Model Predictive Control Toolbox™ Release Notes

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Model Predictive Control Toolbox™ Release Notes

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Contents

Summary by Version

This table provides quick access to what's new in each version. For clarification, see "Using Release Notes" on page 2.

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Latest Version **V4.1 (R2012a)**	Yes Details	Yes Summary	Bug Reports Includes fixes
V4.0 (R2011b)	Yes Details	Yes	Bug Reports Includes fixes
V3.3 (R2011a)	Yes Details	No	Bug Reports Includes fixes
V3.2.1 (R2010b)	No	No	No
V3.2 (R2010a)	Yes Details	No	Bug Reports Includes fixes
V3.1.1 (R2009b)	No	No	Bug Reports Includes fixes
V3.1 (R2009a)	Yes Details	No	Bug Reports Includes fixes
V3.0 (R2008b)	Yes Details	No	Bug Reports Includes fixes
V2.3.1 (R2008a)	No	No	No
V2.3 (R2007b)	Yes Details	No	No
V2.2.4 (R2007a)	No	No	Bug Reports Includes fixes
V2.2.3 (R2006b)	No	No	No bug fixes
V2.2.2 (R2006a)	Yes Details	No	No bug fixes
V2.2.1 (R14SP3)	No	No	No bug fixes

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
V2.2 (R14SP2)	No	No	No bug fixes
V2.1 (R14SP1)	No	No	Bug Reports
V2.0 (R14)	Yes Details	No	Bug Reports

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®). Determine if enhancements, bugs, or compatibility considerations in other products impact you.

If you are upgrading from a software version other than the most recent one, review the current release notes and all interim versions. For example, when you upgrade from V1.0 to V1.2, review the release notes for V1.1 and V1.2.

What Is 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 release appear under Bug Reports at the MathWorks Web site. Bug fixes can sometimes result in incompatibilities, so review the fixed bugs in Bug Reports for any compatibility impact.

Fixed Bugs and Known Problems

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. Bug Reports include 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.

Documentation on the MathWorks Web Site

Related documentation is available on `mathworks.com` for the latest release and for previous releases:

- Latest product documentation
- Archived documentation

Version 4.1 (R2012a) Model Predictive Control Toolbox Software

This table summarizes what's new in Version 4.1 (R2012a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Yes Details labeled as **Compatibility Considerations**, below. See also Summary.	Bug Reports Includes fixes

New features and changes introduced in this version are:

Run-Time Preview of Reference and Measured Disturbance Signals with MPC Controller Block

This release introduces the ability to preview signals by using the **ref** and **md** inports of the MPC Controller block and the Multiple MPC Controllers block.

The **ref** inport now accepts an `N`-by-`Ny` signal, where `N` is the number of previewing steps and `Ny` is the number of plant outputs.

The **md** inport now accepts an `N`-by-`Nmd` signal, where `N` is the number of previewing steps and `Nmd` is the number of measured disturbances.

You cannot preview if the input signal is a vector, unless `Ny` or `Nmd`, as appropriate, is 1.

For more information, see:

- Improving Control Performance with Look-Ahead (Previewing)
- Chemical Reactor with Multiple Operating Points

Compatibility Considerations

In the current release, if you have models with the MPC Controller block or the Multiple MPC Controllers block, you will see a warning if your blocks contain:

- A **custom reference signal** specified in the MATLAB workspace.
- A **custom disturbance signal** specified in the MATLAB workspace.

Custom Reference Signal Specified in MATLAB Workspace. You must clear this warning. If you ignore the warning, the block will assume that the **ref** signal is zero. This behavior is equivalent to leaving the **ref** inport unconnected.

