

# **SimPowerSystems 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.

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
<b>Latest Version V4.3 (R2006b)</b>	Yes Details	No	Bug Reports Includes fixes	Printable Release Notes: PDF  Current product documentation
V4.2 (R2006a)	Yes Details	No	Bug Reports Includes fixes	No
V4.1.1 (R14SP3)	No	No	Bug Reports Includes fixes	No
V4.1 (R14SP2+)	Yes Details	Yes Summary	Bug Reports Includes fixes	No
V4.0.1 (R14SP2)	No	No	Bug Reports Includes fixes	No
V4.0 (R14SP1)	Yes Details	No	Fixed bugs	No
V3.1 (R14)	Yes Details	No	Fixed bugs	No
V3.0 (R13SP1)	Yes Details	Yes Summary	Fixed bugs	V3.0 product documentation

### 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 with the previous version, 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 SimPowerSystems” on page 22.

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.

**Undocumented Extras Library Blocks.** All SimPowerSystems blocks have block mask descriptions and have been tested and validated. However, many blocks in the Extras library do not have block reference pages in the product documentation.

The Extras library blocks without block reference pages are listed below. The blocks shown in bold have corresponding continuous blocks that are documented. The rest of the blocks are undocumented.

### **Active & Reactive Power (Phasor Type)**

Bistable

### **Discrete Active & Reactive Power**

Discrete Bistable

Discrete Butterworth Filter

Discrete Edge Detector

Discrete 1st-order Discrete Filter

### **Discrete Fourier**

Discrete Gamma Measurement

Discrete Lead-Lag

Discrete Mean Value

Discrete Monostable

Discrete On/Off Delay

Discrete 1-phase PLL

Discrete PI Controller

Discrete PID Controller

Discrete PLL-Driven Fundamental Value

**Discrete PWM Generator**

Discrete Rate Limiter

**Discrete RMS Value**

Discrete Sample and Hold

Discrete 2nd-order Filter

Discrete 2nd-order Variable-Tuned Filter

**Discrete Synchronized 6-Pulse Generator**

**Discrete Synchronized 12-Pulse Generator**

Discrete 3-phase PLL

Discrete 3-phase PLL-Driven Positive-Sequence Active & Reactive Power

Discrete 3-phase PLL-Driven Positive-Sequence Fundamental Value

Discrete 3-phase Positive-Sequence Active & Reactive Power

Discrete 3-phase Positive-Sequence Fundamental Value

**Discrete 3-phase Programmable Source**

Discrete 3-phase PWM Generator

**Discrete 3-phase Sequence Analyzer**

Discrete 3-phase Total Power

**Discrete Total Harmonic Distortion**



Discrete 12-Pulse HVDC Control  
Discrete Variable Frequency Mean Value  
Discrete Variable Transport Delay  
Discrete Virtual PLL  
dq0-based Active & Reactive Power  
Edge Detector  
FFT  
1st-order Filter  
Monostable  
On/Off Delay  
1-phase PLL  
Sample & Hold  
2nd-order Filter  
Sequence Analyzer (Phasor Type)  
3-phase Active & Reactive Power (Phasor Type)  
3-phase Instantaneous Active & Reactive Power  
3-phase PLL

## Version 4.3 (R2006b) SimPowerSystems

This table summarizes what's new in Version 4.3 (R2006b):

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

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

### **Mechanical Input Parameter Lets You Connect SimMechanics or SimDriveline to Electric Drives by Specifying Motor Speed as Block Input**

The AC and DC Electric Drive blocks have a new parameter called **Mechanical input**, which lets you specify either the load torque or the motor speed as block input.

As of V4.3 (R2006b), mechanical input is available for the following blocks:

- Six-Step VSI Induction Motor Drive (AC1)
- Space Vector PWM VSI Induction Motor Drive (AC2)
- Field-Oriented Control Induction Motor Drive (AC3)
- DTC Induction Motor Drive (AC4)
- Self-Controlled Synchronous Motor Drive (AC5)
- PM Synchronous Motor Drive (AC6)
- Two-Quadrant Single-Phase Rectifier DC Drive (DC1)
- Four-Quadrant Single-Phase Rectifier DC Drive (DC2)
- Two-Quadrant Three-Phase Rectifier DC Drive (DC3)

- Four-Quadrant Three-Phase Rectifier DC Drive (DC4)
- One-Quadrant Chopper DC Drive (DC5)
- Two-Quadrant Chopper DC Drive (DC6)
- Four-Quadrant Chopper DC Drive (DC7)

To switch to the motor speed as mechanical input, open the block dialog box and set the **Mechanical input** option in the bottom portion of the dialog box to Speed  $w$ . Note that if you select the motor speed as mechanical input, the internal mechanical system is not used and the inertia and viscous friction parameters are not displayed. You have to include these parameters in the external mechanical system.

