PXIe-7890/7891 Getting Started

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Contents

Getting Started

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Note Before you begin, install and configure your chassis and controller.

This document explains how to install, configure, and troubleshoot the PXIe-7890 or PXIe-7891 module. You can program the PXIe-7890/7891 with the following software options.

- NI-FlexRIO driver software
- NI LabVIEW Instrument Design Libraries for FlexRIO (instrument design libraries)

Note Adapter modules are not installable or interchangeable on the PXIe-7890/7891 device.

Unpacking the Kit

Notice To prevent electrostatic discharge (ESD) from damaging the module, ground yourself using a grounding strap or by holding a grounded object, such as your computer chassis.

1. Touch the antistatic package to a metal part of the computer chassis.
2. Remove the module from the package and inspect it for loose components or other signs of damage.

   Notice Never touch the exposed pins of connectors.

   Note Do not install a module if it appears damaged in any way.

3. Unpack any other items and documentation from the kit.

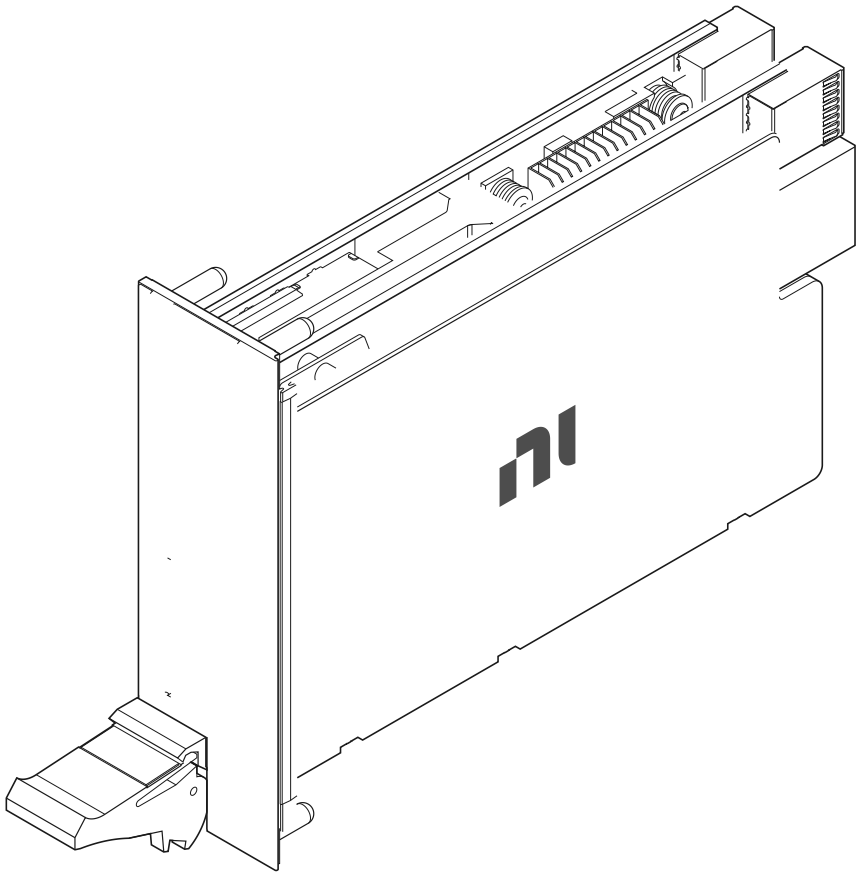
Store the module in the antistatic package when the module is not in use.

What You Need to Get Started

Kit Contents

Verify that the following items are included in the PXIe-7890/7891 kit.

- PXIe-7890 or PXIe-7891 module.



- **PXIe-7890** or **PXIe-7891 Safety, Environmental, and Regulatory Information** document.

Recommended Cables

NI recommends the following cables for use with the PXIe-7890/7891.

