What's New in PSCAD v4.3.0

Written for PSCAD™ X4 version 4.3.0

Manitoba
HYDRO INTERNATIONAL

The following lists the important new features and bug fixes in the latest PSCAD upgrades.

PSCAD X4 - General

Although PSCAD X4 is classified as a minor upgrade (internally 4.3.0), the enhancements that it provides are far from minor.

PSCAD - General

1. **New File Formats**: PSCAD X4 project file extensions have been changed to reflect the switch-over to XML based file storage. The extensions are now *.pslx and *.pscx for library and case projects respectively. Component definition file extensions have been changed from *.cmp to *.psdx.
2. **Upwards Compatibility**: PSCAD X4 supports the import of *.psc and *.psl file formats that have been generated by PSCAD v4.1.x or v4.2.x only. For more details on importing files into X4, see Migrating from Older Versions and Importing a Project.
3. **Downwards Compatibility**: The PSCAD X4 release is not backwards compatible. That is, X4 format project files (*.pscx and *.pslx) cannot be converted back to *.psc or *.psl format.
4. **Enhanced Search**: The searching facilities have been enhanced. The background search engine is now based on XPath. See Searching for details.
5. **Transmission Line/Cable Error Messaging**: Messages derived from the transmission segment solve step in the build process, are now displayed in the Output Window.
6. **Fortran Compiler Support**: See Supported Fortran Compilers.
7. **Circuit View Options**: Navigate into a module and Background colour for definition view.
8. New Graphics Settings dialog options.
9. New Workspace window functionality.
10. New Output Window functionality.

    All output window messages can now be saved as part of the project file. See Projects in Chapter 3 of the On-Line Help for more details.

11. The library pop-up menu system has been slightly modified.

PSCAD - New Features

1. **Multiple Instance Modules**:
   - #BEGIN/#ENDBEGIN Directive Block: This directive provides access to the BEGIN outer process in EMTDC, and is required for supporting MIM in custom components. See The BEGIN Subroutine or #BEGIN/#ENDBEGIN in the On-Line Help for more details.
   - New #STORAGE Arrays: New storage arrays have been added specifically for the transfer of data from BEGIN to DSDYN/DSOUT. The usage of these arrays is required for supporting MIM in custom components. See #STORAGE in the On-Line Help for more details.

2. **Mutual Coupling**: This feature enables users to mutually couple individual line or cable segments with identical lengths. Multiple segments can be merged into a single Right-Of-Way (ROW) without affecting the individuality of each segment. Mutual coupling may be toggled on or off. See Mutual Coupling in the On-Line Help for more details.

3. **Subsystem Splitting**: The subsystem splitting algorithm is now independent of module components. That is, subsystems will be determined by transmission lines only, and will not be affected by module hierarchy. See Mapping in the On-Line Help for details.

4. **Oscilloscope**: A new meter utility has been added as yet another avenue for viewing data online. See Oscilloscopes in the On-Line Help for more details.

5. **Display Voltage on Buses**: This option allows for the display of voltage directly on Bus components. See Project Settings | Runtime in the On-Line Help for more details.

6. **Saving Graphics to File**: Graphic objects used in the Graphics section of the component design environment can now be stored in and imported from files. See The Graphic Section in the On-Line Help for more details.

7. **T-Line and Cable creation buttons**: TLine and Cable objects are now created using special buttons in the main toolbar, which utilize the Component Wizard.