- **Without Look-Ahead (Previewing) Option.** To eliminate this warning:
  1. Add a From Workspace block to your model.
  2. Specify your reference signal variable name as the **Data** parameter of the From Workspace block.
  3. Connect the output of the From Workspace block to the **ref** inport of the MPC Controller block or the Multiple MPC Controllers block.
- **With Look-Ahead (Previewing) Option.** To eliminate this warning:
  1. Copy the Reference Previewer block from the `mpc_preview` model and place it in your model. See Improving Control Performance with Look-Ahead (Previewing) for more information.
  2. Specify your reference signal variable name as the **Signal** parameter of the Reference Previewer block. Also specify appropriate values for the **Sampling time** and **Number of previewing steps** parameters.
  3. Connect the output of the Reference Previewer block to the **ref** inport of the MPC Controller block or the Multiple MPC Controllers block.

Custom Disturbance Signal Specified in MATLAB Workspace. You must clear this warning. If you ignore the warning, the block will assume that the `md` signal is zero. This behavior is equivalent to leaving the `md` inport unconnected.

- **Without Look-Ahead (Previewing) Option.** To eliminate this warning:

1. Add a From Workspace block to your model.
2. Specify your disturbance signal variable name as the **Data** parameter of the From Workspace block.
3. Connect the output of the From Workspace block to the **md** inport of the MPC Controller block or the Multiple MPC Controllers block.

- **With Look-Ahead (Previewing) Option.** To eliminate this warning:

1. Copy the Measured Disturbance Previewer block from the `mpc_preview` model, and place it in your model. See Improving Control Performance with Look-Ahead (Previewing) for more information.
2. Specify your measured disturbance signal variable name as the **Signal** parameter of the Reference Previewer block. Also specify appropriate values for the **Sampling time** and **Number of previewing steps** parameters.
3. Connect the output of the Measured Disturbance Previewer block to the **md** inport of the MPC Controller block or the Multiple MPC Controllers block.

Version 4.0 (R2011b) Model Predictive Control Toolbox Software

This table summarizes what's new in Version 4.0 (R2011b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Yes Summary	Bug Reports Includes fixes

New features and changes introduced in this version are:

- "C Code Generation Improvements for All Targets with MPC Controller Block" on page 7
- "Faster QP Solver Algorithm for Improving MPC Controller Performance" on page 8
- "Run-Time Weight Tuning and Constraint Softening for MPC Controller" on page 8
- "Run-Time Monitoring of MPC Controller Performance to Detect When an Optimal Solution Cannot Not Be Found" on page 9
- "review Command for Diagnosing Issues with MPC Controller Parameters That Could Lead to Run-Time Failures" on page 9
- "mpcmove Returns Aligned Time Horizons for Optimal Control, Predicted Output and Estimated State" on page 10
- "Functionality Being Removed or Changed" on page 10

C Code Generation Improvements for All Targets with MPC Controller Block

The MPC Controller block has been re-implemented using a MATLAB Function block and now supports code generation for all Simulink Coder™ targets.

For more information, see Code Generation with Simulink Coder.

Faster QP Solver Algorithm for Improving MPC Controller Performance

This release implements a new quadratic problem (QP) solver that uses the KWIK algorithm. KWIK is faster and more numerically robust than the previous solver for ill-conditioned QP problems. You can use this solver without default constraints on decision variables.

For more information, see “MPC QP Solver”.

Run-Time Weight Tuning and Constraint Softening for MPC Controller

This release introduces three new run-time tuning parameters for the MPC Controller block:

- **Weights on plant outputs**
- **Weights on manipulated variables rate**
- **Weight on overall constraints softening**

You can use these parameters to tune the weights on plant outputs, manipulated variables rate, and overall constraint softening. These capabilities are available in real time, without redesigning or re-implementing the MPC controller, and help adjust the controller performance.

For more information, see Tuning Controller Weights.

You can also use an `mpcmoveopt` object as an input to `mpcmove` to tune the weights and constraints.