Connector	Cable	Description	Part Number
CONNECTOR 0 and CONNECTOR 4	SHC68-C68-D4	68-Pin, Male VHDCI to 68-Pin, Male VHDCI, 50 Ω, Shielded Digital Cable	781013-01 (0.55 m) 196275-01 (1 m) 781293-01 (2 m)
	SHC68-2MDR26-RDIO2[1]	R Series Digital Cable, 1 m	148709-01 (1 m)
	SHC68-C68- RDIO2[2]	68-PinVHDCI Male to 68-Pin VHDCI Male, 80 MHz, Shielded Digital Cable	156166-01 (1 m) 156166-02 (2 m)
CONNECTOR 1 and CONNECTOR 3	SHC68-C68-D4	68-Pin, Male VHDCI to 68-Pin, Male VHDCI, 50 Ω, Shielded Digital Cable	781013-01 (0.55 m) 196275-01 (1 m) 781293-01 (2 m) 132625-03 (3 m)
	SHC68- 2MDR26-RDIO2[2]	R Series Digital Cable, 1 m	148709-01 (1 m)
	SHC68-C68- RDIO2[3]	68-Pin VHDCI Male to 68-Pin VHDCI Male, 80 MHz, Shielded Digital Cable	156166-01 (1 m) 156166-02 (2 m)

Connector	Cable	Description	Part Number
CONNECTOR 2	SHC68-C68-D3	68-Pin, male VHDCI to 68-Pin, male VHDCI, 100 ohm, double-shielded LVDS cable	188143-01 (1 m)

[1] To be used together with a Read Transition Interface (RTI-12307) in a Switch Load and Signal Conditioning (SLSC) system.

[2] To be used together with a Read Transition Interface (RTI-12301) in an SLSC system.

[3] Used for Connector 3 when the load side is terminated with 50 Ω.

Recommended Accessories

NI recommends the following accessories for use with the PXIe-7890/7891.

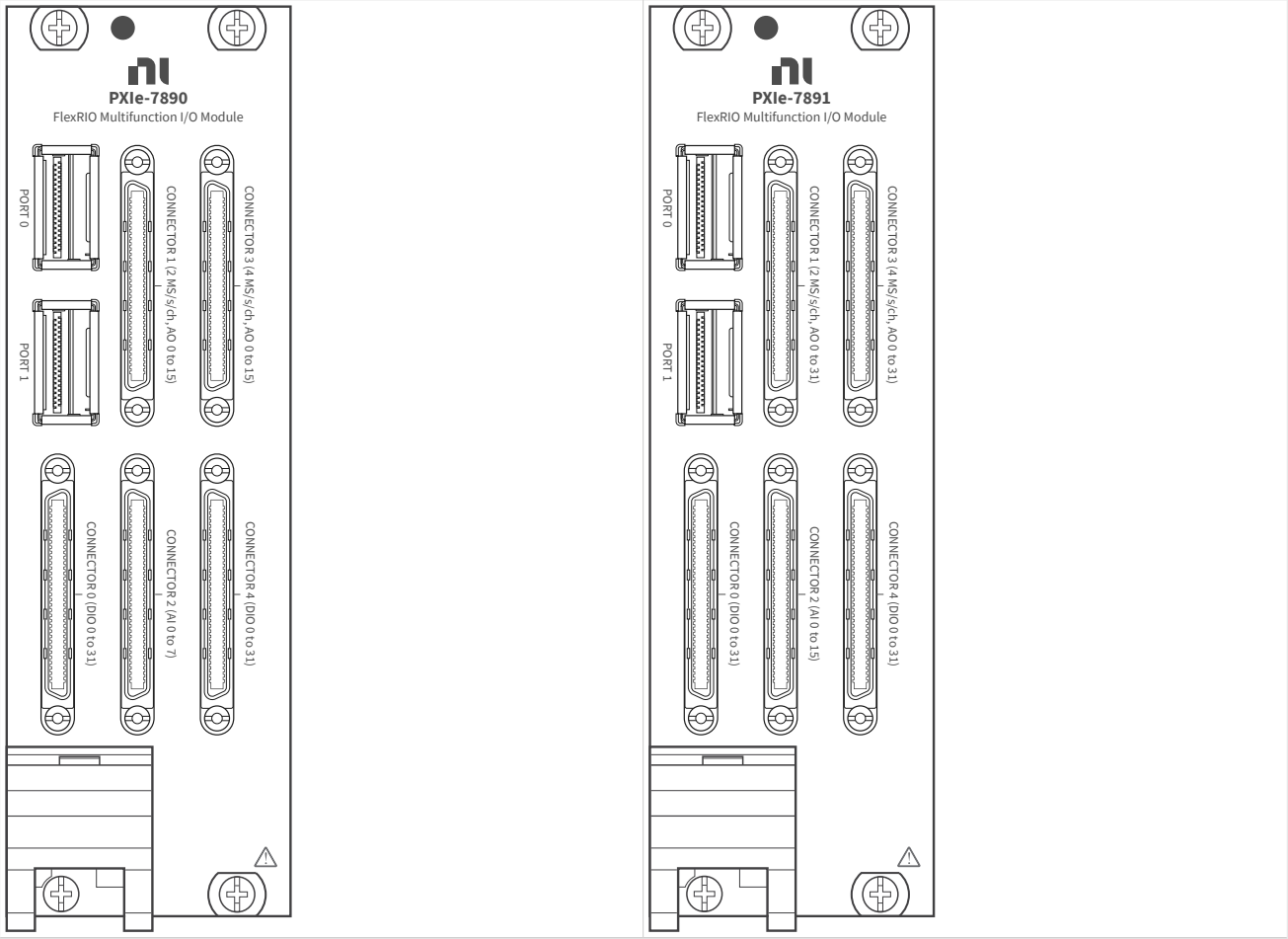
Connector	Accessory	Description	Part Number
CONNECTOR 0 and CONNECTOR 4	SCB-68 HSDIO	Screw Terminal, 68-pin VHDCI, Shielded I/O Connector Block	782914-01
CONNECTOR 1 and CONNECTOR 3	SMB-2153	32-Channel, 1-Pin SMB, 68-Pin VHDCI, Breakout Connector Block	782648-01
	SCB-68 HSDIO	Screw Terminal, 68-pin VHDCI, Shielded I/O Connector Block	782914-01
CONNECTOR 2	SMB-2145[1]	1-Pin SMB, 68-pin VHDCI, 16-Channel Analog Input, NI-5752 Terminal Block	781516-01

