



Open eHS Real-Time Power Electronics Simulation Toolbox (NI PXIe-7976R) Getting Started Guide

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Revision History:

The following table shows the revision history for this manual.

Version	By	Action	Action date
2016.0.0.1	Jonathan Bouchard, Nadine Hariri	First release of eHS Getting Started Manual	September 26, 2016
2016.0.1.0	Jonathan Bouchard, Nadine Hariri	Added clarifications to document	October 5, 2016
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ABSTRACT

The purpose of this document is to provide the user with a quick software and hardware setup guide for the *Open eHS Real Time Power Electronics Simul. Toolbox (NI PXIe-7976R)* package created by OPAL-RT Technologies. This guide explains the hardware and software needs for the toolbox.

REQUIRED COMPONENTS

Due to the highly reconfigurable nature of this toolbox, it is possible to modify the toolbox to support a wide range of NI hardware. As such, this guide will focus on listing the default hardware configuration that is supported by the toolbox which was tested by OPAL-RT Technologies.

- PXI Express Chassis
 - NI PXIe-1082 (or another NI chassis)
- NI PXI Express Controller
 - NI PXIe-8135 RT (or another NI controller)
- FPGA Modules
 - NI PXIe-7976R for eHS operation & Digital Input
 - NI PXIe-7976R for Analog Output
- NI FlexRIO IO Adapter Modules
 - NI 6581B (48-Channel, DIO)
 - NI 5742 (32-Channel, 1 MS/s, 16-Bit Analog Output)
- 1300SMB Breakout Box for High-Speed Digital Devices
- 0.55 m Shielded Cable for High-Speed Digital Devices
- NI myRIO-1900 for external controller (**optional**)

INSTALLING SOFTWARE TO THE WINDOWS HOST

Development System Software

Before installing and using the hardware, you must install the appropriate National Instruments software modules and instrument drivers. Please refer to the *Open eHS Real-Time Power Electronics Simulation Toolbox (NI PXIe-7976R) - User Manual* to determine the minimum software versions required for your hardware components. Install the software in the following order (ideally, with Administrator privileges):

1. Install at least one of the following circuit editors:
 - MATLAB®/Simulink® with the SimPowerSystems™ Toolbox
 - MATLAB®/Simulink® with the PLECS Blockset
 - PSIM
 - NI Multisim 13
2. Install LabVIEW Full or Professional Development System.
3. Install the LabVIEW FPGA Module and the LabVIEW Real-Time Module.
4. Install the NI LabVIEW for myRIO Toolkit (**optional**).
5. Install all required NI drivers. This includes the NI FlexRIO driver (other drivers may be required depending on the hardware being used).
6. Install the NI CompactRIO Waveform Library (this may be installed directly with the package as well).

Installing the Open eHS Package

This section will describe a typical installation procedure which requires *VI Package Manager* (VIPM) to complete. VIPM should be installed by default with LabVIEW. However, if you have not yet installed VIPM, please navigate to the following URL and download the free version of the program.

- <http://vipm.jki.net/get>

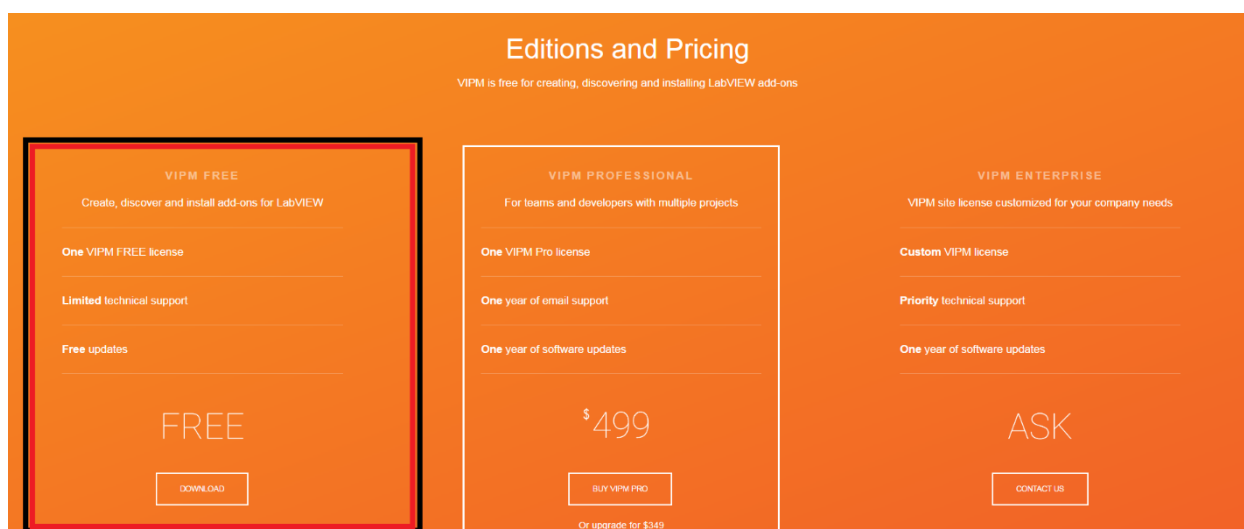


Figure 1 - Install VIPM free version

Locate the installation file (.vip) through VIPM (it may have also been provided to you directly).

