# SimPowerSystems™ Release Notes

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# Contents

# Summary by Version

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

| Version (Release) | New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|---|
| **Latest Version V5.5 (R2011b)** | Yes Details | Yes Summary | Bug Reports Includes fixes |
| V5.4 (R2011a) | Yes Details | No | Bug Reports Includes fixes |
| V5.3 (R2010b) | Yes Details | No | Bug Reports Includes fixes |
| V5.2.1 (R2010a) | Yes Details | No | Bug Reports Includes fixes |
| V5.2 (R2009b) | Yes Details | Yes Summary | Bug Reports Includes fixes |
| V5.1 (R2009a) | Yes Details | Yes Summary | Bug Reports Includes fixes |
| V5.0 (R2008b) | Yes Details | No | Bug Reports Includes fixes |
| V4.6 (R2008a) | Yes Details | Yes Summary | Bug Reports Includes fixes |
| V4.5 (R2007b) | Yes Details | Yes Summary | Bug Reports Includes fixes |
| V4.4 (R2007a) | Yes Details | Yes Summary | Bug Reports Includes fixes |
| V4.3 (R2006b) | Yes Details | No | Bug Reports Includes fixes |
| V4.2 (R2006a) | Yes Details | No | Bug Reports Includes fixes |

| Version (Release) | New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|---|
| V4.1.1 (R14SP3) | No | No | Bug Reports Includes fixes |
| V4.1 (R14SP2+) | Yes Details | Yes Summary | Bug Reports Includes fixes |
| V4.0.1 (R14SP2) | No | No | Bug Reports Includes fixes |
| V4.0 (R14SP1) | Yes Details | No | Fixed bugs |
| V3.1 (R14) | Yes Details | No | Fixed bugs |
| V3.0 (R13SP1) | Yes Details | Yes Summary | Fixed bugs |

## Using Release Notes

Use release notes when upgrading to a newer version to learn about:

- New features

- Changes

- Potential impact on your existing files and practices

Review the release notes for other MathWorks® products required for this product (for example, MATLAB® or Simulink®). Determine if enhancements, bugs, or compatibility considerations in other products impact you.

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

# What Is in the Release Notes

### New Features and Changes

- New functionality

- Changes to existing functionality

### Version Compatibility Considerations

When a new feature or change introduces a reported incompatibility between versions, the **Compatibility Considerations** subsection explains the impact.

Compatibility issues reported after the product release appear under Bug Reports at the MathWorks Web site. Bug fixes can sometimes result in incompatibilities, so review the fixed bugs in Bug Reports for any compatibility impact.

### Fixed Bugs and Known Problems

MathWorks offers a user-searchable Bug Reports database so you can view Bug Reports. The development team updates this database at release time and as more information becomes available. Bug Reports include provisions for any known workarounds or file replacements. Information is available for bugs existing in or fixed in Release 14SP2 or later. Information is not available for all bugs in earlier releases.

Access Bug Reports using your MathWorks Account.

# Documentation on the MathWorks Web Site

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

- Latest product documentation

- Archived documentation

# 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 5.5 (R2011b) SimPowerSystems Software

This table summarizes what's new in Version 5.5 (R2011b):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| Yes<br>Details below | Yes<br>Summary | Bug Reports<br>Includes fixes |

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

## SimPowerSystems Software Now Requires Simscape Product

SimPowerSystems 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 the Simscape documentation for details.

SimPowerSystems block libraries are now located under the **Simscape** node in the Library Browser.

## Interfacing with Simscape Electrical Domains

Four block in the new Interface Elements library allow you to connect a SimPowerSystems electrical connection line to a Physical Networks line connected to Simscape blocks. These blocks have SimPowerSystems ports on one side and Simscape ports on the other, and transfer voltage and current as Physical Networks Across and Through variables, respectively, without energy loss.

## Sharing Models Using Simscape Editing Modes

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

• The Restricted mode requires SimPowerSystems 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 SimPowerSystems model.

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

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

## Block Library Links Must Be Resolved

All core SimPowerSystems 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.

This restriction does not apply to the blocks from Application libraries (Electric Drives, Distributed Resources, and FACTS) and the Extra library.

### Compatibility Considerations

If you have an existing SimPowerSystems model with disabled or broken links from the blocks in the model to the SimPowerSystems block libraries (other than the Applications and Extra library), you must restore all the broken block library links for your model to be valid.