Connector	Accessory	Description	Part Number

[1] The negative analog input will be connected to the common ground GND of the module.

Front Panel and Connectors

Figure 1. PXIe-7890 and 7891 Front Panels



The following table describes the signal connections for the PXIe-7890 and PXIe-7891.

Table 1. Front Panel Connector Descriptions and Functions

Connector	Description	Function
PORT 0 and PORT 1	QSFP connector, SFF-8436 compliant	High-speed serial interfacing port

Connector	Description	Function
CONNECTOR 0 and CONNECTOR 4	68-pin VHDCI receptacle	Digital IO
CONNECTOR 1		Analog Output
CONNECTOR 2		Analog Input
CONNECTOR 3		Low-latency analog output

Connector Pinouts

PORT 0 and PORT 1

Figure 2 shows the pinout for the PXIe-7890/7891 PORT 0 and PORT 1 connectors, followed by pin descriptions.

Figure 2. QSFP Connector Pinout

GND	20	19	GND
Rx2n	21	18	Rx1n
Rx2p	22	17	Rx1p
GND	23	16	GND
Rx4n	24	15	Rx3n
Rx4p	25	14	Rx3p
GND	26	13	GND
ModPrsL	27	12	SDA
IntL	28	11	SCL
Vcc Tx	29	10	Vcc Rx
Vcc1	30	9	ResetL
LPMode	31	8	ModSelL
GND	32	7	GND
Tx3p	33	6	Tx4p
Tx3n	34	5	Rx4n
GND	35	4	GND
Tx1p	36	3	Tx2p
Tx1n	37	2	Tx2n
GND	38	1	GND

Table 2. Pin Descriptions for PORT 0 and PORT 1 Connectors

Pin	Description
Txn <1..4>	Transmitter Inverted Data Input
Txp <1..4>	Transmitter Non-Inverted Data Input
Rxn <1..4>	Receiver Inverted Data Output
Rxp <1..4>	Receiver Non-Inverted Data Output
SCL	2-Wire Serial Interface Clock
SDA	2-Wire Serial Interface Data
ModPrsL	Module Present
ModSelL	Module Select
ResetL	Module Reset
IntL	Interrupt
LPMode	Low Power Mode
Vcc Rx	+3.3 V Power Supply Receiver
Vcc Tx	+3.3 V Power Supply Transmitter
Vcc1	+3.3 V Power Supply
GND	Ground

Notice The maximum input signal levels are valid only when the module is powered on. To avoid permanent damage to the PXIe-7890/7891, do not apply a signal to the device when the module is powered down.

