SimDriveline™ Release Notes

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SimDriveline™ 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	Related Documentation at Web Site
Latest Version V1.5.1 (R2008b)	Yes Details	No	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation
V1.5 (R2008a)	Yes Details	No	Bug Reports Includes fixes	No
V1.4 (R2007b)	Yes Details	No	Bug Reports Includes fixes	No
V1.3 (R2007a)	Yes Details	Yes Summary	Bug Reports Includes fixes	No
V1.2.1 (R2006b)	No	No	Bug Reports Includes fixes	No
V1.2 (R2006a)	Yes Details	No	Bug Reports at Web site	No
V1.1.1 (R14SP3)	No	No	Bug Reports at Web site	No
V1.1 (R14SP2+)	Yes Details	Yes Summary	Bug Reports at Web site	No
V1.0.2 (R14SP2)	No	Yes Summary	Bug Reports at Web site	No
V1.0.1 (R14SP1)	No	No	Fixed Bugs at Web site	No
V1.0 (R14+)	Yes	No	No	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 1.5.1 (R2008b) SimDriveline Software

This table summarizes what's new in Version 1.5.1 (R2008b):

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

- "Improved Fundamental and Controllable Friction Clutch Mode Logic" on page 4

- "Physical Modeling of Mechanical Friction" on page 4

Improved Fundamental and Controllable Friction Clutch Mode Logic

The Fundamental Friction Clutch and Controllable Friction Clutch blocks now have additional state transitions to prevent the Clutch from getting stuck in either Wait state. The Clutch can now transition directly from Wait Forward to Wait Reverse and vice versa. This change in clutch logic might lead to changes in simulation results, compared to results produced by earlier versions. If they differ, the new results are more accurate.

Physical Modeling of Mechanical Friction

A new MATLAB Digest article explains how to simulate mechanical friction with Simulink, SimDriveline™, and SimMechanics™ models. A set of models accompanies the article in a compressed zip archive available from MATLAB Central.

Version 1.5 (R2008a) SimDriveline Software

This table summarizes what's new in Version 1.5 (R2008a):

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

New features and changes introduced in this version are

- "New Fundamental Friction Clutch Block" on page 5

- ""What's This?" Context-Sensitive Help Available for Simulink Configuration Parameters Dialog" on page 5

New Fundamental Friction Clutch Block

The new Fundamental Friction Clutch block allows you to create customized clutch models. It requires you to provide the kinetic and static friction torques as functions of time, in the form of Simulink input signals.

The existing Controllable Friction Clutch block is unchanged in functionality. But it is now based on the Fundamental Friction Clutch.

"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 1.4 (R2007b) SimDriveline Software

This table summarizes what's new in Version 1.4 (R2007b):

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

New features and changes introduced in this version are

- "Interfacing with One-Dimensional Simscape Domains" on page 7
- "Run-Time Parameters Enabled for Three More Blocks" on page 7
- "New Demos" on page 8
- "Code Generation Documentation Consolidated to Simscape User's Guide" on page 8

Interfacing with One-Dimensional Simscape Domains

The Rotational Coupling block of the new Interface Elements library allows you to connect a SimDriveline driveshaft (driveline connection line) to a Physical Networks line connected to Simscape™ blocks. The Rotational Coupling block transfers driveline angular velocity and torque as Physical Networks cross- and through-variables, respectively, without energy loss.

Several new demos illustrate the use of the Interface Elements blocks. See "New Demos" on page 8.

Run-Time Parameters Enabled for Three More Blocks

Run-time parameters for code generation are now enabled for three additional blocks:

- Controllable Friction Clutch (PeakFactor: static friction peak factor)
- Initial Condition
- Torsional Spring-Damper (Backlash: ±backlash: half of full backlash range)

7

New Demos

Two 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 7.

- `drive_interface_hyd_clutch`

- `drive_interface_rot_coupling`

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 SimDriveline User's Guide continues to document uniquely SimDriveline features related to code generation.

Version 1.3 (R2007a) SimDriveline Software

This table summarizes what's new in Version 1.3 (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 Includes fixes	No

New features and changes introduced in this version are

- "SimDriveline 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

SimDriveline Software Now Requires Simscape Product

SimDriveline 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

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

- The Restricted mode requires SimDriveline 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 SimDriveline model.

- The Full mode requires SimDriveline product to be installed with a license. It allows you to change anything in a SimDriveline model.

For more details, see "Using the Simscape Editing Mode".

Block Library Links Must Be Resolved

All SimDriveline 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 SimDriveline model with disabled or broken links from SimDriveline blocks to the SimDriveline block library, you must restore all the broken block library links for your model to be valid.

If you have disabled or broken the SimDriveline 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 SimDriveline block library or your own.

