COMPREHENSIVE SERVICES

We offer competitive repair and calibration services, as well as easily accessible documentation and free downloadable resources.

SELL YOUR SURPLUS

We buy new, used, decommissioned, and surplus parts from every NI series. We work out the best solution to suit your individual needs.

Sell For Cash Get Credit Receive a Trade-In Deal

OBSOLETE NI HARDWARE IN STOCK & READY TO SHIP

We stock **New, New Surplus, Refurbished,** and **Reconditioned** NI Hardware.

APEX WAVES

Bridging the gap *between the manufacturer and your legacy test system.*

1-800-915-6216

www.apexwaves.com

sales@apexwaves.com

Request a Quote CLICK HERE *PCI-7833R*

Getting Started with the NI 783*x*R

This document explains how to install and configure the National Instruments 783*x*R.

Introduction

The NI 783*x*R devices are R Series Reconfigurable I/O (RIO) devices with 16-bit analog input (AI) channels, 16-bit analog output (AO) channels, and digital I/O (DIO) lines.

- The NI PXI-7830R and NI PCI-7830R have four independent AI channels, four independent AO channels, and 56 DIO lines.
- The NI PXI-7831R/7833R and NI PCI-7831R/7833R have eight independent AI channels, eight independent AO channels, and 96 DIO lines.

Traditional I/O devices have a fixed functionality provided by an application-specific integrated circuit (ASIC), but the NI 783*x*R has an FPGA (Field-Programmable Gate Array) that allows you to define device functionality and timing.

You can use the LabVIEW FPGA Module to graphically design the NI 783*x*R timing and functionality without having to learn a low-level programming language or a hardware description language (HDL) traditionally used for FPGA design. With the LabVIEW FPGA Module, you create or download a custom virtual instrument (VI) to the FPGA. You can reconfigure the NI 783*x*R with a new VI at any time.

You can use the LabVIEW Real-Time Module to communicate with and control the NI 783*x*R while performing additional tasks, such as real-time floating-point processing and data logging.

Note If you are using LabVIEW but not the LabVIEW FPGA Module, you can create VIs that run in LabVIEW to control existing FPGA VIs, but you cannot create new FPGA VIs.

The NI 783*x*R has Flash memory that you can use to store a startup VI. You can configure the VI to load to the FPGA and to run when the device powers up.

Required Components

This section lists the items necessary for using the NI 783*x*R with Windows 2000/XP and the LabVIEW Real-Time Module.

Documentation

The *NI 783xR User Manual* describes the electrical and mechanical aspects of the NI 783*x*R and contains information about device operation and programming. This document is included on the NI-RIO CD and is also available at `ni.com/manuals`.

For software reference information for the NI 783*x* devices, refer to *LabVIEW Help*, which is available in LabVIEW by selecting **Help»Search the LabVIEW Help**.

Hardware and Software

PXI-783*x*R with Windows 2000/XP

The following items are necessary to set up and use the PXI-783*x*R on a computer running Windows 2000/XP:

- ❑ NI PXI-783*x*R.
- ❑ The following software packages:
  - LabVIEW 7.1 or later.
  - LabVIEW FPGA Module 1.1 or later—required to develop custom FPGA VIs.
  - NI-RIO 1.3 or later—included with the PXI-783*x*R.

Note The PXI-7831R supports LabVIEW 7.0 or later, LabVIEW FPGA Module 1.0 or later, and NI-RIO 1.0 or later.

- ❑ PXI/CompactPCI chassis and PXI/CompactPCI embedded controller running Windows 2000/XP, or a computer running Windows 2000/XP and a MXI-3 link to a PXI/CompactPCI chassis.
- ❑ At least one cable and device for connecting signals to the PXI-783*x*R.

PXI-783*x*R with the LabVIEW Real-Time Module (ETS)

The following items are necessary to set up and use the PXI-783*x*R with the LabVIEW Real-Time Module for ETS:

- ❑ NI PXI-783*x*R.
- ❑ The following software packages:
  - LabVIEW 7.1 or later.
  - LabVIEW FPGA Module 1.1 or later—required to develop custom FPGA VIs.
  - LabVIEW Real-Time Module 7.1 or later.
  - NI-RIO 1.3 or later—included with the PXI-783*x*R.
  - Ardence (formerly Venturcom) Phar Lap Embedded Tool Suite (ETS).

