

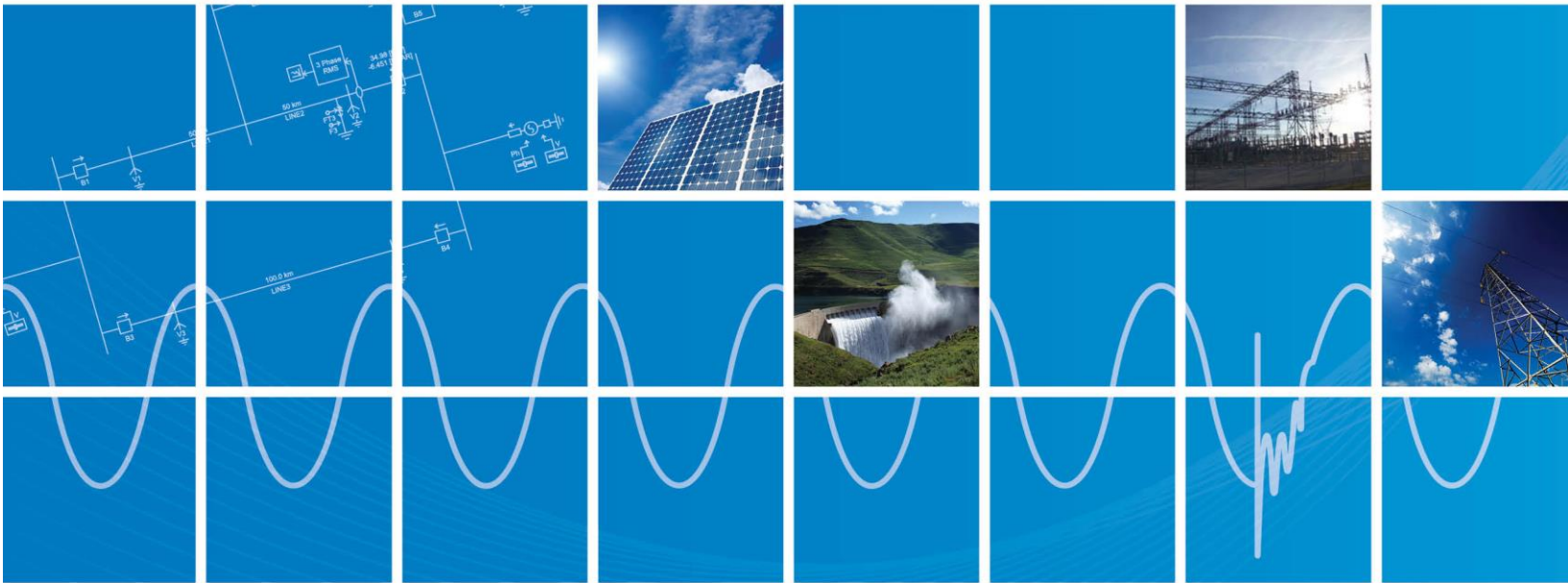


Getting Started – PSCAD v4.6.0

Written for PSCAD X4 version 4.6.0

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Contents

1. COMPUTING REQUIREMENTS	1
2. RECOMMENDATIONS FOR USING THE PARALLEL COMPUTING FEATURES	3
2.1 ELECTRIC NETWORK INTERFACE.....	3
2.2 VOLLEY LAUNCH	3
3. LICENSING REQUIREMENTS	4
3.1 WHEN USING CERTIFICATE LICENSING TO RUN PSCAD	4
3.2 WHEN USING LOCK-BASED LICENSING (SINGLE-USER LICENSE) TO RUN PSCAD	4
3.3 WHEN USING LOCK-BASED LICENSING (NETWORK OR MULTI-USER LICENSE) TO RUN PSCAD	4
4. SCOPE BOUNDARIES	5
4.1 PSCAD IMPOSED BOUNDARIES (ALL EDITIONS AND COMPILERS)	5
4.2 EDITION SPECIFIC BOUNDARIES	5
4.3 FREE EDITION RESTRICTIONS.....	5
5. SUPPORTED FORTRAN COMPILERS	6
6. INSTALLING PSCAD	7
6.1 PROFESSIONAL AND EDUCATIONAL EDITIONS.....	7
6.2 FREE EDITION.....	8
6.3 RUNNING THE FREE EDITION	9
7. TUTORIALS AND EXAMPLES TO GET YOU STARTED	10

1. Computing Requirements

PSCAD is a numerically intensive power system transients simulator; a fast and efficient personal computer is recommended for best results. PSCAD is supported on any computer running Microsoft® Vista or 7. Windows XP is not supported for versions 4.6.0 and higher.