Version 1.2.1 (R2006b) SimDriveline Software

This table summarizes what's new in Version 1.2.1 (R2006b):

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

Version 1.2 (R2006a) SimDriveline Software

This table summarizes what's new in V1.2 (R2006a):

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

- "Improved Clutch Locking and Unlocking" on page 12
- "Changed Transmission Template" on page 12
- "Run-time Parameters Enabled for Key Blocks" on page 13
- "Demos Expanded" on page 13
- "Documentation Enhancements" on page 14

Improved Clutch Locking and Unlocking

The clutch now uses an improved state projection technique when your driveline's dynamic constraints (clutch modes) change. This method minimizes the kinetic energy of the difference between angular velocity states of the system before and after the change. As a result, clutch mode changes now yield more physical results.

See the Controllable Friction Clutch block reference page.

Changed Transmission Template

A new transmission template, CR-CR 4-Speed, has replaced the Simpson 4-Speed transmission block in the Transmission Templates library. The new transmission is constructed and functions somewhat differently from the old one. See the block reference page for more details.

You do not need to update Simpson 4-Speed transmissions in your old models with CR-CR 4-Speed blocks. Instances of transmission templates in your old

models are not linked to the Transmission Templates library. They continue as valid subsystems in any models where you use them.

Run-time Parameters Enabled for Key Blocks

Run-time parameters for code generation are now enabled for certain blocks:

- Inertia
- Simple Gear
- Planet-Planet
- Ring-Planet
- Planetary Gear
- Dual-Ratio Planetary
- Ravigneaux
- Differential

Tunable Parameters

Certain blocks have some run-time parameters tunable during simulation. The tunable parameters on each block are associated with normal Simulink blocks in the underlying subsystem.

- Controllable Friction Clutch
- Diesel Engine
- Gasoline Engine
- Hard Stop
- Longitudinal Vehicle Dynamics
- Tire
- Torsional Spring-Damper

Demos Expanded

Seven new demos have been added.

Animated Gear Demos

These demos include five animated gear demos. They illustrate the motion of five complex gear sets. Each has an associated M-file and MAT-file.

- drive_planet_planet_pic

- drive_ring_planet_pic

- drive_planetary_pic

- drive_dual_ratio_planetary_pic

- drive_ravigneaux_pic

Flexible Shaft Demos

The demos also include one flexible shaft demo and one flexible shaft demo library. They illustrate how to model angular flexibility with discrete inertias connected by torsional springs.

- drive_flexible_shaft

- drive_flexible_shaft_element

Documentation Enhancements

The online SimDriveline Help has been enhanced with additional multimedia support.

- The online Help contains mechanical drawings for five complex gear sets.

- The online Help also contains links to five new Web-based AVI animation files that illustrate the motion of these five complex gear sets.

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

Version 1.1.1 (R14SP3) SimDriveline Software

This table summarizes what's new in V1.1.1 (R14SP3):

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

Version 1.1 (R14SP2+) SimDriveline Software

This table summarizes what's new in V1.1 (R14SP2+):

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.	Bug Reports at Web site	No

New features and changes introduced in this version are

- "Changes to the Driveline Environment Block" on page 16
- "Changes to the Controllable Friction Clutch Block" on page 17
- "Differential Gear Ratio Redefined" on page 17
- "Efficiency Block Library and Demo" on page 18
- "Documentation Improvements" on page 19

Changes to the Driveline Environment Block

The Driveline Environment block has been changed for this release.

- The **Simulation mode** pull-down menu has been removed.

  You can linearize a model directly with the linmod command and other MATLAB and Simulink tools. See "Documentation Improvements" on page 19.

- A new option has been added for enabling and specifying a default velocity tolerance for all clutches in the connected driveline. See the block reference page and "Changes to the Controllable Friction Clutch Block".

Compatibility Considerations

Driveline Environment blocks are automatically updated when you open a model created from previous SimDriveline versions.

The new block uses the default clutch velocity tolerance configuration. The automatic default is enabled for all non-overriding clutches if you use a variable-step solver.

Changes to the Controllable Friction Clutch Block

The Controllable Friction Clutch block has been changed for this release. A new option, controlled by two new check boxes, has been added to choose between a default velocity tolerance for all clutches and an override velocity tolerance for individual clutches.

See the block reference page and "Changes to the Driveline Environment Block".

Compatibility Considerations

Controllable Friction Clutch blocks are automatically updated when you open a model created from previous SimDriveline versions.

- If the previous **Velocity tolerance** value was the default [ ], the velocity tolerance value is reset to 1e-3 radians/second. Both new check boxes are selected.

- If the previous **Velocity tolerance** was a numerical value or expression, that value or expression is preserved. Both new check boxes are unselected.

Differential Gear Ratio Redefined

The gear ratio of the Differential block has been redefined. Its value now is twice the old value. The differential angular velocity constraint is now

$$\omega_I = (1/2) \cdot g_D(\omega_{O1} + \omega_{O2})$$

where the leading 1/2 is new.

If you load an old model with Differential blocks, the SimDriveline software warns you of each obsolete block. If you try to run the model without updating, the simulation stops with an error.

