Simulink® Control Design™ Release Notes

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Simulink® Control Design™ Release Notes

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Summary by Version

This table provides quick access to what's new in each version. For clarification, see "Using Release Notes" on page 1.

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Latest Version V2.4 (R2008b)	Yes Details	No	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation
V2.3 (R2008a)	Yes Details	No	Bug Reports Includes fixes	No
V2.2 (R2007b)	Yes Details	No	Bug Reports Includes fixes	No
V2.1 (R2007a)	Yes Details	No	Bug Reports Includes fixes	No
V2.0.1 (R2006b)	Yes Details	No	Bug Reports Includes fixes	No
V2.0 (R2006a)	Yes Details	No	Bug Reports Includes fixes	No
V1.3 (R14SP3)	Yes Details	No	Bug Reports Includes fixes	No
V1.2 (R14SP2)	Yes Details	No	Bug Reports Includes fixes	No
V1.1 (R14SP1)	No	No	Fixed bugs	No
V1.0 (R14)	Yes Details	No	No bug fixes	No

Using Release Notes

Use release notes when upgrading to a newer version to learn about:

- New features

- Changes

- Potential impact on your existing files and practices

Review the release notes for other MathWorks™ products required for this product (for example, MATLAB® or Simulink®) for enhancements, bugs, and compatibility considerations that also might impact you.

If you are upgrading from a software version other than the most recent one, review the release notes for all interim versions, not just for the version you are installing. For example, when upgrading from V1.0 to V1.2, review the release notes for V1.1 and V1.2.

What's in the Release Notes

New Features and Changes

- New functionality

- Changes to existing functionality

Version Compatibility Considerations

When a new feature or change introduces a reported incompatibility between versions, the **Compatibility Considerations** subsection explains the impact.

Compatibility issues reported after the product is released appear under Bug Reports at the MathWorks Web site. Bug fixes can sometimes result in incompatibilities, so you should also review the fixed bugs in Bug Reports for any compatibility impact.

Fixed Bugs and Known Problems

The MathWorks offers a user-searchable Bug Reports database so you can view Bug Reports. The development team updates this database at release time and as more information becomes available. This includes provisions for any known workarounds or file replacements. Information is available

for bugs existing in or fixed in Release 14SP2 or later. Information is not available for all bugs in earlier releases.

Access Bug Reports using your MathWorks Account.

Version 2.4 (R2008b) Simulink Control Design Software

This table summarizes what's new in Version 2.4 (R2008b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation

New features and changes introduced in this version are

- "New Upsampling Option for Rate Conversion When Linearizing Simulink Models" on page 4
- "Ability to Specify State Order of Linearized Models from the Command Line" on page 5
- "Ability to Filter the Linearization Inspector to Show Blocks in the Linearization Path" on page 5
- "Ability to Disable the Calculation of Linearization Diagnostics and Inspector Data in the GUI" on page 5

New Upsampling Option for Rate Conversion When Linearizing Simulink Models

Version 2.4 includes an upsampling rate conversion method for linearization. This method upsamples discrete-time LTI systems at any sampling rate that is an integer-value-times faster than the sampling rate of the original system. You can select the upsampling rate conversion method in the following ways:

- Using the linearization options GUI
- From the command line using linoptions

For more information on the upsampling rate conversion method, see "Changing Linearization Options" and the linoptions reference page.

Ability to Specify State Order of Linearized Models from the Command Line

You can now specify the order of the states in your linearized model directly from the command line using the `linearize` command. Previously, you could only specify state order using the GUI.

For more information on specifying state order from the command line, see the `linearize` reference page.

Ability to Filter the Linearization Inspector to Show Blocks in the Linearization Path

You can now filter the list of blocks in the Linearization Inspector to show only the blocks in the linearization path. This filtering makes it easier for you to find blocks in the linearization path that you want to inspect.

For information using the Linearization Inspector to inspect blocks in the linearization path, see "Inspecting the Linearization Results Block by Block".

Ability to Disable the Calculation of Linearization Diagnostics and Inspector Data in the GUI

You can now disable the calculation of the linearization inspector and diagnostics information when you linearize using the GUI. This capability allow you to choose when you want to calculate diagnostic information.

For more information on disabling the linearization inspector, see "Changing Linearization Options".