Notice Connections that exceed any of the maximum ratings of any connector on the PXIe-7890/7891 can damage the device and the system. NI is not liable for any damage resulting from such connections.

CONNECTOR 0 and CONNECTOR 4

Figure 3 shows the pinouts for PXIe-7890/7891 CONNECTOR 0 and CONNECTOR 4, followed by pin descriptions.

Figure 3. Digital I/O (DIO) Connectors

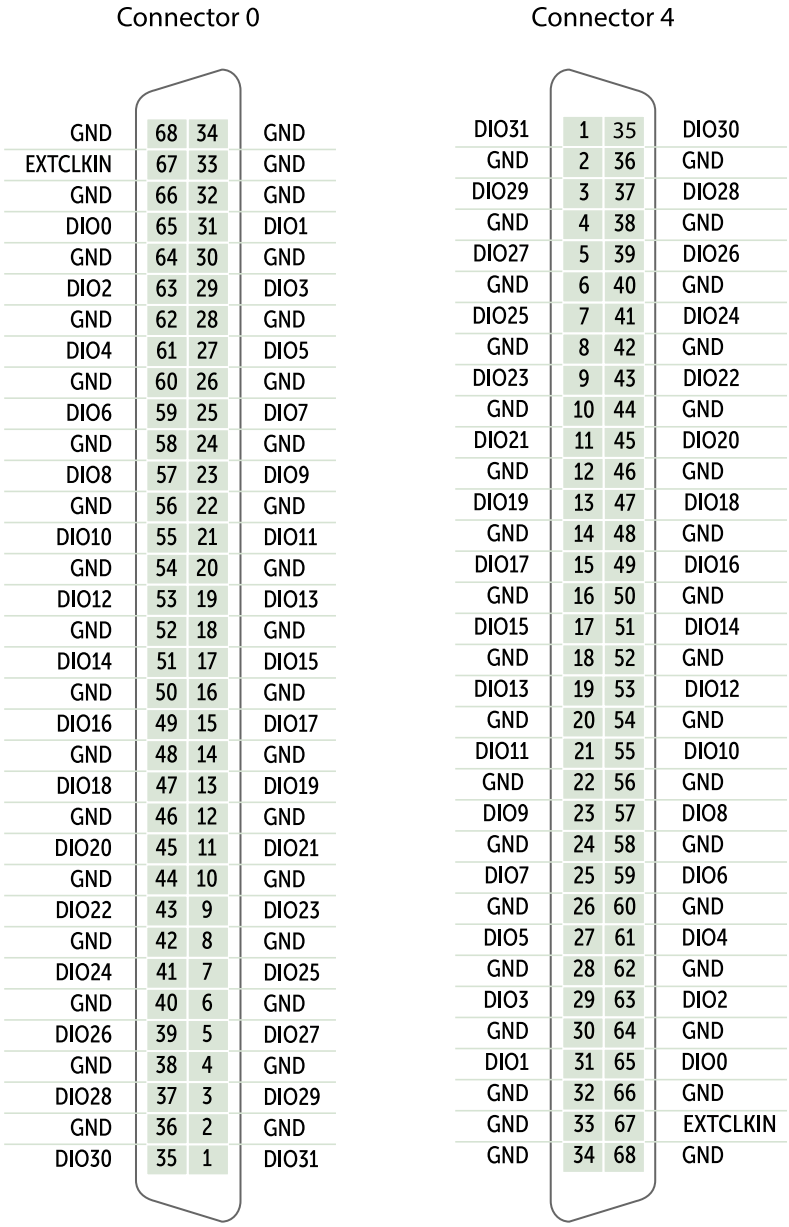


Table 3. Pin Descriptions for CONNECTOR 0 and CONNECTOR 4

Pin	Description	Signal Name in LabVIEW
DIO <0..31>	Bidirectional digital input/ output signal connection	Digital Input: ▪ Conn0 DI / Ch <0..31> ▪ Conn4 DI / Ch <0..31>

Pin	Description	Signal Name in LabVIEW
		Digital Output: ▪ Conn0 DO / Ch <0..31> ▪ Conn4 DO / Ch <0..31>
EXTCLKIN	External clock input source that can be used for source synchronous acquisitions; the provided clock source must be stable and glitch free	Conn 0 External Clock Conn 4 External Clock
GND	Ground reference for digital signals	—
NC	No connection	—

CONNECTOR 1 and CONNECTOR 3

Figure 4 and Figure 5 show the pinout information for CONNECTOR 1 and CONNECTOR 3. The AO connectors are identical on each device, but differ between modules. Pin descriptions are described in the table below the pinout diagrams.

