LabVIEW™ FPGA Module Release Notes

Version 1.0

These release notes contain instructions for installing the LabVIEW FPGA Module, configuring FPGA devices, and selecting execution targets. This document also provides exercises to introduce you to FPGA VIs and host VIs. Refer to the list of resources at the end of this document for more information about developing applications with the FPGA Module.

Contents

NATIONAL INSTRUMENTS™

What You Need to Get Started

This section contains a list of items you need before you can install the FPGA Module and develop a custom hardware solution with a National Instruments Reconfigurable I/O device, which also is known as an *FPGA device*.

❏ The following NI software packages:

– LabVIEW 7.0 CD

– LabVIEW Real-Time Module 7.0 CD if you want to control or monitor the FPGA device in real-time

– National Instruments Device Drivers CD

– LabVIEW FPGA Module 1.0 CD

❏ An FPGA device, like the NI PXI-7831R, and its documentation

❏ PXI/CompactPCI chassis and controller

Upgrading from the LabVIEW FPGA Pioneer System

If you installed the LabVIEW FPGA Pioneer System, you must uninstall Xilinx ISE and all NI software before you can install LabVIEW 7.0 and the FPGA Module 1.0. Complete the following steps to uninstall Xilinx ISE and NI software.

1. Select **Start»Settings»Control Panel»Add/Remove Programs** to open the **Add/Remove Programs** dialog box.

2. Select **Xilinx ISE** from the **Currently installed programs** list and click the **Change/Remove** button. Follow the directions on the screen.

3. Select **NI Software** from the **Currently installed programs** list in the **Add/Remove Programs** dialog box and click the **Change** button.

4. Uninstall NI-VISA, NI-RIO, and any other NI device drivers that you installed.

5. Uninstall NI LabVIEW, NI LabVIEW FPGA, NI LabVIEW Real-Time, and any other NI beta software that you installed.

6. Restart the computer.

Installing the LabVIEW FPGA Module

Complete the following steps to set up a development computer with LabVIEW, the LabVIEW Real-Time Module, the appropriate NI device drivers, and the LabVIEW FPGA Module. The *development computer* is a PC or PXI system running Windows and on which you install the

LabVIEW development system and the FPGA Module. You create and edit FPGA VIs and host VIs on the development computer.

✎ **Note** The NI Device Drivers installer detects the NI software that is currently installed and offers a selection of device drivers based on the components it detects. Both LabVIEW and the LabVIEW Real-Time Module installers prompt you to install device drivers as part of the installations. If you are installing LabVIEW and the LabVIEW Real-Time Module, you can save time by installing device drivers only once after you install LabVIEW and the LabVIEW Real-Time Module. If are not installing the LabVIEW Real-Time Module, you can install device drivers when you install LabVIEW.

To avoid installing device drivers with LabVIEW, perform a custom installation of LabVIEW. On the **Features** screen, click the icon to the left of the **Device Drivers** component and select **Do not install drivers**. Refer to step 4 for information about the device drivers you need to install.

1. Log in to the development computer as an administrator or as a user with administrative privileges.

2. Install LabVIEW 7.0 from the LabVIEW 7.0 installation CD. Refer to the *LabVIEW Release Notes* for information about installing the LabVIEW development system.

3. If you also plan to use the LabVIEW Real-Time Module, install the LabVIEW Real-Time Module from the LabVIEW Real-Time Module 7.0 installation CD. Refer to Chapter 2, *Installing and Configuring the RT Module and RT Targets*, of the *LabVIEW Real-Time Module User Manual* for information about installing the LabVIEW Real-Time Module.

4. As part of the LabVIEW or LabVIEW Real-Time Module installation, install NI device drivers. The installer selects device drivers appropriate for the NI software you have installed on the computer, so you will install everything you need to use the LabVIEW Real-Time Module and FPGA Module if you choose to install the default selection.

   If you choose to modify the default selection, you must install **NI Measurement & Automation Explorer** (MAX) and the following components under **Instrument Control»NI-VISA**:

   • **Run Time Support**
     – **PXI**
     – **Remote**
   • **Configuration Support**
   • **Development Support**

You also can install the following components if your application or configuration requires them:

- **Instrument Control»NI-VISA»Remote Server**—Installs the NI-VISA Server so other computers on the network can access FPGA devices in your development computer.

- **Real-Time and Embedded»NI-VISA**—Saves the Real-Time and Embedded components on the development computer so you can download them to the RT controller using MAX.

- **Real-Time and Embedded»NI-RIO**—Although you can install NI-RIO now, you will install NI-RIO in the next step when you install the LabVIEW FPGA Module, which installs NI-RIO by default.

5. Install the FPGA Module from the LabVIEW FPGA Module 1.0 installation CD, following the instructions that appear on the screen. Select **Complete** when you reach the **Select Installation Type** step.

The FPGA Module installs program files, NI-RIO, documentation, examples, and Xilinx ISE. Xilinx ISE is installed in the `x:\NILVFPGA` directory, where `x` is the drive on which you installed the FPGA Module. If you uninstall the FPGA Module, you first must manually uninstall Xilinx ISE.

