# Centre Journal

PSCAD/EMTDC V3 Now Available

EMTDC has been used worldwide for more than two decades. Unix version of PSCAD/EMTDC has been available for almost a decade. **Now the power of PSCAD/EMTDC is available on PC.**

PSCAD/EMTDC is a general-purpose time domain simulation tool for studying transient behavior of electrical networks. First developed in 1976, the EMTDC simulation program has constantly been evolving in its scope and capabilities. Now you can harness the power of EMTDC through the friendly PSCAD user interface on PC. This seamlessly integrated visual environment supports all aspects of conducting a simulation including circuit assembly, run-time control, analysis and reporting.

Use it to simulate almost any circuit of any size – accurately and efficiently. PSCAD/EMTDC comes with a comprehensive library of models encompassing all aspects of AC and DC power systems and controls. If you need a model that is not in our library, we have got you covered too. Create your own models and libraries using the built-in graphical **Component Workshop** It is very easy. EMTDC supports models written in FORTRAN or C/C++, so you don't even have to learn any proprietary modeling language. If you are studying circuits consisting of power electronic switches such as thyristors and GTOs, you will
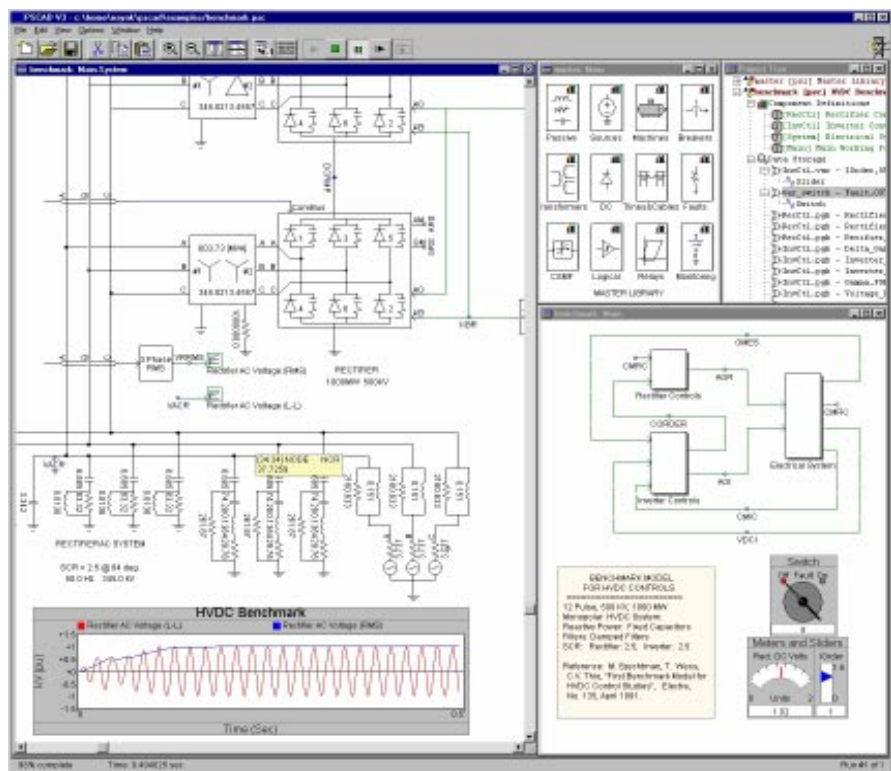
greatly benefit from the *Interpolated Network Solution* and **Chatter Removal** technology of EMTDC. Not only will you be able to study many circuits that are impractical or almost impossible to simulate using other tools, but you will also get the most accurate solution in the least amount of time. There is no limit on the size of the circuit you can simulate except for the resources on your computer. Dynamic EMTDC resizes automatically to give you the optimum performance.

PSCAD has many advanced features to boost your productivity. Intelligent data forms, interactive control and feedback, up-to-date documentation of your circuit along with plots and comments, context sensitive help, hierarchical designs and multiple levels of zooming are just a few features to mention. To truly appreciate the power and flexibility of the PSCAD/EMTDC simulation environment, try it out.

Stay Up to Date with Documentation. Print the circuits, complete with comments and graphs. The template can be customized to suit your internal documentation standards. Thus, what you document is what you design. Your documents will never be out of date.

Cut down your design time by using the interactive controls. Apply a fault or change a setting while the simulation is in progress and observe the response on-line. Use this feature to adjust any circuit parameter to analyze the system response.