Category	Recommended
Computer ¹	<ul style="list-style-type: none"> · Good motherboard with fast front side speed · 8 GB + of fast high quality RAM · Solid state hard drive · 64 bit operating system · 4 + CPU cores with a decent CPU ranking · One USB 2.0 port or internet connection²
Operating System ³	Microsoft® Windows 7, 64-bit
Processor	Generally the faster the better. We recommend at least a 4-core processor in order to take advantage of Parallel and High Performance Computing.
Additional Software	Intel® Visual Fortran Compiler for Windows 2015 ⁴ Microsoft® .NET Framework 4.0 Full ⁵ Microsoft Visual C++ 2010 Redistributables ⁶

¹To obtain specifications for extremely high workloads, please contact The PSCAD Support Desk (support@pscad.com).

² Licensing: For PSCAD v4.6 and above, internet-based certificate licensing is available, along with the older lock-based licensing. An internet connection is required only to refresh the license certificate. Once refreshed, PSCAD may be used offline. For the older lock-based licensing, a USB 2.0 port is required for the [hardware lock](#).

³The PSCAD product is sold as a 32-bit and 64-bit application. On a 64-bit machine, both applications are installed. On a 32-bit machine, only the 32-bit application is installed.

⁴The *Intel® Visual Fortran Compiler for Windows* has shown to provide EMTDC runtime executables that are significantly faster than those built by its predecessors (*Intel Visual Fortran 9 to 11*). The latest *Line Constants Program* is also built with this compiler, with significant speed enhancements as well. You may purchase the Intel® Parallel Studio XE (Composer Edition) directly from the Intel Corporation at this link <https://software.intel.com/en-us/try-buy-tools>. Alternatively, the GFortran 95 compiler comes bundled with PSCAD, but is not recommended for running larger cases. **NOTE:** The *Intel® Visual Fortran Compiler for Windows* is not supported in the PSCAD Free Edition, which uses only the GFortran 95 compiler.

⁵PSCAD requires that *Microsoft® .NET Framework 4.0 Full* be installed. The framework comes complete with the *Microsoft® Windows 7* operating system and later, but is not included with *Microsoft® Windows Vista*. If not already installed on your computer, the installer will automatically install *Microsoft® .NET Framework 4.0 Full*.

⁶PSCAD requires that *Microsoft® Visual C++ 2010 Redistributables* (either x86 for PSCAD 32-bit or x64 for PSCAD 64-bit) be installed. If not already installed on your computer, the installer will automatically install *Microsoft® Visual C++ 2010 Redistributables*.



Personal computers configured with slower processors and lesser RAM may be used, but slower execution performance will result. In other words, simulation speed increases with processor speed and amount of installed RAM.

2. Recommendations for using the Parallel Computing Features

High performance computing is available in PSCAD for faster simulations. This is provided in two parallel computing features, the electric network interface and the volley launch.

Using either of these features requires a balanced combination of computers cores and PSCAD features called “instances of EMTDCs”. Every PSCAD license comes with a standard base of 4 instances of instances of EMTDCs. However, additional blocks of instances may be purchased.

Both of these features may host the simulation on a single computer, or, with the use of third party software (Xoreax Grid Engine), the simulation may be hosted on multiple connected computers.

2.1 Electric Network Interface

In electric network interface (ENI) (or “task parallelism”), a large PSCAD project is split into smaller parts. Each part is processed by one CPU core, with PSCAD also using a single core. These project parts are simulated simultaneously, thereby increasing simulation speed.

For example, on a four-core computer, the project could be split into three parts to be run simultaneously. Four instances of EMTDCs would be required for this.

With the Xoreax Grid Engine installed, a number of multi-core computers could be connected, to divide the project into multiple parts. For example, if four four-core computers are connected using the Grid Engine (combined total of 16 cores), the project may be divided into 12 parts, with one core in each computer (total of 4 cores) available to run PSCAD.

For more information on ENI, refer to the manual “Electric Network Interface Example (ENI)”, which may be downloaded from [here](#). A video may be downloaded from [here](#).

2.2 Volley Launch

In volley launch (or “root control”), multiple separate simulations may be launched simultaneously in parallel, thereby increasing simulation speed.

To use the volley launch feature on a single computer, the most efficient ratio of EMTDC instances to computer CPU cores is 1.5:1, up to a maximum of 2:1. For example, on a four-core computer, the recommended ratio is from six to eight EMTDCs over the four cores. This would allow a user to run six to eight simulations in parallel.

To use the volley launch feature on multiple connected computers using the Xoreax Grid Engine, the ratio of EMTDC instances to computer CPU cores is 1:1. For example, for four four-core computers connected using the Xoreax Grid Engine (combined total of 16 cores), the recommended number of parallel simulations would be 16.

For more information on volley launch, please refer to the manual “What’s New in PSCAD v4.6.0”, which may be downloaded from [here](#). A video may be downloaded from [here](#).