For more information, see the following:

- Switching Controllers Based on Optimal Costs
- Varying Input and Output Constraints

Run-Time Monitoring of MPC Controller Performance to Detect When an Optimal Solution Cannot Not Be Found

This release introduces a new outport parameter—**Optimization status** in the MPC Controller block. You can use this outport to monitor the status of the optimization and take the necessary action when an optimal solution cannot be found. For more information, see Monitoring Optimization Status to Detect Controller Failures.

You can also use the `Info.QPCode` field of the output of `mpcmove` to monitor the status of the optimization.

For more information, see the `mpcmove` reference page.

review Command for Diagnosing Issues with MPC Controller Parameters That Could Lead to Run-Time Failures

You can now use `review` to detect potential stability and robustness issues (both offline and at run time) with an MPC Controller design. The following aspects of the system are inspected:

- Stability of the model predictive controller and the closed loop
- Potential for contradictory settings in the specified constraints and mitigation of an ill-conditioned QP problem by softening constraints
- Validity of QP Hessian matrix

Use this command before implementing the MPC Controller, in conjunction with simulation.

For more information, see the following:

- `review` reference
- Reviewing Model Predictive Controller Design for Potential Stability and Robustness Issues.

mpcmove Returns Aligned Time Horizons for Optimal Control, Predicted Output and Estimated State

`mpcmove` now returns `Info` with a time horizon of `t=`k`,...,`k`+`p, where k is the current time and p is the prediction horizon for the following fields:

- `Info.Uopt` — Optimal manipulated variable adjustments
- `Info.Yopt` — Predicted output
- `Info.Xopt` — Predicted state
- `Info.Topt` — Time horizon

You can now plot `Info.Uopt`,`Info.Yopt` and `Info.Xopt` using `Info.Topt` as the time vector.

For more information, see the `mpcmove` reference page.

Functionality Being Removed or Changed

Functionality	What Happens When You Use This Functionality?	Use This Instead	Compatibility Considerations
`getmpcdata`	Still runs	• `get` • `getconstraint` • `getestim` • `getindist` • `getoutdist`	Not applicable
`pack`	Still runs	Not applicable	Not applicable

Functionality	What Happens When You Use This Functionality?	Use This Instead	Compatibility Considerations
`qpdantz`	Warns	`quadprog` (requires Optimization Toolbox™)	Replace all instances of `qpdantz` with quadprog.
`setmpcdata`	Still runs	• `set` • `setconstraint` • `setestim` • `setindist` • `setoutdist`	Not applicable

Version 3.3 (R2011a) Model Predictive Control Toolbox Software

This table summarizes what's new in Version 3.3 (R2011a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports Includes fixes

New features and changes introduced in this version are:

- "Support for Custom Constraints on MPC Controller Inputs and Outputs" on page 12
- "Ability to Specify Terminal Constraints and Weights on MPC Controller" on page 13
- "Ability to Access Optimal Cost and Optimal Control Sequence" on page 13

Support for Custom Constraints on MPC Controller Inputs and Outputs

In addition to upper and lower bounds, you can now specify constraints on linear combinations of an MPC controller inputs ($u(t)$) and outputs ($y(t)$). Specify custom constraints, such as $u1 + u2 < 1$ or $u + y < 2$, in the `mpc` object using `setconstraint`.

For more information, see:

- "Custom Constraints on Inputs and Outputs"
- "Custom Constraints in a Blending Process"
- MPC Control with Constraints on a Combination of Input and Output Signals demo

Ability to Specify Terminal Constraints and Weights on MPC Controller

You can now specify weights and constraints on the terminal predicted states of an MPC controller.

Using terminal weights, you can achieve infinite horizon control. For example, you can design an unconstrained MPC controller that behaves in exactly the same way as a Linear-Quadratic Regulator (LQR). You can use terminal constraints as an alternative way to achieve closed-loop stability by defining a terminal region.

You can specify both weights and constraints using the `setterminal` command.

