Simulink® Response Optimization Release Notes

Contents

Summary by Version

This table provides quick access to what's new in each version. For clarification, see "About 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 V3.1 (R2006b)	Yes Details	No	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation
V3.0 (R2006a)	Yes Details	No	Bug Reports	No
V2.3 (R14SP3)	Yes Details	No	Bug Reports Includes fixes	No
V2.2 (R14SP2)	Yes Details	No	Bug Reports Includes fixes	No
V2.1 (R14SP1)	No	No	Fixed bugs	No
V2.0 (R14)	Yes Details	Yes Summary	No bug fixes	No

About Release Notes

Use release notes when upgrading to a newer version to learn about new features and changes, and the potential impact on your existing files and practices. Release notes are also beneficial if you use or support multiple versions.

If you are not upgrading from the most recent previous version, review 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 New Features and Changes, Version Compatibility Considerations, and Bug Reports for V1.1 and V1.2.

New Features and Changes

These include

- New functionality

- Changes to existing functionality

- Changes to system requirements (complete system requirements for the current version are at the MathWorks Web site)

- Any version compatibility considerations associated with each new feature or change

Version Compatibility Considerations

When a new feature or change introduces a known incompatibility between versions, its description includes a **Compatibility Considerations** subsection that details the impact. For a list of all new features and changes that have compatibility impact, see the "Compatibility Summary for Simulink Response Optimization" on page 14.

Compatibility issues that become known after the product has been released are added to Bug Reports at the MathWorks Web site. Because bug fixes can sometimes result in incompatibilities, also review fixed bugs in Bug Reports for any compatibility impact.

Fixed Bugs and Known Problems

MathWorks Bug Reports is a user-searchable database of known problems, workarounds, and fixes. The MathWorks updates the Bug Reports database as new problems and resolutions become known, so check it as needed for the latest information.

Access Bug Reports at the MathWorks Web site using your MathWorks Account. If you are not logged in to your MathWorks Account when you link to Bug Reports, you are prompted to log in or create an account. You then can view bug fixes and known problems for R14SP2 and more recent releases.

The Bug Reports database was introduced for R14SP2 and does not include information for prior releases. You can access a list of bug fixes made in prior versions via the links in the summary table.

Related Documentation at Web Site

Printable Release Notes (PDF). You can print release notes from the PDF version, located at the MathWorks Web site. The PDF version does not support links to other documents or to the Web site, such as to Bug Reports. Use the browser-based version of release notes for access to all information.

Product Documentation. At the MathWorks Web site, you can access complete product documentation for the current version and some previous versions, as noted in the summary table.

# Version 3.1 (R2006b) Simulink Response Optimization

This table summarizes what's new in Version 3.1 (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	Printable Release Notes: PDF Current product documentation

New features and changes introduced in this version are described here.

Optimization of Step Response Bounds Supported

When using Simulink Response Optimization along with Simulink Control Design, you can now specify rise-time, overshoot, and settling-time requirements on step response plots. To do this, set **Design requirement type** to Step response bounds in the New Design Requirement dialog box.
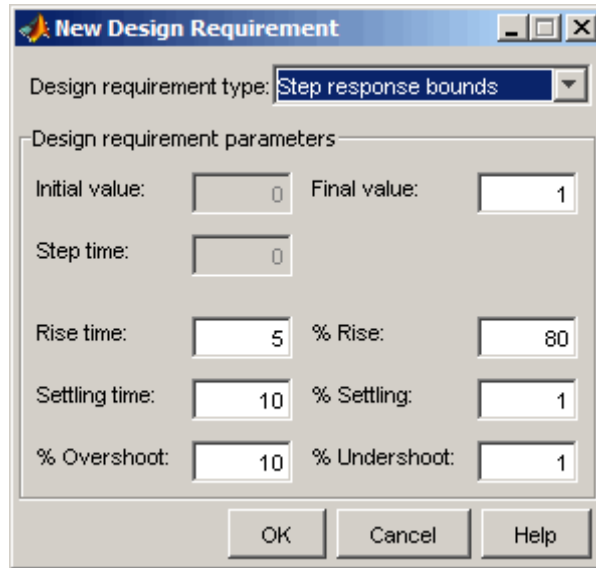
For more information about this dialog box, see "Edit Design Requirement Dialog Box". For some background information about step response bounds, see "Choosing Step Response Specifications".

Design Requirements Dialog Box Changed

The New Design Requirement and Edit Design Requirement dialog boxes have a different look. In particular, when a constraint/requirement contains more than one segment, the lower portion of the dialog box contains a grid with one row for each segment. New **Insert** and **Delete** buttons in the dialog box let you add and remove segments. The **Select segment to edit** parameter no longer appears because the grid shows all segments.

Also, numeric fields of these dialog boxes display data the way format short would display it in MATLAB. This display feature does not affect the way computations are done and the full precision is still available when you edit the data in the fields of the dialog box.

For more information, see "Edit Design Requirement Dialog Box".

5

Version 3.0 (R2006a) Simulink Response Optimization

This table summarizes what's new in Version 3.0 (R2006a):

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

New features and changes introduced in this version are described here:

Optimization of Time- and Frequency-Domain Performance Requirements Is Now Supported

You can now optimize compensator elements directly from the SISO Design Tool using time- and frequency-domain performance requirements. This feature is only available if you have the Control System Toolbox installed.