3. Licensing Requirements

3.1 When using Certificate Licensing to run PSCAD

When using certificate licensing, PSCAD requires access to the following license server URL:

- <http://licensing.pscad.com:80/Licensing> (preferred)
- <net.tcp://licensing.pscad.com:443/Licensing> (fallback)

3.2 When using Lock-based Licensing (Single-User License) to run PSCAD

The following are requirements when the PSCAD client machine is hosting the license (self-licensing):

- The license database file must be installed on the client machine.
- The Sentinel USB lock must be plugged in on the client machine.
- The PSCAD software must be installed and run on the client machine.

Note

These requirements might not be satisfied when running PSCAD in a cloud desktop environment.

3.3 When using Lock-based Licensing (Network or Multi-User License) to run PSCAD

The following are requirements when using the Standalone License Manager:

- On the license host server and PSCAD client machines, ICMP Ping Echo and ICMP Ping Reply must be enabled on the Firewall.
- The protocol for communication between the server and clients is TCP/IP and UDP/IP on port 2053 and 2054.
- The license database file must be installed on the server.
- The Sentinel USB lock must be plugged in on the server.
- The PSCAD client machines must be able to contact and connect to the license manager host.

Note

These requirements might not be satisfied when running PSCAD in a cloud desktop environment.

4. Scope Boundaries

Any boundaries imposed on your projects will depend mainly on which PSCAD edition you are using. The following tables list the most commonly encountered boundaries.

4.1 PSCAD Imposed Boundaries (all Editions and Compilers)

Description	Boundary
Transformers	Unlimited
Mutually coupled windings	Unlimited
Component Graphical Layers	256
T-Lines/Cables	Unlimited
Conductors per T-line Right-of-Way	30
Cables per Right-of-Way	12
Data signal dimension	1,024
Radio Transmitters/Receivers	1,024
STOR allocations	Unlimited
STORF/L/I/C allocations	Unlimited

4.2 Edition Specific Boundaries

Description	Free	Educational	Professional
Electrical Sub-systems	1	1	256
Electrical Nodes	15	200	Unlimited
Modules	5	64	2,048
Components	1,024	32,768	65,536
Output Channels	256	1,024	2,048

4.3 Free Edition Restrictions

Description	PRO and EDU Editions	Free Edition
Create Definition	✓	✗
Edit Definition	✓	✗
Import/Export Definition	✓	✗
Copy/Paste Definition	✓	✗
Commercial FORTRAN Compiler	✓	✗
Frequency-Dependent T-Lines	✓	✗
MATLAB Interface	✓	✗
Graph Watermarks	✗	✓



5. Supported FORTRAN Compilers

PSCAD requires a FORTRAN compiler to build and simulate projects. The following commercially available compilers are presently supported:

- Intel® Visual Fortran Compiler for Windows 9.x, 10.x, 11.x, 12.x, 13.x, 14.x & 15.x¹
- GFortran 95 (v4.2.1 and v4.6.2)²

For your convenience, a free FORTRAN compiler, called the *GFortran 95* compiler, is provided on your PSCAD CD. If you have installed the *Free Edition* with your MyCentre account, the *GFortran* compiler is available as a separate download.

If you are the owner of a professional or educational PSCAD license, it is recommended that you purchase the *Intel® Visual Fortran Compiler for Windows (v15)* compiler, mainly for its superior debugging environment and optimization features. Also, has shown to provide EMTDC runtime executables that are significantly faster than those built by its predecessor (*Intel Visual Fortran 9 to 11*); in some cases *twice as fast*. You may purchase the Intel® Parallel Studio XE (Composer Edition) directly from the Intel Corporation at this link <https://software.intel.com/en-us/try-buy-tools>.

¹The *Intel Visual Fortran Compiler for Windows* compiler is not supported in the PSCAD *Free Edition*, which uses only the *GFortran 95* compiler.

²GFortran v4.2.1 is supported for all versions of PSCAD X4. GFortran 4.6.2 is supported with PSCAD 4.6.0 and onwards.



6. Installing PSCAD

6.1 Professional and Educational Editions

Installing your PSCAD software should be a straightforward process. If problems do arise, please contact the *PSCAD Support Desk* (support@pscad.com) for assistance. Proceed as follows:

- a. Insert CD into a compatible optical drive. The installer should start automatically.
- b. Follow the instructions given in each, sequential installer dialog.
- c. For more detailed instructions, please refer to the references available on the following web page:

<https://hvdc.ca/knowledge-base/topic:151/v:>

- For a new installation, download *PSCAD X4 Installation*.
- For an update, download *Updating PSCAD X4*.