## Version 4.2 (R2006a) SimPowerSystems

This table summarizes what's new in Version 4.2 (R2006a):

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

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

### Average Values of electricdrivelib Blocks

Two more AC drives blocks, AC3 and AC5, in the electricdrivelib library now have a new parameter that allows you to specify average-value models, as opposed to detailed models, for the converters. This parameter was first introduced for some of the electricdrivelib library blocks in V4.1 (R14SP2+).

As of V4.2 (R2006a), average-value models are available for the following blocks:

- Space Vector PWM VSI Induction Motor Drive (AC2)
- Field-Oriented Control Induction Motor Drive (AC3)
- Self-Controlled Synchronous Motor Drive (AC5)
- PM Synchronous Motor Drive (AC6)
- Two-Quadrant Single-Phase Rectifier DC Drive (DC1)
- Four-Quadrant Single-Phase Rectifier DC Drive (DC2)
- Two-Quadrant Three-Phase Rectifier DC Drive (DC3)
- Four-Quadrant Three-Phase Rectifier DC Drive (DC4)
- One-Quadrant Chopper DC Drive (DC5)
- Two-Quadrant Chopper DC Drive (DC6)
- Four-Quadrant Chopper DC Drive (DC7)

To switch to the average-value representation, open the block dialog box and set the **Model detail level** option in the bottom portion of the dialog box to Average.

## Transformer Blocks with SI Units Are Available

The Transformer blocks now have a parameter named **Units**, which allows you to specify the SI units or the pu units. In addition, this parameter can be used to automatically convert pu units into SI units, or the reverse.

## Open Circuit Option Is Added for the RLC Blocks

The RLC branch blocks now have an extra option under the **Branch Type** parameter that allows you to specify an Open Circuit branch. This is particularly useful if you want to temporarily get rid of an RLC element in the circuit without deleting the block.

## New Demos and Enhancements to Existing Demos

The following demos have been added.

<b>Demo Name</b>	<b>Description</b>
power_tcsc_phasor.mdl power_tcsc.mdl	Thyristor Controlled Series Capacitor (TCSC) test systems from Dr. Dragan Jovic from University of Aberdeen, UK
power_asm1ph_auxcontrol power_asm1ph_vectorcontrol	The single-phase Asynchronous Machine block using the Main & auxiliary windings configuration

In the Wind Farm DFIG demos of the Distributed Resources library, control systems have been enhanced.

## Version 4.1.1 (R14SP3) SimPowerSystems

This table summarizes what's new in Version 4.1.1 (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 Includes fixes	No

## Version 4.1 (R14SP2+) SimPowerSystems

This table summarizes what's new in Version 4.1 (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> within descriptions of new features and changes, below. See also Summary.	Bug Reports Includes fixes	No

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

### New Blocks in the Machines Library of powerlib

The machines library of powerlib contains a model of a Switched Reluctance Motor that allow you to model three typical configurations of such a motor. The library also contains a model of a Single-Phase Asynchronous Machine that can be configured as a split phase, a capacitor-start, or as a capacitor-start-run motor mode.

### Enhancements to Existing Blocks of the Machines Library

The core saturation can now be specified for the Asynchronous Machine block when the block is used in a phasor simulation. The saturation model of the Asynchronous Machine is based on the fundamental component of the current and does not include the third harmonic. The saturation parameter is available only when the simulation is in phasor mode. When the Powergui block is set to continuous or discrete mode, the parameter is disabled in the mask of the block.

The Permanent Magnet Synchronous Machine block allows you to specify a trapezoidal flux distribution as an alternative to the sinusoidal flux option of the previous version of the block.

### **Branch Type Parameter of the RLC Branch Blocks**

The Series RLC Branch block, Parallel RLC Branch block, Three-Phase Series RLC Branch block, and Three-Phase Parallel RLC Branch block now have a new parameter that allows you to directly specify the elements that are present in the branch: the R, L, C, RL, LC, RC, and RLC configurations can be specified. It is no longer required to specify an Inf value for the Capacitance in a Series RLC Branch block to get rid of the capacitor device in the branch or to specify 0 value of resistance to get rid of the resistor of a Parallel RLC Branch block.