8. New Zoom Rectangle and Zoom Extents options.

9. Definition linking and re-linking.

10. Namespace project setting. This project attribute is used when linking component definitions.

11. New component input parameter types: Table and Toggle.

Master Library – Models

1. New: Saturable Reactor
2. New: Spark Gap
3. New: 1-Phase 3-Winding Auto Transformer
4. New: 3-Phase Star-Star Auto Transformer with Tertiary
5. New: Discrete Wavelet Transform (DWT)
6. New: X to the Power Y
7. New: Force to DSDYN
8. New: Force to DSOUT
9. New: Runtime Configurable Passive Branch
10. New: XY Table
11. New: Variable Series Impedance Branch
12. New: C-Type Filter
13. New: Multiple Run Additional Recording
14. Updated: Real Pole, Differential Pole, Lead-Lag. Added initial value option when resetting at TIMEZERO.
15. **Updated**: On-Line Frequency Scanner (FFT). Added single-line diagram support.
16. **Updated**: 1-Phase Auto Transformer. Added on-load tap changing capability.
17. **Updated**: 3-Phase Star-Star Auto Transformer. Added on-load tap changing capability.
18. **Updated**: Variable RLC. Added dL/dt or dC/dt effects.
19. **Updated**: Feedback Loop Selector. Added support for non-scalar input.
20. **Updated**: Single-Phase Breaker, Three-Phase Breaker. Added breaker voltage output signal.
21. **Updated**: 6-Pulse Bridge. Added snubber circuit current measurement. Added reverse withstand voltage input. Added ability to set an unblock time.
22. **Updated**: 3-Phase to SLD Electrical Wire Converter (Breakout). Added a compact graphical view option.
23. **Updated**: Multi-Mass Torsional Shaft Interface. Increased maximum total masses from 6 to 26..
24. **Updated**: Random Number Generator. Added Gaussian type random number distribution.

Line Constants Program – General

There have been significant enhancements to the Line Constants Program (LCP) since the previous released version (August 26, 2005). The new **DC Correction** and **Trace Fitting** algorithms have made the Frequency Dependent (Phase) model even more robust than ever: Simultaneously dealing with DC (i.e. 0.0 Hz) accuracy and the intermittent issue regarding the propagation function H and unstable poles.

Line Constants Program – Features / Enhancements:

1. **DC Correction**: Two unique DC correction algorithms have been added, which ensure perfectly accurate DC parameters for time domain simulations. See EMTDC Reference [36].

2. **Trace Fitting**: An alternative algorithm for fitting the propagation function H has been added to the Frequency Dependent (Phase) model. This method derives poles by fitting the trace of H (sum of diagonal elements), instead of fitting the modes of H. This method avoids the problem of occasional unstable poles inherent in the fitting of the modes of H. See EMTDC Reference [37].

3. **Total Number of Conductors Increased**: The total allowable conductors per transmission line/cable has been increased from 20 to 30.

4. **Unique Ground Wires in Overhead Towers**: If there are 2 ground wires in a tower, they may now be entered with unique parameters.

5. **Hollow Conductor Support in Overhead Towers**: All conductors in a tower may now be selected as hollow core.

6. **Bundled Sub-Conductor Limit Increased**: Conductor bundles may now include up to 15 sub-conductors.

7. **Conductor/Ground Wire Permeability**: There is now an input for relative permeability of both conductors and ground wires.

8. **Conductor Library Format Change**: The addition of conductor relative permeability and hollow conductor support has forced a change in the format of Conductor Library files (additional two parameters).

9. **Specific Conductor Layer Elimination in Cables**: Users may now select which conductors are to be eliminated (not just the outer layer).

10. **Enhanced Log File Output**: The *.log file format for the Frequency Dependent (Phase) model has been updated to make it more readable.

11. **Additional Detailed Output Files**: Added additional detailed output files for calculated vs. fitted values when using the Frequency Dependent (Phase) model. Users may now compare calculated versus fitted responses for the first time for this model.

12. **PI Section Auto-Creation**: PI-sections may now be created when using the Manual Entry of Y,Z component.

Line Constants Program – Sanity Checks:

1. **Overlapping Cables**: A check to ensure cable cross-sections do not overlap is now performed. This is accomplished by comparing the centre-point modulus with the sum of the radii.
2. **Cable Depth and Conductor Height**: Checks are performed to ensure these parameters are entered positive.

Line Constants Program – Bug Fixes:

1. **Conductor Permeability**: The relative permeability input parameter value entered in the Ground Plane component was used as the relative permeability value for all ground wires and conductors in overhead towers. Conductor and ground wire permeabilities are now unique.
2. **PI Section Auto-Creation**: PI-section component automatic creation was flawed when solving single-phase transmission systems. This has been fixed.