1. Double-click on the file to open a VIPM installation window. Select the correct version of LabVIEW that you are using from the drop-down menu and click on the **Install** button as detailed below.

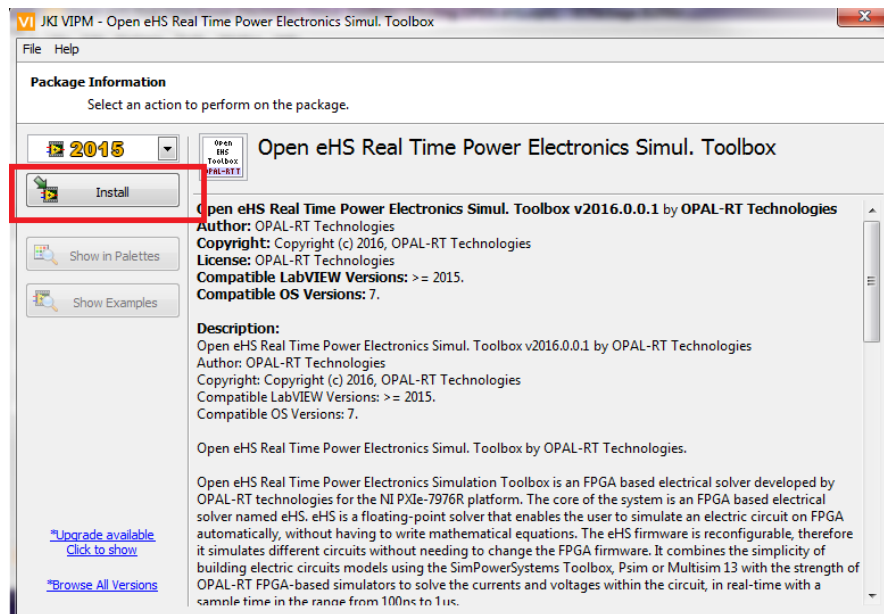


Figure 2 - Installing the Toolbox Using VIPM

This will initiate the installation process. Note that this process can take several minutes.

2. Once complete, you should receive a message stating that the installation was successful. Click **Finish**.

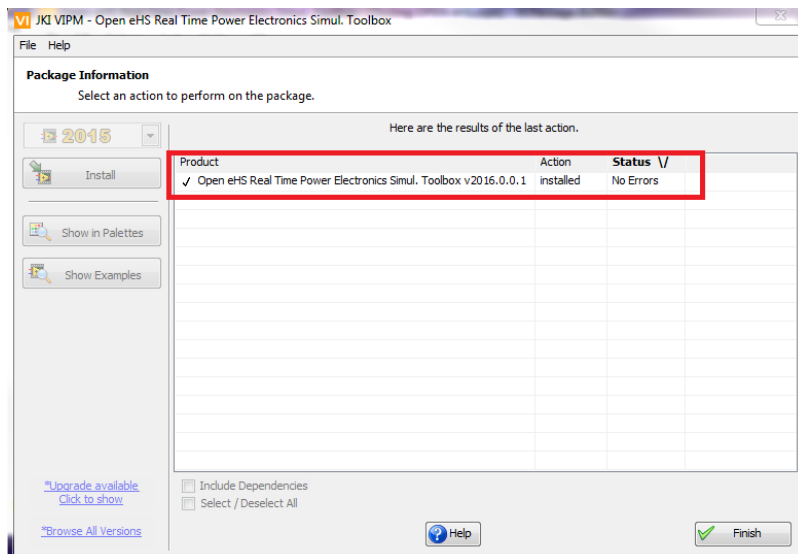


Figure 3 - Successful Installation

Once installed, you can access the template eHS project by clicking on the **Show Examples** button and opening the *Open eHS Real Time Power Electronics Simul. Toolbox (NI PXIe-7976R).lvproj*.