Version 2.3 (R2008a) Simulink Control Design Software

This table summarizes what's new in Version 2.3 (R2008a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	Bug Reports Includes fixes	No

New features and changes introduced in this version are

- "New Diagnostic Messages Help You Troubleshoot Linearization Results" on page 6

- "Ability to Find Operating Points for Simscape Models" on page 7

- "Updated Error and Warning Message System" on page 7

New Diagnostic Messages Help You Troubleshoot Linearization Results

You can now view diagnostic messages for your linearized model that help you diagnose and troubleshoot linearization results. These messages identify blocks in your model that encounter the following block issues during linearization:

- Blocks that have been marked as not supported for linearization

- Blocks with linearization configuration warning messages

- Blocks without pre-programmed exact Jacobian that linearize using numerical approximation

For more information on diagnostic messages, see "Diagnosing Blocks" in the *Simulink® Control Design™ User's Guide*.

Ability to Find Operating Points for Simscape Models

You can now find operating points for models that include Simscape™ and SimHydraulics® blocks using the Simulink Control Design `findop` command.

For more information on finding operating point for Simscape Models, see the Simscape documentation.

Updated Error and Warning Message System

The Simulink Control Design error and warning IDs and messages have been updated. If you use error and warning IDs in your code, you must update your code to reflect the new IDs.

Version 2.2 (R2007b) Simulink Control Design Software

This table summarizes what's new in Version 2.2 (R2007b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	Bug Reports Includes fixes	No

New features and changes introduced in this version are

- "Ability to Linearize Models with Model-Reference Blocks by Any Linearization Method" on page 8
- "Ability to Design Compensators for Models Containing Model-Reference Blocks" on page 9
- "Ability to Generate Linearized Models with Exact Time-Delay Representations" on page 9
- "Ability to Linearize Periodic Function-Call Subsystems" on page 9

Ability to Linearize Models with Model-Reference Blocks by Any Linearization Method

You can now perform any type of linearization for models containing Model blocks that reference other Simulink models.

Previously, you could only perform numerical perturbation linearization for models containing Model blocks. Now, you can also perform block-by-block linearization for such models when you set the simulation mode of the Model blocks to Normal.

For more information on linearizing models containing model-reference blocks, see "Model Reference Blocks" in the *Simulink Control Design User's Guide*.

Ability to Design Compensators for Models Containing Model-Reference Blocks

You can now design compensators for tunable blocks inside external models referenced by your model. Your model references such external models by using Model blocks. You can also update the tunable blocks in the external model with the new compensator designs.

To view and select tunable blocks for compensator design from the referenced model, set the simulation mode of the Model block to Normal.

For more information about the types of blocks that you can tune, see "Picking Blocks to Tune" in *Simulink Control Design Getting Started Guide*.

Ability to Generate Linearized Models with Exact Time-Delay Representations

You can now use the Simulink Control Design software to compute linearized models with exact time-delay representations. Time delays in the original nonlinear model can result from any of the following blocks:

- Transport Delay
- Variable Time Delay
- Variable Transport Delay
- Unit Delay
- Integer Delay

Previously, you could only achieve approximate linearizations of models with continuous time delays using a Padé approximation.

For more information on linearizing models with time delays, see "Linearizing Models with Time Delays" in the *Simulink Control Design User's Guide*.

Ability to Linearize Periodic Function-Call Subsystems

You can now linearize periodic function-call subsystems with a constant sample time as discrete subsystems. You must set the sample time of the

function-call trigger block to equal the sample time of the function-call
generator block.

For more information on function-call subsystems, see "Function-Call
Subsystems" in the Simulink documentation.

Version 2.1 (R2007a) Simulink Control Design Software

This table summarizes what's new in Version 2.1 (R2007a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	Bug Reports Includes fixes	No

New features and changes introduced in this version are

- "Ability to Linearize Using an Operating Point Specified Directly in a Model" on page 11
- "Ability to Capture Linearization Snapshots in GUI" on page 12
- "Ability to Perform Control Design at Snapshots in GUI" on page 12
- "Ability to Retrieve Stored Compensator Designs" on page 12

Ability to Linearize Using an Operating Point Specified Directly in a Model

You can use the Simulink Control Design software to linearize around any operating point that you specify directly in a Simulink model. This capability allows you to make changes to a model and then perform a linearization around the newly specified operating point with the click of a single button. Previously, this same task required two steps: creating a new operating point and then linearizing around this operating point.

