlgLoopOccurrences

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Off

## See Also

- Model block
- Algebraic Loops
- Model Blocks and Direct Feedthrough
- Diagnosing Simulation Errors
- Configuration Parameters Dialog Box
- Model Referencing Pane





## Propagate sizes of variable-size signals

Select how variable-size signals propagate through referenced models.

### Settings

**Default:** Infer from blocks in model

Infer from blocks in model

Searches a referenced model and groups blocks into the following categories.

Category	Description	Example Blocks in This Category
1	Output signal size depends on input signal values.	Switch or Enable Subsystem block whose parameter <b>Propagate sizes of variable-size signals</b> is set to <code>During execution</code>
2	States require resetting when the input signal size changes.	Unit Delay block in an Enabled Subsystem whose parameter <b>Propagate sizes of variable-size signals</b> is set to <code>Only when enabling</code>
3	Output signal size depends only on the input signal size.	Gain block.

The search stops at the boundary of Enable, Function-Call, and Action subsystems because these subsystems can specify when to propagate the size of a variable-size signal.

Simulink sets the propagation of variable-size signals for a referenced model as follows:

- One or more blocks in category 1, and all other blocks are in category 3, select `During execution`.
- One or more blocks in category 2, and all another blocks are in category 3, select `Only when enabling`.

- Blocks in category 1 and 2, report an error.
- All blocks in category 3 with a conditionally executed subsystem that is not an Enable, Function-Call, or Action subsystem, report an error. Simulink, in this case, cannot determine when to propagate sizes of variable-size signals.
- All blocks in category 3 with only conditionally executed subsystems that are an Enable, Function-Call, or Action subsystem, support both Only when enabling and During execution.

#### Only when enabling

Propagates sizes of variable-size signals for the referenced model only when enabling (at Enable method).

#### During execution

Propagates sizes of variable-size signals for the referenced model during execution (at Outputs method).

## Command-Line Information

**Parameter:** PropagateVarSize

**Type:** string

**Value:** 'Infer from blocks in model' | 'Only when enabling' | 'During execution'

**Default:** 'Infer from blocks in model'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Off

## See Also

- Configuration Parameters Dialog Box

- Model Referencing Pane

## Model dependencies

Specify the files on which this model relies. They are typically MAT-files and MATLAB files used to initialize parameters and to provide data.

### Settings

#### No Default

- Specify the dependencies as a cell array of strings, where each cell array entry is the filename or path of a dependent file. These filenames may include spaces and must include file extensions (for example, `.m` or `.mat`).
- Prefix the token `$MDL` to a dependency to indicate that the path to the dependency is relative to the location of this model file.
- Wildcards are allowed. Use a `'%'` to comment out a line; use `'...'` to continue lines.

### Tips

- If Simulink software cannot find a specified dependent file when you update or simulate a model that references this model, Simulink software displays a warning.
- The dependencies automatically include the `model.mdl` and linked library `.mdl` files.
- For files not on the MATLAB path, use absolute paths.

### Command-Line Information

**Parameter:** ModelDependencies

**Type:** string

**Value:** any valid value

**Default:** ''

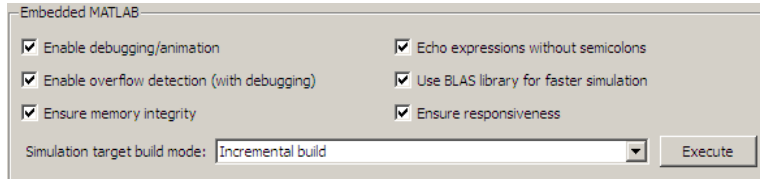
## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Model Dependencies
- Configuration Parameters Dialog Box
- Model Referencing Pane

## Simulation Target Pane: General



### In this section...

“Simulation Target: General Tab Overview” on page 1-443

“Enable debugging/animation” on page 1-444

“Enable overflow detection (with debugging)” on page 1-446

“Ensure memory integrity” on page 1-448

“Echo expressions without semicolons” on page 1-450

“Use BLAS library for faster simulation” on page 1-452

“Ensure responsiveness” on page 1-454

“Simulation target build mode” on page 1-456

## Simulation Target: General Tab Overview

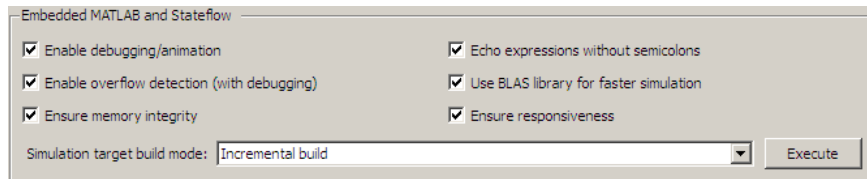
Configure the simulation target for a model that contains Embedded MATLAB Function blocks, Stateflow charts, or Truth Table blocks.

### Configuration

Set the parameters that appear.

### Dependency

If you have a Stateflow license, the title becomes **Embedded MATLAB and Stateflow**. This title also appears if you do not have a Stateflow license, but load a model that contains Stateflow charts or Truth Table blocks. In either case, the parameters remain the same.



### See Also

- [Speeding Up Simulation](#)
- [Configuration Parameters Dialog Box](#)
- [Simulation Target Pane: General](#)

## Enable debugging/animation

Enable debugging and animation during simulation of a model that contains Embedded MATLAB Function blocks, Stateflow charts, or Truth Table blocks.

### Settings

**Default:** On



Enables debugging and animation of a model during simulation.

This action also enables the Stateflow Debugger.



Disables debugging and animation of a model during simulation.

This action also disables the Stateflow Debugger.

### Tip

- If you disable debugging and animation, faster model simulation occurs.

### Command-Line Information

**Parameter:** SFSimEnableDebug

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

### Recommended Settings

Application	Setting
Debugging	On
Traceability	No impact
Efficiency	Off
Safety precaution	On



**See Also**

- [Speeding Up Simulation](#)
- [Configuration Parameters Dialog Box](#)
- [Simulation Target Pane: General](#)

## Enable overflow detection (with debugging)

Enable overflow detection of data during simulation of a model that contains Embedded MATLAB Function blocks, Stateflow charts, or Truth Table blocks. Overflow occurs for data when a value assigned to it exceeds the numeric capacity of the data type.

### Settings

Default: On



Enables overflow detection of data during simulation.

You must also select the **Data Range** check box in the Stateflow Debugger window.



Disables overflow detection of data during simulation.

### Tips

- If your model contains fixed-point data, enable overflow detection.
- If you disable overflow detection, faster model simulation occurs.

### Command-Line Information

Parameter: SFSimOverflowDetection

Type: string

Value: 'on' | 'off'

Default: 'on'

### Recommended Settings

Application	Setting
Debugging	On
Traceability	No impact

<b>Application</b>	<b>Setting</b>
Efficiency	Off
Safety precaution	On

### **See Also**

- [Speeding Up Simulation](#)
- [Overflow Detection for Fixed-Point Types](#)
- [Configuration Parameters Dialog Box](#)
- [Simulation Target Pane: General](#)

## Ensure memory integrity

Detects violations of memory integrity in code generated for Embedded MATLAB function blocks and stops execution with a diagnostic.

### Settings

Default: On



On

Detect violations of memory integrity in code generated for Embedded MATLAB function blocks and stops execution with a diagnostic message.



Off

Does not detect violations of memory integrity in code generated for Embedded MATLAB function blocks.

---

**Caution** Without these checks, violations will result in unpredictable behavior.

---

### Tips

- The most likely cause of memory integrity issues is accessing an array out of bounds.
- Only disable these checks if you are sure that your code is safe and that all array bounds and dimension checking is unnecessary.

### Command-Line Information

Parameter: SimIntegrity

Type: string

Value: 'on' | 'off'

Default: 'on'

## Recommended Settings

Application	Setting
Debugging	On
Traceability	On
Efficiency	Off
Safety precaution	On

## See Also

- “Controlling Runtime Checks” in the *Simulink User’s Guide*.
- Configuration Parameters Dialog Box
- Simulation Target Pane: General

## Echo expressions without semicolons

Enable run-time output in the MATLAB Command Window, such as actions that do not terminate with a semicolon. This behavior applies to a model that contains Embedded MATLAB Function blocks, Stateflow charts, or Truth Table blocks.

### Settings

**Default:** On



Enables run-time output to appear in the MATLAB Command Window during simulation.



Disables run-time output from appearing in the MATLAB Command Window during simulation.

### Tip

- If you disable run-time output, faster model simulation occurs.

### Command-Line Information

**Parameter:** SFSimEcho

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

### Recommended Settings

Application	Setting
Debugging	On
Traceability	No impact
Efficiency	Off
Safety precaution	No impact

**See Also**

- [Speeding Up Simulation](#)
- [Configuration Parameters Dialog Box](#)
- [Simulation Target Pane: General](#)

## Use BLAS library for faster simulation

Enable Embedded MATLAB Function blocks in Simulink models and Embedded MATLAB functions in Stateflow charts to speed up low-level matrix operations during simulation.

### Settings

**Default:** On

On  
Embedded MATLAB Function blocks in Simulink models and Embedded MATLAB functions in Stateflow charts use Basic Linear Algebra Subprograms (BLAS) libraries for low-level matrix operations.

Off  
Embedded MATLAB Function blocks in Simulink models and Embedded MATLAB functions in Stateflow charts do not use Basic Linear Algebra Subprograms (BLAS) libraries for low-level matrix operations.

### Command-Line Information

**Parameter:** SimBlas

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	On
Safety precaution	No impact



## **See Also**

- Configuration Parameters Dialog Box
- Simulation Target Pane: General

## Ensure responsiveness

Enables responsiveness checks in code generated for Embedded MATLAB function blocks.

### Settings

Default: On



On

Enables periodic checks for Ctrl+C breaks in code generated for Embedded MATLAB function blocks. Also allows graphics refreshing.



Off

Disables periodic checks for Ctrl+C breaks in code generated for Embedded MATLAB function blocks. Also disables graphics refreshing.

---

**Caution** Without these checks the only way to end a long-running execution may be to terminate MATLAB.

---

## Command-Line Information

Parameter: SimCtrlC

Type: string

Value: 'on' | 'off'

Default: 'on'

## Recommended Settings

Application	Setting
Debugging	On
Traceability	On
Efficiency	Off
Safety precaution	On

**See Also**

- “Controlling Runtime Checks” in the *Simulink User’s Guide*.
- Configuration Parameters Dialog Box
- Simulation Target Pane: General

## Simulation target build mode

Specifies how you build the simulation target for a model that contains Embedded MATLAB Function blocks, Stateflow charts, or Truth Table blocks.

### Settings

**Default:** Incremental build

Incremental build

This option rebuilds only those portions of the target that you changed since the last build.

Rebuild all (including libraries)

This option rebuilds the target, including libraries, from scratch.

Make without generating code

This option invokes the make process without generating code.

Clean all (delete generated code/executables)

This option deletes both generated source code and executable files.

Clean objects (delete executables only)

This option deletes only executable files.

### Tips

- The default Incremental build is a good choice for most models. This action takes place whenever you simulate your model.
- Set Rebuild all (including libraries) if you have changed your compiler or updated your object files since the last simulation. For example, use this option to rebuild the simulation target to include custom code changes.
- Set Make without generating code when you have custom source files that you must recompile in an incremental build mechanism that does not detect changes in custom code files.

## Command-Line Information

**Parameter:** SimBuildMode

**Type:** string

**Value:** 'sf\_incremental\_build' | 'sf\_nonincremental\_build' | 'sf\_make' | 'sf\_make\_clean' | 'sf\_make\_clean\_objects'

**Default:** 'sf\_incremental\_build'

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Configuration Parameters Dialog Box
- Simulation Target Pane: General

## Simulation Target Pane: Symbols

Reserved names:

--

<b>In this section...</b>
---------------------------

“Simulation Target: Symbols Tab Overview” on page 1-459
---

“Reserved names” on page 1-460
--------------------------------

## **Simulation Target: Symbols Tab Overview**

### **Configuration**

- 1** Enter reserved names for a model that contains Embedded MATLAB Function blocks, Stateflow charts, or Truth Table blocks.
- 2** Click **Apply**.

### **See Also**

- Configuration Parameters Dialog Box
- Simulation Target Pane: Symbols

## Reserved names

Enter the names of variables or functions in the generated code that match the names of variables or functions specified in custom code for a model that contains Embedded MATLAB Function blocks, Stateflow charts, or Truth Table blocks.

## Settings

**Default:** {}

This action changes the names of variables or functions in the generated code to avoid name conflicts with identifiers in custom code. Reserved names must be shorter than 256 characters.

## Tips

- Start each reserved name with a letter or an underscore to prevent error messages.
- Each reserved name must contain only letters, numbers, or underscores.
- Separate the reserved names using commas or spaces.
- You can also specify reserved names by using the command line:

```
config_param_object.set_param('SimReservedNameArray', {'abc', 'xyz'})
```

where *config\_param\_object* is the object handle to the model settings in the Configuration Parameters dialog box.

## Command-Line Information

**Parameter:** SimReservedNameArray

**Type:** string array

**Value:** any reserved names shorter than 256 characters

**Default:** {}



## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Configuration Parameters Dialog Box
- Simulation Target Pane: Symbols

## Simulation Target Pane: Custom Code

The image shows a dialog box titled "Simulation Target Pane: Custom Code". It is divided into two main sections. The top section is titled "Include custom c-code in generated:". On the left side of this section is a list of options: "Source file", "Header file", "Initialize function", and "Terminate function". The "Source file" option is currently selected. To the right of this list is a large, empty rectangular text area labeled "Source file:". The bottom section is titled "Include list of additional:". On the left side of this section is a list of options: "Include directories", "Source files", and "Libraries". The "Include directories" option is currently selected. To the right of this list is another large, empty rectangular text area labeled "Include directories:".

### In this section...

“Simulation Target: Custom Code Tab Overview” on page 1-464

“Source file” on page 1-465

**In this section...**

“Header file” on page 1-466

“Initialize function” on page 1-468

“Terminate function” on page 1-469

“Include directories” on page 1-470

“Source files” on page 1-472

“Libraries” on page 1-474

“Use local custom code settings (do not inherit from main model)” on page 1-476

## **Simulation Target: Custom Code Tab Overview**

Include custom code settings for a model that contains Embedded MATLAB Function blocks, Stateflow charts, or Truth Table blocks.

### **Configuration**

- 1** Select the type of information to include from the list on the left side of the pane.
- 2** Enter a string to identify the specific code, directory, source file, or library.
- 3** Click **Apply**.

### **See Also**

- Including Custom C Code
- Configuration Parameters Dialog Box
- Simulation Target Pane: Custom Code

## Source file

Enter code lines to appear near the top of a generated source code file.

## Settings

**Default:** ''

Code lines appear near the top of the generated *model.c* source file, outside of any function.

## Command-Line Information

**Parameter:** SimCustomSourceCode

**Type:** string

**Value:** any source file name

**Default:** ''

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Including Custom C Code
- Configuration Parameters Dialog Box
- Simulation Target Pane: Custom Code

## Header file

Enter code lines to appear near the top of a generated header file.

## Settings

**Default:** ''

Code lines appear near the top of the generated *model.h* header file.