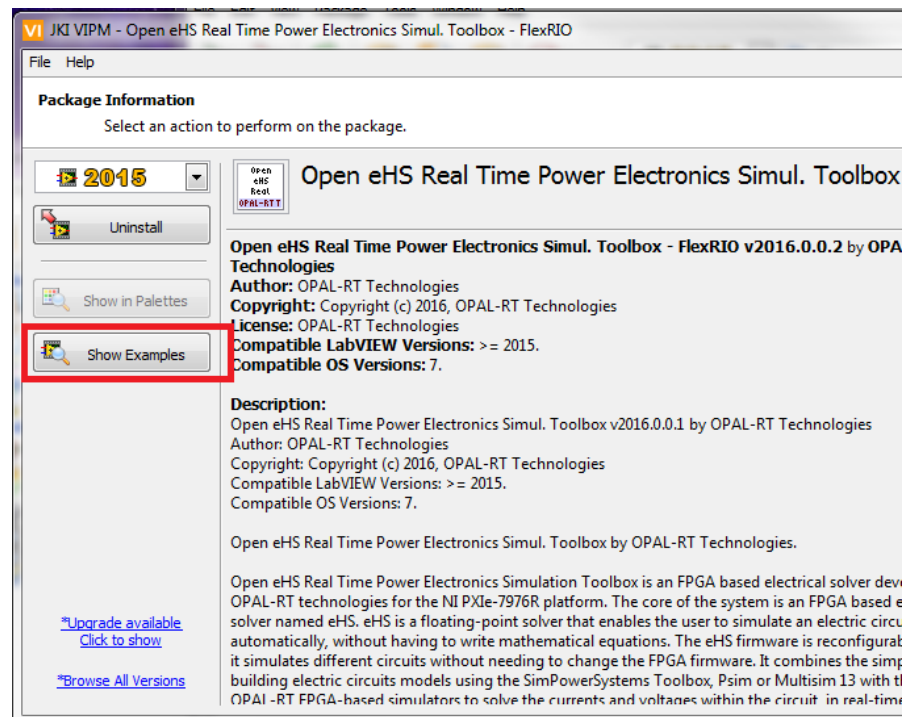


Figure 4 – Opening the example project

Activating the Open eHS Package

1. In LabVIEW, navigate to **Help>>Activate Add-ons...** to open the Third-Party Add-on Activation Wizard.

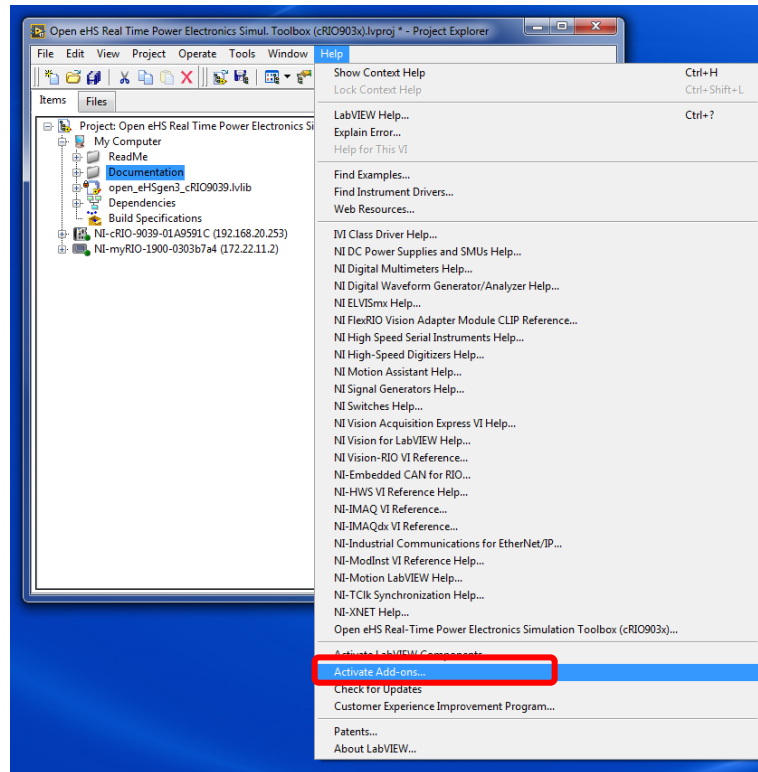


Figure 5 - Activating add-ons

2. Select the *OPAL-RT Technologies Open eHS Real Time Power Electronics Simul. Toolbox (NI PXIe-7679R)* add-on and click **Activate**.

