SimPowerSystems Release Notes

The "SimPowerSystems 3.1 Release Notes" on page 1-1 describe the changes introduced in the latest version of SimPowerSystems. The following topics are discussed in these Release Notes:

- "New Features" on page 1-2
- "Major Bug Fixes" on page 1-4
- "Upgrading from an Earlier Release" on page 1-5
- "Known Software and Documentation Limitations" on page 1-6

If you are upgrading from a release earlier than Release 13 with Service Pack 1, you should also see these sections:

- "SimPowerSystems 3.0 Release Notes" on page 2-1
- "SimPowerSystems 2.3 Release Notes" on page 3-1
- "Power System Blockset 2.2 Release Notes" on page 4-1
- "Power System Blockset 2.1 Release Notes" on page 5-1

Note Versions of SimPowerSystems before Version 2.3 (Release 13) were called Power System Blockset.

Printing the Release Notes
If you would like to print the Release Notes, you can link to a PDF version.

Contents

SimPowerSystems 3.1 Release Notes

1

SimPowerSystems 3.0 Release Notes

2

3

SimPowerSystems 2.3 Release Notes

4

Power System Blockset 2.2 Release Notes

Power System Blockset 2.1 Release Notes

5

1

SimPowerSystems 3.1
Release Notes

New Features

This section summarizes the new features and enhancements introduced in SimPowerSystems since Version 3.0.

If you are upgrading from a release earlier than Release 13 with Service Pack 1, you should also see "New Features" on page 2-2 in the SimPowerSystems 3.0 Release Notes.

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.

Machines Library Enhancements

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

- The Simulink signal going out from the measurement output is re-organized as a bus signal so you can use the Bus Selector block from Simulink to select the machine measurements. The Machine Measurement Demux block is compatible with this new bus signal so you don't need to replace it with a Bus Selector block in your existing models.
- A new parameter named **Preset model** is added to the mask of the machine models. It provides a set of pre determined electrical and mechanical parameters set for various type of machine ratings of power. You select one of the preset models to load the corresponding electrical and mechanical parameters in the entries of the dialog box.
- A new parameter named **Show detailed parameters** is added to the mask of the machine models. It allow you to access the detailed parameters of the machine models, or to hide them when you are using a preset parameter.

Powergui Enhancements

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

Major Bug Fixes

SimPowerSystems 3.1 includes several bug fixes made since Version 3.0. This section describes the particularly important Version 3.1 bug fixes.

If you are upgrading from a release earlier than Release 13 with Service Pack 1, you should also see "Major Bug Fixes" on page 2-4 in the SimPowerSystems 3.0 Release Notes.

Forward Voltage of the Three-Level Bridge Block

Specifying a forward voltage different from zero in the three-level Bridge block no longer introduces a short-circuit of the internal power electronic devices. The output voltages no longer contains an over voltage due to this short-circuit.

Initial Conditions of the Asynchronous Machine Block

You can now enter a 1-by-14 vector for the initial conditions of an Asynchronous Machine SI unit block. You can specify a 1-by-8 vector for initializing the stator currents of the block or a 1-by-14 vector to specify the initial currents of the stator and of the rotor.

Discrete model of the Three-Level Dynamic Load Block

The discretisation of a model with the Three-Level Dynamic Load block no longer causes an initial dimension error the first time you start the simulation. You no longer need to run the simulation twice in order to avoid the error.

Multiple Use of Simplified Synchronous Machine Block

You can now have more that one Simplified Synchronous Machine block in a model.

Upgrading from an Earlier Release

There are no upgrade issues involved in moving from SimPowerSystems 3.0 to SimPowerSystems 3.1.

However, if you are upgrading from a version earlier than Version 2.3, see "Upgrading from an Earlier Release" on page 2-5 in the SimPowerSystems 3.0 Release Notes.

Known Software and Documentation Limitations

This section includes a link to a description of known software and documentation problems in Version 3.1.

Simulink Model Referencing Feature Not Supported

The new model referencing feature introduced in Simulink 6.0 is not supported for SimPowerSystems 3.1.