Figure 4. PXIe-7890 Analog Output (AO) Connectors

Figure 5. PXIe-7891 Analog Output (AO) Connectors

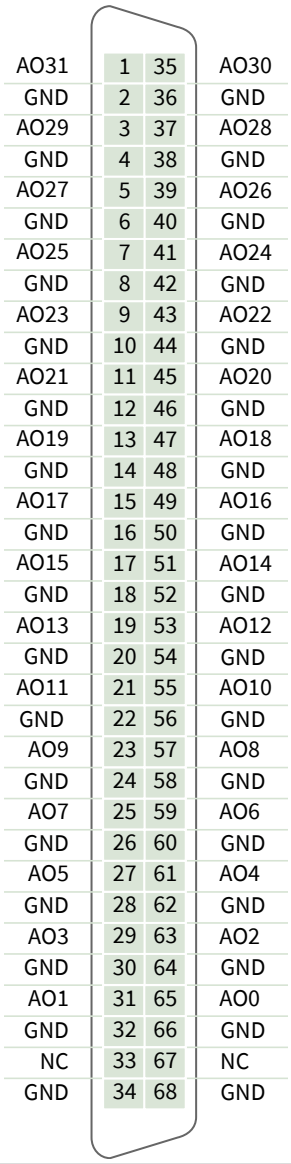


Table 4. Pin Descriptions for CONNECTOR 1 and CONNECTOR 3

Pin	Description	Signal Name in LabVIEW
AO <0..15> (PXIe-7890) AO <0..31> (PXIe-7891)	Analog output signal connection	PXIe-7890: ▪ Calibrated: Conn1 AO / Ch <0..15>

Pin	Description	Signal Name in LabVIEW
		▪ Calibrated: Conn3 AO / Ch <0..15> ▪ Uncalibrated: Conn1 AO Raw / Ch <0..15> ▪ Uncalibrated: Conn3 AO Raw / Ch <0..15> PXIe-7891: ▪ Calibrated: Conn1 AO / Ch <0..31> ▪ Calibrated: Conn3 AO / Ch <0..31> ▪ Uncalibrated: Conn1 AO Raw / Ch <0..31> ▪ Uncalibrated: Conn3 AO Raw / Ch <0..31>
GND	Ground reference for the analog output signal	—
NC	No Connection	—

CONNECTOR 2

Figure 6 and Figure 7 show the pinout information for CONNECTOR 2, the analog input VHDCI front panel connector. Pin descriptions are described in the table below the pinout diagrams.