Note The PXI-7831R supports LabVIEW 7.0 or later, LabVIEW FPGA Module 1.0 or later, and NI-RIO 1.0 or later.

- ❑ Host computer running Windows 2000/XP for developing your application.
- ❑ PXI/CompactPCI chassis and real-time embedded controller running the Phar Lap ETS real-time operating system.
- ❑ CAT 5 Ethernet crossover cable if the real-time PXI system is not configured on a network. To connect the PXI system to a network port, use a standard CAT 5 10/100Base-T Ethernet cable.
- ❑ At least one cable and device for connecting signals to the PXI-783*x*R.

PXI-783*x*R with the LabVIEW Real-Time Module (RTX)

The following items are necessary to set up and use the PXI-783*x*R with the LabVIEW Real-Time Module for RTX:

- ❑ NI PXI-783*x*R.
- ❑ The following software packages:
  - LabVIEW 7.1 or later.
  - LabVIEW FPGA Module 1.1 or later—required to develop custom FPGA VIs.
  - LabVIEW Real-Time Module 7.1 or later.

- NI-RIO 1.3 or later—included with the PXI-783*x*R.
- Ardence (formerly Venturcom) RTX 5.5 or later.

Note The PXI-7831R supports NI-RIO 1.1 or later.

- ❑ PXI/CompactPCI chassis and real-time embedded controller running Windows 2000/XP and RTX.
- ❑ CAT 5 Ethernet crossover cable if the real-time PXI system is not configured on a network. To connect the PXI system to a network port, use a standard CAT 5 10/100Base-T Ethernet cable.
- ❑ At least one cable and device for connecting signals to the PXI-783*x*R.

PCI-783*x*R with Windows 2000/XP

The following items are necessary to set up and use the PCI-783*x*R on a computer running Windows 2000/XP:

- ❑ PCI-783*x*R.
- ❑ The following software packages:
  - LabVIEW 7.1 or later.
  - LabVIEW FPGA Module 1.1 or later—required to develop custom FPGA VIs.
  - NI-RIO 1.3 or later—included with the PCI-783*x*R.

Note The PCI-7831R supports NI-RIO 1.1 or later.

- ❑ Development computer running Windows 2000/XP.
- ❑ At least one cable and device for connecting signals to the PCI-783*x*R.

PCI-783*x*R with the LabVIEW Real-Time Module (ETS)

The following items are necessary to set up and use the PCI-783*x*R with the LabVIEW Real-Time Module for ETS:

- ❑ PCI-783*x*R.
- ❑ The following software packages:
  - LabVIEW 7.1 or later.
  - LabVIEW FPGA Module 1.1 or later—required to develop custom FPGA VIs.

- LabVIEW Real-Time Module for ETS 7.1 or later.
- NI-RIO 1.3 or later—included with the PCI-783*x*R.
- Ardence (formerly Venturcom) Phar Lap Embedded Tool Suite (ETS).

Note The PCI-7831R supports NI-RIO 1.1 or later.

- ❑ Host computer running Windows 2000/XP for developing your application.
- ❑ Target computer running the Phar Lap ETS real-time operating system.
- ❑ At least one cable and device for connecting signals to the PCI-783*x*R.

PCI-783*x*R with the LabVIEW Real-Time Module (RTX)

The following items are necessary to set up and use the PCI-783*x*R with the LabVIEW Real-Time Module for RTX:

- ❑ PCI-783*x*R.
- ❑ The following software packages:
  - LabVIEW 7.1 or later.
  - LabVIEW FPGA Module 1.1 or later—required to develop custom FPGA VIs.
  - LabVIEW Real-Time Module for RTX 7.1 or later.
  - NI-RIO 1.3 or later—included with the PCI-783*x*R.
  - Ardence (formerly Venturcom) RTX 5.5 or later.