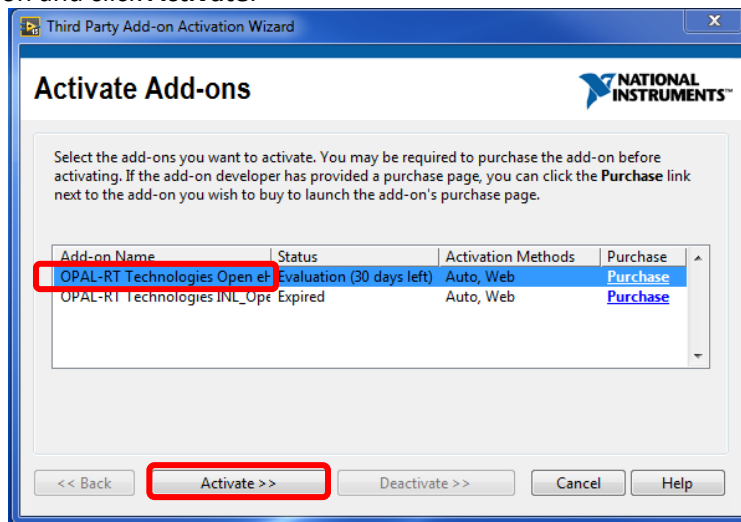


Figure 6 - Activating the Open eHS Toolbox

3. Follow the Activation Wizard prompts and enter the License ID and Password provided to you to activate your package.

CONFIGURING THE HARDWARE

Installing the NI Hardware

NOTE: You must install the software to the Host before you install the hardware.

1. Ensure that the NI PXIe chassis is connected to power and powered off.
2. Ensure that the NI PXIe chassis is configured as detailed in the table below. This configuration will support the *Open eHS Real-Time Power Electronics Simulation Toolbox (NI PXIe-7976R)* package's default configuration. Other configurations are possible.

PXIe Board	FlexRIO Adapter Module	Slot #
PXIe-8135 (controller)	N/A	1
PXIe-7976R (AO)	NI 5742	2
PXIe-7976R (DIO)	NI 6581B	3
empty	N/A	other

3. Connect the NI PXIe-8135 (Slot 1) to the network via an Ethernet cable on Port 1.
4. Power on the NI PXIe device.

Confirming That the NI Hardware Is Detected in NI MAX

1. Open *NI Measurement and Automation Explorer* from the Windows Start Menu.
2. Expand **Remote Systems**.
3. If the hardware and software has been correctly installed, you should detect the NI PXIe-controller under the *Remote Systems* tab. If you expand the controller heading as well as the *Devices & Interfaces* heading, the hierarchy should resemble the one displayed in the following figure.

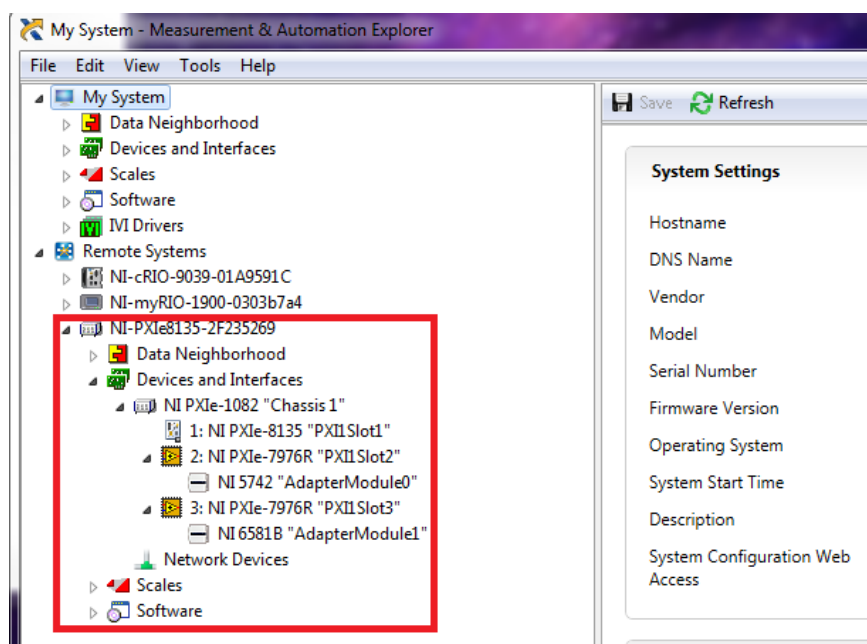


Figure 7: Hardware Verification in NI-MAX

INSTALLING SOFTWARE TO THE REAL-TIME TARGETS

NI PXIe Target (PXIe-8135) Software

Before running the application, the proper software must be installed onto the NI Real-Time target. Please refer to the *Open eHS Real-Time Power Electronics Simulation Toolbox (NI PXIe-7976R) – User Manual* in the *System Requirements* section for instructions to complete this step.

WHERE TO GO NEXT

1. For all NI hardware and software, please visit *ni.com/support* for detailed product specifications, user manuals, and installation instructions.
2. For all OPAL-RT hardware and software, including the eHS package, please visit *opal-rt.com/technical-support* for detailed product specifications, user manuals, and installation instructions.
3. For more information related to the *Open eHS Real-Time Power Electronics Simulation Toolbox (NI PXIe-7976R)* package, please refer to the user manual located in the *Documentation* folder entitled *Open eHS Real-Time Power Electronics Simulation Toolbox (NI PXIe-7976R) - User Manual*.