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

# Version 5.4 (R2011a) SimPowerSystems Software

This table summarizes what's new in Version 5.4 (R2011a):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| Yes<br>Details below | No | Bug Reports<br>Includes fixes |

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

## New Load Flow Tool

The **Load Flow and Machine Initialization** tool that was available in previous releases is renamed **Machine Initialization**. You can use it to set initial conditions of three-phase machines and regulators in order to start simulation in steady-state. The new **Load Flow** tool now provides an improved load flow solution for SimPowerSystems models, with several new features and capabilities:

- The load flow solution uses the Newton-Raphson method. It is more robust and provides a faster convergence than the **Machine Initialization** tool.

- The new **Load Flow** tool comes with a graphical user interface that allows you to display load flow solution at all buses.

- The Three-Phase Source and Three-Phase Programmable Voltage Source blocks are now taken into account in the load flow. You can now specify power and terminal voltage of the Three-Phase Source and Three-Phase Programmable Voltage Source blocks. Similar to the Synchronous Machine, you can declare these voltage sources as PV, PQ, or swing type. Once the load flow is solved, the source internal voltage magnitude and angle are automatically adjusted.

- You can now specify Three-Phase Series and Parallel RLC Load blocks either as constant impedance (constant Z) or as constant power (constant PQ). In the previous tool, the Three-Phase Series and Parallel RLC Load blocks were only considered as constant impedance loads based on the nominal voltage and active and reactive powers specified in the block menu.

The Load Flow Bus block has been added to the Measurements library. The `power_loadflow` function syntax has been modified, and a new **Load Flow** tab has been added to the Powergui block parameters dialog box, as well as to the dialog boxes of all the blocks considered in the load flow solution. For more information on using the new **Load Flow** tool, see "Load Flow Tool".

## New Asynchronous Machine Block Setup Function

The `power_AsynchronousMachineParams` function lets you compute parameters of a double-cage Asynchronous Machine block based on standard manufacturer specifications. It lets you input manufacturer data and returns the computed machine parameters, along with additional derived data such as synchronous speed, number of pole pairs, nominal slip, starting torque, and so on. The function also lets you display relative errors between the input manufacturer data and the equivalent data obtained with the computed parameters. The function comes with a graphical user interface that allows you to compute the block parameters and apply it to selected block, as well as display the detailed results in the Command window.

## 5-Phase Synchronous Machine Model Available

The Permanent Magnet Synchronous Machine block has been modified to allow modeling a 5-phase synchronous machine with sinusoidal back EMF and round rotor type. For details, see the block reference page.

## SimState Support

SimPowerSystems software now supports Simulink SimState feature, introduced in R2009a. This feature allows you to save all runtime data necessary for restoring the simulation state of a model. For more information, see "Saving and Restoring the Simulation State as the SimState" in the *Simulink User's Guide*.

## New SimPowerSystems Demo

The following demo has been added in Version 5.4:

**Demo Name**

Flickermeter on a Distribution STATCOM (`power_flickermeter`)

**Description**

Flickermeter model designed according to functional specifications of the international standard IEC 6100-4-15.

# Version 5.3 (R2010b) SimPowerSystems Software

This table summarizes what's new in Version 5.3 (R2010b):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| Yes<br>Details below | No | Bug Reports<br>Includes fixes |

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

## Double Squirrel-Cage Rotor Option Available in Asynchronous Machine Block

The Asynchronous Machine block now lets you simulate a double squirrel-cage rotor. The **Rotor type** parameter in the block dialog box has a new option, Double squirrel-cage, in addition to the existing rotor modeling options of Wound and Squirrel-cage. For more information, see the block reference page.

## Enhanced Code Generation Capabilities

Code generation support has been added for:

- Models in Phasor mode

- Models employing Ideal Switch mode (under Continuous)

For more information, see "Improving Simulation Performance".

## New SimPowerSystems Demos

The following demos have been added in Version 5.3:

| Demo Name | Description |
|---|---|
| Synchronous Buck Converter (power_switching_power_supply) | Illustrates an abstracted version of a synchronous buck converter that uses ideal switching to give faster simulation times. |

AC3 - Sensorless Field-Oriented Control Induction Motor Drive (`ac3_sensorless`)

Models a sensorless field-oriented control (FOC) induction motor drive with a braking chopper for a 200HP AC motor, using a modified version of the AC3 block.

