

# **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 “Using Release Notes” on page 2.

<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 V4.6 (R2008a)</b>	Yes Details	Yes Summary	Bug Reports Includes fixes	Printable Release Notes: PDF  Current product documentation
V4.5 (R2007b)	Yes Details	Yes Summary	Bug Reports Includes fixes	No
V4.4 (R2007a)	Yes Details	Yes Summary	Bug Reports Includes fixes	No
V4.3 (R2006b)	Yes Details	No	Bug Reports Includes fixes	No
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

## Using Release Notes

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

- New features
- Changes
- Potential impact on your existing files and practices

Review the release notes for other MathWorks™ products required for this product (for example, MATLAB® or Simulink®) for enhancements, bugs, and compatibility considerations that also might impact you.

If you are upgrading from a software version other than the most recent one, review the release notes for all interim versions, not just for the version you are installing. For example, when upgrading from V1.0 to V1.2, review the release notes for V1.1 and V1.2.

## What's in the Release Notes

### New Features and Changes

- New functionality
- Changes to existing functionality

### Version Compatibility Considerations

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

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

### Fixed Bugs and Known Problems

The MathWorks offers a user-searchable Bug Reports database so you can view Bug Reports. The development team updates this database at release time and as more information becomes available. This includes provisions

for any known workarounds or file replacements. Information is available for bugs existing in or fixed in Release 14SP2 or later. Information is not available for all bugs in earlier releases.

Access Bug Reports using your MathWorks Account.

## **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 4.6 (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	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	Printable Release Notes: PDF  Current product documentation

New features and changes introduced in this version are

- “New Fuel Cell Stack Block” on page 6
- “Initial Conditions Can Be Specified for the Permanent Magnet Synchronous Machine Block ” on page 7
- “Multiple Discretization Rates within a Model Now Available” on page 7
- “New SimPowerSystems™ Demos” on page 8

### 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  $\Theta$  (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:

- Asynchronous 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	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

- “New Battery Block” on page 10
- “New Stepper Motor Block” on page 11
- “Three New Transformer Blocks” on page 11
- “New Measurement Option Available for the PI Section Line Block ” on page 12
- “New SimPowerSystems™ Demos” on page 12
- “Renamed psbhysteresis Command” on page 13

### 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-Hydrate, 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  $V_n/3$ .
- 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 ( $Z_0=Z_1$ ).
- 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 ( $Z_0=Z_1$ ).

## 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:

<b>Demo Name</b>	<b>Description</b>
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	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 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.

### New Demo Combining SimPowerSystems™ and SimDriveline™ Elements

A new demo, Hybrid Electric Vehicle (HEV) Power Train (power\_HEV\_powertrain), shows a 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).

## **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).

## 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	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:

### **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	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™ Software

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™ Software

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™ Software

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™ Software

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 Simulink Accelerator mode 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™ Software

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 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	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

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 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.** Version 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 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
<b>Latest Version</b> <b>V4.6 (R2008a)</b>	See the <b>Compatibility Considerations</b> subheading for this new feature or change: “Multiple Discretization Rates within a Model Now Available” on page 7
V4.5 (R2007b)	See the <b>Compatibility Considerations</b> subheading for this new feature or change: “Renamed psbhysteresis Command” on page 13
V4.4 (R2007a)	See the <b>Compatibility Considerations</b> subheading for this new feature or change: “Automated Conversion of Version 2 Models Is No Longer Supported” on page 15
V4.3 (R2006b)	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 22

<b>Version (Release)</b>	<b>New Features and Changes with Version Compatibility Impact</b>
V4.0.1 (R14SP2)	None
V4.0 (R14SP1)	None
V3.1 (R14)	None
V3.0 (R13SP1)	<p>See the <b>Compatibility Considerations</b> subheading for each of these new features or changes:</p> <ul style="list-style-type: none"><li>• “Terminal Ports and Connection Lines” on page 29</li><li>• “Renamed SimPowerSystems™ Commands” on page 31</li></ul>