Quick Guide for PSIM Version 9.1 and SmartCtrl Version 1.1

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1. Introduction

PSIM is a computer simulation software specially designed for the analysis and design of power electronics and motor drives. It provides a powerful simulation and design environment for switchmode power supplies, analog/digital control, and electric motor drives.

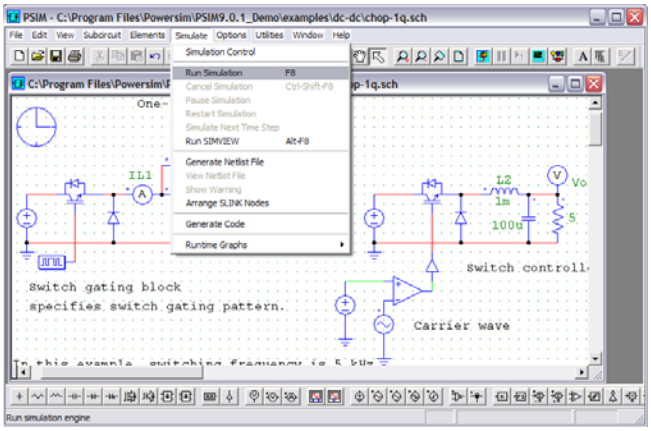
SmartCtrl is a general-purpose controller design software specifically for power electronics applications. It features easy-to-use interface, simple workflow, and visual display of control loop stability and performance. Using SmartCtrl, one can design controllers of various power converters easily and conveniently.

This document describes how to use PSIM and SmartCtrl, and issues related to installation and trouble-shooting.

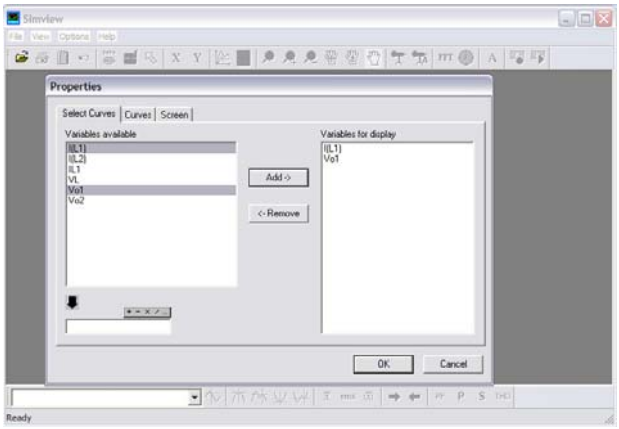
2. Simulating a Circuit in PSIM

To simulate the sample circuit "chop-1q.sch" in PSIM:

- Launch PSIM by running PSIM.exe in the PSIM directory. In PSIM, go to **Open** in the **File** menu, and load the schematic file from the sub-folder “examples\dc-dc”.
- Choose **Run Simulation** from the **Simulate** menu to start the simulation, as shown below.



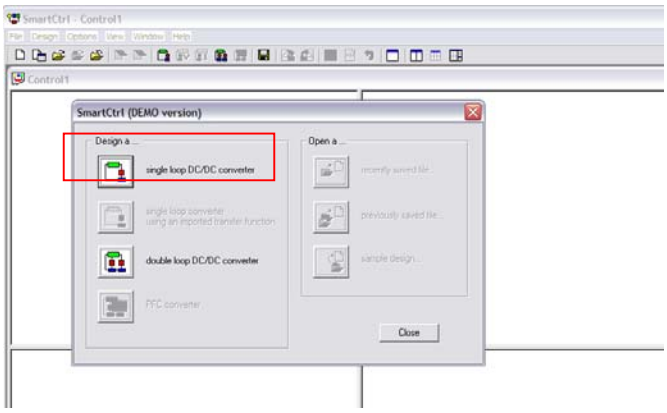
- After the simulation is complete, the waveform processing program Simview will appear. In SIMVIEW, select the curves available for display, as shown below.



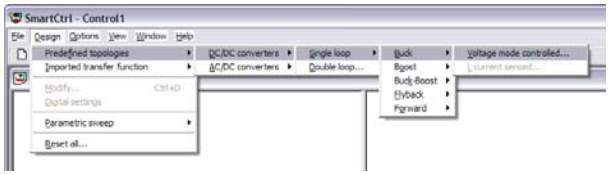
3. Designing a Control Loop in SmartCtrl

To design the voltage loop of a buck converter in SmartCtrl:

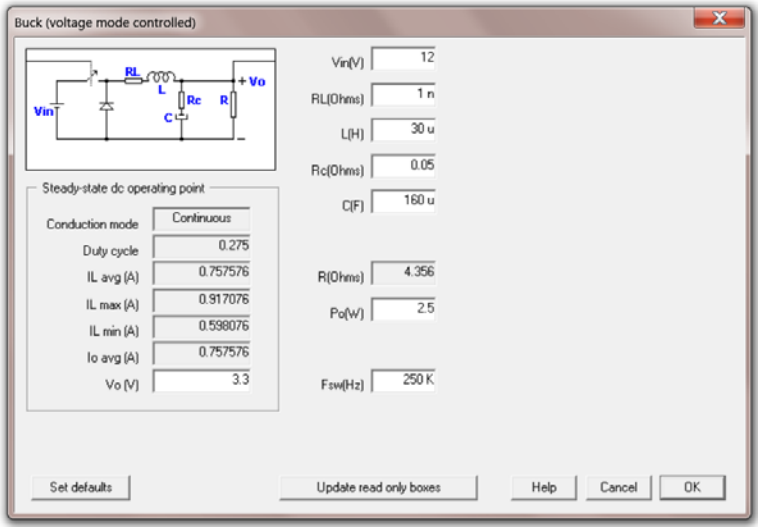
- Launch SmartCtrl by running SmartCtrl.exe in the PSIM directory. In the dialog, choose **Design a single loop DC/DC converter**, as shown below.



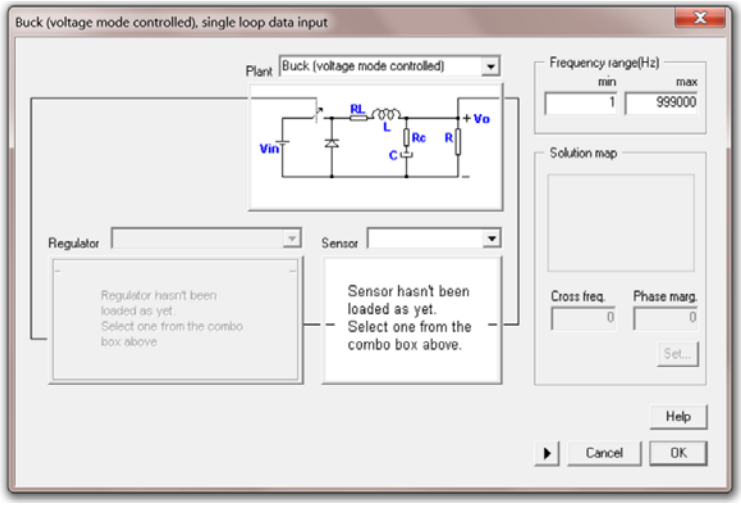
- Then select **Design** -> **Predefined topologies** -> **DC/DC converters** -> **Single loop** -> **Buck** -> **Voltage mode controlled**.



A dialog window that shows the converter power circuit will appear. Define the input voltage and output voltage, and circuit parameters. Based on the parameters, SmartCtrl will automatically determine if the circuit operates in the continuous or discontinuous conduction mode.

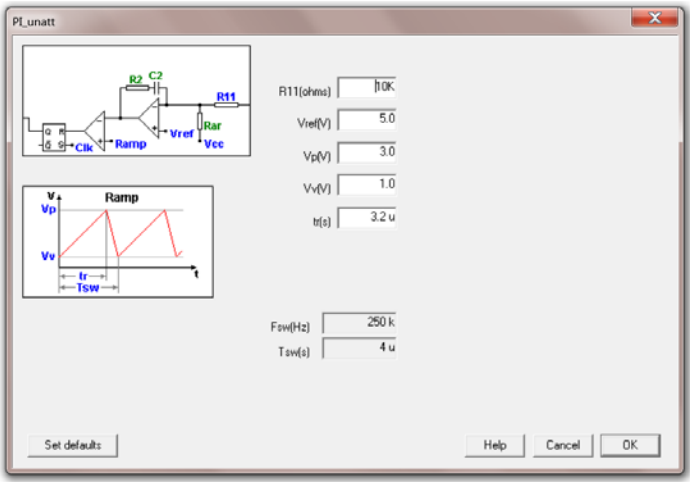


Click on the OK button, and another dialog window with the power circuit as well as the sensor and regulator will appear, as shown below.