For more information, see:

- “Terminal Weights and Constraints”
- “Using Terminal Penalty to Provide LQR Performance”
- Implementing Infinite-Horizon LQR by Setting Terminal Weights in a Finite-Horizon MPC Formulation demo

Ability to Access Optimal Cost and Optimal Control Sequence

This release introduces two new parameters **Enable optimal cost outport** and **Enable control sequence outport** in the MPC Controller block. Using these parameters, you can access the optimal cost and control sequence along the prediction horizon. This information helps you analyze control performance.

You can also access the optimal cost and control sequence programmatically using the new `Cost` and `Yopt` fields, respectively, of the structure `info` returned by `mpcmove`.

For more information on using optimal cost and control sequence, see the following demos:

- MPC Control with Input Quantization Based on Comparing the Optimal Costs

- Analysis of Control Sequences Optimized by MPC on a Double Integrator System

Version 3.2.1 (R2010b) Model Predictive Control Toolbox Software

This table summarizes what's new in Version 3.2.1 (R2010b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
No	No	No

Version 3.2 (R2010a) Model Predictive Control Toolbox Software

This table summarizes what's new in Version 3.2 (R2010a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports Includes fixes

New features introduced in this version:

New Ability to Analyze SISO Generalized Predictive Controllers (GPC)

You can now use `gpc2mpc` to convert your SISO GPC controller to an MPC controller. Analyze and simulate the resulting MPC controller using available Model Predictive Control Toolbox™ commands.

For more information, see the `gpc2mpc` reference page.

Version 3.1.1 (R2009b) Model Predictive Control Toolbox

This table summarizes what's new in Version 3.1.1 (R2009b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
No	No	Bug Reports Includes fixes

Version 3.1 (R2009a) Model Predictive Control Toolbox Software

This table summarizes what's new in Version 3.1 (R2009a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports Includes fixes

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

New Sensitivity Analysis to Determine Effect of Weights on Tuning MPC Controllers

You can now perform sensitivity analysis to determine the effect of weights on the closed-loop performance of your system. You can perform sensitivity analysis using the following:

- MPC Tuning Advisor. See Tuning Advisor in the *Model Predictive Control User's Guide*.
- `sensitivity` command. See the sensitivity reference page.

Version 3.0 (R2008b) Model Predictive Control Toolbox Software

This table summarizes what's new in Version 3.0 (R2008b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports Includes fixes

New features and changes introduced in this version are:

- "New Multiple MPC Controllers Block in the Model Predictive Control Toolbox Simulink Library" on page 19
- "Tested Code Generation Support for Real-Time Workshop Target Systems" on page 20
- "Ability to Design Controllers with Time-Varying Weights and Constraints Using the GUI" on page 20

New Multiple MPC Controllers Block in the Model Predictive Control Toolbox Simulink Library

You can now use the Multiple MPC Controllers block in Simulink software to control a nonlinear process over a range of operating points. You include an MPC controller for each operating point in the Multiple MPC Controllers block and specify switching between these controllers in real-time based on the input scheduling signal to the block. If you need to change the design of a specific controller, you can open the MPC Design Tool GUI directly from the Multiple MPC Controllers block.

During model simulation, Model Predictive Control Toolbox provides bumpless transfer when the system transitions between operating points.

To learn more about configuring the new block, see the Multiple MPC Controllers block reference page.

Tested Code Generation Support for Real-Time Workshop Target Systems

After designing an MPC controller in Simulink software using the MPC Controller block, you can use Real-Time Workshop® software to build this controller and deploy it to the following target systems for real-time control:

- Generic Real-Time Target
- Real-Time Workshop® Embedded Coder™
- Real-Time Windows Target
- Rapid Simulation Target
- Target Support Package FM5
- xPC Target
- dSpace Target
- Target for Infineon TriCore

The following target systems are either not supported or not recommended because they result in significant performance issues:

- Embedded Target for TI C2000 DSP
- Embedded Target for TI C6000 DSP
- Target Support Package IC1 (for Infineon C166)
- Tornado (VxWorks) Real-Time Target

Note The Multiple MPC Controllers block has not been tested with the target systems supported by Real-Time Workshop software.