Setting up Remote RT Systems with FPGA Devices

If you need to access FPGA devices in remote RT systems, set up the RT target as described in Chapter 2, *Installing and Configuring the RT Module and RT Targets*, of the *LabVIEW Real-Time Module User Manual*, making sure you download NI-VISA, the NI-VISA Server, and NI-RIO RT to the RT target.

Accessing and Configuring FPGA Devices

FPGA devices might be located in the local development computer or in other systems on the network, which are known as *remote systems*. This section contains instructions for accessing and configuring FPGA devices in the following systems:

- Local development computer
- Remote systems
  - Networked RT system, which is a PXI system with an RT controller running the Real-Time Operating System (RTOS) and the RT Engine, located on the local subnet
  - Networked RT system *not* located on the local subnet
  - Networked Windows computer, which can be a PC or PXI system running Windows

Configuring FPGA Devices in the Local Development Computer

MAX automatically detects FPGA devices installed in the local development computer. If you install an FPGA device in the development computer, you can locate the device in MAX under the **My System»Devices and Interfaces** category. After you verify that MAX recognizes the FPGA device, you can begin developing FPGA VIs in LabVIEW. Refer to the *Targeting an FPGA Device with LabVIEW* section later in this document for information about selecting the FPGA device as the LabVIEW execution target.

Configuring FPGA Devices in Remote Systems

The FPGA Module uses the NI-VISA communication protocol to locate remote FPGA devices, which are detected as VISA resources, and display them in MAX. Although NI-VISA has a very rich feature set, you do not need to develop an in-depth understanding of NI-VISA to successfully use the FPGA Module. As a user of the FPGA Module, you just run the NI-VISA Server on the remote system to make FPGA devices installed in that system accessible to other computers on the network.

The NI-VISA Server is a tool that enables users on a network to access VISA resources on the computer on which the NI-VISA Server is running. The NI-VISA Server can run on networked RT targets, located both on and off the local subnet, and Windows computers.

Tip Remote systems can access the VISA resources on your development computer when you run the NI-VISA Server on your development computer and grant access permissions, as described in the *Setting Access Permissions* section later in this document.

You configure FPGA devices interactively in MAX so you can select them as execution targets from LabVIEW. You must complete the following general steps before you can target LabVIEW to an FPGA device in a remote system. Refer to the following sections for detailed information about each step.

1. Make the FPGA device appear in MAX.

2. Set access permissions to grant or deny access to the FPGA device from other computers on the network.

3. Enable remote finding for the remote FPGA device on the local computer.

Making FPGA Devices Appear in MAX

There are three different ways to make remote FPGA devices accessible in MAX—one for each type of the following remote systems:

- Networked RT systems located on the local subnet
- Networked RT systems *not* located on the local subnet
- Networked Windows computers

Complete the steps in the following sections to make FPGA devices appear in MAX.

Networked RT Systems on the Local Subnet

1. If you have not already installed NI-VISA and the NI-VISA Server on the RT target, download them from MAX. Refer to Chapter 2, *Installing and Configuring the RT Module and RT Targets*, of the *LabVIEW Real-Time Module User Manual* for information about downloading software to RT targets.

2. Restart the RT target. The NI-VISA Server runs automatically on networked RT targets when you have NI-VISA and the NI-VISA Server installed on the RT target. When the NI-VISA Server runs on an RT target, the monitor output displays a message that the NI-VISA Server started successfully.

3. Find the FPGA device in the Remote Systems category in MAX. MAX automatically detects NI-VISA Servers running on networked RT systems located on the local subnet. You can locate FPGA devices under the **Remote Systems»***Remote System Name***»Devices and Interfaces** category, where *Remote System Name* is the name or IP address of the remote system.

   Figure 1 shows a remote system, named **fpga027**, that contains NI PXI-7831R FPGA devices. Notice that MAX lists the FPGA devices using a VISA resource name. In Figure 1, the selected FPGA device is identified as `PXI1::15::INSTR (PXI-7831R)`. From the VISA resource name, you know that the device is installed in the first bus (`PXI1`) and that the device number is `15`.
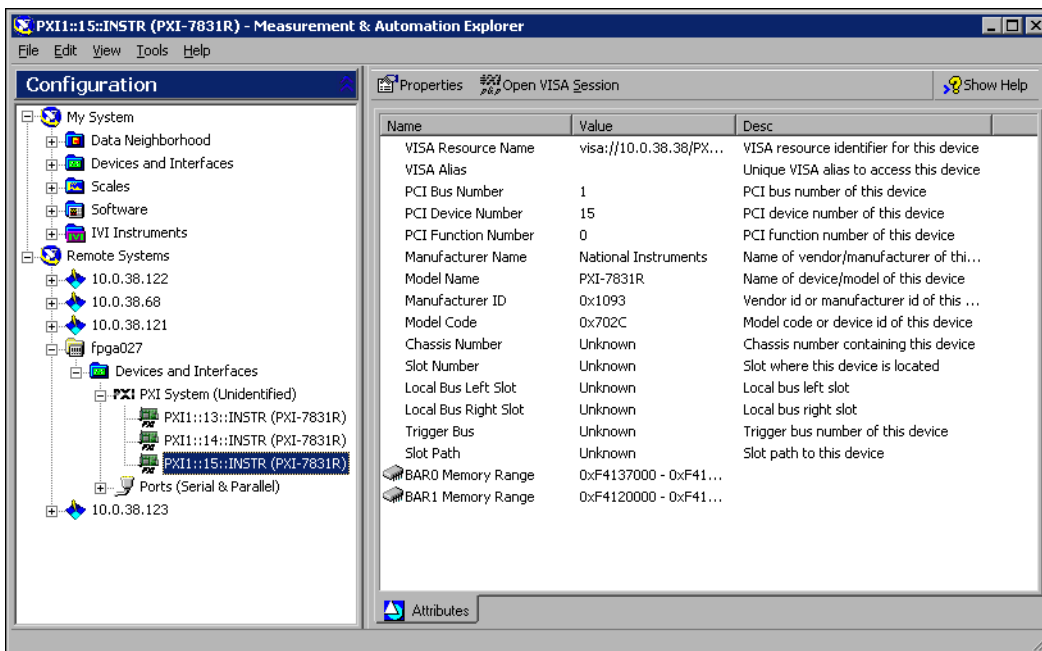
Figure 1. FPGA Device Installed on a Remote System