Figure 6. PXIe-7890 Analog Input (AI) VHDCI Connector

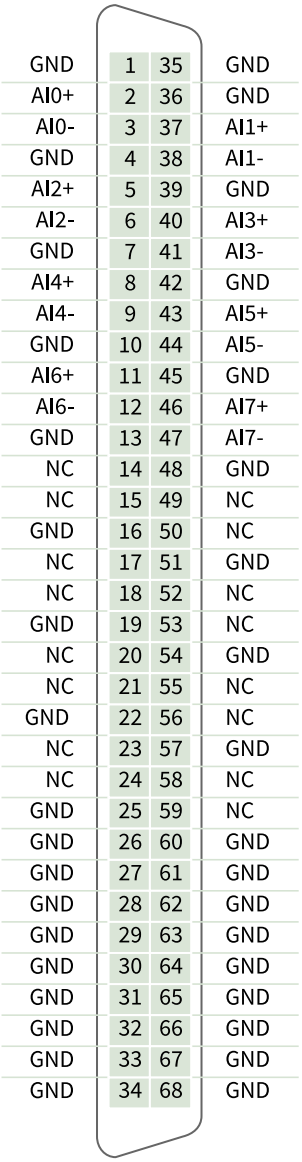


Figure 7. PXIe-7891 Analog Input (AI) VHDCI Connector

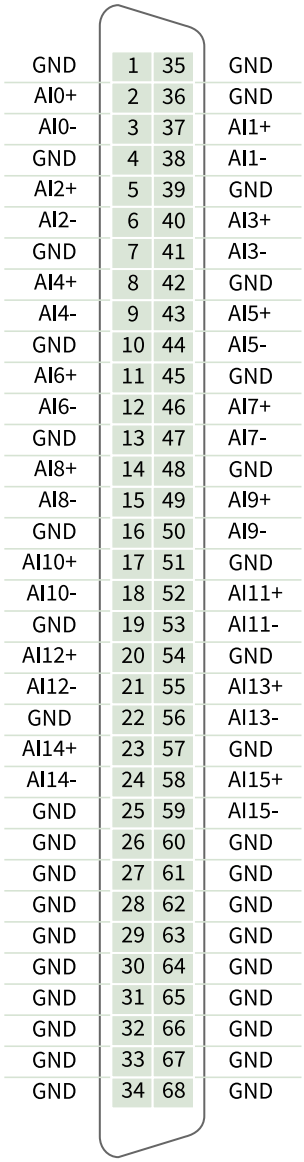


Table 5. Pin Descriptions for CONNECTOR 2

Pin	Description	Signal Name in LabVIEW
AI <0+...7+> (PXIe-7890) AI <0+...15+> (PXIe-7891)	Positive analog input signal connection	PXIe-7890: ▪ Calibrated: Conn2 AI / Ch <0..7>

Pin	Description	Signal Name in LabVIEW
AI <0-...7-> (PXIe-7890) AI <0-...15-> (PXIe-7891)	Negative analog input signal connection	▪ Uncalibrated:Conn2 AI / Ch <0..7> PXIe-7891: ▪ Calibrated: Conn2 AI / Ch <0..15> ▪ Uncalibrated:Conn2 AI / Ch <0..15>
GND	Ground reference for the analog input signal	—
NC	No connection	—

Preparing the Environment

Ensure that the environment you are using the PXIe-7890 in meets the following specifications.

Temperature	
Operating	0 °C to 55 °C
Storage	-40 °C to 71 °C
Humidity	
Operating	10% to 90%, noncondensing
Storage	5% to 95%, noncondensing
Pollution Degree	2
Maximum altitude	2,000 m (800 mbar) (at 25 °C ambient temperature)

Notice This device is intended for use in indoor applications only.

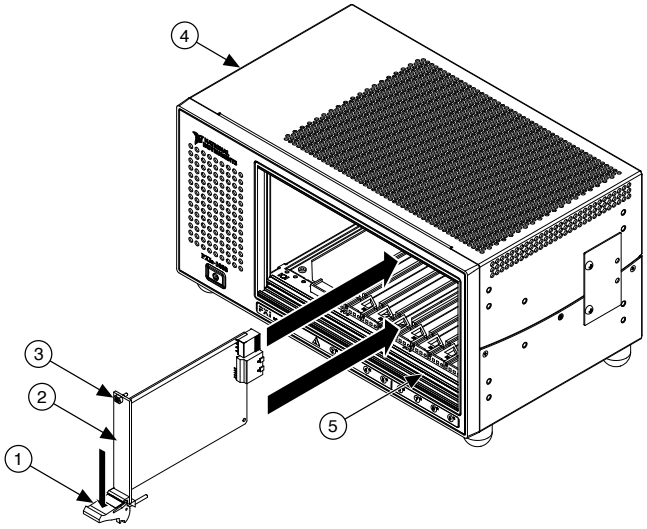
Note Refer to the device specifications on ni.com/manuals for complete specifications.

Installing the PXIe-7890/7891 Module

This section contains instructions for installing the PXIe-7890 or PXIe-7891 module in a PXI Express chassis. Refer to your chassis user manual for specific instructions and warnings. To install the module, complete the following steps:

1. Connect the AC power source to the PXI Express chassis before installing the module. The AC power cord grounds the chassis and protects it from electrical damage while you install the module.
2. Ensure that the chassis is powered off.
3. Inspect the slot pins on the chassis backplane for any bends or damage prior to installation. Do not install any module if the backplane is damaged.
4. Remove the black plastic covers from all the captive screws on the module front panel.
5. Touch any metal part of the chassis to discharge static electricity.
6. Place the module edges into the module guides at the top and bottom of the chassis, as shown in the following figure. Slide the module into the slots until it is fully inserted. Slide the module to the rear of the chassis, making sure that the injector/ejector handle is pushed down.