Compatibility Considerations

You need to update any old Differential blocks in your model. SimDriveline version 1.1 provides an update script. To update your model `drive_model`,

1 Enter `drive_update('drive_model')` at the command line.

2 The script updates your blocks, then opens a **Save** dialog for you to save the updated model under a new name.

3 The script warns you if you have any Differentials linked to external libraries.

When you run the script on a model, it does not update any linked libraries. You must update each library separately the same way you would update a model.

Caution Once you update a model this way, you cannot recover the old version. If you want to keep it, save the old version under a different name, or save the updated version under a new name.

Efficiency Block Library and Demo

The demos directory `toolbox/physmod/drive/drivedemos` contains a new block library with driveline efficiency loss blocks and one efficiency demo.

Efficiency Library

The `drive_efficiency` demo model is a block library. It contains three efficiency blocks (masked subsystems) that model these efficiency-power loss phenomena in driveline systems:

- Constant efficiency loss (introduces an algebraic loop)

- Variable efficiency loss (introduces an algebraic loop)

- Power measurement

You can break the induced algebraic loops by inserting Transfer Fcn blocks into the underlying subsystems.

The library also contains two unmasked subsystems that implement the basic load- or torque-based driveline efficiency loss.

Documentation Improvements

The "Advanced Methods" chapter has been improved and expanded.

- The "Improving Performance" section has been expanded.
- A new section, "Trimming and Linearizing Driveline Models", has been added.

Version 1.0.2 (R14SP2) SimDriveline Software

This table summarizes what's new in V1.0.2 (R14SP2):

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

- "Documentation Improvements" on page 20

- "Using SimDriveline and SimMechanics Software Together" on page 20

Documentation Improvements

The SimDriveline documentation is significantly improved over the Version 1.0.1 documentation. The User's Guide includes a revised set of tutorials, including a full car simulation example. It also includes a new chapter on advanced driveline modeling methods.

Using SimDriveline and SimMechanics Software Together

If you open the SimMechanics library or a model with SimMechanics blocks, then open an old SimDriveline model (built in Version 1.0.1 or earlier) in the new Version 1.0.2, you might cause a MATLAB memory segmentation violation.

Compatibility Considerations

To work around this problem, you must update your old models. Download the necessary file from the MathWorks Web site www.mathworks.com by following the Web link provided. This link is available only in the HTML

version of these Release Notes, accessible through the Help browser or the MathWorks Web site.

Once you have downloaded the file `fix_opaque.p`, place it anywhere on your MATLAB path. Then shut down and restart MATLAB. At the command line, enter

```
rehash toolboxcache
```

Then run the file on your old model by entering

```
fix_opaque('<model_name>')
```

where `model_name` is the name of the old model.

Note Your file download uses the MathWorks FTP server. To log in to the FTP server, use `anonymous` as your username and your full e-mail address when you are prompted for a password.

Version 1.0.1 (R14SP1) SimDriveline Software

This table summarizes what's new in V1.0.1 (R14SP1):

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

New features and changes introduced in this version are

Documentation Improvements

The SimDriveline documentation is significantly improved over the Version 1.0 documentation. The User's Guide now includes a complete set of tutorials, including a full car simulation example.

Version 1.0 (R14+) SimDriveline Software

This table summarizes what's new in V1.0 (R14+):

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

Introduction to SimDriveline Software

SimDriveline Physical Modeling software is a new product in the Physical Modeling family that models and simulates drivetrain systems. With it, you can model bodies rotating around multiple driveline axes, connect them with gears, and create idealized powertrains with clutches, transmissions, and other dynamic elements and subsystems. SimDriveline software also lets you actuate and measure rotational motion and torques by interfacing with normal Simulink signal lines and blocks. You can develop controllers with Simulink and connect them to SimDriveline models. With SimDriveline software, you can model, simulate, analyze, and control the rotational motions of complex drivetrains.

Compatibility Summary for SimDriveline 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 V1.5.1 (R2008b)	No
V1.5 (R2008a)	No
V1.4 (R2007b)	No
V1.3 (R2007a)	See the **Compatibility Considerations** subheading for this new feature: • "Block Library Links Must Be Resolved" on page 10
V1.2.1 (R2006b)	No
V1.2 (R2006a)	No
V1.1.1 (R14SP3)	No
V1.1 (R14SP2+)	See the **Compatibility Considerations** subheading for each of these new features or changes: • "Changes to the Driveline Environment Block" on page 16 • "Changes to the Controllable Friction Clutch Block" on page 17 • "Differential Gear Ratio Redefined" on page 17

Version (Release)	New Features and Changes with Version Compatibility Impact
V1.0.2 (R14SP2)	See the **Compatibility Considerations** subheading for this new change: • "Using SimDriveline and SimMechanics Software Together" on page 20
V1.0.1 (R14SP1)	No
V1.0 (R14+)	No