There are two ways to linearize around an operating point specified directly in the model:

- From the Controls and Estimation Tools Manager, as described in "Linearizing at a Simulink Model Operating Point" in the *Simulink Control Design User's Guide*.
- Using `linearize`. For more information, see `linearize` in the reference pages.

Ability to Capture Linearization Snapshots in GUI

You can use the Controls and Estimation Tools Manager to linearize at snapshots of your model operating point at the following simulation points:

- Specified simulation times, such as when the simulation reaches a steady state solution, as described in "Linearizing at Specified Simulation Times" in the *Simulink Control Design User's Guide*.

- Events during a specified simulation interval, as described in "Linearizing at Simulation Events" in the *Simulink Control Design User's Guide*.

As in prior releases, you can use `linearize` to perform linearization at snapshots in your model operating point, as described in `linearize` in the reference pages.

Ability to Perform Control Design at Snapshots in GUI

You can use the Controls and Estimation Tools Manager to perform control design at snapshots of your model operating point at the following simulation points:

- Specified simulation times, such as when the simulation reaches a steady state solution, as described in "Selecting an Operating Point" in the *Simulink Control Design Getting Started Guide*.

- Events during a specified simulation interval, as described in "Selecting an Operating Point" in *Simulink Control Design Getting Started Guide*.

Ability to Retrieve Stored Compensator Designs

When you design a compensator using the SISO design tool, you can store the current design and then continue making changes to this design. A new button called **Retrieve Design** lets you retrieve the stored design at any time by undoing the design changes you made since you last stored the design. For more information on retrieving stored compensator designs, see "Storing and Retrieving Designs" in *Simulink Control Design Getting Started Guide*.

Version 2.0.1 (R2006b) Simulink Control Design Software

This table summarizes what's new in Version 2.0.1 (R2006b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	Bug Reports Includes fixes	No

Version 2.0 (R2006a) Simulink Control Design Software

This table summarizes what's new in Version 2.0 (R2006a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	Bug Reports Includes fixes	No

New features and changes introduced in this version are

Compensator Design in Simulink Is Now Supported

This release provides new tools to streamline the workflow for designing Single-Input Single-Output (SISO) control loops directly in Simulink. In previous releases, designing a compensator was a multistep process that involved several tools.

The new tools support any linearizable control architecture, such as single loops, multiple loops, and cascaded loops. With the new tools, you simply select the blocks you want to tune. Then, the Simulink Control Design software automatically analyzes your model to identify the relevant control loops and opens a preconfigured session of the SISO Design Tool (in the Control System Toolbox™ software). For more information, see "Designing Compensators" in the *Simulink Control Design Getting Started Guide*.

Supported tunable SISO Simulink blocks include Gain, Transfer Function, Zero-Pole-Gain, State-Space, and PID blocks.

In the SISO Design Tool you can

- Graphically tune multiple SISO loops in a single GUI.

- Gain visual insight into loop interactions and coupling effects.

- Focus the analysis on a specific loop in a multiloop design by removing the effect of other feedback loops.

- Generate first-cut compensator designs using systematic design algorithms, such as Ziegler-Nichols PID tuning, IMC design, or LQG design.

- Optimize linear responses to meet time and frequency-based design constraints (requires the Simulink® Response Optimization™ software).

- Directly tune Simulink block parameters, such as PID gains, zero-pole-gain representations, and masked blocks.

- Tune continuous or discrete control loops.

- Examine the closed-loop response of any portion of a model.

After a design is completed, you can write the tuned parameter values back to your model for verification with the full nonlinear system.

Version 1.3 (R14SP3) Simulink Control Design Software

This table summarizes what's new in Version 1.3 (R14SP3):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	Bug Reports Includes fixes	No

New features and changes introduced in this version are

- "Control and Estimation Tools Manager Enhanced" on page 16

- "Support for Operating Point Search and Linearization of Models with Model Reference Blocks" on page 16

Control and Estimation Tools Manager Enhanced

You can copy and edit operating points within the Control and Estimation Tools Manager. For more information on this feature, see "Copying Operating Points" in the *Simulink Control Design User's Guide*.

You can initialize a model for simulation using operating points from within the Control and Estimation Tools Manager. For more information on this feature, see the example in "Validating Linearization Results" in the *Simulink Control Design User's Guide*.