4. Refer to the *Setting Access Permissions* and *Enabling Remote Finding* sections later in this document for information about configuring access permissions to remote FPGA devices and creating a find list so LabVIEW can display available FPGA devices as possible execution targets.

## Networked RT Systems Not on the Local Subnet

1. If you have not already installed NI-VISA and the NI-VISA Server on the RT target, download them using MAX from a computer on the local subnet. Refer to Chapter 2, *Installing and Configuring the RT Module and RT Targets*, of the *LabVIEW Real-Time Module User Manual* for information about downloading software to RT targets.

2. Restart the RT target. The NI-VISA Server runs automatically on networked RT targets when you have NI-VISA and the NI-VISA Server installed on the RT target. When the NI-VISA Server runs on an RT target, the monitor output displays a message that the NI-VISA Server started successfully.

   MAX cannot automatically detect NI-VISA Servers running on remote RT targets not located on the local subnet—unlike NI-VISA Servers running on RT targets located on the local subnet—so you must manually add the remote system.

3. In MAX on the development computer, right-click the **Remote Systems** category and select **Create New** from the shortcut menu.

4. Select **Remote Device (not on the local subnet)** and click the **Next** button.

5. Specify the remote system using the network name or IP address of the RT target and click the **Finish** button.

6. After MAX displays the remote system, locate the FPGA device under the **Remote Systems»***Remote System Name***»Devices and Interfaces** category, where ***Remote System Name*** is the name or IP address of the remote system, as shown in Figure 1.

7. Refer to the *Setting Access Permissions* and *Enabling Remote Finding* sections later in this document for information about configuring access permissions to remote FPGA devices and creating a find list so LabVIEW can display available FPGA devices as possible execution targets.

Networked Windows Computers

1. On the remote computer that contains the FPGA device you want to access, start the NI-VISA Server by selecting **Start»Programs» National Instruments»VISA»NI-VISA Server**.
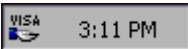
   When the NI-VISA Server runs on a Windows computer, you see the VISA icon in the Windows system tray, shown at left. MAX cannot automatically detect NI-VISA Servers running on networked PCs or PXI systems running Windows, so you must manually add the remote system.

2. In MAX on the development computer, right-click the **Remote Systems** category and select **Create New** from the shortcut menu.

3. Select **Remote VISA System** and click the **Next** button.

4. Specify the remote system using the network name or IP address of the Windows computer running the NI-VISA Server and click the **Finish** button.

5. After MAX displays the remote system, locate the FPGA device under the **Remote Systems»***Remote System Name***»Devices and Interfaces** category, where ***Remote System Name*** is the name or IP address of the remote system, as shown in Figure 1.

6. Refer to the *Setting Access Permissions* and *Enabling Remote Finding* sections later in this document for information about configuring access permissions to remote FPGA devices and creating a find list so LabVIEW can display available FPGA devices as possible execution targets.

Setting Access Permissions

Complete the following steps to allow other computers to access the remote system.

1. If the NI-VISA Server is running on an RT target, select the RT target under the **Remote Systems** category in MAX. If the NI-VISA Server is running on a Windows computer, open MAX on that computer and proceed to the next step.

2. For RT targets, open the **VISA Options** page by clicking the **VISA Options** tab. For Windows computers, open the **VISA Options** page by selecting **Tools»NI-VISA»VISA Options**.