Figure 8. Installing the Module



1. Injector/Ejector Handle2. PXIe-7890/7891 Module3. Front Panel Mounting Screws (2x)4. PXI Express Chassis5. Module Guides

7. When you begin to feel resistance, push up on the injector/ejector handle to fully seat the module into the chassis frame. Secure the module front panel to the chassis using the module front-panel mounting screws.

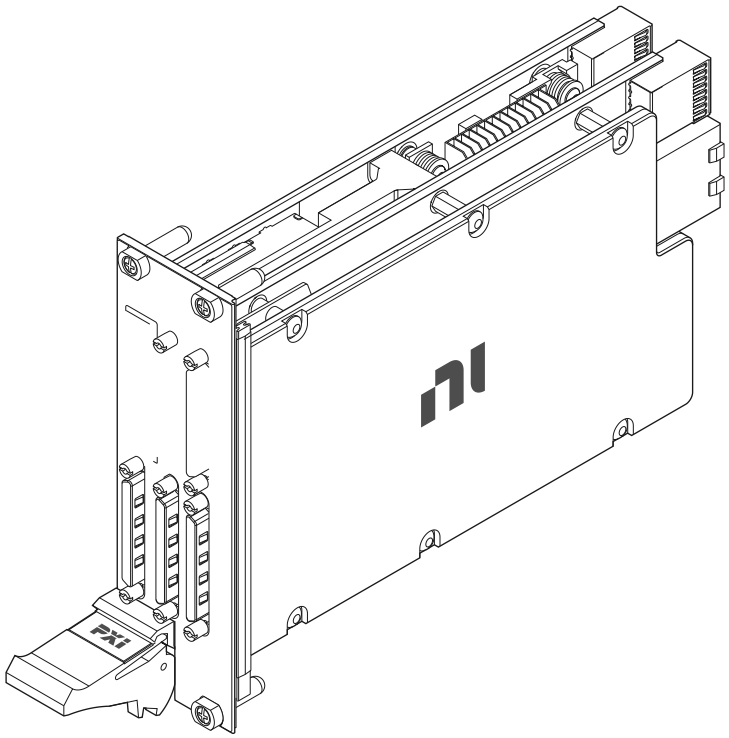
> **Note** Tightening the top and bottom mounting screws increases mechanical stability and also electrically connects the front panel to the chassis, which can improve the signal quality and electromagnetic performance.

8. Cover all empty slots using EMC filler panels or fill using slot blockers to maximize cooling air flow, depending on your application.
9. Leave the chassis powered off until you have installed the PXIe-7890 or PXIe-7891 module.

Installing the Hot Pluggable QSFP Module

1. Hold the QSFP module with the pull-tab facing the left.
2. Remove the protective cover from the opposite end of the pull-tab. Leave the dust plug inserted in the pull-tab end.

Figure 9. QSFP Module Install



3. With the pull-tab facing the left, align the QSFP module with the socket opening at PORT 0 or PORT 1 on the PXIe-7890/7891. Carefully slide the QSFP module into the port.
4. Use your thumb to press firmly on the QSFP module until it fully seats into PORT 0 or PORT 1.

> **Note** The QSFP module must be fully seated in PORT 0 or PORT 1 for the PXIe-7890/7891 to detect a connection.

5. Power on the chassis.

To protect the QSFP module from dust and debris, NI recommends leaving the dust plug inserted in the pull-tab end of the module until you are ready to connect a cable.

Installing the Software

You must be an Administrator to install NI software on your computer.

1. Install an ADE, such as LabVIEW or LabWindows™/CVI™.
2. Download the driver software installer from ni.com/downloads.
   NI Package Manager downloads with the driver software to handle the installation. Refer to the NI Package Manager Manual for more information about installing, removing, and upgrading NI software using NI Package Manager.
3. Follow the instructions in the installation prompts.

   Note Windows users may see access and security messages during installation. Accept the prompts to complete the installation.