Quickly develop complex systems using basic building blocks. Then use the *Hierarchical Modeling* ability to organize your circuit into super-blocks. The detailed circuit on the left is the expanded view of this block. You can build multi-level super-blocks consisting of electrical networks, control systems or both.

Stay organized using the *Project Manager*. Use this to manage your cases and maintain your libraries.

*I*ntelligent and dynamic data input forms** make it very easy to enter the model data. The data forms support multiple pages, several types of data fields, choice boxes and pull-

down lists. These parameters can have default settings, maximum and minimum limits and error checking expressions. You can design these forms in the *Component Workshop* for your custom components.

Create custom libraries using the built-in *Component Workshop*—the tool used to create all our **Master Library** components. The look of the component and the data forms are all designed graphically. The dynamics of the model are written in FORTRAN, either inside the component or as a call to a subroutine. The subroutine can be written in FORTRAN or C/C++.

With this totally integrated visual simulator you can design complex circuits at a fraction of the time you would otherwise spend with text based or semi-graphical tools. Powered by the advanced technology of PSCAD / EMTDC, you can now systematically analyze many circuits that were either overwhelmingly complex to conceive or beyond the technical capability of other tools.

For more information or to purchase PSCAD/EMTDC contact :

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Summary of PSCAD/EMTDC Special Features:

- **Totally Graphical:** Circuit Assembly, Data Entry, Run Control, and Analysis.
- **Modular:** Electrical systems and controls can be organized in hierarchical modules.
- **On-line Help:** Context sensitive Flybys and HTML help.
- **Customization:** Built-in *Component Workshop* to add new models quickly and easily.
- **Design Documentation:** Print the circuit complete with plots, settings and comments.
- **Extensive Library:** Includes a broad range of models for power system and power electronic studies.
  Sample of models and the scope of study.
  - Frequency Dependant T-Lines and Cables
  - Multi-limb Transformers with Saturation
  - Synchronous Machines and SSR Studies
  - Arrestors and Insulation Coordination
  - Lightning and Impulse Studies
  - HVDC, FACTS and Control Coordination
  - Power Electronics and Drives
  - Control System Modeling Functions
  - Logic Functions
  - Or write your own model in FORTRAN or C/C++
- **Unlimited Size:** Dynamic EMTDC automatically dimensions to the optimum size.
- **Fast and Accurate Solution:** *Interpolated network solution* gives you the speed of large time steps and the accuracy of infinitesimally small time steps. You will greatly appreciate it if you are simulating power electronic circuits.
- **Reliable:** Continuously detects and removes spurious numerical oscillations *(chatter)*.
- **Batch Processing and Optimization:** Simply run a case multiple times with a set of parameters changed each time in a predetermined manner or find out the optimum set of parameters based on a criterion defined by you.
- **MATLAB Interface:** Use MATLAB engine and graphics from within PSCAD/EMTDC.

Real Time Playback (RTP): Case Summary

Manitoba Hydro Nelson River HVDC BP2 system experienced some unexplained operation during AC system undervoltage conditions. In one case the Pole 3 AC undervoltage operated while the identical Pole 4 protection did not. A month later during a similar experience the Pole 4 protection operated when the Pole 3 protection did not. The station Digital Transient Fault Recorder (DTRF) captured both events as a COMTRADE file.

