

# **SimDriveline Release Notes**

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## Summary by Version

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

<b>Version (Release)</b>	<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>	<b>Related Documentation at Web Site</b>
<b>Latest Version V1.3 (R2007a)</b>	Yes Details	Yes Summary	Bug Reports Includes fixes	Printable Release Notes: PDF  Current product documentation
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

### About Release Notes

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

If you are not upgrading from the most recent previous version, review release notes for all interim versions, not just for the version you are installing. For example, when upgrading from V1.0 to V1.2, review the New Features and Changes, Version Compatibility Considerations, and Bug Reports for V1.1 and V1.2.

## **New Features and Changes**

These include

- New functionality
- Changes to existing functionality
- Changes to system requirements (complete system requirements for the current version are at the MathWorks Web site)
- Any version compatibility considerations associated with each new feature or change

## **Version Compatibility Considerations**

When a new feature or change introduces a known incompatibility between versions, its description includes a **Compatibility Considerations** subsection that details the impact. For a list of all new features and changes that have compatibility impact, see the “Compatibility Summary for SimDriveline” on page 19.

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

## **Fixed Bugs and Known Problems**

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

Access Bug Reports at the MathWorks Web site using your MathWorks Account. If you are not logged in to your MathWorks Account when you link

to Bug Reports, you are prompted to log in or create an account. You then can view bug fixes and known problems for R14SP2 and more recent releases.

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

## **Related Documentation at Web Site**

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

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

## Version 1.3 (R2007a) SimDriveline

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 <b>Compatibility Considerations</b> , below. See also Summary.	Bug Reports Includes fixes	Printable Release Notes: PDF  Current product documentation

New features and changes introduced in this version are

- “SimDriveline Now Requires Simscape” on page 4
- “Sharing Models Using Simscape Editing Modes” on page 4
- “Block Library Links Must Be Resolved” on page 5

### SimDriveline Now Requires Simscape

SimDriveline now depends on and requires Simscape, the foundation for Physical Modeling products. Simscape includes common Physical Modeling utilities and block libraries. See “What Is SimDriveline?” and the Simscape documentation.

### Sharing Models Using Simscape Editing Modes

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

- The Restricted mode requires SimDriveline 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 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 requirement of Simscape. 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 library is SimDriveline or your own.

## Version 1.2.1 (R2006b) SimDriveline

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

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

## Version 1.2 (R2006a) SimDriveline

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 7
- “Changed Transmission Template” on page 7
- “Run-time Parameters Enabled for Key Blocks” on page 8
- “Demos Expanded” on page 8
- “Documentation Enhancements” on page 9

### Improved Clutch Locking and Unlocking

The new version of SimDriveline 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 to SimDriveline.

## **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

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

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

## Version 1.1 (R14SP2+) SimDriveline

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 <b>Compatibility Considerations</b> , 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 11
- “Changes to the Controllable Friction Clutch Block” on page 12
- “Differential Gear Ratio Redefined” on page 12
- “Efficiency Block Library and Demo” on page 13
- “Documentation Improvements” on page 14

### 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 tools based on MATLAB® and Simulink. See “Documentation Improvements” on page 14.
- 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 versions of SimDriveline.

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 versions of SimDriveline.

- 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, SimDriveline 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 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.

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**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.

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## 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

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 <b>Compatibility Considerations</b> , below. See also Summary.	Bug Reports at Web site	No

New features and changes introduced in this version are

- “Documentation Improvements” on page 15
- “Using SimDriveline and SimMechanics Together” on page 15

### 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 Together

If you open SimMechanics 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 memory segmentation violation in MATLAB.

### 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](http://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.

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**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.

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## Version 1.0.1 (R14SP1) SimDriveline

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

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

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

### **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

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

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

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

### Introduction to SimDriveline

SimDriveline 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 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, you can model, simulate, analyze, and control the rotational motions of complex drivetrains.

## Compatibility Summary for SimDriveline

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.

<b>Version (Release)</b>	<b>New Features and Changes with Version Compatibility Impact</b>
<b>Latest Version V1.3 (R2007a)</b>	See the <b>Compatibility Considerations</b> subheading for this new feature: <ul style="list-style-type: none"> <li>• “Block Library Links Must Be Resolved” on page 5</li> </ul>
V1.2.1 (R2006b)	No
V1.2 (R2006a)	No
V1.1.1 (R14SP3)	No
V1.1 (R14SP2+)	See the <b>Compatibility Considerations</b> subheading for each of these new features or changes: <ul style="list-style-type: none"> <li>• “Changes to the Driveline Environment Block” on page 11</li> <li>• “Changes to the Controllable Friction Clutch Block” on page 12</li> <li>• “Differential Gear Ratio Redefined” on page 12</li> </ul>
V1.0.2 (R14SP2)	See the <b>Compatibility Considerations</b> subheading for this new change: <ul style="list-style-type: none"> <li>• “Using SimDriveline and SimMechanics Together” on page 15</li> </ul>
V1.0.1 (R14SP1)	No
V1.0 (R14+)	No