## Tips

- When you include a custom header file, enclose the file name in double quotes. For example, `#include "sample_header.h"` is a valid declaration for a custom header file.
- You can include extern declarations of variables or functions.

## Command-Line Information

**Parameter:** SimCustomHeaderCode

**Type:** string

**Value:** any header file name

**Default:** ''

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Including Custom C Code

- Configuration Parameters Dialog Box
- Simulation Target Pane: Custom Code

## Initialize function

Enter code statements that execute once at the start of simulation.

### Settings

Default: ''

Code appears inside the model's initialize function in the *model.c* file.

### Tip

- Use this code to invoke functions that allocate memory or to perform other initializations of your custom code.

### Command-Line Information

Parameter: SimCustomInitializer

Type: string

Value: any code

Default: ''

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

### See Also

- Including Custom C Code
- Configuration Parameters Dialog Box
- Simulation Target Pane: Custom Code



## Terminate function

Enter code statements that execute at the end of simulation.

### Settings

**Default:** ''

Code appears inside the model's terminate function in the *model.c* file.

### Tip

- Use this code to invoke functions that free memory allocated by the custom code or to perform other cleanup tasks.

### Command-Line Information

**Parameter:** SimCustomTerminator

**Type:** string

**Value:** any code

**Default:** ''

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

### See Also

- Including Custom C Code
- Configuration Parameters Dialog Box
- Simulation Target Pane: Custom Code

## Include directories

Specify a list of directory paths that contain files you include in the compiled target.

### Settings

**Default:** ' '

Enter a space-separated list of directory paths.

- Specify absolute or relative paths to the directories.
- Relative paths must be relative to the directory containing your model files, not relative to the build directory.
- The order in which you specify the directories is the order in which they are searched for header, source, and library files.

---

**Note** If you specify a Windows® path string containing one or more spaces, you must enclose the string in double quotes. For example, the second and third path strings in the **Include directories** entry below must be double-quoted:

```
C:\Project "C:\Custom Files" "C:\Library Files"
```

If you set the equivalent command-line parameter `SimUserIncludeDirs`, each path string containing spaces must be separately double-quoted within the single-quoted third argument string, for example,

```
>> set_param('mymodel', 'SimUserIncludeDirs', ...  
            'C:\Project "C:\Custom Files" "C:\Library Files"')
```

---

## Command-Line Information

**Parameter:** `SimUserIncludeDirs`

**Type:** string

**Value:** any directory file name

**Default:** ' '

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## See Also

- Including Custom C Code
- Configuration Parameters Dialog Box
- Simulation Target Pane: Custom Code

## Source files

Specify a list of source files to compile and link into the target.

### Settings

**Default:** ''

You can separate source files with a comma, a space, or a new line.

### Limitation

This parameter does not support Windows file names that contain embedded spaces.

### Tip

- The file name is sufficient if the file is in the current MATLAB directory or in one of the include directories.

### Command-Line Information

**Parameter:** SimUserSources

**Type:** string

**Value:** any source file name

**Default:** ''

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

**See Also**

- [Including Custom C Code](#)
- [Configuration Parameters Dialog Box](#)
- [Simulation Target Pane: Custom Code](#)

## Libraries

Specify a list of static libraries that contain custom object code to link into the target.

## Settings

**Default:** ''

Enter a space-separated list of library files.

## Limitation

This parameter does not support Windows file names that contain embedded spaces.

## Tip

- The file name is sufficient if the file is in the current MATLAB directory or in one of the include directories.

## Command-Line Information

**Parameter:** SimUserLibraries

**Type:** string

**Value:** any library file name

**Default:** ''

## Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

## **See Also**

- [Including Custom C Code](#)
- [Configuration Parameters Dialog Box](#)
- [Simulation Target Pane: Custom Code](#)

## Use local custom code settings (do not inherit from main model)

Specify if a library model can use custom code settings that are unique from the main model.

### Settings

Default: Off



**On**

Enables a library model to use custom code settings that are unique from the main model.



**Off**

Disables a library model from using custom code settings that are unique from the main model.

### Dependency

This parameter is available only for library models that contain Embedded MATLAB Function blocks, Stateflow charts, or Truth Table blocks. To access this parameter, select **Tools > Open Simulation Target** in the Embedded MATLAB Editor or Stateflow Editor for your library model.

### Command-Line Information

**Parameter:** SimUseLocalCustomCode

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

### Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact



<b>Application</b>	<b>Setting</b>
Efficiency	No impact
Safety precaution	No impact

### **See Also**

- Including Custom C Code
- Configuration Parameters Dialog Box
- Simulation Target Pane: Custom Code



# Library Browser

---

- “About the Library Browser” on page 2-2
- “Libraries Pane” on page 2-5
- “Library Pane” on page 2-8
- “Block Description Pane” on page 2-14
- “Search Toolbar” on page 2-15
- “Found Pane” on page 2-18
- “Most Frequently Used Blocks Pane” on page 2-21
- “Library Data Repository” on page 2-22
- “Library Browser Keyboard Shortcuts” on page 2-23

# About the Library Browser

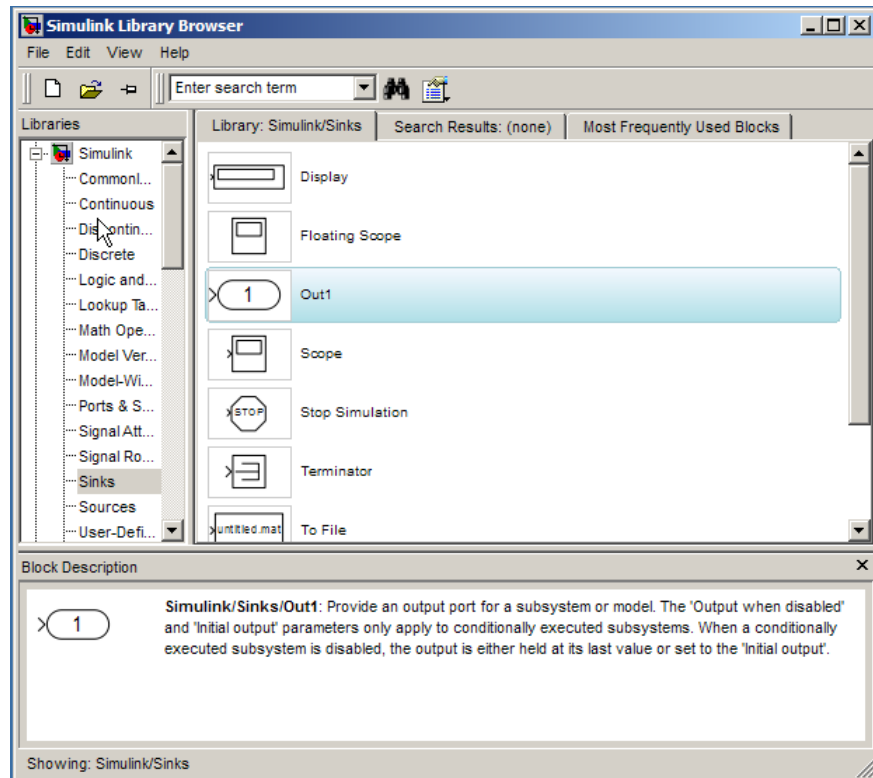
Use the Library Browser to browse and search Simulink block libraries for blocks to use in your models. You can also select from a list of your most frequently used blocks.

The following figure shows the Library Browser with:

- The Sinks library selected from the **Libraries** pane (left-most pane)
- The Out1 block selected in the **Library** pane, which lists the blocks from the library selected in the **Libraries** pane (Sinks, in this example)
- A **Block Description** pane for the Out1 block (the block selected in the **Library** pane), at the bottom of the Library browser.

The Library Browser has a search box for searching for blocks or libraries whose names that contain the search term you specify.

The **Most Frequently Used Blocks** pane displays a list of the blocks you have added the most often.



For details about Library Browser features, see:

- “Libraries Pane” on page 2-5
- “Library Pane” on page 2-8
- “Most Frequently Used Blocks Pane” on page 2-21
- “Block Description Pane” on page 2-14
- “Search Toolbar” on page 2-15
- “Found Pane” on page 2-18

For information about key tasks involving the Library Browser, see:

- “Populating a Model”

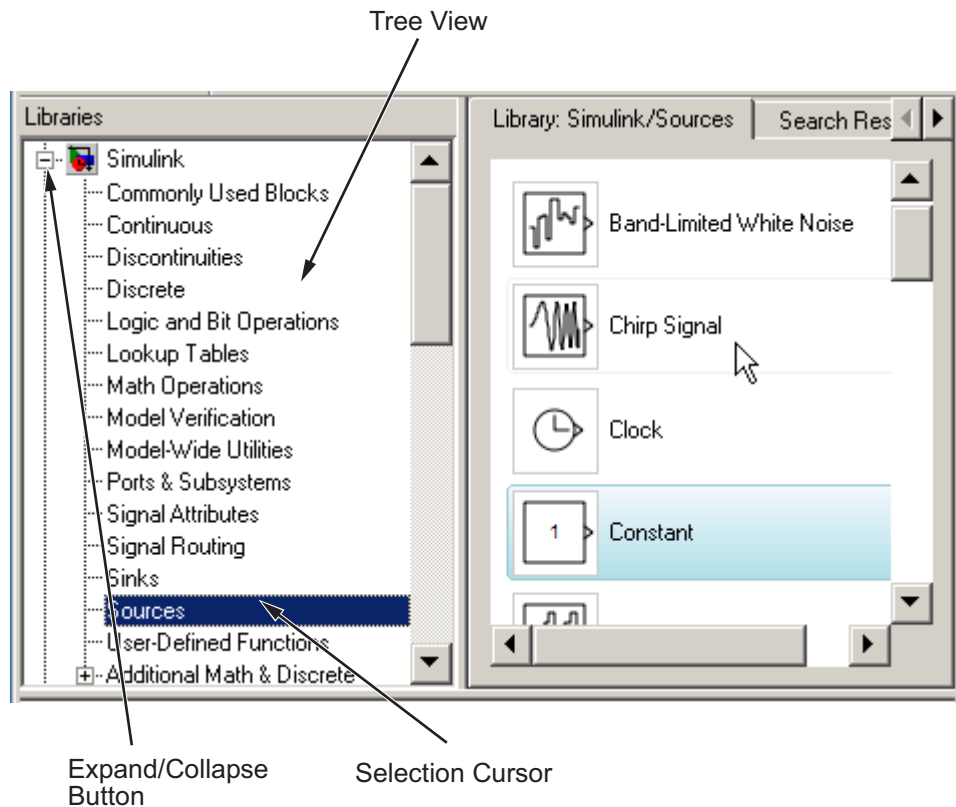
- “Adding Blocks”
- “Adding Libraries to the Library Browser”

## Libraries Pane

In this section...
“About the Libraries Pane” on page 2-5
“Selecting Nodes” on page 2-6
“Expanding and Collapsing Nodes” on page 2-7
“Refreshing the Tree View” on page 2-7

### About the Libraries Pane

The **Libraries** pane allows you to select block libraries for browsing. The pane displays a tree-structured directory (tree view) of libraries installed on your system, each of whose nodes you can select with your mouse or keyboard. Selecting a node displays the contents of the corresponding library in the Library Browser's **Library** pane. The **Libraries** pane indicates the selected library via a selection cursor that highlights the corresponding node.



### Selecting Nodes

You can use your keyboard or your mouse to select a node in the tree view. To select a node with the mouse, first use the **Libraries** pane's scroll bars, if necessary, to move the node into view. Then click the node. To select a node with the keyboard, use the keyboard's **Up** or **Down** arrow key to move the tree's node selection cursor to the desired node.

---

**Note** Selecting a node can cause the Library Browser to update its library data repository (see “Library Data Repository” on page 2-22). In this case, it displays an advisory dialog box while the update is in process.

---



## Expanding and Collapsing Nodes

To facilitate navigation of large directory trees, the **Libraries** pane displays libraries containing sublibraries as expandable nodes, each containing a toggle button labeled + or -, depending on whether the node is collapsed or expanded. Clicking the button expands or collapses its node to show or hide the corresponding parent library's children. You can also expand or collapse the currently selected node by pressing the **Right** or **Left** arrow keys on your keyboard, respectively.

## Refreshing the Tree View

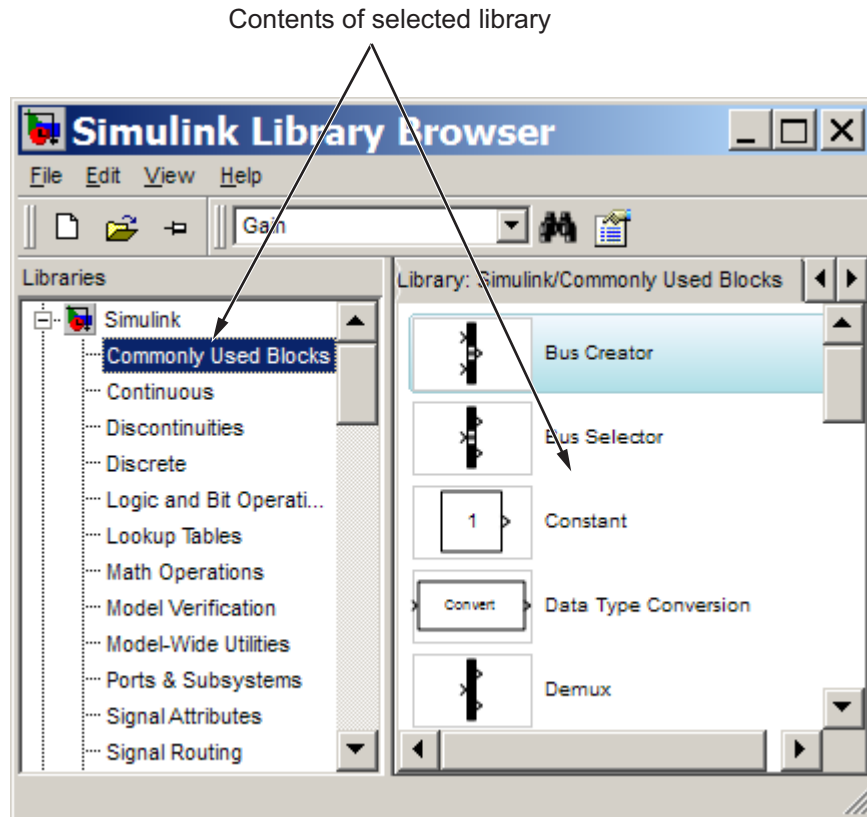
To refresh the tree view displayed in the **Libraries** pane, select **Refresh Tree View** from the Library Browser's **View** menu. The Library Browser adds or removes any libraries from the tree view that have been added or deleted, respectively, from the MATLAB path since the view was last updated.