### **Average Values of electricdrivelib Blocks**

The seven DC drives blocks, and the AC2 and AC6 AC drives of the electricdrivelib library now have a new parameter that allows you to specify average value models, as opposed to detailed models, for the converters.

To switch to the average-value representation, open the block dialog box and set the **Model detail level** option in the bottom portion of the dialog box to Average.

### **Obsolete Blocks**

The Discrete System block and the Machine Measurement Demux block are no longer supported in V4.1 (R14SP2+).

### **Compatibility Considerations**

The table below indicates blocks that are obsolete as of the current version, and lists blocks that you can use as replacement for the obsolete blocks.



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Obsolete Block	Removed from Version	Replacement
Discrete System	4.1	Powergui
Machine Measurement Demux	4.1	Bus Selector

## Version 4.0.1 (R14SP2) SimPowerSystems

This table summarizes what's new in Version 4.0.1 (R14SP2):

<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 4.0 (R14SP1) SimPowerSystems

This table summarizes what's new in Version 4.0 (R14SP1):

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

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

### Electric Drives Library

The Electric Drives library is a major new addition to the SimPowerSystems library. The library is designed for engineers from many disciplines who want to incorporate easily and trustfully electric drives in the simulation of their systems.

This application library has seven typical direct current (DC) drives used in industries and transportation systems, six alternating current (AC) drives providing more efficient and versatile motors from traction to positioning devices, and shaft and speed reducer models useful for connecting to the motor a model of load made of Simulink blocks.

The Electric Drives library is accessible in the Simulink Library Browser under the SimPowerSystems / Application Libraries folder.

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**Note** The Accelerator mode of Simulink is highly recommended to simulate models from the Electric Drives library.

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### Flexible AC Transmission Systems (FACTS) Library

The FACTS library provides phasor models of power-electronics based flexible AC transmission systems such as the Static Synchronous Compensator (STATCOM), the Static Synchronous Series Compensator (SSSC), the Static Var Compensator (SVC), and the Unified Power Flow Controller

(UPFC). Detailed and realistic case studies illustrating shunt reactive power compensation and power conversion are provided with the FACTS library.

The FACTS library is accessible in the Simulink Library Browser under the SimPowerSystems / Application Libraries folder.

### **Distributed Resources (DR) Library**

The DR library provides phasor models of wind turbines. It includes a model of a variable pitch wind turbine, a variable speed doubly-fed induction generator driven by a wind turbine, and a squirrel-cage induction generator driven by a variable pitch wind turbine. Case studies illustrate the steady-state and dynamic performance of wind farms connected to a distribution system.

The DR library is accessible in the Simulink Library Browser under the SimPowerSystems / Application Libraries folder.

## Version 3.1 (R14) SimPowerSystems

This table summarizes what's new in Version 3.1 (R14):

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

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

### Elements Library Enhancements

The following new blocks and enhancements have been added to the Elements library:

- The Three-Phase Harmonic Filter block implements four types of three-phase harmonic filters using RLC components.
- The Multi-Windings Transformer block implements a transformer where the number of windings on the primary side and on the secondary side can be specified. Tap windings can also be specified.
- The Parallel RLC Branch block, Series RLC Branch block, Parallel RLC Load block, and Series RLC Load block allow the initial values of capacitor voltage and inductor current to be set through the block dialog box.

### Machines Library Enhancements

The following enhancements have been made to the Asynchronous Machine, the DC Machine, the Permanent Magnet Synchronous Machine, and the Synchronous Machine blocks:

- The Simulink signal going out from the measurement output is re-organized as a bus signal so you can use the Bus Selector block from Simulink to select the machine measurements. The Machine Measurement Demux block is compatible with this new bus signal so you don't need to replace it with a Bus Selector block in your existing models.

- A new parameter named Preset model is added to the mask of the machine models. It provides a set of pre determined electrical and mechanical parameters set for various type of machine ratings of power. You select one of the preset models to load the corresponding electrical and mechanical parameters in the entries of the dialog box.
- A new parameter named Show detailed parameters is added to the mask of the machine models. It allow you to access the detailed parameters of the machine models, or to hide them when you are using a preset parameter.

## **Powergui Enhancements**

The Powergui block features a new tool to compute the RLC parameters of an overhead transmission line from its conductor characteristics and tower geometry. This new function is also available directly from the command line by entering `power_lineparam` at the MATLAB prompt.