3. On the **VISA Options** page, select **VISA Server»Security** to view the **Remote Access List**, as shown in Figure 2.
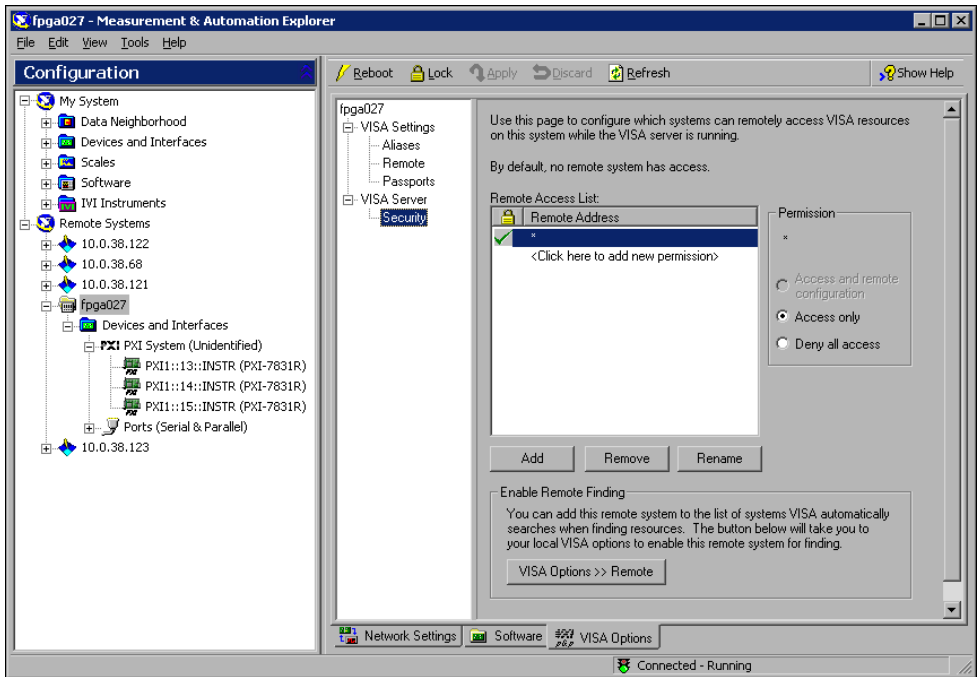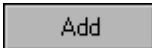

Figure 2. Setting Access Permissions for Remote Systems

Add

4. Click the **Add** button, shown at left, to add a computer to the **Remote Access List** and enter the name or IP address of the computer. You can use the ∗ wildcard to specify a group of computers or all computers on the network. In general, use the ∗ wildcard to set up general allowances or denials, and follow those entries with more specific entries. Refer to the *LabVIEW Help*, available by selecting **Help»VI, Function, & How-To Help** in LabVIEW, for general information about access list entries and wildcards.

5. Select a **Permission** option to either allow access to the remote system or deny access to the remote system.

Apply

6. Click the **Apply** button, shown at left, to set the access permissions.

Enabling Remote Finding

You can configure NI-VISA on the development computer to automatically search specific remote systems when searching for VISA resources, such as FPGA devices. The FPGA Module uses NI-VISA to find available FPGA devices when LabVIEW starts so you can select an FPGA device as an execution target. You must enable remote finding for an FPGA device before you can target the FPGA device in LabVIEW. Complete the following steps to create a find list.

1. If you are currently configuring access permissions for a remote system, click the **VISA Options >> Remote** button, as shown in Figure 2, to open the **VISA Options** page for the local VISA settings. Otherwise, select **Tools»NI-VISA»VISA Options** to open the **VISA Options** page and select **VISA Settings»Remote**, as shown in Figure 3.
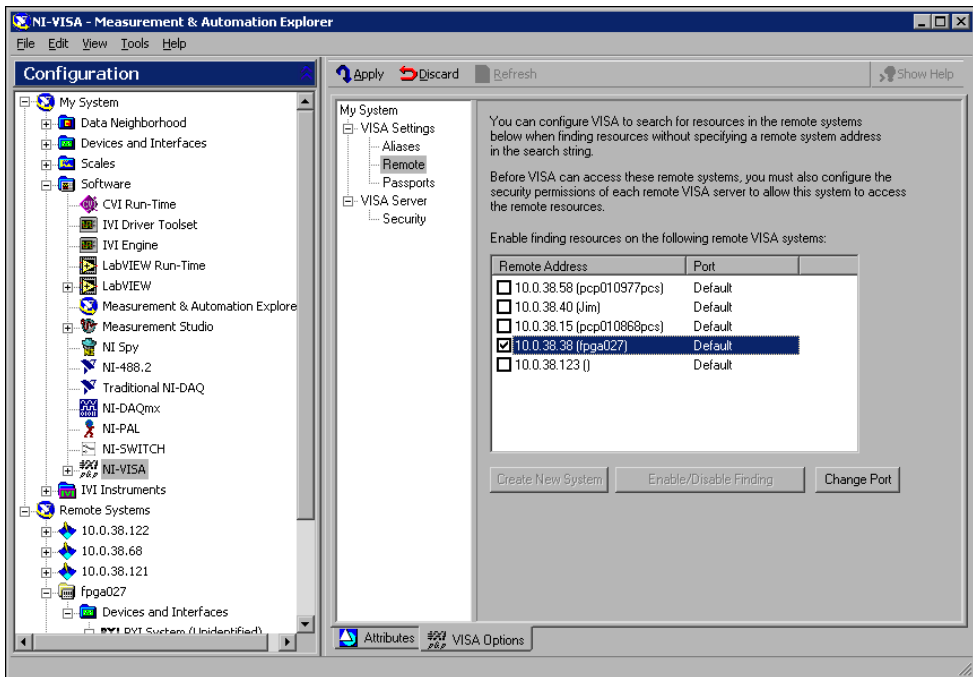

Figure 3. Enabling Remote Finding on Specific Remote Systems

2. Place checkmarks in the checkboxes next to the remote systems that you want VISA on the local computer to automatically search for VISA resources.