## Library Pane

In this section...
“About the Library Pane” on page 2-8
“How to Tell Blocks from Libraries in the Library Pane” on page 2-9
“Choosing the Library Pane’s Layout” on page 2-10
“Setting Icon Size” on page 2-11
“Selecting Blocks” on page 2-12
“Creating an Instance of a Library Block in a Model” on page 2-12
“Displaying a Library Block’s Parameters” on page 2-12
“Displaying Help for a Library Block” on page 2-12
“Displaying the Contents of a Sublibrary” on page 2-12
“Displaying a Block or Sublibrary’s Parent” on page 2-13

### About the Library Pane

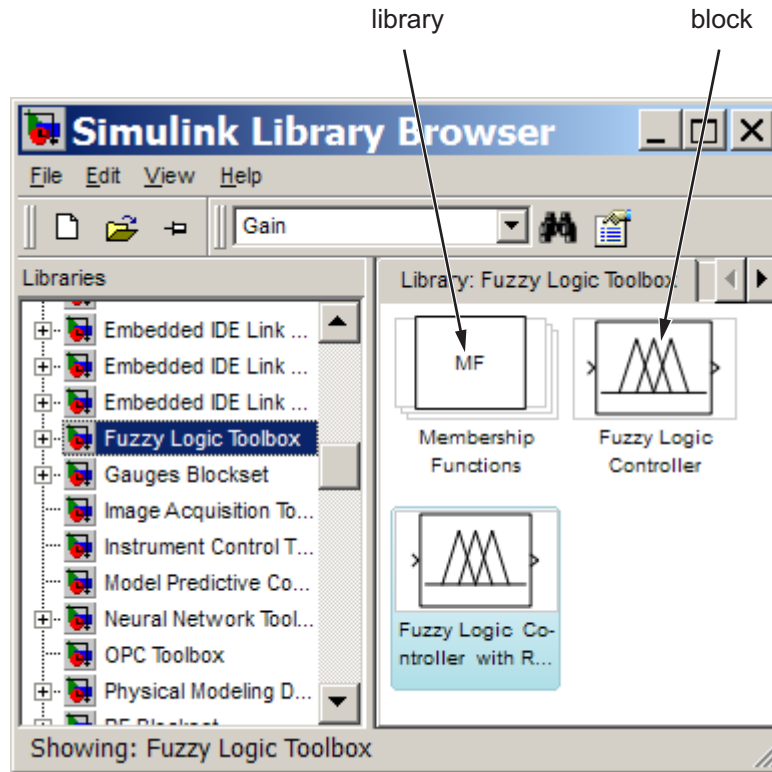
The Library Browser’s **Library** pane displays the contents of the library selected in the **Libraries** pane (see “Libraries Pane” on page 2-5).



You can use the **Library** pane to browse the contents of the selected library, to view a library block's parameters or help, and to create instances of library blocks in models.

## How to Tell Blocks from Libraries in the Library Pane

The **Library** pane displays the icon and name of each block or sublibrary contained by the library selected in the **Libraries** pane. To enable you to determine at a glance which icons represent libraries and which blocks, the Library Browser by default draws a single rectangle around an icon representing a block and a stack of three rectangles around an icon representing a library.



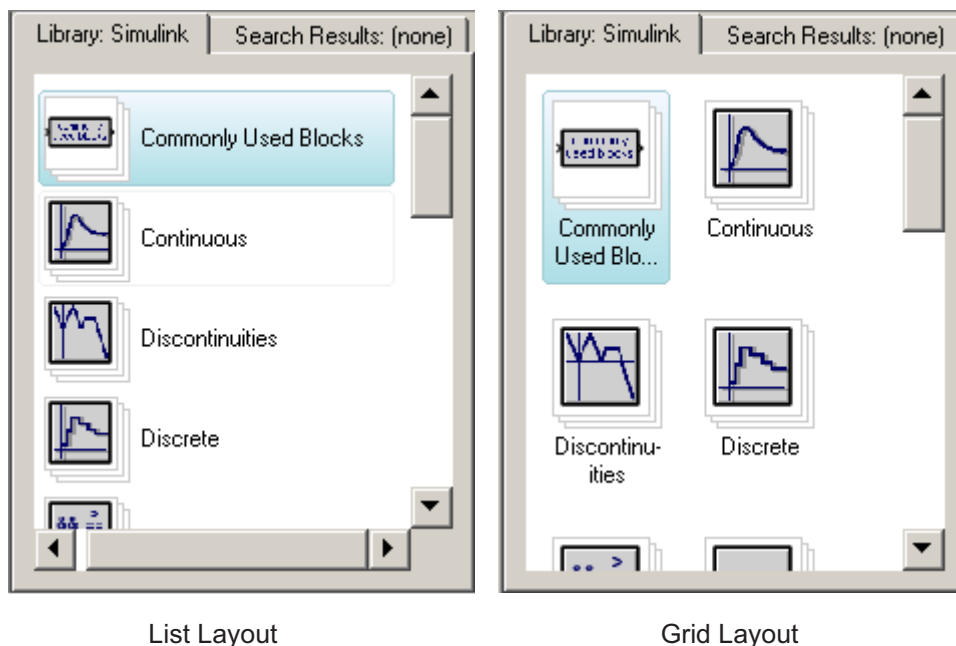
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**Note** The Library Browser's compact icon option eliminates display of rectangles around icons (see "Setting Icon Size" on page 2-11). This allows the Library Browser to fit more blocks and libraries into the visible area of the **Library** pane.

---

### Choosing the Library Pane's Layout

The Library Browser can display blocks in either a list (single-column) layout or a screen-saving grid layout. To choose a layout, select **List** or **Grid** from the Library Browser's **View > Layout** menu.



### Tip

Setting the Library Browser's layout option to grid and its icon size to compact (see "Setting Icon Size" on page 2-11) results in the most compact display of a library's contents in the **Library** pane.

### Setting Icon Size

The Library Browser's **View > Icon Size** menu allows you to select any of four icon sizes: **Compact (Ctrl+1)**, **Small (Ctrl+2)**, **Medium (Ctrl+3)**, **Large (Ctrl+4)**. The compact option eliminates the use of rectangles to distinguish block icons from library icons and thus takes up the least amount of space. Use this option if you want to maximize the number of icons visible in the Library Browser's **Library** pane.

### Selecting Blocks

Many **Library** pane procedures require you to select a block displayed in the pane. To select a block, click it with the mouse. The Library Browser moves the block selection cursor to the selected block.

### Creating an Instance of a Library Block in a Model

To create an instance of a library block in an existing model, select the block in the **Library** pane and drag it into the model's window.

To create an instance of a library block in a new model, select the block in the **Library** pane and then select **Add to a new model** from the library block's context menu or **Add Selected Block to a New Model** from the Library Browser's **Edit** menu.

### Displaying a Library Block's Parameters

To display a library block's parameter dialog box, double-click the block in the **Library** pane or select **Block parameter** from the block's context menu.

---

**Note** The dialog box is disabled to prevent you from using it to change a library block's parameters.

---

### Displaying Help for a Library Block

To display help for a library block, select the block and then select **Help** from the block's context menu or from the Library Browser's **Help** menu.

### Displaying the Contents of a Sublibrary

To display the contents of a sublibrary appearing in the **Library** pane, double-click the library. The library's contents replaces the parent's contents in the **Library** pane.

## **Displaying a Block or Sublibrary's Parent**

To display the parent of an item (block or library) displayed in the **Library** pane, select **Go to parent** from the item's context menu. The contents of the parent replaces the contents of the child in the **Library** pane.

## **Block Description Pane**

This pane displays a description of the block selected in the **Library** pane. The text of the description is the same as the text of the description that appears on the block's parameter dialog box.

To hide this pane, deselect **Show block descriptions** on the Library Browser's **View** menu.



## Search Toolbar

### In this section...

“About the Search Toolbar” on page 2-15

“Using the Search Toolbar to Find Blocks” on page 2-15

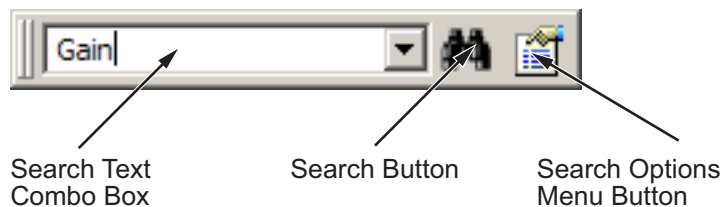
“Search Text Combo Box” on page 2-16

“Search Options Menu” on page 2-16

“Search Button” on page 2-17

### About the Search Toolbar

The Library Browser’s **Search** toolbar allows you to search the block libraries installed on your system for blocks whose names contain or match a text string that you specify. The **Search** toolbar displays the blocks it finds in the Library Browser’s **Found** pane. You can use the **Found** pane to view a found block’s help or parameters or create an instance of the block in a model (see “Found Pane” on page 2-18 for more information).



### Using the Search Toolbar to Find Blocks

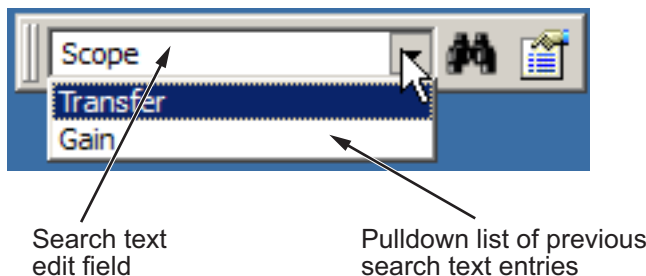
To find blocks whose names contain or match a specified text string:

- 1 Enter the string in the toolbar search text combo box (see “Search Text Combo Box” on page 2-16).
- 2 Use the toolbar search options menu to specify the search options you want to use, e.g., match whole words (see “Search Options Menu” on page 2-16).
- 3 Select the toolbar **Search** button to start the search.

The Library Browser searches the libraries installed on your system whose names contain or match the search string you specified, depending on the options you specified. It displays the results of the search in its **Found** pane (see “Found Pane” on page 2-18).

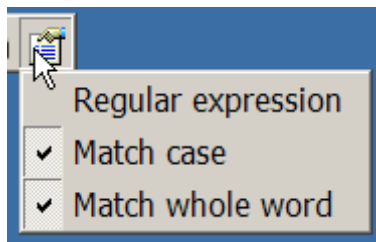
### Search Text Combo Box

The search text combo box allows you to specify the text string to be used to search the block libraries on your system. The combo box consists of an edit field and a drop-down list of search strings that you previously entered in the current or previous sessions. To specify a string, enter the string in the edit field or choose a string from the drop-down list.



### Search Options Menu

The **Search Options** menu allows you to specify various search options. To display the menu, select the search options menu button on the **Search** toolbar.



**Regular Expression**

Treat search text as a MATLAB regular expression (see “Regular Expressions”).

**Match Case**

Consider case when matching search text against block names.

**Match Whole Word**

Allow a match only if the search string matches a word, i.e., text set off by white space, in a block’s name.

**Search Button**

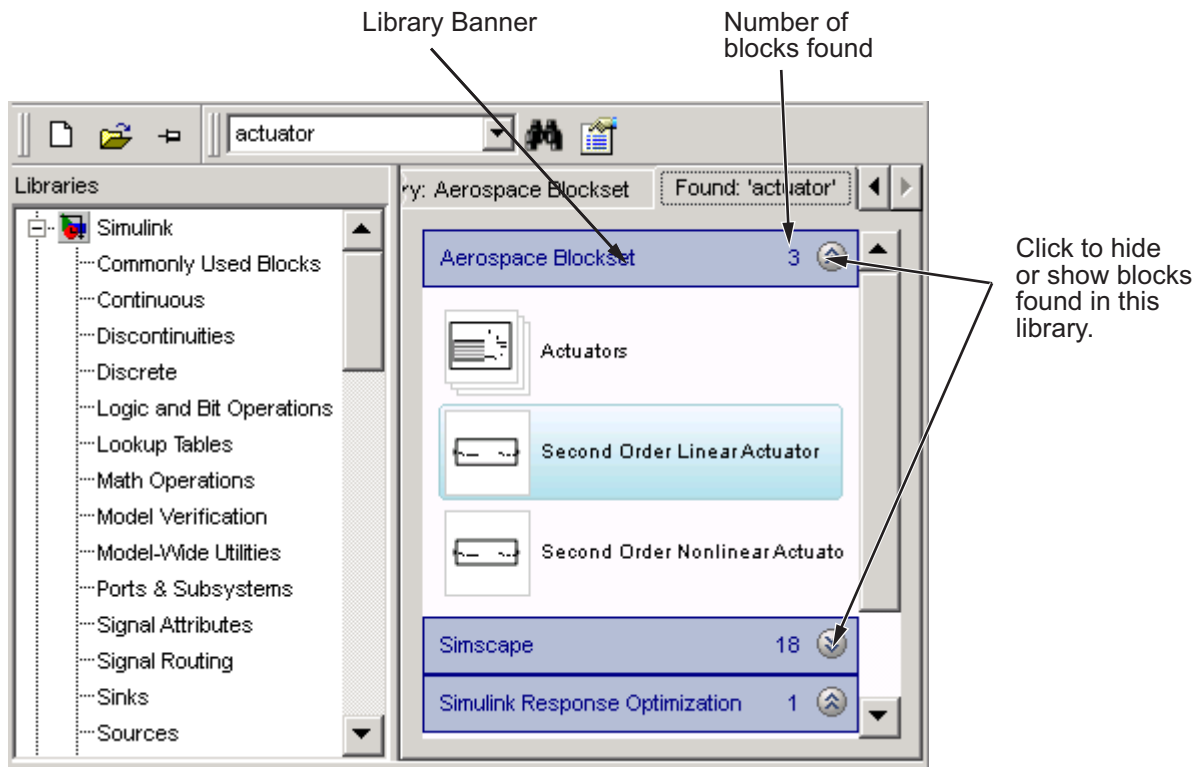
Selecting this button initiates a search of the block libraries on your system, using the text string and search options specified in the toolbar’s search text combo box (see “Search Text Combo Box” on page 2-16) and search options menu (see “Search Options Menu” on page 2-16), respectively.

## Found Pane

In this section...
“About the Found Pane” on page 2-18
“Selecting a Found Block in Library View” on page 2-19
“Displaying a Found Block’s Path” on page 2-20

### About the Found Pane

The **Found** pane allows you to view and select blocks found by the Library Browser’s **Search** tool. The pane displays the blocks found by the tool grouped by library. A banner at the top of each group displays the name of the top-level library containing the found blocks, the number of blocks found in the library, and a button that allows you to hide or display the search results for the library.



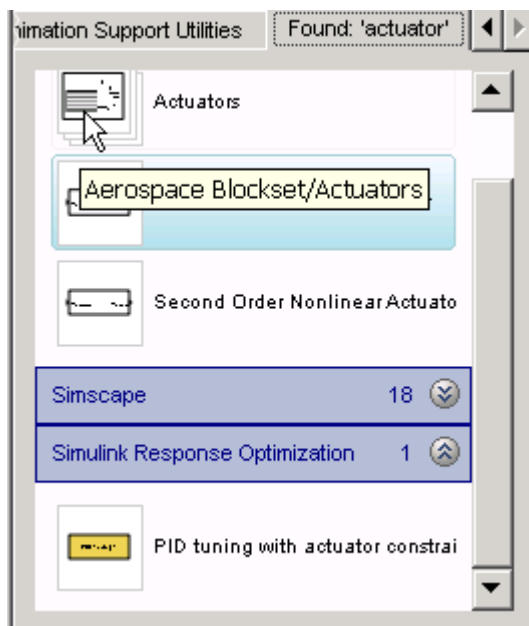
You can use the **Found** pane to perform many of the same tasks you can perform with the **Library** pane, including creating instances of found blocks in models and other libraries, displaying a found block's parameters, and displaying help for a found block. The procedures for these tasks are the same as for the **Library** pane (see “Library Pane” on page 2-8 for more information).