AC7 - Sensorless Brushless DC Motor Drive During Speed Regulation (`ac7_sensorless`)

Models a sensorless brushless DC motor drive with a braking chopper for a 3HP motor, using a modified version of the AC7 block.

Electrically-Driven Hydraulic Motor Pump (`power_Hydraulic_Pump`)

Models a hydraulic pump driven by an electric motor, using SimPowerSystems and SimHydraulics® blocks.

# Version 5.2.1 (R2010a) SimPowerSystems Software

This table summarizes what's new in Version 5.2.1 (R2010a):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| Yes<br>Details below | No | Bug Reports<br>Includes fixes |

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

## Permanent Magnet Model Available in DC Machine Block

The DC Machine block now lets you model a permanent magnet DC machine, parameterized either by torque (torque per current constant) or by back-emf (voltage per speed constant). A new parameter, **Field type**, allows you to select between the wound-field and the permanent magnet DC machine. For more information, see the block reference page.

# Version 5.2 (R2009b) SimPowerSystems Software

This table summarizes what's new in Version 5.2 (R2009b):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| Yes<br>Details below | Yes—Details labeled as **Compatibility Considerations** within descriptions of new features and changes, below. See also Summary. | Bug Reports<br>Includes fixes |

New features and changes introduced in this version are

- "Enhanced `power_cableparam` Function" on page 15
- "Changes to the Fuel Cell Stack Block " on page 15
- "New SimPowerSystems Demos" on page 16

## Enhanced `power_cableparam` Function

The `power_cableparam` function, introduced in Version 5.1 (R2009a) as part of the Computation of R L and C Cable Parameters (`power_cable`) demo, is now available as a standalone command-line function with associated graphical user interface. It lets you compute RLC parameters of radial copper cables with single screen, based on conductor and insulator characteristics. For more information, see the `power_cableparam` reference page.

## Changes to the Fuel Cell Stack Block

The Fuel Cell Stack block has been improved to better represent the cell dynamics. The model parameters and the meaning of some detailed parameters have changed since the last release, as described in the following section.

### Compatibility Considerations

The Fuel Cell Stack block parameters have been changed in Version 5.2 (R2009b). If you used the **(No) User-Defined** option for the **Preset model** parameter in previous releases and defined particular detailed parameters for your Fuel Cell Stack block, the software will automatically convert your old block parameters into new values corresponding to the block changes.

The following table compares the old parameter names to the new ones. It also provides details on how the new values are computed:

| Old Parameters | New Parameters and Values |
|---|---|
| Open circuit voltage | Voltage at 0A and 1A [V_0(V), V_1(V)]<br><br>`= [oldvalue, oldvalue*0.95]` |

## New SimPowerSystems Demos

The following demos have been added in Version 5.2:

| Demo Name | Description |
|---|---|
| Six-Pulse Cycloconverter (power_cycloconverter) | Illustrates a six-pulse cycloconverter driving a static load. |
| Speed Control of a DC Motor Using BJT H-Bridge (power_Hbridge) | Illustrates simulation of an H-bridge used to generate a chopped voltage and control speed of a DC motor, in open loop, in both directions. |
| Five-Cell Multi-Level Converter (power_fivecells) | Illustrates a five-cell multilevel converter driving a static load. |
| Multi-Level Modeling for Rapid Prototyping of Complex Systems (power_HEV_MultiFidelity) | Illustrates how to use different detail level in model simulation. For more information, see "Multi-Level Modeling for Rapid Prototyping". |

# Version 5.1 (R2009a) SimPowerSystems Software

This table summarizes what's new in Version 5.1 (R2009a):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| Yes<br>Details below | Yes—Details labeled as **Compatibility Considerations** within descriptions of new features and changes, below. See also Summary. | Bug Reports<br>Includes fixes |

New features and changes introduced in this version are

- "Powergui Tools Are Also Available as Standalone Command-Line Functions" on page 17
- "Enhancements to the Ideal Switching Algorithm" on page 17
- "Powergui Block No Longer Added Automatically" on page 18
- "Changes to the Battery Block " on page 18
- "New SimPowerSystems Demos" on page 19

## Powergui Tools Are Also Available as Standalone Command-Line Functions

The graphical user interface analysis tools, available in the Powergui block, are now also implemented as standalone command-line functions. Each of these tools can be activated by entering the appropriate command at the MATLAB prompt. For more information, see the following reference pages: `power_fftscope`, `power_hysteresis`, `power_initstates`, `power_lineparam`, `power_loadflow`, `power_ltiview`, `power_report`, `power_steadystate`, `power_zmeter`.

