SimMechanics™ Release Notes

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	Related Documentation at Web Site
Latest Version V2.7.1 (R2008a)	Yes Details	No	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation
V2.7 (R2007b)	Yes Details	No	Bug Reports Includes fixes	No
V2.6 (R2007a)	Yes Details	Yes Summary	Bug Reports Includes fixes	No
V2.5 (R2006b)	Yes Details	Yes Summary	Bug Reports Includes fixes	No
V2.4 (R2006a)	Yes Details	No	Bug Reports at Web site	No
V2.3 (R14SP3)	Yes Details	No	Bug Reports at Web site	No
V2.2.2 (R14SP2)	Yes Details	No	Bug Reports at Web site	No
V2.2.1 (R14SP1)	Yes Details	No	Fixed bugs at Web site	No
V2.2 (R14)	Yes Details	Yes Summary	Fixed bugs at Web site	No
V2.1.1 (R13SP1)	No	No	Yes Details	No

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
V2.1 (R13+)	Yes Details	No	Fixed bugs at Web site	No
V2.0.1 (R13+)	No	No	Yes Details	No
V2.0 (R13+)	Yes Details	No	Fixed Bugs at Web Site	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 2.7.1 (R2008a) SimMechanics™ Software

This table summarizes what's new in Version 2.7.1 (R2008a):

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

New features and changes introduced in this version are

"What's This?" Context-Sensitive Help Available for Simulink® Configuration Parameters Dialog

R2008a introduces "What's This?" context-sensitive help for parameters that appear in the Simulink® Configuration Parameters dialog. This feature provides quick access to a detailed description of the parameters, saving you the time it would take to find the information in the Help browser.

To use the "What's This?" help, do the following:

1 Place your cursor over the label of a parameter.

2 Right-click. A **What's This?** context menu appears.

For example, the following figure shows the **What's This?** context menu appearing after a right-click on the **Start time** parameter in the **Solver** pane.

3 Click **What's This?** A context-sensitive help window appears showing a
description of the parameter.

Version 2.7 (R2007b) SimMechanics™ Software

This table summarizes what's new in Version 2.7 (R2007b):

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

New features and changes introduced in this version are

- "Interfacing with One-Dimensional Simscape™ Domains" on page 6

- "SimMechanics™ State Names Now Available to Simulink® and Real-Time Workshop®" on page 7

- "Controlling Redundant Constraint Analysis with New Tolerance Setting" on page 7

- "New Demos" on page 7

- "Code Generation Documentation Consolidated to Simscape™ User's Guide" on page 8

Interfacing with One-Dimensional Simscape™ Domains

The Prismatic-Translational Interface and Revolute-Rotational Interface blocks of the new Interface Elements library allow you to connect a SimMechanics™ Prismatic or Revolute joint primitive to a Physical Networks line connected to Simscape™ blocks. The Prismatic-Translational Interface and Revolute-Rotational Interface blocks transfer mechanical velocities and forces/torques as Physical Networks cross- and through-variables, respectively, without energy loss, along or around axes that you can define.

Several new demos illustrate the use of the Interface Elements blocks. See "New Demos" on page 7.

SimMechanics™ State Names Now Available to Simulink® and Real-Time Workshop®

You can access the names of the mechanical states of your SimMechanics models through the mech_stateVectorMgr command. The names of these states and the SimMechanics blocks that define them are now available to Simulink® and appear in the outputs of model simulations. They also appear in simulations based on code generated with Real-Time Workshop®.

See the Simulink and Real-Time Workshop documentation for further details about states.

Controlling Redundant Constraint Analysis with New Tolerance Setting

You can now adjust the sensitivity of the SimMechanics redundant constraint analysis in the **Constraints** panel of the Machine Environment block, which allows you to choose between automatic constraint redundancy analysis or specifying a constraint redundancy tolerance explicitly.

Certain mechanical configurations are sensitive to the constraint redundancy tolerance and can spuriously lose or gain degrees of freedom if this tolerance is adjusted incorrectly. See "Configuring Methods of Solution", "How SimMechanics Software Works", and "Troubleshooting Simulation Errors" in the SimMechanics User's Guide.