## Selecting a Found Block in Library View

To select a found block in the **Library** pane, select the block in the **Found** pane and then select **Select in library view** from the block's context menu or enter **Ctrl+R**. This brings the **Library** pane forward in the Library Browser with the found block in view and selected.

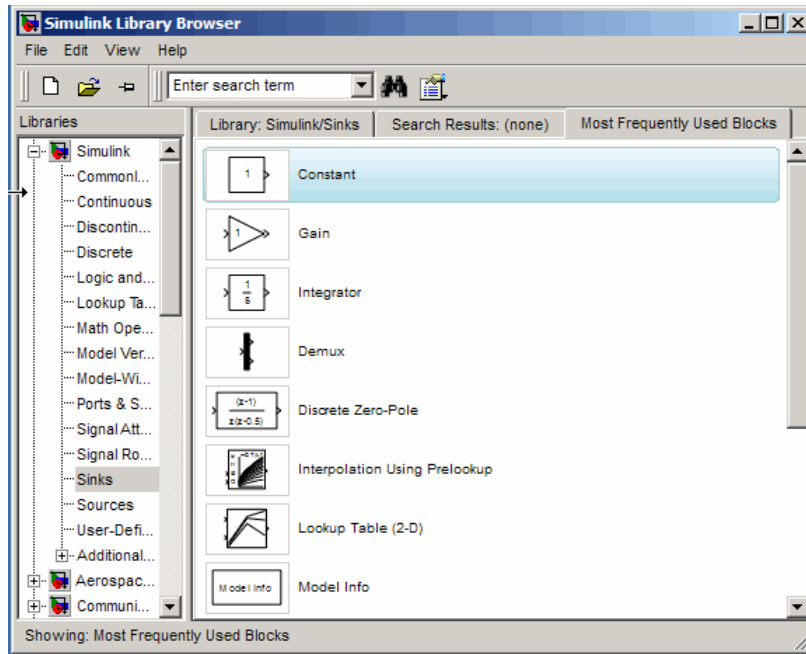
## Displaying a Found Block's Path

To display the path of a found block, move the cursor over the block. The block's path appears in a tooltip.



## Most Frequently Used Blocks Pane

Open the **Most Frequently Used Blocks** pane from the third tab in the Library Browser.



For details, see “Selecting Your Most Frequently Used Blocks From the Library Browser”.

### **Library Data Repository**

To allow you to browse and search libraries without first loading them, the Library Browser maintains a repository of data about each library installed on your system. The data includes block paths and icons. The Library Browser updates the repository when you select a library whose contents have changed since the last time you selected the library.



## Library Browser Keyboard Shortcuts

<b>Task</b>	<b>Shortcut</b>
Select <b>Libraries</b> or <b>Library</b> panes or tools on the <b>Search</b> toolbar.	<b>Tab</b>
Switch from the <b>Library</b> pane to the <b>Found</b> pane, or vice versa.	<b>Ctrl+P</b>
Open a model.	<b>Ctrl+O</b>
Move node selection down in the <b>Libraries</b> pane tree view.	<b>Down Arrow</b>
Move node selection up in the <b>Libraries</b> pane tree view.	<b>Up Arrow</b>
Expand a node in the <b>Libraries</b> pane tree view.	<b>Right Arrow</b>
Collapse a node in the <b>Libraries</b> pane tree view.	<b>Left Arrow</b>
Select a block found with the search tool in the <b>Library</b> pane.	<b>Ctrl+R</b>
Insert the selected block in a new model.	<b>Ctrl+I</b>
Increase the Library Browser's font size.	<b>Ctrl++</b>
Decrease the Library Browser's font size	<b>Ctrl+-</b>
Use compact block icons.	<b>Ctrl+1</b>
Use small block icons.	<b>Ctrl+2</b>
Use medium block icons.	<b>Ctrl+3</b>
Use large block icons.	<b>Ctrl+4</b>
Find a block.	<b>Ctrl+F</b>



# Signal Properties Dialog Box

---

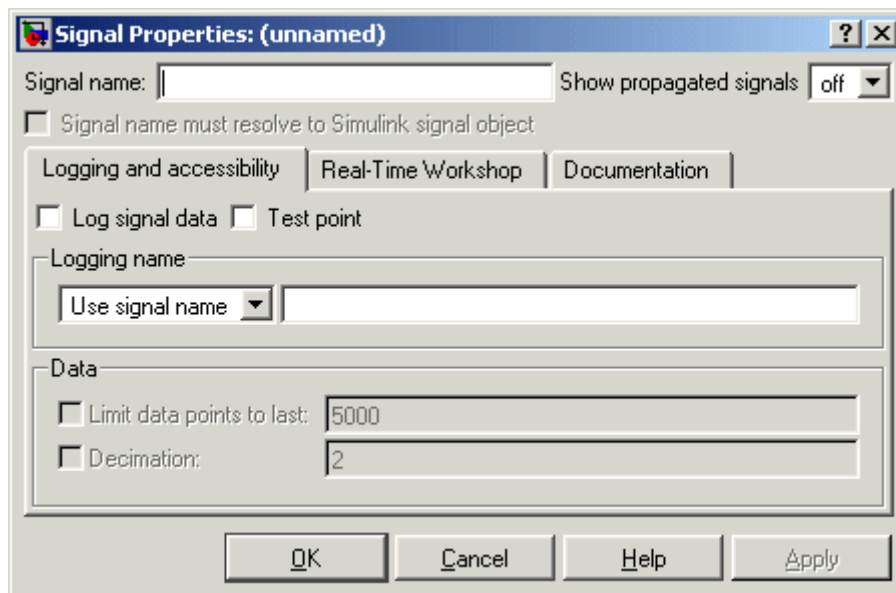
The **Signal Properties** dialog box lets you display and edit signal properties. To display the dialog box, either

- Select the line that represents the signal whose properties you want to set and then choose **Signal Properties** from the signal's context menu or from the Simulink **Edit** menu

or

- Select a block that outputs or inputs the signal and select **Port Signal Properties** from the block's context menu, then select the port to which the signal is connected from the resulting menu

The **Signal Properties** dialog box appears.



The dialog box includes the following controls.

- “Signal Properties Controls” on page 3-2
- “Logging and Accessibility Options” on page 3-4
- “Real-Time Workshop Options” on page 3-6
- “Documentation Options” on page 3-7

## Signal Properties Controls

### Signal name

Name of signal.

### Signal name must resolve to Simulink signal object

Specifies that either the base MATLAB workspace or the model workspace must contain a `Simulink.Signal` object with the same name as this signal.

Simulink software displays an error message if it cannot find such an object when you update or simulate the model containing this signal.

---

**Note** Simulink.Signal objects in the model workspace must have their storage class set to Auto. See “Using Model Workspaces” for more information.

---

When **Signal name must resolve to Simulink signal object** is enabled, a signal resolution icon appears by default to the left of any label on the signal. The icon looks like this:



See “Signal Resolution Indicators” for more information.

## Show propagated signals

---

**Note** This option appears only for signals that originate from a virtual block other than a Bus Selector block.

---

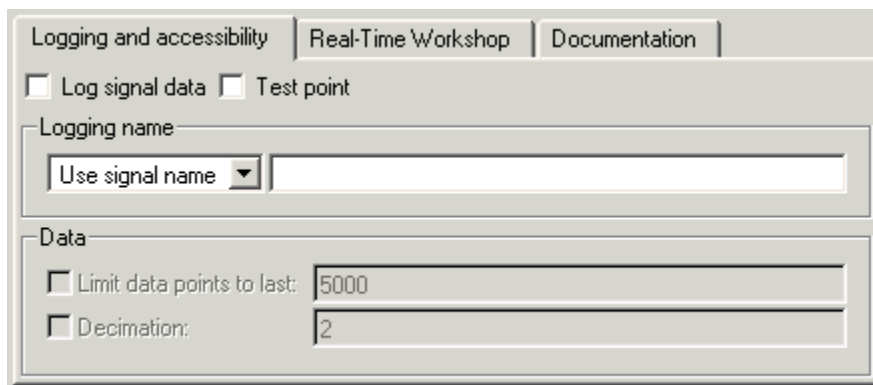
Show propagated signal names. You can select one of the following options:

Option	Description
off	Do not display signals represented by a virtual signal in the signal's label.
on	Display the virtual and nonvirtual signals represented by a virtual signal in the signal's label. For example, suppose that virtual signal s1 represents a nonvirtual signal s2 and a virtual signal s3. If this option is selected, the label for s1 is s1<s2, s3>.
all	Display all the nonvirtual signals that a virtual signal represents either directly or indirectly. For example, suppose that virtual signal s1 represents a nonvirtual signal s2 and a virtual signal s3 and virtual signal s3 represents nonvirtual signals s4 and s5. If this option is selected, the label for s1 is s1<s2, s4, s5>.

See “Displaying the Nonvirtual Components of Virtual Signals” for more information.

## Logging and Accessibility Options

Select the **Logging and accessibility** tab on the **Signal Properties** dialog box to display controls that enable you to specify signal logging and accessibility options for this signal.



The screenshot shows the 'Logging and accessibility' tab of the Signal Properties dialog box. It features three tabs: 'Logging and accessibility', 'Real-Time Workshop', and 'Documentation'. The 'Logging and accessibility' tab is active. It contains two checkboxes: 'Log signal data' and 'Test point'. Below these is a 'Logging name' section with a dropdown menu set to 'Use signal name' and an adjacent text input field. A 'Data' section contains two checkboxes: 'Limit data points to last:' with a text input field containing '5000', and 'Decimation:' with a text input field containing '2'.

### Log signal data

Select this option to cause Simulink software to save this signal’s values to the MATLAB workspace during simulation. See “Logging Signals” for details.

### Test point

Select this option to designate this signal as a test point. See “Working with Test Points” for details.

### Logging name

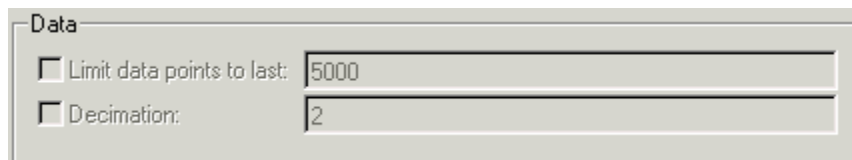
This pair of controls, consisting of a list box and an edit field, specifies the name associated with logged signal data.



Simulink software uses the signal's signal name as its logging name by default. To specify a custom logging name, select **Custom** from the list box and enter the custom name in the adjacent edit field.

## Data

This group of controls enables you to limit the amount of data that Simulink software logs for this signal.



The options are as follows.

### Limit data points to last

Discard all but the last  $N$  data points where  $N$  is the number entered in the adjacent edit field.

### Decimation

Log every  $N$ th data point where  $N$  is the number entered in the adjacent edit field. For example, suppose that your model uses a fixed-step solver with a step size of  $0.1$  s. if you select this option and accept the default decimation value (2), Simulink software records data points for this signal at times  $0.0$ ,  $0.2$ ,  $0.4$ , etc.

## **Real-Time Workshop Options**

The following controls set properties used by Real-Time Workshop to generate code from the model. You can ignore them if you are not going to generate code from the model.

### **Storage class**

Select the storage class of this signal from the list. See “Interfacing Signals to External Code”, “Using the State Attributes Tab to Interface States to External Code”, and “Storage Classes for Data Store Memory Blocks” for information on how to use the listed options.

### **Storage type qualifier**

Enter a storage type qualifier for this signal. For more information, see “Interfacing Signals to External Code”, “Using the State Attributes Tab to Interface States to External Code”, and “Storage Classes for Data Store Memory Blocks”.



## Documentation Options

### Description

Enter a description of the signal in this field.

### Document link

Enter a MATLAB expression in the field that displays documentation for the signal. To display the documentation, click “Document Link.” For example, entering the expression

```
web(['file:/// ' which('foo_signal.html')])
```

in the field causes MATLAB software’s default Web browser to display `foo_signal.html` when you click the field’s label.

### 3 Signal Properties Dialog Box

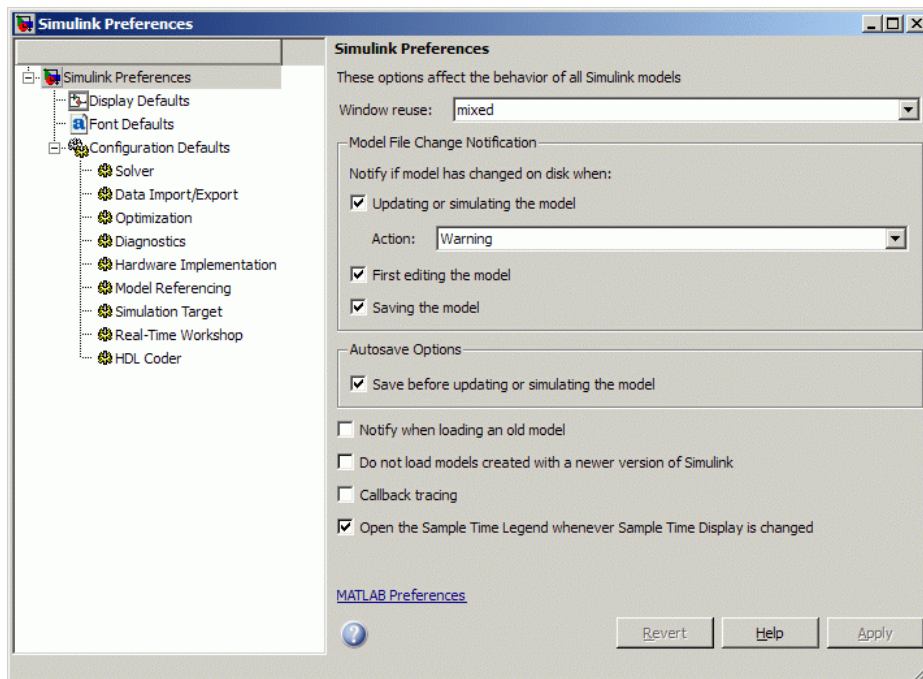
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# Simulink Preferences Window

---

- “Simulink Preferences Window: Main Pane” on page 4-2
- “Simulink Preferences Window: Display Defaults Pane” on page 4-21
- “Simulink Preferences Window: Font Defaults Pane” on page 4-28
- “Simulink Preferences Window: Configuration Defaults Pane” on page 4-29

# Simulink Preferences Window: Main Pane



### In this section...

“Simulink Preferences Window Overview” on page 4-3

“Window Reuse” on page 4-5

“Model File Change Notification” on page 4-7

“Updating or simulating the model” on page 4-8

“Action” on page 4-9

“First editing the model” on page 4-11

“Saving the model” on page 4-12

“Autosave” on page 4-13

“Save before updating or simulating the model” on page 4-14

**In this section...**

“Notify when loading an old model” on page 4-17

“Do not load models created with a newer version of Simulink” on page 4-18

“Callback tracing” on page 4-19

“Open the Sample Time Legend whenever Sample Time Display is changed” on page 4-20

## Simulink Preferences Window Overview

The Simulink Preferences Window comprises the following panes:

- General Preferences (root level)  
Set preferences for configuring window reuse, file change and old version notifications, autosave, and callback tracing.
- Display Defaults  
Configure display options for the Model Browser, block connection lines and port data types.
- Font Defaults  
Configure font options for blocks, lines and annotations.
- Configuration Defaults  
Edit the template Configuration Parameters to be used as defaults for new models.