The Centre RTP system was utilized to help identify the source of the problems. The RTP system is a multiple channel arbitrary waveform which can replay transient waveforms generated either by PSCAD/EMTDC simulation, or as is in this case, COMTRADE system disturbance recordings. The BP2 AC undervoltage protection retrieves signals from single phase to ground valve timing potential transformers. The secondary side of the valve timing signals are processed by a set of 3 phase star - delta auxiliary transformers to reproduce the valve voltages as seen in the star and delta 6 pulse valve groups. These voltages are the input to a threshold detection card which determines the set and rest of an ac undervoltage condition. In order to test the behavior of the protection system, system spare auxiliary transformers and the ac undervoltage detection card were wired according to the installed circuits. Using the RTP to play back the DTFR waveforms allowed laboratory testing results previously unobtainable. RTP was used to convert the COMTRADE file into the required RTP format but was also used to create a recorder trigger signal by adding an additional A phase channel. This additional channel was graphically editted to produce a trigger signal at the start of the disturbance.
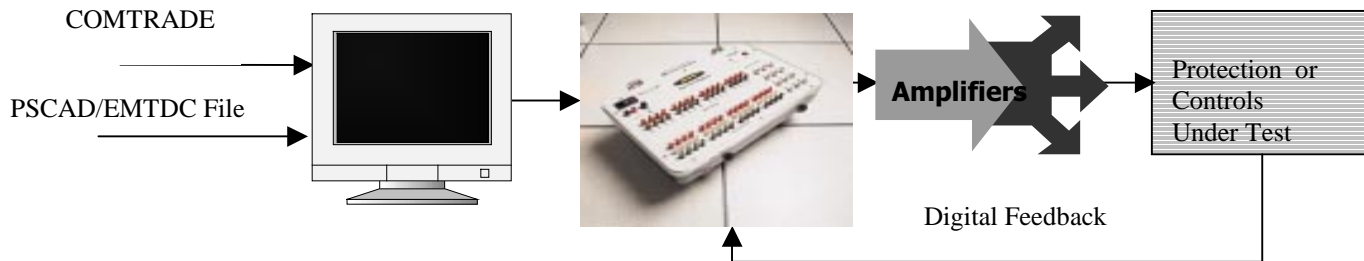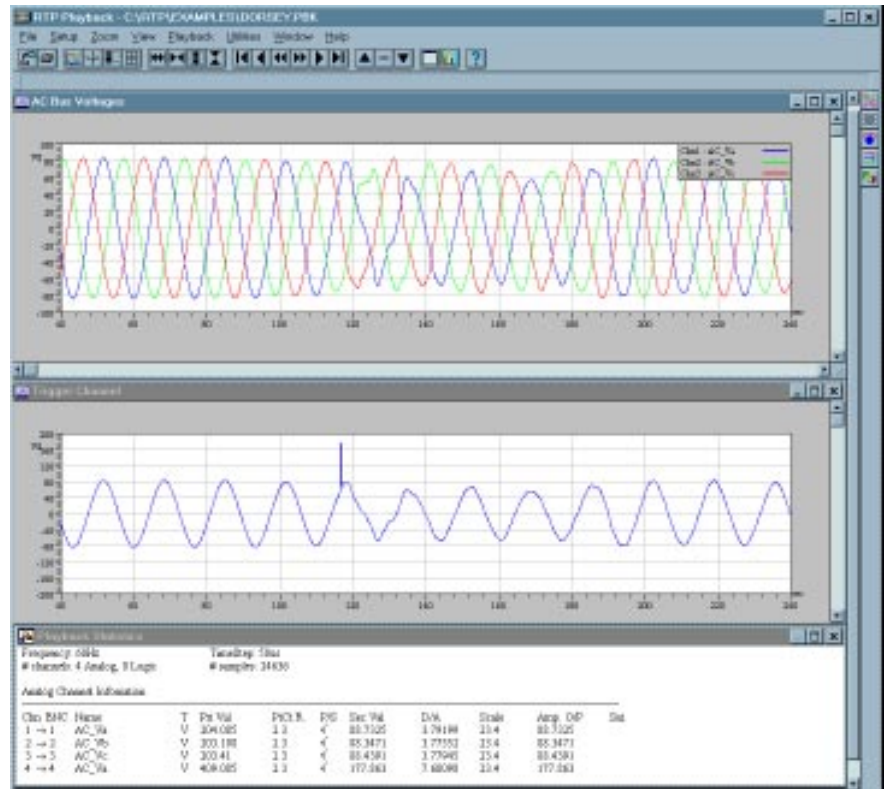

Figure 1: RTP Test Configuration

As the complexity and sophistication of controls and protection continues to increase, testing requirements will also continue to increase. RTP represents a part of this new generation of test equipment. For more information on RTP contact the Centre, visit the Centre's web site www.hvdc.ca. or come to the Centre's Hospitality Suite at the Winter IEEE meeting in New York.

PSCAD EMTDC

RTP

**You are cordially invited to
visit us at our hospitality suite during
the 1999 IEEE Winter Power Meeting in New York.**

**New York Hilton Hotel
Monday - Wednesday
February 1- 3 , 1999
5:00 PM to 8:00 PM**

- **Hands on Demo and Discussion of PSCAD/EMTDC V3 Graphical Electromagnetic Transients Simulation Program.**

- **RTP : Real Time Playback test system demonstration.**

Centre Staff
Wishing You a Happy and
Properous New Year