

XEM6110

Thank You!

Thank you for purchasing an Opal Kelly PCI Express product. We've included this printed guide to help you start using the module and FrontPanel software. Much more documentation is available on the included CD-ROM. In addition, several examples are included which illustrate how to add FrontPanel support to your own FPGA designs. Finally, source code to several programs in both C/C++, Python, and Java show how easy it is to add FPGA communication to your own software.

If you have any questions or just want to chat, please visit our community forums online at:

<http://forums.opalkelly.com>

For technical answers from our support staff, email us at:

support@opalkelly.com

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Contents

Your module package should have arrived with the following items. If anything is missing, please contact us as soon as possible so we may replace the item.

- FPGA Integration Module
- Software CD-ROM
- Printed Getting Started Guide
- PCI Express cable (only included in the Starter Kit)
- Breakout Board (only included in the Starter Kit)
- Host Interface Board (only included in the Starter Kit)

Installation and Setup

This section will guide you through the software installation. The module is an external PCI Express device which requires a special driver to be installed on your system. You should install this driver before connecting the device to your system. After installation, you should attach your device. Windows performs additional device driver installation after the device is attached, so you should do this before starting FrontPanel for the first time.

System Requirements

- Microsoft Windows Vista, or Windows 7 (32- or 64-bit)
(Windows XP is also supported, but you must already have WinUSB installed as our PCI driver will not install that, but it is required by our SDK.)
- One available x1 PCI Express slot
- 1 GB RAM
- Approximately 30 MB free disk space

CD-ROM Contents

The CD-ROM contains the following items in the root directory:

File / Folder	Description
Documentation	This folder contains the Adobe PDF documentation for FrontPanel and the module. Also included in this directory is the HTML documentation for the FrontPanel API.
Extras	This folder contains items that are not directly related to FrontPanel development, but may be of interest to programmers.
FrontPanel	This folder contains the installer files as well as a Windows "Driver-Only" installer that OEMs can use when distributing products that integrate an Opal Kelly module.
Setup-Win-Win32.exe	The 32-bit Windows installation executable for FrontPanel, the PCI driver and several samples to get you started.
Setup-Win-x64.exe	The 64-bit Windows installation executable for FrontPanel, the PCI driver and several samples to get you started.
GettingStarted.pdf	This guide in Adobe PDF format.

Enable Unsigned Drivers

The initial release and some interim releases of the Opal Kelly PCI driver are self-signed and not WHQL certified. This will require some additional configuration to complete installation. WHQL versions of the driver will be available to OEM integrators. This step is required for 64-bit Windows installations but should not be required for 32-bit installations.

In Windows 7 (see Microsoft documentation for other release instructions), start a command prompt with administrator privileges. Then type:

```
bcdedit.exe /set TESTSIGNING ON
```

Reboot before installing the Opal Kelly software and driver.

Software Installation

The software included with the XEM includes the following components:

- PCI Express driver
- Opal Kelly's FrontPanel™ virtual instrumentation software
- FrontPanel API for C, C++, C#, Python, and Java
- Sample Verilog and VHDL projects
- Verilog and VHDL simulation models for FrontPanel HDL components
- Sample FrontPanel projects

To start installation, run the appropriate `Setup.exe` application in the root directory of the included CD. The installation wizard will guide you through the installation and should only take a minute or two. We suggest installing everything available -- it won't take up much space. By default, the installation procedure will copy files to the following directory:

C:\Program Files\Opal Kelly\FrontPanel

When installation is complete, a two new entry will be made in your Start Menu:

Start Menu → All Programs → Opal Kelly

The folder (**Opal Kelly**) contains shortcuts to the documentation as well as a shortcut to the Samples folder. The shortcut (**Opal Kelly FrontPanel**) will start FrontPanel.

Powering the XEM6110

The XEM6110 requires a well-regulated DC power supply to be delivered through the expansion connectors. The BRK6110 may be used to apply power from a standard DC power connector with the following specifications:

- Voltage: 4.5-5.5VDC (must be well-regulated)
- DC connector: 2.1mm center / 5.5mm ring, Ring is DGND

Note that the XEM6110 needs to be treated as a normal PCI Express device and must be powered on the entire time that the PC is powered on. Power must be applied before the PC boots and must not be removed while the PC is turned on.

The exception to this is when using the XEM6110 with a laptop and ExpressCard PCIe host interface board. Such configurations typically support hot plug of the XEM6110.

IMPORTANT - Heat Dissipation

Care should be taken to provide proper cooling for the XEM and components on the board. The devices can potentially generate more heat than can be dissipated in still air. Passive or active cooling should be considered. Cooling requirements must be determined by the end-user using empirical data or simulation information from the Xilinx tools.

Connecting the Device

Once the software is installed on your system, connect the device to the Host Interface Board (HIB) using a PCI Express cable, then turn on the computer.