## Enhancements to the Ideal Switching Algorithm

The **Display circuit differential equations** option, available in the Powergui block parameters dialog box, lets you display differential equations

of the model in the command window when the simulation starts. This option is visible only if **Enable use of ideal switching devices** is selected. For more information, see "Using the Ideal Switching Device Method".

# Powergui Block No Longer Added Automatically

The Powergui block is no longer automatically added to your model upon simulation. You need to explicitly add it to your model. For more information, see "Using the Powergui Block to Simulate SimPowerSystems Models".

### Compatibility Considerations

If you have an old model without a Powergui block, which used to run in previous releases because Powergui was added automatically during simulation, you will now get an error trying to simulate it. Add a Powergui block and save the model to avoid the error.

# Changes to the Battery Block

The Battery block has been improved to accurately represent the battery dynamics during the charge and the discharge processes. The model parameters and the meaning of some detailed parameters have changed since the last release, as described in the following section.

### Compatibility Considerations

The Battery block parameters have been changed in Version 5.1 (R2009a). If you used the **(No) User-Defined** option for the **Battery Type** parameter in previous releases and defined particular detailed parameters for your Battery block, the software will automatically convert your old block parameters into new values corresponding to the block changes.

The following table compares the old parameter names to the new ones. It also provides details on how the new values are computed:

| Old Parameters | New Parameters and Values |
|---|---|
| Battery Type, set to `(No) User-Defined` | Battery Type, set by default to `Nickel-Metal-Hybrid` |
| - | Maximum Capacity (Ah) `= RatedCapacity*1.05` |
| Full charge voltage (%) | Fully charged voltage (v) `= [oldvalue]/100*NominalVoltage` |
| Nominal Discharge Current (% of Rated Capacity) | Nominal Discharge Current (A) `= [oldvalue]/100*RatedCapacity` |
| Capacity (% of Rated Capacity) @ Nominal Voltage | Capacity (Ah) @ Nominal Voltage `= [oldvalue]/100*RatedCapacity` |
| Exponential zone Voltage (%) Exponential zone Capacity (% of the Rated Capacity) | Exponential zone Voltage (V) `= [oldvalue]/100*NominalVoltage` Exponential zone Capacity (Ah) `= [oldvalue]/100*RatedCapacity` |

## New SimPowerSystems Demos

The following demos have been added in Version 5.1:

| Demo Name | Description |
|---|---|
| Computation of R L and C Cable Parameters (power_cable) | Illustrates use of the power_cableparam demo function to calculate the R,L, and C parameters of two 132kV 2-phase cables with screen cables. |
| Single-Phase Dynamic Load Block (power_1phdynamicload) | Illustrates an example of a single-phase dynamic load block built with Simulink blocks. This is the recommended template for interfacing custom-built Simulink blocks with SimPowerSystems models. |

| | |
|---|---|
| Zener Diode Regulator (power_zener) | Presents a model of the zener diode used in a voltage regulator. |
| Full Wave Rectifier (power_FullWaveRectifier) | Illustrates use of the Ideal Switching Device solution method to simulate a full wave rectifier using ideal diodes. |
| Multilevel Multiphase Space-Vector PWM (power_svpwm_multiPhasesLevel) | Illustrates modeling and operation of the Multilevel Multiphase Space-Vector PWM and Two-Level Multiphase Space-Vector PWM blocks. The demo includes a five-level five-phase inverter feeding a passive load. |
| Synchronous Generator and Full Scale Converter (Type 4) Detailed Model (power_wind_type_4_det) | Illustrates simulation of a 10 MW wind farm using a detailed model of a Type 4 wind turbine. |
| Synchronous Generator and Full Scale Converter (Type 4) Average Model (power_wind_type_4_avg) | Illustrates simulation of a 10 MW wind farm using an average model of a Type 4 wind turbine. |

# Version 5.0 (R2008b) SimPowerSystems Software

This table summarizes what's new in Version 5.0 (R2008b):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| Yes<br>Details below | No | Bug Reports<br>Includes fixes |

New features and changes introduced in this version are

- "New Ideal Switching Algorithm" on page 21
- "Changes to the Universal Bridge Block " on page 21
- "New SimPowerSystems Demos" on page 21

## New Ideal Switching Algorithm

New Ideal Switching algorithm, available in the Powergui block, enables faster and more accurate simulation of power electronic devices. For more information, see "Using the Ideal Switching Device Method".