Click items in the tree to select panes.

### Configuration

- 1 On the root level pane, select the check boxes to configure preferences.
- 2 Close the window to apply your changes.  
Click **Apply** to apply your changes and keep the window open.

Your settings affect the behavior of all Simulink models, including those currently open, and all subsequent models. Your preference settings are preserved for the next time you use the software.

### **See Also**

- Model File Change Notification
- “Simulink Preferences Window: Main Pane” on page 4-2
- “Simulink Preferences Window: Display Defaults Pane” on page 4-21
- “Simulink Preferences Window: Font Defaults Pane” on page 4-28
- “Simulink Preferences Window: Configuration Defaults Pane” on page 4-29

## Window Reuse

Specify whether to use the current window or open new windows to display a subsystem or its parent.

### Settings

**Default:** Mixed

#### Mixed

Mixed window reuse. Subsystem opens in its own window. When you press **Escape** (go to parent), the parent window rises to the front, and the subsystem window disappears.

#### None

Never reuse windows. Subsystem opens in a new window. Press **Escape**: the parent window moves to the front.

#### Replace

Replace parent window. Subsystem opens in a new window. Parent window disappears. Press **Escape**: the parent window appears, and the subsystem window disappears.

#### Reuse

Reuse parent window. Subsystem replaces the parent in the current window. Press **Escape**: the parent window replaces subsystem in current window.

### Tips

- Reusing windows avoids cluttering your screen.
- Creating a window for each subsystem allows you to view subsystems side by side with their parents or siblings.
- The **WindowReuse** preference does not affect the behavior of library windows.

### Command-Line Information

**Parameter:** WindowReuse

**Type:** string

**Value:** 'none' | 'reuse' | 'replace' | 'mixed'  
**Default:** 'mixed'



## **Model File Change Notification**

Use these preferences to specify notifications if the model has changed on disk when you update, simulate, edit or save the model. When updating or simulating, you can choose the action to take: warn, error, reload if unmodified, or show a dialog box where you can choose to reload or ignore. For more information, see Model File Change Notification.

The frame contains these controls:

- “Updating or simulating the model” on page 4-8
- “Action” on page 4-9
- “First editing the model” on page 4-11
- “Saving the model” on page 4-12

### Updating or simulating the model

Specify whether to notify if the model has changed on disk when updating or simulating the model.

#### Settings

**Default:** On



On

Notify if the model has changed on disk when updating or simulating the model. Select the action to take in the **Action** list.



Off

Do not notify if the model has changed on disk when updating or simulating the model.

#### Tip

To programmatically check whether the model has changed on disk since it was loaded, use the function `slIsFileChangedOnDisk`.

#### Dependency

This parameter enables **Action**.

#### Command-Line Information

**Parameter:** `MDLFileChangedOnDiskChecks`

**Type:** struct, field name: `CheckWhenUpdating`

**Value:** `true` | `false` | `1` | `0`

**Default:** `true`

#### See Also

Model File Change Notification

## Action

Select what action to take if the file has changed on disk since it was loaded.

## Settings

**Default:** Warning

### Warning

Displays a warning in MATLAB command window

### Error

Displays an error, at the MATLAB command window if simulating from the command line, or if simulating from a menu item, in the Simulation Diagnostics window.

### Reload model (if unmodified)

Reloads if the model is unmodified. If the model is modified, you see the prompt dialog.

### Show prompt dialog

Shows prompt dialog. In the dialog, you can choose to close and reload, or ignore the changes.

## Tip

To programmatically check whether the model has changed on disk since it was loaded, use the function `slIsFileChangedOnDisk`.

## Dependencies

This parameter is enabled by the parameter **Updating or simulating the model**.

## Command-Line Information

**Parameter:** `MdlFileChangedOnDiskHandling`

**Type:** string

**Value:** 'Warning' | 'Error' | 'Reload model (if unmodified)' | 'Show prompt dialog'

**Default:** 'Warning'

**See Also**

Model File Change Notification

## First editing the model

Specify whether to notify if the file has changed on disk when editing the model.

### Settings

**Default:** On



On

Displays a warning if the file has changed on disk when you modify the block diagram. Any graphical operation that modifies the block diagram (e.g., adding a block) causes a warning dialog to appear. Any command-line operation that causes the block diagram to be modified (e.g., a call to `set_param`) will result in a warning like this at the command line:

```
Warning: Block diagram 'mymodel' is being edited but file has
changed on disk since it was loaded. You should close and
reload the block diagram.
```



Off

Do not check for changes on disk when first editing the model.

### Tip

To programmatically check whether the model has changed on disk since it was loaded, use the function `slIsFileChangedOnDisk`.

### Command-Line Information

**Parameter:** `MDLFileChangedOnDiskChecks`

**Type:** struct, field name: `CheckWhenEditing`

**Value:** `true` | `false` | `1` | `0`

**Default:** `true`

### See Also

Model File Change Notification

### Saving the model

Specify whether to notify if the file has changed on disk when saving the model.

#### Settings

**Default:** On



On

Notify if the file has changed on disk when you save the model.

- The `save_system` function displays an error, unless the `OverwriteIfChangedOnDisk` option is used.
- Saving the model by using the menu (**File > Save**) or a keyboard shortcut causes a dialog to be shown. In the dialog, you can choose to overwrite, save with a new name, or cancel the operation.



Off

Do not check for changes on disk when saving the model.

#### Tip

To programmatically check whether the model has changed on disk since it was loaded, use the function `slIsFileChangedOnDisk`.

#### Command-Line Information

**Parameter:** `MDLFileChangedOnDiskChecks`

**Type:** struct, field name: `CheckWhenSaving`

**Value:** `true` | `false` | `1` | `0`

**Default:** `true`

#### See Also

Model File Change Notification

## **Autosave**

Use this preference to specify whether to automatically save a backup copy of the model before updating or simulating.

For more information, see the check box control “Save before updating or simulating the model” on page 4-14.

### Save before updating or simulating the model

Specify whether to automatically save a backup copy of the model before updating or simulating.

#### Settings

Default: On



On

If the model has unsaved changes, automatically save a backup copy of the model before updating or simulating. This autosave copy can be useful for crash recovery.

The copy is saved in the same directory as the model, with the name *MyModel.mdl.autosave*.



Off

Do not automatically save a copy before updating or simulating.

#### Tips

If you open or load a model with a more recent autosave copy available, the model loads, and the non-modal dialog Model Recovery appears.

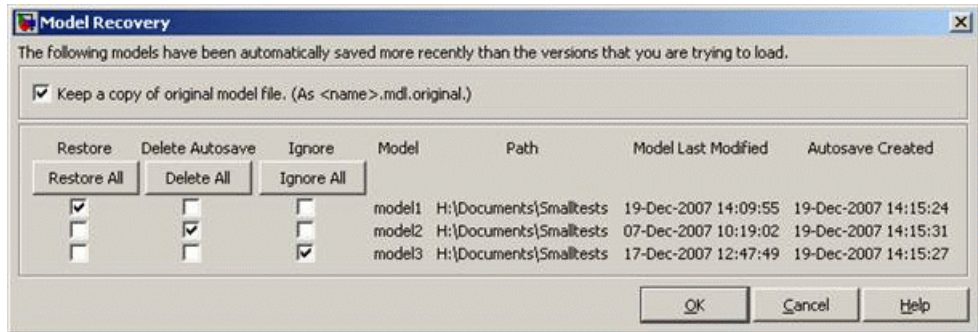
For each model in the list, you can choose to:

- **Restore** — Overwrite the original model file with the autosave copy, and delete the autosave copy.

If you select the check box to **Keep a copy of original model file**, you can save copies of the original model files named *MyModel.mdl.original*.

- **Delete Autosave** — Delete the autosave copy, and do nothing else.
- **Ignore** — Do nothing. This leaves the model and the autosave copy untouched. The Model Recovery dialog will reappear the next time you open the model, so you can choose to restore or delete autosave files later.





Select a check box for each model in the list to specify whether to restore, delete autosave, or ignore. You can click the **Restore All**, **Delete All** or **Ignore All** buttons to select that option for all models.

The default option is **Ignore All**. If you click **OK** without making any changes, your models and autosave copies are left untouched. The next time you open the model, the Model Recovery dialog will reappear and you can choose again whether to restore or delete any autosave copies.

---

**Caution** If you restore, any changes made since your last save will be lost.

If a segmentation violation occurred, note that the last autosave file for the model reflects the state of the autosave data prior to the segmentation violation. Because Simulink models might be corrupted by a segmentation violation, a model is not autosaved after a segmentation violation occurs.

---

Click **OK** to apply your choices.

Autosave has the following rules:

- If you deliberately close a modified model, any autosave copy is deleted.
- Autosave does not occur for models that are part of the MATLAB installation, so you will not create autosave copies of the demo models.
- Autosave does not occur if the autosave file or location is read only.

### **Command-Line Information**

**Parameter:** AutoSaveOptions

**Type:** struct, field name: SaveOnModelUpdate

**Value:** true | false | 1 | 0

**Default:** true

## Notify when loading an old model

Specify whether to notify when loading a model last saved in a older version of Simulink software.

### Settings

**Default:** Off



On

Print a message in the command window when loading a model last saved in an old version of Simulink software.



Off

No notification when loading old models.

### Tips

- Run `slupdate('modelName')` to convert the block diagram to the format of the current version of Simulink software.
- For advice on upgrading a model to the current version of Simulink software, see “Consulting the Model Advisor”.

### Command-Line Information

**Parameter:** `NotifyIfLoadOldModel`

**Type:** string

**Value:** 'on' | 'off'

**Default:** off

### Do not load models created with a newer version of Simulink

Specify whether to load a model last saved in a newer version of Simulink software.

#### Settings

**Default:** Off



On

Do not load any model last saved in a newer version of Simulink software, and print an error message in the command window.



Off

Load models last saved in a newer version of Simulink software, and print a warning message in the command window.

#### Tip

If possible, use the **Save As** command to convert the block diagram to the format of the desired version of Simulink software. The **Save As** command allows you to save a model created with the latest version of the Simulink software in formats used by earlier versions. See “Saving a Model in an Earlier Simulink Version”.

#### Command-Line Information

**Parameter:** ErrorIfLoadNewModel

**Type:** string

**Value:** 'on' | 'off'

**Default:** off

## Callback tracing

Specify whether to display the model callbacks that Simulink software invokes when simulating a model.

### Settings

**Default:** Off



On

Display the model callbacks in the MATLAB command window as they are invoked.

Callback tracing allows you to determine the callbacks the software invokes, and in what order, when you open or simulate a model.



Off

Do not display model callbacks.

### Command-Line Information

**Parameter:** CallbackTracing

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

### Open the Sample Time Legend whenever Sample Time Display is changed

Specify whether to display the Sample Time Legend whenever Sample Time Display is changed.

#### Settings

**Default:** On



On

Display the Sample Time Legend whenever you change Sample Time Display by selecting Colors, Annotations, or All from the Sample Time Display submenu. The model diagram is updated and the legend opens.



Off

Do not display the Sample Time Legend whenever Sample Time Display is changed.

#### Command-Line Information

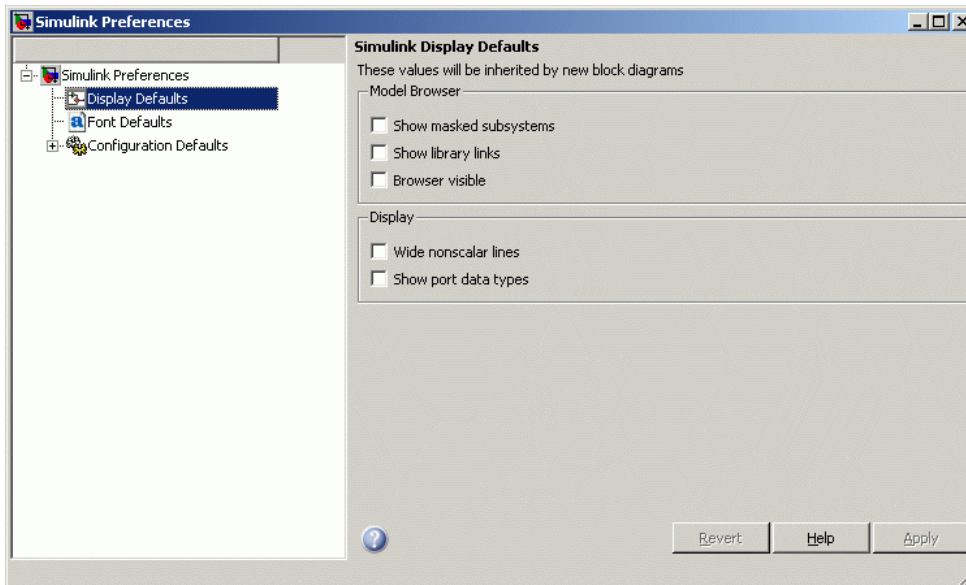
**Parameter:** OpenLegendWhenChangingSampleTimeDisplay

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'on'

## Simulink Preferences Window: Display Defaults Pane



### In this section...

“Simulink Display Defaults Overview” on page 4-21

“Show masked subsystems” on page 4-23

“Show library links” on page 4-24

“Browser visible” on page 4-25

“Wide nonscalar lines” on page 4-26

“Show port data types” on page 4-27

## Simulink Display Defaults Overview

Configure display options for the Model Browser, block connection lines and port data types.

### Configuration

- 1 Select check boxes to configure display properties that will be applied to all new block diagrams.
- 2 Close the window to apply your changes.

Click **Apply** to apply your changes and keep the window open.

These values will be inherited by new block diagrams.

### See Also

- “The Model Browser” (Windows only)
- Signal Display Options



## Show masked subsystems

Specify whether masked subsystems and their contents are shown in the Model Browser (Windows only).

### Settings

**Default:** Off



On

Display masked subsystems and their contents in the Model Browser.



Off

Do not display masked subsystems and their contents in the Model Browser.

### Command-Line Information

**Parameter:** BrowserLookUnderMasks

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

### Show library links

Specify whether library links and their contents are shown in the Model Browser (Windows only).

#### Settings

**Default:** Off



On

Display library links and their contents in the Model Browser.



Off

Do not display library links and their contents in the Model Browser.

#### Command-Line Information

**Parameter:** BrowserShowLibraryLinks

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

## Browser visible

Specify whether the Model Browser (Windows only) is shown when you open a model.

### Settings

**Default:** Off



On

Display the Model Browser.



Off

Do not display the Model Browser.

### Command-Line Information

**Parameter:** ModelBrowserVisibility

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

### Wide nonscalar lines

Specify whether to show thick lines for nonscalar connections between blocks.