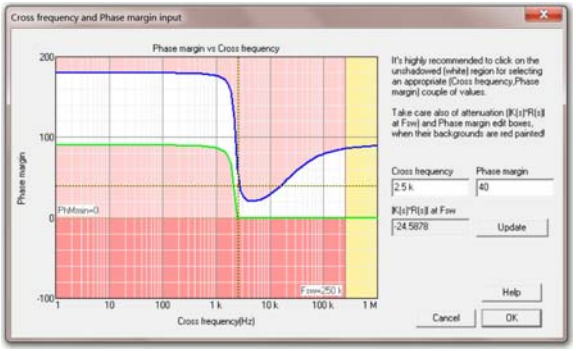


- From the **Sensor** drop-down menu, one can select different sensor types. In this example, choose "Voltage divider", and specify the divider gain and the feedback voltage. Note that for the demo version, the sensor type is fixed to the default setting and cannot be changed.
- From the **Regulator** drop-down menu, one can select different regulator types. Note that for the demo version, the regulator type is fixed to the default setting and cannot be changed.

  The figure below shows the dialog window of a PI regulator. Define the regulator and other parameters.

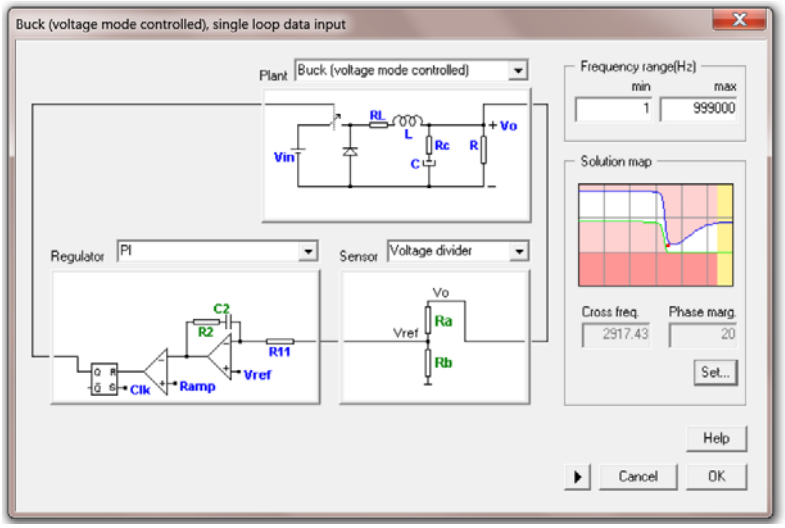


- Close the dialog window. Back in the main dialog window, click on the **Set** button in the Solution map region on the right of the dialog window. The dialog of the Solution Map will appear.

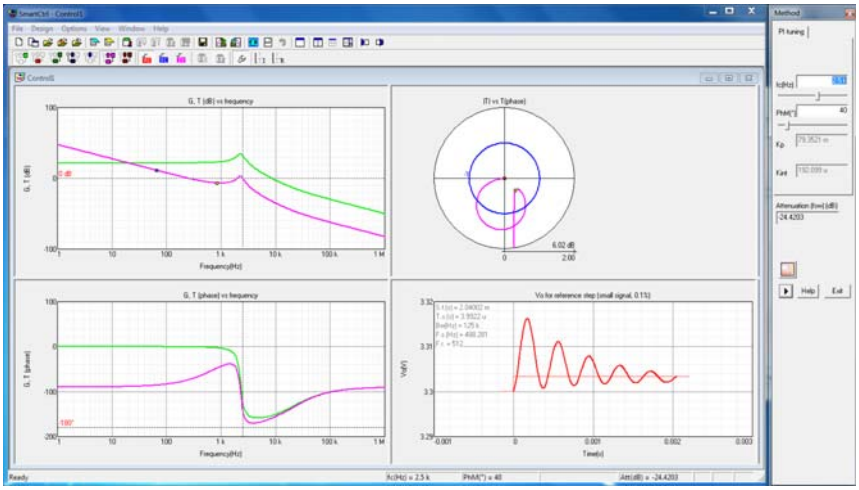


The x-axis of the Solution Map represents the crossover frequency, and the y-axis represents the phase margin. A design point in the Solution Map, therefore, defines the crossover frequency and the phase margin of the control loop. The white region of the Solution Map indicates the area where the design point should be placed. Click in

the white region to define the crossover frequency and the phase margin. Then click on **OK** to exit the Solution Map dialog window, and back to the design dialog window, as shown below.



- Click on **OK** again in the converter dialog window to show the Bode plot, time-domain response, and the regulator parameters, as shown below.



- Fine tune the crossover frequency fc and the phase margin PhM on the right if needed.
- Go to **File** -> **Generate report** -> **To Notepad** to generate the overall design report.
- Go to **File** -> **Export** -> **Regulator** -> **To PSIM (schematic)** to export the controller schematic and parameters to PSIM.