## Changes to the Universal Bridge Block

The Universal Bridge block has two new options for modeling voltage-sourced converters (VSC):

- Switching-function based VSC
- Average-model based VSC

## New SimPowerSystems Demos

The following demos have been added in Version 5.0:

| Demo Name | Description |
|---|---|
| Switching an Inductive Circuit Using a Breaker With no Snubber (`power_breaker`) | Illustrates the Ideal Switching device solution method of the Powergui block. |
| Fuel Cell Vehicle (FCV) Power Train (`power_FCV_powertrain`) | Demonstration of a Fuel Cell Vehicle (FCV) power train using SimPowerSystems and SimDriveline™. The FCV power train is of the series type. This FCV is propelled by one electric motor powered by a fuel cell and a battery. |

# Version 4.6 (R2008a) SimPowerSystems Software

This table summarizes what's new in Version 4.6 (R2008a):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
| --- | --- | --- |
| Yes<br>Details below | Yes—Details labeled as **Compatibility Considerations** within descriptions of new features and changes, below. See also Summary. | Bug Reports<br>Includes fixes |

New features and changes introduced in this version are

- "New Fuel Cell Stack Block" on page 23

- "Initial Conditions Can Be Specified for the Permanent Magnet Synchronous Machine Block " on page 24

- "Multiple Discretization Rates within a Model Now Available" on page 24

- "New SimPowerSystems Demos" on page 25

## New Fuel Cell Stack Block

A new block, Fuel Cell Stack, has been added to the Extra Sources sublibrary of the Electric Drives library. It implements a generic model parameterized to represent most popular types of fuel cell stacks fed with hydrogen and air. The 6 kW 45 Vdc Fuel Cell Stack demo (`power_fuel_cell`) shows how to use the Fuel Cell Stack block to model a Proton Exchange Membrane (PEM) Fuel Cell Stack feeding an average value 100Vdc DC/DC converter.

The Battery block from the Electrical Sources library is now included in the Extra Sources sublibrary of the Electric Drives library as well.

## Initial Conditions Can Be Specified for the Permanent Magnet Synchronous Machine Block

The following enhancements have been implemented for the Permanent Magnet Synchronous Machine block:

- A new parameter, `Initial conditions`, allows you to specify the initial mechanical speed (rad/s), mechanical angle Θ (degrees) and instantaneous stator current (A).

- A new drop-down list lets you select the machine constant that you wish to specify for block parameterization: the flux linkage, the voltage constant, or the torque constant. Once you select a constant, you can enter its value in the appropriate parameter field, while the other two parameters become inaccessible and are only shown for information.

- The dialog box has been rearranged into three tabs, **Configuration**, **Parameters**, and **Advanced**, to improve usability.

## Multiple Discretization Rates within a Model Now Available

For certain blocks, you can specify a different sample time than the one specified by the Powergui block. This allows you to discretize different parts of a model at different rates in a fixed time step simulation. For example, if one block needs to run at a smaller time step (*t1*) than the rest of the simulation (*t2*), you can speed up simulation of the whole model by specifying a different time step for this block, as long as *t2* = *n* * *t1* (where *n* is an integer).

The following is a list of blocks that currently can be discretized at a different rate:

- Asyhchronous Machine

- DC Machine

- Permanent Magnet Synchronous Machine

- Simplified Synchronous Machine

- Single Phase Asynchronous Machine

- Stepper Motor

- Switched Reluctance Motor

- Synchronous Machine

Dialog boxes for most of these blocks have also been rearranged into three tabs, **Configuration**, **Parameters**, and **Advanced**, to improve usability.

### Compatibility Considerations

The DC Machine block can be discretized now. It is recommended that you use it instead of the Discrete DC Machine block, which will be deprecated in the future.