#### Settings

**Default:** Off



On

Show thick lines for nonscalar connections between blocks



Off

Do not show thick lines for nonscalar connections between blocks

#### Command-Line Information

**Parameter:** WideVectorLines

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

## Show port data types

Specify whether to show the data type on each block port

### Settings

**Default:** Off



On

Display the data type for each port on each block.



Off

Do not display data types on block ports.

### Command-Line Information

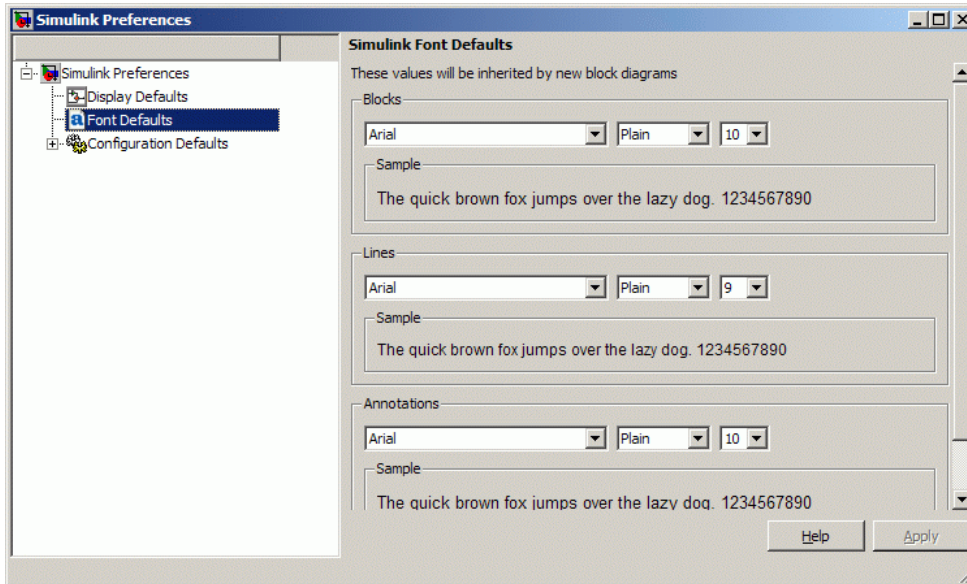
**Parameter:** ShowPortDataTypes

**Type:** string

**Value:** 'on' | 'off'

**Default:** 'off'

# Simulink Preferences Window: Font Defaults Pane



## Simulink Font Defaults Overview

Configure font options for blocks, lines and annotations.

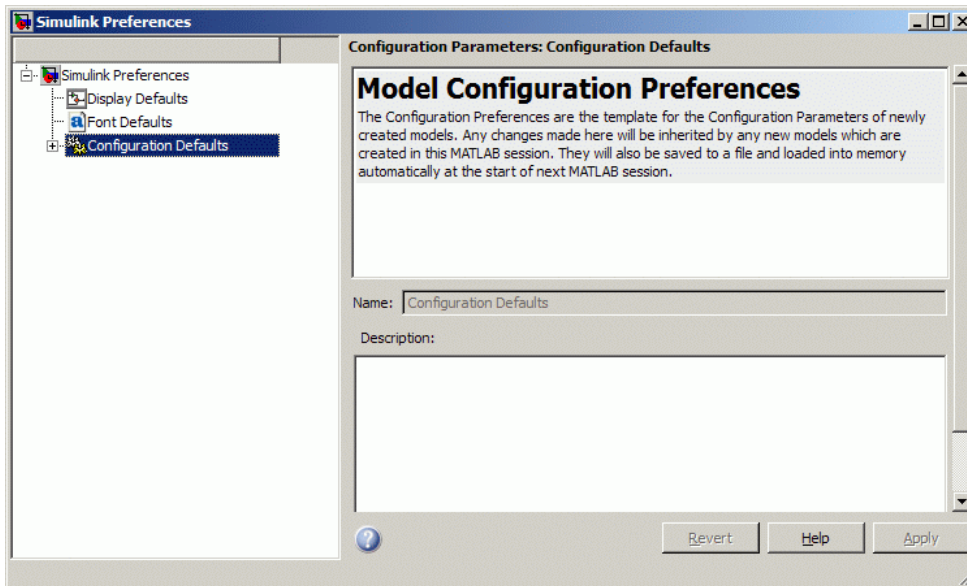
### Configuration

- 1 Use the drop-down lists to specify font types, styles, and sizes that will be applied to all new block diagrams.
- 2 Close the window to apply your changes.

Click **Apply** to apply your changes and keep the window open.

These properties will be inherited by new block diagrams.

## Simulink Preferences Window: Configuration Defaults Pane



### Simulink Configuration Defaults Overview

On the main Configuration Defaults pane you can edit the description of your template configuration set.

Expand the tree under Configuration Defaults to edit the template Configuration Parameters to be used as defaults for new models.

### Configuration

- 1 Expand the tree under Configuration Defaults to edit the template for default Configuration Parameters.
- 2 Edit Configuration Parameters that you want to apply to all new block diagrams.
- 3 Close the window to apply your changes.

Click **Apply** to apply your changes and keep the window open.

These values will be inherited by new block diagrams.

### **See Also**

“Configuration Parameters Dialog Box Overview” on page 1-2



# Simulink Mask Editor

---

- “Mask Editor Overview” on page 5-2
- “Icon & Ports Pane” on page 5-5
- “Parameters Pane” on page 5-12
- “Initialization Pane” on page 5-22
- “Documentation Pane” on page 5-25

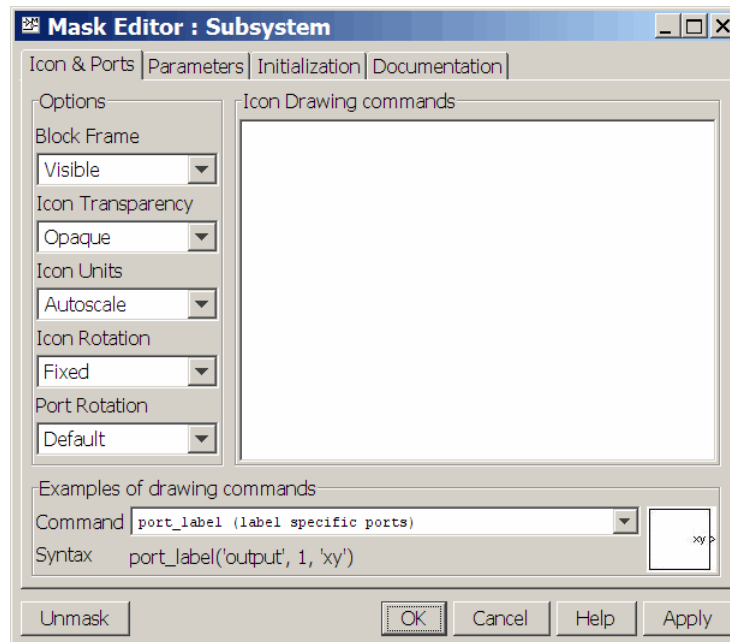
## Mask Editor Overview

You can use the Simulink Mask Editor to define a custom interface for a Subsystem block, Model block, or S-Function block. This chapter provides reference information about Mask Editor capabilities, but does not describe the workflows needed to combine those capabilities to create and use masks. That information appears in “Working with Block Masks” in the Simulink User’s Guide.

To invoke the Mask Editor on a block, do one of the following:

- To create a new mask, select the block to be masked, then choose **Mask *BlockType*** from the model window’s **Edit** menu or the block’s context menu.
- To edit an existing mask, select the masked block, then choose **Edit Mask** from the model window’s **Edit** menu or the block’s context menu.

A Mask Editor like the following appears. If the block is already masked, the current mask specification appears in the editor, allowing you to change the mask as needed. Otherwise, the editor is initially empty:



The Mask Editor contains a set of tabbed panes, each of which enables you to define a feature of the mask:

- The **Icon & Ports** pane enables you to define the block icon. See “Icon & Ports Pane” on page 5-5.
- The **Parameters** pane enables you to define and describe mask dialog box parameter prompts, and to name the variables associated with the parameters. See “Parameters Pane” on page 5-12.
- The **Initialization** pane enables you to specify initialization commands. See “Initialization Pane” on page 5-22.
- The **Documentation** pane enables you to define the mask type and specify the block description and the block help. See “Documentation Pane” on page 5-25.

Five buttons appear along the bottom of the Mask Editor:

- The **Unmask** button deactivates the mask and closes the Mask Editor. While the model is still active, the mask information is still retained so that you can reactivate it.

To reactivate the mask, select the block and choose **Mask Subsystem**. The Mask Editor opens, displaying the previous settings. Click **OK** or **Apply** to restore the mask.

When you close the model, the inactive mask information is discarded. If you want the mask information after this, you will need to recreate it the next time you open the model.

- The **OK** button applies the mask settings on all panes and closes the Mask Editor.
- The **Cancel** button closes the Mask Editor without applying any changes made since you last clicked the **Apply** button.
- The **Help** button displays online information about the Mask Editor.
- The **Apply** button applies the mask settings on all panes and leaves the Mask Editor open.

To see the system under the mask without unmasking it, select the Subsystem block, then select **Look Under Mask** from the **Edit** menu or the block's context menu. This command opens the subsystem. The block's mask is not affected.

## Icon & Ports Pane

### In this section...

“About the Icon & Ports Pane” on page 5-5

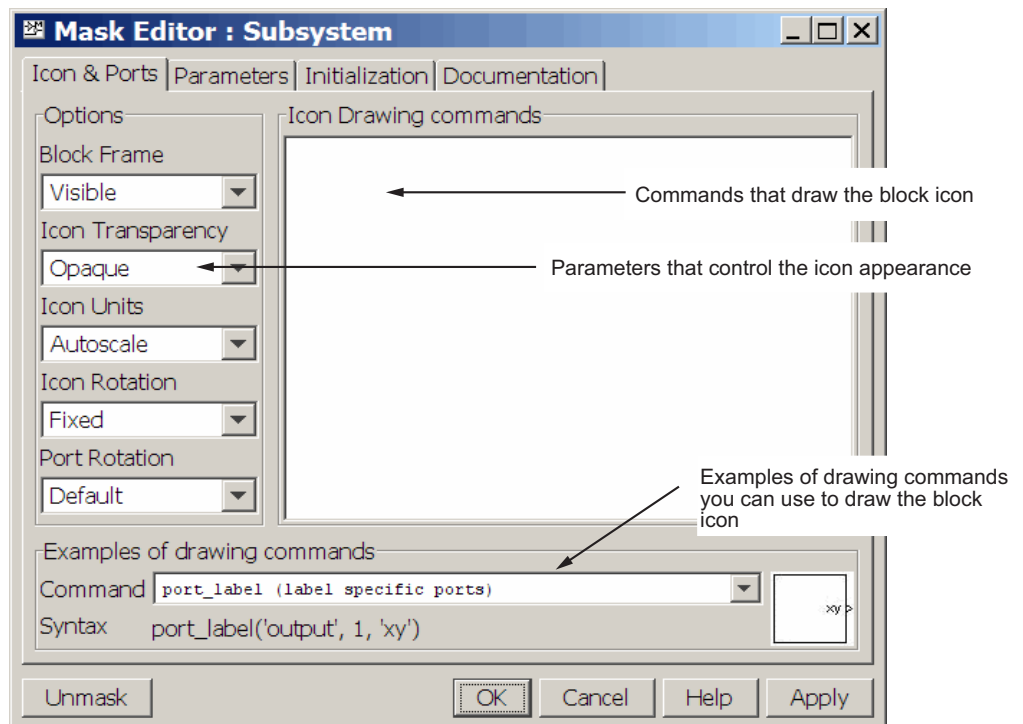
“Icon Drawing commands” on page 5-6

“Examples of drawing commands” on page 5-6

“Icon & Ports options” on page 5-7

## About the Icon & Ports Pane

The Mask Editor’s **Icon & Ports** pane enables you to create block icons that can contain descriptive text, state equations, images, and graphics.



The **Icon & Ports** pane contains the controls described in this section.

## Icon Drawing commands

The Icon Drawing commands text box allows you to enter commands that draw the block's icon. A set of commands is provided that can display text, one or more plots, or show a transfer function, as described in “Mask Icon Drawing Commands”.

You can use only these commands to draw your icon. The drawing commands are executed in the order in which they appear in this field. Drawing commands have access to all variables in the mask workspace. If any drawing command cannot successfully execute, the icon displays three question marks.

You can include MATLAB comments at the end of a drawing command or on their own line, as in the following examples:

```
image(imread('engine.jpg'))    % Use engine icon for subsystem

% Use engine icon for subsystem
image(imread('engine.jpg'))
```

The drawing commands execute when you:

- Load the model.
- Run or update the block diagram.
- Apply any changes made in the mask parameter dialog box, either by clicking **Apply** or **OK**.
- Apply any changes made in the Mask Editor, either by clicking **Apply** or **OK**.
- Make changes to the block diagram that affect the appearance of the block, such as rotating the block.
- Copy the masked block within the same model or between different models.

## Examples of drawing commands

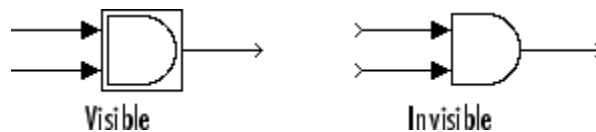
This panel illustrates the usage of the various icon drawing commands supported by the Simulink product. To determine the syntax of a command, select the command from the **Command** list. An example of the selected command is displayed at the bottom of the panel and the icon produced by the command to the right of the list.

## Icon & Ports options

These controls allow you to specify the following attributes of the block icon.

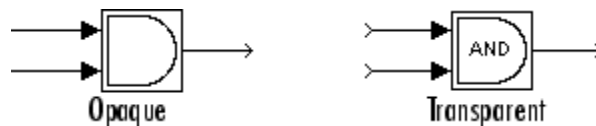
### Block Frame

The icon frame is the rectangle that encloses the block. You can choose to show or hide the frame by setting the **Frame** parameter to **Visible** or **Invisible**. The default is to make the icon frame visible. For example, this figure shows visible and invisible icon frames for an AND gate block.



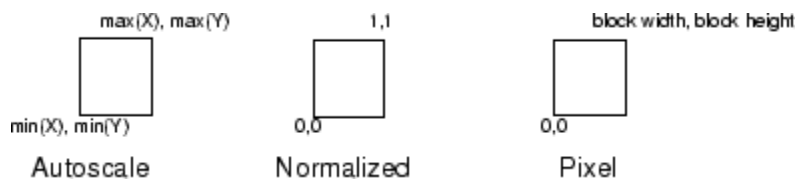
### Icon Transparency

The icon can be set to **Opaque** or **Transparent**, either hiding or showing what is underneath the icon. **Opaque**, the default, covers information the Simulink software draws, such as port labels. This figure shows opaque and transparent icons for an AND gate block. Notice the text on the transparent icon.



### Icon Units

This option controls the coordinate system used by the drawing commands. It applies only to plot and text drawing commands. You can select from among these choices: **Autoscale**, **Normalized**, and **Pixel**.