New Demos

Nine new demos have been added.

Interface Blocks

These demos illustrate how to use the new Interface Elements blocks. See "Interfacing with One-Dimensional Simscape™ Domains" on page 6.

- mech_interface_crate_transfer

- mech_interface_dspring_damper

- mech_interface_hyd_cylinder

- mech_interface_hyd_slidercrank

- `mech_interface_rot_spr_damper`

- `mech_interface_trans_spr_damper`

Car Modeling

These new demos provide examples of sophisticated automotive modeling.

- `mech_car_handling`

- `mech_car_kinematics`

These demos shipped in the Version 2.6 (R2007a) SimMechanics product.

Code Generation Documentation Consolidated to Simscape™ User's Guide

Documentation of code generation features common to all vertical Physical Modeling products based on Simscape software has been consolidated to the Simscape User's Guide. The SimMechanics User's Guide continues to document uniquely SimMechanics features related to code generation.

Version 2.6 (R2007a) SimMechanics™ Software

This table summarizes what's new in Version 2.6 (R2007a):

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

New features and changes introduced in this version are

- "SimMechanics™ Software Now Requires Simscape™ Product" on page 9
- "Sharing Models Using Simscape™ Editing Modes" on page 9
- "Block Library Links Must Be Resolved" on page 10
- "Two Blocks Now with Tunable Parameters" on page 10
- "Demos Expanded" on page 11
- "Modeling Constraints with SimMechanics™ Software" on page 11

SimMechanics™ Software Now Requires Simscape™ Product

SimMechanics™ software now depends on and requires Simscape™ software, the foundation for Physical Modeling products. Simscape software includes common Physical Modeling utilities and block libraries. See "Product Overview" and the Simscape documentation.

Sharing Models Using Simscape™ Editing Modes

SimMechanics software now features a selection of two Simscape editing modes that allow full or restricted editing of models.

- The Restricted mode requires SimMechanics product to be installed, but does not require a license. It allows you to change a limited set of model parameters, but not the blocks or connections, in a SimMechanics model.

- The Full mode requires both Simscape and SimMechanics products to be installed. It allows you to change anything in a SimMechanics model.

For more details, see "Using the Simscape Editing Mode" in "Running Mechanical Models".

Block Library Links Must Be Resolved

All SimMechanics blocks in your models must now have resolved block library links. You can neither disable nor break these library links. This is a global Simscape requirement. Consult the Simscape documentation for further details.

Compatibility Considerations

If you have an existing SimMechanics model with disabled or broken links from SimMechanics blocks to the SimMechanics block library, you must restore all the broken block library links for your model to be valid.

If you have disabled or broken the SimMechanics library link for blocks that you have customized and want to keep these modified blocks in your model, you must move these modified blocks to your own custom library or libraries, then copy the block instances that you need to your model.

You must still restore the block link to its parent library, whether that parent is the SimMechanics block library or your own.

Two Blocks Now with Tunable Parameters

These SimMechanics parameters are now tunable from their respective block dialogs:

- The **Gravity vector** field of the Machine Environment block.

- All three parameter fields of the Body Spring & Damper block.

See "Limitations" in "Running Mechanical Models" for more about SimMechanics tunable parameters and the Simulink® documentation for tunable parameters in general.

Demos Expanded

Five new demos have been added.

Angular Motion Equivalence

The mech_gimbal_transform demo shows the equivalence of a body's angular motion as measured by Joint Sensors and as measured by Body Sensors.

Joint Limits

Two demos illustrate how to model limits or clearance on joint motion:

- mech_jointlimit_prismatic
- mech_jointlimit_revolute

The first illustrates limits on translational motion; the second, limits on rotational motion.

Stochastic Oscillator and Controller

Two demos simulate a mixture of deterministic and random forces with a model of a micromechanical damped linear oscillator:

- mech_brownian_osc
- mech_brownian_osc_control

The first model has no controller; the second, a control force in addition to the damped spring and white noise forces.