Ability to Design Controllers with Time-Varying Weights and Constraints Using the GUI

While you design an MPC controller using the MPC Design Tool graphical user interface (GUI), you can specify time-varying weights and constraints for manipulated variables, rate of change of manipulated variables, and output variables. In the previous version, you could only specify the time-varying weights and constraints at the command line.

Furthermore, you can load an MPC controller with time-varying information from the command line into the MPC Design Tool GUI.

To learn more about the new options in the MPC Design Tool GUI, see the Model Predictive Control Toolbox documentation.

Version 2.3.1 (R2008a) Model Predictive Control Toolbox Software

This table summarizes what's new in Version 2.3.1 (R2008a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
No	No	No

Version 2.3 (R2007b) Model Predictive Control Toolbox Software

This table summarizes what's new in Version 2.3 (R2007b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	No

New features and changes introduced in this version are:

- "New Option for Specifying Time-Varying Constraints" on page 23
- "Ability to Specify Nondiagonal Q and R Weight Matrices in the Cost Function" on page 23

New Option for Specifying Time-Varying Constraints

You can now configure the Model Predictive Controller block in Simulink to accept time-varying constraint signals that are generated by other blocks. To add inports to which you can connect time-varying constraint specifications, select the new **Enable input port for input and output limits** check box in the MPC Controller block. See also the `mpcvarbounds` demo.

In the previous version, you could only specify the constraints during the design phase and these contraints remained constant for the duration of the simulation.

For more information about the new **Enable input port for input and output limits** check box in the Model Predictive Controller block, see the MPC Controller block reference page.

Ability to Specify Nondiagonal Q and R Weight Matrices in the Cost Function

You can now specify off-diagonal weights in the cost function. In the previous release, only diagonal Q and R matrices were supported.

To learn more about specifying off-diagonal weights, see the discussion about weights in the MPC Controller block reference pages.

To access a new demo that shows how to use nondiagonal weight matrices, type the following command at the MATLAB prompt:

```
showdemo('mpcweightsdemo')
```

Version 2.2.4 (R2007a) Model Predictive Control Toolbox Software

This table summarizes what's new in Version 2.2.4 (R2007a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
No	No	Bug Reports Includes fixes

Version 2.2.3 (R2006b) Model Predictive Control Toolbox Software

This table summarizes what's new in Version 2.2.3 (R2006b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
No	No	No bug fixes

Version 2.2.2 (R2006a) Model Predictive Control Toolbox Software

This table summarizes what's new in Version 2.2.2 (R2006a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	No bug fixes

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

Bumpless Transfer Added to MPC Block

Bumpless transfer between manual and automatic operation or from one controller to another has been added to the Model Predictive Controller block in Simulink. This block now allows feedback of the true manipulated variable signals, which allows the controller to maintain an accurate state estimate during periods when its calculated adjustments are not being sent to the plant. For example, the controller's output might be ignored during a startup period or during temporary intervention by a (simulated) plant operator. If the controller assumes that its adjustments are being implemented (the default behavior), its state estimate will be incorrect, leading to a "bump" when the controller is reconnected to the plant. A tutorial example has been added to the documentation.

New Bumpless Transfer Demo

A new demo illustrating bumpless transfer has been added to the toolbox.

Version 2.2.1 (R14SP3) Model Predictive Control Toolbox Software

This table summarizes what's new in Version 2.2.1 (R14SP3):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
No	No	No bug fixes

Version 2.2 (R14SP2) Model Predictive Control Toolbox Software

This table summarizes what's new in Version 2.2 (R14SP2):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
No	No	No bug fixes

Version 2.1 (R14SP1) Model Predictive Control Toolbox Software

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

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
No	No	Bug Reports

Version 2.0 (R14) Model Predictive Control Toolbox Software

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

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports

New features and changes introduced in this version are

- "Object-Oriented Command Syntax Revised" on page 31
- "MPC Block for Simulink Revised" on page 32
- "MPC Tools Designer Added" on page 32
- "Integration with Other MATLAB Toolboxes" on page 32
- "Demos" on page 33
- "Documentation" on page 33