- **Autoscale** scales the icon to fit the block frame. When the block is resized, the icon is also resized. For example, this figure shows the icon drawn using these vectors:

$$X = [0 \ 2 \ 3 \ 4 \ 9]; \ Y = [4 \ 6 \ 3 \ 5 \ 8];$$



The lower-left corner of the block frame is (0,3) and the upper-right corner is (9,8). The range of the  $x$ -axis is 9 (from 0 to 9), while the range of the  $y$ -axis is 5 (from 3 to 8).

- **Normalized** draws the icon within a block frame whose bottom-left corner is (0,0) and whose top-right corner is (1,1). Only  $X$  and  $Y$  values between 0 and 1 appear. When the block is resized, the icon is also resized. For example, this figure shows the icon drawn using these vectors:

$$X = [.0 \ .2 \ .3 \ .4 \ .9]; \ Y = [.4 \ .6 \ .3 \ .5 \ .8];$$



- **Pixel** draws the icon with  $X$  and  $Y$  values expressed in pixels. The icon is not automatically resized when the block is resized. To force the icon to resize with the block, define the drawing commands in terms of the block size.

### Icon Rotation

When the block is rotated or flipped, you can choose whether to rotate or flip the icon or to have it remain fixed in its original orientation. The default is not to rotate the icon. The icon rotation is consistent with block port rotation. This figure shows the results of choosing **Fixed** and **Rotates** icon rotation when the AND gate block is rotated.





### Port Rotation

The **Icon & Ports > Port Rotation** port option lets you specify a masked block's port rotation type. The choices are:

- default

Ports are reordered after a clockwise rotation to maintain a left-to-right port numbering order for ports along the top and bottom of the block and a top-to-bottom port numbering order for ports along the left and right sides of the block.

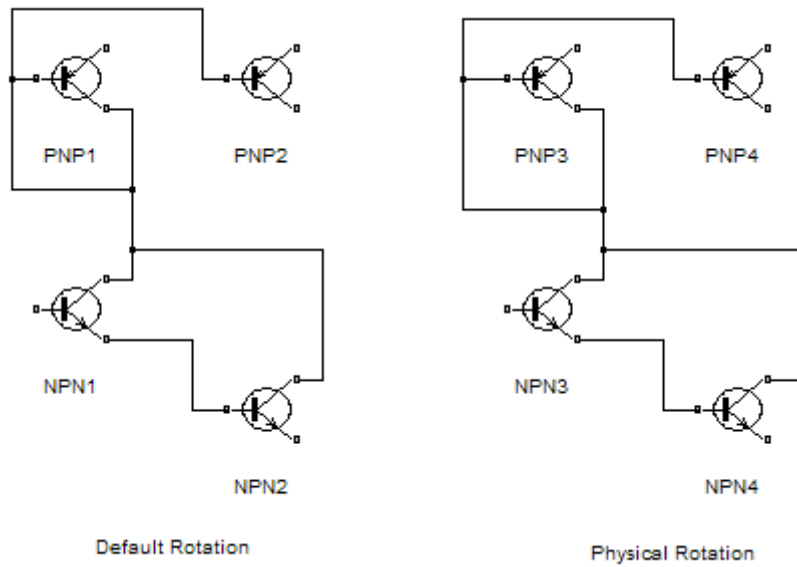
- physical

Ports rotate with the block without being reordered after a clockwise rotation.

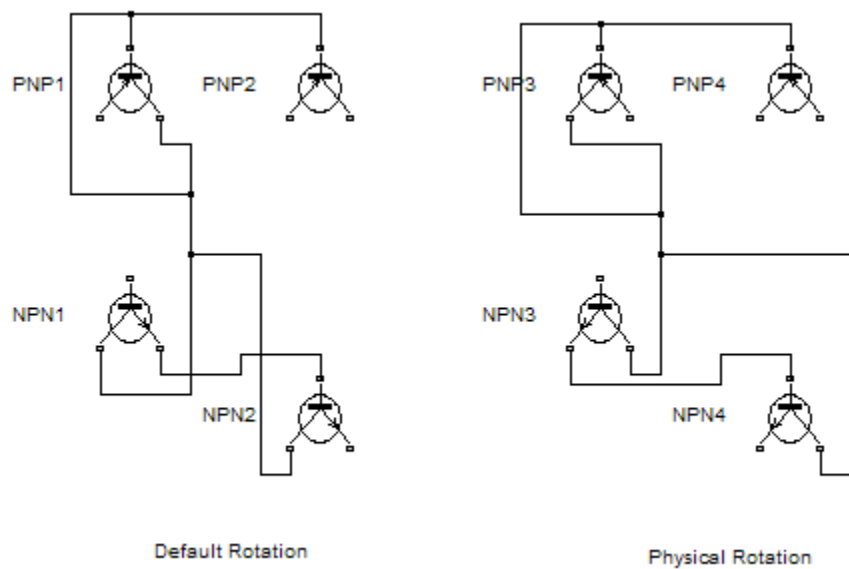
The default rotation option is appropriate for control systems and other modeling applications where block diagrams typically have a top-down and left-right orientation. It simplifies editing of diagrams by minimizing the need to reconnect blocks after rotations to preserve the standard orientation.

Similarly, the physical rotation option is appropriate for electronic, mechanical, hydraulic, and other modeling applications where blocks represent physical components and lines represent physical connections. The physical rotation option more closely models the behavior of the devices represented, i.e., the ports rotate with the block as they would on a physical device. In addition, the option avoids introducing line crossings as the result of rotations, making diagrams easier to read.

For example, the following figure shows two diagrams representing the same transistor circuit. In one, the masked blocks representing transistors use default rotation; in the other, physical rotation.



Both diagrams avoid line crossings that make diagrams harder to read. The next figure shows the diagrams after a single clockwise rotation.



Note that the rotation introduces a line crossing in the diagram that uses default rotation but not in the diagram that uses physical rotation. Note also that there is no way to edit the diagram with default rotation to remove the line crossing. See “Changing a Block’s Orientation” for more information.

## Parameters Pane

### In this section...

“About the Parameters Pane” on page 5-12

“Dialog Parameters Panel” on page 5-13

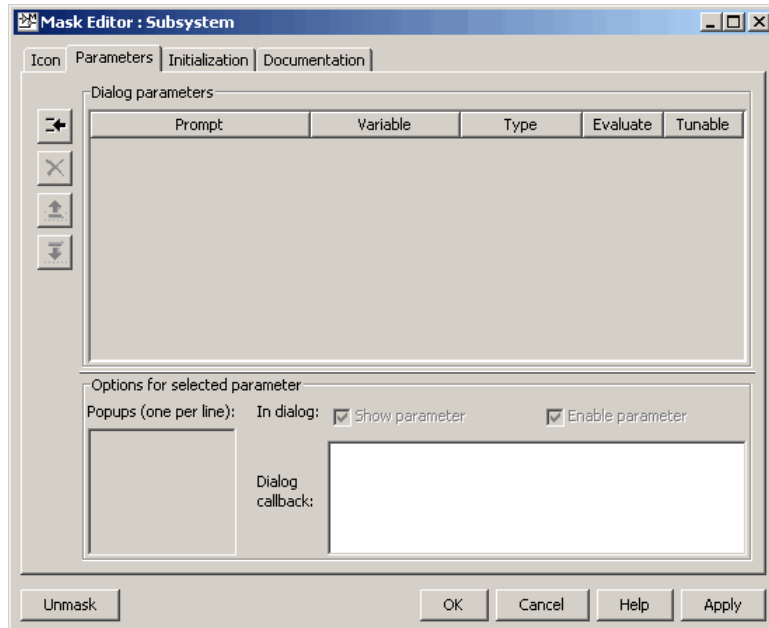
“Control Types” on page 5-15

“Options for Selected Parameter Panel” on page 5-18

“Parameter Buttons” on page 5-20

### About the Parameters Pane

The **Parameters** pane allows you to create and modify masked subsystem parameters (mask parameters, for short) that determine the behavior of the masked subsystem.



The **Parameters** pane contains the following elements:

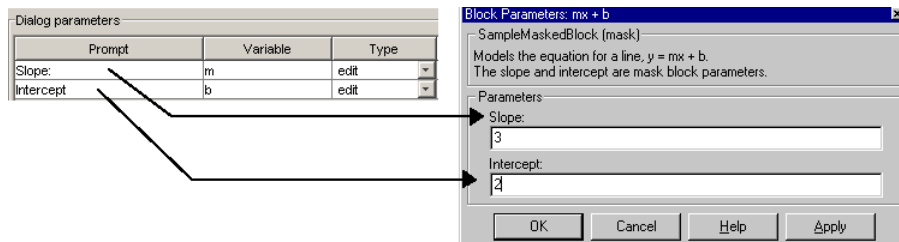
- The **Dialog parameters** panel allows you to select and change the major properties of the mask's parameters. See "Dialog Parameters Panel" on page 5-13 for more information.
- The **Options for selected parameter** panel allows you to set additional options for the parameter selected in the **Dialog parameters** panel.
- The buttons on the left side of the **Parameters** pane allow you to add, delete, and change the order of appearance of parameters on the mask's parameter dialog box. See "Dialog Parameters Panel" on page 5-13 for more information.

## Dialog Parameters Panel

Lists the mask's parameters in tabular form. Each row displays the major attributes of one of the mask's parameters.

## Prompt

Text that identifies the parameter on a masked subsystem's dialog box.



## Variable

Name of the variable that stores the parameter's value in the mask's workspace. You can use this variable as the value of parameters of blocks inside the masked subsystem, thereby allowing the user to set the parameters via the mask dialog box.

---

**Note** The `set_param` and `get_param` commands are insensitive to case differences in mask variable names. For example, suppose a model named `MyModel` contains a masked subsystem named `A` that defines a mask variable named `Volume`. Then, the following line of code returns the value of the `Volume` parameter.

```
get_param('MyModel/A', 'voLUME')
```

However, case does matter when using a mask variable as the value of a block parameter inside the masked subsystem. For example, suppose a Gain block inside the masked subsystem `A` specifies `VOLUME` as the value of its Gain parameter. This variable name does not resolve in the masked subsystem's workspace, as it contains a mask variable named `Volume`. If the base workspace does not contain a variable named `VOLUME`, simulating `MyModel` produces an error.

---

The mask variable name set by the **Variable** field cannot duplicate any parameter name in or beneath the mask. Thus you cannot use any built-in block parameter name, such as `name`, as a mask variable name. Violating this requirement will cause an error when you apply changes in the Mask Editor.

### Type

Type of control used to edit the value of this parameter. The control appears on the mask's parameter dialog box following the parameter prompt. The button that follows the type name in the **Parameters** pane pops up a list of supported commands. To change the current control type, select another type from the list. See “Control Types” on page 5-15 for more information.

### Evaluate

Simulink can use the value of a mask parameter as the user enters it in the Mask Parameters dialog box, or it can evaluate what the user specifies and use the result of the evaluation. Select the parameter's **Evaluate** option in the **Dialog parameters** table to specify parameter evaluation (the default) or clear the option to suppress evaluation. The effect of the **Evaluate** option depends on the control type, as shown in “Control Types” on page 5-15.

If checked, this option causes the Simulink software to evaluate the expression entered by the user before it is assigned to the variable. Otherwise, the expression itself is treated as a string value and is assigned to the variable. For example, if the user enters the expression `gain` in an edit field and the **Evaluate** option is checked, `gain` is evaluated and the result is assigned to the variable. Otherwise, the string `'gain'` is assigned to the variable. See “Check Box Control” on page 5-17 and “Pop-Up Control” on page 5-17 for information about how this option affects evaluation of the parameters.

If you need both the string entered and the evaluated value, clear the **Evaluate** option. To get the value of a base workspace variable entered as the literal value of the mask parameter, use the MATLAB `evalin` command in the mask initialization code. For example, suppose the user enters the string `'gain'` as the literal value of the mask parameter `k` where `gain` is the name of a base workspace variable. To obtain the value of the base workspace variable, use the following command in the mask’s initialization code:

```
value = evalin('base', k)
```

## Tunable

Select the parameter’s **Tunable** option in the Mask Parameters dialog box to specify that the value of the parameter can be changed during simulation (the default) or clear the option to specify that the parameter value cannot be changed. If the masked block does not support parameter tuning, Simulink ignores the setting of a mask parameter’s **Tunable** option. See “Using Tunable Parameters” for information about parameter tuning and the blocks that support it.

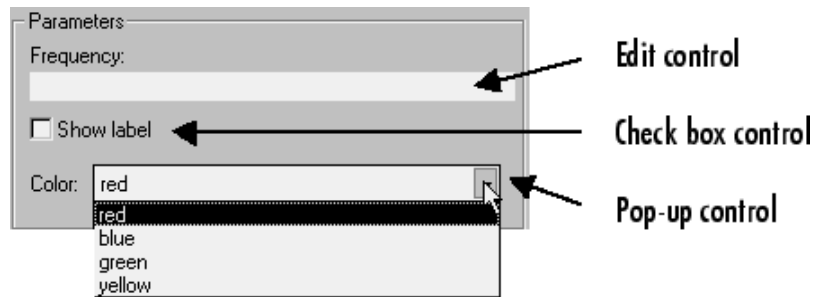
## Control Types

You can choose how parameter values are entered or selected. You can create three styles of controls: edit fields, check boxes, and pop-up controls. To specify the type of control that the Mask Parameters dialog box provides for a mask parameter, set the parameter **Type** to `edit`, `checkbox`, or `popup`:

- An *edit control* enables the user to enter a parameter value by typing it into a field.

- A *check box control* enables the user to choose between two alternatives by selecting or deselecting a check box.
- A *pop-up control* enables the user to choose a parameter value from a list of possible values.

For example, this figure shows the **Parameters** pane of a Mask Parameters dialog box that uses all three types of controls, with the pop-up control open to show its possible values:



### Edit Control

An *edit field* enables the user to enter a parameter value by typing it into a field. This figure shows how the prompt for the sample edit control was defined.

Dialog parameters				
Prompt	Variable	Type	Evaluate	Tunable
Slope:	m	edit	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Intercept	b	edit	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

The value of the variable associated with the parameter is determined by the **Evaluate** option.

### Edit Control Evaluation

Evaluation	Edit Control Parameter Value
On	The result of evaluating the expression entered in the field
Off	The literal string entered in the field



## Check Box Control

A *check box* enables the user to choose between two alternatives by selecting or deselecting a check box. This figure shows how the sample check box control is defined.

Dialog parameters				
Prompt	Variable	Type	Evaluate	Tunable
Saturate	sat	checkbox	<input checked="" type="checkbox"/>	<input type="checkbox"/>

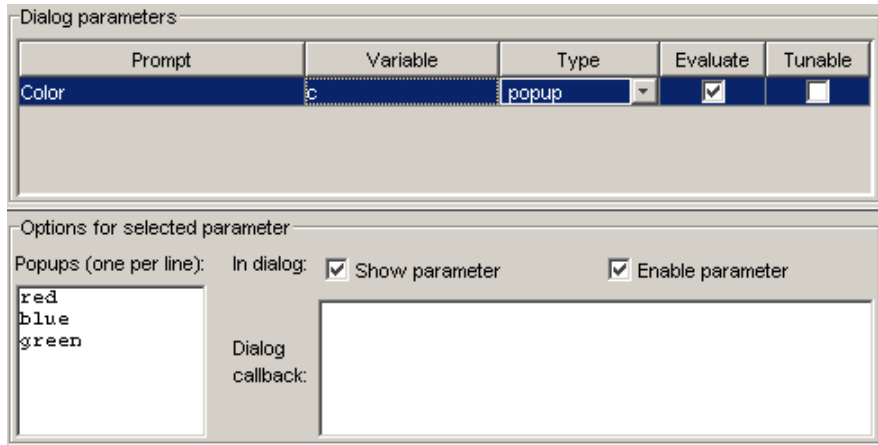
The value of the variable associated with the parameter depends on whether the **Evaluate** option is selected.