✏️ **Note** Each time you start LabVIEW, LabVIEW searches for FPGA devices on the remote systems for which you have enabled remote finding. LabVIEW attempts to query each remote system for approximately 40 seconds. If LabVIEW cannot connect to a remote system in that time, LabVIEW skips that remote system and moves to the next remote system on the find list. If you know that a remote system is not available, remove the checkmark next to the remote system in the find list so LabVIEW does not attempt to query that remote system.

3. Click the **Apply** button.

4. Restart LabVIEW so LabVIEW can recognize the new FPGA devices and list them as execution targets. Refer to the *Targeting an FPGA Device with LabVIEW* section for information about selecting execution targets in LabVIEW.

Targeting an FPGA Device with LabVIEW

With the FPGA Module, you must select the location on which you want a VI to run, which is called an *execution target*. For example, you run FPGA VIs on an FPGA device, so you will select an FPGA device as the execution target. After you select an execution target, LabVIEW modifies the palettes, VIs, functions, and development tools to offer only those that make sense for the execution target.

To change the execution target from the **LabVIEW** dialog box, as shown in Figure 4, select an FPGA device from the **Execution Target** pull-down menu. Alternatively, you can switch the execution target from an open VI by selecting **Operate»Switch Execution Target**.
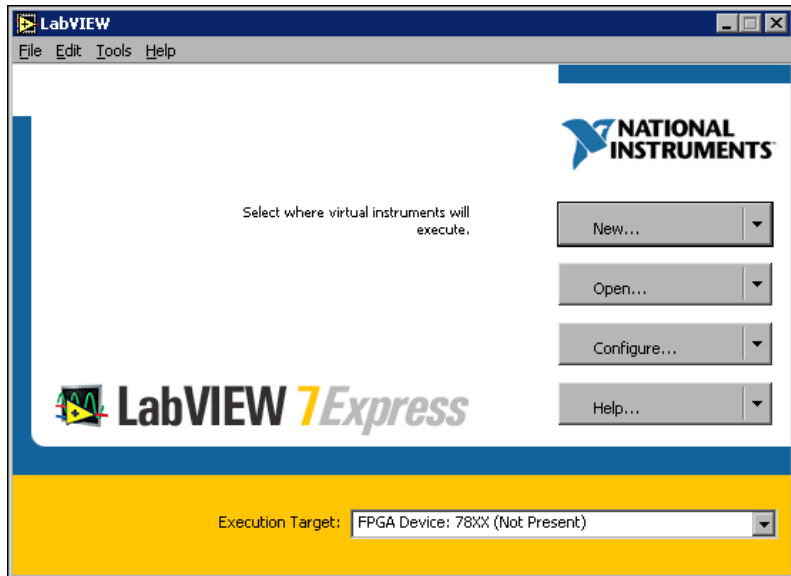
Figure 4. Selecting an Execution Target in the **LabVIEW** Dialog Box

You can create and compile FPGA VIs even if you do not have an FPGA device. Select **FPGA Device: 78XX (Not Present)** in the **Execution Target** pull-down menu, as shown in Figure 4, and develop the FPGA VI as you develop any VI. However, if you attempt to download and run the FPGA VI, you will receive an error because the device is not present.

You can test the logic of an FPGA VI with traditional LabVIEW debugging tools before compiling it by targeting an emulator. To target an emulator rather than the FPGA device, select **FPGA Device: 78XXEmulator** from the **Execution Target** pull-down menu. You must have an FPGA device for the emulator to work. Refer to Chapter 6, *Debugging FPGA VIs*, of the *LabVIEW FPGA Module User Manual* for information about testing FPGA VIs with FPGA device emulators.

Getting Started with FPGA VIs and Host VIs

Use the FPGA Module examples to learn about building FPGA VIs and host VIs, communicating between VIs running on the FPGA device and on the host computer, and programming hardware functionality in the FPGA VI. An *FPGA VI* is a VI that you download to an FPGA device that determines the functionality of the hardware using the FPGA Device I/O functions. A *host VI* is a VI that runs in software on the host computer and controls and monitors the FPGA VI on the FPGA device using the FPGA Interface functions.

In this section, you will learn to browse the FPGA Module examples with the NI Example Finder, download and run an FPGA VI, and communicate with an FPGA VI from a host VI.

Browsing Examples with the NI Example Finder

Complete the following steps to browse installed examples with the NI Example Finder.

1. Select **Help»Find Examples** in LabVIEW to browse all LabVIEW examples installed on the development computer.

2. Select **Directory Structure** on the **Browse** tab to browse the examples by directory structure.

3. Browse the examples in the FPGA directory. The FPGA Module examples demonstrate a variety of tasks and concepts, including the following:

   • Performing basic I/O

   • Building hardware counters in LabVIEW

   • Exploring timing and triggering possibilities

   • Communicating between the FPGA VI running on the FPGA device and the host VI running on the host computer

   You can find information about these topics and more in the *LabVIEW FPGA Module User Manual*. Refer to the hardware documentation for information specific to the FPGA device.