## Version 3.0 (R13SP1) SimPowerSystems

This table summarizes what's new in Version 3.0 (R13SP1):

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> within descriptions of new features and changes, below. See also Summary.	Fixed bugs	V3.0 product documentation

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

### Terminal Ports and Connection Lines

SimPowerSystems 3.0 introduces the terminal port, specific to the electrical domain of Physical Modeling and different from the Simulink input and output ports. It is represented on blocks by a small white square □. You can branch the electrical connection lines connecting such terminal ports. The electrical connection lines of the Physical Modeling domain, unlike Simulink signal lines, are intrinsically nondirectional.

### Separating SimPowerSystems and Simulink Lines and Ports

In the previous versions of SimPowerSystems and Power System Blockset, the electrical block ports were modeled by Simulink input and output ports. The distinction between Simulink ports and electrical terminal ports is now clearly defined. You cannot connect terminal ports to Simulink input and output ports. For example, you cannot by mistake connect a Simulink Scope block directly to the phase terminals of a Synchronous Machine block.

You must also keep Simulink signal lines and SimPowerSystems electrical connection lines separate. You cannot connect one type of line to the other by branching.

## Blocks That Interface Between Simulink and SimPowerSystems Domains

The blocks of SimPowerSystems 3.0 can have only terminal ports or only Simulink ports, or both types. Blocks such as the Synchronous Machine block and the Thyristor block feature both port types. Such blocks serve as interfaces between the part of your model connected by Simulink signal lines and the part connected by electrical connection lines.

## Compatibility Considerations

**Converting Version 2 Models to Version 3.** SimPowerSystems 3.0 provides the `psupdate` command to convert your old Version 2 models to the new block library and interface of Version 3. See the HTML or PDF forms of the special documentation for model conversion. If you are viewing these Release Notes in PDF form, note that the HTML form of the Release Notes provides links to both forms of the conversion guide.

**Keeping Version 2 and Version 3 Blocks Separate.** The Version 3 `powerlib` and Version 2 `powerlib2` block libraries form separate, parallel resources for creating power system models. These two block libraries and their interfaces are not compatible.

**Building and Running Models with the Version 2 Library.** For your convenience, you can open and simulate your old Version 2 models in Version 3.0 and obtain the same simulation results you would get with previous releases. You can also build new models with the old Version 2 block library, `powerlib2`.

You can access the Version 2 block library by entering `powerlib2` at the command line. It is strongly recommended, however, that you use the `powerlib` block library to take the full advantage of SimPowerSystems 3.0.

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**Note** You cannot put Version 2 and Version 3 blocks in the same model file.

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**Accessing the Version 2 Documentation.** For your convenience, the documentation of SimPowerSystems 3.0 includes the old documentation of Version 2.3. This documentation is available in PDF format. If you are viewing these Release Notes in PDF form, note that the HTML form of the Release Notes provides a link to the old documentation.

## Renamed SimPowerSystems Commands

In SimPowerSystems 3.0, the analysis commands of earlier SimPowerSystems and Power System Blockset versions have been renamed.

### **power\_analyze**

`power_analyze` is the new name for the old `power2sys` command. With it, you can analyze models built with the new block library of SimPowerSystems 3.0.

### **power\_init**

`power_init` is the new name for the old `powerinit` command. You use it exactly the same way you would use the `powerinit` command.

### **power\_statespace**

`power_statespace` is the new name for the old `circ2ss` command. You use it exactly the same way you would use the `circ2ss` command.

## Compatibility Considerations

You can still use the analysis commands of earlier versions of SimPowerSystems and Power System Blockset with old models.

The `powerinit` and `circ2ss` commands are compatible with either Version 2 or Version 3 models.

You should use the `power2sys` command only for old models built with previous versions of SimPowerSystems or Power System Blockset. If you want to analyze Version 3 models, you must use the new `power_analyze` command.

## Compatibility Summary for SimPowerSystems

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.

<b>Version (Release)</b>	<b>New Features and Changes with Version Compatibility Impact</b>
<b>Latest Version V4.3 (R2006b)</b>	None
V4.2 (R2006a)	None
V4.1.1 (R14SP3)	None
V4.1 (R14SP2+)	See the <b>Compatibility Considerations</b> subheading for this new feature or change: “Obsolete Blocks” on page 12
V4.0.1 (R14SP2)	None
V4.0 (R14SP1)	None
V3.1 (R14)	None
V3.0 (R13SP1)	See the <b>Compatibility Considerations</b> subheading for each of these new features or changes: <ul style="list-style-type: none"> <li>• “Terminal Ports and Connection Lines” on page 19</li> <li>• “Renamed SimPowerSystems Commands” on page 21</li> </ul>