4. When the installer completes, select **Restart** in the dialog box that prompts you to restart, shut down, or restart later.

   Note Install LabVIEW FPGA Compilation Tool for Vivado if you want to use the local compile server to compile a LabVIEW FPGA bit file.

Configuring the PXIe-7890/7891 in MAX

Use Measurement & Automation Explorer (MAX) to configure your NI hardware. MAX informs other programs about which NI hardware products are in the system and how they are configured. MAX is automatically installed with FlexRIO.

1. Launch MAX.
2. In the configuration tree, expand **Devices and Interfaces** to see the list of installed NI hardware.
   Installed modules appear under the name of their associated chassis.
3. Expand your **Chassis** tree item.
   MAX lists all modules installed in the chassis. Your default names may vary.

> **Note** If you do not see your module listed, press <F5> to refresh the list of installed modules. If the module is still not listed, power off the system, ensure the module is correctly installed, and restart.

4. Record the identifier MAX assigns to the hardware. Use this identifier when programming the PXIe-7890/7891.
5. Self-test the hardware by selecting the item in the configuration tree and clicking **Self-Test** in the MAX toolbar.
   The MAX self-test performs a basic verification of hardware resources.

Troubleshooting

If an issue persists after you complete a troubleshooting procedure, search our KnowledgeBase for additional information our technical support engineers create as they answer common user questions and resolve unexpected issues.

What Should I Do if the PXIe-7890/7891 Does Not Appear in MAX?

1. In the MAX configuration tree, expand **Devices and Interfaces**.
2. Expand the **Chassis** tree to see the list of installed hardware, and press <F5> to refresh the list.
3. If the module is still not listed, power off the system, ensure that all hardware is correctly installed, and restart the system.
4. Navigate to the Device Manager by right-clicking the Start button, and selecting **Device Manager**.
5. Verify the PXIe-7890/7891 appears in the Device Manager.
   a. Under an NI entry, confirm that a PXIe-7890/7891 entry appears.

> **Note** If you are using a PC with a device for PXI remote control system, under **System Devices**, also confirm that no error conditions appear for the **PCI-to-PCI Bridge**.

b. If error conditions appear, reinstall the PXIe-7890/7891 driver.

What Should I Do if the PXIe-7890/7891 Fails the Self-Test?

1. Restart the system.
2. Launch MAX.
   - Failed self-test Perform self-calibration, then perform the self-test again. The PXIe-7890/7891 must be calibrated to pass the self-test.
   - Failed self-calibration Perform self-calibration again.
3. Power off the chassis.
4. Reinstall the failed module in a different slot.
5. Power on the chassis
6. Perform the self-test again.

What Should I Do if the AO Channel on Connector 3 (LLAO) Is Not Operational

1. Check for an error returned in the IO Error node: **304335 (NIFLEXRIO_Status_AnalogOutputShutdown)**. This error indicates that the output channel(s) is shut down to protect against excessive power consumption or temperature. Check the status of analog output channel(s) to determine which channel(s) is shut down. Download the bit file again to restore normal operation of analog output channel(s).
2. Check if there is any fault condition on the IO pins connection.
3. Make sure the chassis cooling fan is still functional.
4. Restart the Test VI to reset the module.

Why Does DC Voltage Remain at the AO Channel When Connector 3 (LLAO) is Shut Down in Over-Temperature Condition?

Up to 3.5 V of residue voltage may remain on Connector 3, depending on the AO configuration on dual output range channels before the shutdown occurs. This is not a hardware issue, but if it occurs, you can reset the module through the Test VI and power up again to reset all channels to default 0 V output.

What Should I Do if the Driver Returns Power Shutdown Status to Prevent Excessive Power Consumption?

1. Check for an error returned in the IO Error node: **-304313 (NIFLEXRIO_Status_PowerShutdown)** . This error indicates that the device has shut down to protect against excessive power consumption. Check airflow and cooling, and download the bit file again. To avoid this error, monitor the power consumption, power shutdown threshold, and margin of the device. If necessary, reduce FPGA power consumption.
2. Check the air flow and cooling of the PXI chassis.
3. Restart the Test VI to reset the module.
4. Monitor the power consumption and power shutdown threshold.
5. If power is near to the power shutdown threshold, reduce the power consumption from AO or FPGA.