4. Navigate to the Getting Started\Interactive - IO Primitives.llb in the listbox.

5. Select **Digital.vi** in the listbox. Notice that a brief description of the Digital VI appears in the **Description** text box. All examples in the Getting Started directory contain descriptions to help you find a relevant example quickly.

Exploring an FPGA VI

The Digital VI demonstrates basic concepts of programming an FPGA device like the NI PXI-7831R using the FPGA Module. Complete the following steps to view and run an example of an FPGA VI and verify that you correctly installed and configured the FPGA device.

✏️ **Note** You must have an FPGA device available and configured to complete this exercise. Refer to the *Accessing and Configuring FPGA Devices* section earlier in this document for information about configuring local and remote FPGA devices.

1. After completing the steps in the *Browsing Examples with the NI Example Finder* section, double-click **Digital.vi** in the listbox of the NI Example Finder to launch the Digital VI.

2. Because this VI is designed to run on an FPGA device, select an FPGA device as the execution target. Refer to the *Targeting an FPGA Device with LabVIEW* section earlier in this document for information about selecting execution targets.

    Figure 5 shows the front panel of the Digital VI. Notice that the execution target appears in the lower left corner of the window.
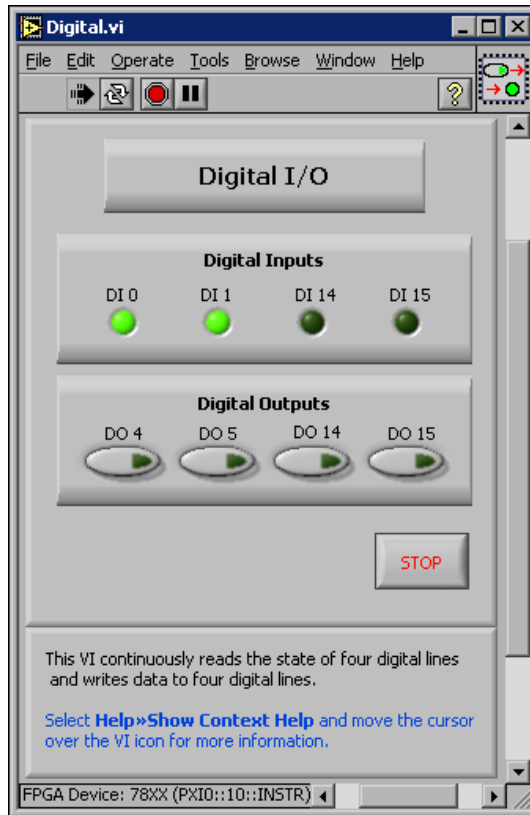

Figure 5. Front Panel of the FPGA VI

Select **Help»Show Context Help** and move the cursor over the VI icon in the upper right corner of the window. Notice the **Context Help** window contains information to help you set up and run the example. You can use the **Context Help** window in all FPGA Module Getting Started examples to learn how to setup and run each example.

3. Click the **Run** button. The Digital VI is already compiled to run on the the NI PXI-7831R. The FPGA Module determines which VI currently

resides on the FPGA device, and if the Digital VI does not exist on the FPGA device, the FPGA Module downloads and runs it on the FPGA device.

✎ **Note** If a VI is not already compiled for the FPGA device, LabVIEW compiles the VI the first time you target LabVIEW to an FPGA device and click the **Run** button. Refer to Chapter 4, *Running FPGA VIs*, of the *LabVIEW FPGA Module User Manual* for information about compiling, downloading, and running FPGA VIs.

4. Click the push buttons in the **Digital Outputs** panel and notice how they affect the LEDs in the **Digital Inputs** panel. For example, when you click the **DO 14** push button, the **DI 14** LED turns on. When you click the **DO 15** button, the **DI 15** LED turns on. However, if you click the **DO 4** or **DO 5** push buttons, nothing happens. **DO 4** and **DO 5** are not configured to write to the same connector pins that **DI 0** and **DI 1** read, the behavior of which is documented in the **Context Help** window for this VI.

5. Select **Window»Show Block Diagram** to view the block diagram, as shown in Figure 6. Notice how the indicators and controls are wired to the Digital Input and Digital Output functions.
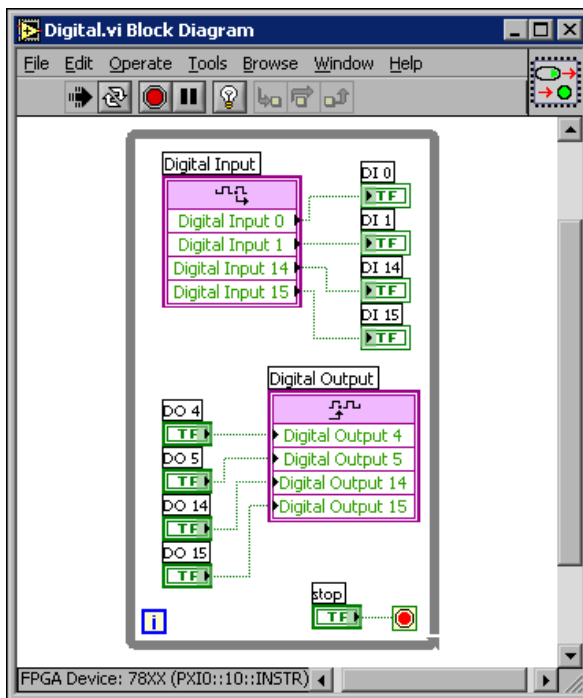

Figure 6. Block Diagram of the FPGA VI

Refer to the *LabVIEW Help*, available by selecting **Help»VI, Function, & How-To Help**, for information about using these and other FPGA Device I/O functions in FPGA VIs.