Note The PCI-7831R supports NI-RIO 1.1 or later.

- ❑ Computer running Windows 2000/XP and RTX.

Note RTX 5.5 does not support Hyper-Threading enabled processors. Refer to the RTX documentation for information about disabling multiprocessor access.

- ❑ At least one cable and device for connecting signals to the PCI-783*x*R.

Installing Software

Complete the following sets of steps in the order listed to successfully install LabVIEW, the LabVIEW Real-Time Module, the LabVIEW FPGA Module, and the NI-RIO device drivers.

If you are using NI-RIO without LabVIEW, skip these steps and proceed to the *NI-RIO Device Drivers Installation* section.

LabVIEW Installation

Complete the following steps to install LabVIEW. Refer to the *LabVIEW Release Notes* for additional information about installing LabVIEW.

1. Insert the LabVIEW CD into the CD-ROM drive to display the LabVIEW installation screen.
2. Click **Install LabVIEW**.
3. Follow the installer prompts through the rest of the installation.

The installer also may prompt you to insert the Driver CD. Disregard this prompt. The Driver CD is not required for the NI 783*x*.

LabVIEW Real-Time Module Installation

Complete the following steps to install the LabVIEW Real-Time Module. Refer to the *LabVIEW Real-Time Module Release Notes* for additional information about installing the LabVIEW Real-Time Module.

Note If you are using the NI 783*x*R with Windows 2000/XP only, it is not necessary to install the LabVIEW Real-Time Module.

1. Insert the LabVIEW Real-Time Module CD into the CD-ROM drive to display the LabVIEW Real-Time Module installation screen.
2. Click **Install LabVIEW Real-Time Module**.
3. Follow the installer prompts through the rest of the installation.

LabVIEW FPGA Module Installation

Complete the following steps to install the LabVIEW FPGA Module. Refer to the *LabVIEW FPGA Module Release Notes* for additional information about installing the LabVIEW FPGA Module.

1. Insert the LabVIEW FPGA Module CD into the CD-ROM drive to display the LabVIEW FPGA Module installation screen.
2. Click **Install LabVIEW FPGA Module**.
3. Follow the installer prompts through the rest of the installation.

NI-RIO Device Drivers Installation

Complete the following steps to install the NI-RIO device drivers that are included with the NI 783*x*R device.

Note You must install LabVIEW and the LabVIEW modules you will use *before* you install the NI-RIO device drivers.

Tip If you installed NI-RIO from the LabVIEW FPGA installer, skip this section.

1. Insert the NI-RIO CD into the CD-ROM drive to display the NI-RIO installation screen.
2. Click **Install NI-RIO**.
3. Follow the on-screen instructions until the **Feature Tree** window appears.
4. In the **Feature Tree** window, select the components to install. You must install NI-VISA, NI-RIO, and NI Measurement & Automation Explorer (MAX).
5. Follow the on-screen instructions to complete the driver installation.
6. Restart the computer.

Installing Hardware

This section describes how to unpack and install the PXI-783*x*R and PCI-783*x*R devices.

Note You must install the NI-RIO device drivers before installing the NI 783*x*R.

Unpacking

The NI 783*x*R is shipped in an antistatic package to prevent electrostatic discharge from damaging device components. To prevent such damage when handling the device, take the following precautions:

- Ground yourself using a grounding strap or by holding a grounded object, such as your computer chassis.
- Touch the antistatic package to a metal part of the computer chassis before removing the device from the package.

Caution *Never* touch the exposed pins of connectors.

Remove the device from the package and inspect the devices for loose components or any other sign of damage. Notify NI if the device appears damaged in any way. Do *not* install a damaged device into the computer.

Store the NI 783*x*R in the antistatic envelope when not in use.

PXI-783*x*R Installation

You can install the PXI-783*x*R in any available peripheral slot in the PXI or CompactPCI chassis. Complete the following instructions to install the PXI-783*x*R:

Note You must install the software before installing the hardware. For software installation instructions, refer to the *Installing Software* section.