4. Setting up Co-Simulation with Matlab/Simulink

PSIM can perform co-simulation with Matlab/Simulink. When PSIM is installed, if the SimCoupler Module is enabled in the license, the installation will set up the co-simulation between PSIM and Matlab/Simulink automatically. But if you change the PSIM folder name after PSIM is installed, you must run "SetSimPath.exe" in the PSIM directory to set up the co-simulation again.

If you are running multiple versions of PSIM or Matlab/Simulink, to associate a specific version of PSIM with a specific version of Matlab/Simulink, from the directory of that PSIM version, run "SetSimPath.exe", and select the desired Matlab/Simulink version.

To see how the co-simulation works, follow the steps below to simulate the sample circuit "chop1q_ifb_simulink_r13.mdl":

- From the PSIM directory, run the executable “SetSimPath.exe”. This will set up PSIM for the co-simulation. Note that this needs to be run only once.
- Launch Matlab. From Matlab, launch Simulink.
- In Simulink, load the file “chop1q_ifb_simulink_r13.mdl” from the “examples\SimCoupler” sub-folder in the PSIM directory.
- Double click on the SimCoupler block (the block with the orange color). Make sure that the path for the file “chop1q_ifb_psim.sch” is correct. If it is not, click on the **Browser** button and locate the file in the “examples\SimCoupler” sub-folder in the PSIM directory.
- In Simulink, start the simulation. After the simulation is complete, SIMVIEW will be launched to view waveforms.

5. Running Multiple PSIM Versions

PSIM has different licensing options (professional v.s. standard version, stand-alone v.s. network, and hasp key v.s. softkey) for both 32-bit and 64-bit computers. In PSIM, the setup file “setup.exe” (for 32-bit) or “setup_x64.exe” (for 64-bit) is common to all versions, and is meant for only one version of PSIM release on a computer. If you would like to run more than one PSIM version of the same release on a computer, you need to rename the folder of the previous installation before starting another installation. Otherwise, when running the second installation, the previous installation will be uninstalled.

For example, if you are going to run both PSIM 9.1.3 (Version 9.1, Release 3) hasp stand-alone version and PSIM 9.1.3 hasp network version, first install the stand-alone version to a folder (for example, “c:\program files\Powersim\ PSIM9.1.3”). Then rename this folder (for example, to “c:\program files\Powersim\PSIM9.1.3_hasp”). Run “setup.exe” again. When asked to “*Modify, repair, or remove the program*”, choose “*Remove*”. After it is complete, run “setup.exe” again to install the network version.

There is, however, no problem of installing both 32-bit and 64-bit versions, or versions of different releases (for example, V9.1.3 and V9.0.4) on the same computer.

Below is a comparison of demo version, standard version, and professional version:

Table 1: Comparison of demo version, standard version, and professional version

Features	Demo	Standard	Professional
Cost	Free	$	$$$
Circuit size limit	34 elements*	60 elements	No Limit
Motor Drive Module	√	√√ (except nonlinear machine models)	√√
Digital Control Module	√	√√	√√
SimCoupler Module	√	×	√√
Thermal Module	√	×	√√
Renewable Energy Module	√	√√	√√
MagCoupler Module	×	×	√√
MagCoupler-RT Module	×	×	√√
SimCoder with TI F28335 Target	×	√√	√√
ModCoupler Module	×	×	√√
C blocks (built-in C interpreter)	×	×	√

Saturable core element	√	×	√
Advanced DLL blocks (Embedded Software Block, and General DLL Block)	×	×	√
SmartCtrl	√	√√	√√

√: Feature is available.
√√: Feature is available as an add-on option at additional cost.
×: Feature is not available.
* In addition to the 34-element limit, the demo version also imposes limits and restrictions on individual elements and functionality.

6. Running the Hasp Network Version

This section is for these who use the PSIM hasp network version, and need to customize the Hasp License Manager.

6.1 Monitoring the Login

To monitor the Hasp License Manager and find out who is using the license at any moment, you need to run the License Manager Monitoring program. To install the Monitoring program, run “aks32mon.exe” from the PSIM CD-ROM. After the installation, run “askmon.exe”.

Running the Monitoring program is not required for the License Manager to function properly.

6.2 Limiting the Access to the Software

To limit the access of the software so that only computers with authorization can run it, in the file “nhsrv.ini” on the computer that runs the Hasp License Manager, set:

NHS_IP_LIMIT = <IPAddr1>, <IPAddr2>, …

where IPAddr1 and IPAddr2 are the IP addresses of the computers that can run the software. With this setting, only the computers on this limit will have the access to the software.

6.3 Configuring the Access to the License Manager

Normally, you will be able to run the PSIM software from a computer on the network with no changes to the default settings. However, under certain situations (for example, the computer is not in the same local area network as the License Manager computer), you may need to change the settings on the client computer for PSIM to log on to the License Manager and find the key.