## Check Box Evaluation

Evaluation	Check Box Parameter State	Check Box Parameter Value
On	Selected	1
	Cleared	'on'
Off	Selected	0
	Cleared	'off'

## Pop-Up Control

A *pop-up* enables the user to choose a parameter value from a list of possible values. When you define a Pop-Up control, you must specify the values that the control presents to the user in the Mask Parameters dialog box. To specify the values, select the parameter in the **Dialog parameters** table, then enter the values in the **Popups** field of the **Options for selected parameter pane** below the table. The next figure shows a pop-up control definition



The value of the variable associated with the parameter (Color) depends on the item selected from the pop-up list and whether the **Evaluate** option is checked (on).

### Pop-Up Evaluation

Evaluation	Pop-Up Parameter Value
On	The index of the value selected from the list, starting with 1. For example, if the third item is selected, the parameter value is 3.
Off	The literal string that is the value selected, as it appears in the Mask Editor <b>Popups</b> field and the corresponding Mask Parameters dialog box list.

### Options for Selected Parameter Panel

This panel allows you to set additional options for the parameter selected in the **Dialog parameters** table.

#### Show parameter

The selected parameter appears on the masked block's parameter dialog box only if this option is checked (the default).

## Enable parameter

Clearing this option grays the selected parameter's prompt and disables its edit control. This means that the user cannot set the value of the parameter.

## Popups

This field is enabled only if the edit control for the selected parameter is a pop-up. Enter the values of the pop-up control in this field, each on a separate line.

## Callback

Enter the MATLAB code that you want the Simulink software to execute when a user applies a change to the selected parameter by selecting the **Apply** or **OK** button on the mask dialog box. You can use such callbacks to create dialogs whose appearance changes, depending on changes to control settings made by the user, such as enabling an edit field when a user checks a check box.

---

**Note** Callbacks are not intended to be used to alter the contents of a masked subsystem. Altering a masked subsystem's contents in a callback, for example by adding or deleting blocks or changing block parameter values, can trigger errors during model update or simulation. If you need to modify the contents of a masked subsystem, use the mask's initialization code to perform the modifications. See "Initialization Pane" on page 5-22 for more information.

---

The callback can create and reference variables only in the block workspace. If the callback needs the value of a mask parameter, it can use `get_param` to obtain the value, for example:

```
if str2num(get_param(gcf, 'g'))<0
    error('Gain is negative.')
end
```

The Simulink software executes the callback commands when you

- Open the mask parameter dialog box. Callback commands execute top down, starting with the top mask dialog parameter

- Modify a parameter value in the mask parameter dialog box then change the cursor's focus by pressing the **Tab** key or clicking into another field in the dialog

---

**Note** The callback commands are not executed when the parameter value is modified using the `set_param` command.

---

- Modify the parameter value, either in the mask parameter dialog box or via a call to `set_param`, then apply the change by clicking **Apply** or **OK**. Any mask initialization commands execute after the callback commands. See “Initialization Pane” on page 5-22 for more information.
- Cancel any applied changes made in the mask dialog box by clicking **Cancel**.
- Hover over the masked block to see the block's data tip, when the data tip contains parameter names and values. The callback executes again when the block data tip disappears.





---

**Note** The callback commands do not execute if the mask dialog box is open when the block data tip appears.

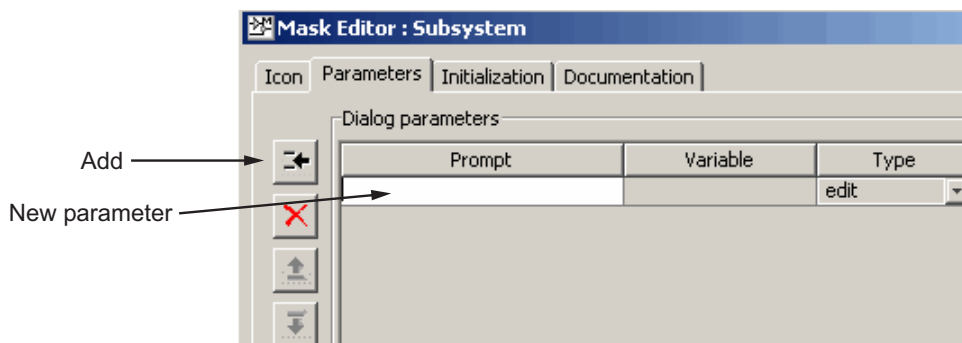
---

### Parameter Buttons

This table explains the purpose of the buttons that appear on the **Parameters** pane in the order of their appearance from the top of the pane.

Click this button...	To perform this action...
 Add	Add a new mask parameter. An empty parameter appears in the adjacent <b>Dialog parameters</b> table: If an existing parameter is selected, the new parameter appears below the selected parameter.
 Delete	Delete the parameter that is currently selected in the <b>Dialog parameters</b> table.
 Up	Move the currently selected parameter up one row in the <b>Dialog parameters</b> table. The prompt for this parameter moves up one slot in the Mask Parameters dialog box.
 Down	Move the currently selected parameter down one row in the <b>Dialog parameters</b> table. The prompt for this parameter moves down one slot in the Mask Parameters dialog box.

For example, this figure shows the result of clicking the **Add** button to create the first parameter defined by a mask:



## Initialization Pane

### In this section...

“About the Initialization Pane” on page 5-22

“Dialog variables” on page 5-23

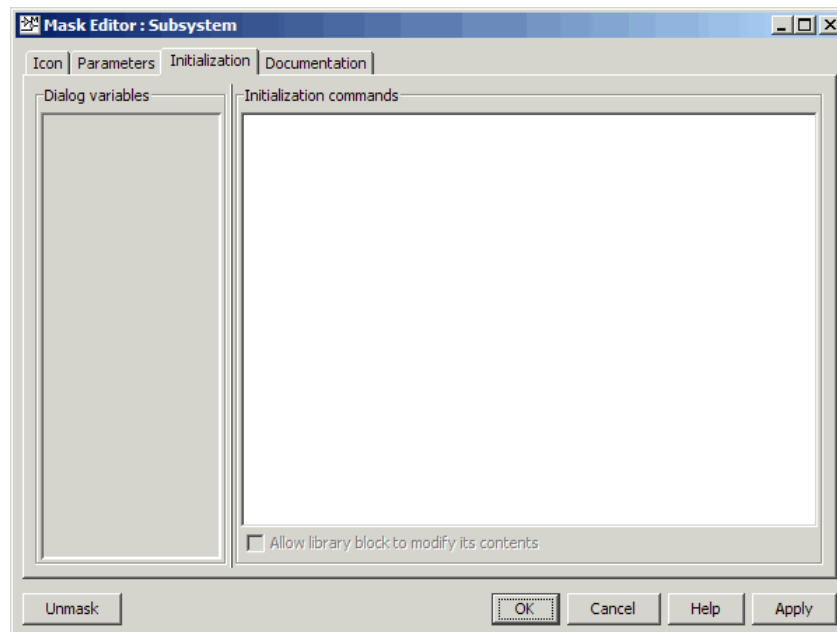
“Initialization commands” on page 5-24

“Allow library block to modify its contents” on page 5-24

“Initialization Command Limitations” on page 5-24

## About the Initialization Pane

The **Initialization** pane allows you to enter MATLAB commands that initialize the masked subsystem.



When you open a model, initialization commands execute for all masked blocks that are visible because they reside at the top level of the model or in

an open subsystem. Initialization commands for masked blocks that are not initially visible execute when you open the subsystem or model that contains the blocks.

When you load a model into memory without displaying the model graphically, no initialization commands initially run for any masked blocks. See “Loading a Model” and `load_system` for information about loading a model without displaying it.

Initialization commands for all masked blocks in a model run when you:

- Update the diagram
- Start simulation
- Start code generation.

Initialization commands for an individual masked block run when you:

- Change any of the parameters that define the mask, such as `MaskDisplay` and `MaskInitialization`, by using the Mask Editor or `set_param`.
- Change the appearance of the masked block, for example by resizing or rotating the block.
- Change the value of a mask parameter by using the block dialog or `set_param`.
- Copy the masked block within the same model or between different models.

The **Initialization** pane contains the controls described in this section.

## Dialog variables

The **Dialog variables** list displays the names of the variables associated with the subsystem’s mask parameters, which are defined in the **Parameters** pane. You can copy the name of a parameter from this list and paste it into the adjacent **Initialization commands** field, using the Simulink keyboard copy and paste commands. You can also use the list to change the names of mask parameter variables. To change a name, double-click the name in the list. An edit field containing the existing name appears. Edit the existing name and press **Enter** or click outside the edit field to confirm your changes.

## Initialization commands

Enter the initialization commands in this field. You can enter any valid MATLAB expression, consisting of MATLAB functions and scripts, operators, and variables defined in the mask workspace. Initialization commands run in the mask workspace, not the base workspace. Terminate initialization commands with a semicolon to avoid echoing results to the MATLAB Command Window.

## Allow library block to modify its contents

This check box is enabled only if the masked subsystem resides in a library. Checking this option allows the block's initialization code to modify the contents of the masked subsystem by adding or deleting blocks and setting the parameters of those blocks. Otherwise, an error is generated when a masked library block tries to modify its contents in any way. To set this option at the MATLAB prompt, select the self-modifying block and enter the following command.

```
set_param(gcf, 'MaskSelfModifiable', 'on');
```

Then save the block.

## Initialization Command Limitations

Mask initialization commands must observe the following rules:

- Do not use initialization code to create mask dialogs whose appearance or control settings change depending on changes made to other control settings. Instead, use the mask callbacks provided specifically for this purpose.
- Avoid prefacing variable names in initialization commands with `L_` and `M_` to prevent undesirable results. These specific prefixes are reserved for use with internal variable names.
- Avoid using `set_param` commands to set parameters of blocks residing in masked subsystems that reside in the masked subsystem being initialized. See “Setting Nested Masked Block Parameters” for details.



## Documentation Pane

### In this section...

“About the Documentation Pane” on page 5-25

“Mask Type Field” on page 5-26

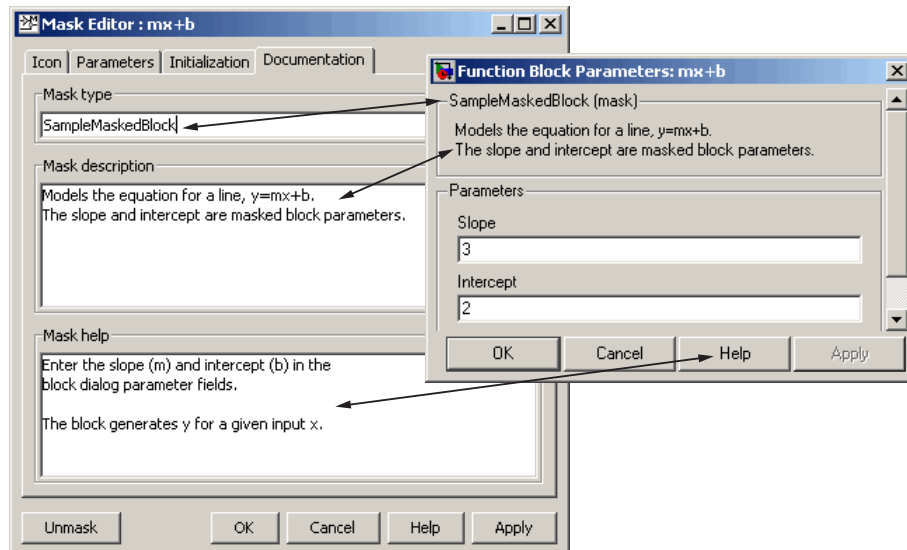
“Mask Description Field” on page 5-26

“Mask Help Field” on page 5-26

## About the Documentation Pane

The **Documentation** pane enables you to define or modify the type, description, and help text for a masked block.

The next figure shows the relationship between the values in the **Documentation** pane and the appearance of the corresponding Mask Parameters dialog box and **Online Help** window.



## Mask Type Field

The *mask type* is a block classification that appears in the masked block's Mask Parameters dialog box and on all Mask Editor panes for the block. When Simulink displays a masked block's Mask Parameters dialog box, it suffixes (mask) to the mask type. To define the mask type, enter it in the **Mask type** field. The text can contain any legal MATLAB character, but cannot contain line breaks.

## Mask Description Field

The *mask description* is summary Help text that describe the block's purpose or function. The description appears in the masked block's Mask Parameters dialog box under the mask type. To define the mask description, enter it in the **Mask description** field. The text can contain any legal MATLAB character. Simulink automatically wraps long lines. You can force line breaks by using the **Enter** or **Return** key.

## Mask Help Field

A masked block's Online Help provides information in addition to that provided by the block's **Mask type** and **Mask description** fields. This information appears in a separate window when the user clicks the **Help** button on the masked block's Mask Parameters dialog box. To define the mask help, enter one of the following in the **Mask help** field.

- URL specification
- web or eval command
- Literal or HTML text

### Providing a URL

If the first line of the **Mask help** field is a URL, Simulink passes the URL to your default web browser. The URL can begin with `http:`, `www:`, `file:`, `ftp:`, or `mailto:`. Examples:

```
http://www.mathworks.com
file:///c:/mydir/helpdoc.html
```

Once the browser is active, MATLAB and Simulink have no further control over its actions.

### Providing a web Command

If the first line of the **Mask help** field is a **web** command, Simulink passes the command to MATLAB, which displays the specified file in the MATLAB Web Browser or the MATLAB Online Help browser. Example:

```
web([docroot 'MyBlockDoc/' get_param(gcb,'MaskType') '.html'])
web('hello.html', '-helpbrowser')
```

See the MATLAB **web** command documentation for details. A **web** command used for mask help cannot return values.

### Providing an eval Command

If the first line of the **Mask help** field is an **eval** command, Simulink passes the command to MATLAB, which performs the specified evaluation. Example:

```
eval('!Word My_Spec.doc')
```

See the MATLAB **eval** command documentation for details. An **eval** command used for mask help cannot return values.

### Providing Literal or HTML Text

If the first line of the **Mask help** field is not a URL, or a **web** or **eval** command, Simulink displays the text in the MATLAB Online Help browser under a heading that is the value of the **Mask type** field. The text can contain any legal MATLAB character, line breaks, and any standard HTML tag, including tags like **img** that display images.

Simulink first copies the text to a temporary directory, then displays the text using the **web** command. If you want the text to display an image, you can provide a URL path to the image file, or you can place the image file in the temporary directory. Use **tempdir** to find the temporary directory that Simulink uses for your system.