Support for Operating Point Search and Linearization of Models with Model Reference Blocks

You can linearize and compute operating points for models that reference other models using the Model block. Linearization of model reference models must use the numerical perturbation linearization algorithm. This algorithm accepts state and input perturbation values in the form of an operating point object. For more information on this feature, see the examples in "Example: Linearizing a Model Using Numerical-Perturbation at the MATLAB Command Line" and "Example: Linearizing a Model Using

Numerical-Perturbation in the GUI" in the *Simulink Control Design User's Guide*.

Version 1.2 (R14SP2) Simulink Control Design Software

This table summarizes what's new in Version 1.2 (R14SP2):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	Bug Reports Includes fixes	No

New features and changes introduced in this version are

- "Context-Sensitive Help Added" on page 18

- "View Linearizations in the Control and Estimation Tools Manager" on page 18

- "Discretization Methods Added" on page 19

- "List of Blocks with Preprogrammed Analytic Jacobians Added" on page 19

- "Block Name Readability Improved" on page 19

Context-Sensitive Help Added

Access context-sensitive help for the Linearization, Operating Point Search, and Linearization State Ordering Options window of the Control and Estimation Tools Manager. To access help on a field within the options window, right-click the option's label and select **What's this?** from the context menu. Help for the option will appear in this window.

View Linearizations in the Control and Estimation Tools Manager

You can view state space, transfer function, and zero-pole gain representations of linearized models within the Control and Estimation Tools Manager without exporting to the workspace. These linearized models appear in the linearization summary pane of the Control and Estimation Tools Manager.

Discretization Methods Added

You can select from three different discretization methods for linearization of multirate and hybrid models.

List of Blocks with Preprogrammed Analytic Jacobians Added

You can view a complete list of blocks indicating which blocks have preprogrammed analytic Jacobians for use with the block-by-block analytic linearization algorithm. This list is in the "Linearizing Individual Blocks Using Analytic Linearization" section of the Simulink Control Design documentation.

Block Name Readability Improved

You can use either truncated block names or full block names in the state space matrices of a linearized model, and within the LTI Viewer, to improve readability.

Version 1.1 (R14SP1) Simulink Control Design Software

This table summarizes what's new in Version 1.1 (R14SP1):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
No	No	Fixed bugs	No

Version 1.0 (R14) Simulink Control Design Software

This table summarizes what's new in Version 1.0 (R14):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	No bug fixes	No

New features and changes introduced in this version are

About the Simulink Control Design Software

The Simulink Control Design software provides tools for the linearization of control systems and models. A graphical user interface (GUI) simplifies the tasks of specifying operating conditions, linearizing the model, and analyzing the results. Linearized models often facilitate system analysis and compensator design. This is useful in many industries and applications, including

- Aerospace: flight control, guidance, navigation

- Automotive: cruise control, emissions control, transmission

- Equipment manufacturing: motors, disk drives, servos

The Simulink Control Design software improves upon previous Simulink linearization tools by providing more options for computing operating conditions, allowing open loop analysis without the removal of feedback loops, and including a linearization inspector and debugger. Linearization projects are easier to manage with the new Control and Estimation Tools Manager. Furthermore, the Control System Toolbox software features, such as the LTI Viewer, are integrated with the Control Designer software to improve control system analysis and design.

Key Features Introduced

Key features of the Simulink Control Design software include the ability to

- Specify linearization input, output, and open loop analysis points using right-click menus

- Perform open loop analysis without deleting feedback loops

- Extract operating conditions from a simulation

- Compute operating conditions by optimization (trimming)

- Create output constraints for trim analysis

- Linearize individual blocks using context menus

- Inspect and debug results of the linearization

- Identify blocks in a model that contribute to a linearization

- Export results to the MATLAB workspace

- Manage linearization projects, compute operating conditions, and perform linearization with a graphical user interface (GUI)

- Use improved functions at the command line for linearization and trim analysis

Compatibility Summary for Simulink Control Design Software

This table summarizes new features and changes that might cause incompatibilities when you upgrade from an earlier version, or when you use files on multiple versions. Details are provided in the description of the new feature or change.

Version (Release)	New Features and Changes with Version Compatibility Impact
Latest Version **V2.4 (R2008b)**	None
V2.3 (R2008a)	None
V2.2 (R2007b)	None
V2.1 (R2007a)	None
V2.0.1 (R2006b)	None
V2.0 (R2006a)	None
V1.3 (R14SP3)	None
V1.2 (R14SP2)	None
V1.1 (R14SP1)	None
V1.0 (R14)	None