6. Return to the front panel and click the **STOP** button.

7. Return to the block diagram and double-click the Digital Input function icon. The **Configure Digital Input** dialog box appears. Select different inputs in the **Preview** list and notice how each input is associated with a specific DIO pin.

Table 1 shows the mapping of digital inputs and digital outputs to pin names on the NI PXI-7831R. Digital Input 14 and Digital Output 14 refer to the same physical pin—pin 13. Also, Digital Input 15 corresponds to Digital Output 15. However, Digital Input 0, Digital Input 1, Digital Output 4, and Digital Output 5 all refer to different pins. Refer to the FPGA device documentation for information about connector pin assignments.

Table 1. Mapping of Digital Inputs and Outputs on Connector 0 for the NI PXI-7831R

Terminal Alias	Connector Pin
Digital Input 0	Pin 36
Digital Input 1	Pin 37
Digital Input 14	Pin 13
Digital Input 15	Pin 47
Digital Output 4	Pin 40
Digital Output 5	Pin 41
Digital Output 14	Pin 13
Digital Output 15	Pin 47
Digital Ground	Pin 2

8. Click the **Cancel** button to close the **Configure Digital Input** dialog box.

9. Close the Digital VI.

Refer to Chapter 2, *Creating FPGA VIs*, of the *LabVIEW FPGA Module User Manual* for information about designing FPGA VIs.

Exploring a Host VI

The Digital (Host) VI demonstrates basic concepts of communicating with the FPGA VI running on the FPGA device from a VI running on a Windows computer or networked RT target. Complete the following steps to view and run an example of a host VI.

1. From the NI Example Finder, open `FPGA\Getting Started\ Programmatic - IO Primitives.llb\Digital (Host).vi`.

2. Because this VI is designed to run on the host computer, select LabVIEW for Windows or an RT target as the execution target.

3. Click the **Run** button.

   Figure 7 shows the front panel of the Digital Host VI. If you target LabVIEW to an RT target, the execution target appears in the lower left corner of the window, as shown in Figure 7.
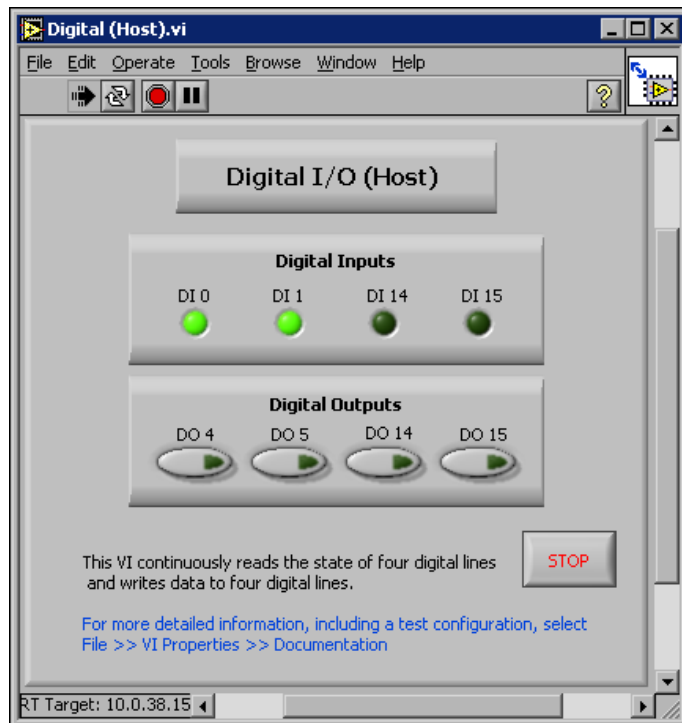

Figure 7. Front Panel of the Host VI

4. Click the push buttons in the **Digital Outputs** panel and notice how they affect the LEDs on the **Digital Inputs** panel. The Digital (Host) VI behaves the same as the Digital VI in the *Exploring an FPGA VI* section earlier in this document.