1. Power off and unplug the PXI or CompactPCI chassis.
2. Make sure there are no lit LEDs on the chassis. Wait for any lit LEDs to go out before continuing the installation.
3. Remove the filler panel for the peripheral slot.
4. Ground yourself using a grounding strap or by touching a grounded object, such as the PXI or CompactPCI chassis.
5. Insert the PXI-783*x*R into the slot. Use the injector/ejector handle to fully inject the PXI-783*x*R into place.

6. Screw the front panel of the PXI-783*x*R to the front panel mounting rails of the chassis.
7. Visually verify the installation. Make sure the PXI-783*x*R is not touching other devices or components and that the PXI-783*x*R is fully inserted into the slot.
8. Plug in and power on the PXI or CompactPCI chassis.

PCI-783*x*R Installation

You can install the PCI-783*x*R in any available PCI expansion slot in the computer. To achieve the best noise performance, leave as much room as possible between the PCI-783*x*R and other boards.

Complete the following instructions to install the PCI-783*x*R:

Note You must install the software before installing the hardware. For software installation instructions, refer to the *Installing Software* section.

1. Power off and unplug the computer.

Caution To protect both yourself and the computer from electrical hazards, the computer must remain off and unplugged until the PCI-783*x*R is completely installed.

2. Remove the computer cover. Make sure there are no lit LEDs on the motherboard. Wait for any lit LEDs to go out before continuing the installation.
3. Touch the metal part of the power supply case inside the computer to discharge any static electricity that might be on your clothes or body.
4. Locate the metal bracket that covers the cut-out in the back panel of the chassis for the slot you have selected. Remove and save the bracket-retaining screw and the bracket cover.
5. Align the PCI-783*x*R card-edge connector with the expansion slot receptacle. Using slow, evenly distributed pressure, press the PCI-783*x*R straight down until it seats in the expansion slot.
6. Reinstall the bracket-retaining screw to secure the PCI-783*x*R to the back panel rail.
7. Visually verify the installation.
8. Replace the computer cover, and plug the computer in.

Using the NI 783*x*R with the LabVIEW Real-Time Module for RTX

You can use the LabVIEW Real-Time Module for RTX with the NI 783*x*R. After you have installed RTX, the LabVIEW Real-Time Module for RTX, and RTX support from the NI-RIO Driver CD, complete the following steps:

Note The NI-RIO device drivers and NI 783*x*R must be installed before adding RTX support for the R Series device.

1. If necessary, close all NI software.
2. Select **Start»Program Files»Ardence RTX»RTX»RTX Properties**.
3. On the **Plug and Play** tab, right-click the name of your device and select **Add RTX INF Support**.
4. Click the **Apply** button. RTX Properties returns a Warning dialog box. Click **OK**.
5. In the RTX Properties window, click **OK**.
6. Right-click **My Computer** and select **Properties**.
7. Select the **Hardware** tab and click **Device Manager**.
8. For Windows XP, expand NI-RIO Devices, right-click the name of your device and select **Update Driver**. In the Hardware Update Wizard window, select **Install the software automatically** and click **Next**. When the wizard finishes installing the software, click **Finish**.

   For Windows 2000, expand NI-RIO Devices, right-click the name of your device, and select **Properties**. On the **Driver** tab, click **Update Driver**. In the **Upgrade Device Driver Wizard** window, click **Next**. Select **Search for a suitable driver for my device** and click **Next** three times. When Windows finishes installing the software, click **Finish**.
9. In the Device Manager window, select **View»Resources by connection**.
10. In the Device Manager window, expand **Interrupt Request (IRQ)**. Make sure that the NI 783*x*R is not sharing an IRQ with any other devices. Refer to the *RTX Runtime Help* for information about modifying a device.
11. Reboot your computer.
12. Select **Start»Run**. In the Run window, enter `net start nirtrtx` and click **OK**.

The NI 783*x*R now supports RTX. When you launch LabVIEW, the NI 783*x*R appears in the **LabVIEW Execution Target** menu as **FPGA Device [*device name*] visa://localhost::RTRTX::0/RIO0::INSTR**.