Modeling Constraints with SimMechanics™ Software

A new MATLAB Digest article explains how to model mechanical constraints with SimMechanics blocks. The article uses a set of four existing SimMechanics demos as illustrations.

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Version 2.5 (R2006b) SimMechanics™ Software

This table summarizes what's new in Version 2.5 (R2006b):

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

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

- "Computer-Aided Design Translator for Pro/ENGINEER® Available via the Web" on page 12
- "SolidWorks®-to-SimMechanics™ Translator Now Available Only via the Web" on page 13
- "New Demo" on page 14
- "Modeling Flexible Bodies with SimMechanics™ Software" on page 14

Computer-Aided Design Translator for Pro/ENGINEER® Available via the Web

A new computer-aided design (CAD) Pro/ENGINEER®-to-SimMechanics™ translator is available. You install and use this translator with Pro/ENGINEER. It is independent of MATLAB®.

The translator converts a Pro/ENGINEER CAD machine assembly into an XML file in the Physical Modeling format. The XML file represents the assembly in a form that you can use to generate a SimMechanics block diagram model dynamically equivalent to the original CAD assembly. To generate models, use the import_physmod command.

Installing the Pro/ENGINEER®-to-SimMechanics™Translator

Obtain and use the installer executable by locating and downloading its archive at `www.mathworks.com/products/simmechanics/`. A README page is provided that describes installation and configuration details.

Translator Documentation

Help files accompany the Pro/ENGINEER-to-SimMechanics translator. They include two HTML pages and a PDF book. These files are independent of the MATLAB help system.

Translator Examples

Some examples of Pro/ENGINEER CAD assemblies are included with the Pro/ENGINEER-to-SimMechanics translator.

One of the examples is a robot arm assembly. The corresponding XML file in Physical Modeling format, `robot.xml`, is located in the `toolbox/physmod/mech/mechdemos/` directory, relative to your MATLAB root.

Compatibility Considerations

Versions of Pro/ENGINEER compatible with the Pro/ENGINEER-to-SimMechanics translator are listed at the MathWorks™ Web site. The translator is available only for the Microsoft Windows® (32-bit) operating system.

SolidWorks®-to-SimMechanics™ Translator Now Available Only via the Web

The existing SolidWorks®-to-SimMechanics translator for the SolidWorks CAD platform continues to be available via the Web, at `www.mathworks.com/products/simmechanics/`. However, it no longer ships with the SimMechanics product.

Compatibility Considerations

Versions of SolidWorks compatible with the SolidWorks-to-SimMechanics translator are listed at the MathWorks Web site.

The SolidWorks CAD platform and the SolidWorks-to-SimMechanics translator are available only for the Microsoft Windows (32-bit) operating system.

New Demo

This version of SimMechanics software includes one new demo model, mech_brownian_osc, a stochastic linear harmonic oscillator based on micro- and biomechanics.

Modeling Flexible Bodies with SimMechanics™ Software

A new MATLAB Digest article and related technical paper explain how to simulate flexible bodies with SimMechanics models and third-party finite element analysis applications. A set of models accompanies the technical paper in a compressed zip archive available from MATLAB Central.

Version 2.4 (R2006a) SimMechanics™ Software

This table summarizes what's new in V2.4 (R2006a):

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

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

- "New Block Dialogs and the Simulink® Model Explorer" on page 15
- "Joint Spring & Damper Adds Extra Simulink® State When Connected to a Revolute" on page 15
- "Improved SolidWorks® CAD Translation" on page 16

New Block Dialogs and the Simulink® Model Explorer

Most of the SimMechanics™ block dialogs have been upgraded and are now compatible with the Simulink® Model Explorer. See the Simulink documentation for more about Model Explorer.

Block Dialogs Not Rendered in Model Explorer

Model Explorer cannot render the dialogs of these blocks:

- Shared Environment
- Point-Curve Constraint

Joint Spring & Damper Adds Extra Simulink® State When Connected to a Revolute

Each Joint Spring & Damper block connected to a revolute primitive now adds a Simulink state to your model. These states are in addition to other normal

Simulink states, such as those associated with Integrator and Transfer Fcn blocks. See the Simulink documentation for more about Simulink model states.