## New SimPowerSystems Demos

The following demos have been added in Version 4.6:

| Demo Name | Description |
| --- | --- |
| 6 kW 45 Vdc Fuel Cell Stack (`power_fuel_cell`) | Demonstration of the Proton Exchange Membrane (PEM) Fuel Cell Stack model feeding an average value 100Vdc DC/DC converter. The nominal Fuel Cell Stack voltage is 45Vdc and the nominal power is 6kW. |
| Solid-Oxide Fuel Cell Connected to Three-Phase Electrical Power System (`power_SOFC`) | This demo illustrates a model of a solid oxide fuel cell (SOFC). The system consists of a SOFC, which is connected to a three-phase infinite bus through an IGBT inverter. |
| Mechanical Coupling of Synchronous Generator with Exciter System (`power_SM_exciter`) | In large alternators, the excitation system is provided by a small synchronous machine connected on the same shaft as the main synchronous machine. This demo illustrates interconnecting two machines on the same shaft by use of speed input. |
| Three-Phase Core-Type Transformer (`power_Transfo3phCoreType`) | This demo illustrates use of the Three-Phase Transformer Inductance Matrix Type block to model a three-phase core-type saturable transformer. It also demonstrates that using three single-phase transformers to simulate a Yg/Yg core-type transformer is not acceptable. |

Three-Phase Matrix Converter (power_three_phase_matrix_converter)

This demo illustrates a three-phase matrix converter driving a static load. Indirect space-vector modulation allows direct control of input current and output voltage and hence allows the power factor of the source to be controlled. As a result, the demo outputs the unity power factor at the source.

Three-Phase Active Harmonic Filter (power_active_filter)

This demo illustrates the use of a shunt active harmonic filter (AHF) to minimize the harmonic content propagated to the source from a nonlinear load.

# Version 4.5 (R2007b) SimPowerSystems Software

This table summarizes what's new in Version 4.5 (R2007b):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
| --- | --- | --- |
| Yes<br>Details below | Yes—Details labeled as **Compatibility Considerations** within descriptions of new features and changes, below. See also Summary. | Bug Reports<br>Includes fixes |

New features and changes introduced in this version are

- "New Battery Block" on page 27

- "New Stepper Motor Block" on page 28

- "Three New Transformer Blocks" on page 28

- "New Measurement Option Available for the PI Section Line Block " on page 29

- "New SimPowerSystems Demos" on page 29

- "Renamed `psbhysteresis` Command" on page 30

## New Battery Block

A new block, Battery, has been added to the Electrical Sources library. It implements a generic battery that models most popular battery types, such as Nickel-Metal-Hybride, Lead-Acid, Lithium-Ion, and Nickel-Cadmium. User-Defined Battery type allows you to modify detailed parameters to represent any particular discharge characteristics.

The Hybrid Electric Vehicle (HEV) Power Train demo (`power_HEV_powertrain`), which was introduced in Version 4.4 (R2007a) and shows a multi-domain simulation of a HEV power train based on SimPowerSystems and SimDriveline blocks, has been modified to use the Battery block. It is now called Hybrid Electric Vehicle (HEV) Power Train Using Battery Model.

## New Stepper Motor Block

A new block, Stepper Motor, has been added to the Machines library.
Depending on the motor configuration specified by the Motor type parameter,
this block models:

- A two- or four-phase permanent magnet or hybrid stepper motor

- A three-, four-, or five-phase variable reluctance stepper motor

## Three New Transformer Blocks

Three new transformer blocks have been added to the Elements library:

- Grounding Transformer implements a transformer that is used to provide a
  neutral in a three-phase, three-wire system. The transformer consists of
  three two-winding transformers connected in a zigzag. The nominal voltage
  of each of the six windings is Vn/3.

- Three-Phase Transformer Inductance Matrix Type (Two Windings)
  represents inductive coupling between windings located on different phases
  of a three-limb or a five-limb core. It also allows modeling of a three-phase
  transformer built with three single-phase units (no coupling between
  phases). The transformer R L parameters are obtained from no-load
  excitation tests and short-circuit tests in positive- and zero-sequence. When
  core type is specified as **Three-limb or five-limb core**, the transformer
  is modeled by 9 coupled windings; otherwise, it is modeled by 3 sets of 2
  coupled windings (Z0=Z1).

- Three-Phase Transformer Inductance Matrix Type (Three Windings)
  represents coupling between windings located on different phases of a
  three-limb or a five-limb core. It also allows modeling of a three-phase
  transformer built with three single-phase units (no coupling between
  phases). The transformer R L parameters are obtained from no-load
  excitation tests and short-circuit tests in positive- and zero-sequence. When
  core type is specified as **Three-limb or five-limb core**, the transformer
  is modeled by 9 coupled windings; otherwise, it is modeled by 3 sets of 3
  coupled windings (Z0=Z1).