Object-Oriented Command Syntax Revised

The command syntax has been completely revised, and is similar to that used in the Control System Toolbox™ software. You create an "LTI object" to represent the plant to be controlled, using it and other specifications to create an MPC object, which represents the controller. You can then analyze controller properties, run simulations, modify the controller design, etc. The following list summarizes the major command features:

- Create and modify an MPC object.
- Extract a linear representation of the unconstrained controller as an LTI object (transfer function, state space, or zero-pole-gain).
- Calculate closed-loop steady-state gains for the unconstrained controller.
- Determine closed-loop steady-state conditions for given inputs and/or outputs.

- Calculate the constrained control action at a specified condition (can be used repeatedly as time evolves in a simulation or experiment).
- Simulate closed-loop constrained response for a linear plant and arbitrary changes in the reference signals (setpoints), disturbances, and noise.
- Specify disturbance characteristics to improve regulation while maintaining good response to reference signal changes (2-DOF design).

MPC Block for Simulink Revised

The completely revised MPC block lets you insert your MPC controller object into a Simulink block diagram. You can use multiple MPC blocks within a single Simulink model if you want. In any case, the MPC block makes it easy to evaluate controller performance with a nonlinear plant.

MPC Tools Designer Added

MPC Tools is a new graphical environment that lets you design and test an MPC controller object without learning the command syntax. It is tightly integrated with the MPC block for Simulink, making it easy to run either a linear or nonlinear simulation.

Integration with Other MATLAB Toolboxes

The Model Predictive Control Toolbox software uses the same LTI model representation found in the Control System Toolbox software, System Identification Toolbox™ software, etc. Examples of ways in which you can exploit toolbox compatibility include the following:

- Import raw dynamic response data to the System Identification Toolbox software, determine an appropriate LTI plant model, and export it to Model Predictive Control Toolbox software for controller design.
- Extract an LTI representation of a model predictive controller for analysis in the Control System Toolbox or Robust Control Toolbox™ software.

Integration with the Control and Estimation Tools Manager

The MPC Design Tool graphical user interface is integrated with other control and estimation projects within the Control and Estimation Tools Manager environment. In general, this lets you group control-related applications associated with the same Simulink model and share infrastructure. Specifically, the ability to combine the functionality of Model Predictive Control Toolbox and Simulink Control Design™ software allows in-situ model predictive control design in Simulink by linearizing a Simulink model as it is connected to an MPC block, with automatic use of the resulting linear model to define the internal MPC plant model.

Demos

The Model Predictive Control Toolbox software includes new demos that highlight all the added features.

Documentation

The documentation has been revised completely.

Compatibility Summary for Model Predictive Control Toolbox

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 with the description of the new feature or change.

Version (Release)	New Features and Changes with Version Compatibility Impact
Latest Version V4.1 (R2012a)	See the **Compatibility Considerations** subheading for the following new features or changes: "Run-Time Preview of Reference and Measured Disturbance Signals with MPC Controller Block" on page 4
V4.0 (R2011b)	See "Functionality Being Removed or Changed" on page 10
V3.3 (R2011a)	None
V3.2.1 (R2010b)	None
V3.2 (R2010a)	None
V3.1.1 (R2009b)	None
V3.1 (R2009a)	None
V3.0 (R2008b)	None
V2.3.1 (R2008a)	None
V2.3 (R2007b)	None
V2.2.4 (R2007a)	None
V2.2.3 (R2006b)	None
V2.2.2 (R2006a)	None
V2.2.1 (R14SP3)	None
V2.2 (R14SP2)	None

Version (Release)	New Features and Changes with Version Compatibility Impact
V2.1 (R14SP1)	None
V2.0 (R14)	None