Removing RTX Support

Complete the following steps to remove RTX support from the NI 7831R.

1. Close all NI software.
2. Select **Start»Program Files»Ardence RTX»RTX»RTX Properties**.
3. On the **Plug and Play** tab, right-click the name of your device and select **Remove RTX INF Support**.
4. Click **Apply**. RTX Properties returns a Warning dialog box. Click **OK**.
5. In the RTX Properties window, click **OK**.
6. Right-click **My Computer** and select **Properties**.
7. Select the **Hardware** tab and click **Device Manager**.
8. For Windows XP, expand **RTX Drivers**, right-click **[*device name*] RTX Supported** and select **Update Driver**.

You have removed RTX support for the NI 783*x*R.

Using Remote NI 783*x*R Devices

The following sections discuss working with remote NI 783*x* devices.

Configuring and Accessing Remote FPGA Targets

The NI 783*x*, which is an FPGA target, might be located in other systems on the network, which are known as remote systems. The FPGA Module uses the NI-VISA communication protocol to locate FPGA targets in remote systems, which are known as remote FPGA targets. MAX detects remote FPGA devices as VISA resources and displays them in the **Devices and Interfaces** category for the remote system they are connected to. To make remote FPGA targets accessible to other computers on the network, you run the NI-VISA Server on the remote system.

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.

After you install and start the NI-VISA Server on the remote system, you must grant access permissions to the remote system in MAX, as described in the *Setting Access Permissions for Remote FPGA Targets* section. When the FPGA target appears in MAX, verify that you can access the FPGA

target, as described in the *Verifying Communication with Remote FPGA Targets* section. If you cannot verify access to the remote FPGA target using MAX or if you receive an error message when attempting to add the remote FPGA target to the **Project Explorer** window in LabVIEW, verify that you correctly set access permissions. You then can add the remote system to the **Project Explorer** window in LabVIEW. Refer to the *LabVIEW Help* for information about adding the remote system to the **Project Explorer** window. The *LabVIEW Help* is available by clicking **Help»Search the LabVIEW Help** in LabVIEW.

Note The NI-VISA server starts automatically after it is installed on an RT target.

Verifying Communication with Remote FPGA Targets

Complete the following steps to test communication with a remote system in MAX.

1. Expand the **Remote Systems** category in MAX.
2. Expand the remote system in which the FPGA target is installed and **Devices and Interfaces** so you can view the FPGA targets installed in that system.
3. Select the FPGA target you want to test and click the **Open VISA Test Panel** button, shown at left.

If the VISA test panel opens, you have access to the remote FPGA target and you can add the remote FPGA target to the **Project Explorer** window in LabVIEW. If the test panel does not open or if you receive an error message when attempting to add the remote FPGA target to the **Project Explorer** window in LabVIEW, refer to the *Setting Access Permissions for Remote FPGA Targets* section.

Setting Access Permissions for Remote FPGA Targets

If you cannot verify communication with a remote system in MAX or if you receive an error message when attempting to add the remote FPGA target to the **Project Explorer** window in LabVIEW, you might need to set access permissions for the remote system.

Complete the following steps to allow other computers to access the remote FPGA target.

1. Make sure the remote FPGA target appears in MAX. If you cannot locate the remote system and FPGA target in MAX, refer to the *Measurement & Automation Explorer Help* by selecting **Help»MAX Help** in MAX for information about recognizing remote systems in MAX.
2. 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.

3. For RT targets, open the **VISA Options** page by clicking the **Remote Systems»*Remote System Name*»Software»NI-VISA *x.x*** category, where ***Remote System Name*** is the name or IP address of the remote system and ***x.x*** is the version of NI-VISA you have installed, and then clicking the **VISA Options** tab. For Windows computers, open the **VISA Options** page by selecting **Tools»NI-VISA»VISA Options**.
4. On the **VISA Options** page, select **VISA Server»Security** to view the **Remote Access List**, as shown in Figure 1.