Ideal Transformer Block

There is a known bug with the Linear Transformer block, the Saturable Transformer block or any version of the Three-phase transformer blocks when the transformer is set as an ideal transformer (when both R and L are =0 for the windings). To work around the issue you need to specify a small resistance value for the windings. This small value should not change anything. The simulation and the transformer can be taken as a quasi ideal transformer.

SimPowerSystems and the Use of Enabled Subsystems

There is a potential problem if you try to put a portion of a SimPowerSystems model within an enabled subsystem. SimPowerSystems uses 'internal' Goto and From blocks to pass its required internal Simulation data. Since the Goto/From combination of blocks cannot be used across enabled subsystems (this is a Simulink limitation), one cannot put electrical blocks in an enabled subsystem, unless all of the electrical blocks are inside the subsystem.

Undocumented Blocks

Many blocks in the Extras library do not have block reference pages in the User's Guide. All SimPowerSystems blocks have block mask descriptions, however.

Undocumented Extras Library Blocks

All SimPowerSystems blocks have block mask descriptions and have been tested and validated. But many blocks in the Extras library do not have block reference pages in the user's guide. These blocks are listed here.

The Extras library blocks without block references 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

2

SimPowerSystems 3.0 Release Notes

New Features

This section summarizes the new features and enhancements introduced in SimPowerSystems 3.0 since Version 2.3 (Release 13).

If you are upgrading from a release earlier than Release 13, then you should also see "New Features" on page 3-2 in the SimPowerSystems 2.3 Release Notes.

Terminal Ports and Connection Lines

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

Separating SimPowerSystems and Simulink Lines and Ports

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

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

Blocks That Interface Between Simulink and SimPowerSystems Domains

The blocks of SimPowerSystems 3.0 can have only terminal ports or only Simulink ports, or both types. Blocks such 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.

Renamed SimPowerSystems Commands

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

power_analyze

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

You should use the power2sys command only for old models built with previous versions of SimPowerSystems or Power System Blockset. See "Using the Version 2 Commands" on page 2-6 for details about the use of the power2sys command in SimPowerSystems 3.0.

power_init

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

power_statespace

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

Major Bug Fixes

This section describes the important Version 3.0 bug fixes.

If you are upgrading from a release earlier than Release 13, see "Powergui Enhancements" on page 3-3 of the SimPowerSystems 2.3 Release Notes.

FFT Block Input Ports

The FFT block in the Discrete Measurements library of **powerlib_extras** now implements the FFT analysis for a vector signal of any number of components and is no longer limited to the analysis of three components. The number of input ports has been reduced to one vector input. If you used this block in your old models, you must use a Mux block to combine the three input signals into one vector signal.

Synchronous Machine Block Parameter

The parameter **F** of the Synchronous Machine block in the Machines library quantifies the machine's friction factor. This parameter's was not correctly described in previous releases. The block reference page has been corrected.

Simplified Synchronous Machine Block Parameter

The parameter **Kd** of the Simplified Synchronous Machine block in the Machines library quantifies the machine's damping factor. This parameter's role in the block was not correctly described in previous releases. The block reference page has been corrected.

Upgrading from an Earlier Release

This section presents issues involved in upgrading from SimPowerSystems 2.3 to SimPowerSystems 3.0.

If you are upgrading from a release earlier than Release 13, see "Upgrading from an Earlier Release" on page 3-6 of the SimPowerSystems 2.3 Release Notes.

Converting Version 2 Models to Version 3

SimPowerSystems 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 SimPowerSystems 3.0.

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

Using the Version 2 Commands

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

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

The `power2sys` command can only be used to analyze Version 2 models. If you want to analyze Version 3 models, you must use the new `power_analyze` command.

Accessing the Version 2 Documentation

For your convenience, the documentation of SimPowerSystems 3.0 includes the old documentation of Version 2.3. This documentation is available in HTML format and PDF format. 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 old documentation.

You can also access the old Version 2.3 documentation from the special Version 2 model conversion chapter in the online Help. See "Converting Version 2 Models to Version 3" on page 2-5 preceding.

SimPowerSystems 2.3 Release Notes

New Features

Note Previous versions of SimPowerSystems before Release 13 were called Power System Blockset.

This section summarizes the new features and enhancements introduced in SimPowerSystems since Version 2.2 (Release 12.1).