This new feature does not change the mechanical states of your model, those associated with SimMechanics joint blocks. See the `mech_stateVectorMgr` command reference for more about mechanical states.

Improved SolidWorks® CAD Translation

The SolidWorks®-to-SimMechanics translator and Physical Modeling XML import command have been improved. See "Modeling with Computer-Aided Design" and the `import_physmod` command reference in the *SimMechanics User's Guide*.

- Mates in a CAD assembly (restrictions on the free motion of CAD parts) are now translated into Joint blocks that reflect a particular combination of joint primitives, such as Prismatic, Revolute, Spherical, Bushing, etc. Previously, all degrees of freedom in a CAD assembly were translated into appropriately configured Custom Joint blocks. Rigid connections between parts continue to be translated into Welds.

- Blocks in SimMechanics models generated from Physical Modeling XML files are now, by default, labeled with shorter names. You can change the naming convention in the `import_physmod` command options.

Version 2.3 (R14SP3) SimMechanics™ Software

This table summarizes what's new in V2.3 (R14SP3):

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

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

- "New Shared Environment Block" on page 17
- "Updated Body Spring & Damper Block" on page 17
- "Normalizing Rotations" on page 18
- "New State Vector Commands" on page 18
- "New import_physmod Dialog" on page 18
- "Demos Expanded" on page 18
- "Documentation Enhancements" on page 19

New Shared Environment Block

The new Shared Environment block allows you to link two separate SimMechanics™ block diagrams with a nonphysical connection. The block enforces the same machine environment settings on both machines but adds no mechanical components (bodies or degrees of freedom) to either. Two machines so connected require exactly one Machine Environment block, rather than two.

See the Shared Environment block reference for further details.

Updated Body Spring & Damper Block

The Body Spring & Damper block no longer contains any degrees of freedom.

Previous versions of the Body Spring & Damper block contained six degrees of freedom (DoFs) represented by a Joint. This Joint had to be taken into account when counting DoFs and loops in your model.

The new Body Spring & Damper block instead uses a Shared Environment block to connect the two sides and contains no DoFs. See their respective block references for more information.

Normalizing Rotations

The Body dialog accepts various rotational forms (Euler angles, rotation matrix, quaternion). The Body block now interprets these rotational forms in a slightly different way, so that the standard normalization conditions on rotation matrices and quaternions are consistently enforced. As a result, you might now see slightly different simulation results from earlier versions.

New State Vector Commands

Four new SimMechanics commands allow you to manipulate the mechanical states of your models. See the command references for more.

- mech_get_states

- mech_runtime_states

- mech_set_states

- mech_transfer_states

New import_physmod Dialog

The import_physmod command generates SimMechanics models from Physical Modeling XML files. In addition to importing Physical Modeling XML through the command line, you can now set up the command through a dialog.

See the import_physmod command reference for further information.

Demos Expanded

Two new demos have been added:

- mech_flexible_four_bar models a flexible four bar machine.

- `mech_pole_vault` models a rigid pole vaulter, with a discrete event.

The second demo has an associated MAT-file.

Documentation Enhancements

The SimMechanics User's Guide has been enhanced.

- The review chapter on representing motion has been revised.

- The motion analysis chapter has been revised.

- The computer-aided design (CAD) documentation (also available as a separate book) has been significantly revised. See the CAD chapter.

- A new chapter of case studies, based on the Stewart platform, has been added. The studies apply advanced methods and tasks to this system. SimMechanics software includes a related set of demo model and library files.

  - Degrees of freedom, states, closed topology, and constraints
  - Trimming and linearization
  - Designing controllers for the platform
  - Generating code versions of the model
  - Implementing code on dedicated hardware (hardware in the loop)

Version 2.2.2 (R14SP2) SimMechanics™ Software

This table summarizes what's new in V2.2.2 (R14SP2):

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

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

- "Demos Expanded" on page 20
- "Documentation Enhancements" on page 20

Demos Expanded

Two new demos have been added:

- mech_sticky_box
- mech_sticky_screw

Each demo has an associated MAT-file.