6.2 Free Edition

Installing your PSCAD Free software is a simple process. If problems do arise, please request support through the 'Support' tab in your MyCentre account. Proceed as follows:

- a. Register a user profile in MyCentre (<https://mycentre.hvdc.ca/login>).
- b. Install the *MyUpdater* tool, which manages your software installation and updates, from the following link on the MyCentre *Home* page:



- c. Launch *MyUpdater*, and install or update your PSCAD Free product.
- d. Ensure that the *GFortran* product is installed (also via *MyUpdater*).

Note

Once GFortran is installed, ensure to log out and log in to (or restart) your computer, prior to running a PSCAD simulation with GFortran. This is required to apply the changes to your computer.

- e. For more detailed instructions, please download *Managing MyCentre* from the following web page:

<https://hvdc.ca/knowledge-base/read,article/213/managing-mycentre/v>:



6.3 Running the Free Edition

- a. Launch the *MyUpdater* tool.
- b. If your PSCAD Free installation is outdated, you will need to first select *Update* before you can run it.
- c. If your PSCAD Free installation is up-to-date, select *Run* to launch.
- d. Acquire a license to run PSCAD Free.

Notes:

- - The certificate will automatically be set to expire in four weeks. However, it will be refreshed to a new four-week period whenever you launch PSCAD online.
 - The certificate may be released and returned to MyCentre, so that it may be activated on a different machine. Or it may be retained on your machine so that you may work offline.
 - Software updates are regularly published, and are only available when logged in on the MyUpdater tool.
- e. For more detailed instructions, please download *Managing MyCentre* from the following web page:

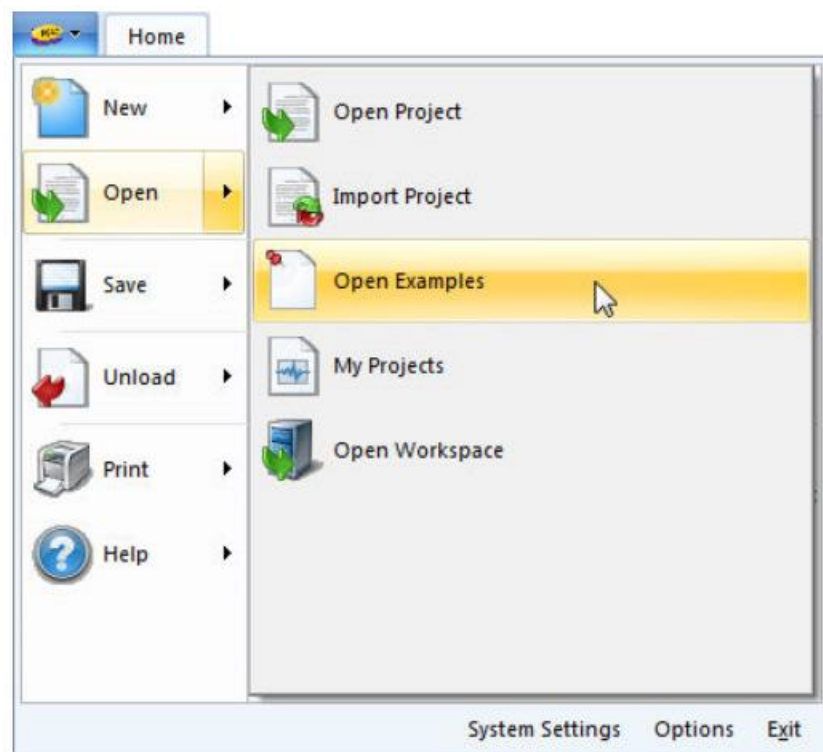
<https://hvdc.ca/knowledge-base/read,article/213/managing-mycentre/v:>

7. Tutorials and Examples to get you started

There are a few tutorials in the online help to get you started quickly (in the PSCAD application, click on the yellow “PSCAD” start button, and select “Help”). The tutorials are:

- My First Simulation
- Creating a New Case Project
- Creating a New Component

There are also a collection of simple projects already constructed, to help you become more familiar with the software. They can be found in the application examples folder. Simply start PSCAD, select **Open | Examples** from the PSCAD tab in the ribbon control bar, and navigate to the *tutorials* folder.



Further references, user guides, examples and applications may be found on our [Knowledge base](#).



DOCUMENT TRACKING

Rev.	Description	Date
0	Initial: Content for this manual was taken from the PSCAD v4.6.0 Help System. This manual supersedes "Getting Started PSCAD X4 v4.5 and v4.6", as that manual was split out into two separate documents, one for each branch (v4.5 and v4.6).	08/Jan/2016
1	Updated to v4.6.1	12/Sep/2016
2	Updated Intel Fortran compiler purchasing information, Updated weblinks, Added new Section 2 (Licensing Requirements), updated remaining section numbers Updated Section 6, Minor formatting	03/Nov/2016
3	Added new Section 2 (Recommendations for using the Parallel Computing Features), updated remaining section numbers	04/Nov/2016
4	Update to new Branding Guidelines	18/May/2018