## New Measurement Option Available for the PI Section Line Block

A new measurement option, `All pi-section voltages and currents`, is available for the PI Section Line block. It allows you to measure voltages and currents at the start and end of each pi-section.

## New SimPowerSystems Demos

The following demos have been added in Version 4.5:

| Demo Name | Description |
| --- | --- |
| Ni-MH Battery Model (power_battery) | Demonstration of the battery model during charge and discharge process. The demo models a 200 V, 6.5 Ah Ni-MH battery. |
| Stepper Motor Drive (power_steppermotor) | Demonstration of a hybrid stepper motor drive. The parameters are those of a small stepper motor (size 23). |
| D-STATCOM (Average Model) (power_dstatcom_avg) | In the average model of a Distribution STATCOM, the IGBT Voltage-Sourced Converters (VSC) are represented by equivalent voltage sources generating the AC voltage averaged over one cycle of the switching frequency. This model does not represent harmonics, but the dynamics resulting from the control system and power system interaction are preserved. This model allows using much larger time steps (typically 40-50 microseconds), thus allowing simulations of several seconds. |

| | |
|---|---|
| D-STATCOM (Detailed Model) (`power_dstatcom_pwm`) | The detailed model of a Distribution STATCOM includes detailed representation of power electronic IGBT converters. In order to achieve an acceptable accuracy with the 1680 Hz switching frequency used in this demo, the model must be discretized at a relatively small time step (5 microseconds). This model is well suited for observing harmonics and control system dynamic performance over relatively short periods of times (typically hundreds of milliseconds to one second). |
| UPFC (Detailed Model) (`power_upfc_gto48p`) | Detailed model of a 48-pulse, GTO-based Unified Power Flow Controller (500 kV, 100 MVA). |

## Renamed `psbhysteresis` Command

In Version 4.5 (R2007b), `power_hysteresis` is the new name for the old `psbhysteresis` command. You use it exactly the same way you would use the `psbhysteresis` command.

### Compatibility Considerations

Currently, if you issue the `psbhysteresis` command, it will automatically redirect to its new name, `power_hysteresis`. However, it is recommended that you update your scripts and use the new command name going forward.

# Version 4.4 (R2007a) SimPowerSystems Software

This table summarizes what's new in Version 4.4 (R2007a):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| Yes<br>Details below | Yes—Details labeled as **Compatibility Considerations** within descriptions of new features and changes, below. See also Summary. | Bug Reports<br>Includes fixes |

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

## New Brushless DC Motor Drive Block

A new block, Brushless DC Motor Drive, has been added to the Electric Drives/AC Drives library. It implements a brushless DC motor drive using a Permanent Magnet Synchronous Motor (PMSM) with trapezoidal back electromotive force (BEMF). It is possible to use a simplified version of the drive containing an average-value model of the inverter for faster simulation. In SimPowerSystems software, the Brushless DC Motor Drive block is commonly called the AC7 motor drive.

## Automated Conversion of Version 2 Models Is No Longer Supported

The automated conversion of old models, created with blocks from SimPowerSystems 2.3 or Power System Blockset™ 2 libraries, is no longer supported in Version 4.4 (R2007a).

### Compatibility Considerations

The psbupdate function is obsolete as of Version 4.4 (R2007a).

## New SimPowerSystems Demos

The following demos have been added in Version 4.4:

| Demo Name | Description |
|---|---|
| Hybrid Electric Vehicle (HEV) Power Train (`power_HEV_powertrain`) | Multi-domain simulation of a HEV power train based on SimPowerSystems and SimDriveline blocks. The HEV power train is of the series-parallel type, such as the one found in the Toyota Prius car. This HEV has two kinds of motive power sources, an electric motor and an internal combustion engine (ICE), in order to increase the drive train efficiency and reduce air pollution. It combines the advantages of the electric motor drive (no pollution and high available power at low speed) and the advantages of an internal combustion engine (high dynamic performances and low pollution at high speeds). |
| Aircraft Electrical Power Generation and Distribution (`power_aircraft_distribution`) | This circuit illustrates a generic aircraft Electrical Power Generation & Distribution System. The AC power frequency is variable and depends of the engine speed. |