These demos illustrate static friction (stiction) implemented with the Joint Stiction Actuator.

Documentation Enhancements

The online SimMechanics™ Help has been enhanced with links to four new Web-based AVI animation files (one of them new in this release) that record SimMechanics simulations.

You can access these links most easily by using the Examples index in the Help browser, under **Prerecorded Animations**.

Version 2.2.1 (R14SP1) SimMechanics™ Software

This table summarizes what's new in V2.2.1 (R14SP1):

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

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

- "Demos Updated and Expanded" on page 21
- "Documentation Enhancements" on page 21

Demos Updated and Expanded

The demos used in the open-topology Inverse Dynamics case study have been changed:

- mech_dpend_invdyn1
- mech_dpend_invdyn2
- mech_dpend_act (a new demo replacing mech_dpend_stat)

The last, new demo has an associated MAT-file, mech_dpend_act.mat. See "Documentation Enhancements" on page 21.

Two other new demos have been added:

- mech_cambelt models a cam, belt, and pulley system with a Point-Curve Constraint block.
- mech_viscous illustrates how to model a viscous medium with a Joint Spring-Damper block.

Documentation Enhancements

The online SimMechanics™ Help has been enhanced with additional multimedia support.

- The online Help contains four detailed mechanical drawings for systems modeled in the user's guide: the conveyor, the four bar machine, and the Stewart platform.

- The online Help also contains links to three new Web-based AVI animation files that record SimMechanics simulations.

You can access these features most easily by using the Examples index in the Help browser, under **Mechanical Drawings** and **Prerecorded Animations**, respectively.

The open-topology Inverse Dynamics section of the motion analysis chapter has been enhanced with a new, more complex and more realistic example. The related demos have been changed as well; see "Demos Updated and Expanded" on page 21 previously.

Version 2.2 (R14) SimMechanics™ Software

This table summarizes what's new in V2.2 (R14):

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

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

- "Simulation and Visualization Controls Changes" on page 24
- "New Machine Environment Block" on page 24
- "Choosing a Ground Block as Machine Root" on page 25
- "Optional Two-Dimensional Solver" on page 25
- "Optional Gravity Signal" on page 26
- "New SimMechanics™ Diagnostics Settings" on page 26
- "Restricted Body Coordinate System References" on page 26
- "Minimum Number of Body Coordinate Systems" on page 27
- "Visualization Controls Relocated" on page 27
- "Manual Updating of Body Visualization" on page 27
- "Internal Virtual Reality Visualization No Longer Supported" on page 27
- "Code Generation with Point-Curve Constraint Now Enabled" on page 28
- "Code Generation Improvements" on page 28
- "Additional Simulink® Features Now Supported" on page 28
- "SimMechanics™ Software Now Supported on HP-UX Platforms" on page 28

Simulation and Visualization Controls Changes

This version of SimMechanics™ software introduces significant changes to how you control simulation, mechanical environment, and visualization in SimMechanics models. These changes, summarized below, include

The new controls are fully documented in the SimMechanics User's Guide chapters on running simulations and visualization.

New Machine Environment Block

In the new version of SimMechanics software, you configure the mechanical environment for an entire model in the **SimMechanics** node of the **Configuration Parameters** dialog, accessed via the **Simulation** menu. You configure the mechanical environment for each separate machine diagram (one or more per model) via its Machine Environment block. These two dialogs replace the old **Mechanical Environment Settings** dialog.

You must connect exactly one Machine Environment block to each separate machine diagram at one of the machine's Ground blocks. The new Machine Environment block is located in the Bodies library.

See "Choosing a Ground Block as Machine Root" on page 25.

Compatibility Considerations

Prior to this version, SimMechanics models recorded mechanical environment data in the **Mechanical Environment Settings** dialog. Although you can no longer access this dialog from the **Simulation** menu, you can continue to run old models as they are. If you want to view these old settings, enter mech_environment(gcs) at the command line with your old model open. You cannot change the dialog settings.