To change the settings, locate the file “nethasp.ini” in the Windows system folder on the client computer (on the computer that you wish to run PSIM). Open it with a text editor. In the file, under the section [NH_COMMON], define the type of protocols, and set parameters accordingly.

For example, if TCP/IP is used, below are the steps:

- Under the section [NH_COMMON], add:

  NH_TCPIP = Enabled

- Then go to the section [NH_TCPIP], add:

  NH_SERVER_ADDR = xxx.xxx.xxx.xxx [IP address of the machine that runs the license manager. If the IP address is not static, enter the machine hostname instead.]

  NH_USE_BROADCAST = Disabled

By default, the Hasp network key uses TCP/IP Port #475. If your network uses a different port number, the following must be set:

NH_PORT_NUMBER = xxx [The network TCP/IP port number]

In some cases, the timeout length may need to be increased for the software to find the License Manager. To set the timeout length, add:

NH_SESSION = xx	[xx is the timeout in sec.]
NH_SEND_RCV = xx	[xx is the timeout in sec.]

7. Troubleshooting

The following is a list of problems that one may encounter when installing and running PSIM, and possible solutions.

Problem: There is a problem in running PSIM softkey version. It used to work, but when the computer is connected to a different network, it does not work.

Error message: Error: Computer ID is not registered. Please contact Powersim to register the ID.

Possible cause and the solution:

- **Cause:** The PSIM softkey version checks the MAC address of the computer against the registered MAC address. If you are using a removable network adaptor or running VPN, the computer MAC address can change and this problem can occur.
- **Solution:** Make sure that you are not running VPN or using a removable network adaptor. Then run the program "MAC.exe" from the PSIM folder, and send to Powersim the MAC address of a network card that is always present on the computer. Powersim will generate a new license file for you based on that MAC address.

Problem: The Hasp network key cannot be found during the PSIM installation

Error message: Hasp network key was not detected.

Possible causes and the solutions:

- **Cause:** Either the License Manager is not running, or the Hasp network key is not connected to the same machine that runs the License Manager.
- **Solution:** Make sure that the License Manager is running, and the Hasp network key is connected to the same computer.
- **Cause:** The Windows XP firewall is preventing the setup program from communicating with the License Manager.
- **Solution:** In Windows XP, go to **Control Panel** -> **Security Center** -> **Windows firewall**, and temporarily turn off the Windows firewall. This should help solve the problem.

  After the installation and after the Windows firewall is turned on again, if there is a problem running either PSIM or SIMVIEW, go to the Windows firewall settings. Under **Exceptions**, click on **Add Program** to add PSIM to the firewall exception, and click on **Add Port** to add Port 475 with the following settings:

Name:	PSIM
Port number:	475
	UDP

Problem: Cannot start PSIM or SIMVIEW

Error message: Error: No Hasp key with the correct ID found!

Possible causes and the solutions:

- **Cause:** The Hasp key is not connected to the computer.
- **Solution:** Connect the Hasp key to the computer.
- **Cause:** The Hasp driver is not properly installed.
- **Solution:** Run "**haspUserSetup.exe**" in the PSIM directory to install the Hasp driver. The installation needs administrative privilege. Make sure that you have the administrative privilege on the

computer if you perform the installation, or you should ask your system administrator to perform the installation.

- **Cause:** You are using the PSIM network version. The Hasp key is connected and the Hasp driver is installed, but the Hasp license manager server is not running.
- **Solution:** Ask your system administrator to run the Hasp license manager.

- **Cause:** You are using the PSIM network version. The Hasp key is connected, the Hasp driver is installed, and the license manager is running. But under certain network settings and configurations, PSIM can not find the key over the network. In this case, you need to modify the "nethasp.ini" file.
- **Solution:** Modify the file "nethasp.ini" and configure the access to the License Manager. Please refer to Section 4.3 for more details. In most of the cases, setting the parameters NH_SERVER_ADDR and NH_USE_BROADCAST as instructed in Section 5.3 will solve the problem.

  Also, if you are running PSIM from a network drive, copy the entire PSIM folder from the network driver to the local drive, and run PSIM from the local drive.

Problem: Can not start PSIM or SIMVIEW

Error message: Error: Invalid Hasp key version!

Possible cause and the solution:

- **Cause:** You were trying to run a newer version of PSIM with an older version of the Hasp key. For example, if your Hasp key is for Version 9.0 and if you try to run a version of PSIM which is higher than 9.0, you will get this error message.
- **Solution:** Make sure that you run the version of PSIM that matches the Hasp key.