# Version 4.3 (R2006b) SimPowerSystems Software

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

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| Yes<br>Details below | No | Bug Reports<br>Includes fixes |

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

## Mechanical Input Parameter Lets You Connect SimMechanics or SimDriveline Blocks 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 Software

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

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| Yes<br>Details below | No | Bug Reports<br>Includes fixes |

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 how 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.

| Demo Name | Description |
|---|---|
| power_tcsc_phasor.mdl<br>power_tcsc.mdl | Thyristor Controlled Series Capacitor (TCSC) test systems from Dr. Dragan Jovcic from University of Aberdeen, UK |
| power_asm1ph_auxcontrol<br>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 Software

This table summarizes what's new in Version 4.1.1 (R14SP3):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| No | No | Bug Reports<br>Includes fixes |

# Version 4.1 (R14SP2+) SimPowerSystems Software

This table summarizes what's new in Version 4.1 (R14SP2+):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| Yes<br>Details below | Yes—Details labeled as **Compatibility Considerations** within descriptions of new features and changes, below. See also Summary. | Bug Reports<br>Includes fixes |

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.

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

# Version 4.0.1 (R14SP2) SimPowerSystems Software

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

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| No | No | Bug Reports<br>Includes fixes |

# Version 4.0 (R14SP1) SimPowerSystems Software

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

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| Yes<br>Details below | No | Fixed bugs |

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.

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

## 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 Software

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

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| Yes<br>Details below | No | Fixed bugs |

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 library 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 Software

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

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|---|---|---|
| Yes<br>Details below | Yes—Details labeled as **Compatibility Considerations** within descriptions of new features and changes, below. See also Summary. | Fixed bugs |

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

## Terminal Ports and Connection Lines

Version 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™ software, 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

In Version 3.0, SimPowerSystems blocks can have only terminal ports or only Simulink ports, or both types. Blocks such 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.** Version 3.0 provides the `psbupdate` 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 Version 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, SimPowerSystems documentation for Version 3.0 includes links to 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 Version 3.0, the analysis commands of earlier 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 Version 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 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 software. If you want to analyze Version 3 models, you must use the new power_analyze command.

# Compatibility Summary for SimPowerSystems 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 with the description of the new feature or change.

| Version (Release) | New Features and Changes with Version Compatibility Impact |
|---|---|
| **Latest Version**<br>**V5.5 (R2011b)** | See the **Compatibility Considerations** subheading for this new feature or change:<br><br>"Block Library Links Must Be Resolved" on page 8 |
| V5.4 (R2011a) | None |
| V5.3 (R2010b) | None |
| V5.2.1 (R2010a) | None |
| V5.2 (R2009b) | See the **Compatibility Considerations** subheading for this new feature or change:<br><br>"Changes to the Fuel Cell Stack Block " on page 15 |
| V5.1 (R2009a) | See the **Compatibility Considerations** subheading for each of these new features or changes:<br><br>"Powergui Block No Longer Added Automatically" on page 18<br><br>"Changes to the Battery Block " on page 18 |
| V5.0 (R2008b) | None |

| Version (Release) | New Features and Changes with Version Compatibility Impact |
|---|---|
| V4.6 (R2008a) | See the **Compatibility Considerations** subheading for this new feature or change:<br><br>"Multiple Discretization Rates within a Model Now Available" on page 24 |
| V4.5 (R2007b) | See the **Compatibility Considerations** subheading for this new feature or change:<br><br>"Renamed `psbhysteresis` Command" on page 30 |
| V4.4 (R2007a) | See the **Compatibility Considerations** subheading for this new feature or change:<br><br>"Automated Conversion of Version 2 Models Is No Longer Supported" on page 31 |
| V4.3 (R2006b) | None |
| V4.2 (R2006a) | None |
| V4.1.1 (R14SP3) | None |
| V4.1 (R14SP2+) | See the **Compatibility Considerations** subheading for this new feature or change:<br><br>"Obsolete Blocks" on page 39 |
| V4.0.1 (R14SP2) | None |
| V4.0 (R14SP1) | None |

| Version (Release) | New Features and Changes with Version Compatibility Impact |
|---|---|
| V3.1 (R14) | None |
| V3.0 (R13SP1) | See the **Compatibility Considerations** subheading for each of these new features or changes:<br><br>• "Terminal Ports and Connection Lines" on page 45<br><br>• "Renamed SimPowerSystems Commands" on page 47 |