When working in the SISO Design Tool, you perform the optimization using the following steps:

1 Specify design requirements. For example, you can add frequency-domain design requirements to plots, such as root-locus, Nichols, and Bode plots in the SISO Design Tool graphical tuning editor. You can also add time-domain design requirements to plots, such as step response or impulse response (when displayed in the LTI Viewer as part of a SISO Design Tool).

2 Select the compensator elements and parameters you want to optimize. For example, you can select poles, zeros, and gains.

3 Optimize selected compensator elements until responses meet specified time- and frequency-domain performance requirements.

If you have Simulink® Control Design installed and are starting with a Simulink model, you simply select the Simulink blocks you want to tune. Then, use Simulink Control Design to automatically analyze your model, identify the relevant control loops, and open a preconfigured session of the SISO Design Tool where you proceed with the optimization.

For more information, see the "Frequency Domain Response Optimization Example" section of the Getting Started guide.

Version 2.3 (R14SP3) Simulink Response Optimization

This table summarizes what's new in Version 2.3 (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 described here:

Constraint Segment Alignment Enhanced

You can use the **Shift** key to easily and precisely align constraint segments horizontally or vertically. See "Moving Constraints" for more information.

Response Optimization Solutions Search Enhanced

You can automatically search for response optimization solutions that lie further inside the constraint region, rather than stopping after finding the first feasible solution which typically lies at the edge of the region (the default behavior). See "Selecting Optimization Termination Options" for more information.

Version 2.2 (R14SP2) Simulink Response Optimization

This table summarizes what's new in Version 2.2 (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 described here:

Graphical Representation of Signal Constraints Enhanced

You can manipulate signal constraints more easily due to their enhanced graphical representation.

Response Optimizations Enhanced

You can start response optimizations at nonzero start times.

You can save response optimization projects to the model workspace as well as MAT-files and the MATLAB workspace.

You can view the number of simulations performed at each step of a response optimization.

Version 2.1 (R14SP1) Simulink Response Optimization

This table summarizes what's new in Version 2.1 (R14SP1):

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

Version 2.0 (R14) Simulink Response Optimization

This table summarizes what's new in Version 2.0 (R14):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	Yes—Details labeled as **Compatibility Considerations**, below. See also Summary.	No bug fixes	No

New features and changes introduced in this version are described here:

About Simulink Response Optimization

Simulink Response Optimization provides a graphical user interface (GUI) to assist in design of control systems and physical systems. With this product, you can tune parameters within a nonlinear Simulink model to meet time-domain performance requirements by graphically placing constraints within a time-domain window or tracking and closely matching a reference signal. You can tune any number of Simulink variables including scalars, vectors, and matrices by entering the variable name into the appropriate dialog box. In addition, you can place uncertainty bounds on other variables in the model for robust design. Simulink Response Optimization makes attaining performance objectives and optimizing tuned parameters an intuitive and easy process.

To use Simulink Response Optimization, you need only to include a special block, the Signal Constraint block, in your Simulink diagram. Just connect the block to any signal in the model to signify that you want to place some kind of constraint on the signal. Simulink Response Optimization automatically converts time-domain constraints into a constrained optimization problem and then solves the problem using optimization routines taken from the Optimization Toolbox and Genetic Algorithm and Direct Search Toolbox. The constrained optimization problem formulated by Simulink Response Optimization iteratively calls for simulations of the Simulink system, compares the results of the simulations with the constraint objectives,

and uses gradient methods to adjust tuned parameters to better meet the objectives.

Key Features Introduced

Key features of Simulink Response Optimization include the ability to

- Optimize signals or design criteria in any Simulink model by tuning selected model parameters

- Constrain signals to lie within time-domain signal bounds

- Closely track a reference, or desired, signal

- Optimize responses for systems that include physical actuation limits and constraints on state/variable values

- Optimize responses for noisy systems by including uncertainty in your parameter values

- Compute the continuous and digital cumulative root mean square values of signals with the CRMS and DRMS blocks. Use these blocks with the Signal Constraint block to optimize the cumulative root mean square of signals in your models.

Major Enhancements

Simulink Response Optimization features several major enhancements to the Nonlinear Control Design Blockset. These major enhancements include

- Support for discrete and hybrid models

- Support for stopping and restarting an optimization

- Ability to undo or redo optimization of parameter values

- Support for three different optimizers, offering more robust optimization algorithms

- Ability to constrain any signal in the model hierarchy

- Support for vector-valued signals

Product Name Change

In previous releases, Simulink Response Optimization was called the Nonlinear Control Design Blockset (NCD). Simulink Response Optimization includes and improves upon the functionality of NCD.

Compatibility Considerations

Models that were created using NCD will not work with Simulink Response Optimization. To convert your NCD models for use with Simulink Response Optimization, use the `ncdupdate` function which is described in the Simulink Response Optimization Function Reference.

Compatibility Summary for Simulink Response Optimization

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 V3.1 (R2006b)	None
V3.0 (R2006a)	None
V2.3 (R14SP3)	None
V2.2 (R14SP2)	None
V2.1 (R14SP1)	None
V2.0 (R14)	See the **Compatibility Considerations** subheading for this new feature or change: • "Product Name Change" on page 13