5. Select **Window»Show Block Diagram** from the Digital (Host) VI to view the block diagram. The block diagram appears as shown in Figure 8.
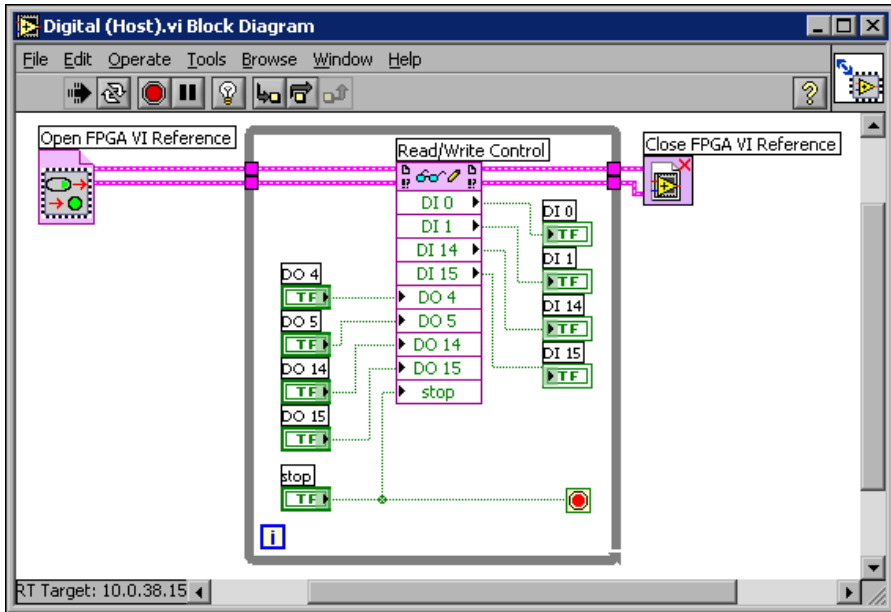

Figure 8. Block Diagram of the Host VI

Notice that the Digital (Host) VI uses the Open FPGA VI Reference function to open and run the Digital (FPGA) VI. The image inside the Open FPGA VI Reference function icon matches the icon for the Digital (FPGA) VI.

The Digital (Host) VI then uses the Read/Write Control function to read from or write to the indicators and controls in the Digital (FPGA) VI running on the FPGA device. Specifically the Read/Write control reads the state of the digital inputs on the FPGA device and allows you to change the state of the digital outputs on the FPGA device from the host computer.

The Close FPGA VI Reference function closes the reference to the FPGA VI. Refer to the *LabVIEW Help*, available by selecting **Help»VI, Function, & How-To Help**, for information about using these and other FPGA Interface functions in host VIs.

6. Return to the front panel and click the **STOP** button on the front panel to stop the VI.

7. Close the Digital (Host) VI.

Refer to Chapter 5, *Communicating with FPGA VIs*, of the *LabVIEW FPGA Module User Manual* for information about creating host VIs that you can use to programmatically interact with FPGA VIs.

Where to Go from Here

National Instruments provides many resources to help you succeed with your National Instruments products. Please use the following resources as you start exploring LabVIEW and the FPGA Module.

FPGA Module Examples

Start with an existing FPGA Module example and use it as a framework for your FPGA VIs and host VIs.

From LabVIEW, launch the NI Example Finder by selecting **Help»Find Examples** and browse the `FPGA` directory for examples. Refer to the **Description** text box for descriptions of the examples to quickly locate a relevant example.

Consider browsing the examples by directory in the following order to build your knowledge of the FPGA Module.

- Getting Started
- IO Primitives
- Timing and Triggering
- Host Synchronization
- Counters
- Applets

FPGA Module Templates

The FPGA Module offers templates to help you get started quickly. In the **LabVIEW** dialog box, click the **New** button and browse template previews and descriptions to find a template appropriate for your application. When you find a template that you want to use, select it in the **Create new** list and click the **OK** button.

Related Documentation

Refer to the following documents for conceptual information about LabVIEW, the LabVIEW Real-Time Module, and the FPGA Module.

✎ **Note** You must have Adobe Acrobat Reader with Search and Accessibility 5.0.5 or later installed to view the PDFs. Refer to the Adobe Systems Incorporated Web site at `www.adobe.com` to download Acrobat Reader.

- *LabVIEW FPGA Module User Manual* (PDF only)—Information about using the FPGA Module to create FPGA VIs and host VIs. Select **Start»Programs»National Instruments»LabVIEW 7.0» Module Documents»LabVIEW FPGA Module User Manual** to view a PDF of the document.

- *LabVIEW User Manual*—Information about using LabVIEW to create VIs. In LabVIEW, select **Help»Search the LabVIEW Bookshelf** to search documentation for the LabVIEW development system.

- *LabVIEW Real-Time Module User Manual*—Information about using the LabVIEW Real-Time Module to create deterministic VIs. In LabVIEW, select **Help»Search the Real-Time Module Bookshelf** to search documentation for the LabVIEW Real-Time Module.

Refer to the *LabVIEW Help* and **Context Help** window for information about using VIs and functions.

- *LabVIEW Help*—Available by selecting **Help»VI, Function, & How-To Help**. Browse the **FPGA Module** book in the **Contents** tab for an overview of the FPGA Module information included in the *LabVIEW Help*.

- **Context Help** window—Available by selecting **Help»Show Context Help**.

Refer to the following documents, which are available by selecting **Start»Programs»National Instruments»NI-RIO»Documents**, for information about the NI PXI-7831R.

- *Where to Start with the NI PXI-7831R*—Information about connector pin assignments and installing the NI PXI-7831R.

- *NI PXI-7831R User Manual*—Information about the NI PXI-7831R.

NI Web Site

Visit ni.com for the latest NI Developer Zone articles, examples, and support information for the FPGA Module.

Known Issues

Refer to readme.txt on the LabVIEW FPGA Module CD for information about known issues with the FPGA Module.