If you want to change the settings in old models or build a new SimMechanics model, you must use the new Machine Environment block. Copying this block from the Bodies library into an old model causes the old **Mechanical Environment Settings** data to be copied into the block. You can then reconfigure the new block as you want.

Choosing a Ground Block as Machine Root

The new Ground block has the option of being chosen as the root for a machine's Machine Environment block. In each separate machine diagram (one or more per model), choose one such Ground by selecting **Show Mechanical Environment port** in its dialog. The corresponding port then appears on the Ground. Then connect a Machine Environment block to the Ground at this port.

See "New Machine Environment Block" on page 24.

Optional Two-Dimensional Solver

The new Machine Environment block allows you to choose, through its **Machine dimensionality** pull-down menu, a specialized solver for a machine that moves in only two dimensions. SimMechanics software detects the dimensionality and automatically adjusts the solver by default. But you can override the default and require SimMechanics software to simulate in either three or two dimensions.

The two-dimensional solver significantly improves simulation performance in two and one dimensions.

Optional Gravity Signal

The new Machine Environment block allows you to input gravity as an external Simulink® signal. In the block dialog, select **Input gravity as signal**. A Simulink inport appears for connecting the Simulink signal line. The gravity must be a three-component vector signal. You choose the units in the **Gravity vector** units pull-down menu of the block dialog. SimMechanics software interprets the vector gravity signal the same way it interprets the static **Gravity vector** field value in the block dialog.

If you choose gravity as a signal, the **Gravity vector** field is ignored.

New SimMechanics™ Diagnostics Settings

SimMechanics software now lets you control diagnostic messages. In the **SimMechanics** node of the **Configuration Parameters** dialog, accessed via the **Simulation** menu, you can select to enable or disable certain warning messages, and whether to mark closed-loop joints cut automatically by SimMechanics software.

Restricted Body Coordinate System References

All coordinate system (CS) references in Body blocks from one CS to another CS must now refer to only

- Other CSs on the same Body
- Adjoining CSs (coordinate systems on Bodies directly connected to the referring body)
- World

All other CS references now cause simulation errors.

Compatibility Considerations

Other types of CS references from one Body to another now lead to simulation errors. If any of your old models contain such references, you must update them.

Minimum Number of Body Coordinate Systems

You can no longer eliminate all the non-center-of-gravity (CG) Body coordinate systems (CSs) on a Body block dialog. Besides the undeletable CG CS entry, at least one non-CG CS must remain.

Visualization Controls Relocated

You now enable SimMechanics visualization and animation for an entire model in the **Visualization** area of the **SimMechanics** node of the **Configuration Parameters** dialog, reached via the **Simulation** menu. You now enable or disable visualization for individual machines within a model via the **Visualization** pane of the Machine Environment block dialog. See "New Machine Environment Block" on page 24.

All SimMechanics visualization controls are now located on the specially configured MATLAB® Graphics visualization window, in the **SimMechanics** menu and toolbar.

Manual Updating of Body Visualization

SimMechanics visualization no longer immediately displays a Body newly added to a model. Instead you must update the model by selecting **Update Diagram** from the **Edit** menu.

Internal Virtual Reality Visualization No Longer Supported

SimMechanics software no longer includes internally integrated Virtual Reality Toolbox™ visualization. Models configured to use virtual reality now default to the MATLAB Graphics visualization/animation tool, which is still supported by SimMechanics software.

See the virtual reality section of the visualization chapter in the SimMechanics documentation.

Consult the Web product page for more about Virtual Reality Toolbox.

Compatibility Considerations

You can continue to use Virtual Reality Toolbox with SimMechanics models by creating your own virtual world for your machine, incorporating into your model a VR Sink block linked to your virtual world, and feeding Body Sensor signals to the VR Sink.

Code Generation with Point-Curve Constraint Now Enabled

The Point-Curve Constraint no longer creates algebraic loops in Simulink. This improvement means that you can now generate code from models containing Point-Curve Constraints.