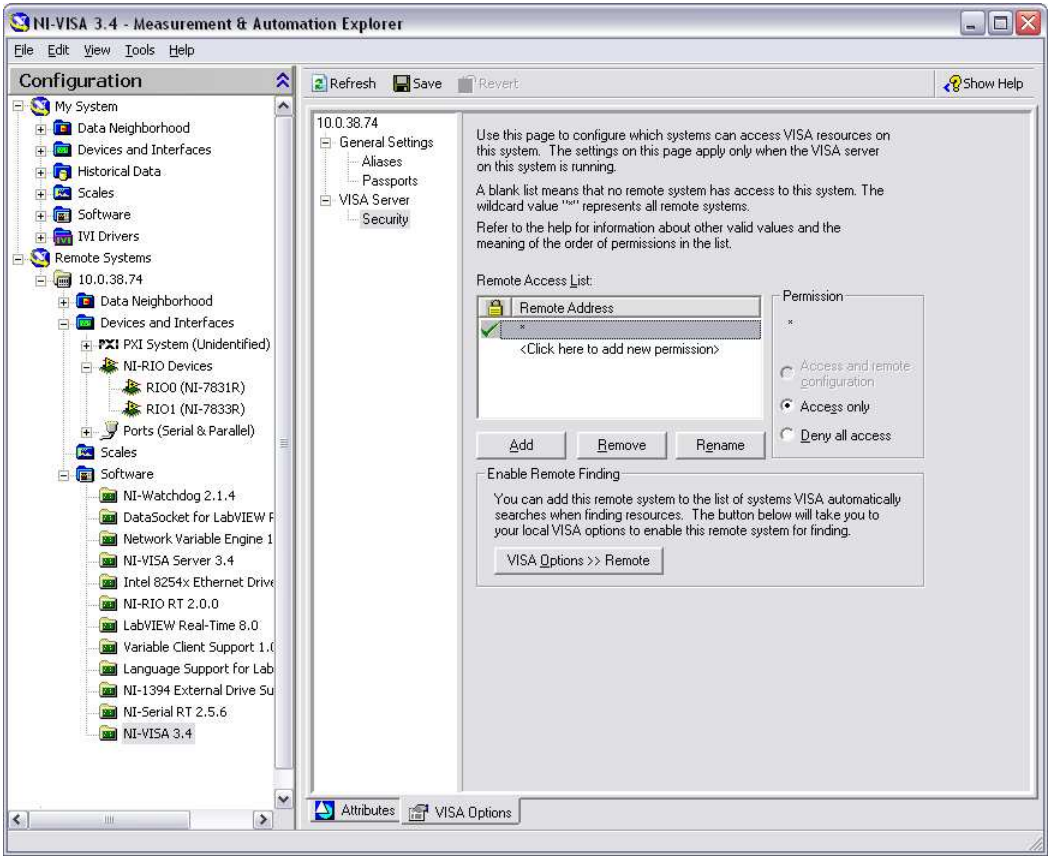

Figure 1. Setting Access Permissions for Remote Systems

5. Click the **Add** button, shown at left, and enter the name or IP address of the computer to add a computer to the **Remote Access List**. 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»Search the**

LabVIEW Help, for general information about access list entries and wildcards.

6. Select a **Permission** option to either allow access to the remote system or deny access to the remote system.
7. Click the **Save** button, shown at left, to set the access permissions.

Connecting Signals

Figure 2 shows the I/O connector locations for the NI PXI-783*x*R and the NI PCI-783*x*R. The NI PXI-7830R and NI PCI-7830R do not have Connector 2 (DIO).