If you are upgrading from a release earlier than Release 12.1, then you should also see "New Features" on page 4-2 in the Power System Blockset 2.2 Release Notes.

Simulation Enhancements

The SimPowerSystems 2.3 enables you to simulate almost any circuit with the phasor simulation feature. The simulation time is reduced dramatically with this method (the differential equations representing the network are replaced by a set of algebraic equations at a fixed frequency). The phasor simulation facilitates transient stability studies of multimachine systems. The Transient Stability of 2 Machines demo illustrates a phasor simulation.

Electrical Sources Library Enhancements

The 3-Phase Programmable Voltage Source block has been moved to the Electrical Sources library. This block implements a three-phase voltage source, with programmable time variation for the amplitude, phase, and frequency of the fundamental frequency, and two superposable harmonics.

Elements Library Enhancements

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

• The 3-Phase Dynamic Load block implements a three-phase dynamic load where the active power and reactive power can be programmed or controlled by external Simulink signals.

• The Zigzag Phase-Shifting Transformer block implements a three-phase transformer where you can specify the phase angle and phase shift.

- You can activate an optional hysteresis characteristic in the Saturable Transformer, Three-Phase Transformer (Two-Windings), and Three-Phase Transformer (Three-Windings) blocks.

Power Electronics Library Enhancements

The Three-Level Bridge block has been added to the Power Electronics library. You can use this block to model complex converter configurations

Machines Library Enhancements

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

- The Generic Power System Stabilizer and Multiband Power System Stabilizer blocks
- Four new measurements have been added to the Machine Measurement Demux block for use with the Synchronous Machine block. See "Synchronous Machine Block Output" on page 3-6 for a possible associated upgrade issue.

Extras Library Enhancements

The Static Var Compensator block has been added for use with the phasor solution in the Phasor Library.

Powergui Enhancements

The Powergui block features these new tools and enhancements:

- The Powergui block now replaces the old Discrete System block that was used in the previous versions to discretize models. The Discrete System block is still in the library for backward compatibility.
- The **Phasor simulation** feature is activated directly from the Powergui dialog. You specify in the dialog the frequency used during the simulation.
- The **Impedance vs Frequency Measurement** tool now displays the Bode plots directly in the Powergui dialog in order to limit the number of windows.
- The **FFT Analysis** tool is now available in the Powergui dialog. New parameters have been added to refine the calculations.

- A **Hysteresis Design** tool has been added to enable you to define and edit any hysteresis characteristics for use with the Saturable Transformer block.

Major Bug Fixes

The SimPowerSystems Version 2.3 includes one important bug fix made since Version 2.2.

Parasitic Currents

Parasitic currents no longer flow in Power Electronics blocks when the block is not conducting.

Upgrading from an Earlier Release

This section describes an upgrade issue involved in moving from the Power System Blockset 2.2 to SimPowerSystems 2.3.

Note SimPowerSystems will automatically update your Power System blocks when you save your model. If you are using a model that contains Power System blocks from a previous version of the blockset, simply save your model when you open it from the newer version.

Synchronous Machine Block Output

If you were using a Selector block in your Version 2.2 models to output the Synchronous Machine block measurements, you need to set the Selector block's **Input Port Width** parameter to the value 22. If you were using a Demux block, the number of elements in Demux is now 22. (It was previously 18.)

Power System Blockset 2.2 Release Notes

New Features

Note Power System Blockset was renamed SimPowerSystems as of Release 13, Version 2.3.

This section introduces the new features and enhancements added in the Power System Blockset Version 2.2 (Release 12.1) since the Power System Blockset Version 2.1 (Release 12.0).

For information about Power System Blockset features that are incorporated from recent releases, see "New Features" on page 5-2 in the Power System Blockset 2.1 Release Notes.

New Extras Library Documentation

The Extras library of Power System Blockset 2.2 consists of miscellaneous, previously undocumented, power blocks. Fifteen of these blocks now have online block reference pages. The other blocks have short block descriptions or block documentation in their masks.

5

Power System Blockset 2.1 Release Notes

New Features

Note Power System Blockset was renamed SimPowerSystems as of Release 13, Version 2.3.