Code Generation Improvements

The stand-alone SimMechanics library used for code generation is now precompiled for supported platforms using standard targets. This feature significantly speeds up compilation of generated code.

SimMechanics code generation now supports Real-Time Windows Target.

Additional Simulink® Features Now Supported

SimMechanics software now supports Model Referencing and S-function target. It also now supports Simulink External mode, but without visualization. See the sections on generating code and SimMechanics limitations in the SimMechanics documentation.

SimMechanics™ Software Now Supported on HP-UX Platforms

SimMechanics software is now supported on the Hewlett-Packard UNIX® (HP-UX) operating system.

Demos Updated and Expanded

All SimMechanics demos have been updated with the new Machine Environment block. New demos have also been added:

- `mech_bouncing_ball` demonstrates how to model impact and collisional forces using a bouncing ball.

- `mech_flyball` models a flyball governor mechanism.

- `mech_rack_pinion` models a driven rack-and-pinion mechanism.

- `mech_rolling_sphere` demonstrates how to model nonholonomic constraints using a sphere rolling on a two-dimensional surface.

- `mech_toroid` illustrates the Point-Curve Constraint with a body sliding on a toroidal curve.

Documentation Enhancements

The SimMechanics User's Guide has been enhanced.

- The review chapter on body motion and coordinate systems is expanded with greater detail and more examples.

- The computer-aided design (CAD) documentation (also available as a separate book) has been significantly revised and expanded. See the CAD chapter.

- The case study sections on trimming and linearization have been revised and expanded, including a new closed-loop linearization example.

You can find a more complex closed-loop linearization example using a Stewart platform model at

    www.mathworks.com/company/newsletters/digest/sept02/stewart.html

Version 2.1.1 (R13SP1) SimMechanics™ Software

This table summarizes what's new in V2.1.1 (R13SP1):

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

New changes introduced in this version are described here.

Model Reinitialization After Simulation Errors

Restarting a model that had encountered an error during a previous simulation sometimes returned warnings and zero results. Starting the model a third time reproduced the errors of the first simulation. This bug is now fixed.

Version 2.1 (R13+) SimMechanics™ Software

This table summarizes what's new in V2.1 (R13+):

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

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

- "Computer-Aided Design Translator for SolidWorks®" on page 31

- "import_physmod Command for Generating Models" on page 32

- "Documentation and Examples for SolidWorks®-to-SimMechanics™ Translator" on page 32

Computer-Aided Design Translator for SolidWorks®

SimMechanics™ version 2.1 contains a standalone computer-aided design (CAD) translator for the SolidWorks® CAD platform. You install and use this translator with SolidWorks but independently of MATLAB®.

The translator converts a SolidWorks CAD machine assembly into an XML file in the Physical Modeling format. The XML file represents the assembly in a form that you can use to generate a SimMechanics block diagram model dynamically equivalent to the original CAD assembly. To generate models, use the new import_physmod command. See "import_physmod Command for Generating Models" on page 32 below.

Installing the SolidWorks®-to-SimMechanics™ Translator

Obtain the self-extracting executable archive SimMechanics_Translator_for_SolidWorks.exe by locating and downloading its archive at www.mathworks.com/products/simmechanics/.

import_physmod Command for Generating Models

Using the CAD-to-SimMechanics translator, you export a CAD assembly into an XML file in the Physical Modeling format. (See "Computer-Aided Design Translator for SolidWorks®" on page 31.)

This XML file represents the assembly in a form that you can use to generate a SimMechanics block diagram model dynamically equivalent to the original CAD assembly. You generate the model from the XML file with the import_physmod command.

The generated model contains Bodies and Joints that represent the original parts and degrees of freedom of the assembly. You can edit the generated model to add additional SimMechanics and Simulink® blocks.

Documentation and Examples for SolidWorks®-to-SimMechanics™ Translator

The SimMechanics User's Guide has not been updated for this release.

Translator Documentation

Special help files accompany the SolidWorks-to-SimMechanics translator. They include two HTML pages and a PDF book. These files are independent of the MATLAB help system.