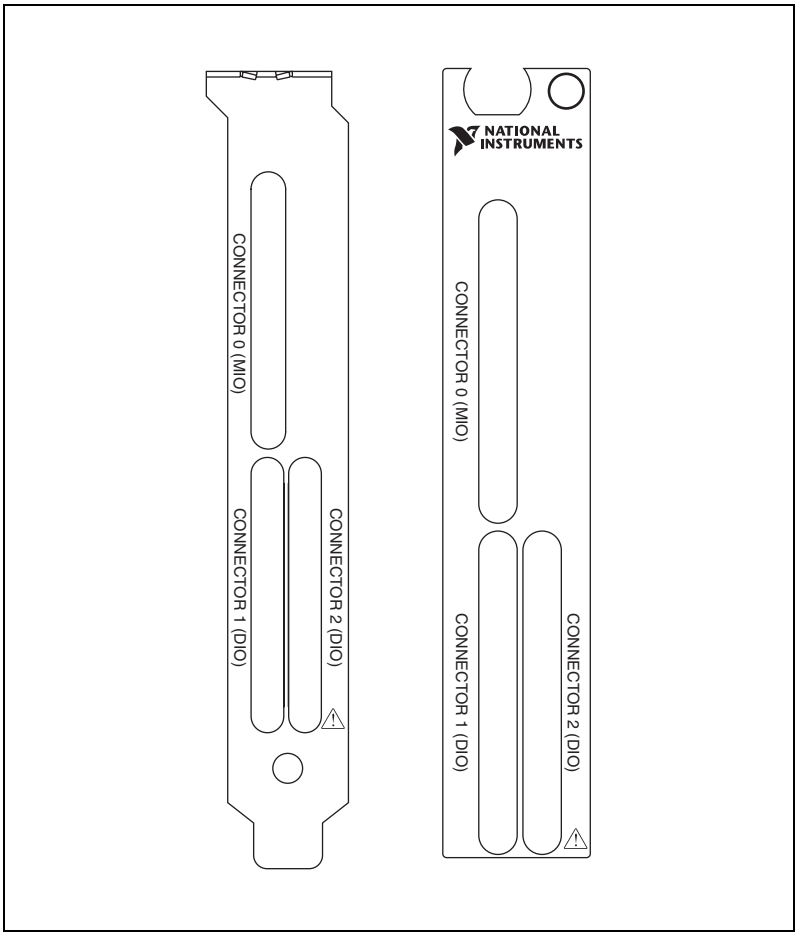

Figure 2. NI 783*x*R Connector Locations

Figure 3 shows the I/O connector pin assignments for the I/O connectors on the NI 783*x*R. The DIO connector pin assignment applies to connector 1 on the NI 7830R and connectors <1..2> on the NI 7831R/7833R.