This section introduces the new features and enhancements added in the Power System Blockset Version 2.1 since the Power System Blockset Version 1.1 (Release 11.0).

Faster Circuit Topology Analysis

Power System Blockset now dramatically speeds up circuit topology analysis, allowing your power system simulations to start much more quickly. The blockset can now handle larger, more complex models with reduced simulation overhead.

Simulation Enhancements

Powerful discretization features have been added to Power System Blockset. These can dramatically speed up your simulations – especially those with Power Electronics blocks.

- In addition to the continuous simulation of power systems, you can now also discretize your models, using the fixed-step trapezoidal method (illustrated in the Current Transformer Saturation demo). See the Powergui block in the Power System Blockset library for more information.
- You also now have– especially those with power electronics devices. the ability to generate code from discretized Power System Blockset models through Real-Time Workshop for even more simulation speed.

The forward voltage of discretized power electronic devices (e.g., diode, thyristor, IGBT, and GTO) is now simulated in all cases, including discrete and continuous (with Lon=0).

Elements Library Enhancements

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

- The new 3-Phase Fault block implements a three-phase circuit breaker with external or internal control.
- The new Three-Phase Transformer (Two Windings) and Three-Phase Transformer (Three Windings) blocks implement a three-phase transformer with a configurable phase connection.
- The 3-Phase Breaker block now includes internal and external control.
- You now have the option to specify two and three windings for the Universal Three-Phase Transformer block.
- You now have the option to specify internal or external breaker timing for the Circuit Breaker block.

Power Electronics Library Enhancements

The following new blocks have been added to the Power Electronics library:

- The Universal Bridge block allows continuous or discrete simulation of the three-phase bridges of diodes, thyristors, IGBT diodes, GTO diodes, or MOSFET diodes.
- The IGBT block implements a semiconductor device controllable by a gate signal.

Machines Library Enhancements

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

- The Steam Turbine and Governor (STG) block and DC Machine block have been added.
- In all three Synchronous Machine blocks, a choice of **Rotor type** between Salient-pole or Round has been added.
- In both Simplified Synchronous Machine blocks, a choice of **Connection type** between three or four wires has been added. Use the 3-wire Y option to set the initial conditions with the Powergui dialog, then come back to the 4-wire Y option to simulate transients.
- For both Asynchronous Machine blocks, you can choose a **Reference frame** for the dq transformation.

Measurements Library Enhancements

The following new block and enhancement have been added to the Measurements library:

• The Impedance Measurement block has been added (see the Linear Filter and the Single-Phase Line demos).

• You can now use the Multimeter block to measure the voltage, current, and flux of transformers without adding voltage or current measurement blocks (see the Three-Phase Saturable Transformer demo).

Extras/Measurements Library Enhancements

The following new blocks have been added to the Extras/Measurements library:

• 3-Phase Sequence Analyzer

• Total Harmonic Distortion

• abc_to_dq0 Transformation

• dq0_to_abc Transformation

Extras/Control Blocks Library Enhancements

The following new blocks have been added to the Extras/Control Blocks library:

• PWM Generator

• Synchronized 6-Pulse Generator

• Synchronized 12-Pulse Generator

Extras/Discrete Control Blocks Library Enhancements

The following new blocks have been added to the Extras/Discrete Control Blocks library:

• Discrete Virtual PLL, Discrete 1-Phase PLL, and Discrete 3-Phase PLL

• Discrete Synchronized 6-Pulse Generator

• Discrete Synchronized 12-Pulse Generator

• Discrete 12-Pulse HVDC Control

• Discrete 3-Phase Programmable Source

Powergui Enhancements

The Power System Blockset 2.1 includes a redesigned Powergui block. You can now:

• Resize the Powergui dialog box windows
• Display phasor magnitude in peak or rms values

New Demos and Improved Documentation

Several new demos have been added to the Demos library. The new demos illustrate multimeters, discretization, and several new blocks. Examples include the Complete 12-Pulse HVDC Transmission System and the Three-Phase Series Compensated Network demos.

The tutorial chapter of the Power System Blockset User's Guide has been expanded, including new test cases and an explanation of how to customize your blocks.