Windows should detect the new hardware and complete installation of the driver. If prompted, allow Windows to install the software automatically and click **Next**. Windows should then properly locate the driver installed previously and complete the installation. Your XEM is now ready to be used and will be recognized in FrontPanel.

An Introductory Project

A few examples have been installed with the FrontPanel software. These can be found at the following location under the Start Menu:

Opal Kelly → FrontPanel → Samples

Browse to this location and open the **First** example to find the following:

File / Folder	Description
XEMxxxx-Verilog	Project source folder for the XEMxxxx in Verilog.
XEMxxxx-VHDL	Project source folder for the XEMxxxx in VHDL.
...	Project source folders for other Opal Kelly boards.
First.xfp	The FrontPanel XML interface description.
first-xxxx-yyyy.bit	Pre-built FPGA bitfile for each board model.

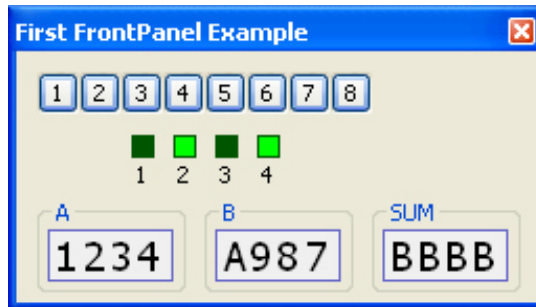
Download the Configuration File

Start FrontPanel and click the download button to open a file selector dialog. Browse to the appropriate bitfile (e.g. **first-xem6110.bit**) and click **Ok**. FrontPanel will then download the configuration file to the FPGA. Download time typically varies between 50 ms and 300 ms.

Note: Instead of using the file selector dialog to browse for the bitfile, you can drag the bitfile onto the FPGA Download button.

Load the FrontPanel Profile

When the download is complete, click the "Load Profile" button to open another file selector dialog. This time, select the First.xfp file and click Ok. FrontPanel will load the profile and open the first (and only) panel in the profile. It should look like this:



The panel contains eight `okToggleButtons` which are connected to the physical LEDs on the XEM6110 as well as four `okLEDs` which are unconnected on the XEM6110. You can click on the toggle buttons and observe that the LEDs change state. You can also press the pushbuttons and observe the virtual LEDs in FrontPanel echo their state. At the bottom are the inputs (A and B) and the output (SUM) of a 16-bit adder designed into the FPGA. Using the mousewheel or keyboard, you can change the inputs and observe the output.

Note that the functionality varies slightly depending on what LEDs and buttons are available on your specific hardware. For example, the XEM6110 does not have pushbuttons.

Congratulations! You've just been introduced to the simplicity and power of FrontPanel. More elaborate examples are available in the [Samples](#) directory. Please see the FrontPanel User's Manual for a short tutorial on FrontPanel.

What's Next?

You're ready to start using the XEM. A few documents will help get you going quickly. These documents are located on the installation CD, and, if you elected to do so, were installed with the Opal Kelly FrontPanel software.

FrontPanel User's Manual - This manual describes FrontPanel and describes how to add FrontPanel support to new or existing FPGA designs.

XEM User's Manual - This manual describes the design and function of the XEM. Look here to find details about the XEM such as FPGA pin mappings.

FrontPanel API Documentation - This HTML documentation is a browsable description of the FrontPanel programmer's interface. Although specifically written for the C++ API, it readily translates to the other language APIs except in noted areas.

Samples - Several sample projects provide a great starting point to developing your own project. These are installed with FrontPanel in the installation directory.

Extras

Included on the installation CD-ROM are several packages that you may find useful in conjunction with the XEM. You may want to check the respective websites to see if a more recent version of any of this software is available.

Xilinx ISE WebPack and latest Service Pack [NOT INCLUDED]

This is a free download from Xilinx's website and provides the tools necessary to design and implement a complete project on the XEM6110. Xilinx provides several tutorial examples and a lot of design assistance on their website: <http://www.xilinx.com>

Python 2.7 for Windows

Python is an object-oriented, multi-platform interpreted language with a simple syntax. Together with extensive libraries, application development with Python is quick, easy, and robust. FrontPanel Python extensions allow you to configure and communicate with the XEM within any Python program. More information on Python can be found at their official website: <http://www.python.org>

wxWidgets 2.8

wxWidgets is an Open Source C++ class library designed to make GUI design fast and portable. Applications designed with wxWidgets can easily be ported between Windows, Linux, and Apple operating systems. wxWidgets is often favorably compared to the Microsoft Foundation Classes (MFC). More information can be found at the website: <http://www.wxwidgets.org>

wxPython 2.8

This is an implementation of the wxWidgets library for use under Python. This diverse library makes it very easy to build graphical applications quickly. In addition to the FrontPanel Python extensions, a complete GUI interface to your project can be built quickly and easily. The official website for wxPython is at: <http://www.wxpython.org>