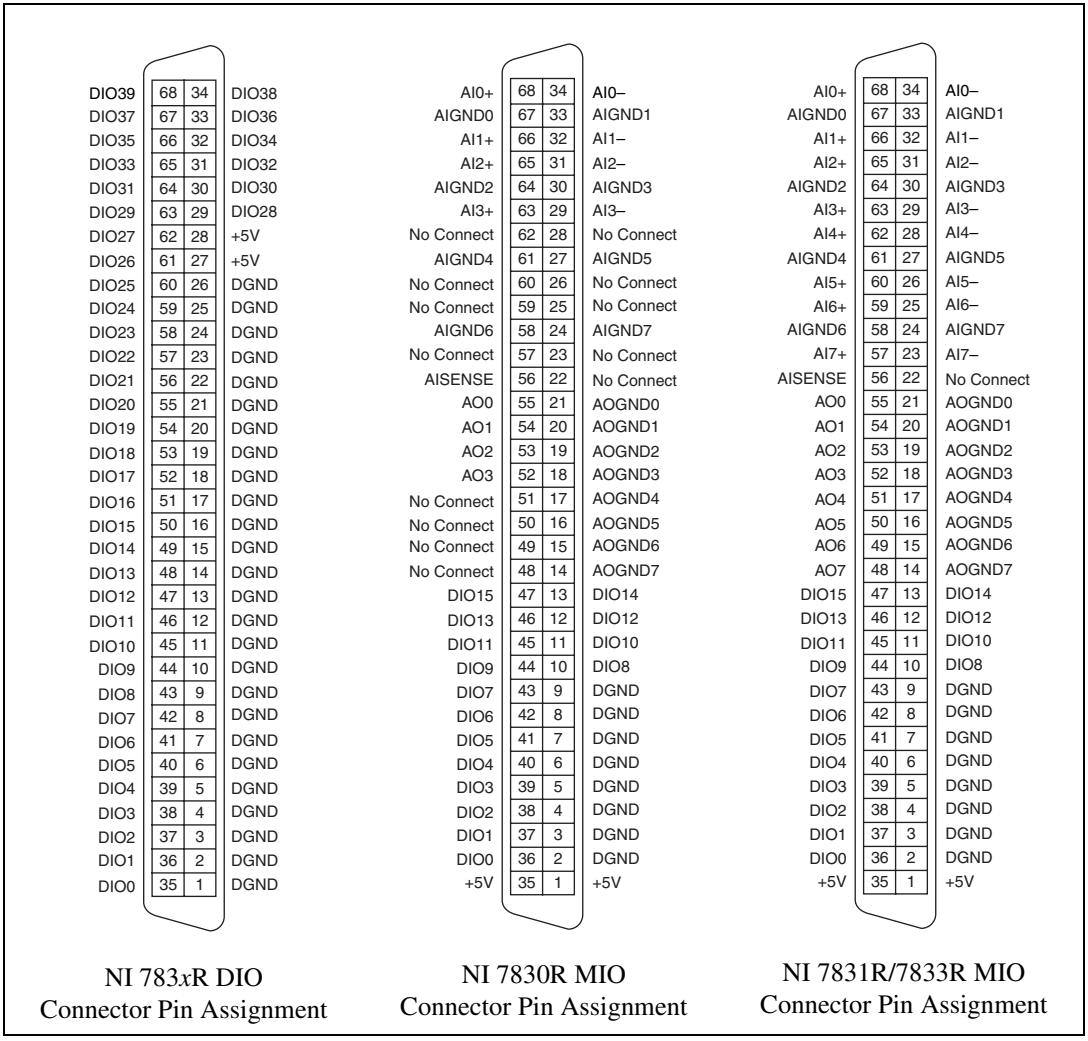

Figure 3. NI 783*x*R I/O Connector Pin Assignments

Caution Connections that exceed any of the maximum ratings of input or output signals on the NI 783*x*R can damage the NI 783*x*R and the computer. NI is *not* liable for any damage resulting from such signal connections. Refer to the *NI 783xR User Manual* for the maximum input ratings for each signal.

For detailed information about connecting I/O signals, refer to the *NI 783xR User Manual*.

Cabling Options

Accessing the signals on the I/O connectors requires at least one cable and one signal accessory. Table 1 summarizes the National Instruments cables available for use with the NI 783*x*R device.

Table 1. Cabling Options

Cable	Connector	Description
SH68-C68-S	MIO/DIO	For connecting signals from the MIO or DIO connector to the NI SCB-68 terminal block.
SHC68-68-RMIO	MIO	For connecting signals from the MIO connector to the SCB-68 terminal block. Improves signal integrity and noise immunity. Provides shielding on all AI channels and an overall analog shield to reduce digital-to-analog crosstalk.
NSC68-262650	MIO	For direct connection of the NI 783*x*R to 5B and SSR analog and digital signal conditioning backplanes. Routes signals to connectors that attach directly to 5B backplanes (for analog signals) and SSR backplanes (for digital signals).
NSC68-5050	DIO	For direct connection of the NI 783*x*R and SSR backplanes. Routes signals to connectors that attach directly to SSR backplanes.

Related Documentation

Refer to the following documentation for information about the LabVIEW FPGA Module, R Series hardware, and VIs necessary for your application.

- *LabVIEW FPGA Module Release Notes*—describes the software installation and other known software issues.
- *NI 783xR User Manual*—describes the electrical and mechanical aspects of the NI 783*x*R and contains information about its operation and programming.
- *LabVIEW Help*—includes VI descriptions and function reference information for the NI 783*x* devices.
- *CompactRIO R Series Expansion System Installation Instructions*—describes how to install the CompactRIO R Series Expansion chassis and CompactRIO I/O modules.

373256D-01 Nov05