Translator Examples

Some examples of SolidWorks CAD assemblies are included with the SolidWorks-to-SimMechanics translator.

One of the examples is a robot arm assembly. The corresponding XML file in Physical Modeling format, robot.xml, is located in the toolbox/physmod/mech/mechdemos directory, relative to your MATLAB root.

Version 2.0.1 (R13+) SimMechanics™ Software

This table summarizes what's new in V2.0.1 (R13+):

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

New changes introduced in this version are described here.

Code Compilation with lcc Compiler

Attempting to compile code generated from SimMechanics™ models using lcc led to errors in Version 2.0. This bug is now fixed.

Version 2.0 (R13+) SimMechanics™ Software

This table summarizes what's new in V2.0 (R13+):

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

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

- "Code Generation with Real-Time Workshop®" on page 34
- "Accelerator Mode and Discrete Events" on page 34
- "Expanded Handle Graphics Visualization Features" on page 35
- "Variable Body Mass and Inertia Tensor" on page 35
- "Vectorized Joint Initial Condition Actuation" on page 35
- "Damped Linear Force Element Blocks" on page 35
- "New Mechanical Branching Bar Block" on page 35

Code Generation with Real-Time Workshop®

You can now generate stand-alone C code from SimMechanics™ models using Real-Time Workshop®. You can also export it to a PC kernel using xPC Target.

SimMechanics version 2.0 requires Real-Time Workshop 5.0.1 or later to generate code for the Rapid Simulation (RSIM) target.

Accelerator Mode and Discrete Events

Accelerator mode now supports discrete events associated with the Joint Stiction Actuator and the Point-Curve Constraint.

Expanded Handle Graphics Visualization Features

The SimMechanics visualization tool has a large number of new features, including recording and playback of simulation animations.

Variable Body Mass and Inertia Tensor

The Sensors & Actuators library features a new Variable Mass & Inertia Actuator block. This block accepts Simulink® signals that vary the mass and/or inertia tensor of the Body block to which it is connected. The block only simulates the changes in the body's mass properties and does not simulate the effect of the thrust forces or torques resulting from the accretion or ejection of mass.

Vectorized Joint Initial Condition Actuation

The Joint Initial Condition Actuator block now lists all the primitives in the Joint block to which it is connected. You can set initial positions/angles and initial velocities separately for each prismatic and revolute primitive.

Damped Linear Force Element Blocks

This release introduces a new block library, Force Elements, with two blocks representing damped linear harmonic oscillator forces. The Body Spring-Damper block simulates a damped spring-like force between two bodies. The Joint Spring-Damper block actuates a joint primitive with a damped spring-like force or torque.

New Mechanical Branching Bar Block

The Utilities library features the new Mechanical Branching Bar block. You can use this block to map multiple sensor and actuator lines to one sensor/actuator port on a Joint, Constraint, or Driver or to one Body coordinate system on a Body.

Compatibility Summary for SimMechanics™ 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 V2.7.1 (R2008a)	No
V2.7 (R2007b)	No
V2.6 (R2007a)	See the **Compatibility Considerations** subheading for this new feature: • "Block Library Links Must Be Resolved" on page 10
V2.5 (R2006b)	See the **Compatibility Considerations** subheading for each of these new features: • "Computer-Aided Design Translator for Pro/ENGINEER® Available via the Web" on page 12 • "SolidWorks®-to-SimMechanics™ Translator Now Available Only via the Web" on page 13
V2.4 (R2006a)	No
V2.3 (R14SP3)	No
V2.2.2 (R14SP2)	No
V2.2.1 (R14SP1)	No

Version (Release)	New Features and Changes with Version Compatibility Impact
V2.2 (R14)	See the **Compatibility Considerations** subheading for each of these new features or changes: • "New Machine Environment Block" on page 24 • "Restricted Body Coordinate System References" on page 26 • "Internal Virtual Reality Visualization No Longer Supported" on page 27
V2.1.1 (R13SP1)	No
V2.1 (R13+)	No
V2.0.1 (R13+)	No
V2.0 (R13+)	No